

TIME-IN-THE MARKET VS TIMING THE MARKET:

A TRADING SYSTEM BASED ON GOOGLE
TRENDS



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ABSTRACT



Search engines are contemporarily used to scrutinize user attention allocation, such insights being helpful in the interpretation of the functioning of the overall economic environment, but more specifically, the stock market.

This paper examines the practicality of such engines, such as Google Trends, which can be used to construct an investing portfolio with higher returns than the benchmark, based on data reporting weekly concerns on some topics.

With the use of specific programming languages, we can observe how a buy-and hold portfolio behaves, compared to one constructed based on search engines, in the 2016 - end of 2021 time frame.

KEY WORDS



- STOCKS
- PYTHON
- GOOGLE TRENDS
- BUY AND HOLD
- RESEARCH
- TRADING SYSTEM
- RETURN
- BENCHMARK
- INVESTING

INTRODUCTION



The stock market has suffered several changes, both in its substance and in the trading style, correlated with the shift in trends and overall economic and societal environment behavior throughout the years.

The hypothesis that a regular buy-and-hold strategy over a stock portfolio is no longer satisfactory for an investor, considering all the refittings in the economic environment in the modern years, is what represented the catalyst for this paper.

Considering that the benchmark indicates a conservative return of the performance which is around 8%, the value desired to bring with this project is a better fit trading design with higher returns which are personalized with what the community undertakes.

METHODS



```
#the needed libray
import pandas as pd
import yfinance as yf
import seaborn as sns
import matplotlib.pyplot as plt
```

```
#extracting the data
trends = pd.read_csv(r'C:\Users\Teo\Desktop\googletrends\StockWorld.csv')
djia = yf.download("DJIA", start="2016-12-11", interval="1wk")
```

STEP 1: IMPORTING LIBRARIES AND EXTRACTING THE DATA

Several libraries needed to be imported in order to allow the import and display of data into different formats or plots. Next, the second part of the code takes the data from the CSV/ Excel files extracted from Google Trends and also downloads the data from the desired timeframe and splits it by weeks in order to easily observe the returns.

```
#we construct the dataframes
df = pd.DataFrame()
df["searches"] = trends.Adjusted
df["close"] = djia.reset_index().Close
df["pct_change"] = df.close.pct_change() + 1
df["N"] = df.searches.rolling(window=3).mean().shift(1)
df["n"] = df.searches - df.N
print(df)
```

STEP 2: CONSTRUCTING THE DATAFRAMES

The stencil for the table of data is created by naming the Headers of the columns which will subsequently be displayed in this paper and constructing the data set.

METHODS

```
#creating the signals
df["signal"] = ""

for i, data in enumerate(df.n):
    if data > 0:
        df.loc[i, "signal"] = 1
    else:
        df.loc[i, "signal"] = 0

df = df[3:]
df = df.reset_index()
print(df)
```

