Randomised Portfolios in Insurance

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Introduction

Basic Concept

Insurance Use Cases

Random Portfolios

Risk/Reward Tradeoff

Risk Tolerance

Risk Limits

Only NASDAQ, NYSE listed stocks

No single stock greater than 5% of portfolio

Market Cap greater than 100M USD

No sector greater than 25% of portfolio

Key Finding

Portfolio performance is highly dependent on risk limits

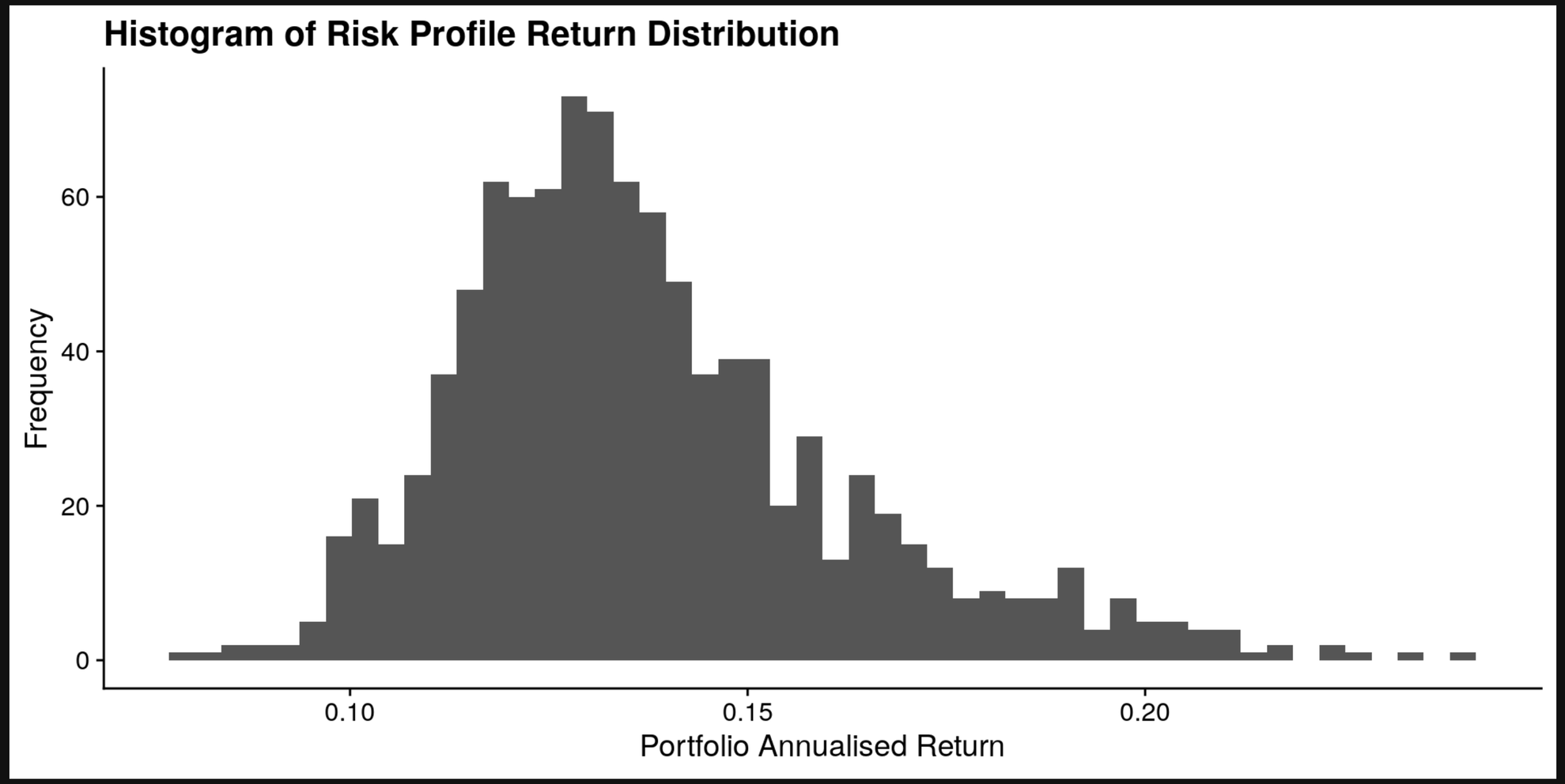
Separate “alpha” from “beta”?

