AI in the Investment Office

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CLIENT

DUMAC - Duke Management Company

Formed in 1989 by approval of the Duke's Board of Trustees as a separate nonprofit support corporation.

Duke's Long Term Pool (LTP) is managed by DUMAC Inc., an investment organization of 55 employees controlled by Duke University.

In addition to Duke's endowment of $8.6 billion, DUMAC also manages the employee's retirement pool and Duke University Health System's investments leading to a cumulative $19 billion in assets under management .

We used artificial intelligence tools and data visualizations to support DUMAC's venture investment analysis and cost optimization.

Background

DUMAC

- DUMAC has 4 investors:
  - Duke University
  - Duke Health
  - Duke Retirement Plan
  - Duke Endowment
- DUMAC created an SMA platform to combine funds of these investors (~6 billion dollars)
- Each investor owns interest in the platform
- Their managers invest directly in the securities

Prime Broker

- Prime brokers offer a bundle of services to hedge funds
- DUMAC's prime brokers earn fees on stock borrow costs and financing charges
- When cash < total market value of short positions at a prime broker, DUMAC pays a fee to the prime broker
  - Our goal is to reduce financing charges

1. Cost Optimization

Preview of Data

Actual Cash Information

- Available Tradable Cash
- PB Equity and Excess Margin
- Un-reinvested Proceeds
- Imputed Cost
- Annualized Cost (Local/Base)

Pro Forma

- Takes proposed transfer and changes the prior day information to calculate cost savings
- Relates to Cost Optimization portion of the project

