2025 BAS Case Competition

Team #06: Willem De Haan, Raine Hoang, Zaide Pasion, May Tran

Welcome, Montgomery Realty

Agenda

1. Volatility Exhibits
2. Insurance Portfolio Performance
3. An Additional Metric
4. Insurer 1's Proposal
5. Final Advisory

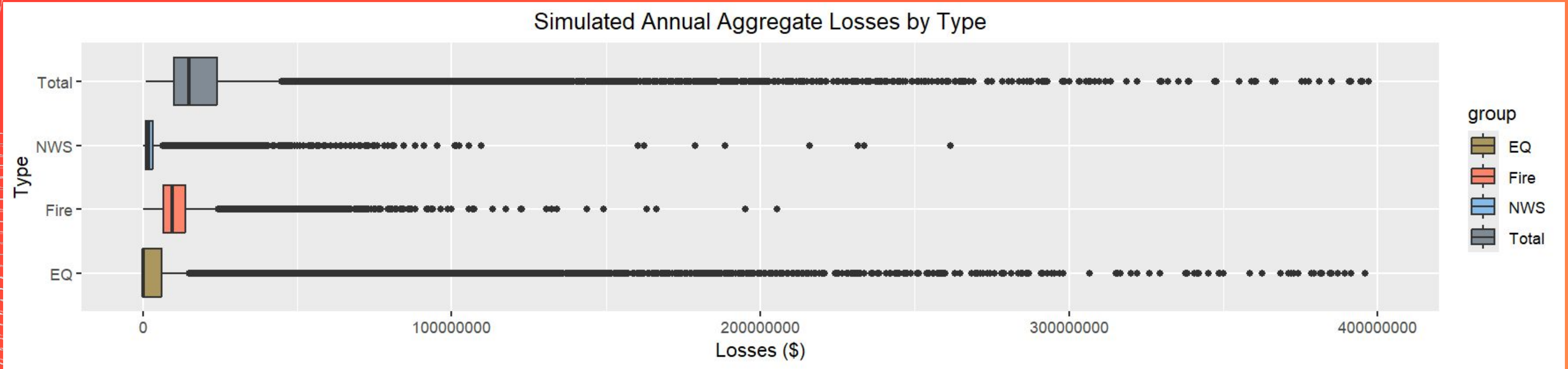
Volatility Exhibits

Methodology:

Monte Carlo Simulations

- Inputs: Frequency distributions for each peril and Severity distributions of the losses per claim
  - Distribution information came from CAT Models and Severity Fitting
- Simulate 100,000 times to see the range of possible outcomes