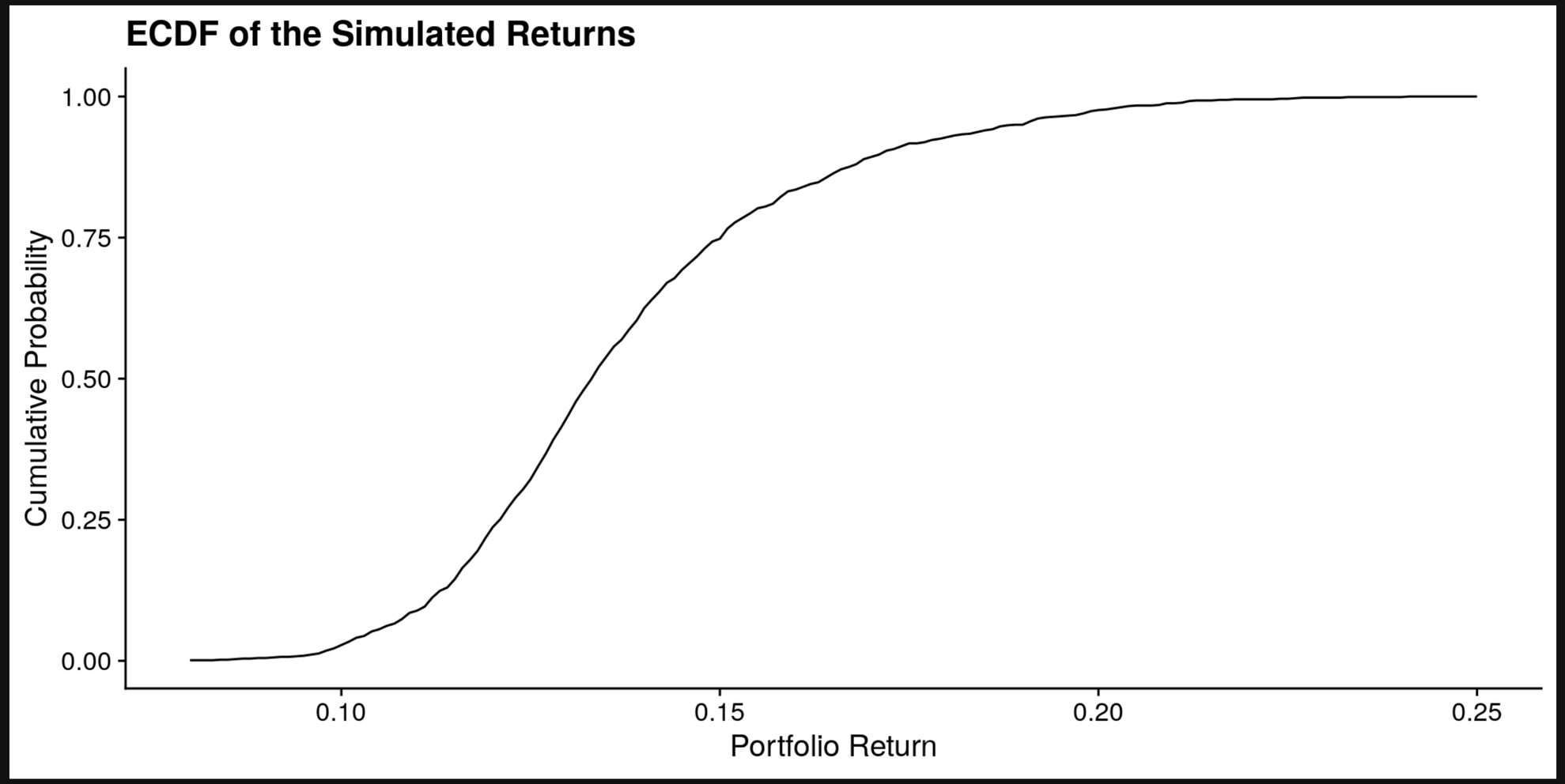
CAPM Model

$$r = \alpha + \beta m$$

Basic Approach

1. Generate random portfolios obeying risk limits
2. Measure performance of random portfolios
3. Compare actual with simulated returns