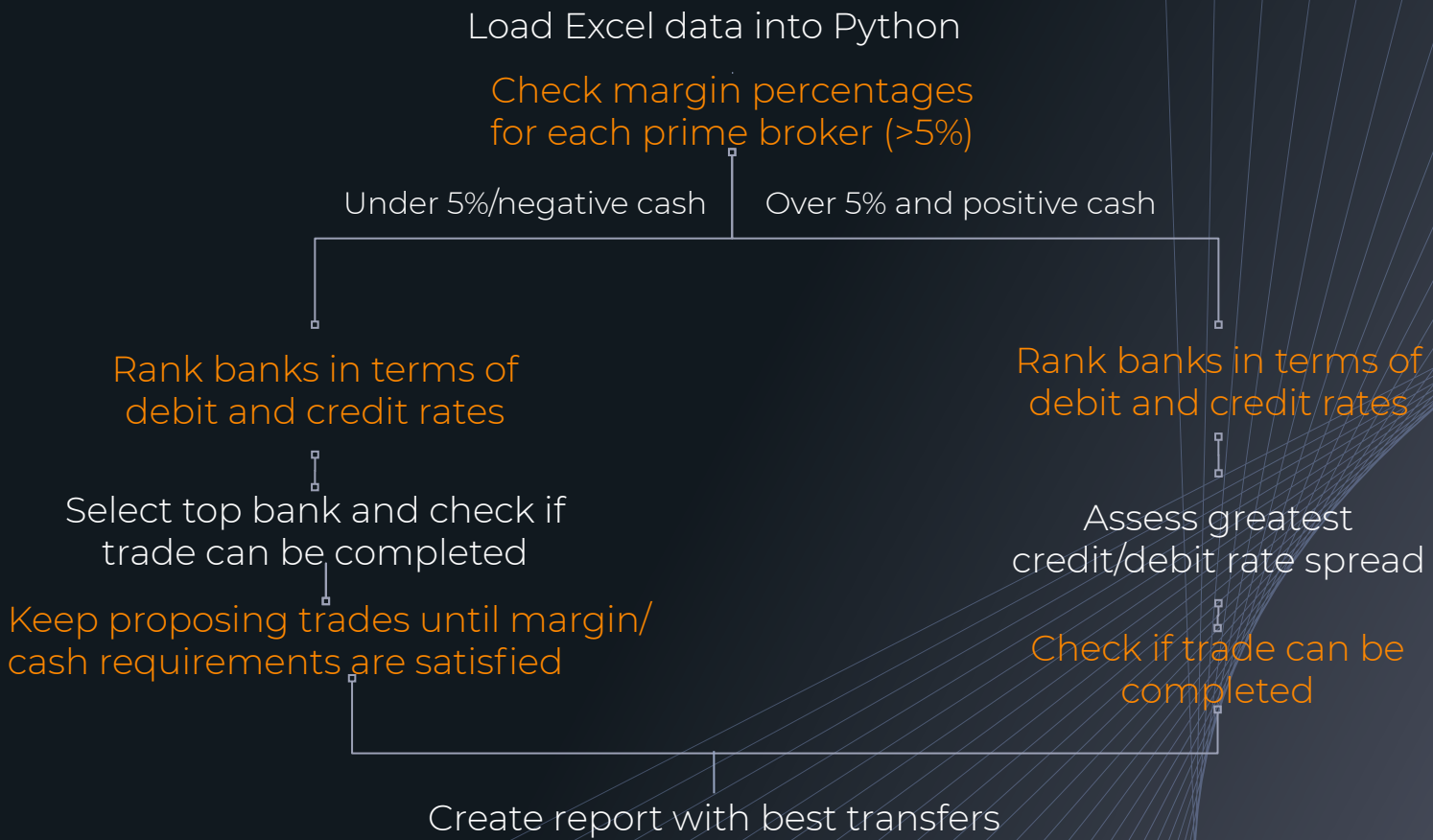
Proposed Transfers

- Framework for proposing margin/cost-optimization transfers
- The part of the process we are automating

Margin Requirements

- One of the basic rules for cash allocation
- Maintain a certain percentage of cash at each Prime Broker

Cost Optimization Flowchart



Margin vs. Savings Transfers

Margin Transfer

- DUMAC is required to have at least **5%** of the prime broker equity in cash at all times
- If cash under a prime broker falls below margin, a transfer from another broker must be made
  - A transfer can't make the margin of another PB <10%
  - If the margin of a PB is between 5-10%, a transfer cannot be made to make the margins <10%
- Additionally, if the net tradable cash at a PB is negative, a transfer is proposed
- **Mandatory**

Savings Transfer

- Financing charges occur when cash < short position
- Every prime broker has different rates that they charge
- Savings transfers shift cash towards high-rate brokers from lower-rate ones
- Do not cause margins to fall under **10%** and follow a set of rules
- **Optional**

Rules for making a savings transfer:

- Savings resulting from the transfer are greater than **$10K**
- Margins do not fall below **10%**
- Savings must be **5 basis points** of the transferred money
    - Basis points are a measure of financing charges

Data Input

Xlrd/PIP

- Able to use xlrd to read in new Spreadsheet every day
- Accesses specific Actual tab and pulls information

Data Storage

- Currently using dictionaries with the keys as Prime Brokers (margins) and as the individual deals (info)
- Easily accessible and manipulatable

Running the Code

- Uses the computer's built-in command line
- Navigate to the file location
- Run the code and input the file name

Commands Used

- cd file_location
- python3 script.py
- excel_name.xlsm

Sample Output

Necessary Transfers (margin and negative cash issues)

Suggested Scenarios (cost optimization)
Note: Dependent on each other. Meant to be done sequentially. Occur after the necessary margin transfers.

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Suggested Transfers for 2020-07-09:

Necessary Margin and Net Trade Cash Transfers:

1. [redacted] should give [redacted] $100000 USD.
2. [redacted] should give [redacted] $810000 USD.
3. [redacted] should give [redacted] $2080000 USD.

Total Margin Savings: $4030 USD

Suggested Cost Optimization Transfers:

Scenario 1.
[redacted] should give [redacted] $32670000 AUD to save $159573 USD.
    [redacted] should give [redacted] $68530000 CHF to save $390381 USD.
    [redacted] should give [redacted] $48080000 USD to save $341067 USD.
    [redacted] should give [redacted] $41670000 EUR to save $148436 USD.

