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In Demand:

The Rapidly Growing Role for Actuaries in the ILS Market

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1. What is the alternative capital market?

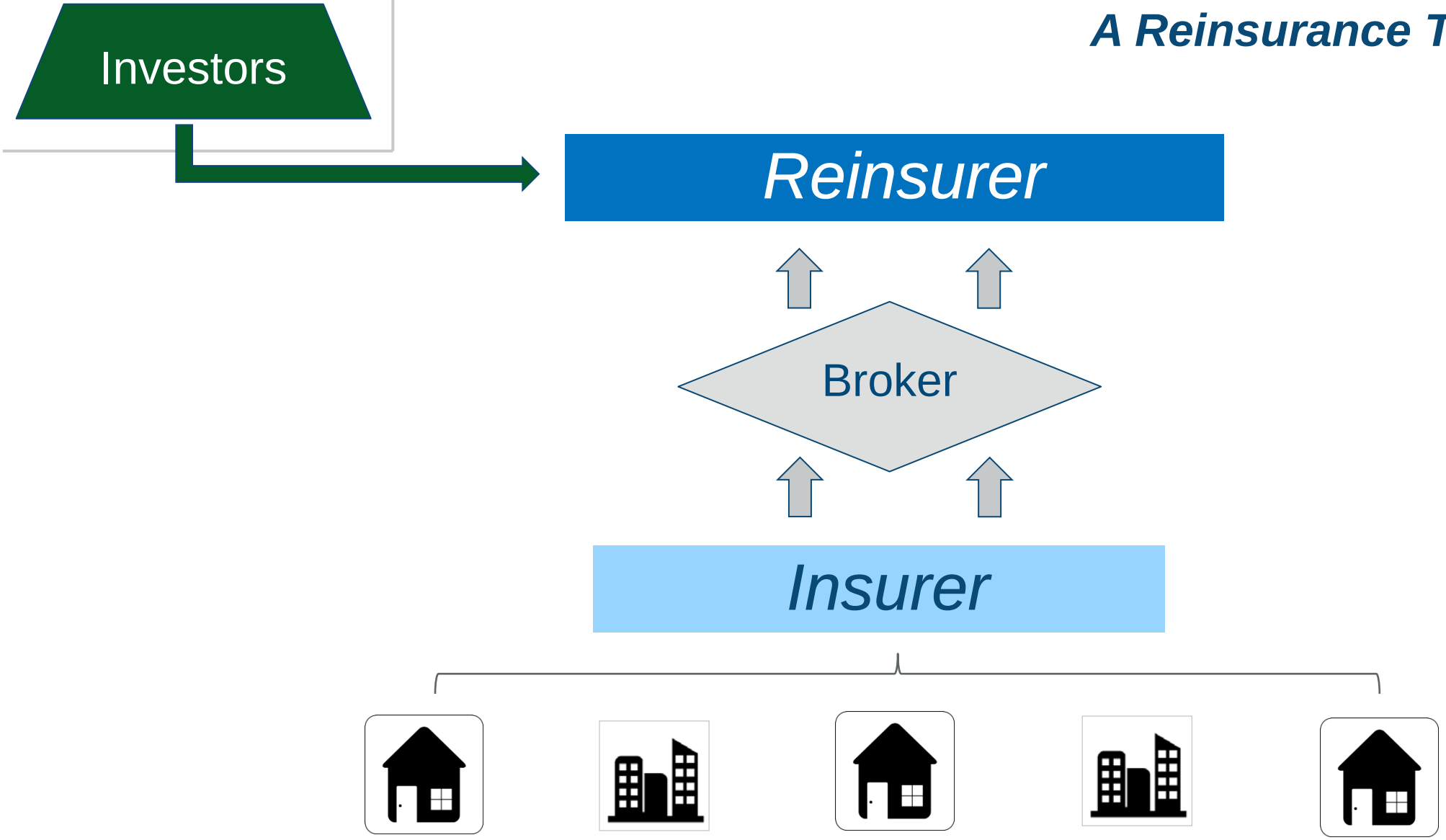
2. How has the alternative capital market become “more actuarial” over the past couple of years?

