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Reinsurance Evaluation using Capital Tranching

Don Mango, Claude Bunick

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Common “Tail” Risk Measures and

The Risk Preferences That Are Implied When Using Them

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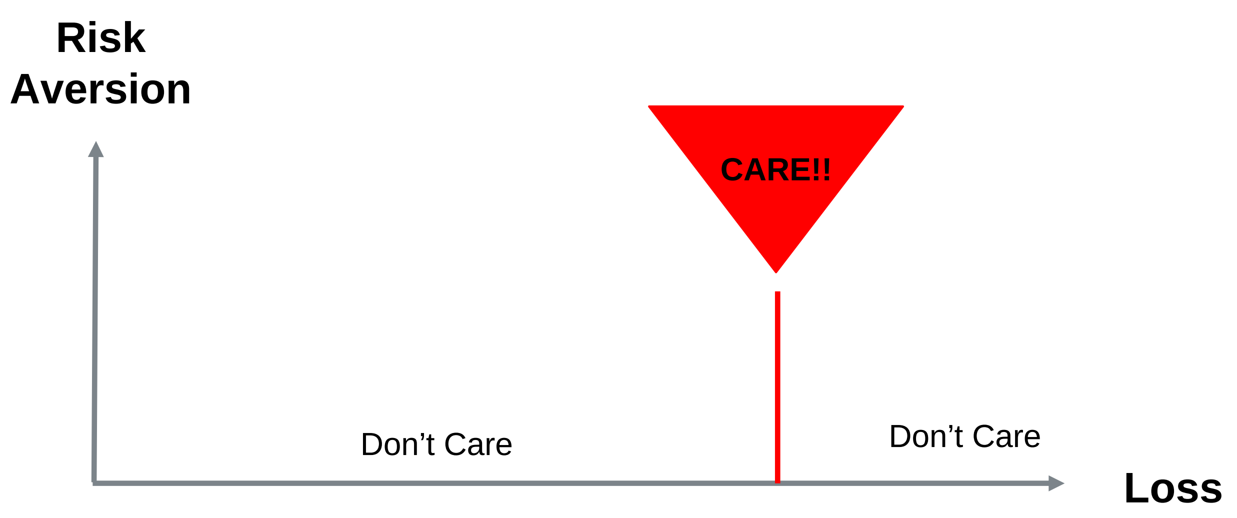
Every Tail Measure Has an IMPLICIT **Risk Preference**

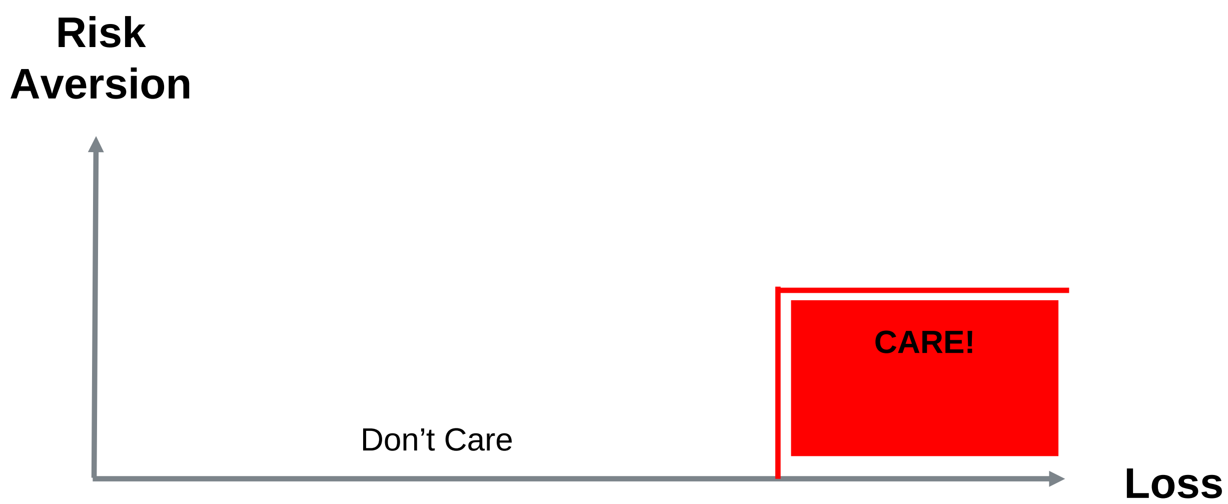
VaR (a/k/a “PML”)



- AM Best uses this type of measure for each risk element in their BCAR calculation (premium risk, reserve risk, catastrophe risk charges, etc.)
- Regulators use this type of measure in their RBC calculations

Every Tail Measure Has an IMPLICIT **Risk Preference**

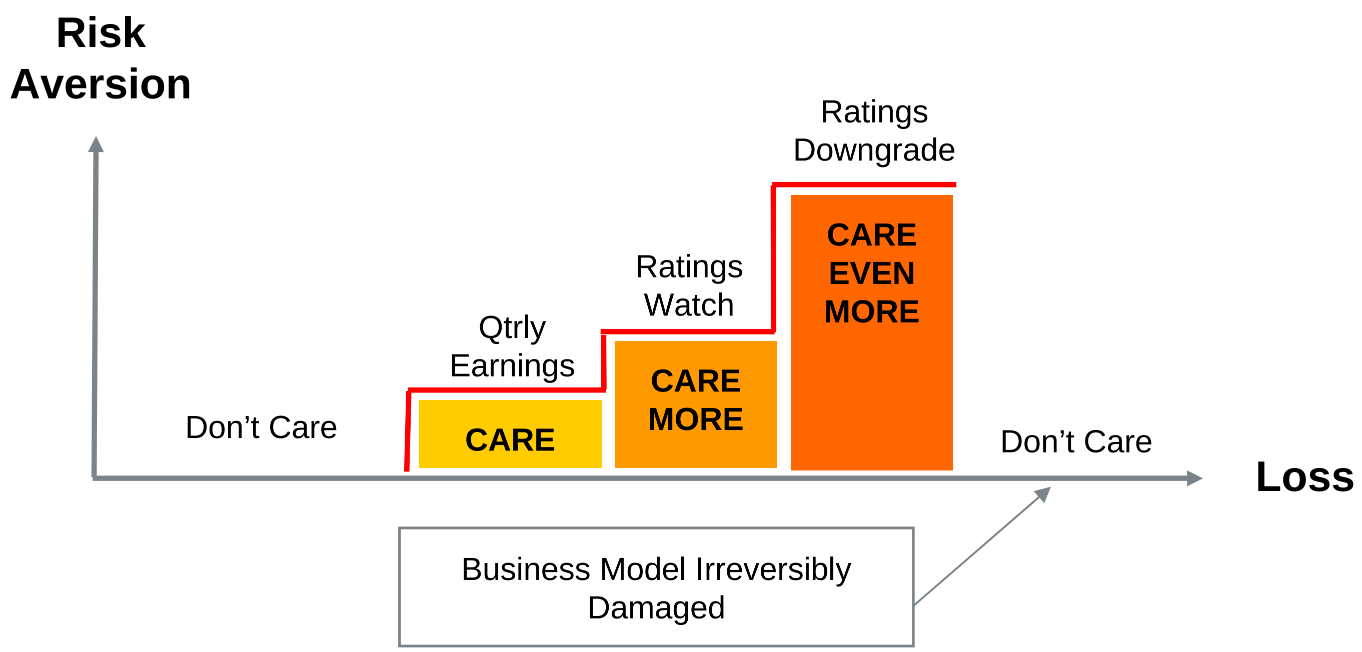
TVaR (Average loss given a PML threshold has been exceeded)



- Problem: risk neutral within the red zone
  - E.g., assume threshold corresponds to 5% loss of surplus
  - Compare losing the first 5% in the red zone (from 5% to 10%) to losing the next 5 (from 10% to 15%) -- TVaR treats them identically = equally distasteful

Every Tail Measure Has an IMPLICIT **Risk Preference**

Multi-VaR / TVaR type measures (a/k/a R*eplacement Cost Measures)*



- This is scenario-driven replacement cost
- Eliciting the height of the "ladder steps" is new ground, part of an ERM Advisory offering

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Tranching Capital™ "101"