STEP 3: CREATING THE SIGNALS

The following step contains a for loop in order for the signals to be generated based on the previously imported data. Therefore, the value “1” was set for selling and “0” for buying. Also, the index was set to start after the first three weeks, in order to have some historical value before the first signal.

```
# we construct the portfolio and the returns
i = 0
current_port = 100
current_bh = 100
correct = 0
df["portfolio"] = 0
df["buyhold"] = 0
buy_signals = []
sell_signals = []

while i < len(df):
    if df.signal[i] == 0:
        current_port *= df["pct_change"][i]
        buy_signals.append(i)
        if df["pct_change"][i] > 1:
            correct += 1
    else:
        current_port /= df["pct_change"][i]
        sell_signals.append(i)
        if df["pct_change"][i] < 1:
            correct += 1

    current_bh *= df["pct_change"][i]

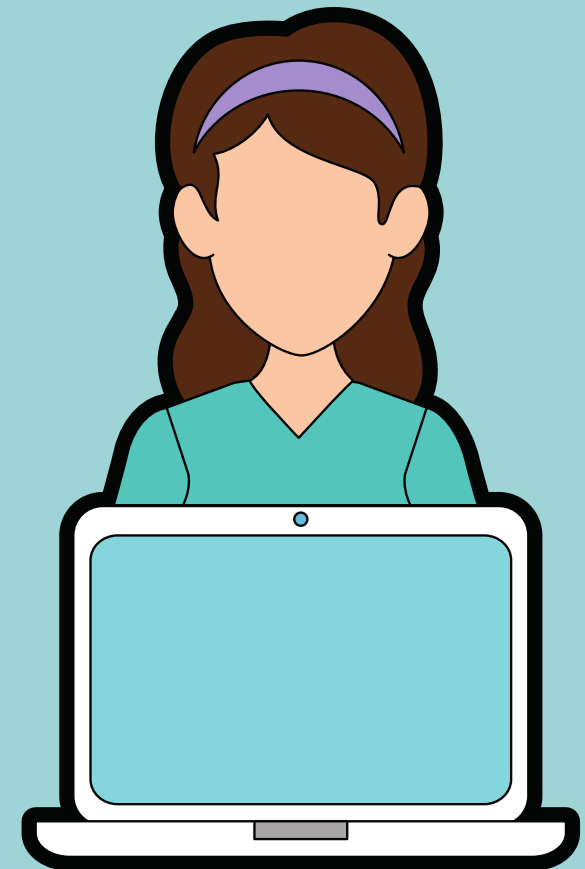
    df.loc[i, "portfolio"] = current_port
    df.loc[i, "buyhold"] = current_bh

    i += 1

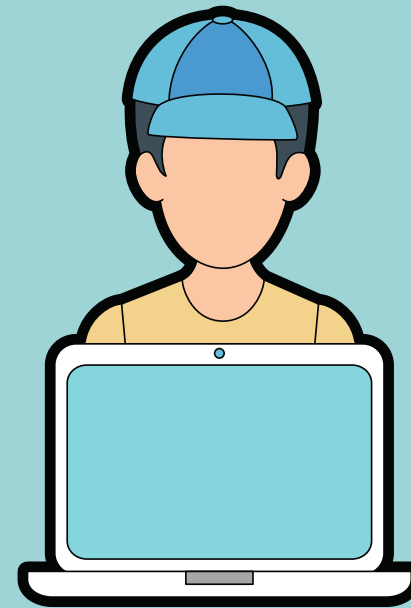
df["portfolio"].iloc[-1]
```

STEP 4: CONSTRUCTING THE PORTFOLIO

The next part of the code helps in processing the previously created signals and adjusting the buy and hold calculus in order to insert the results in the table which will be created.



METHODS



```
print("Annualised Buy-and-Hold Portfolio Return:",  
      round(((df["buyhold"].iloc[-1] / 100) ** (1 / (len(df)/52)) - 1) * 100, 1), "%")  
  
print("Accuracy:", round((correct / len(df)) * 100, 1), "%")  
print("Total Return:", round((df["portfolio"][len(df)-1] / 100) * 100, 1), "%")  
print("Annualised Google Portfolio Return:", round(((df["portfolio"][len(df)-1] / 100) ** (1 / (len(df)/52)) - 1) * 100, 1), "%")
```

STEP 5: CONSTRUCTING THE RETURNS

The figure illustrates the subsequent step of computing and displaying the results for the “Annualised Buy-and-Hold Portfolio Return”, “Accuracy”, “Total Return” and “Annualised Google Portfolio Results”. These computations are standardised return formulas for investment portfolios.

