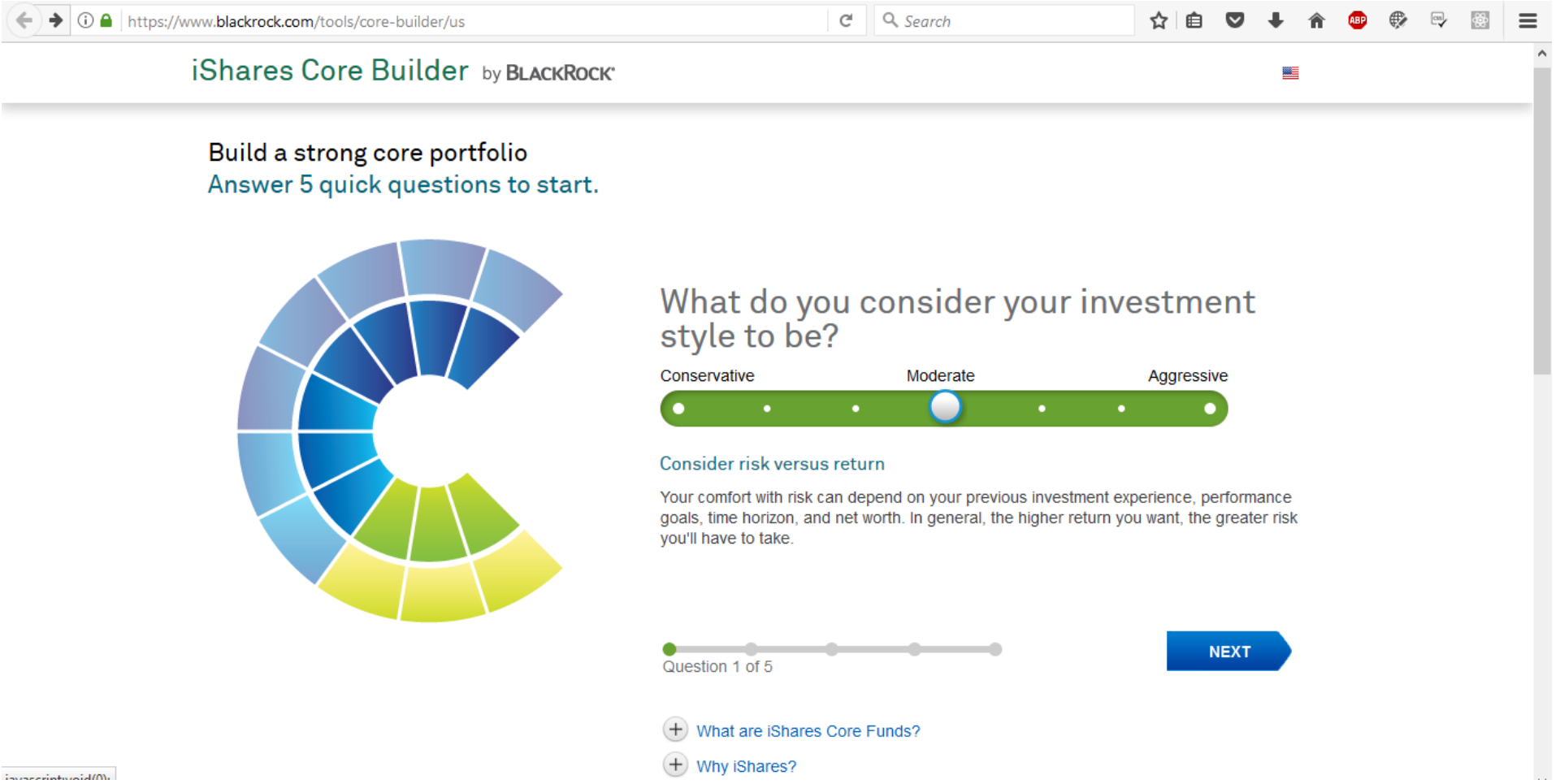
Project 4 – Portfolio Optimizer

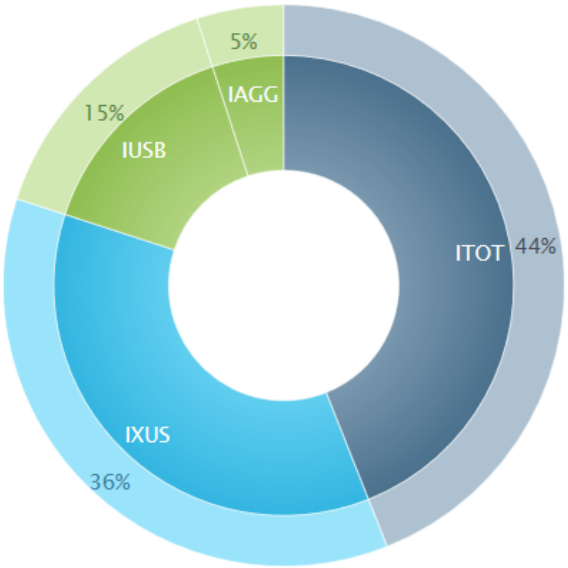
By kepler62f



https://www.blackrock.com/tools/core-builder/us

iShares Core Builder by BLACKROCK

Sample Portfolio Overview



U.S. Stocks

ITOT iShares Core S&P Total U.S. Stock Market ETF
Allocation: 44%, Expense Ratio: 0.03%

