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# Dynamic program for selecting syari'ah share for maximum profit

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**ABSTRACT**
The right investment can increase a person's income by placing a number of funds in an investment instrument. One of the investment instruments is investing in the capital market by buying a number of stocks with good fundamentals. The selection of syari'ah shares is the right choice for the Indonesian people, most of whom are Muslim. The method used to select Islamic stocks in this study is dynamic programming. Simulations carried out with dynamic program algorithms produce selected syari'ah stocks, namely ACES, ICBP, SMGR and ANTM in order to get the maximum profit. Among the five shares, the one that provided the greatest return was ANTAM shares. This was proven in 2025 when ANTAM's share price rose by 22% even though the Indonesian economy was sluggish. ANTAM shares are given priority as shares that an investor must own.

**Keywords:**
dynamic programming, syari'ah share, maximum profit

## Introduction

Everyone wants when they are old they will not experience financial difficulties. One way to achieve this is to invest from a young and productive age. Investment is a means by which an individual can generate an increase in income from several funds placed in an investment instrument, such as gold, property, securities, or shares, for a specified period (Hidayati 2017). The main goal of a person investing is to achieve financial freedom as early as possible. Financial freedom is achieved when a person no longer works for money, but money works for that person.

One of the investment instruments that jumped sharply during the COVID-19 pandemic was investment in the capital market. According to data released by the OJK (Financial Services Authority) at the end of February 2021 the number of investors in the capital market has reached 4.51 million, whereas at the end of 2020 the number was around 3.88 million, which means that there has been an increase in the number of investors in the capital market by 16,24%. (https://investasi.kontan.co.id/news/wah-pandemi-covid-19-picu-percepat-nomor-investor-pasar-modal-dan-reksadana). Stock prices in the capital market are indeed volatile, but for an investor who is good at choosing stocks with good fundamentals, he will definitely get a significant profit..

The syari'ah lifestyle has become a trend of living in Indonesia because the majority of Indonesian citizens are Muslim, so that in investing, some people will prefer syari'ah shares which are believed not to conflict with the principles of Islam. According to the OJK, Syari'ah shares are securities which are evidence of the participation of a certain amount of capital into the company so that shareholders have rights from the results of the company's operations (Choirunnisak 2019). The current range of syari'ah stock indices include the Indonesian Syari'ah Stock Index (ISSI), the Jakarta Islamic Index (JII), and the Jakarta Islamic Index 70 (JII70). Evaluation of syari'ah shares by ISSI, JII and JII70 is carried out twice a year.

An investor typically seeks to maximise profit when investing. Stock investors can benefit from rising stock prices (capital gains) and dividends. Investors must be careful in choosing stocks to be included in their portfolio, if they choose the wrong stock or just take the stock, it will not be a profit but a loss because the stock price cannot rise but falls continuously until it is delisted from the stock exchange. . One of the advantages of dynamic programs in stock transactions is their flexibility and low time complexity (Jonathan Benedict 2014)

In mathematics, there is one way to choose Islamic stocks that can choose stocks with good fundamentals and can provide maximum benefits, namely dynamic program algorithms. In this paper, we will discuss how to determine a syari'ah stock portfolio that can provide maximum profit.

The term shares in the KBBI is defined as a proof of ownership of the share capital of a limited liability company that grants dividend rights and others according to the size of the paid-up capital. Shares are proof of ownership of equity/funds in a company (Yulia 2016). According to (Darmadji and Fakhruddin 2012) shares are defined as a sign of ownership of a person or institution in a company or limited liability company. The form of shares is in the form of a piece of paper that explains that the owner of the paper is the owner of the company that issued the securities.

Based on the trading performance, the stock can be divided into three, namely 1) blue chip stock, which is the stock of a company that has a high reputation as a leader in a similar industry whose income is stable and always provides dividends. 2) income stock, namely stocks that can provide higher dividends than the previous year's average dividend. 3) growth stocks (growth stocks-well known), namely stocks that have high income growth, are leaders in similar industries and have a high reputation. In addition, there are also known growth stocklessers, namely stocks that are not leaders in similar industries but have growth stocks. 4) Speculative shares are shares of a company that does not consistently provide high income in the future. 5) Cyclic stocks, namely stocks that are not affected by the general macroeconomic or business situation. (Darmadji and Fakhruddin 2012)

Syari'ah shares are proof of ownership of a company whose business activities and how to manage them do not conflict with syari'ah principles. The syari'ah principle referred to here is that the company does not violate syari'ah principles such as gambling, usury and producing illegal goods (Choirunnisak 2019). There are several indexing of syari'ah stocks, including JII, JII70 and ISSI. Some syari'ah stocks according to JII for the period of August 2021 include: ACES, ADRO, AKRA, ANTM, BRIS etc.