Total Cost Savings: $1039458 USD
Total Margin and Cost Savings: $1043489 USD

Scenario 2.
[redacted] should give [redacted] $32350000 CHF to save $138115 USD.
    [redacted] should give [redacted] $68530000 CHF to save $390381 USD.
    [redacted] should give [redacted] $38710000 USD to save $285588 USD.
    [redacted] should give [redacted] $32670000 AUD to save $159573 USD.

Total Cost Savings: $973658 USD
Total Margin and Cost Savings: $977689 USD

Scenario 3.
[redacted] should give [redacted] $68530000 CHF to save $390381 USD.
    [redacted] should give [redacted] $34210000 USD to save $242677 USD.
    [redacted] should give [redacted] $32670000 AUD to save $159573 USD.
    [redacted] should give [redacted] $41670000 EUR to save $148436 USD.

Total Cost Savings: $941068 USD
Total Margin and Cost Savings: $945099 USD
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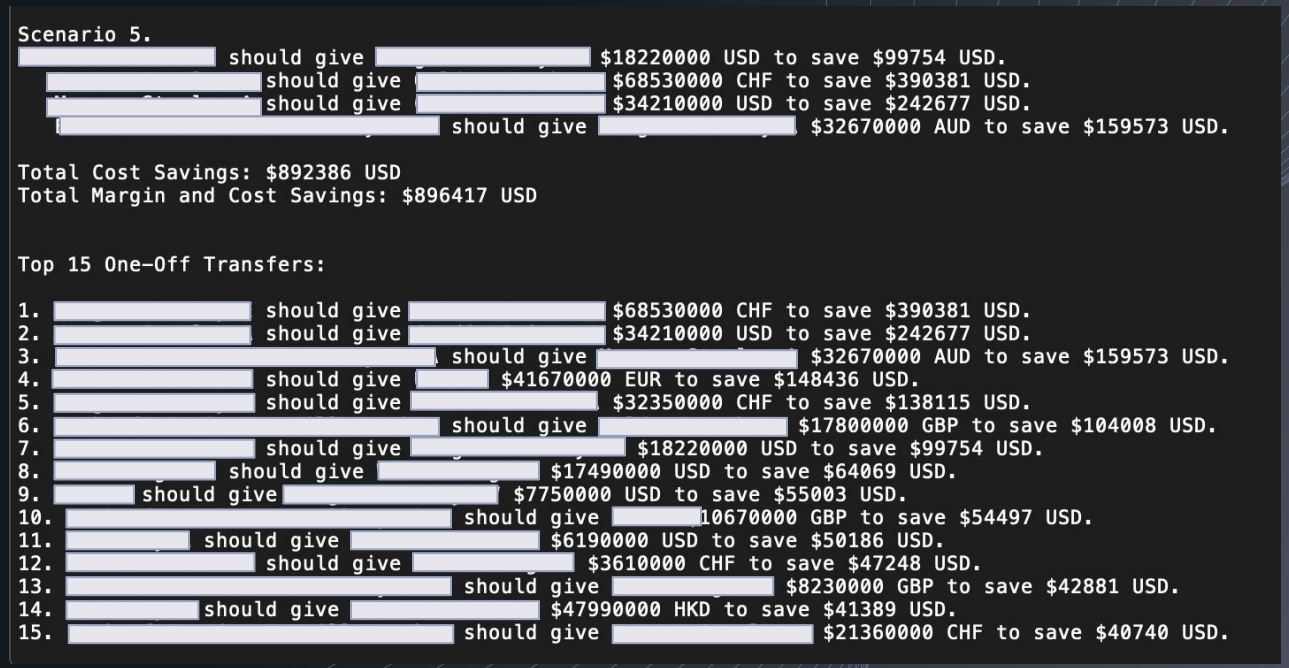
Sample Output

Last Scenario
(Dependent transfers)

One-Off Transfers (cost optimization)
Note: Must be done independently of each other. Avoid making transfers with the same Prime Broker.



