

Johnny Bolivar & Patricia Romero

Problem Statement

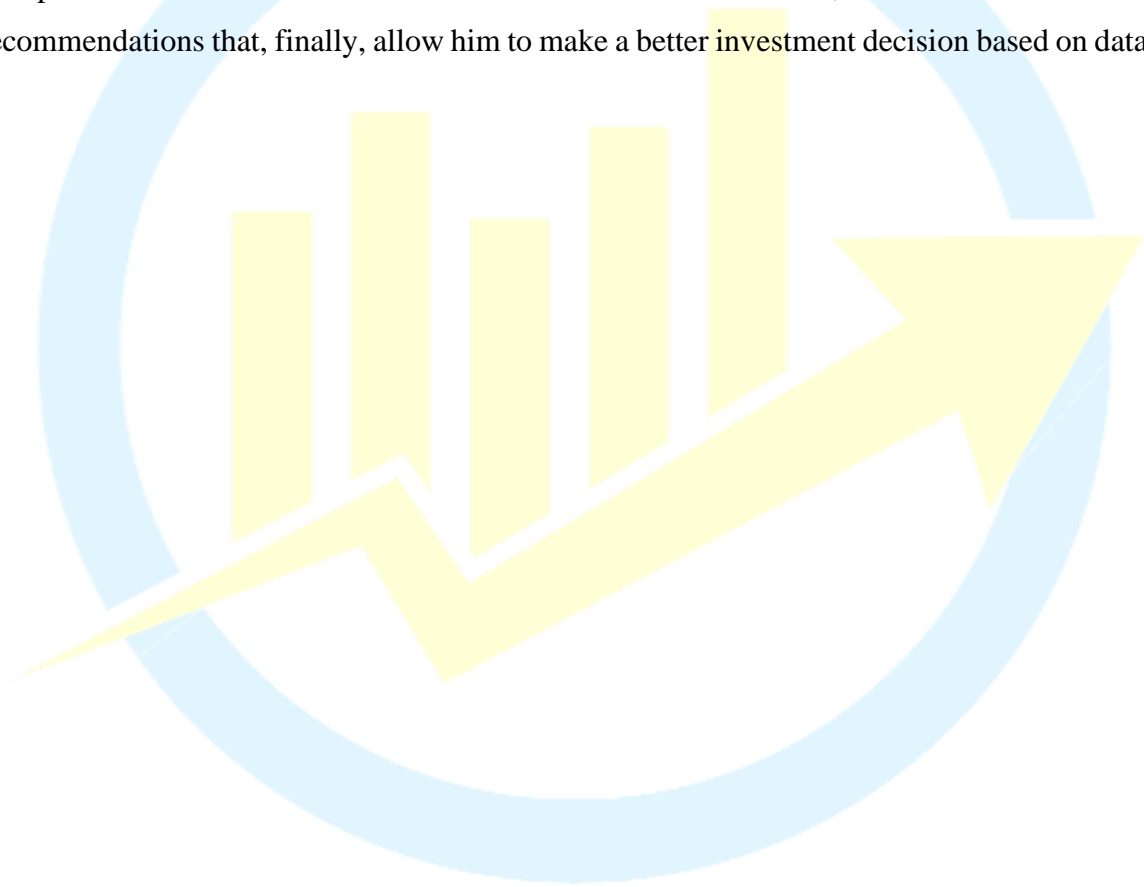
An investor from Southeast Asia, specifically Singapore, wishes to build an investment portfolio with two different types of stocks. After the publication of the results of a macroeconomic study done by a data analyst hired by the investor, in two Southeast Asian countries, such as Malaysia and Singapore, it was determined that both were suitable for investment; then, the investor, decided to place his investment capital in two of the main stock market indexes belonging to each country, namely: Malaysia's FTSE Bursa Malaysia KLCI (FBMKLCI) and Singapore's Straits Times Index (STI), each grouping the top 30 companies, by market capitalization, within their respective countries, the equivalent of the Standard & Poor's 500 (S&P 500) in the United States. The study conducted by the data analyst was based on the analysis of four macroeconomic indicators of these two countries: GDP growth, GDP per capita, inflation and unemployment rate. After choosing the stocks from the stock market indexes, the investor is now faced with the problem of knowing in what proportion he should buy these stocks to obtain the most convenient portfolio for him.