Dynamic programming is a mathematical technique used to make decisions from a series of interrelated choices. Dynamic programming was first developed by a scientist named Ricard Bellman in 1957. In this case dynamic programming provides a systematic procedure for determining the optimal combination of decisions. The main purpose of this model is to facilitate the solution of optimization problems that have certain characteristics. Optimization problems can be solved by linear programming and dynamic programming. The difference between a dynamic program and a linear program is that in the dynamic program there is no standard mathematical formulation and the type of problem solving that is generally approached (Maslihah 2018)

## Methods

This research was completed using the dynamic programming method which has the following completion steps:

a. Determine the solving procedure (forward or backward)
b. Define stages (stages), stage is represented by the number of shares (1, 2,…, n)
c. Define a state variable (stage) at each stage, variable shows the projected amount of profit for each share

e. Define the return function at each stage, $f_n^*(s_n) = \max_{x_n=0,1,\ldots,s_n} f_n(s_n, x_n)$

f. Define the transition function

g. Define a recursive function $f_n^*(s_n) = \max_{x_n=0,1,\ldots,s_n} \{p_n(x_n) + f_{n+1}^*(s_n - x_n)\}, n = 1, .., \mathrm{n}$

h. Calculation

i. Determine the optimal solution with backtracking

**Results and Discussions**

This study examines the selection of syari'ah shares listed on idx.co.id using a dynamic programming approach. This research begins with conducting a literature study to collect the required amount of information. The researcher collected a number of relevant library sources such as related books and journals. Researchers study these sources and apply them to solve problems in this study using dynamic methods.

The data (Table 1) that researchers need includes data related to stock investment, specifically data on Islamic stock prices for the last five years (2017–2021), as well as data on company dividends. Researchers obtained a list of Islamic stocks according to the Jakarta Islamic Index (JII) and data on Islamic stock prices from www.idx.co.id. Researchers get data on the amount of dividends from RTI Business. The list of names of syari'ah shares registered by JII for the period February - July 2021 consists of 30 names of syari'ah shares consisting of several industrial sectors. The researcher chose syari'ah stocks indexed by JII as well as indexed by LQ 45. The researcher also chose syari'ah stocks that had positive profit projections and regularly gave dividends to investors. Researchers obtained these criteria as many as 8 stocks, namely KLBF, ACES, ICBP, SMGR, UNTR, INTP, ANTM, and PTBA. The following table shows the selected LQ45 indexed Islamic stock prices:

**Table 1.** Average share price from year 2017 – 2021

| Stock code | 2021 | 2020 | 2019 | | 2017 |
|---|---|---|---|---|---|
| **KLBF** | 1.472,75 | 1.445,41 | 1.597,60 | 1.449,58 | 1.605,83 |
| **ACES** | 1.505,63 | 1.542,73 | 1.719,10 | 1.367,91 | 1.033,75 |
| **ICBP** | 8.642,16 | 10.021,90 | 10.700,97 | 8.970,83 | 8.591,67 |
| **SMGR** | 9.781,25 | 9.875,00 | 12.472,92 | 9.775,00 | 9.722,91 |
| **UNTR** | 21.938,40 | 20.031,62 | 24.453,68 | 33.187,50 | 29.258,33 |
| **INTP** | 12.002,00 | 13.010,83 | 20.200,00 | 17.831,25 | 18.308,75 |
| **ANTM** | 2.479,25 | 785,95 | 993,29 | 2.400,83 | 703,75 |
| **PTBA** | 2.417,37 | 2.148,83 | 3.147,33 | 3.828,33 | 11.050,83 |

Table 2 shows the average share price data per year obtained from idx.co.id, for 2021 the data is only until July because the data is currently running. This price is the price per share. The provisions for buying shares that apply in Indonesia are in units of lots, where one lot is equal to one hundred shares.

**Table 2.** dividend value in 2021

| Stock code | Dividend percentage | Dividends/shares | Dividend/lot |
|---|---|---|---|
| **KLBF** | 2,53 | 37,26 | 3.726,06 |
| **ACES** | 2,42 | 36,44 | 3.643,62 |
| **ICBP** | 2,49 | 215,19 | 21.518,98 |
| **SMGR** | 2,16 | 211,28 | 21.127,50 |
| **UNTR** | 3,26 | 715,19 | 71.519,18 |
| **INTP** | 7,06 | 847,34 | 84.734,12 |
| **ANTM** | 0,64 | 15,87 | 1.586,72 |
| **PTBA** | 3,36 | 81,22 | 8.122,36 |

To calculate the selection of the best stock that can provide the greatest return with a dynamic programming algorithm, it is necessary to know the projected profit of each stock. The stock price data will be analyzed by examining the annual growth or decline in stock prices compared to the previous year. Projected growth is calculated by averaging growth or subtraction and then multiplying by the last year's stock price. The results of the projected growth of each share are as follows in Table 3.