2. Venture Analysis

Venture Analysis

Burgiss

- Provides investors with information on private investments (~70,000 holdings), benchmarks, risk models, and other cash flow and performance data on companies

Pitchbook

- Provides private market data on 3 million companies, 308,000 investors, 1.2 million deals, and 55,000 funds

Venture Financing Stages

- Seed
  - The first official money that a venture raises (typically through support from friends, family, founders, and incubators)
- Stage A
  - Further optimizing user base and product offerings to scale the product (raise $2-15 million)
- Stage B
  - Focus on business development and increasing market reach
- Stage C
  - Focus on expanding into more markets, developing new products, and potential acquisitions

Venture Analysis

THE GOAL:

Use Burgiss and Pitchbook data to calculate the length of investments that DUMAC has made in the past 20 years based on the initial investment date and the dollar-weighted realizations of a company over time.

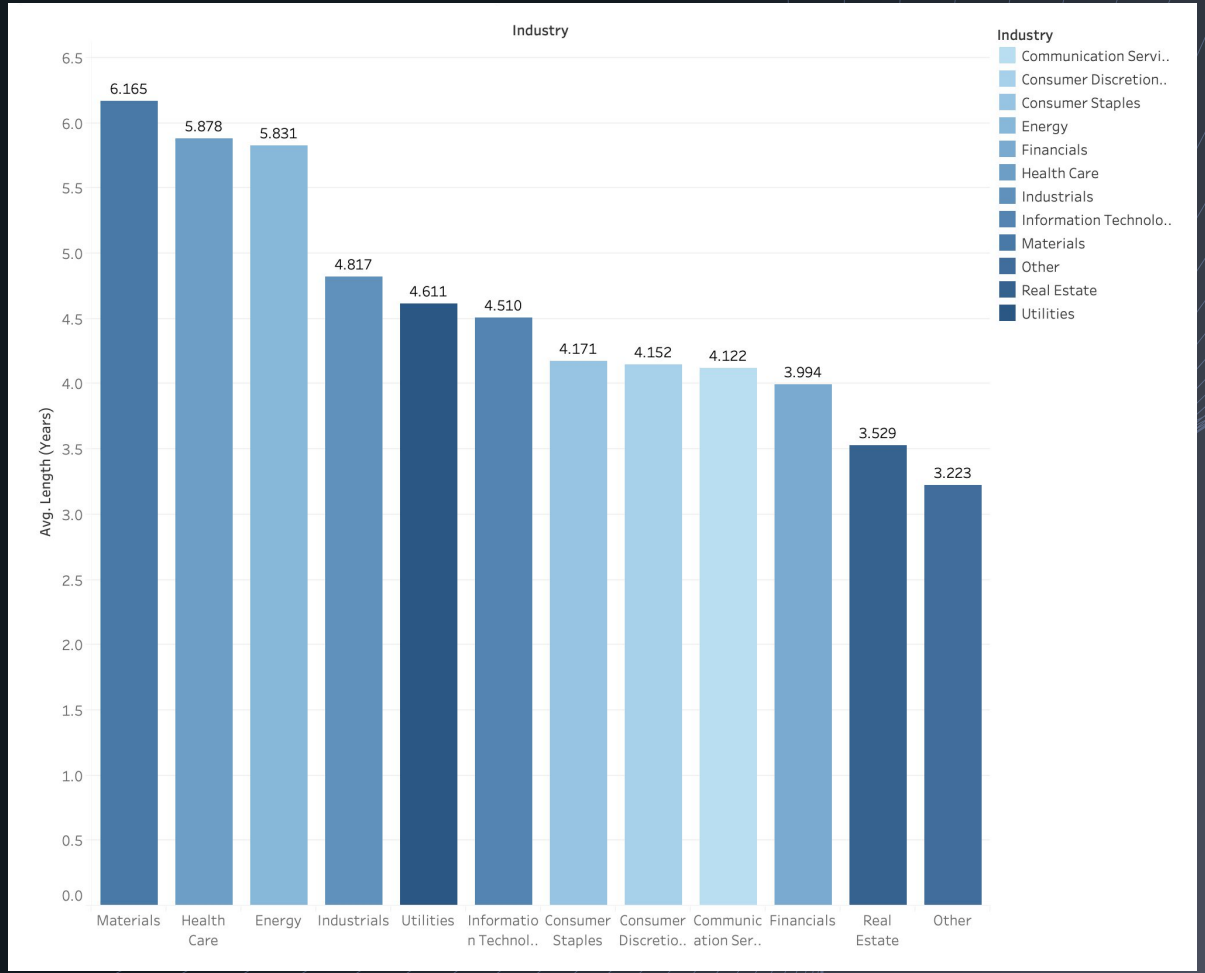
Create data visualizations that provide DUMAC analysts with another historical data point in their venture investment analysis.