There are two types of investors in the market, located at both ends of the spectrum of investor profiles: the conservative investor and the risky investor. The conservative investor prioritizes the security of his investment, he seeks a lower risk even if the dividend return is the lowest. On the other hand, the risky investor's priority is to obtain the highest dividend returns while assuming the highest investment risks. In the middle of both investor profiles there is a grey scale between investors who are closer to a more conservative profile, without being conservative, and there are those who take a little more risk to obtain a little more profit margin; and those who are closer to a riskier profile, without being risky, those who take a slightly safer position at the expense of a lower profit margin.

Aware of the spectrum of investor profiles, the Singaporean investor commissions the data analyst to build a visual model, in the form of a dashboard, or interactive scorecard, showing what percentage of each stock an investor should buy according to their profile, what percentage of Singaporean and Malaysian stocks would a conservative investor buy,

what percentage of those same stocks would a risky investor buy, and what percentage of those stocks would someone at either end of the spectrum buy. Thus, the Singaporean investor, knowing what type of investor profile he has, can place himself in the spectrum and know the percentage of shares of each stock index that he should buy and have in his investment portfolio.

Besides, the investor asks the data analyst to build another dashboard showing the behavior of the 4 indicators of the macroeconomic study previously conducted to determine whether it was possible to invest in Malaysian and Singaporean stock indexes and to prepare a report with the results obtained from both visual models, with conclusions and recommendations that, finally, allow him to make a better investment decision based on data.



Theoretical Framework

Macroeconomy

Macroeconomic indicators: Are statistics or data readings that reflect the economic circumstances of a given country, region or sector. They are used by analysts and governments to assess the current and future health of the economy and financial markets.

Gross Domestic Product (GDP): The market value of the final goods and services produced in a country during a certain period. Gross domestic product is determined in two ways: by total expenditure on goods and services or by total income earned by producing goods and services.

Nominal Gross Domestic Product (Nominal GDP): It is the value of final goods and services produced in a given year, considering the prices that prevailed in that same year. Nominal GDP is just a more precise name for GDP.

Gross Domestic Product per Capita (GDP per Capita): It is Nominal GDP divided by the total population.

$$GDP \text{ per Capita} = \frac{\text{Nominal GDP}}{\text{Total Population}} \quad (1)$$

Inflation: It is the percentage change in the price level over a given period: year, quarter, month, fortnight. To estimate the price level, what is called the Consumer Price Index is calculated. The Consumer Price Index (CPI) is a measure of the average prices paid by urban consumers for a fixed basket of consumer goods and services.

Unemployment Rate: This is an indicator of the number of people who want a job and cannot find it. The unemployment rate is expressed as the percentage of people in the labor force who are unemployed.

$$\text{Unemployment Rate} = \frac{\text{Number of unemployed persons}}{\text{Workforce}} \quad (2)$$

Investments

Investment: Purchase of assets that increase in value over time and provide returns in the form of income payments or capital gains.

Investor: Individuals or legal entities that forgo the expenditure or consumption of their wealth in the present, placing it in a project or company, with the purpose of obtaining a return in the future.

Portfolio: A portfolio or investment portfolio is the total set of financial assets held by an investor. It may be composed of fixed income, variable income or mixed instruments such as bonds, stocks, currencies, cash, commodities and derivative products.

Stock Market Index: This is a number calculated from the prices of the securities that comprise it in the market at any given time. The change in value over time of a stock index reflects its profitability, so tracking these indexes is common among those who invest in the stock market.

Bursa Malaysia: Malaysian Stock Exchange.

Singapore Exchange: Singapore Stock Exchange.

FTSE Bursa Malaysia KLCI (FBMKLCI): A stock market index comprising the 30 largest companies listed in Bursa Malaysia.

Straits Times Index (STI): A stock market index that tracks the performance of the top 30 companies listed on the Singapore Exchange.

Results and Analysis of Results

Macroeconomic Indicators



Figure 1. Dashboard image showing the performance of the macroeconomic indicators studied, from 2010 to 2022.

