# ¿Which one is the best stock market index?

## A market study of the main stock indexes in the world

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# Introduccion and summary

The objective of this project is to carry out a financial analysis of the main stock market indexes in the world in order to determine which is the most convenient to invest in the long term. To answer this question, a calculation of risks and returns will be carried out in order to find the average annualized sharpe ratio of the last 20 years for each stock market index. We will find that the index with the highest accumulated return as well as the best sharpe ratio is the Nasdaq index.

In **section 1** (Data) we will explain the data used in this project, in **section 2** (methodology) the financial analysis criteria will be detailed , in **section 3** (results) we will show the main results of this project, and, in **section 4** (conclusion) the conclusions of the project, implications of the results and possible extensions will be explained.

This project was programmed and developed in the python language, but for simplicity purposes, this pdf was written and its purpose is to give a summary illustration of what the project is. Those people who are interested in the technical details of programming and coding of data analysis and financial analysis, you can see it in the notebook with the code saved in this same repository

# 1. Data

The data used in this project covers the period from 2002-01-01 to 2022-12-31 and the stock market indexes studied are:

**S&P500**: It is a stock index that includes the 500 largest companies in the United States. It is one of the most important indicators of the performance of the American stock market. **Dow Jones**: It is the oldest stock index in the United States and is made up of 30 leading companies in various sectors of the US economy.

**Nasdaq**: It is a stock index that includes more than 3,000 companies listed on the NASDAQ market, the second largest stock market in the United States. This index is composed mainly of technology companies.

**FTSE**: It is the most important stock market index in the United Kingdom and is made up of the 100 largest companies listed on the London Stock Exchange.

**DAX**: It is the most important stock index in Germany and is made up of the 30 largest companies listed on the Frankfurt Stock Exchange.

**Hang Seng**:It is the largest stock index in Hong Kong and is made up of the 50 largest companies listed on the Hong Kong Stock Exchange.

**Nikkei 225**: It is the most important stock index in Japan and is made up of the 225 largest companies listed on the Tokyo Stock Exchange.

**CAC 40**: is the benchmark stock index of the Paris Stock Exchange and represents the 40 companies with the highest market capitalization listed on this market.

**Kospi 200**: is the most important stock index in South Korea and is made up of the 200 largest and most liquid companies listed on the Korea Stock Exchange (KRX).

**Euro stoxx 100**: The Euro Stoxx 100 (also known as the EURO STOXX 50) is a European stock index that includes the 100 largest companies in the Eurozone, which are the countries that use the euro as their official currency.

**IMOEX.ME**: is the reference stock index of the Moscow Stock Exchange (MICEX), which is the main stock exchange in Russia. The index is made up of the 50 largest and most liquid companies listed on the Moscow Stock Exchange

The information that is extracted from each index is the most relevant in it for a stock market in one day. For example, for the S&P 500 the first 5 days of the period covered:

| Date | Open | High | Low | Close | Adj Close | Volume |
|---|---|---|---|---|---|---|
| 2002-01-02 | 1148.079956 | 1154.670044 | 1136.229980 | 1154.670044 | 1154.670044 | 1171000000 |
| 2002-01-03 | 1154.670044 | 1165.270020 | 1154.010010 | 1165.270020 | 1165.270020 | 1398900000 |
| 2002-01-04 | 1165.270020 | 1176.550049 | 1163.420044 | 1172.510010 | 1172.510010 | 1513000000 |
| 2002-01-07 | 1172.510010 | 1176.969971 | 1163.550049 | 1164.890015 | 1164.890015 | 1308300000 |
| 2002-01-08 | 1164.890015 | 1167.599976 | 1157.459961 | 1160.709961 | 1160.709961 | 1258800000 |

Where open is the price of the index when the day begins, close is the closing price, high is the maximum price reached in the day, low is the minimum price reached in the day, adj close is the closing price adjusted by distribution of dividends and stock splits, and the volume is the amount traded on the day The data used for this project was extracted from yahoo finance (https://finance.yahoo.com/).