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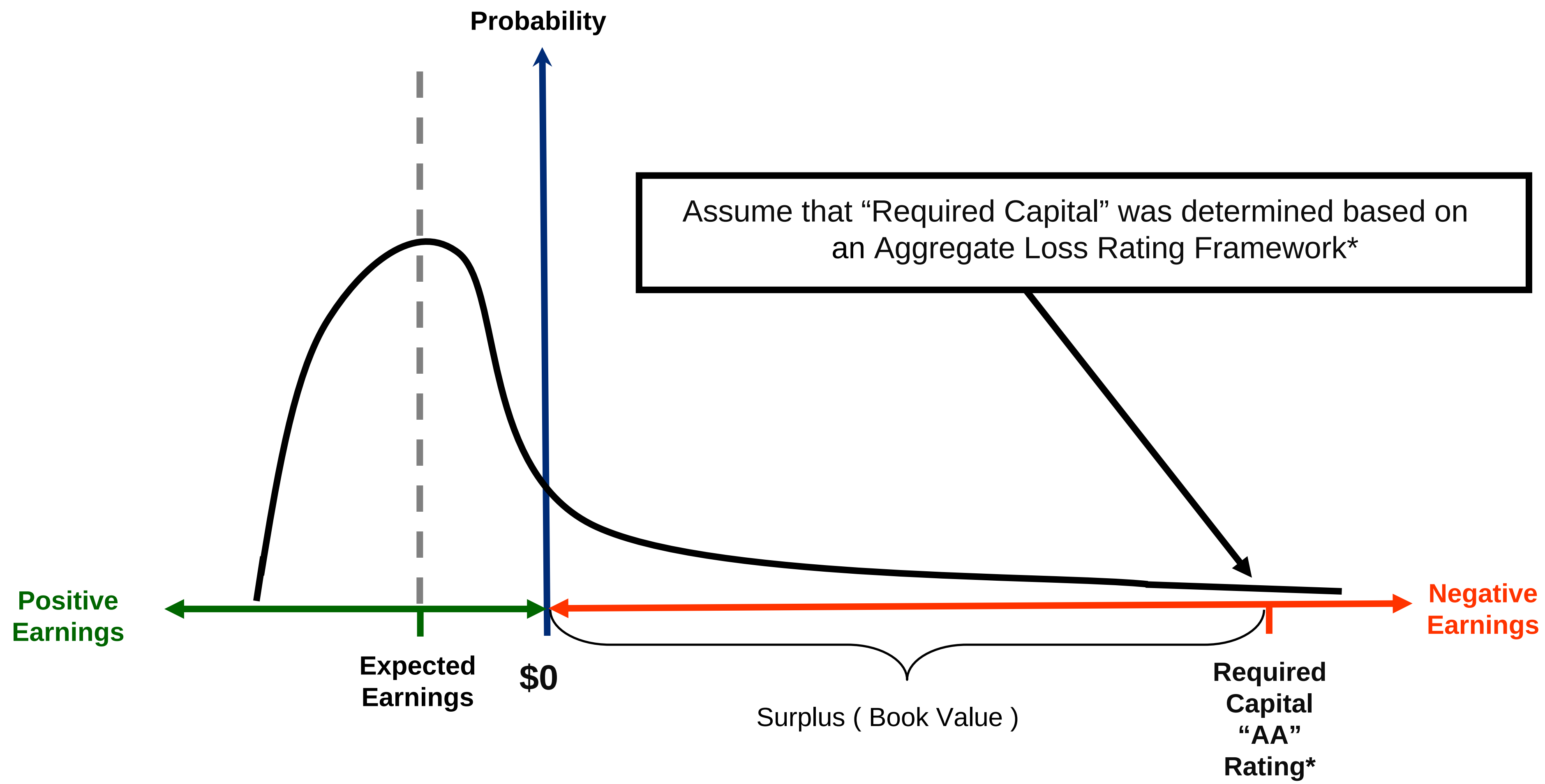
Base Case Assumptions

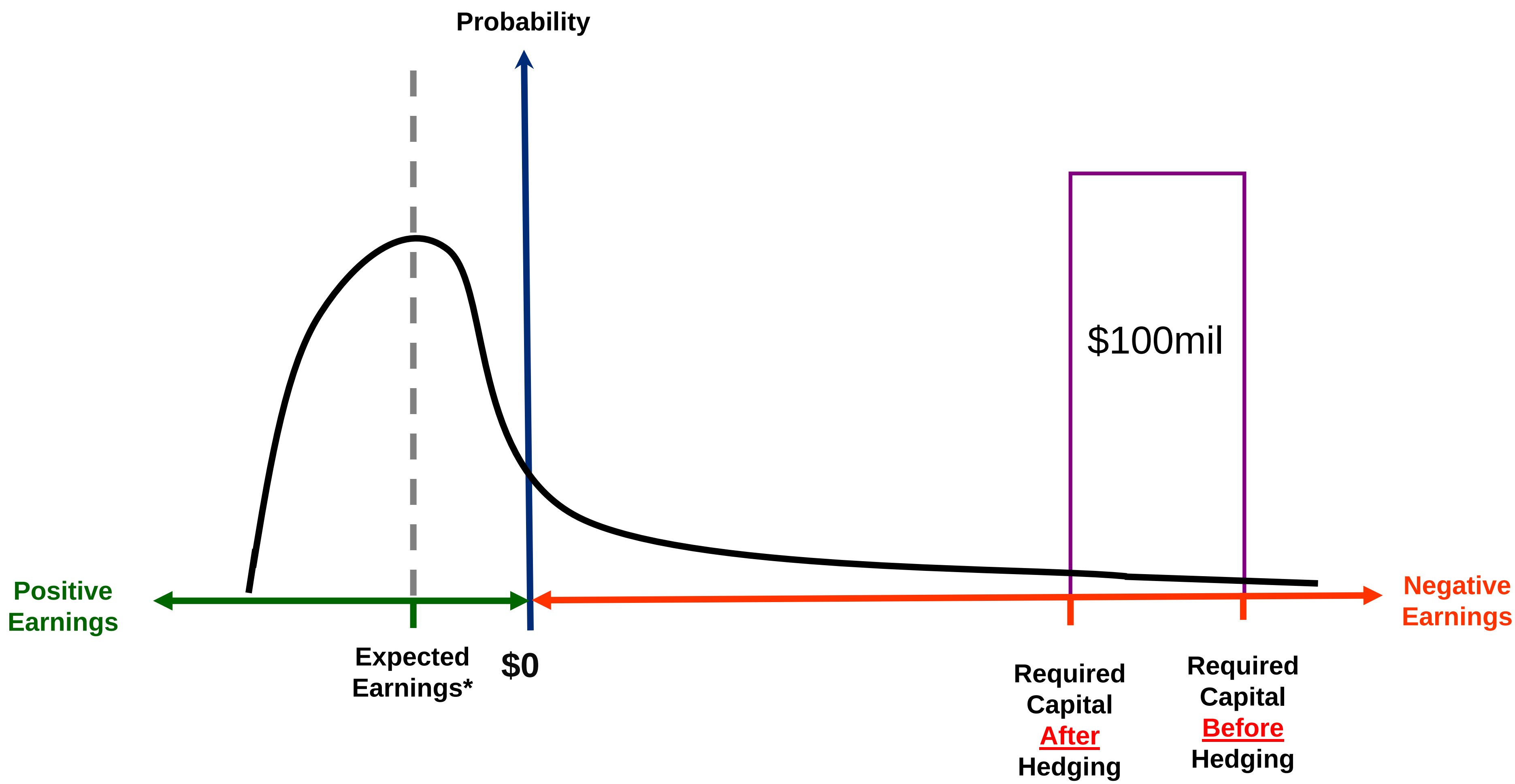
- All assets are short term US Treasuries (i.e. “risk free”)
- All assets are continuously liquid
- All premiums are written and collected on January 1st and all liabilities are paid and settled by December 31st
- Efficient markets exist (think CAPM here)
- Capital structure does not matter
- Investors are rational
- Losses are paid and incurred instantly
- Etc.

Aggregate Earnings Distribution and Required Capital



*Ratings criteria are actually based on a number of criteria both qualitative and quantitative.

Change in Required Capital (a/k/a "Capital Release"):
After reinsurance hedging (e.g. Whole Account Aggregate Stop Loss)



* To keep the example simple for this introduction, we ignored a curve shift; Expected earnings will actually be reduced by the margin ceded to pay for the hedge or lost due to business exit.