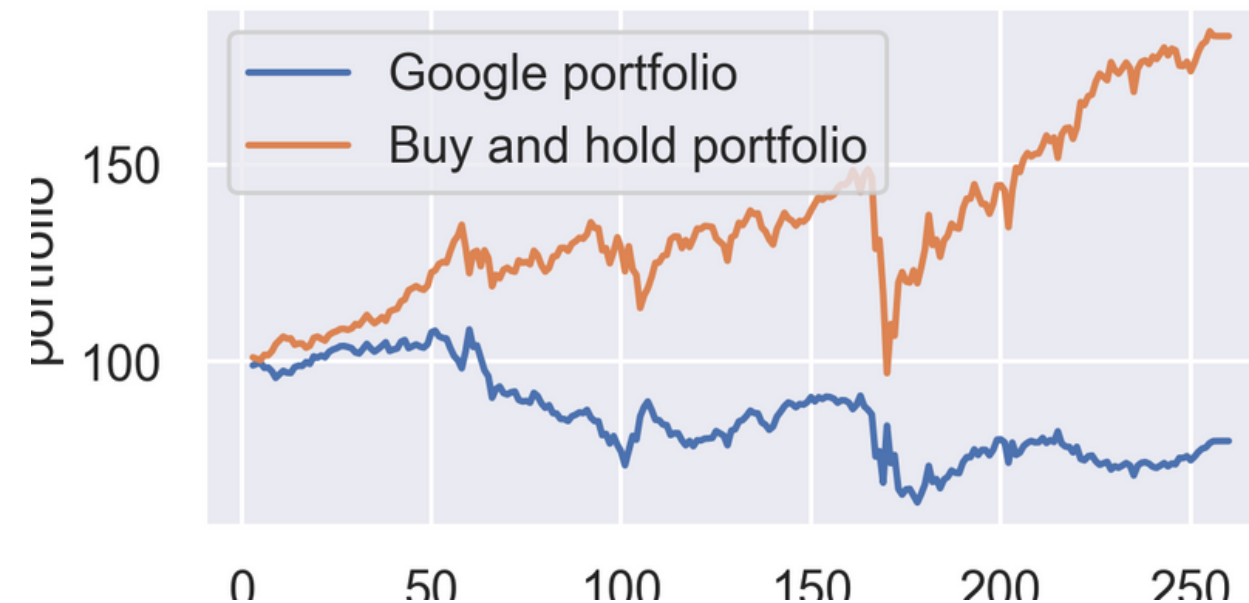
```
#Plotting everything  
sns.set()  
  
fig, ax = plt.subplots(1, 1, dpi=300)  
  
sns.lineplot(x="index", y="portfolio", data=df, ax=ax, label="Google portfolio")  
sns.lineplot(x="index", y="buyhold", data=df, ax=ax, label="Buy and hold portfolio")  
ax.legend()  
plt.show()  
  
fig, ax = plt.subplots(1, 1, dpi=300)  
  
sns.lineplot(x=df["index"], y=df["close"], ax=ax)  
sns.scatterplot(x=df["index"], y=df["close"][buy_signals], ax=ax, color="green")  
sns.scatterplot(x=df["index"], y=df["close"][sell_signals], ax=ax, color="red")  
plt.show()
```

STEP 6: PLOTTING THE DATA

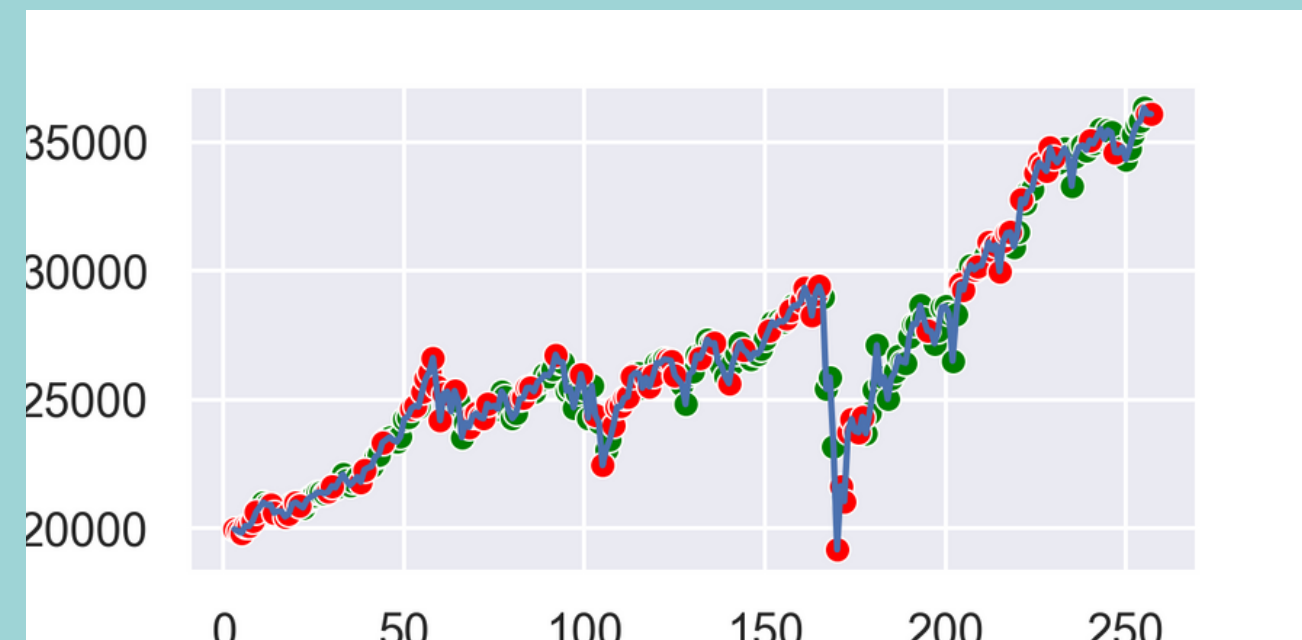
The final step is necessary in order to obtain a visual representation of the results through plotting the outputs, thus creating two graphs, one being a line chart and one a scatter chart.