Figure 1 shows the behavior of the 4 macroeconomic indicators used to conduct the study, ranging from 2010 to 2022, comparing the performances of Malaysia and Singapore with each other, and with respect to the world average. The line graph shows the annual trend of the indicator, and the bars show the average performance during those 13 years. The data for this study were taken from the World Bank's official website, and data for January 2024 has not yet been published for the year 2023.

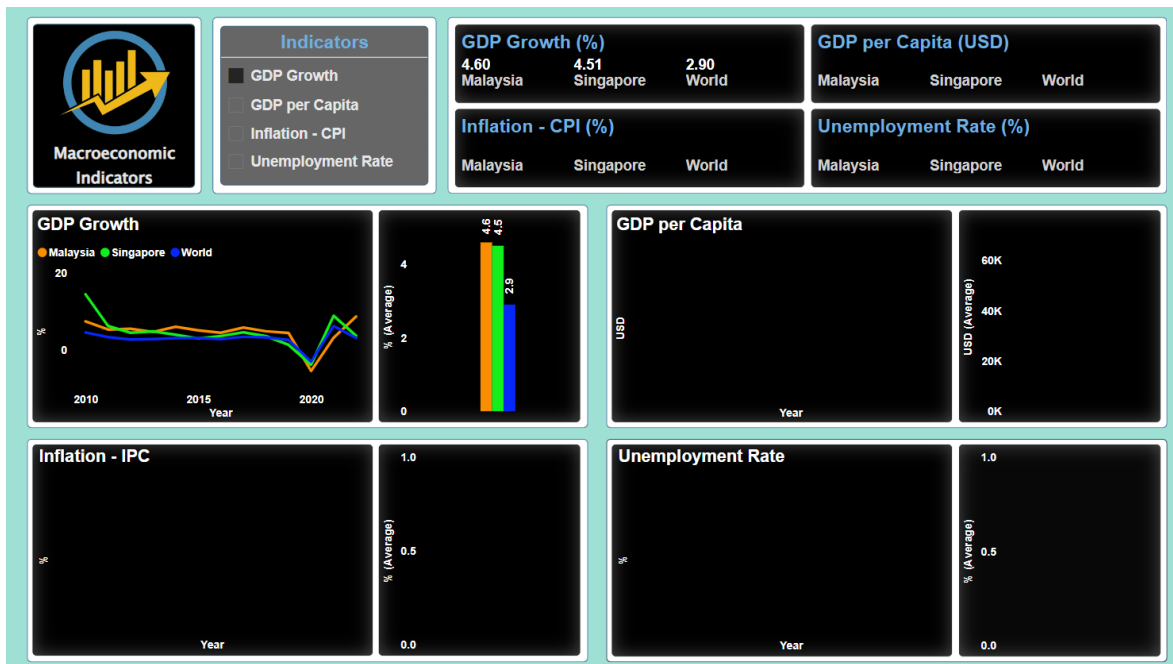


Figure 2. GDP Growth from 2010 to 2022.

Figure 2 shows that during most of the period 2010 to 2022, both Malaysia and Singapore were favorably above the world average in terms of GDP Growth, reflecting this behavior in the bar chart; both countries had a stable and similar performance over time, of this macroeconomic indicator, as can be seen in the line chart, except in 2020, the year of the COVID 19 pandemic, where the trend falls, but then grows significantly, both for Malaysia and Singapore, for the year 2021 and 2022.