Traditional “Economic Decision Making” Framework

(Over-simplification, but many companies do this in one form or another e.g. **“Ceded ROE”)**

- Capital “Released” = $100Mil
- Cost of Capital (%) = 15% or $15 Mil

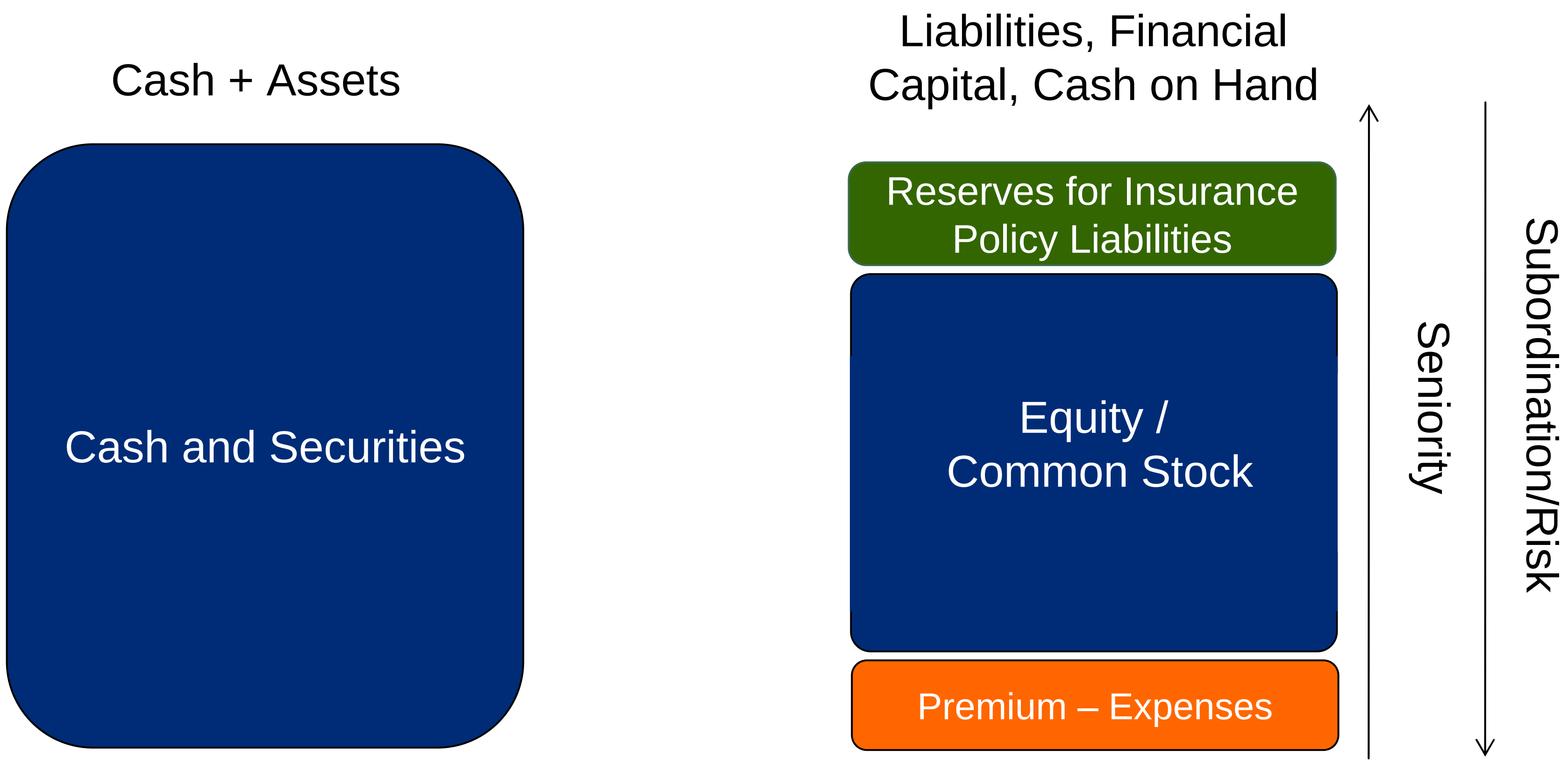
  Source: Corporate ROE target, CAPM, Analyst feedback, etc.
- Cost of Hedge = 5% ROL or $5 Mil

Buying this hedge creates $10Mil in value !

Buy it

Don’t buy it

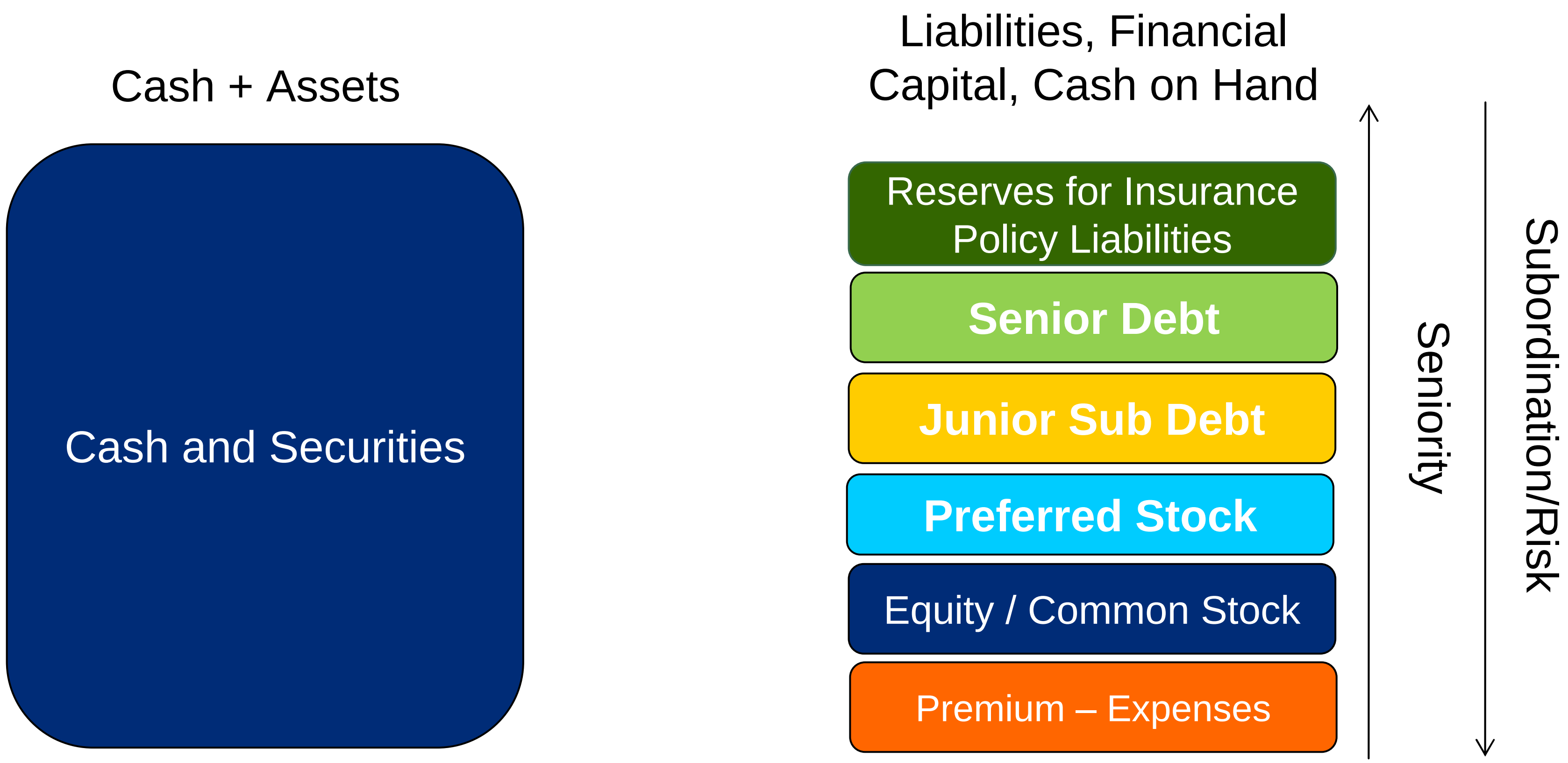
Pseudo Balance Sheet and Possible Capital Structure for a P&C Insurer