Venture Analysis

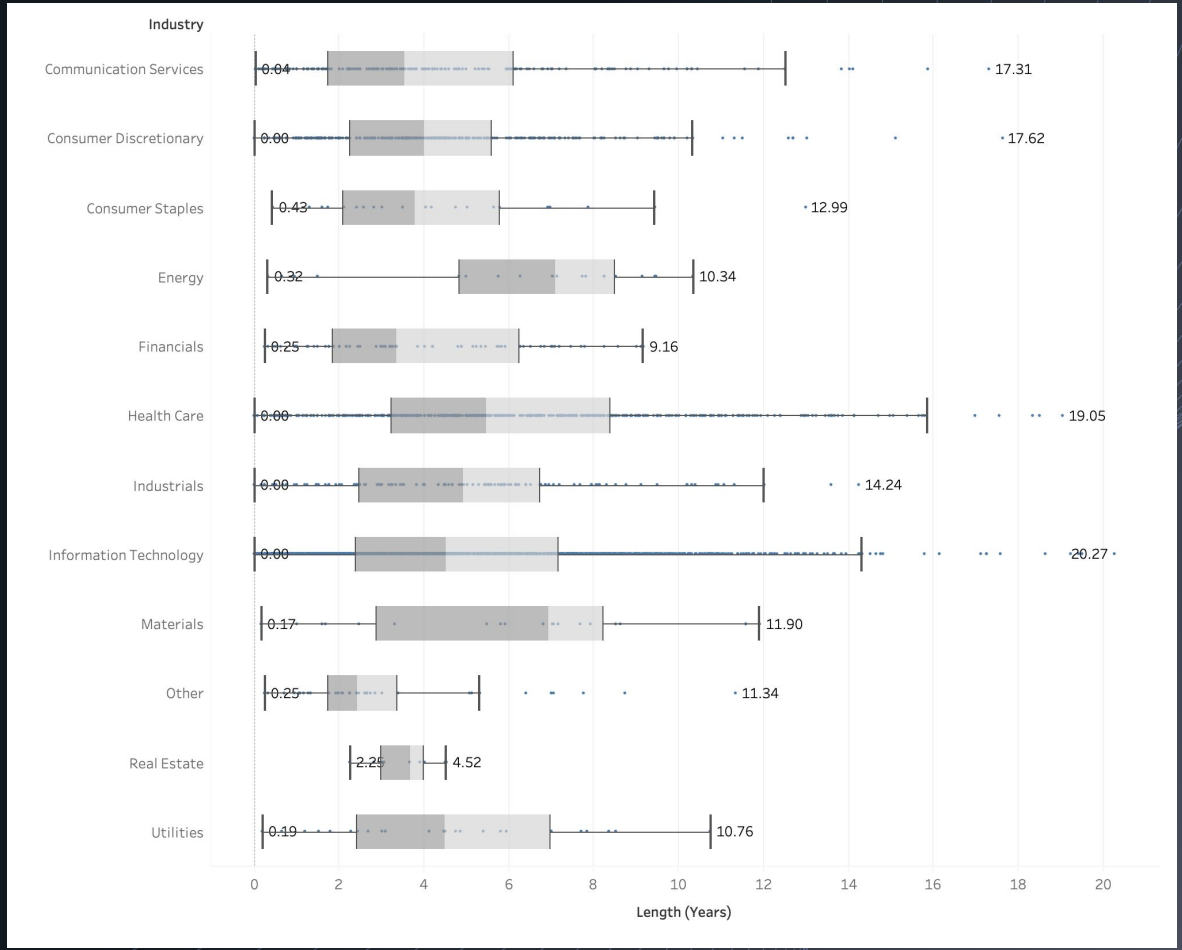
How?