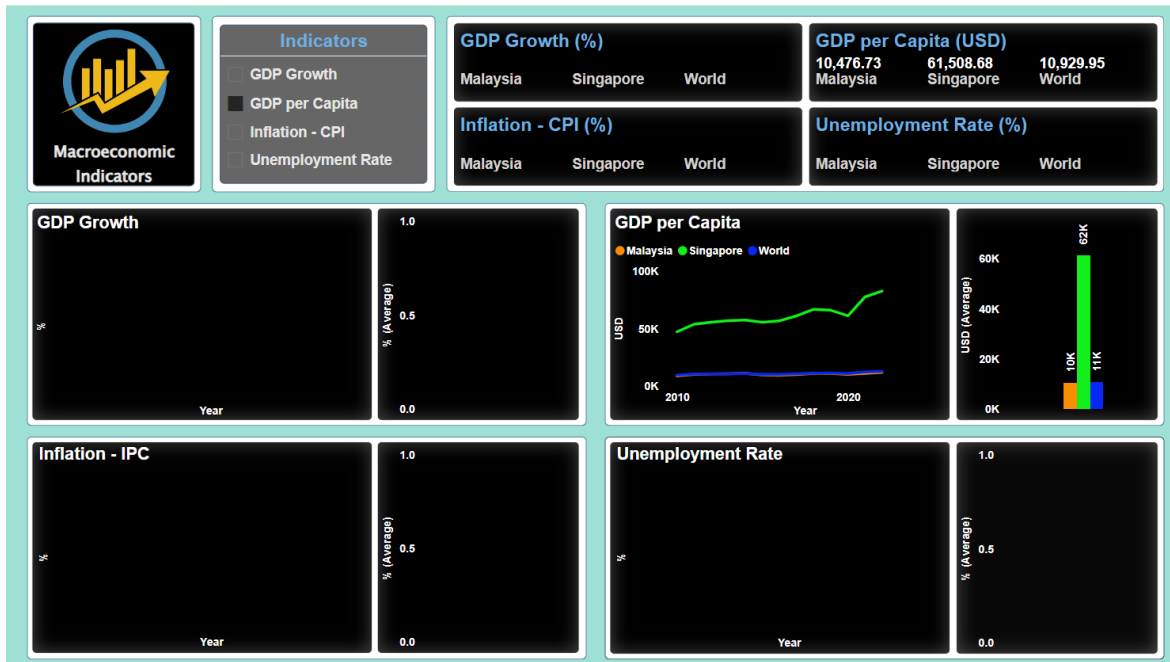


Figure 3. GDP per Capita from 2010 to 2022.

Figure 3 contrasts the significant difference in terms of Singapore's GDP per capita, with values well above those of Malaysia and the world average, from 2010 to 2022, with Singapore being the eighth richest country in the world, according to the latest World Bank data for 2022. On the other hand, Malaysia exhibits a behavior, although below the world average, not so far from it and with a slight upward trend. There is also a contraction of this indicator in 2020 for both Malaysia and Singapore, the year of the global COVID 19 pandemic, but a growth for the subsequent years 2021 and 2022.



Figure 4. Inflation - CPI from 2010 to 2022.

Figure 4 presents how inflation, according to the Consumer Price Index (CPI), for both Malaysia and Singapore, is below the world average, as seen in the bar chart. In the line graph it can be seen that in most of the period 2010 - 2022 both countries maintain inflation below the world average, even in 2020, when the global pandemic of COVID 19 emerges; and despite the fact that for the years 2021 and 2022 this indicator increases with respect to 2020, it still remains below the world average.



Figure 5. Unemployment Rate from 2010 to 2022.

Figure 5 depicts the Unemployment Rate for both Malaysia and Singapore well below the world average, as seen in the bar chart. The annual behavior, as shown in the line graph, is to maintain an almost constant trend over time, and below the world average, for both Malaysia and Singapore. This trend tends to grow for both countries in 2020, the year of the COVID 19 pandemic, but always remaining below the world average.