**Table 3.** Growth projection and profit projection

| Stock code | 2021 | 2020 | 2019 | 2018 | avarage | Growth projection | Profit projection |
|---|---|---|---|---|---|---|---|
| **KLBF** | 0,45 | -6,82 | 3,31 | 3,11 | 0,01 | 19,44 | 3.243,47 |
| **ACES** | -2,40 | -10,26 | 25,67 | 32,33 | 11,33 | 17.064,15 | 20.707,77 |
| **ICBP** | -13,77 | -6,35 | 19,29 | 4,41 | 0,90 | 7.748,29 | 29.267,27 |
| **SMGR** | -0,95 | -20,83 | 27,60 | 0,54 | 1,59 | 15.547,54 | 36.675,04 |
| **UNTR** | 9,52 | -18,08 | -26,32 | 13,43 | -5,36 | -117.655,21 | -46.136,03 |
| **INTP** | -7,75 | -35,59 | 13,28 | -2,61 | -8,17 | -98.018,84 | -13.284,72 |
| **ANTM** | 215,45 | -20,87 | -58,63 | 241,15 | 94,27 | 233.727,03 | 235.313,75 |
| **PTBA** | 0,45 | -6,82 | 3,31 | 3,11 | 0,01 | -61.868,83 | -53.746,47 |

Based on table 4, there are 5 stocks that have positive growth projections, namely KLBF, ACES, ICBP, SMGR and ANTM. Stocks that have positive growth projections become stocks that will be analyzed using dynamic programming algorithms, because stocks that have positive growth projections will definitely provide maximum profit if they invest in these stocks, in other words, these stocks will continue to grow in the future.

**Table 4.** Selected stocks for analysis

| Stock code | Stock price | Profit projection |
|---|---|---|
| **KLBF** | 147.275,00 | 3.243,47 |
| **ACES** | 150.563,00 | 20.707,77 |
| **ICBP** | 864.216,00 | 29.267,27 |
| **SMGR** | 978.125,00 | 36.675,04 |
| **ANTM** | 247.925,00 | 235.313,75 |

The problem of selecting syari'ah shares in order to get the maximum profit will be solved by a dynamic program algorithm that has the following recurrence relation:

$$f_0(y) = 0$$

$$f_k(y) = -\infty$$

$$f_k(y) = \max\{ f_{k-1}(y), p_k + f_{k-1}(y - c_k)\}$$

Description:

1. Stage (k) is the process of entering stocks into the portfolio
2. Status (y) states the remaining capital after entering shares in the previous stage

Next, the dynamic programming algorithm is calculated using a case study. In this casel, the researcher will use a capital of three million rupiah. The result of the calculation is as follows in Tables 5-9.

Based on the table in step 5, it can be interpreted that if an investor has three million rupiah to invest for 1 year by choosing to buy 3 lots of ACES shares, 1 lot of ICBP shares, 1 lot of SMGR shares, and 2 lots of ANTM shares, the profit obtained by the investor is Rp 598,689 or 19.96% over 1 year. Based on table 5, it can be concluded that the researcher recommends that investors buy ANTAM, ACES, and SMGR shares, adjusted to their capital. Although ANTAM shares are the primary focus, stock diversification must still be implemented. The stock that provides the highest return is ANTAM shares, this is proven in 2025, ANTAM's share price rose 22%

despite the sluggish Indonesian economy. Calculated, investing in the capital market is far more profitable than investing in deposits which can only provide deposit interest of around 4% - 7% per year. Investments in the capital market are indeed fluctuating in price when viewed in the short term, but in the long term, investing in the capital market will provide quite large returns.

**Table 5.** Stage 1: $f_1(y) = \max\{f_0(y), 3243 + f_0(y-0,2)\}$

| $y$ | $f_0(y)$ | $3243 + f_0(y-0,2)$ | **Optimum solution** | |
|---|---|---|---|---|
| | | | $f_1(y)$ | $x_1^*, x_2^*, x_3^*, x_4^*, x_5^*$ |
| **0** | 0 | $\infty$ | 0 | 0,0,0,0,0 |
| **0,5** | 0 | 9729 | 9729 | 3,0,0,0,0 |
| **1** | 0 | 19458 | 19458 | 7,0,0,0,0 |
| **1,5** | 0 | 32430 | 32430 | 10,0,0,0,0 |
| **2** | 0 | 42159 | 42159 | 13,0,0,0,0 |
| **2,5** | 0 | 51888 | 51888 | 16,0,0,0,0 |
| **3** | 0 | 64860 | 64860 | 20,0,0,0,0 |