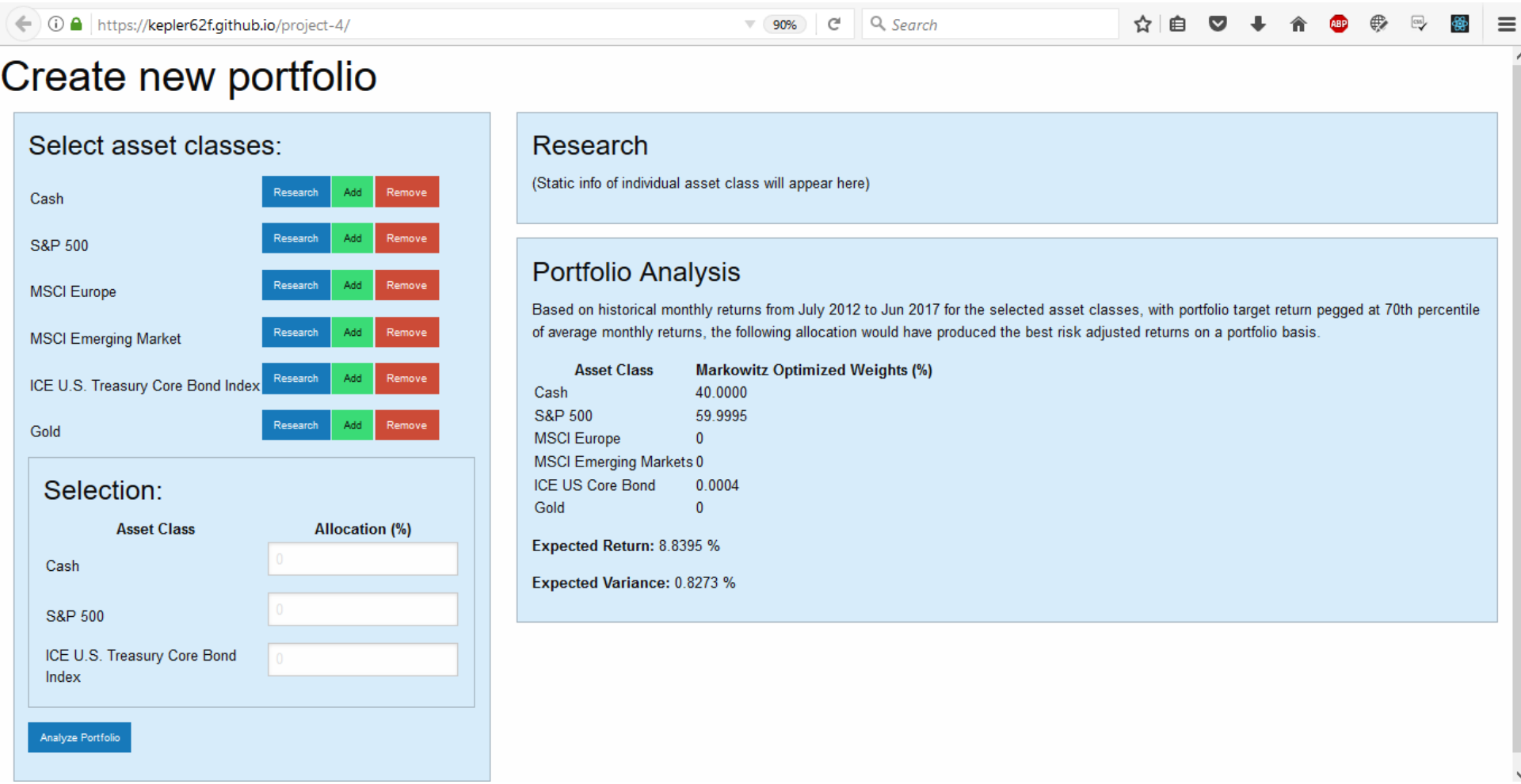
Change Answers | Change Holdings

Exposure / Fund Name	Expense Ratio (%)	Value $	Weight (%)
Broad Market ITOT iShares Core S&P Total U.S. Stock Market ETF	0.03	440.00	44
World IXUS iShares Core MSCI Total International Stock ETF	0.11	360.00	36