**View of the open price time series chart of each index**
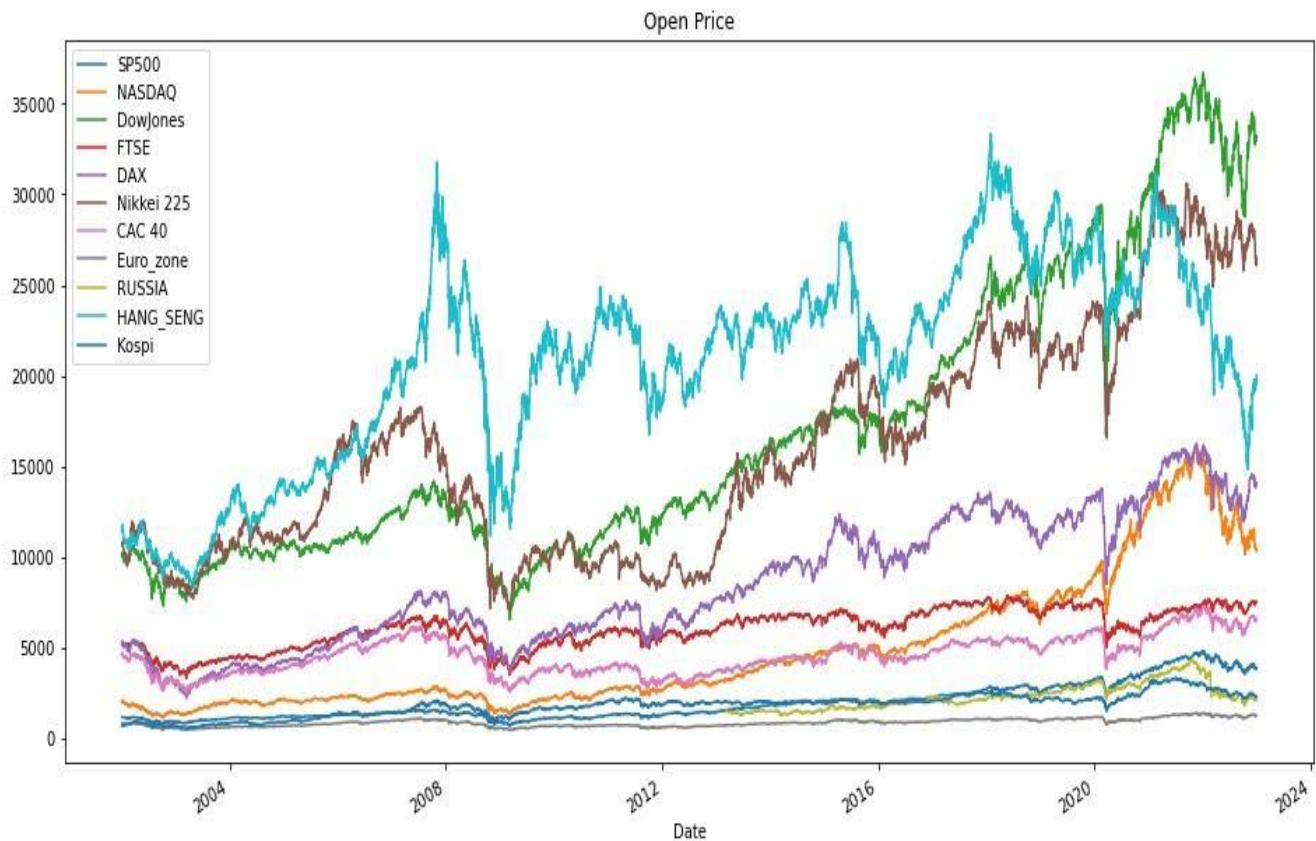


# 2. Methodology

In financial analysis, the calculation of the return (profit or benefit obtained from an investment in percentage or monetary terms. It is a measure of profitability that indicates how much money has been earned in relation to the amount invested) or the accumulated return (the sum of all the returns that have been obtained over time in an investment. It is the total profit generated by an investment from its inception to the current date) are not enough to determine if the realization of a financial investment is optimal, we also have to take into account the risk of the investment. In finance, returns generally have a normal distribution, so to determine the risk of an investment, the standard deviation of the return, or in other words, its volatility, is used as a proxy.

To decide which stock index is better to invest in the long term, we will use the sharpe ratio. The Sharpe Ratio is a measure for calculating risk-adjusted return, and this ratio has

become the industry standard for such calculations, so the best index to invest will be the one with the highest sharpe ratio

Sharpe ratio = (Mean portfolio return – Risk-free rate)/Standard deviation of portfolio return.