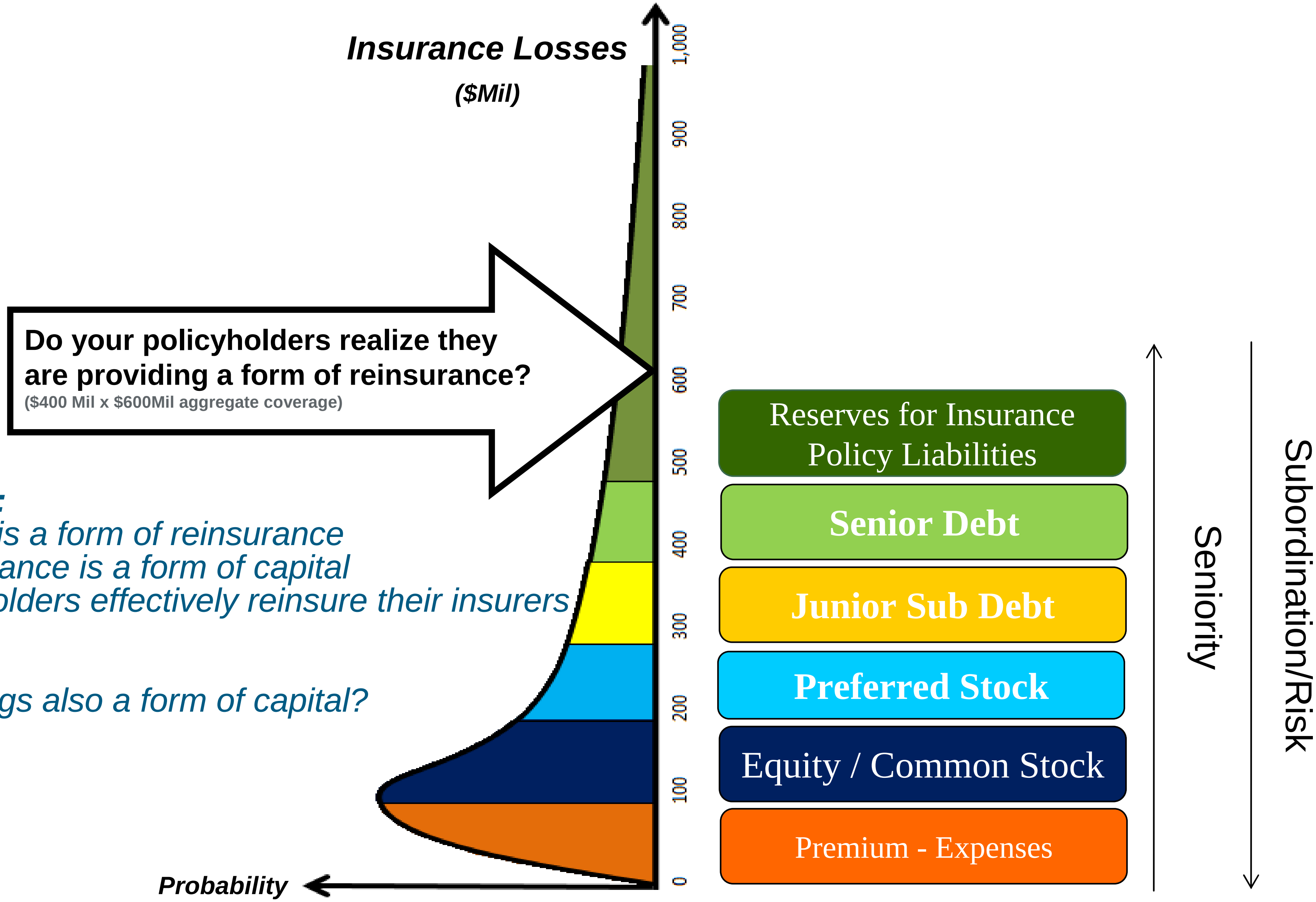
Tranched Capital Structure of a P&C Insurer

Notice:

*Capital Can Be Explicitly <u>Subordinated</u> or **"Tranched"***



Tranched Capital Structure of a P&C Insurer

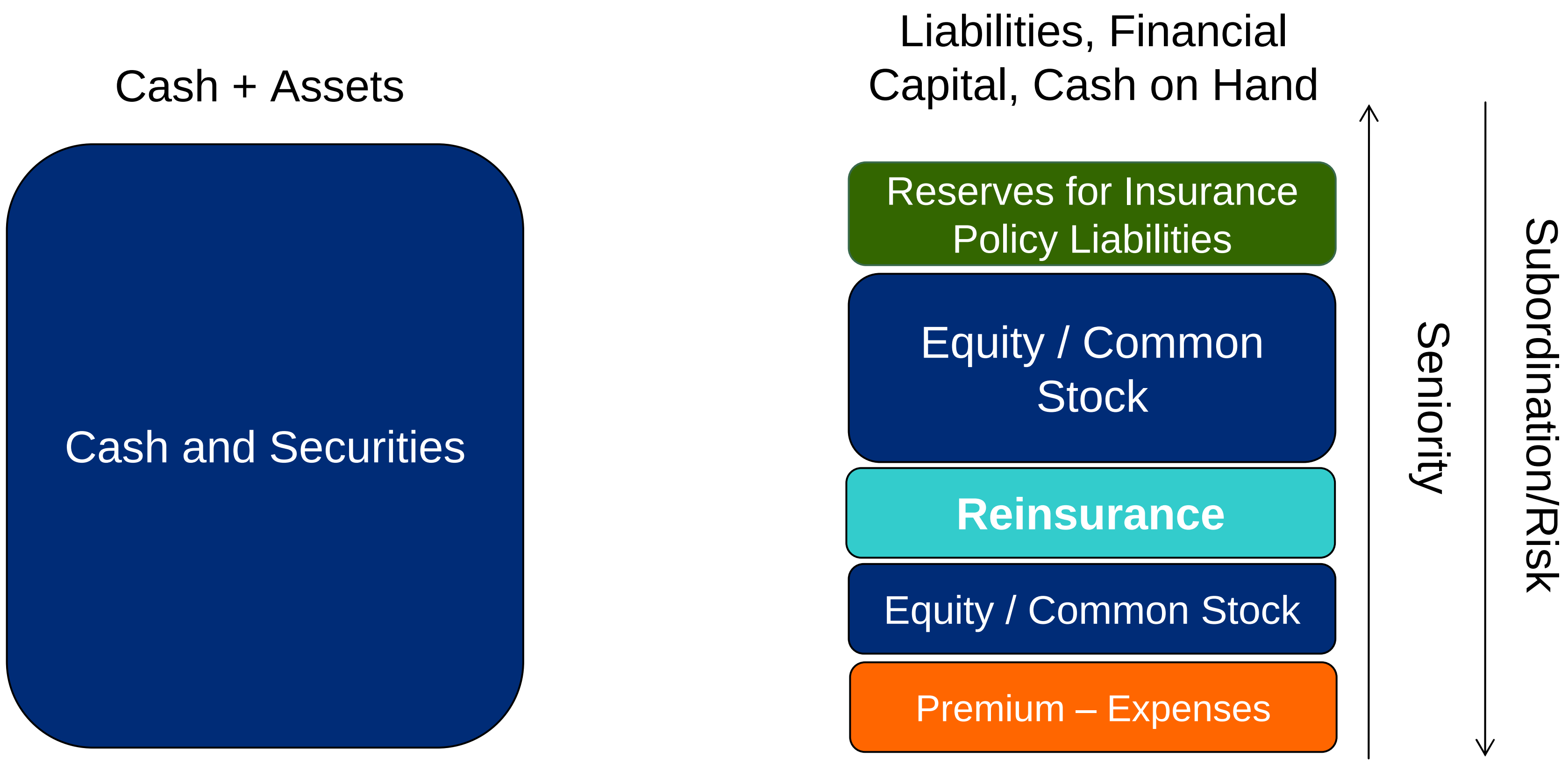


Concepts:
1) Capital is a form of reinsurance
2) Reinsurance is a form of capital
3) Policyholders effectively reinsure their insurers

Question:
Are earnings also a form of capital?

Pseudo Balance Sheet and Possible Capital Structure for a P&C Insurer

Who Said Equity Capital Must Be "Tranched" Continuously



S&P Debt Rating Framework

Can be used to estimate value Equity Capital in Rated CDO-Like Tranches

S&P Rating	Probability of Attaching *	Return Period
AAA	0.00%	33,333
AA+	0.01%	10,000
AA	0.02%	6,667
AA-	0.03%	4,000
A+	0.04%	2,500
A	0.06%	1,667
A-	0.09%	1,176
BBB+	0.23%	427
BBB	0.35%	283
BBB-	0.55%	183
BB+	1.63%	61
BB	2.53%	40
BB-	3.52%	28
B+	4.51%	22
B	5.82%	17
B-	8.14%	12
CCC+	23.58%	4