Broad Market IUSB iShares Core Total USD Bond Market ETF	0.06	150.00	15
International Bond IAGG iShares Core International Aggregate Bond ETF	0.09	50.00	5
Clear ▸ Show All Funds		$1,000.00	100%

Portfolio Value: $ 1000

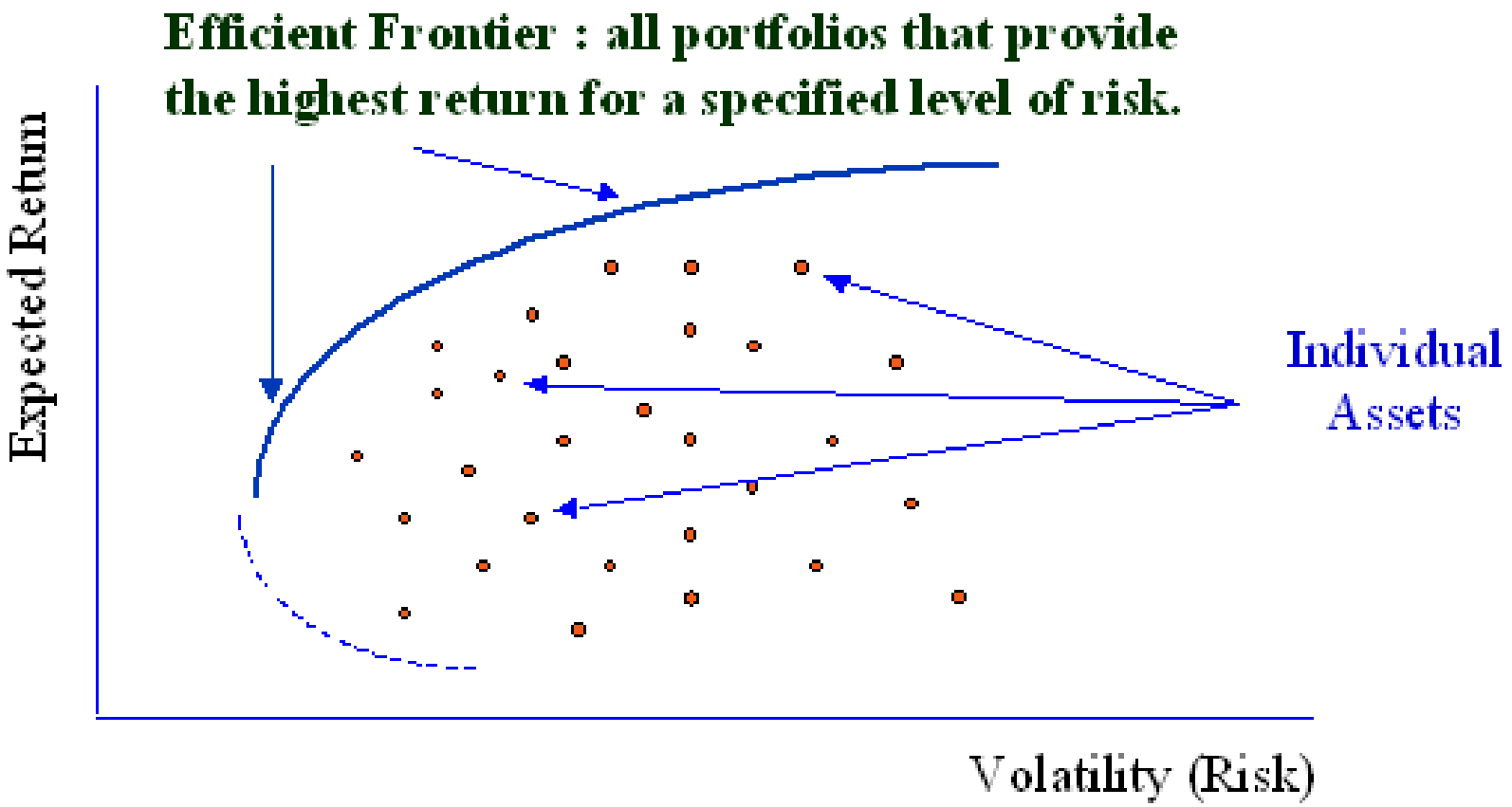
ⓘ Why does the amount matter?

