Algorithmic Trading (Equal Weights S&P500)

1. Introduction

This is my first personal project on algorithmic trading.

The strategy for this project is assigning equal weights to all the companies in the S&P500 (a static list).

The hypothesis for this strategy is that smaller-cap stocks may have more room for growth or are more likely to be mispriced, compared to the mega-cap stocks that dominate the S&P 500's market-cap-weighted index.

How this hypothesis may work:

1. Diversification of Risk: Equal-weighting reduces the concentration of risk by spreading it evenly across all 500 companies, limiting the dominance of large-cap stocks.
2. Smaller-Cap Exposure: The strategy increases exposure to mid- and small-cap stocks, potentially leading to higher returns compared to large-cap stocks over certain periods.

The output of this project is a excel sheet recommending the number of shares to buy for each S&P500 company.

2. Methodology

- Data processing
  - Loaded a csv file of 505 S&P500 companies

```
    Ticker
0        A
1      AAL
2      AAP
3     AAPL
4     ABBV
..     ...
500    YUM
501    ZBH
502   ZBRA
503   ZION
504    ZTS

[505 rows x 1 columns]
```

Figure 1: Static List of S&P500 Companies

  - Output of APIs

```
{'Global Quote': {'01. symbol': 'AAPL',
  '02. open': '225.1400',
  '03. high': '226.8050',
  '04. low': '223.3200',
  '05. price': '225.6700',
  '06. volume': '34044158',
  '07. latest trading day': '2024-10-03',
  '08. previous close': '226.7800',
  '09. change': '-1.1100',
  '10. change percent': '-0.4895%'}}
```

Figure 2: Response of API to get Stock Price of companies

```
[12]: {'Symbol': 'AAPL',
       'AssetType': 'Common Stock',
       'Name': 'Apple Inc',
       'Description': "Apple Inc. is an American multinational technology company that specializes in consumer electronics, computer software, and
      online services. Apple is the world's largest technology company by revenue (totalling $274.5 billion in 2020) and, since January 2021, the w
      orld's most valuable company. As of 2021, Apple is the world's fourth-largest PC vendor by unit sales, and fourth-largest smartphone manufact
      urer. It is one of the Big Five American information technology companies, along with Amazon, Google, Microsoft, and Facebook.",
       'CIK': '320193',
       'Exchange': 'NASDAQ',
       'Currency': 'USD',
       'Country': 'USA',
       'Sector': 'TECHNOLOGY',
       'Industry': 'ELECTRONIC COMPUTERS',
       'Address': 'ONE INFINITE LOOP, CUPERTINO, CA, US',
       'OfficialSite': 'https://www.apple.com',
       'FiscalYearEnd': 'September',
       'LatestQuarter': '2024-06-30',
       'MarketCapitalization': '3447985799000',
```

Figure 3: Response of API to get Market Capitalisation of companies

- Looping through all S&P500 companies
  - Created a loop to obtain the relevant data (price and market capitalisation) of all S&P500 companies
  - Created a DataFrame to store the data

    * only looped for first 5 companies to get result

	Ticker	Price	Market Capitalization	Number Of Shares to Buy
0	A	144.5500	42104959000	N/A
1	AAL	10.8200	7105537000	N/A
2	AAP	38.8900	2218094000	N/A
3	AAPL	225.6700	3447985799000	N/A
4	ABBV	195.4500	347651047000	N/A

Figure 4: DataFrame consisting of data on S&P500 companies

- User Interface

- Using input function of python, users can input their portfolio size
- Calculated position size by dividing portfolio size with number of companies
- Calculated number of shares to buy of respective companies by dividing position size with stock price

	Ticker	Price	Market Capitalization	Number Of Shares to Buy
0	A	144.55	42104959000	1383
1	AAL	10.82	7105537000	18484
2	AAP	38.89	2218094000	5142
3	AAPL	225.67	3447985799000	886
4	ABBV	195.45	347651047000	1023

Figure 5: Data Frame with updated data on number of shares to buy

- Saving output into an excel file
  - By using xlsxwriter library in python, an excel sheet with the recommended trades will be created and saved

	Ticker	Price	Market Capitalization	Number of Shares to Buy
2	A	$144.55	$42104959000.00	1383
3	AAL	$10.82	$7105537000.00	18484
4	AAP	$38.89	$2218094000.00	5142
5	AAPL	$225.67	$3447985799000.00	886
6	ABBV	$195.45	$347651047000.00	1023
7				

Recommended Trades +

Figure 6: Excel Sheet of recommended trades

3. Learning Summary

- Algorithmic Trading Process is broken down generally into these steps:
  - Collecting Data
  - Developing a hypothesis for a strategy
  - Backtesting the strategy* (did not do for this project)
  - Implement strategy in production* (did not do for this project)
- **How I can improve this project:**
  - Purchasing an API to get real-time list of S&P500 companies
  - Purchasing an API that allows for batch calls (optimises the speed at which the data is collected)
  - Backtest the strategy against historical data