- Web-scraping (extraction of data from websites) for age and investment series
  - Pitchbook
  - Assessing founding date and initial investment date to calculate company age
  - Pulling all available series data to find investment round
- Use Tableau to consolidate the Burgiss data with the data scraped off the internet and then create appropriate visualisations
- Calculate length of investments using weighted averages
- Calculate return on investments
- Consolidate data using Python scripts and Excel functions

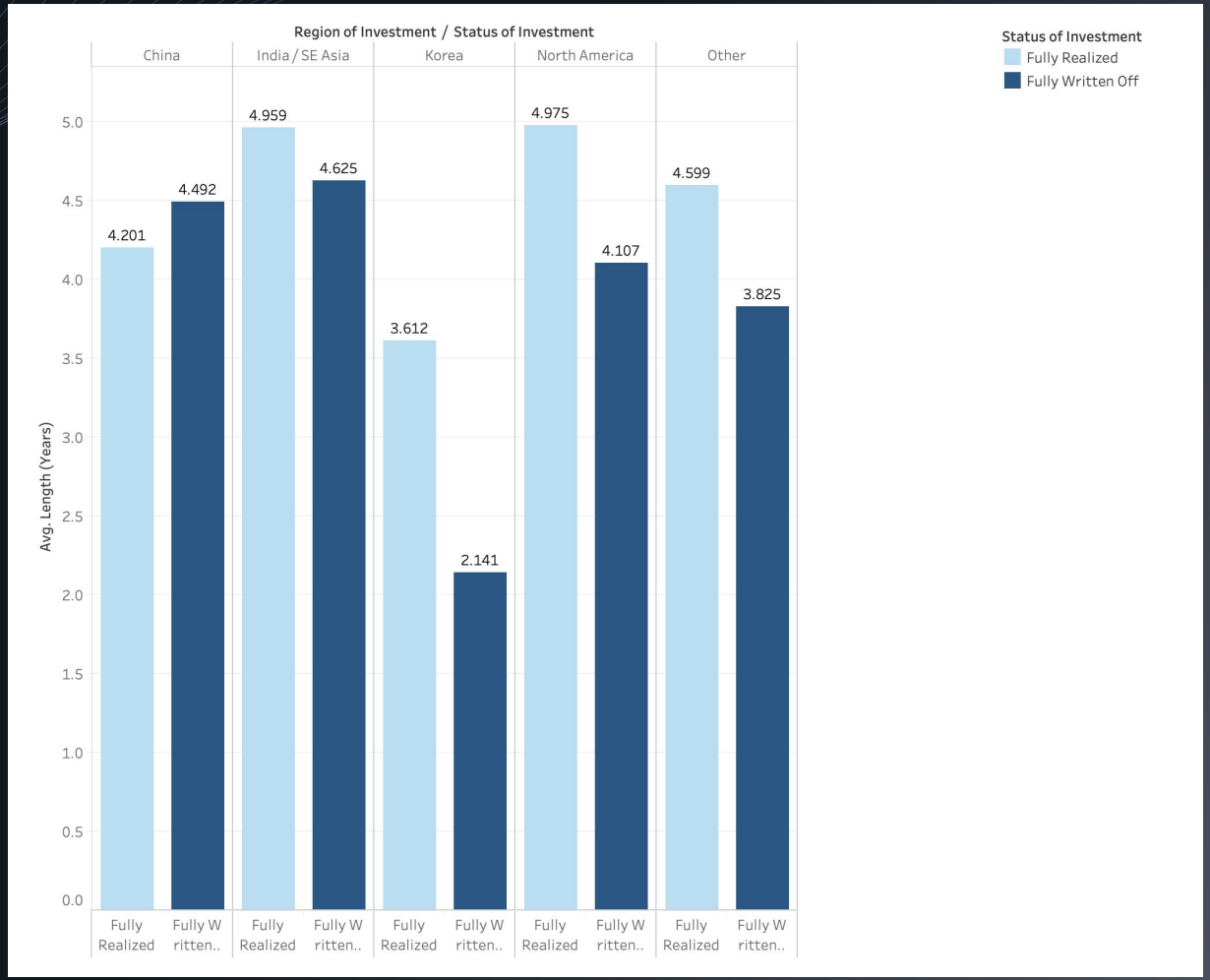
Average Length of Investment by Industry (**Incl**. Write Offs)