Your Unique Portfolio



https://kepler62f.github.io/project-4/

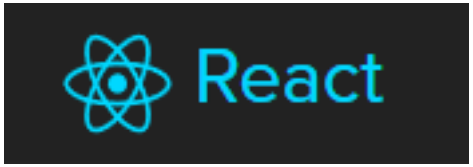
Modern Portfolio Theory…



Modern Portfolio Theory…

$$\begin{array}{ll} \mathcal{M} & \text{minimize} \quad \frac{1}{2} w^T \Sigma w \\ & \text{subject to} \quad \mathrm{m}^T w \geq \mu_b, \text{ and } \mathrm{e}^T w = 1 \ , \end{array}$$

Tech Stack…



PDRP?

WARNING

Project 4 can be experimental.
But please take into account
the steep learning curve…

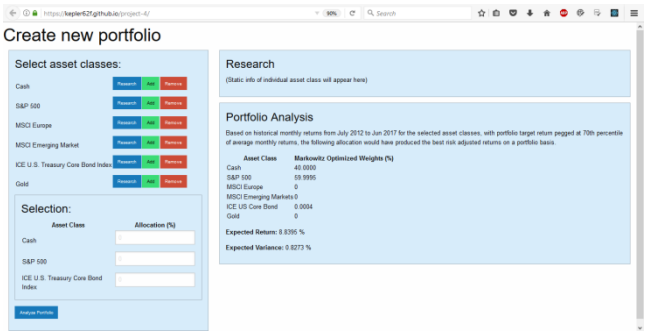
High Risk High Return / Loss

Django vs Ruby vs Node.js

Django	Ruby	Node.js
Models–Views–Templates	MVC	MVC
python manage.py runserver Makemigrations	rails s, rails g rails db:migrate	yarn start
Built-in ORM	Active Record	Sequelize
pip install	gem	npm, yarn
url(r^'/user/$', function)	rails routes Get '/user/id	App.get('/user/id', function)

Architecture

React Frontend



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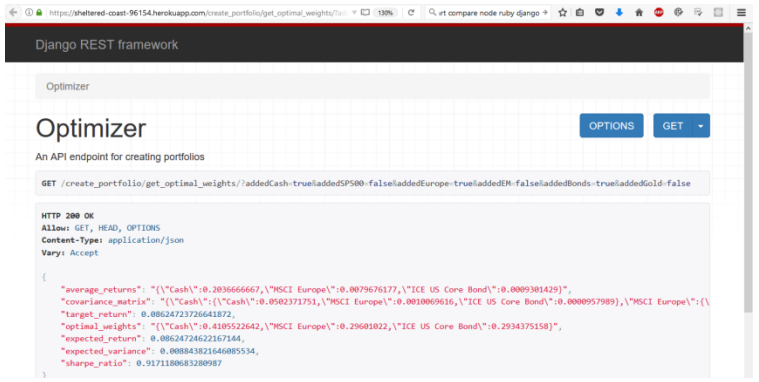
Postgresql Server

