# Real -Time Portfolio Analytics Tool

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# We understand

- Financial stock market is a dynamic and complex system
- Even the professional users need to use computer technology for its modeling and prediction.
- Not to mention people with no financial knowledge and background, it's much harder for them to make investment to fit their financial goals
- Simplify the process and make the tool more available

# Current Market

- SmartFolio
  - Designed by BMO
  - Online portfolio manager
  - Enable to customize portfolio using the Black-Litterman
- 401K Plus
  - Developed by Retirement Management System Inc.
  - Use Mean Variance optimization as one of their tool to make asset allocation decisions

# Problem Definition

- *Create a software system that allows a user to create multiple portfolios given a set of assets and associated data.*
- *Also, the system should allow ad-hoc side constraints for all model types e.g. portfolio limits*
- *The system is user friendly in terms of entering data, choosing portfolio model types, and displaying results*

# Models Adopted

## Mean Variance Optimization

- Fundamental of many portfolio management techniques
- Asset allocation by considering the trade-off between risk and return.
- Enable to choose either a desired minimum level of return or maximum level of risk with the combination of the assets
- Maximize the return with minimizing the covariance between each asset

## Black-Litterman

- The model combines CAPM, MVO, and specific user views into a single model, creating a sophisticated, yet customizable model.
- The model provides a clear way to specify investors views on returns and to blend the investors views with prior information.
- It uses the equilibrium market portfolio, as a starting point for estimation of asset returns, to balance against investor's subjective view

# BUT

# Mean Variance Optimization

- Early tests show that MVO results in portfolios with unrealistically heavy weights in a small number of assets, especially there are more stocks get selected.
- MVO also possesses many limitations that could potentially derail the result produced. MVO tends to creates biased portfolios when there are more stocks selected

# Black -Litterman

# Problem Re-Definition

**New**

*Create an asset allocation decision software system*

- *Enable to customize equity portfolio for both professional and non-professional groups*
- *The system should allow ad-hoc side constraints for professional users, and generate portfolio automatically for non-professional users*
- *The system is user friendly in terms of entering data, and displaying results*

# Targeting Users

**Professional**

- Use the Black-Litterman as the main model to optimize the portfolio
- Able to input their selected stocks and views, and generate the portfolio weights based on the views and market equilibrium expected return

**Non-Professional**

- Use the Black-Litterman as the main model to optimize as well
- Stocks will be selected from different sectors based on their Earning Per Share
- Relative Strength Index and Stochastic Oscillator will be used to generate the views

# Professional Users

- *Stocks can be selected from S&P500*
- *Views can be input by the users*
- *The market equilibrium portfolio is calculated from market capitalizations of portfolio components*
- *Covariance matrix will be calculated every time based on the different combination of the assets*

# Non-Professional Users

| | |
|---|---|
| Information Technology | ebay, intel |
| Health Care | Lilly, Edwards |
| Financials | CME Group, NASDAQ |
| Consumer Discretionary | NETFLIX |
| 6 more sectors ….. | TESORO, EQUIFAX |

Relative Strength Index

Stochastic Oscillator

Stocks → View → View

# Non- professional Users

- *The list is generated based on the top earning per share performances in different sectors from S&P500*
- *Views are generated using Relevant Asset Index and Stochastic Oscillator*
- *The market equilibrium portfolio is calculated from market capitalizations of portfolio components*
- *Covariance matrix will be calculated every time based on the different combination of the assets*

# Relative Strength Index

RSI = 100 -100/ RS


14 Days Average

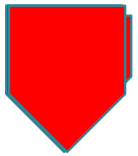
> 80 Overbought

< 20 Oversold


Oversold will outperform overbought by 1%

# Stochastic Oscillator

High 20 days



Low 20 days

Current Close

$$K\% = \frac{\text{Current Close} - \text{Low 20 days}}{\text{High 20 days} - \text{Low 20 days}}$$