3. How does actuarial expertise translate to the alternative capital market?

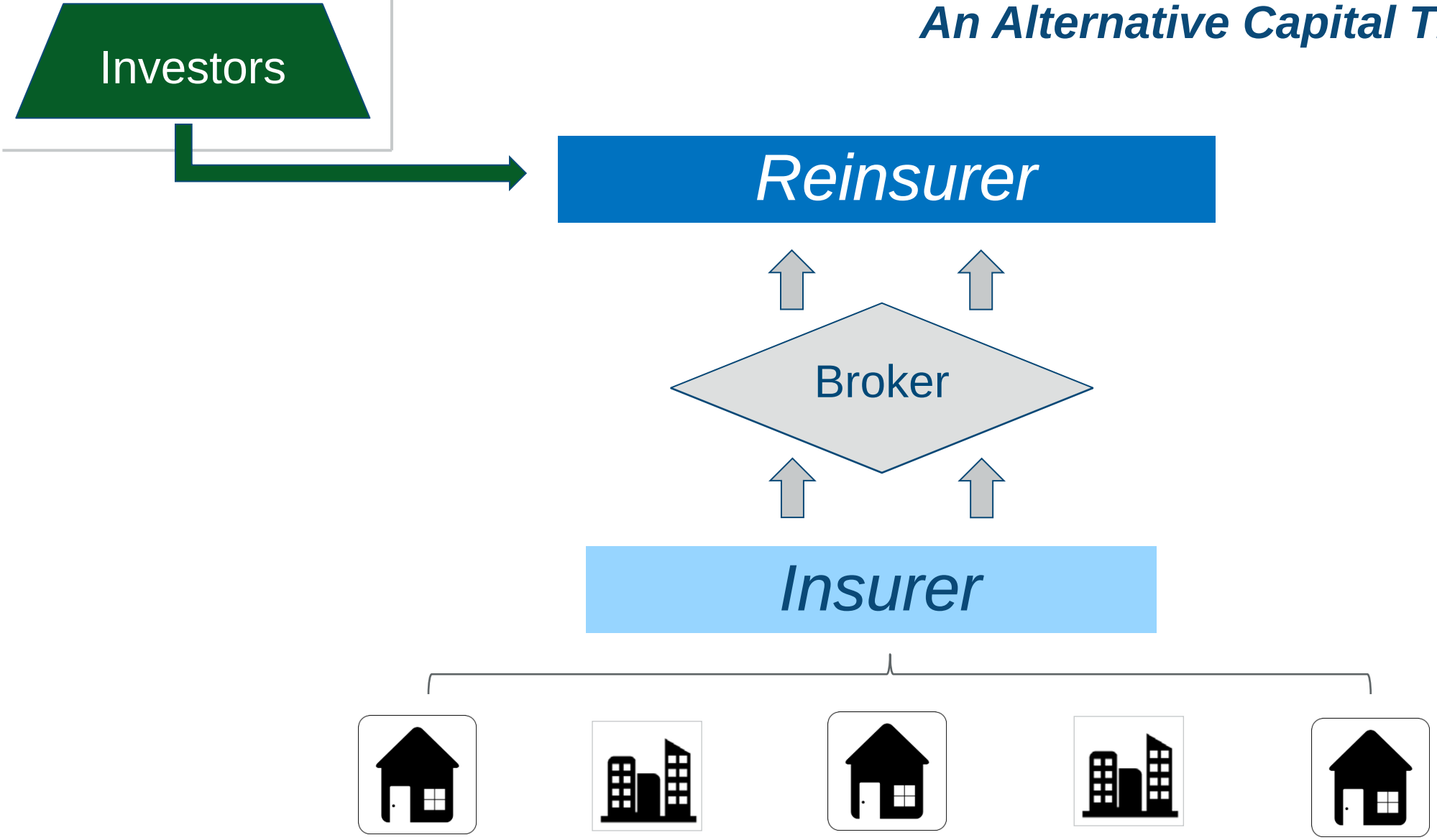