Django ORM

Pandas

Portfolioopt, numpy

Django Backend (API server)

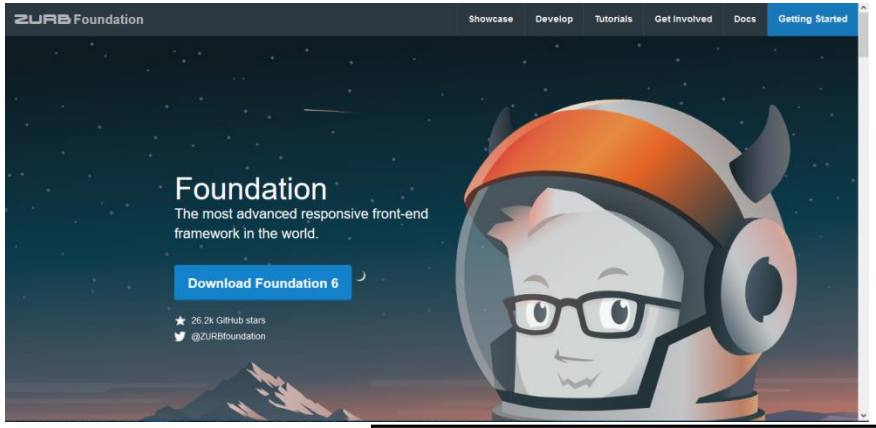


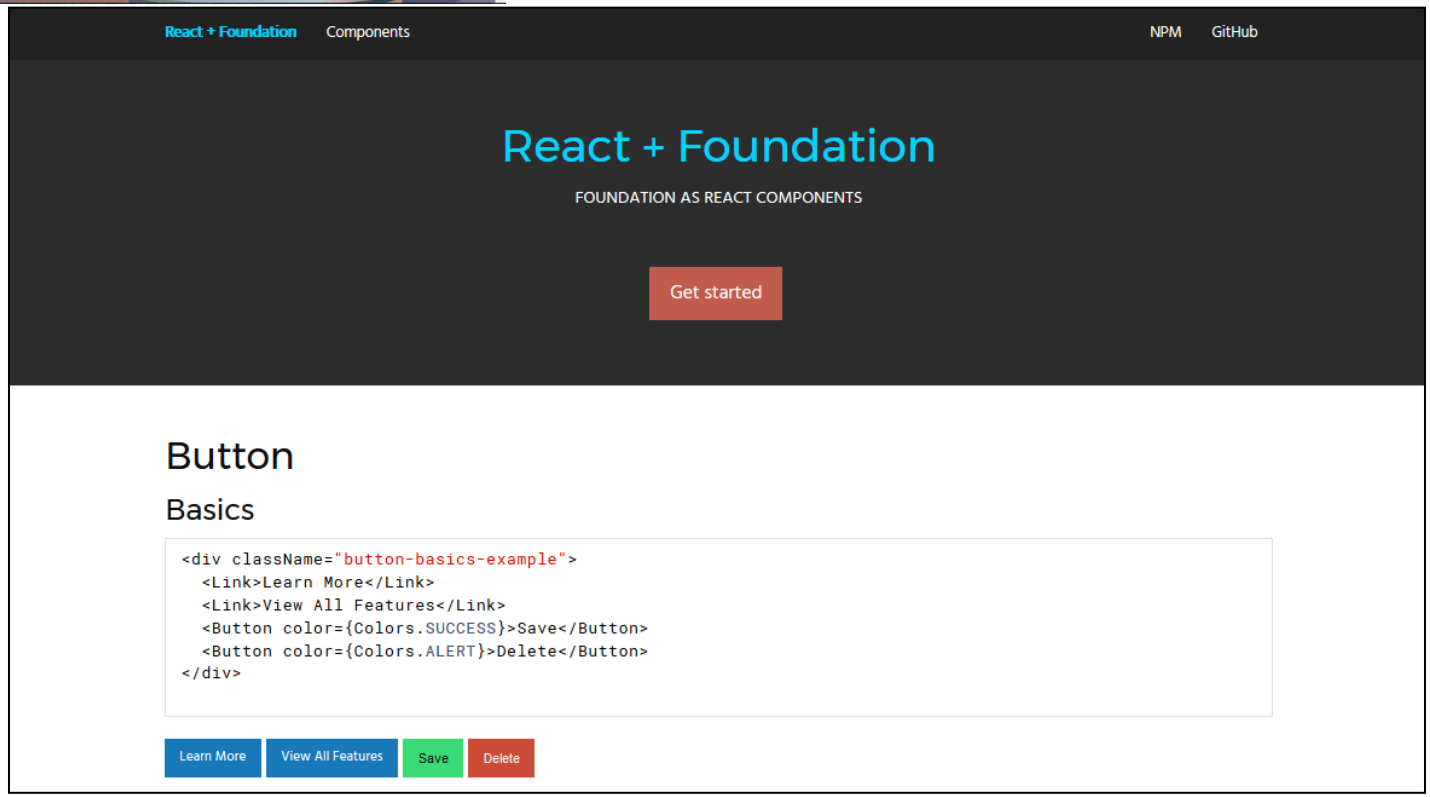
/create_portfolio/get_optimal_weights/?addedCash=true&addedSP500=false&addedEurope=true&addedEM=false&addedBonds=true&addedGold=false