Investor Portfolio

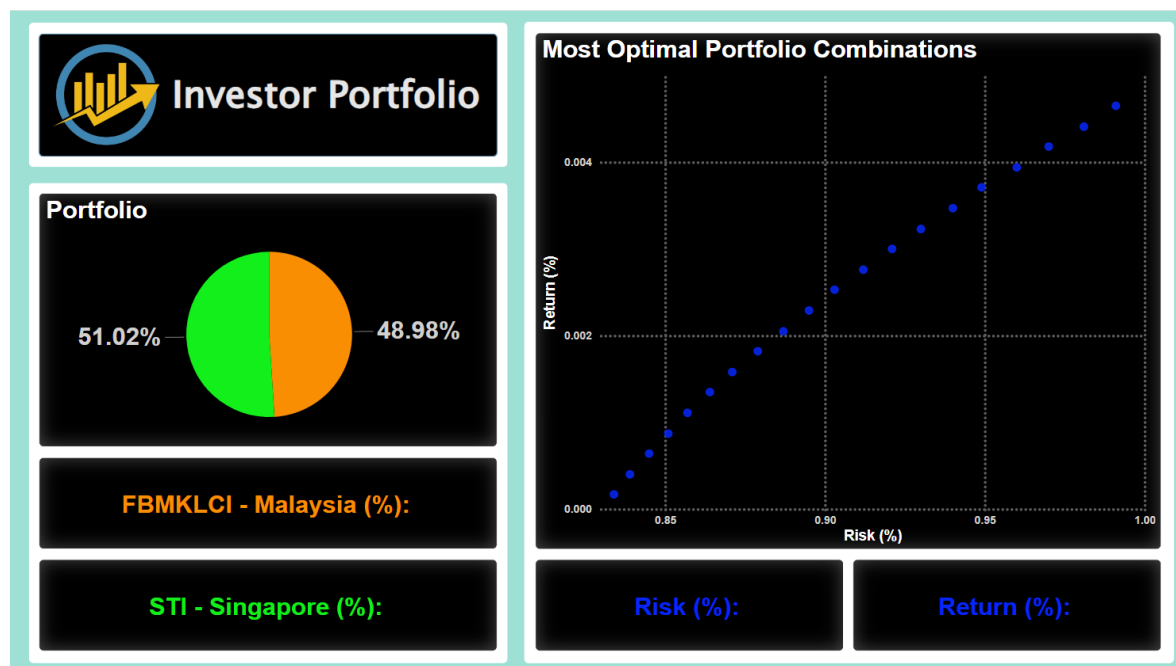


Figure 6. Dashboard image showing the most optimal portfolio combinations for the investor.

Figure 6 shows the most optimal portfolio combinations available to the investor. To determine these portfolios, the efficient frontier method of Harry Markowitz (1952) was used and the stock indexes FBMKLCI (Malaysia) and STI (Singapore), from the Yahoo Finance website, were consulted to obtain the data. The graph on the right shows 20 points on a risk-return coordinate plane, representing the 20 most optimal and suitable portfolios for the investor. The pie chart shows the percentage of shares to be purchased according to the selected portfolio; when no specific portfolio is selected, the dashboard shows the average portfolio by default.

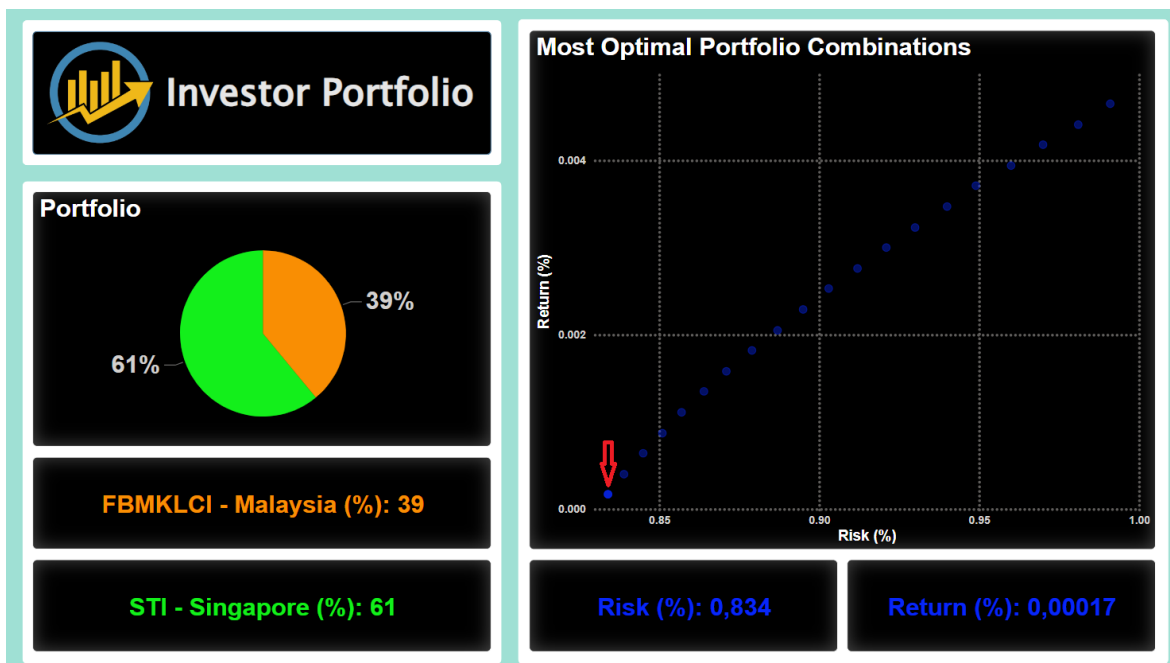


Figure 7. Portfolio with lower risk and lower return.