**Table 6.** Stage 2: $f_2(y) = \max\{f_1(y), 20707 + f_1(y-0,15)\}$

| $y$ | $f_1(y)$ | $20707 + f_1(y-0,15)$ | **Optimum solution** | |
|---|---|---|---|---|
| | | | $f_2(y)$ | $x_1^*, x_2^*, x_3^*, x_4^*, x_5^*$ |
| **0** | 0 | $\infty$ | 0 | 0,0,0,0,0 |
| **0,5** | 9729 | 62121 | 62121 | 0,3,0,0,0 |
| **1** | 19458 | 65828 | 65828 | 3,3,0,0,0 |
| **1,5** | 32430 | 69535 | 69535 | 7,3,0,0,0 |
| **2** | 42159 | 73243 | 73243 | 10,3,0,0,0 |
| **2,5** | 51888 | 76950 | 76950 | 13,3,0,0,0 |
| **3** | 64860 | 80657 | 80657 | 16,3,0,0,0 |

**Table 7.** Stage 3: $f_3(y) = \max\{f_3(y), 29267 + f_2(y-1)\}$

| $y$ | $f_2(y)$ | $29267 + f_2(y-1)$ | **Optimum solution** | |
|---|---|---|---|---|
| | | | $f_3(y)$ | $x_1^*, x_2^*, x_3^*, x_4^*, x_5^*$ |
| **0** | 0 | $\infty$ | 0 | 0,0,0,0,0 |
| **0,5** | 62121 | $\infty$ | 62121 | 0,3,0,0,0 |
| **1** | 65828 | 29267 | 65828 | 0,0,1,0,0 |
| **1,5** | 69535 | 91388 | 91388 | 0,3,1,0,0 |
| **2** | 73243 | 95095 | 95095 | 3,3,1,0,0 |
| **2,5** | 76950 | 98802 | 98802 | 7,3,1,0,0 |
| **3** | 80657 | 122510 | 122510 | 10,3,1,0,0 |

**Table 8.** Stage 4: $f_4(y) = \max\{f_4(y), 36675 + f_3(y-1)\}$

| $y$ | $f_3(y)$ | $36675 + f_3(y-1)$ | **Optimum solution** | |
|---|---|---|---|---|
| | | | $f_4(y)$ | $x_1^*, x_2^*, x_3^*, x_4^*, x_5^*$ |
| **0** | 0 | $\infty$ | 0 | 0,0,0,0,0 |
| **0,5** | 62121 | $\infty$ | 62121 | 0,3,0,0,0 |
| **1** | 65828 | 36675 | 65828 | 3,3,0,0,0 |
| **1,5** | 91388 | 98796 | 98796 | 0,3,0,1,0 |
| **2** | 95095 | 102503 | 102503 | 3,3,0,1,0 |
| **2,5** | 98802 | 128063 | 128063 | 0,3,1,1,0 |
| **3** | 122510 | 131770 | 131770 | 3,3,1,1,0 |

Table 13. Stage 5: $f_5(y) = \max\{ f_5(y), 235313 + f_4(y-0,5)\}$

| $y$ | $f_4(y)$ | $235313 + f_4(y-0.5)$ | **Optimum solution** | |
|---|---|---|---|---|
| | | | $f_5(y)$ | $x_1^*, x_2^*, x_3^*, x_4^*, x_5^*$ |
| **0** | 0 | $\infty$ | 0 | 0,0,0,0,0 |
| **0,5** | 62121 | 470626 | 470626 | 0,0,0,0,2 |
| **1** | 65828 | 532747 | 532747 | 0,3,0,0,2 |
| **1,5** | 98796 | 536454 | 536454 | 3,3,0,0,2 |
| **2** | 102503 | 569422 | 569422 | 0,3,0,1,2 |
| **2,5** | 128063 | 573129 | 573129 | 3,3,0,1,2 |
| **3** | 131770 | 598689 | 598689 | 0,3,1,1,2 |

## Conclusion

Sharia-compliant stocks that can provide maximum returns with dynamic algorithm programs include ACES, ICBP, SMGR, and ANTM. Based on the dynamic algorithm analysis of these five stocks, the researcher recommends selecting the following stocks in order: ANTAM, ACES, SMGR, KLBF, and ICBP. ANTAM shares provide the highest returns. Therefore, it is recommended that investors invest the largest portion of their capital in ANTAM shares. Investing in the capital market can generate significantly higher returns than investing in deposits, provided investors are skilled at selecting stocks with sound fundamentals and buying at the right time. Further research is recommended to analyze the use of technical analytics in determining the optimal time to sell selected stocks.

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