Annualized Sharpe Ratio = K-value * SR

K-values for various sampling rates:

- Daily = sqrt(252)
- Weekly = sqrt(52)
- Monthly = sqrt(12)

Since the annualized sharpe ratio will be calculated in this project, the 12-month US bond interest rate will be used as the risk free rate. This information was extracted from the bloomberg website (https://www.bloomberg.com/markets/rates-bonds/government-bonds/us)

# 3. Results

## Accumulated daily return time series chart
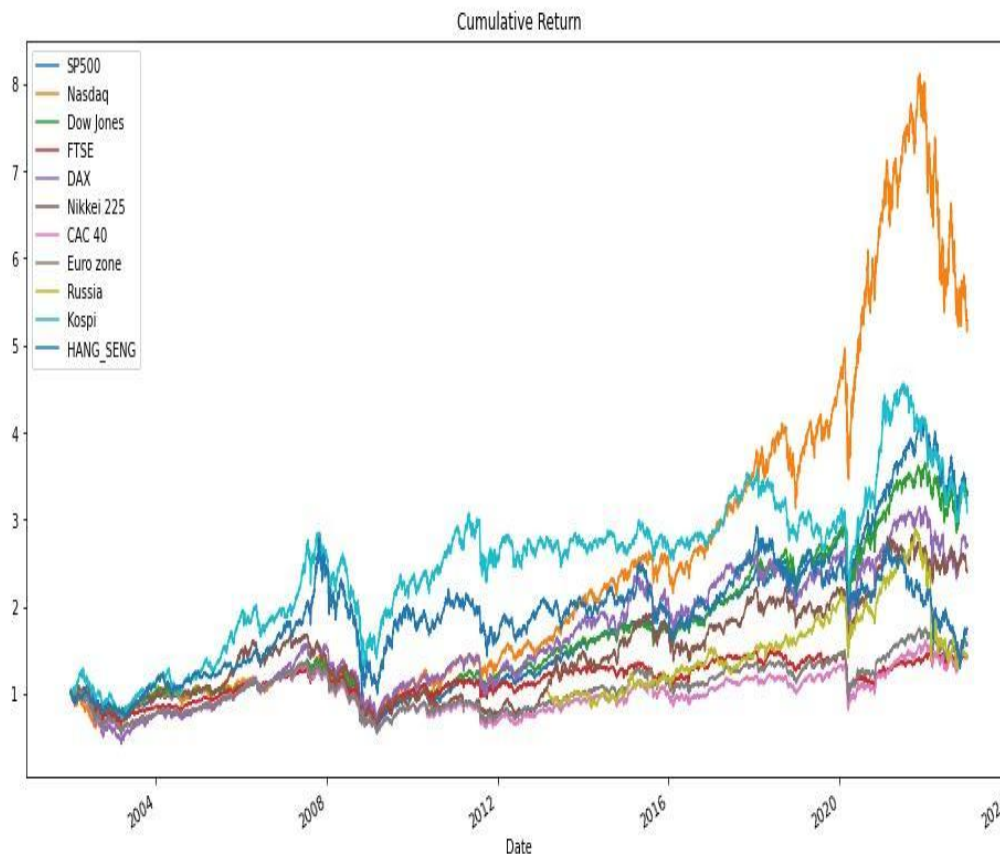
We can see that the highest cumulative return of the last 20 years was made by the Nasdaq index. But as we said in the previous section, we also need to know the risk of the investment.