RESULTS AND DISCUSSION

FLOWERS



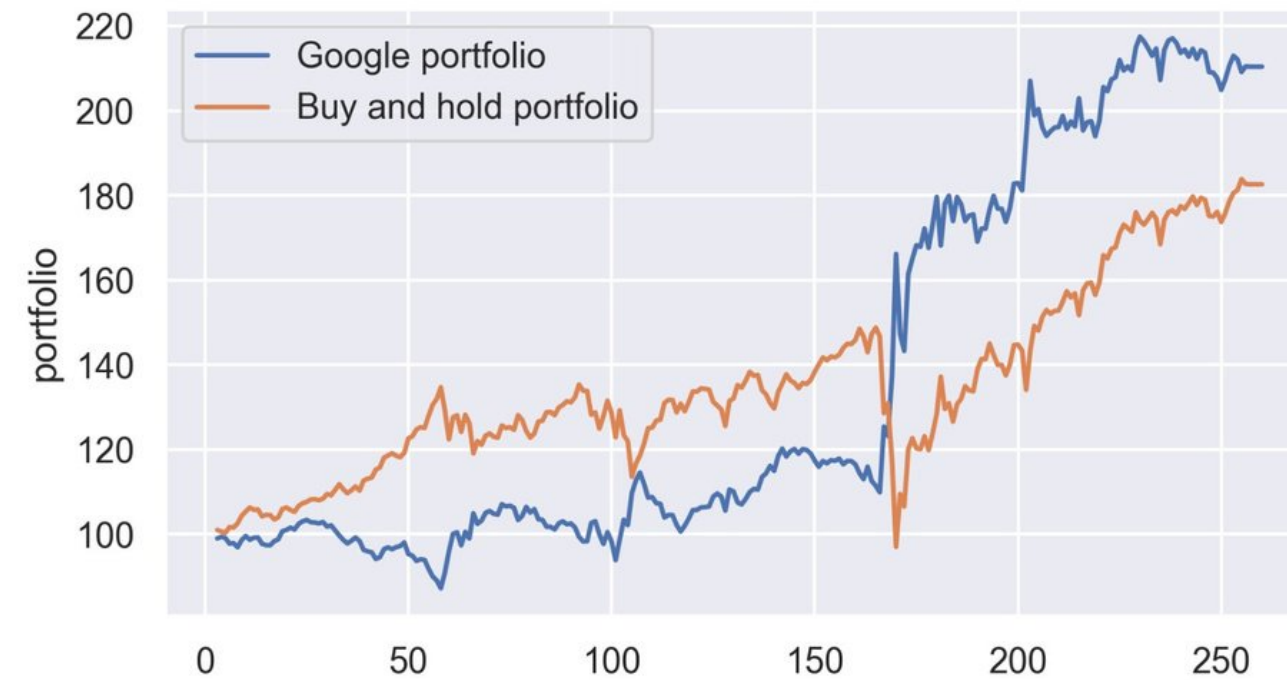
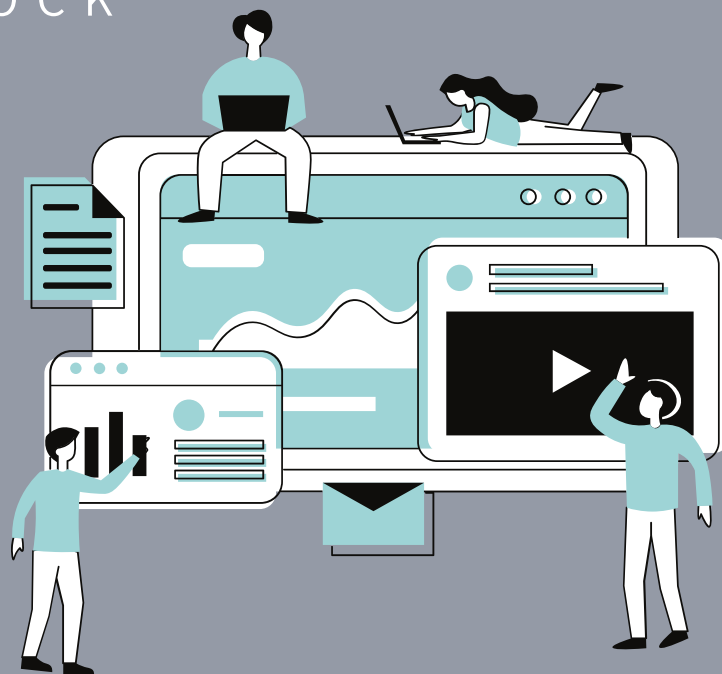
The use of a random word, such as “flowers” does not offer satisfactory results, implying that the buy and hold strategy would be the best, depicting therefore parallel graph lines.