Box-and-Whisker Plot

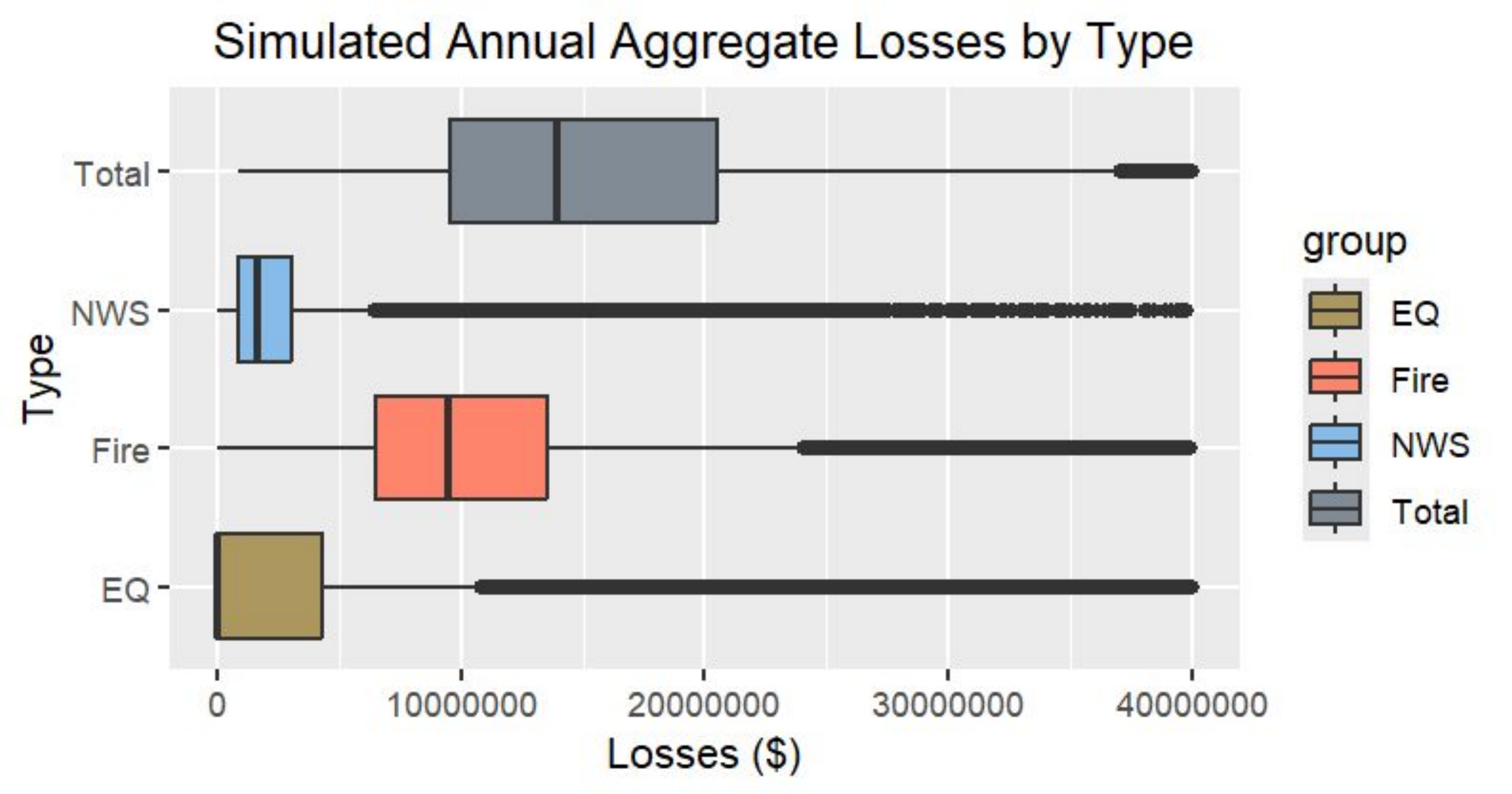


A Closer Look:

	Num Outliers	SD	IQR
Claim Type			
Fire	4380	7084381	7101818
NWS	6425	5296280	2237166
EQ	14228	38468940	5984701

↓

	Num Outliers	SD	IQR
Claim Type			
Total	7205	39546187	13962049



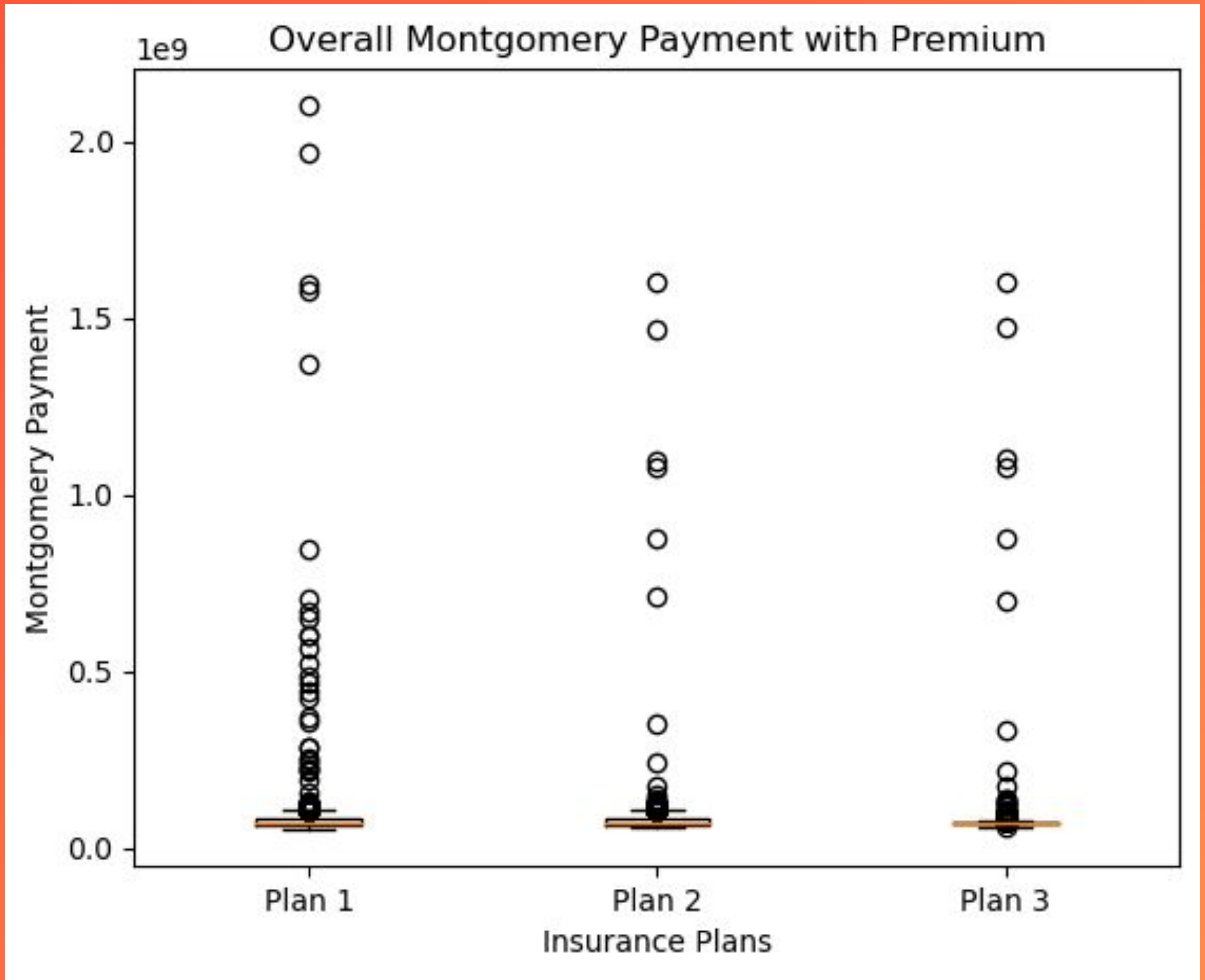
Insurance Portfolio Performance

Methodology:

Insurance Stress Test

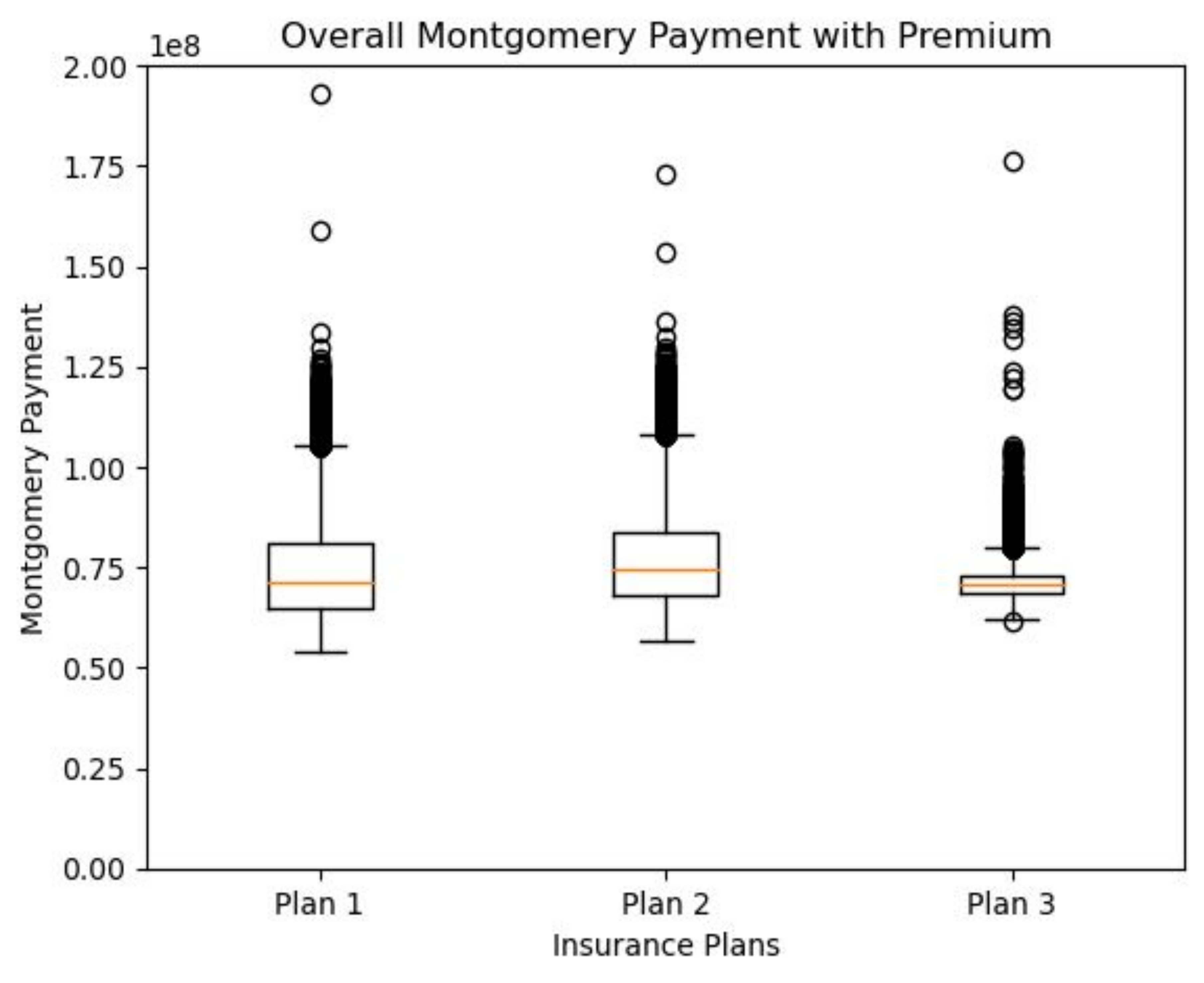
- Simulate number of losses in a year using given distributions
- Simulate claim amounts associated with those losses
- Run each trial through the 3 insurance plans
- Compare performance

Overall Performance:



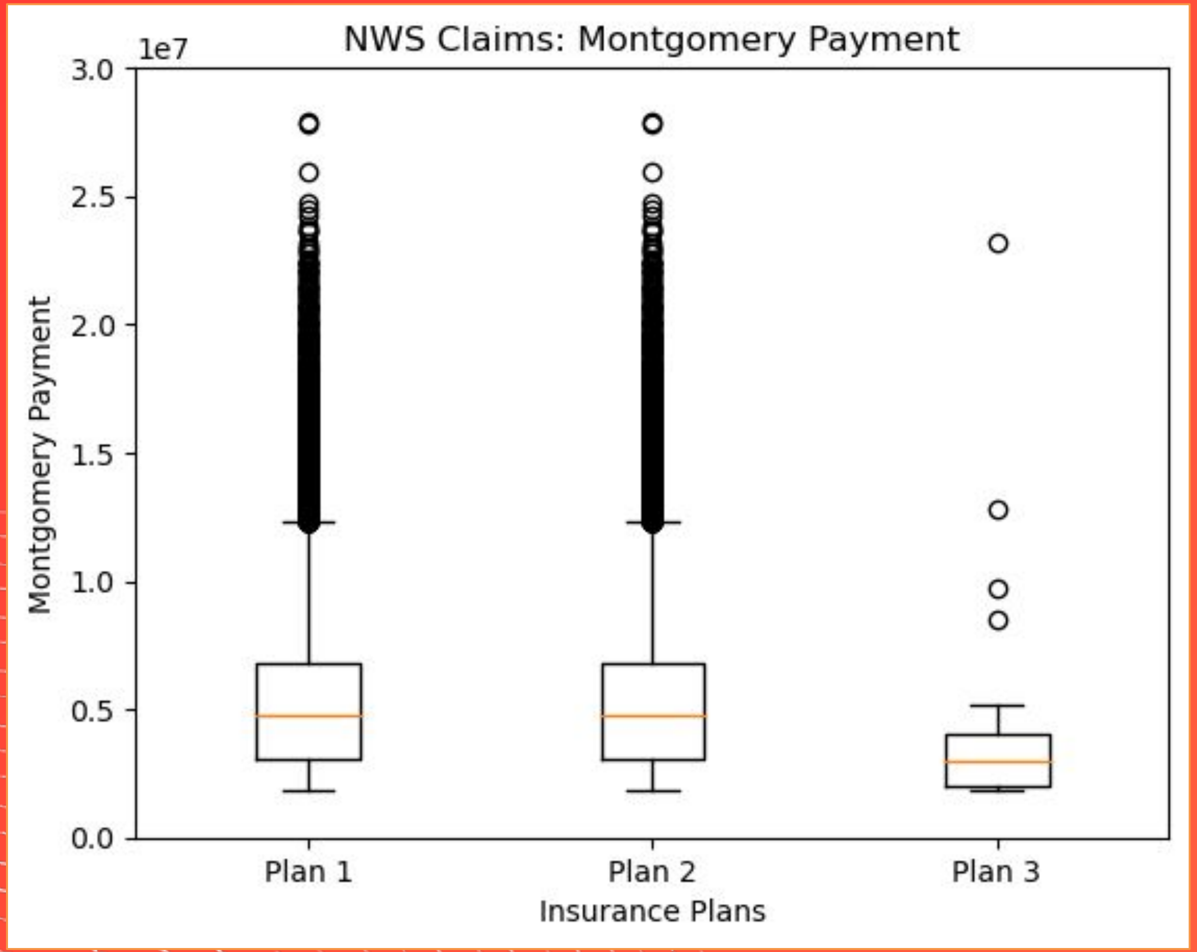
A Closer Look:

Plan	Average Payment per Year	IQR	Standard Deviation
Plan 1	7.437474e+07	1.607468e+07	1.776537e+07
Plan 2	7.710725e+07	1.606905e+07	1.462143e+07
Plan 3	7.115357e+07	4.574010e+06	9.390252e+06