To graphically represent the volatilities of the indices, density graphs were carried out, where the wider the bell, the more volatile the value.
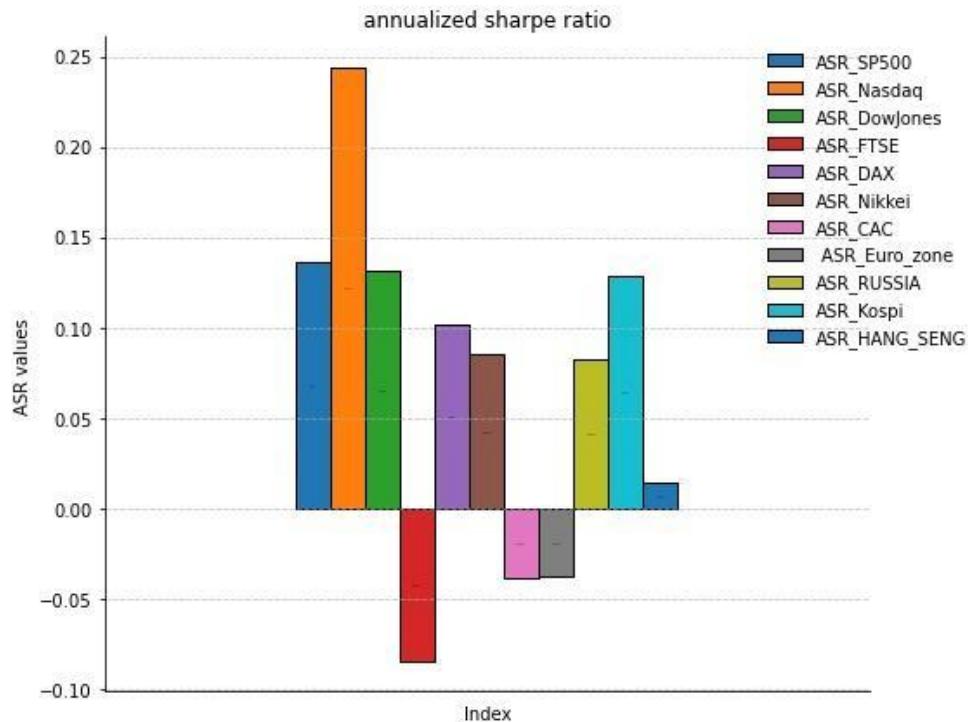
## Adjusted closing price density chart
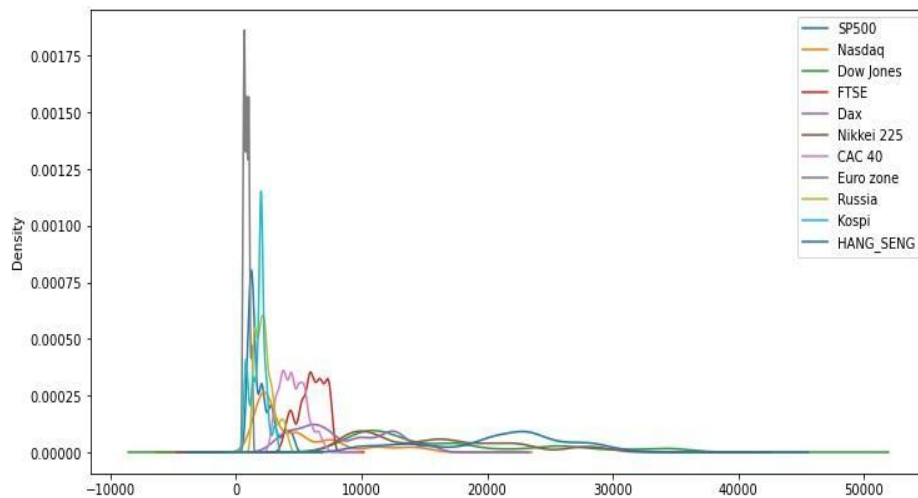


## Daily return density chart
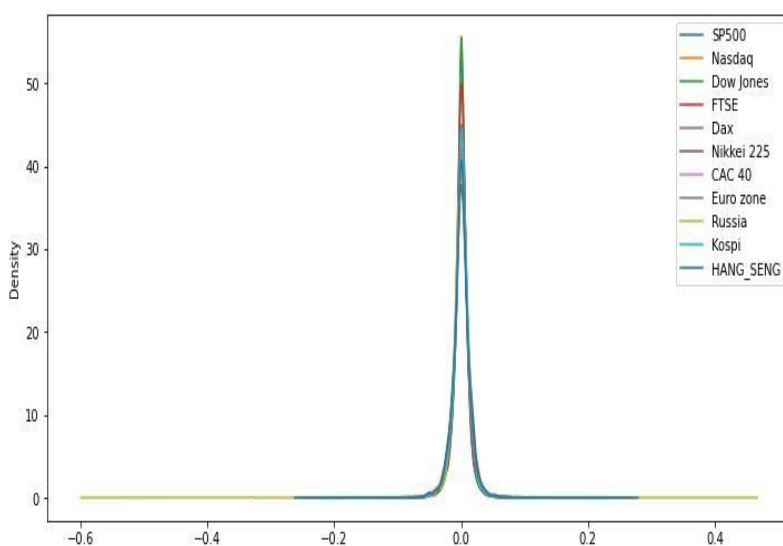


We can see in the previous graph that all the campaigns are practically overlapping, with which we could say that the returns of the indexes have practically the same volatility.

**Graph of each annualized sharpe ratio**



annualized sharpe ratio

As can be seen in the annualized sharpe ratio graph, the Nasdaq index is the one with the best risk-adjusted return.

# 4. Conclusion

Of all the stock indexes seen, the Nasdaq is the one with the highest risk-adjusted return, with which we could conclude that it is the best option among those selected, to invest in the long term.

In finance, there is no concept of the best investment. The investment decision is conditioned by the risk, and that risk is weighted differently by each investor according to their aversion to risk, which is subjective. This project is carried out under the assumption that investors are risk averse, with which the risk-adjusted return and the investor's utility have a positive correlation.

Note that, for simplicity, several stock indices that could be considered relevant to the analysis have been left out. With which, the same financial analysis carried out here could be extended to several more investment options.