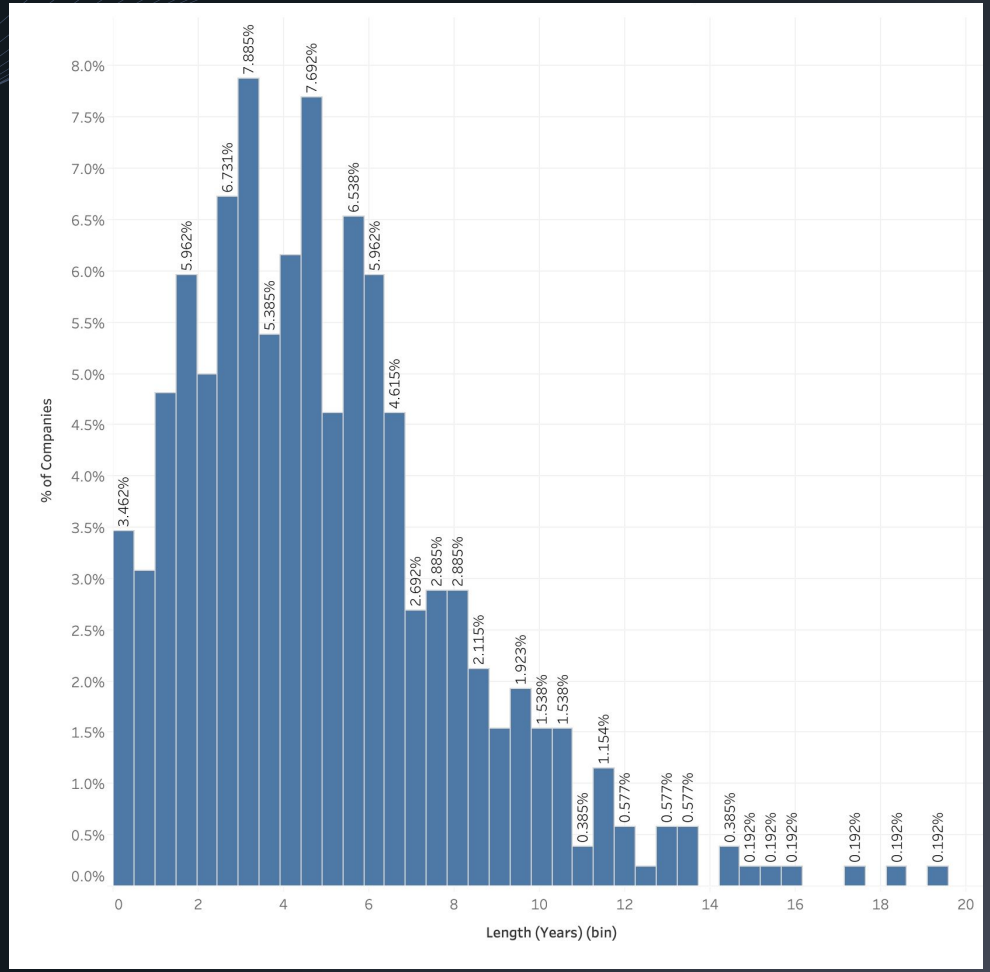
Length of Investment by Industry (**Incl.** Write Offs, Max. and Min. Labeled)