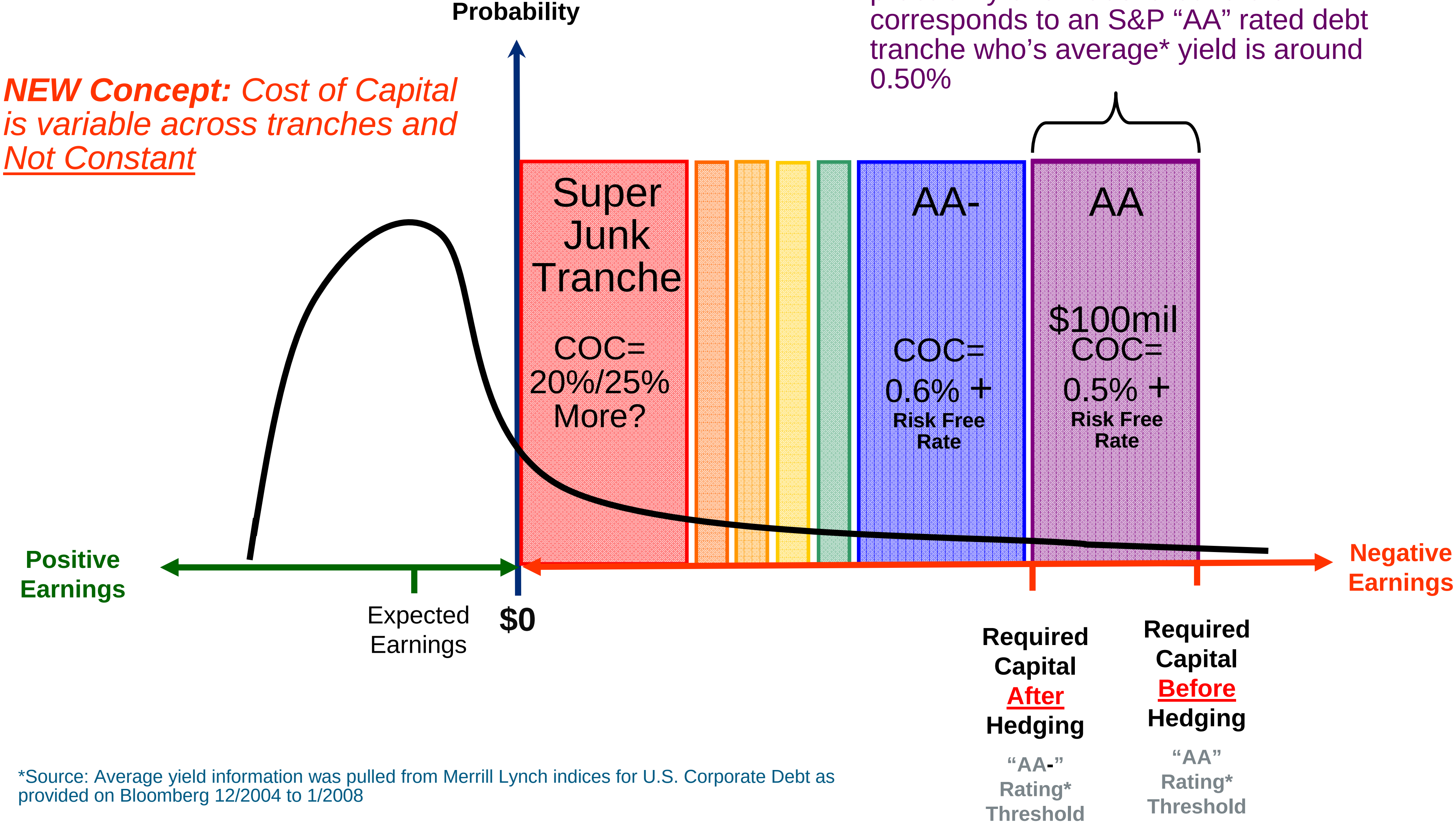
Source: S&P Catastrophe Bond Rating Methodology

*** In this context Prob. of attaching is equivilent to Prob. of Default.**

Tranching Capital™

Probability of attachment around 0.02% & probability of exhaust around 0.01% corresponds to an S&P "AA" rated debt tranche who's average yield is around 0.50%*

NEW Concept: *Cost of Capital is variable across tranches and* *<u>Not Constant</u>*



*Source: Average yield information was pulled from Merrill Lynch indices for U.S. Corporate Debt as provided on Bloomberg 12/2004 to 1/2008

Tranching Capital™ Decision Making Framework

(Over-simplification, but simply meant to demonstrate the concept)

- AA Rated Capital Tranche “Released” = $100Mil
- Cost of Capital for this Tranche = 0.5% or $500k
- Cost of Hedge is 5% ROL or $5Mil

Buying this hedge may <u>DESTROY $4.5Mil</u> in value!

☐ Buy it

☑ Don’t buy it

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“Reinsurance is not debt – it’s pre-arranged, post-event financing”

-Don Mango

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Capital Tranching

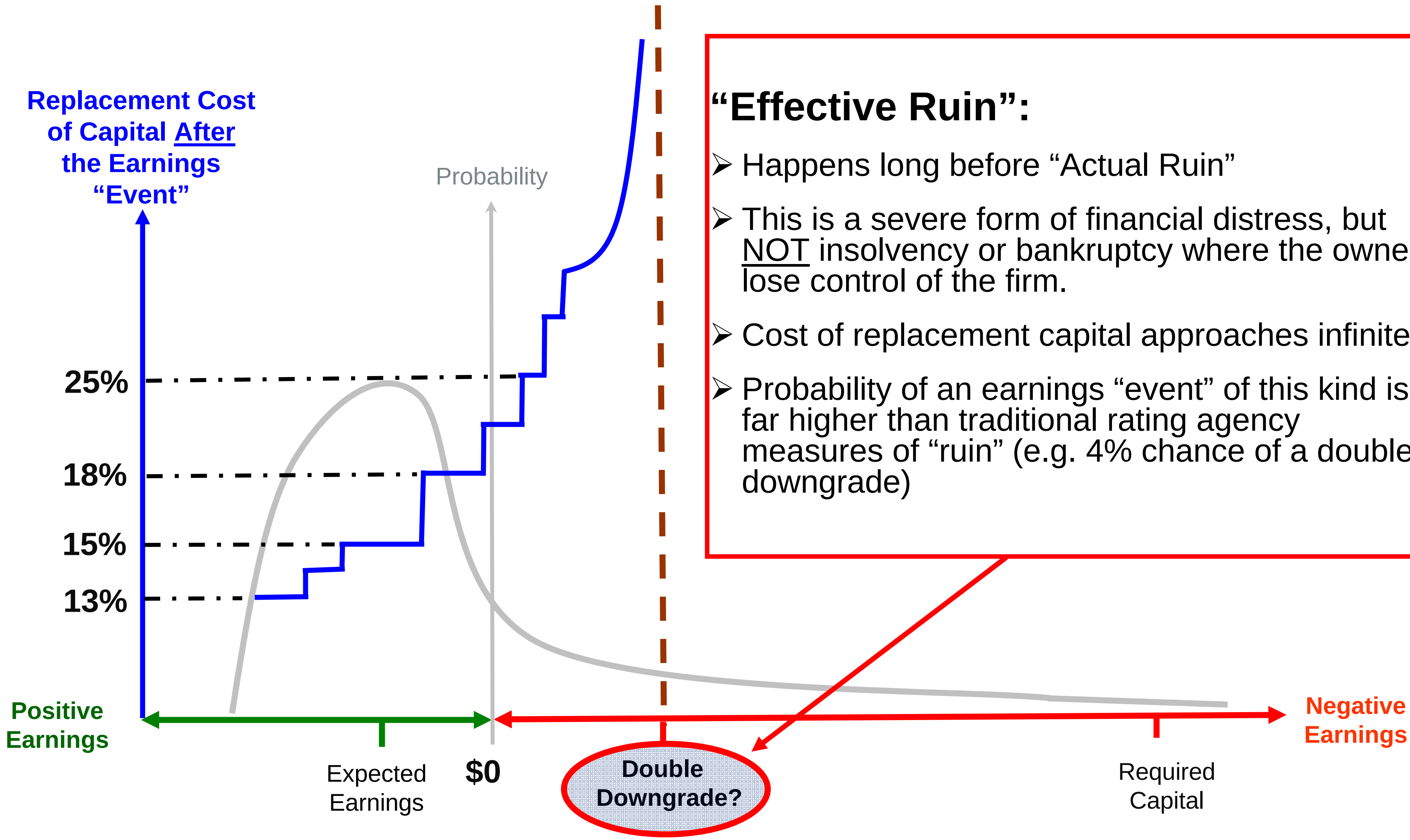
- Argues that cost of capital should not be evaluated on a steady state or pro-forma basis
- Cost of capital can be thought of as an average of the costs of different “tranches” or “layers” of capital
- This average is a function of the negative earnings distribution (capital consumption)
- We can measure the impact on that cost from changes in risk management strategy
  – E.g., retention, limit, exposure profile

Innovations we are proposing

- Reinsurance is not debt – it's pre-arranged, post-event financing (capital) without consideration of ongoing financial condition or covenants or restrictions (e.g., give me a Board seat)
- Reinsurance replaces this post-event financing
- Changes in point of view:
  - Cost of capital on a contingent (replacement) basis is not constant
  - Borrow the tranching concept from CDO world (~layering in reinsurance)