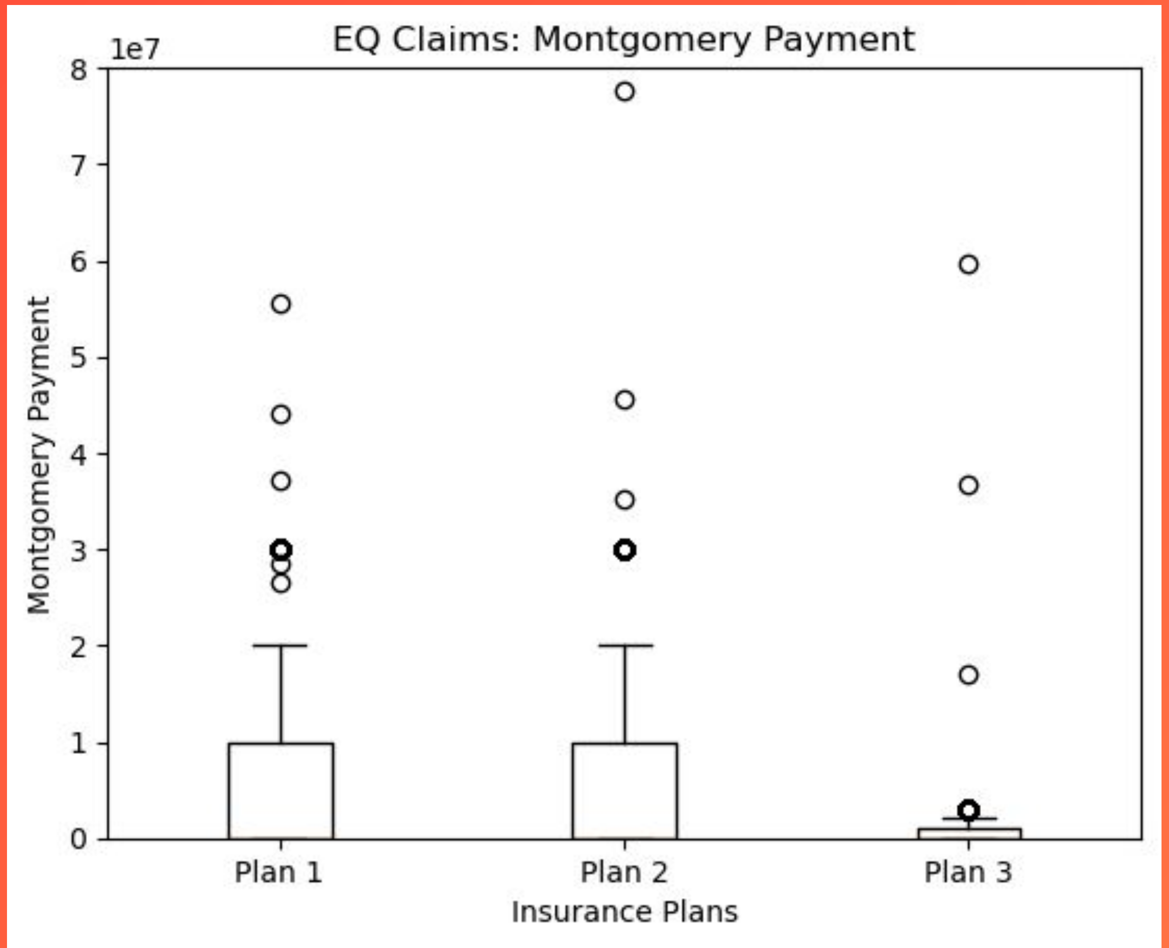
Claim Performance

NWS



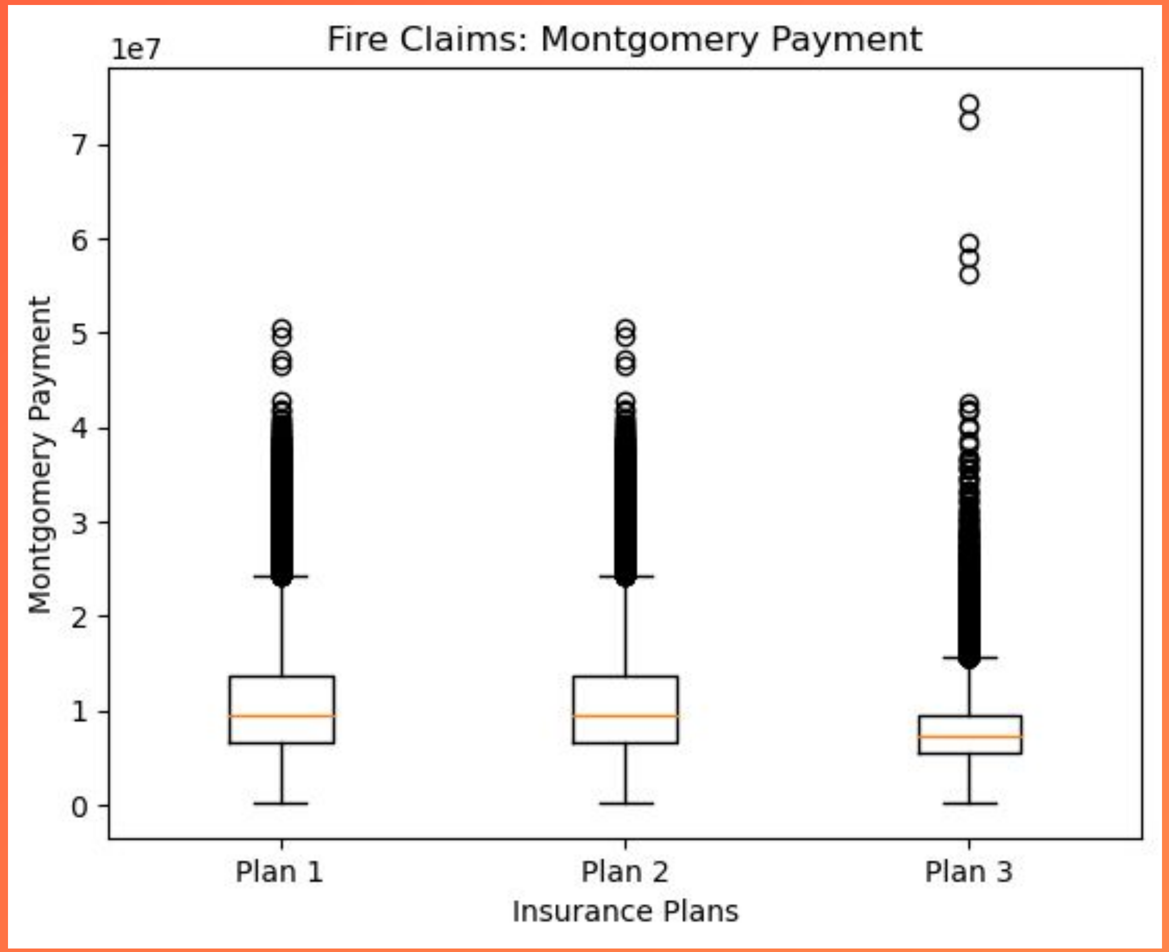
Plan	Average Payment per Year	IQR	Standard Deviation
Plan 1	5.330658e+06	3.694310e+06	3.523041e+06
Plan 2	5.330658e+06	3.694310e+06	3.523041e+06
Plan 3	3.190759e+06	2.000000e+06	2.354059e+06