Alternative capital =

Financial investors directly writing (re)insurance

A Reinsurance Transaction



An Alternative Capital Transaction



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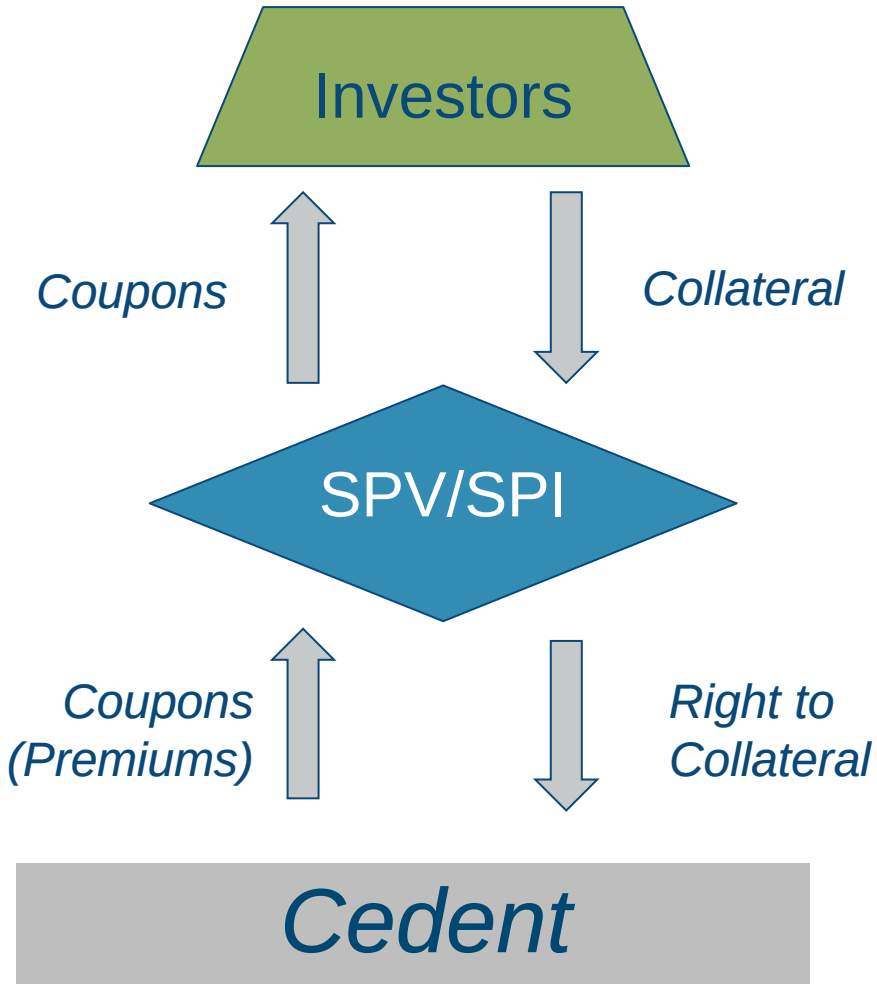
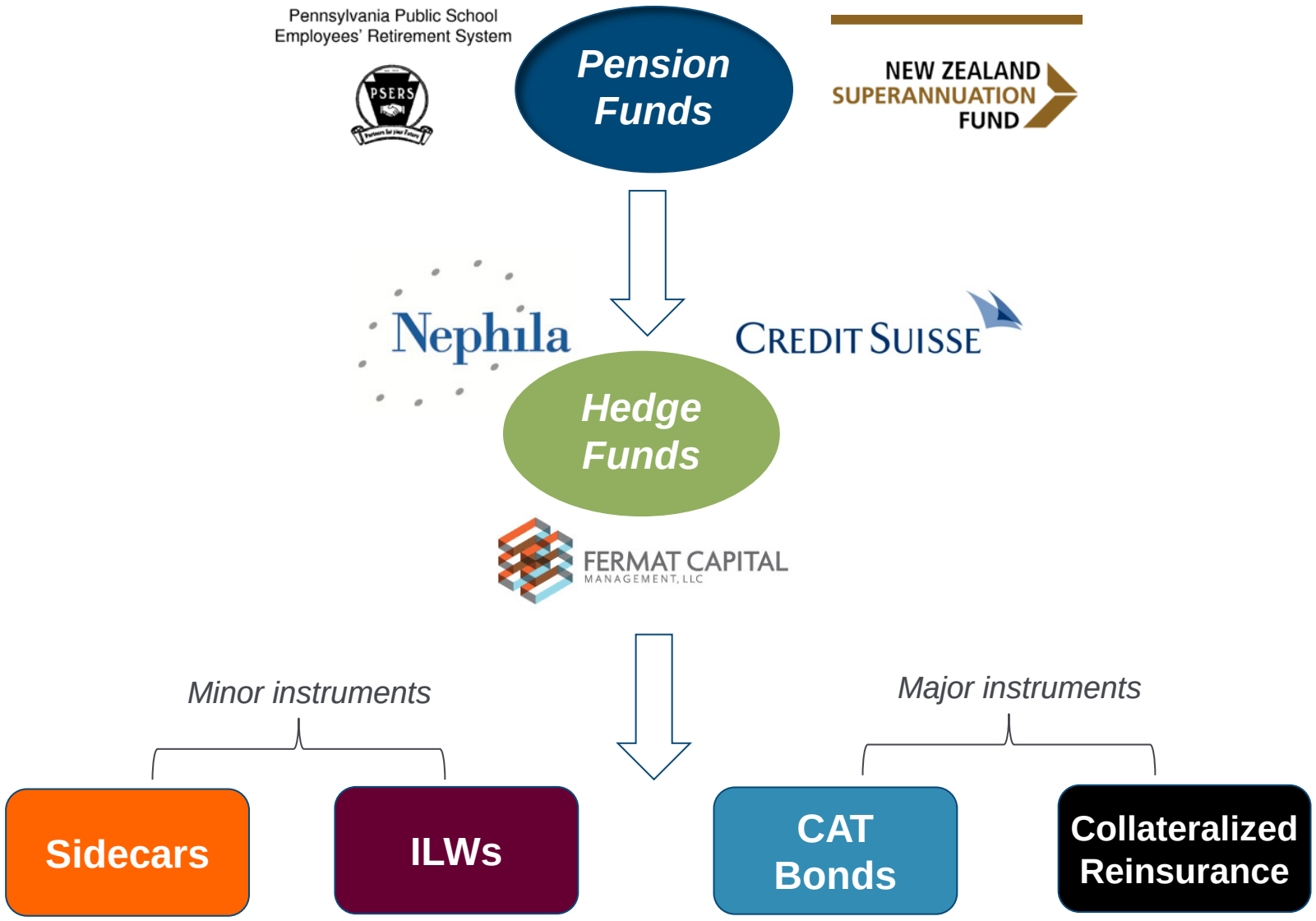
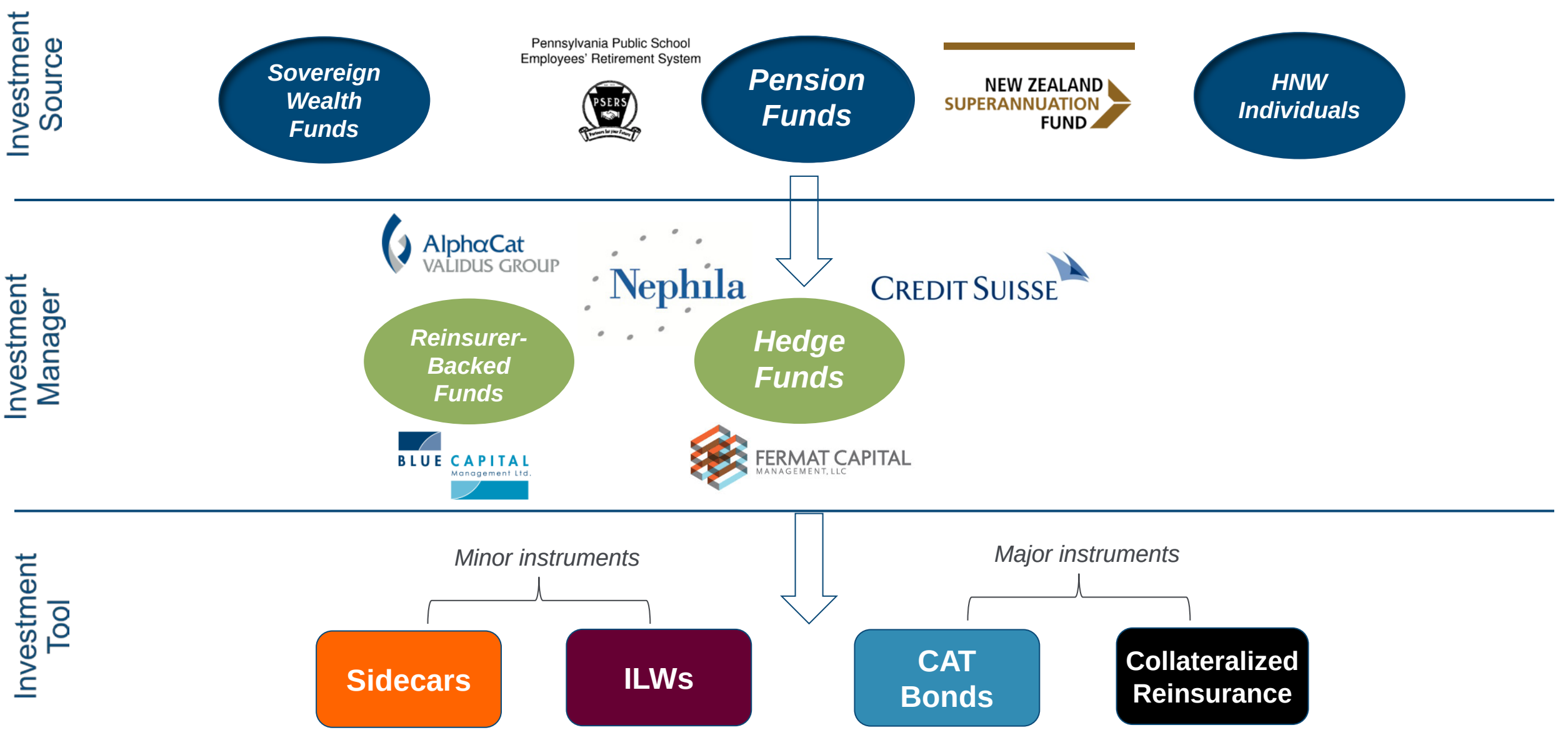