Histogram of Risk Profile Return Distribution
Frequency
60
40
20
0
0.10
0.15
0.20
Portfolio Annualised Return


ECDF of the Simulated Returns
Cumulative Probability
1.00
0.75
0.50
0.25
0.00
0.10
0.15
0.20
0.25
Portfolio Return

But what about insurance???

Steal the simple idea...

Use random portfolios of policies to do stuff

What sort of stuff?

Insurance Use Cases

Premium Forecasting

Lloyd’s Underwriter

Premium Planning

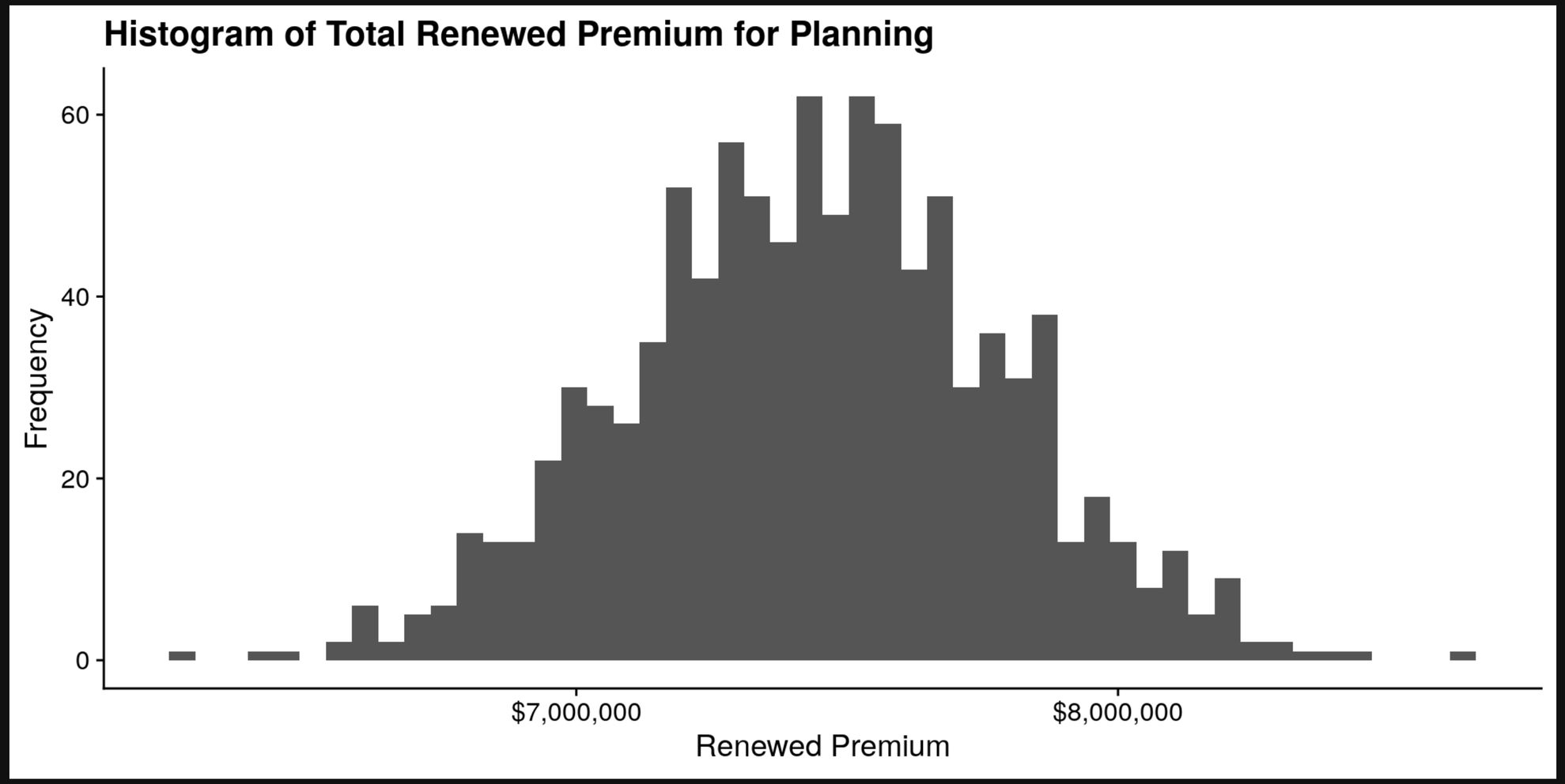
Knows the Market

Policy_Number	Company_Sector	Company_Name	Premium	Retention
GL00001	Technology	Technology Co 2	$40,404	Medium
GL00002	Technology	Technology Co 3	$41,952	Low
GL00005	Healthcare	Healthcare Co 6	$32,854	Medium
GL00007	Construction	Construction Co 8	$26,090	High
GL00008	Healthcare	Healthcare Co 9	$25,467	Medium
GL00009	Renewable Energy	Renewable Energy Co 10	$81,331	Medium
GL00012	Technology	Technology Co 13	$37,076	High
GL00013	Renewable Energy	Renewable Energy Co 14	$68,826	Low
GL00014	Renewable Energy	Renewable Energy Co 15	$50,257	High
GL00015	Renewable Energy	Renewable Energy Co 16	$34,535	High

Assigned High, Medium, Low chances of the retaining policy

Assign probability for policy

Run simulations


Histogram of Total Renewed Premium for Planning
Frequency
60
40
20
0
$7,000,000
$8,000,000
Renewed Premium

Premium Planning

US Liability Business

Grow from 60mm USD to 80mm USD

Where does the premium come from?