REST API response

REST API request

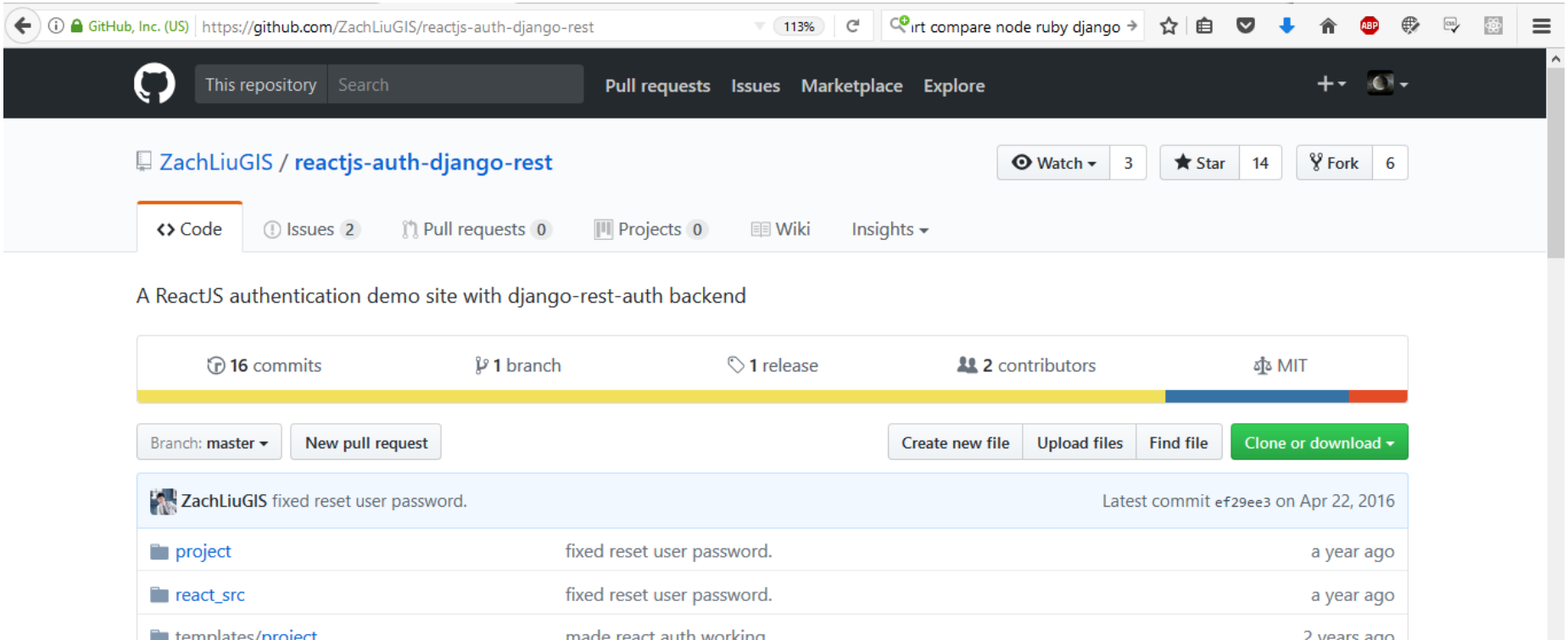
CSS Framework



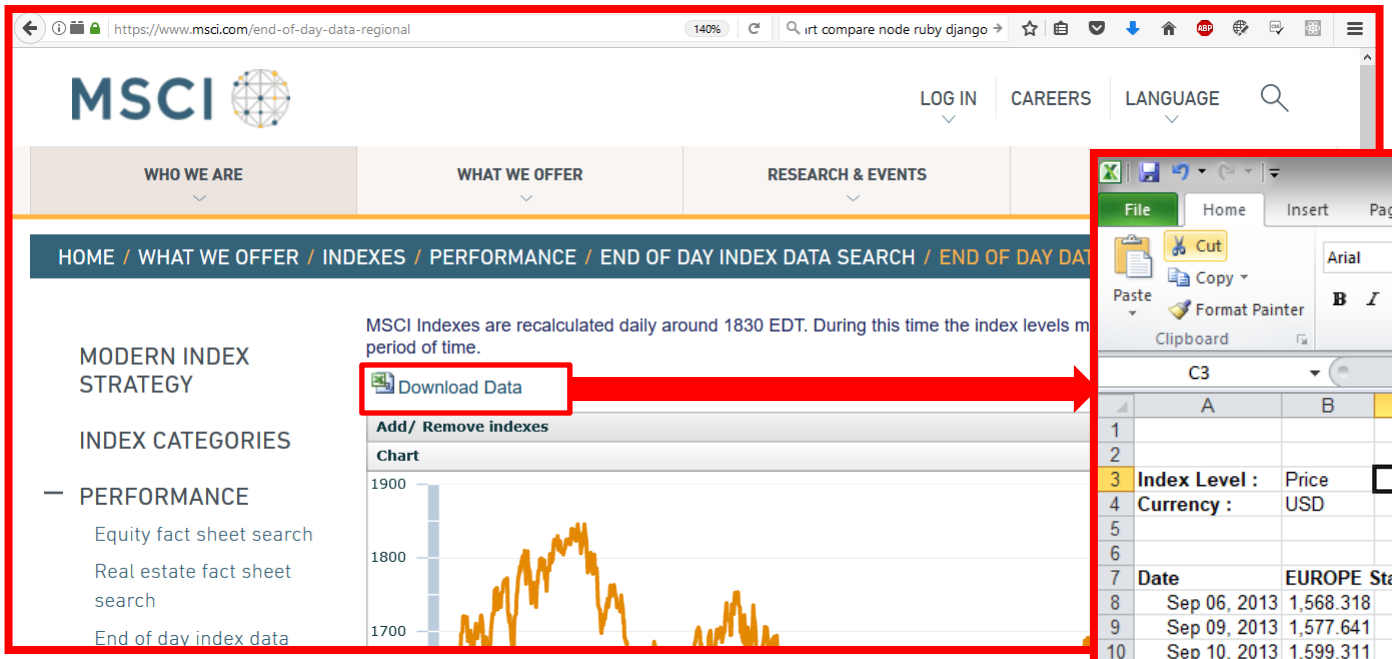


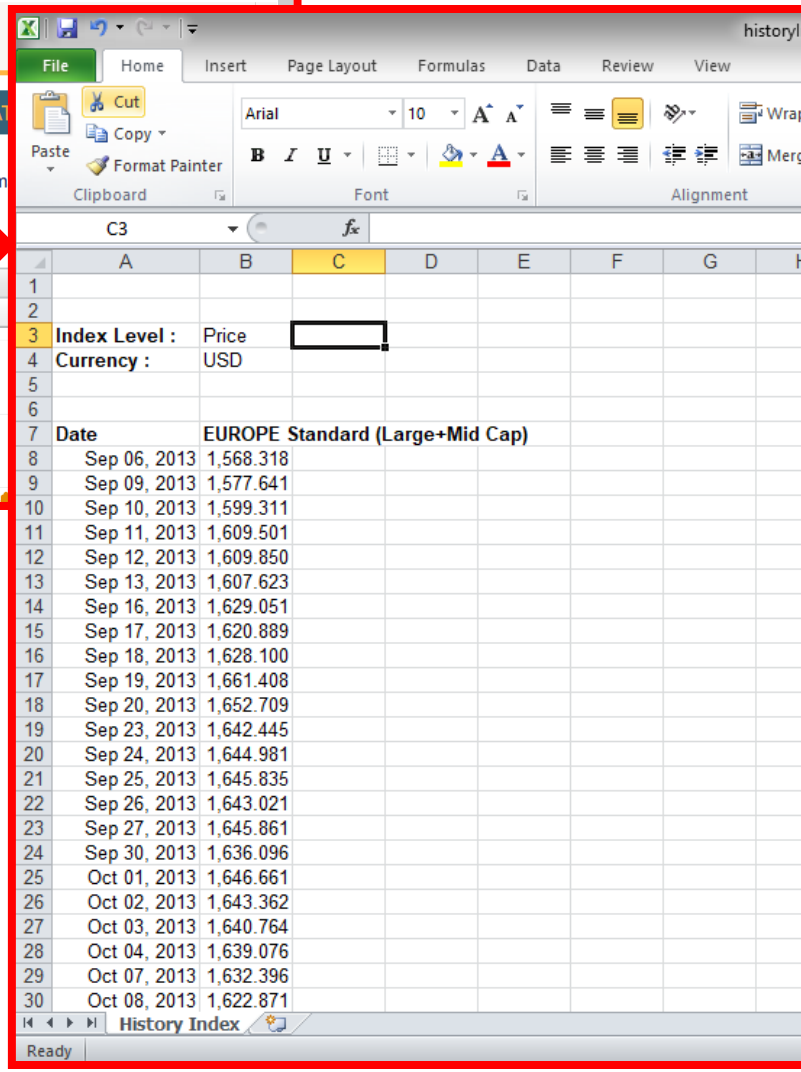
Challenges

- Authentication
  - django.contrib.auth (= Node passport, Ruby device)
  - Django-rest-auth (with json web token)
  - Reactjs + djang-rest-auth



Challenges – Index Data – Can't scrape?





Data Munging…..

- Manual download
- Clean in excel
- Save as .csv ('YYYY-MM-DD' for pandas)
- Create DB table with Pgadmin
- psql \copy
- Resample daily -> monthly (pandas dataframes)

Challenges – setState on nested states

```
16      this.state = {
17        selectedAssets: {
18          addedCash: false,
19          addedSP500: false,
20          addedEurope: false,