- Full collateralization of the reinsurance limit
- Collateral held until end of risk period, and after to cover any resulting losses
- “Transforming” structure depends on type of transaction


Pennsylvania Public School Employees' Retirement System
PSERS
Pension Funds
NEW ZEALAND SUPERANNUATION FUND
Nephila
CREDIT SUISSE
Hedge Funds
FERMAT CAPITAL MANAGEMENT, LLC
Minor instruments
Major instruments
Sidecars
ILWs
CAT Bonds
Collateralized Reinsurance


Investment Source
Sovereign Wealth Funds
Pennsylvania Public School Employees' Retirement System
PSERS
Pension Funds
NEW ZEALAND SUPERANNUATION FUND
HNW Individuals
Investment Manager
AlphaCat VALIDUS GROUP
Nephila
CREDIT SUISSE
Reinsurer-Backed Funds
Hedge Funds
BLUE CAPITAL Management Ltd.
FERMAT CAPITAL MANAGEMENT, LLC
Investment Tool
Minor instruments
Major instruments
Sidecars
ILWs
CAT Bonds
Collateralized Reinsurance

ILS Instruments of Choice

Catastrophe Bond

Fixed-income security that loses principal on major events

Collateralized Reinsurance

Fully-collateralized participation on traditional reinsurance syndications

Sidecar

Quota share participation in a company's book of business

Industry Loss Warranty (ILW)