Northeast US -> 10mm

Heathcare sector -> 5mm

Small business -> 5mm

Co-occurrence of Risk Factors

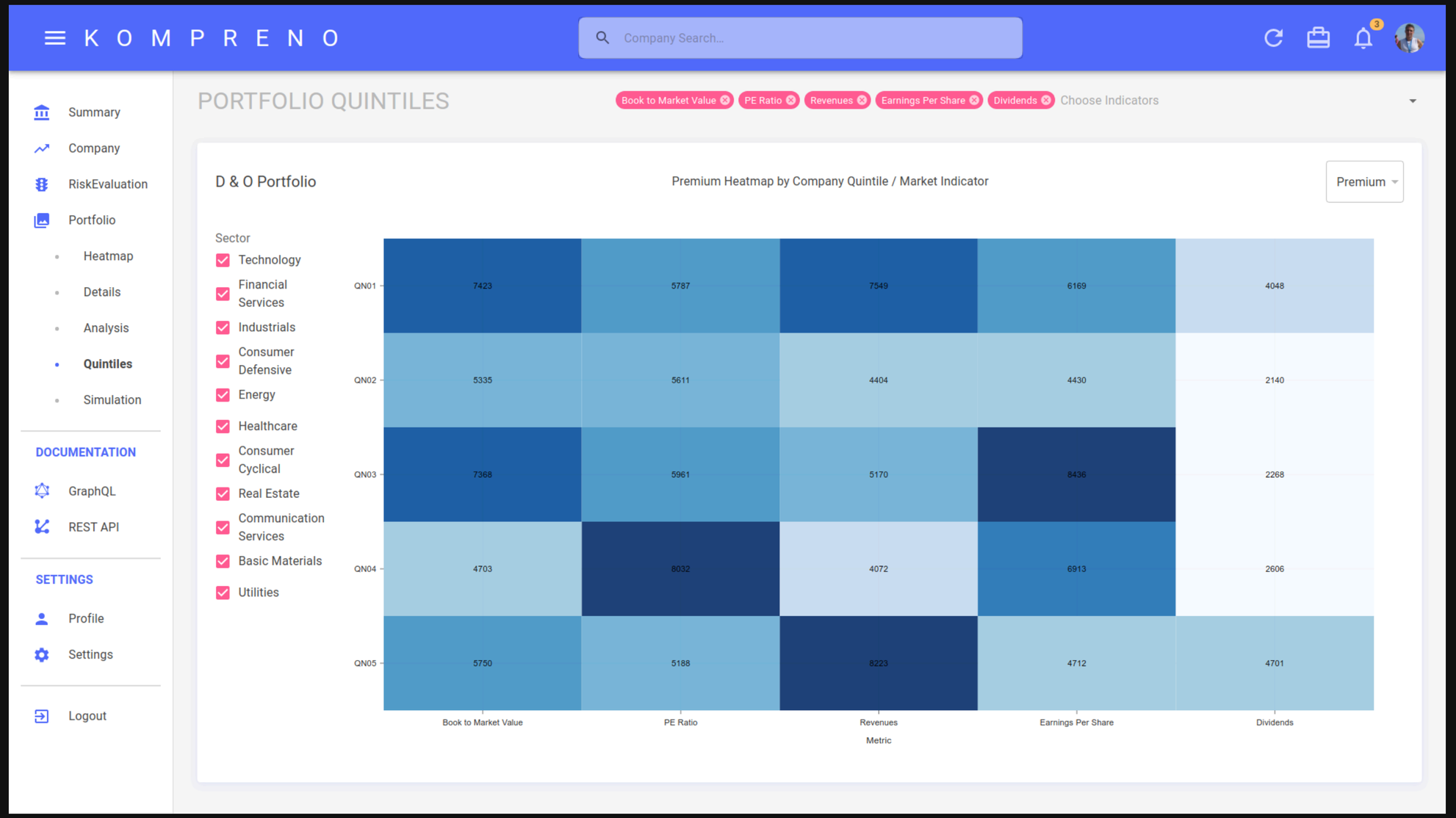
Allocate by simulating policies

Also allocates across other policies

Portfolio Optimisation

Involved

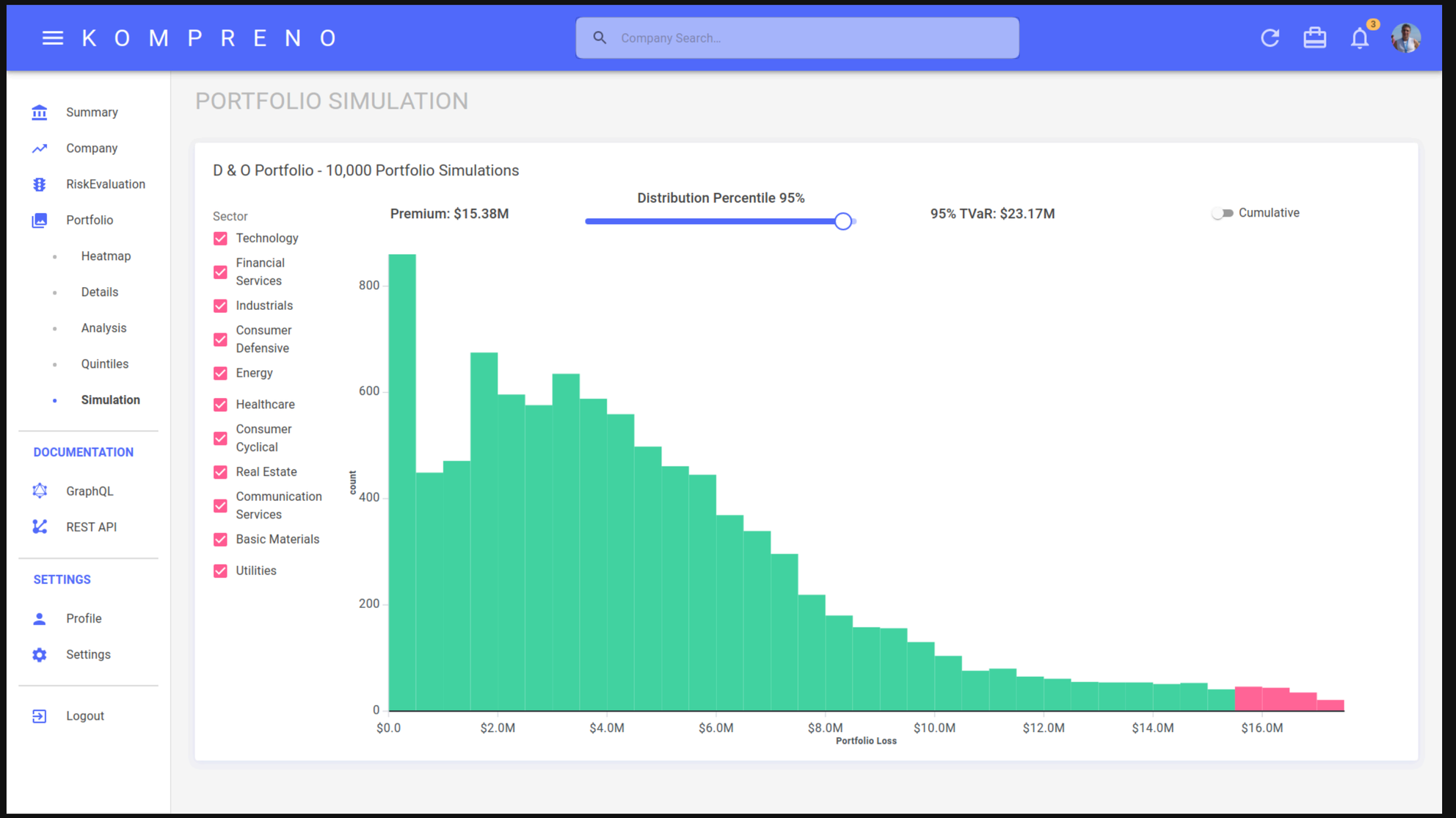
Basic visualisations


KOMPRENO
Company Search...
3
Summary
Company
RiskEvaluation
Portfolio
Heatmap
Details
Analysis
Quintiles
Simulation
DOCUMENTATION
GraphQL
REST API
SETTINGS
Profile
Settings
Logout
PORTFOLIO QUINTILES
Book to Market Value
PE Ratio
Revenues
Earnings Per Share
Dividends
Choose Indicators