21          addedEM: false,
22          addedBonds: false,
23          addedGold: false
24        },
25        proposed_allocation: [0,0,0,0,0,0],
26        portfolioAnalysis: [{
27          average_returns: [
28            {"Cash":0},
29            {"S&P 500":0}
30          ],
31          covariance_matrix: [0,0],
32          target_return: [0,0],
33          optimal_weights: [
34            {"Cash": 0},
35            {"S&P 500": 0},
36            {"MSCI Europe": 0},
37            {"MSCI Emerging Markets": 0},
38            {"ICE US Core Bond": 0},
39            {"Gold": 0}
40          ],
41          expected_return: 0,
42          expected_variance: 0,
43          sharpe_ratio: 0
```

Need to wrap in array else can't compile render

Can’t reach deep state variables…solution: Immutability-helper….

```
Object.keys(weights).map((weight) => {
  console.log(weight)
  console.log(weights[weight])

  if (weight === "Cash") {

    console.log("before, weight is: ", this.state.portfolioAnalysis[0].optimal_weights[0].Cash)

      let newState = update(this.state, {
          portfolioAnalysis: {
            0: {
            optimal_weights: {
              0: {
                "Cash": {
                  $set: (weights[weight]*100).toFixed(4)
                }
              }
            }
          }}}
      )

    this.setState(newState,
      () => console.log('after change this.state', this.state.portfolioAnalysis[0].optimal_weight
    )
  } // if cash
```