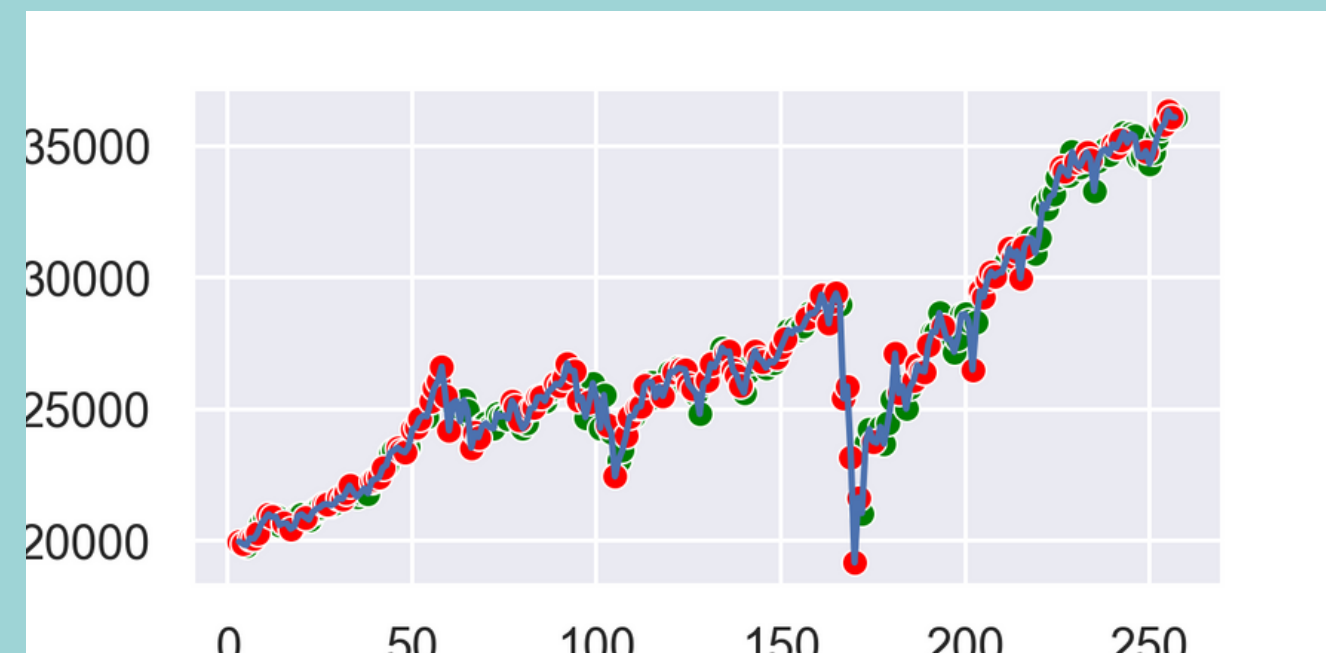
A scatter chart regarding the decision of buying and selling was generated with the help of the imported data. On the vertical axes, we have the closing prices of the index at the end of the weeks, and on the horizontal axes, also the search index mentioned previously.