EQ



Plan	Average Payment per Year	IQR	Standard Deviation
Plan 1	7.157348e+06	10000000.0	1.651904e+07
Plan 2	7.064061e+06	10000000.0	1.308513e+07
Plan 3	7.626215e+05	1000000.0	8.491272e+06

Fire



Plan	Average Payment per Year	IQR	Standard Deviation
Plan 1	1.061673e+07	7.124473e+06	5.490825e+06
Plan 2	1.061673e+07	7.124473e+06	5.490825e+06
Plan 3	7.789187e+06	4.056284e+06	3.250061e+06

Internal Objectives

CFO	Risk Manager	Broker
Select plan with lowest premium option	Select plan with lowest Total Retained amount at 50th percentile regardless of premium	Select plan with lowest Total Cost of Risk

Plan 1	Plan 2	Plan 3
$51.3M PREMIUM	$54.1M PREMIUM	$59.4M PREMIUM
$20.2M TOTAL RETAINED	$20.2M TOTAL RETAINED	$11.3M TOTAL RETAINED
$74.5M AVERAGE TCOR	$77.2M AVERAGE TCOR	$71.2M AVERAGE TCOR

Plan 1	Plan 2	Plan 3
$51.3M PREMIUM	$54.1M PREMIUM	$59.4M PREMIUM
$20.2M TOTAL RETAINED	$20.2M TOTAL RETAINED	$11.3M TOTAL RETAINED
$74.5M AVERAGE TCOR	$77.2M AVERAGE TCOR	$71.2M AVERAGE TCOR

Internal Objectives

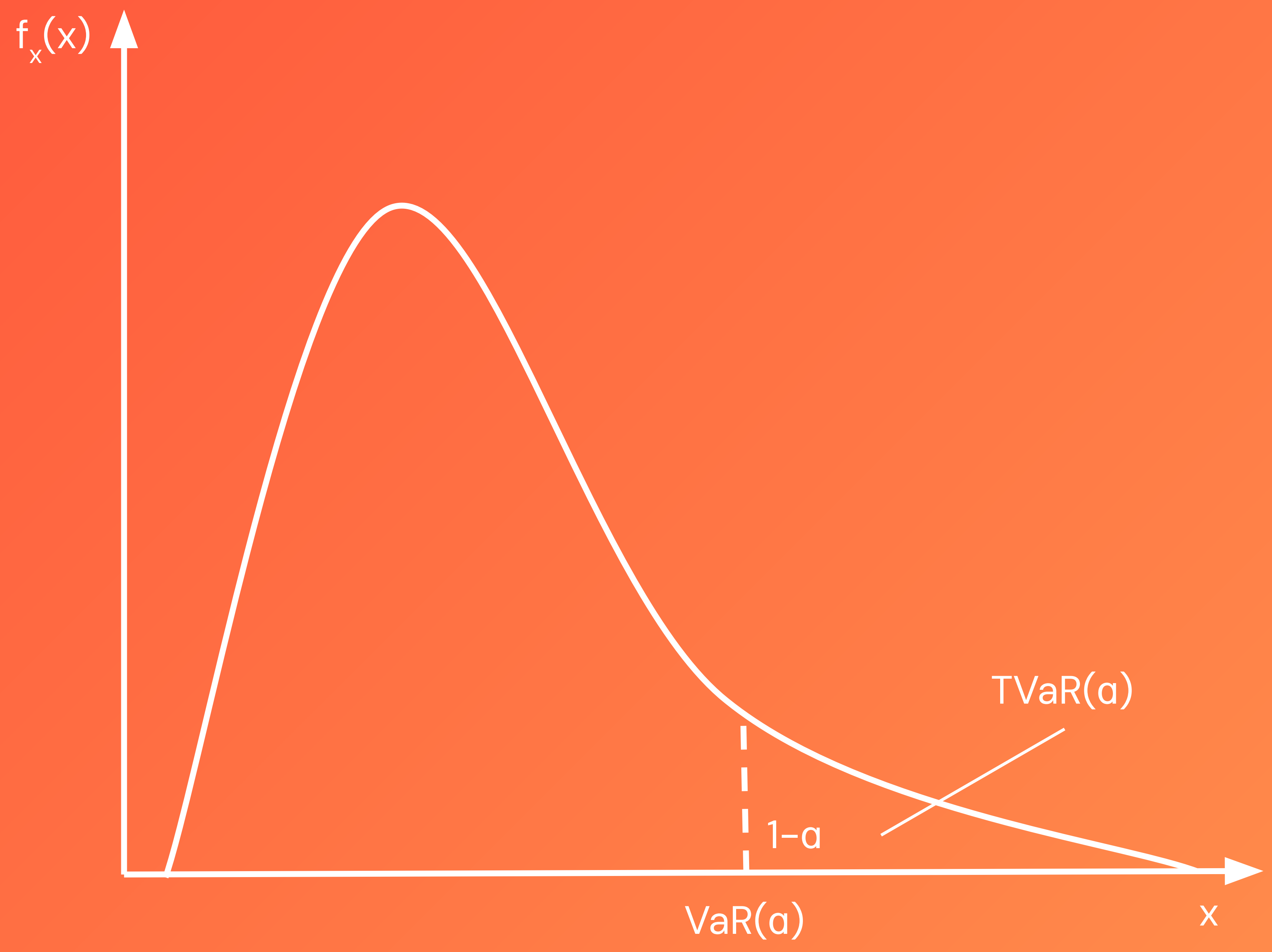
CFO	Risk Manager	Broker
Select plan with lowest premium option	Select plan with lowest Total Retained amount at 50th percentile regardless of premium	Select plan with lowest Total Cost of Risk
Plan 1	**Plan 3**	**Plan 3**