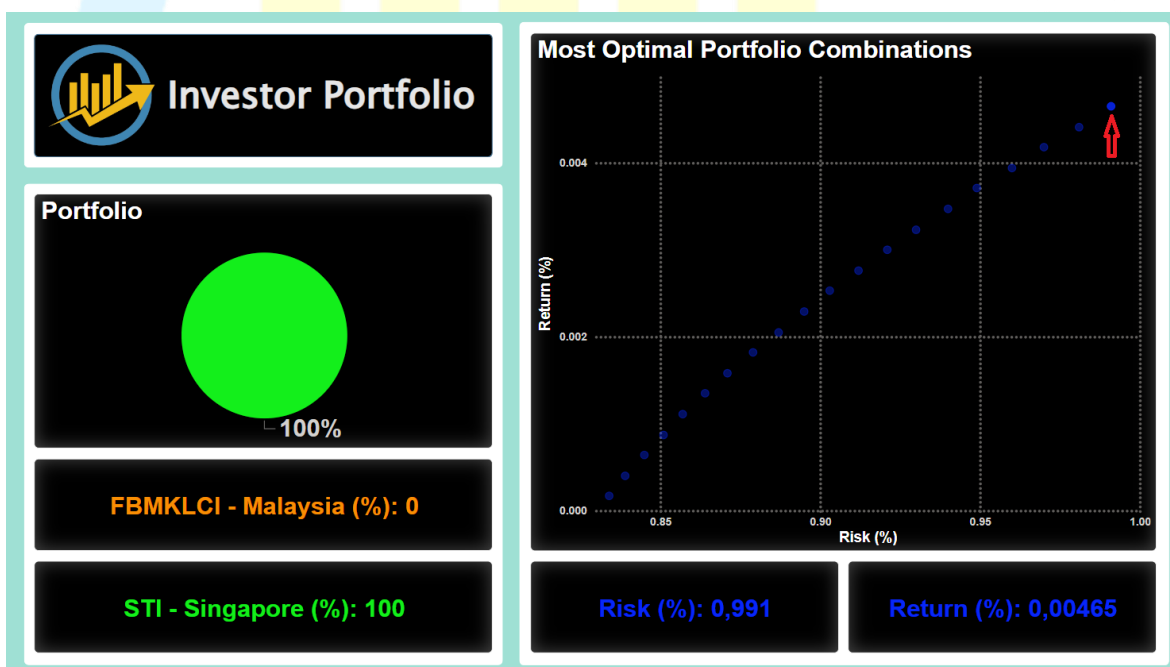


Figure 8. Portfolio with higher risk and higher return.