RESULTS AND DISCUSSION

STOCK



With the appearance of the Sars-Cov-2 virus, it is noticeable that the investing behavior has switched, the buy and hold strategy becoming insufficient. As such, the need of a personalized portfolio with the use of Google Trends obviously takes the spotlight with regards to the profitability over the benchmark of the market. Thus, the initial hypothesis that the economic and societal trends would imply a new investment behavior stands true.



The plot we created for this more relevant word depicts the actualized signals for buying and selling, in order to generate a higher return. There is an obvious improvement in the decision-making process, the signals being more appropriate.

RESULTS AND DISCUSSION

STOCK



```
[261 rows x 5 columns]
      index  searches      close  pct_change      N      n signal
0         3        15  19963.800781    1.010181  14.666667    0.333333    1
1         4        16  19885.730469    0.996089  14.333333    1.666667    1
2         5        14  19827.250000    0.997059  14.666667   -0.666667    0
3         6        16  20093.779297    1.013443  15.000000    1.000000    1
4         7        18  20071.460938    0.998889  15.333333    2.666667    1
..      ...      ...      ...      ...      ...      ...
253      256        29  36100.308594    0.993734  26.666667    2.333333    1
254      257        28  36087.449219    0.999644  28.000000    0.000000    0
255      258        23         NaN    1.000000  28.333333   -5.333333    0
256      259        27         NaN    1.000000  26.666667    0.333333    1
257      260        27         NaN    1.000000  26.000000    1.000000    1
```

The index of the searches indicates an overall ascending trend in the interest over stocks and investing, from 15 in 2016 until 27 in the current year. This exact snapshot does not illustrate all the values, but as seen in our database, the searches for the word 'stock' grew significantly amid the rise of Covid-19, when most people started to look for ways of nurturing their wealth, reaching the maximum index of 100 January 2021.

```
[258 rows x 7 columns]
Annualised Buy-and-Hold Portfolio Return: 12.9 %
Accuracy: 50.0 %
Total Return: 210.4 %
Annualised Google Portfolio Return:: 16.2 %
```

The Annualised Google Portfolio Return exceeds the Buy-and-Hold one with almost 4%. The scope of any investor is to maximize their profits, thus one might consider this system to be more appropriate, as illustrated by the Total Return of 210.4%. The Accuracy, however, might be an issue, as 50% represents a high level of uncertainty.

PROBLEMS AND SHORTCOMINGS

LOW RELIABILITY OF THE SEARCH BASED SYSTEM

One is unaware of the period during which that word will continue to be relevant, especially because interest in stock investments may falter and return to the initial levels.

THE SYSTEM MIGHT BE LACKING IN GIVING THE APPROPRIATE SIGNAL

Due to the fact that it reacts to the prices rather than predicting them.

THE LEVEL OF ACCURACY OF AROUND 50%

Does not offer enough certainty.

CONCLUSIONS

Investors must continuously research new methods in order for their wealth to upscale and keep up with such shifts. Thus, a regular buy-and-hold portfolio is a good strategy to keep in mind in order to gain steady, but lower returns, whereas taking advantage of the search engines which become increasingly popular could result in the creation of new, more profitable strategies, without higher risks.

The initial hypothesis that the historical strategy could no longer be satisfactory and investors must develop a strategy in line with the global trends was confirmed, our results generated by using the programming language Python depicting higher returns in the case of employing Google Trends as a support



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