"Effective Ruin™" is Defined Based on Investor Interests and Preferences

Additional Support for Variable Replacement Cost



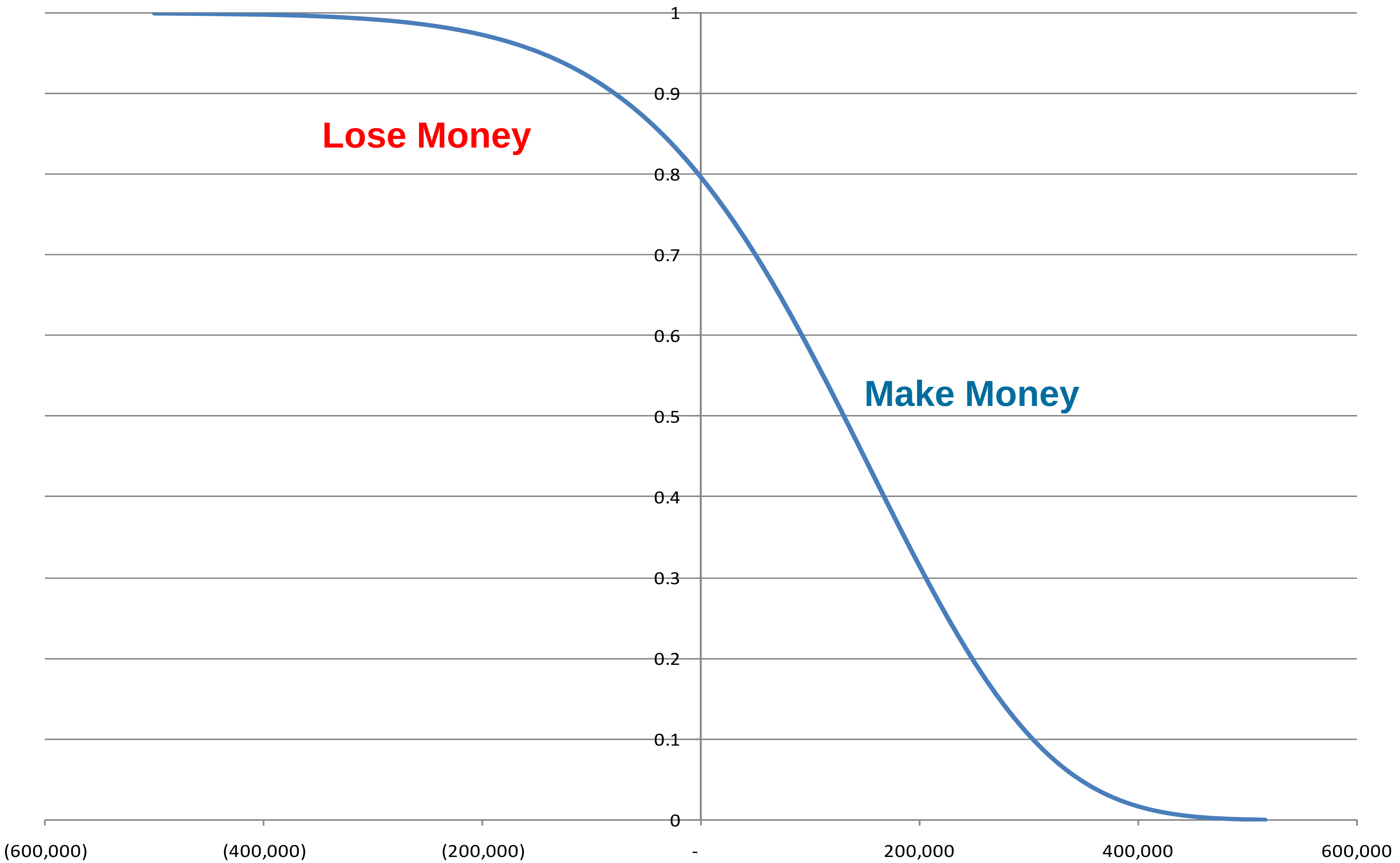
"Effective Ruin":

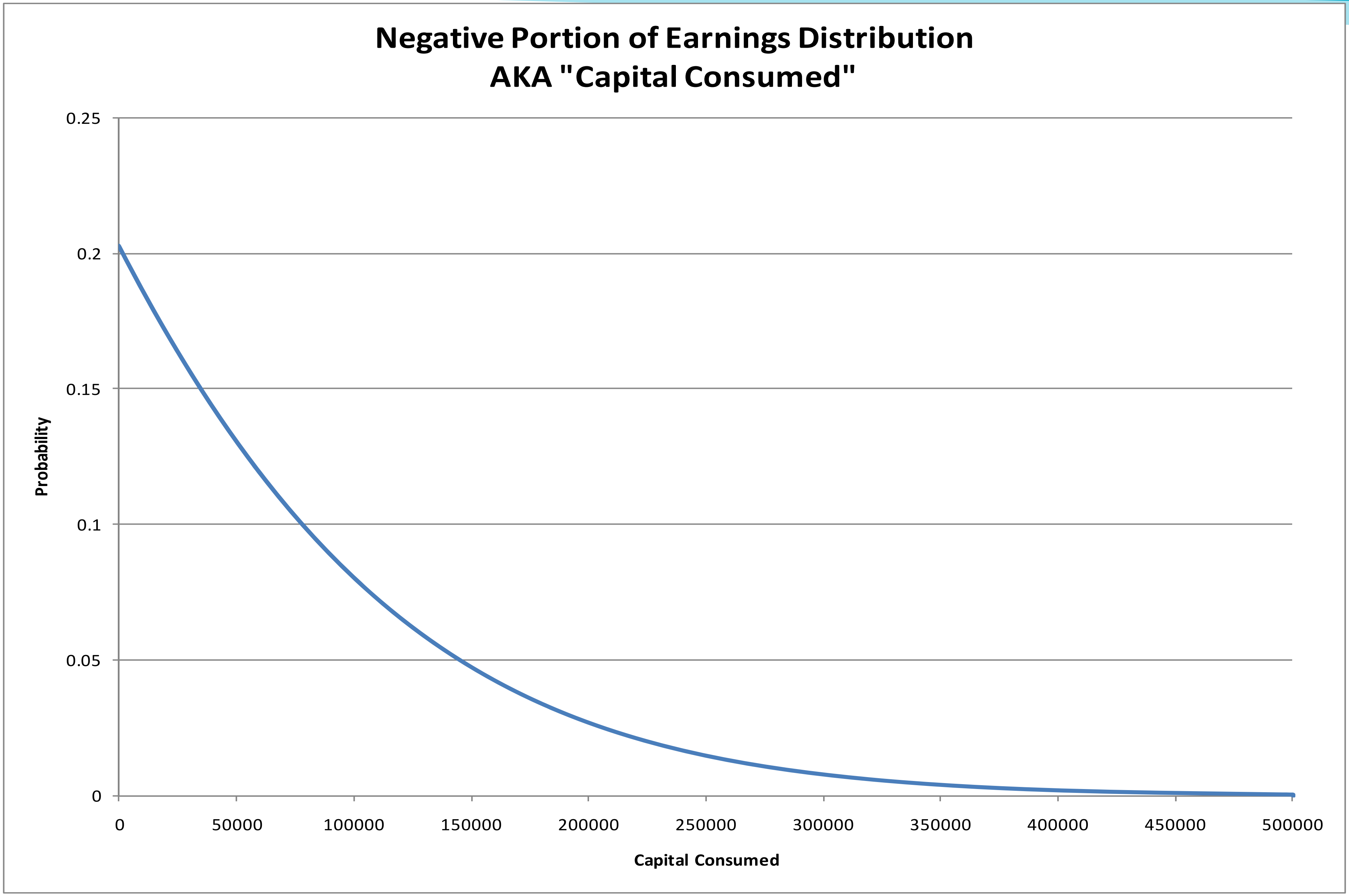
- Happens long before "Actual Ruin"
- This is a severe form of financial distress, but NOT insolvency or bankruptcy where the owners lose control of the firm.
- Cost of replacement capital approaches infinite.
- Probability of an earnings "event" of this kind is far higher than traditional rating agency measures of "ruin" (e.g. 4% chance of a double downgrade)

Capital Tranching in Practice

- Requires a relativity formula for moving up or down in priority (~layer position)
- With such a formula, we can estimate the benefit of reinsurance or other hedging, which **changes the shape of the earnings distribution**
- While not suggesting debt replicates equity, the relative impact of moving the buffer up or down in priority can be approximated by a tranching framework from debt
  - Put in arbitrary tranches (layers) with their implicit debt ratings (prob of attaching)
  - Higher (lower) rated layers cost less (more)
- Can use this to calculate the change in overall cost of capital for any strategic alternative
- Under this framework, **ANY REINSURANCE COVER CAN POTENTIALLY ADD VALUE**