(Generally) binary derivative instrument that pays out if industry event losses hit a pre-specified level

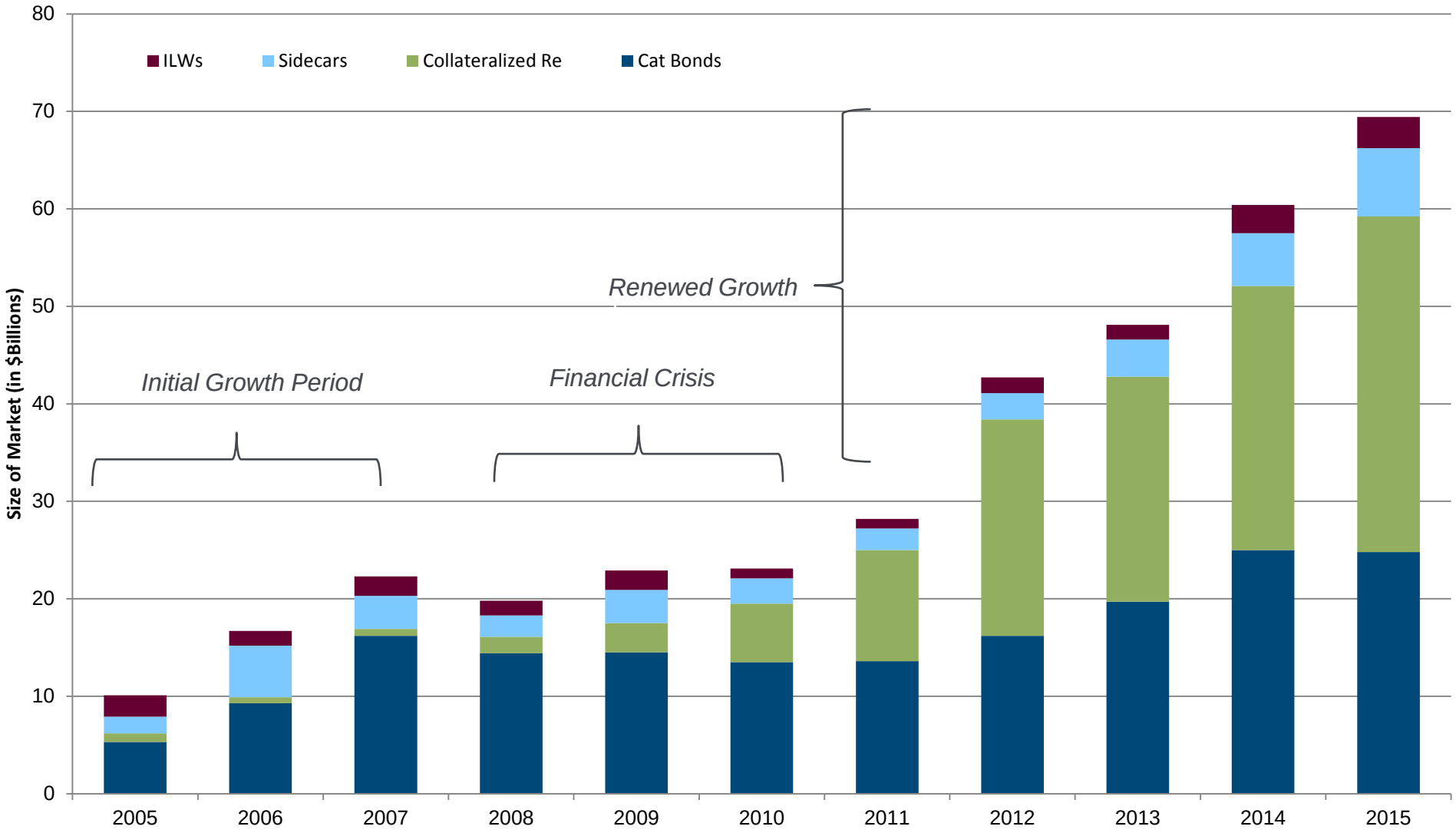
Historical Monthly Performance

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
2017	0.36	0.32	0.21	0.15	0.19	0.40	0.56	0.08	n/a	n/a	n/a	n/a	2.30
2016	0.21	0.53	0.40	0.40	0.04	0.26	0.41	0.86	1.03	0.42	0.31	0.18	5.19
2015	0.39	0.24	0.21	0.08	0.16	0.15	0.40	0.84	1.03	0.27	0.31	0.08	4.24
2014	0.50	0.50	0.45	0.32	0.08	0.21	0.41	0.81	0.86	0.60	0.14	0.42	5.42
2013	0.67	0.74	0.64	0.85	0.44	0.00	0.40	0.92	1.20	0.61	0.48	0.42	7.61
2012	0.18	0.19	0.32	0.43	0.58	0.57	0.61	0.94	1.18	-0.51	0.27	1.01	5.93
2011	0.70	0.18	-3.94	0.06	0.21	0.72	0.68	0.13	0.54	0.74	-0.03	-0.04	-0.14
2010	0.92	0.94	0.45	0.49	0.28	0.16	0.51	0.75	1.16	0.90	0.29	0.42	7.52
2009	0.36	0.22	0.28	0.59	0.51	1.33	1.03	1.03	1.58	1.06	0.14	0.52	8.99
2008	0.93	0.75	0.67	0.27	0.46	0.53	0.56	0.59	-0.71	-0.59	0.25	0.06	3.83
2007	1.60	1.56	0.92	0.75	0.74	0.95	0.95	0.96	1.37	1.09	0.85	0.74	13.22
2006	0.65	0.63	0.93	0.70	-0.82	0.15	0.62	0.81	1.32	1.37	0.84	1.18	8.68

* Based on 48.48% of funds which have reported Aug 2017 returns as at 19 Sep 2017