An Additional Metric

Proposed Metric: *TVaR*

- Tails Value at Risk is a commonly used risk measure that analyzes the extreme catastrophes that occur infrequently, but result in large losses

- Quantifies the expected, or average, loss of a catastrophic events that has a (1-α)% likelihood of occuring



How TVaR Balances Internal Objectives

CFO	Risk Manager	Broker
TVaR broadens the time horizon for cost.	TVaR provides information on the average retained amount for extreme catastrophes.	TVaR complements TCOR as it contextualizes expected cost for extreme catastrophes.

Plan 1	Plan 2	Plan 3
$51.3M PREMIUM	$54.1M PREMIUM	$59.4M PREMIUM
$20.2M TOTAL RETAINED	$20.2M TOTAL RETAINED	$11.3M TOTAL RETAINED
$74.5M AVERAGE TCOR	$77.2M AVERAGE TCOR	$71.2M AVERAGE TCOR
$9.78M TVaR	$9.69M TVaR	$4.59M TVaR

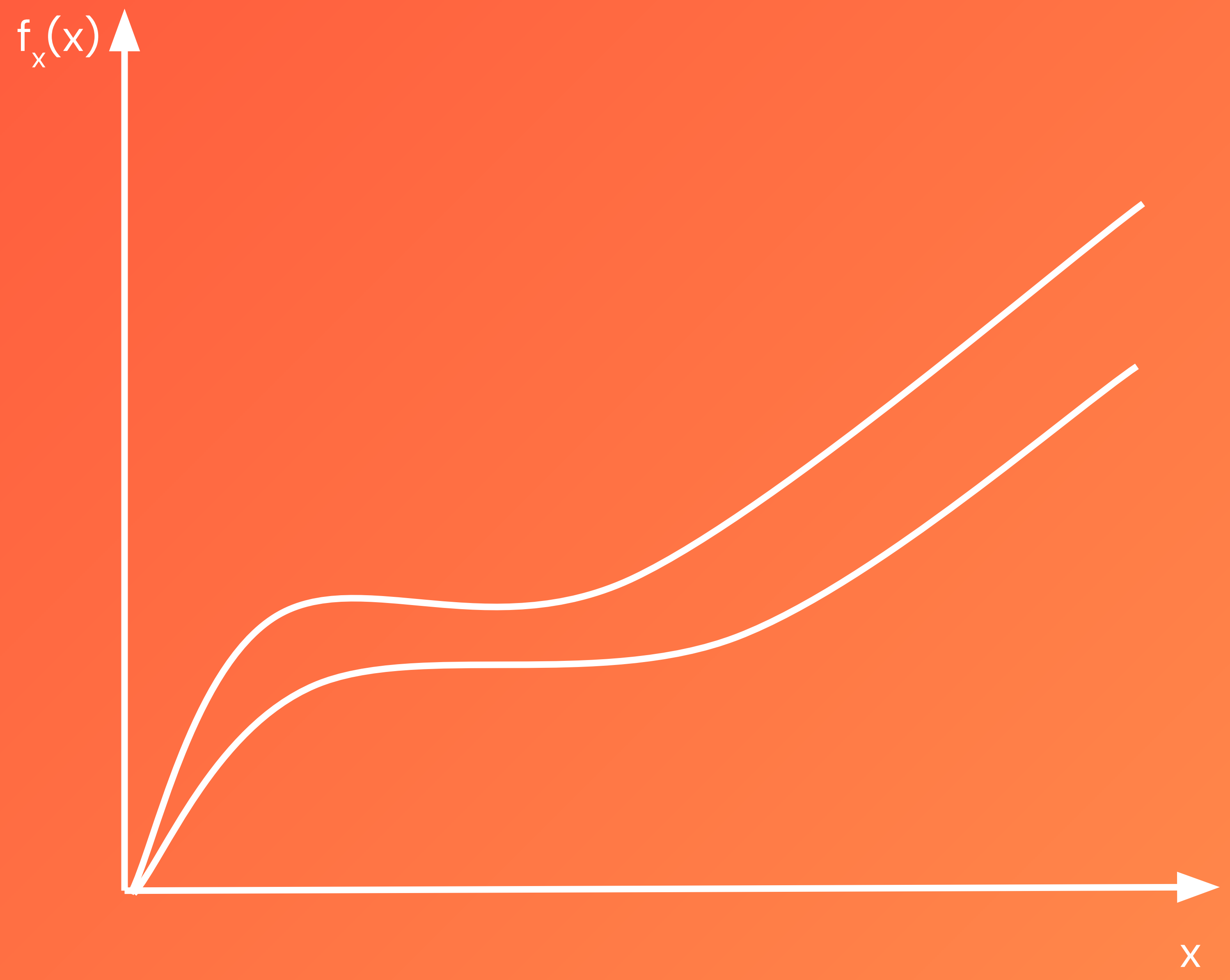
	Plan 1	Plan 2	Plan 3
PREMIUM	$51.3M	$54.1M	$59.4M
TOTAL RETAINED	$20.2M	$20.2M	$11.3M
AVERAGE TCOR	$74.5M	$77.2M	$71.2M
TVaR	$9.78M	$9.69M	$4.59M