D & O Portfolio
Premium Heatmap by Company Quintile / Market Indicator
Premium
Sector
Technology
Financial Services
Industrials
Consumer Defensive
Energy
Healthcare
Consumer Cyclical
Real Estate
Communication Services
Basic Materials
Utilities
QN01
QN02
QN03
QN04
QN05
7423
5787
7549
6169
4048
5335
5611
4404
4430
2140
7368
5961
5170
8436
2268
4703
8032
4072
6913
2606
5750
5188
8223
4712
4701
Book to Market Value
PE Ratio
Revenues
Earnings Per Share
Dividends
Metric

Use pricing / loss models

Simulate portfolios

What does ‘optimal’ mean?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PORTFOLIO SIMULATION
D & O Portfolio - 10,000 Portfolio Simulations
Distribution Percentile 95%
Premium: $15.38M
95% TVaR: $23.17M
Cumulative
Sector
Technology
Financial Services
Industrials
Consumer Defensive
Energy
Healthcare
Consumer Cyclical
Real Estate
Communication Services
Basic Materials
Utilities
800
600
400
200
0
count
$0.0
$2.0M
$4.0M
$6.0M
$8.0M
$10.0M
$12.0M
$14.0M
$16.0M
Portfolio Loss

Proper use may require rethinking relationships

Summary

Random Portfolios are a powerful idea

Lots of use cases in insurance

Requires computational power

Thank You!

Slides for Talk

Detailed Work