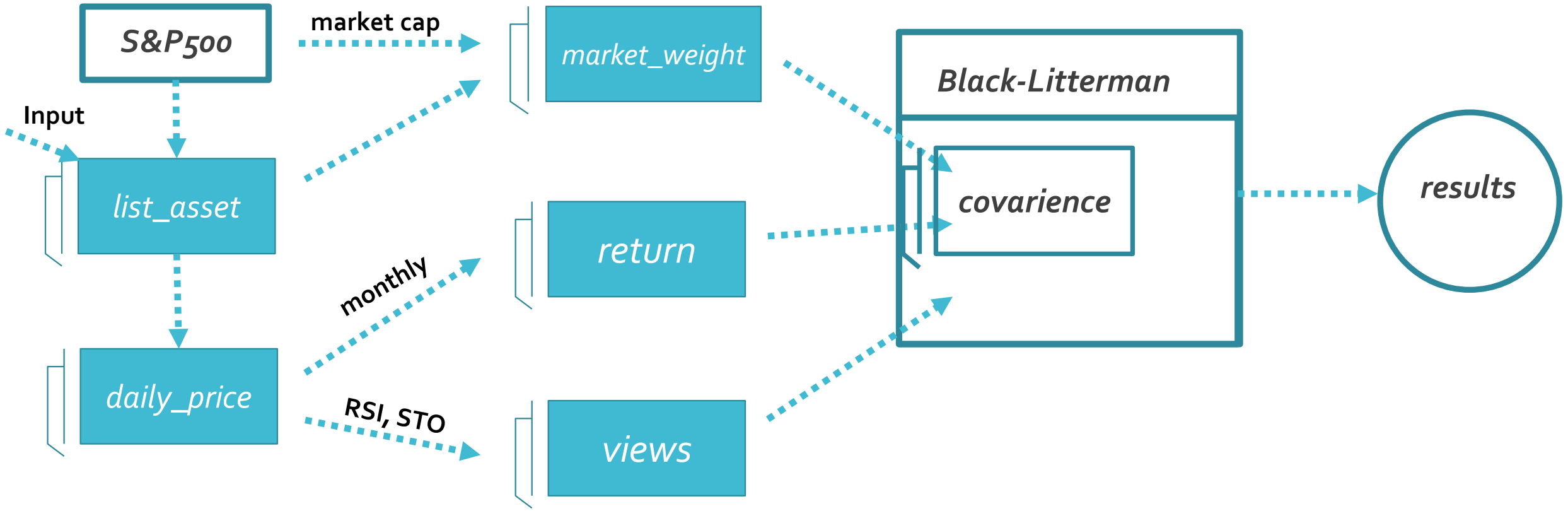
Compare 20 Days

> 80 Overbought

< 20 Oversold

Oversold will outperform overbought by 1%

# Product Design: Back-End Flow



# Product Design: Front-End Flow

app.py

/custompportfolio

form 1

submit

1)

@app.route ('/customtportfolio')

2) Request.form.getlist("form1)

3) Python code to change input from form into type suited for optimization functions

4) Get weights back from optimization functions

5) Session ['data'] weights this saves the results in a session cookie for passing between pages

6) Return direct ('/customresult')

@app.route ('/customtportfolio')

7) data=session.get('data', none)

gets cookie data from previous page

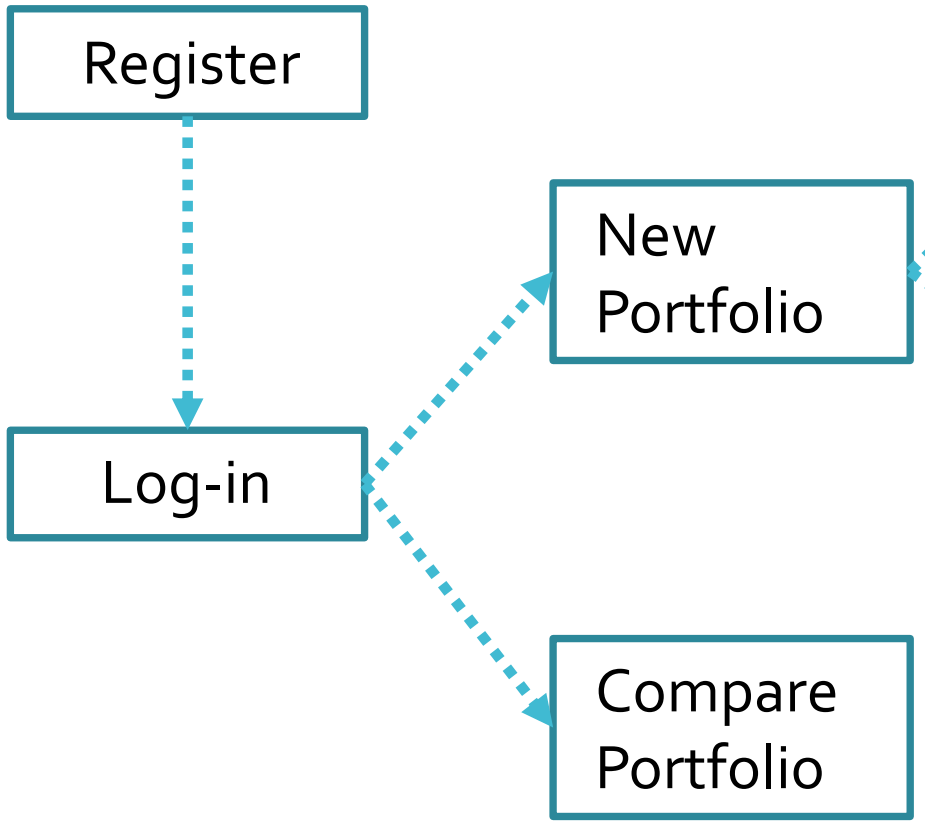
8) Return render_template ('customresulthtml,' data=data)

customresult.html

Table is generated by jinja with this line{{data|safe}}

| ticker | holdings |
| --- | --- |
| | |

# User Work Flow




## Professional

- Input stocks and views
- Generate to get the optimized portfolio

## Quick create

- Specify the stocks we want to invest
- Generate to get the optimized portfolio

# Demo Time

# Product Strengths

- We have provide an alternative approach to use the Black –Litterman, as we generate the views from Relative Strength Index and Stochastic Oscillator
- Our product enable to select a large combination of assets from S&P500, and easy and effective to use for both professional and non-professional users
- Input Views are really simple, no dimension matches

# Further Improvements

- Transaction cost has not been used in the model, which in fact can affect many decisions in real life scenarios.
- Diversified models adopted in the future. ie.VaR and CVaR
- Better Styles


Thank You