Example Earnings Distributions




Negative Portion of Earnings Distribution
AKA "Capital Consumed"
0.25
0.2
0.15
0.1
0.05
0
Probability
0
50000
100000
150000
200000
250000
300000
350000
400000
450000
500000
Capital Consumed

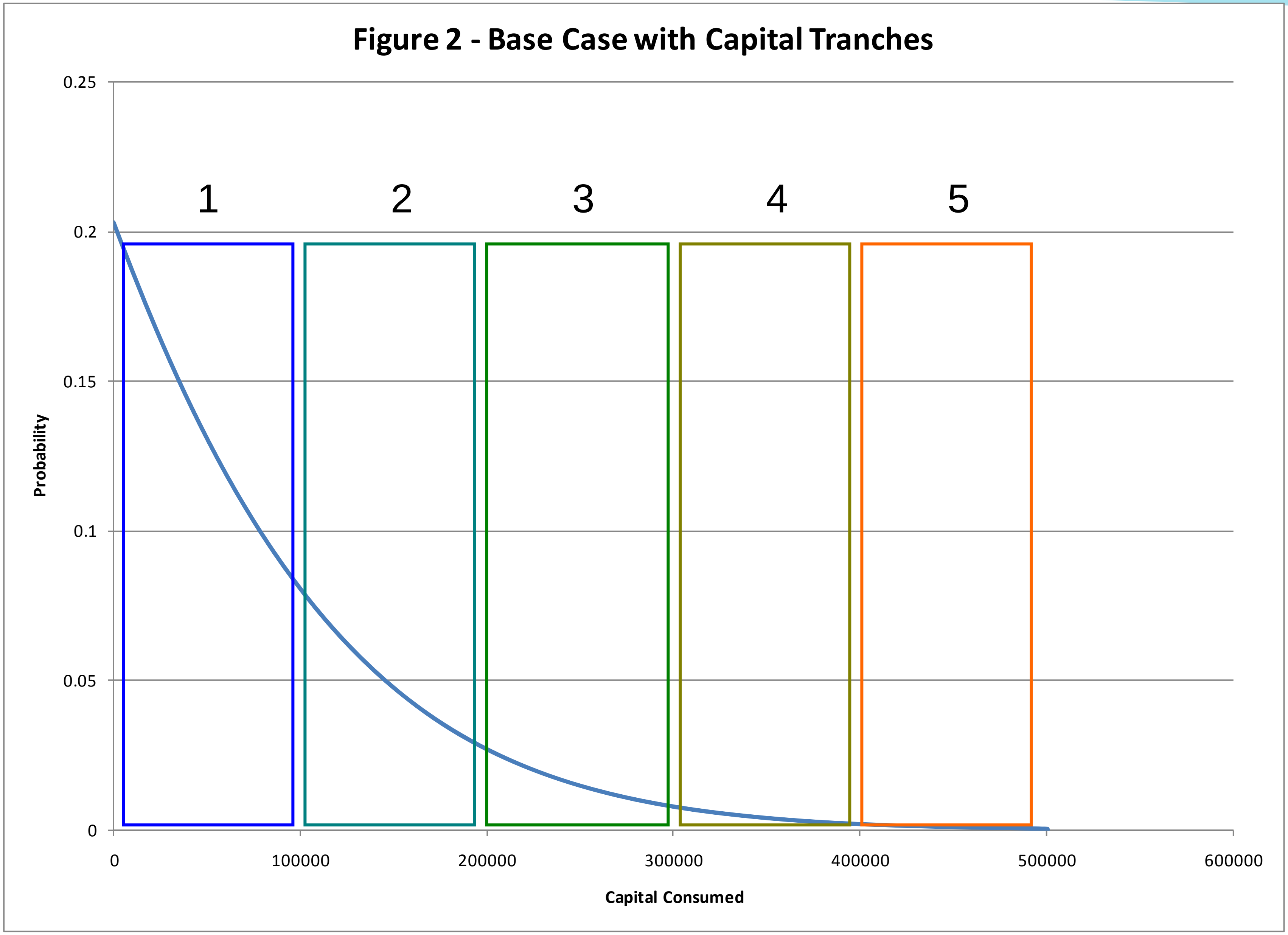


Figure 2 - Base Case with Capital Tranches
0.25
0.2
0.15
0.1
0.05
0
Probability
1
2
3
4
5
0
100000
200000
300000
400000
500000
600000
Capital Consumed