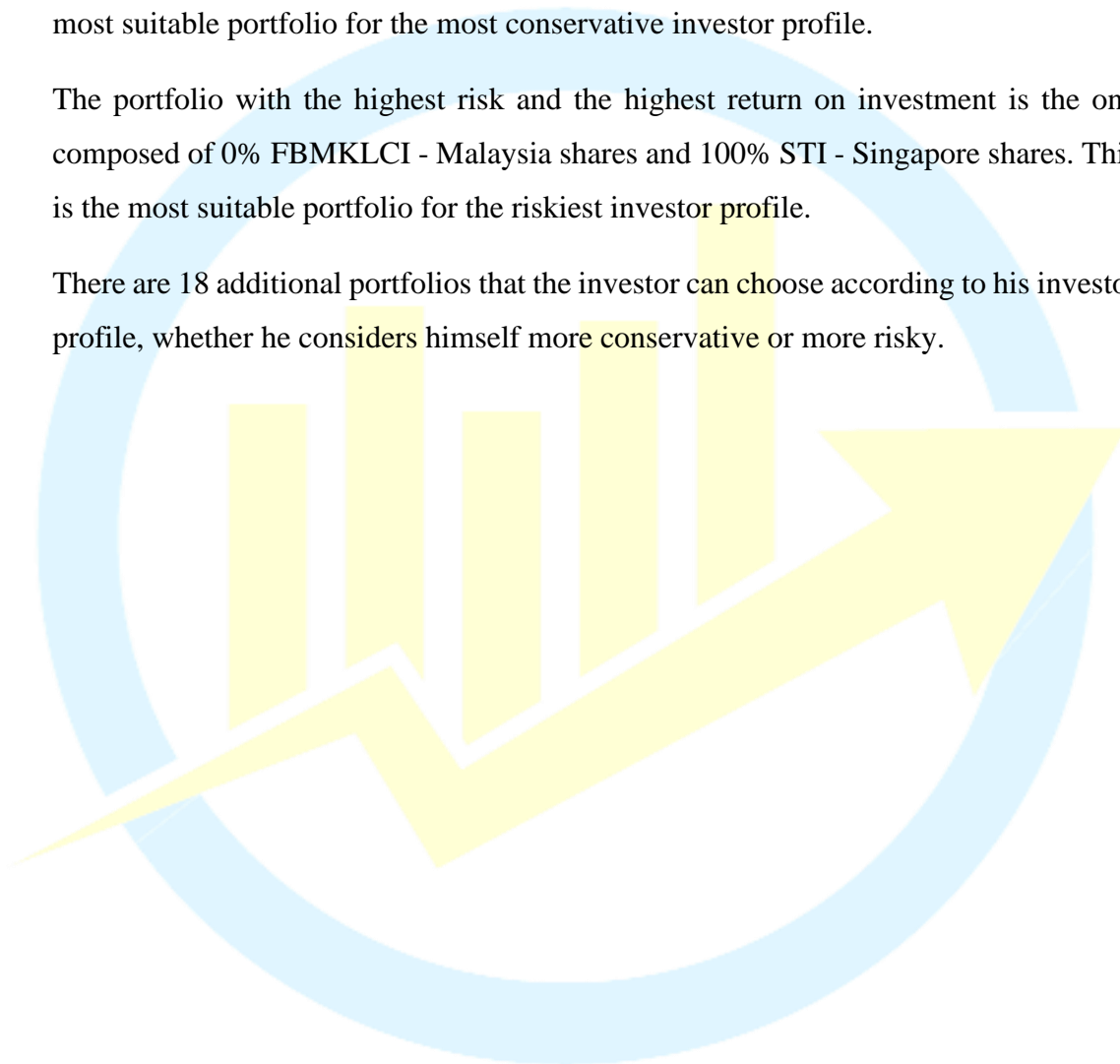
Figure 7 shows, by means of the red arrow, the portfolio with the lowest risk and lowest return on investment, which consists of 39% of FBMKLCI - Malaysia shares and 61% of STI - Singapore shares. On the contrary, Figure 8 shows, by means of the red arrow, the portfolio with the highest risk and the highest return on investment, with 0% of FBMKLCI -

Malaysia shares and 100% of STI - Singapore shares. In the middle of both extremes are 18 additional portfolios where the investor can choose, at his convenience, prioritizing more risk or return on investment (see dashboard). Note the trend that indicates that the greater the number of Singapore shares purchased by the investor, the greater the profit margin obtained from them, but at the same time, the greater the risk assumed on the investment.



CONCLUSIONS

1. Macroeconomic Indicators show a favorable performance of the Malaysian and Singaporean economies, which makes them suitable for stock market investment.
2. The portfolio with the lowest risk and lowest return on investment is the one composed of 39% of FBMKLCI - Malaysia shares and 61% of STI - Singapore shares. This is the most suitable portfolio for the most conservative investor profile.
3. The portfolio with the highest risk and the highest return on investment is the one composed of 0% FBMKLCI - Malaysia shares and 100% STI - Singapore shares. This is the most suitable portfolio for the riskiest investor profile.
4. There are 18 additional portfolios that the investor can choose according to his investor profile, whether he considers himself more conservative or more risky.



RECOMMENDATIONS

The 20 most optimal portfolios are those recommended to the investor so that he/she can choose the one that best suits his/her profile. Any portfolio you choose, other than these 20, will not be the most efficient and you will do so at your own risk and responsibility for the investment you make.



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