Insurer 1's Proposal

Finding the “Right Price”

Methodology: Increased Risk Exposure

1. Construct Plan 1 without the aggregate limit
2. Perform a Stress Test on the original Plan 1 and the modified Plan 1
3. Calculate the average retained amount for both plans
4. Compute the increased risk, the ratio between the average retained of both plans
5. Use this ratio to recalculate the premium



	Plan 1	Modified Plan 1	Plan 2
Retention	$10M per occurrence	$10M per occurrence	$10M per occurrence
Fire Limits	$1B per occurrence	$1B per occurrence	$1B per occurrence
NWS Limits	$100M per occurrence/ $100M aggregate	$100M per occurrence	$100M per occurrence
EQ Limits	$500M per occurrence	$500M per occurrence	$1B per occurrence
Quoted premium	$51,270,000	?	$54,095,800

Determining the Premium

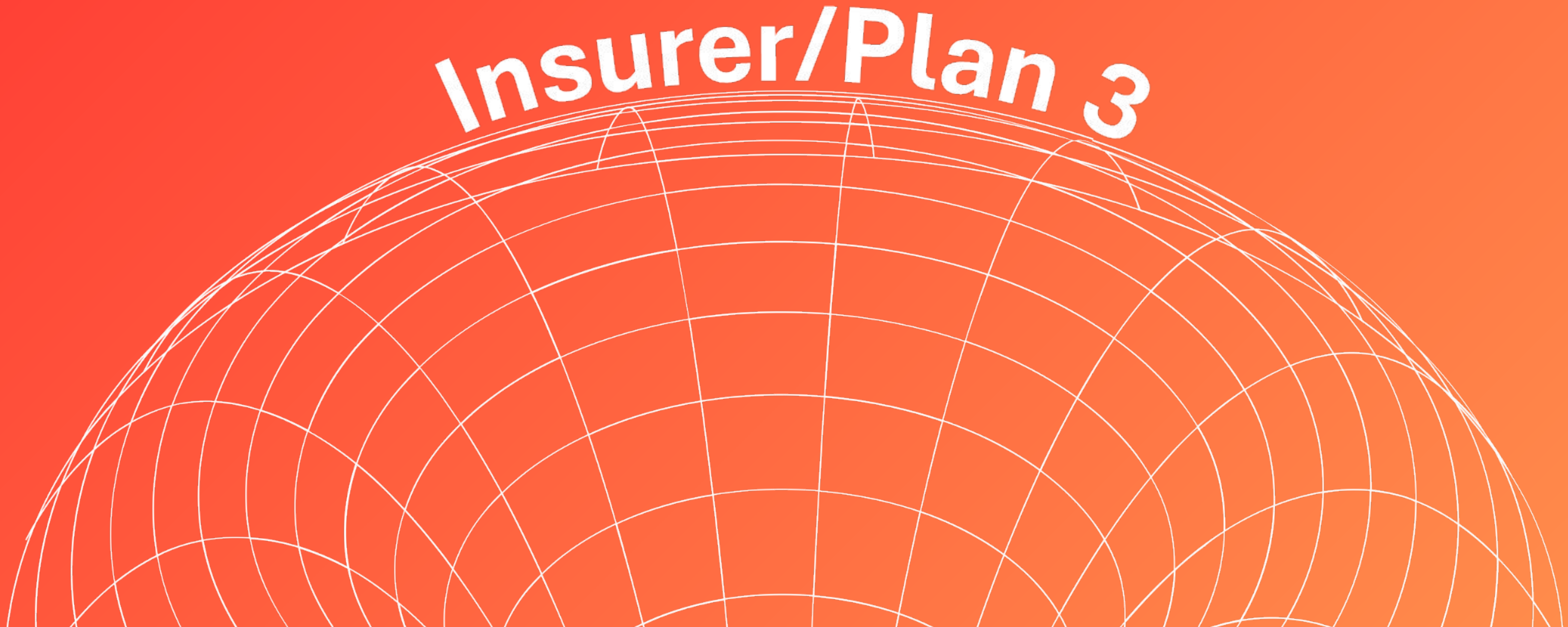
Risk Ratio		Adjusted Premium
$\dfrac{\text{Modified Plan 1}}{\text{Plan 1}}$	= 1.0	1.0 · 51,270,000 = $51,270,000
$\dfrac{\text{Modified Plan 1}}{\text{Plan 2}}$	= 0.995	0.995 · 54,095,800 = $53,832,618

The Adjusted Premium

We recommend Montgomery negotiate a premium of **$51.3 million** for Modified Plan 1

Final Advisory

Final Choice



Thank you!
Any Questions?