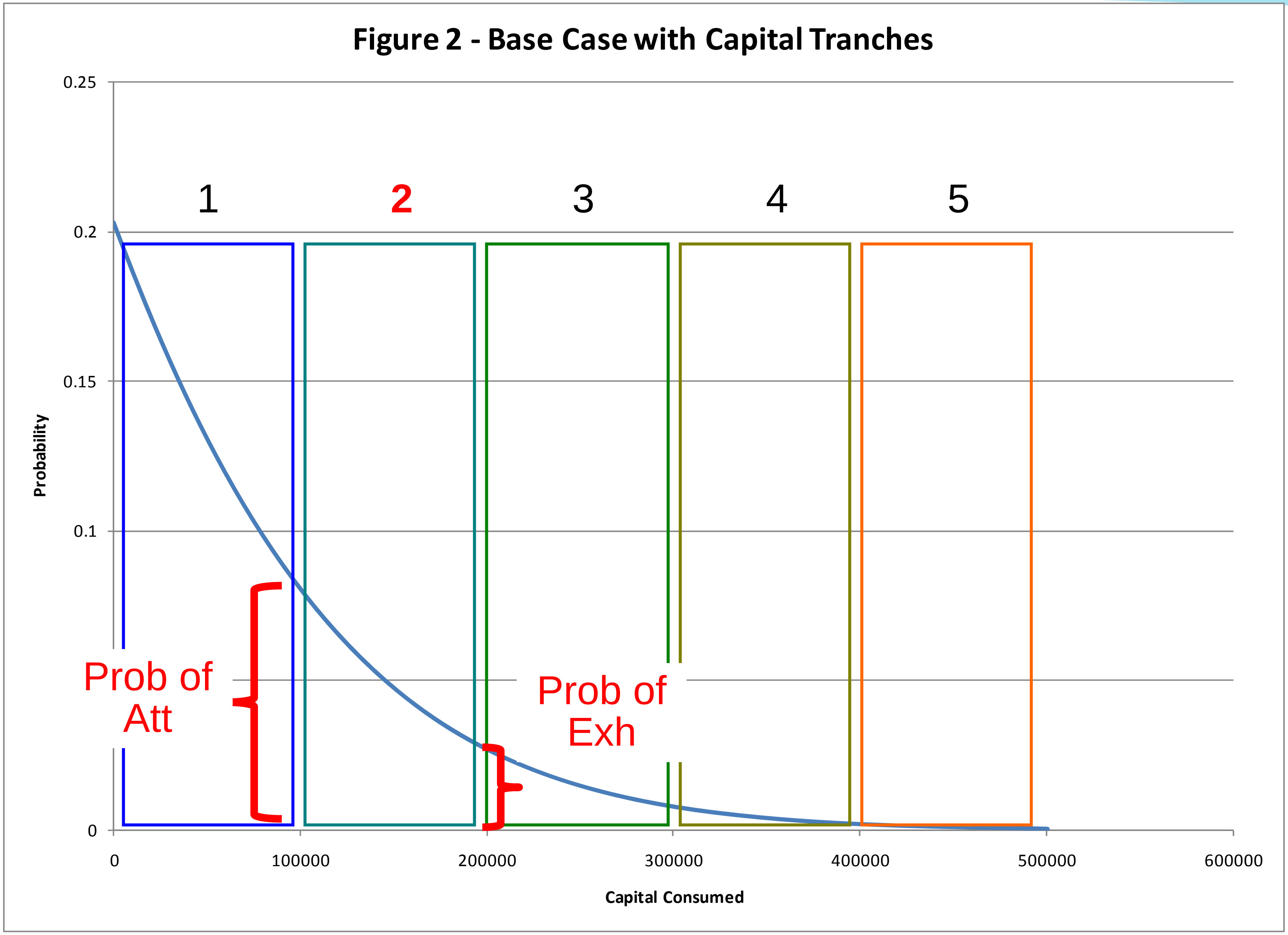
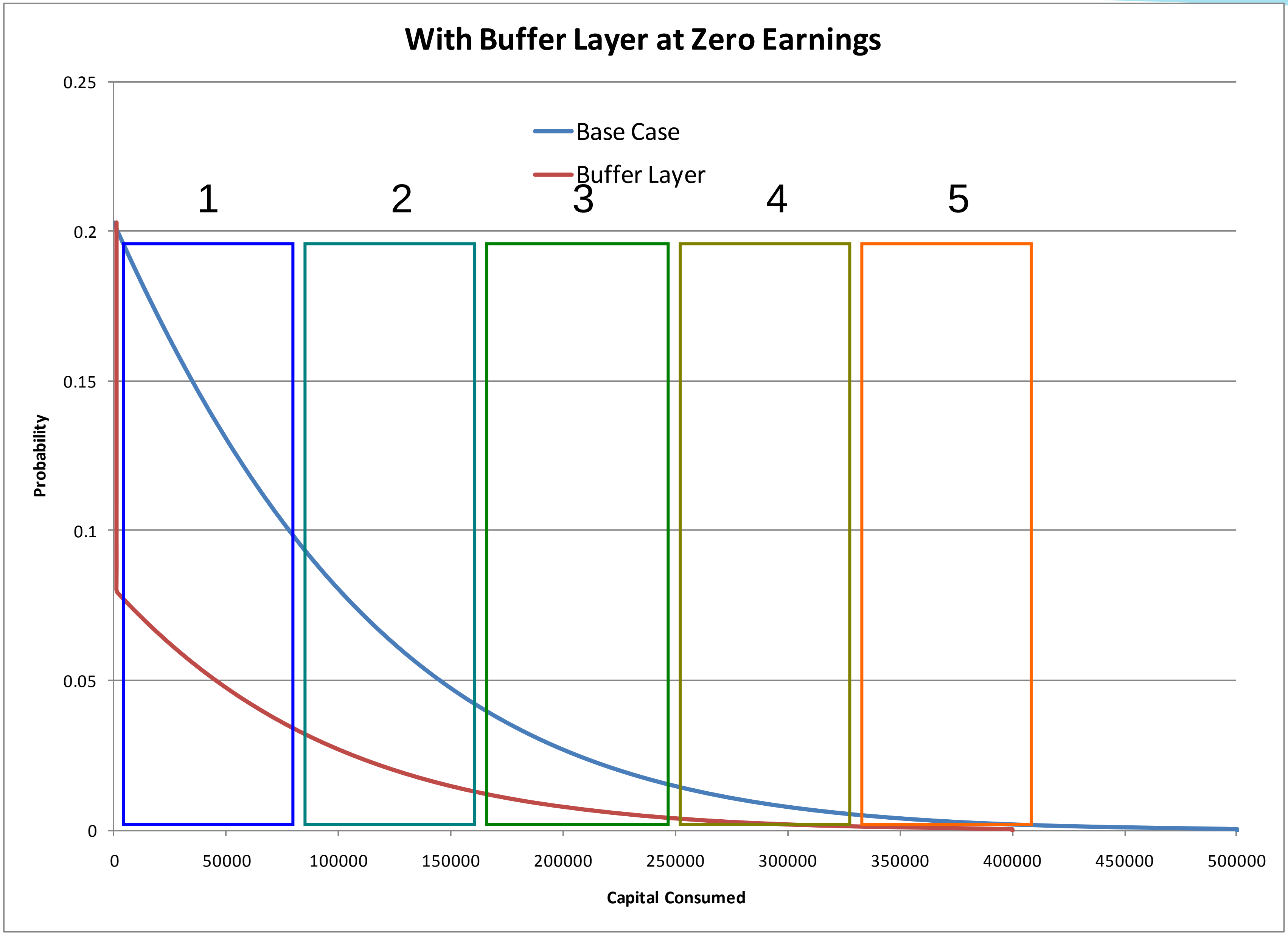
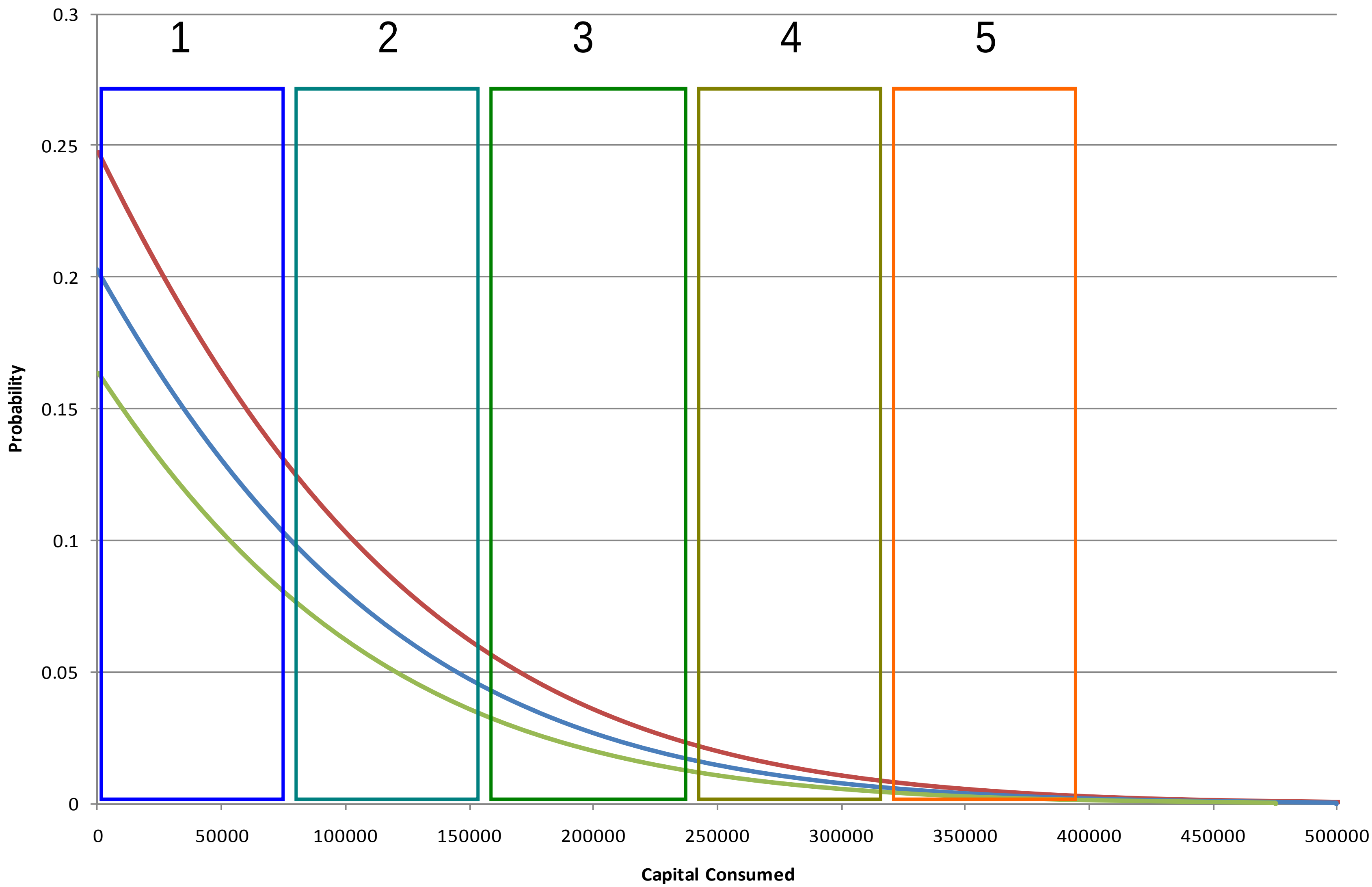


Figure 2 - Base Case with Capital Tranches
0.25
0.2
0.15
0.1
0
1
2
3
4
5
Probability
Prob of Att
Prob of Exh
0
100000
200000
300000
400000
500000
600000
Capital Consumed


With Buffer Layer at Zero Earnings
Base Case
Buffer Layer
1
2
3
4
5
0.25
0.2
0.15
0.1
0.05
0
Probability
0
50000
100000
150000
200000
250000
300000
350000
400000
450000
500000
Capital Consumed

Capital Consumed for Better / Worse Earnings Distributions



Take Away

- Tail measures tend to <u>**ignore**</u> earnings events which occur at much higher probabilities
- Hedging decisions based on tail measures alone puts too much focus on **POLICYHOLDER** interests and not enough focus on **EQUITYHOLDER** interests.
- Capital can be **subordinated** / layered / tranched (e.g. Subordination of debt)
- Cost of capital is **NOT constant** for each capital tranche
- Business decisions based the notion that **"cost of capital is fixed"** and using only tail capital concepts like "capital released" may lead to **suboptimal outcomes**.

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