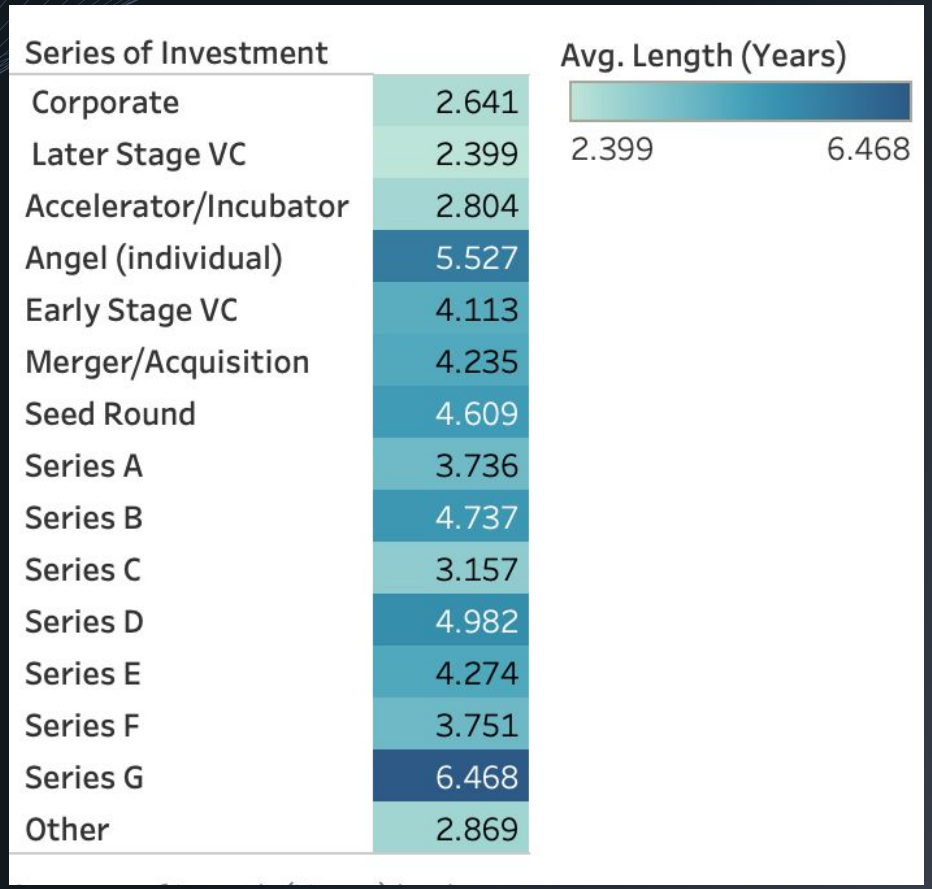
Length of Investment by Region and Status



Length of Investment Frequency (Ex. Filtered for Age 2 and 3)



Length of Investment by Series



Series of Investment	Avg. Length (Years)
Corporate	2.641
Later Stage VC	2.399
Accelerator/Incubator	2.804
Angel (individual)	5.527
Early Stage VC	4.113
Merger/Acquisition	4.235
Seed Round	4.609
Series A	3.736
Series B	4.737
Series C	3.157
Series D	4.982
Series E	4.274
Series F	3.751
Series G	6.468
Other	2.869

Intralinks

THE GOAL:

Intralinks provides a database for partners to upload files that DUMAC manually downloads. The goal is to use their provided API to automate the downloads into a folder structure for DUMAC to access in a more efficient and time-effective manner. A secondary goal would be to then organize these files into the existing DUMAC file database.

Going Forward:

We are currently planning an extended relationship with DUMAC to continue to help with projects similar to this.

Need to get familiar with the API and existing DUMAC code and file base

Create mapping for file names to create more organized and clear database

Thank you for listening!