Source: Artemis.bm, Eurekahedge

Alternative Capital Growth



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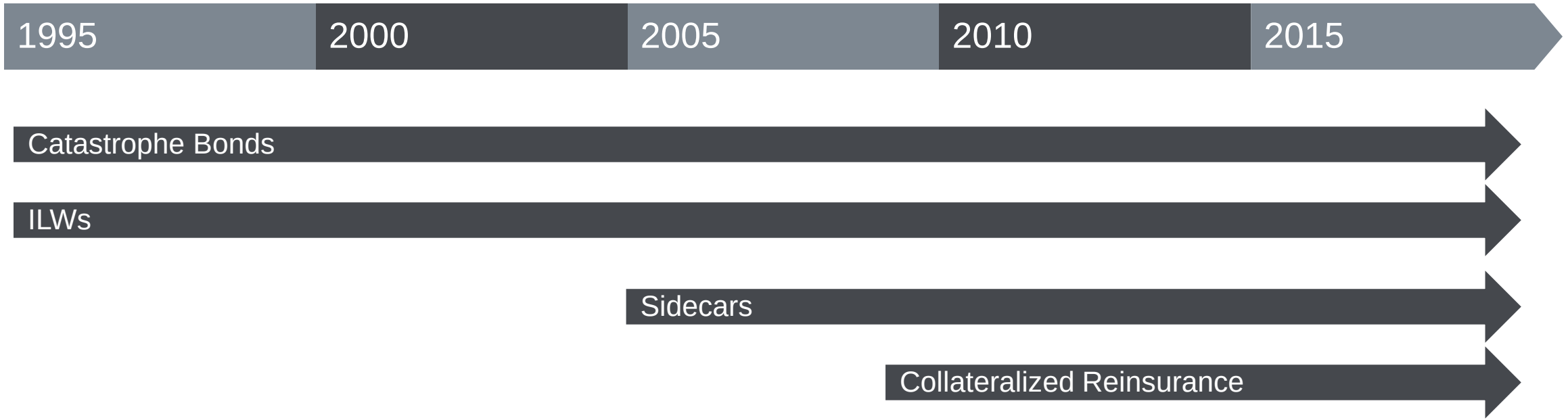
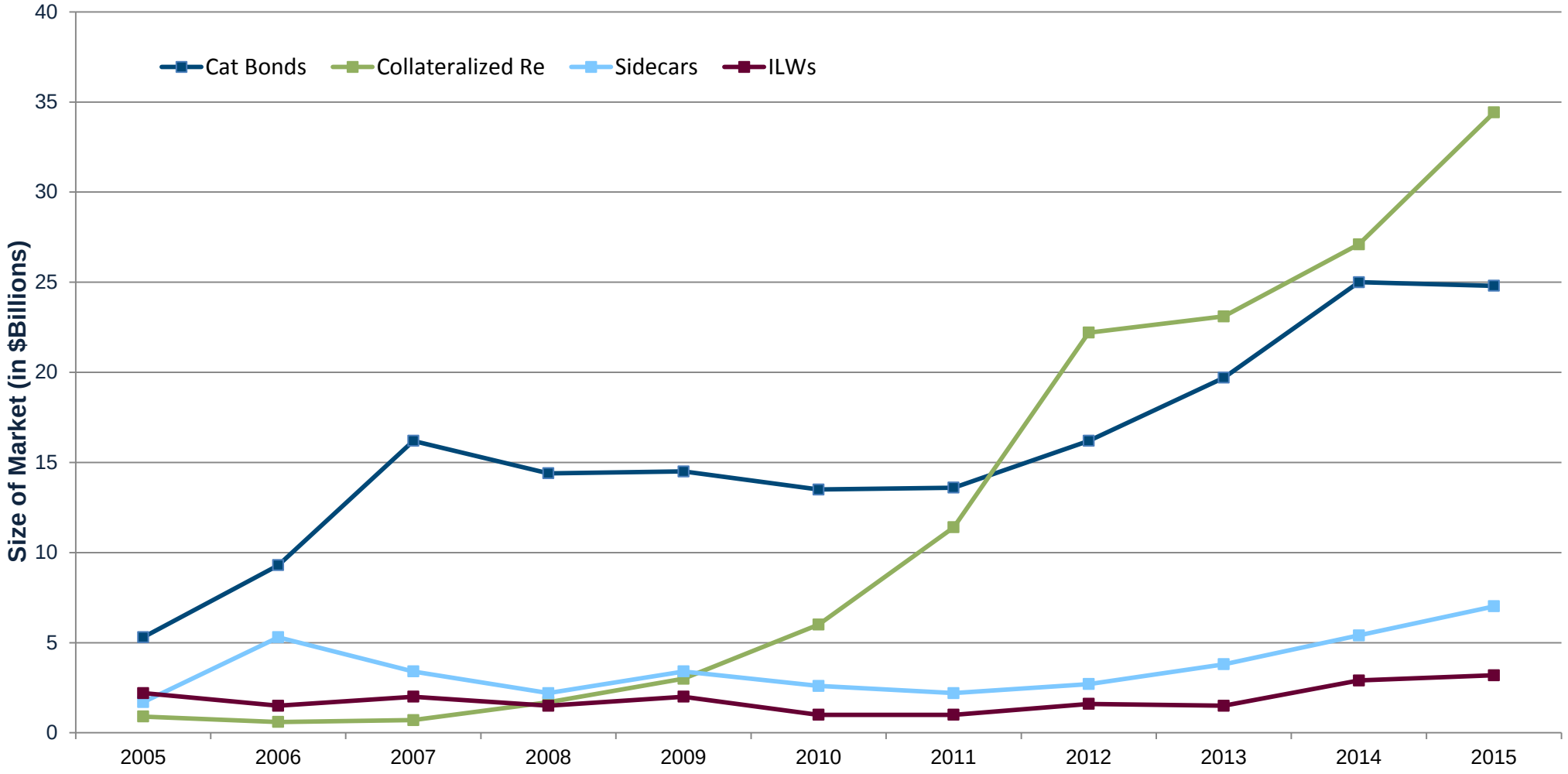
Timeline: Development of Alternative Capital Instruments



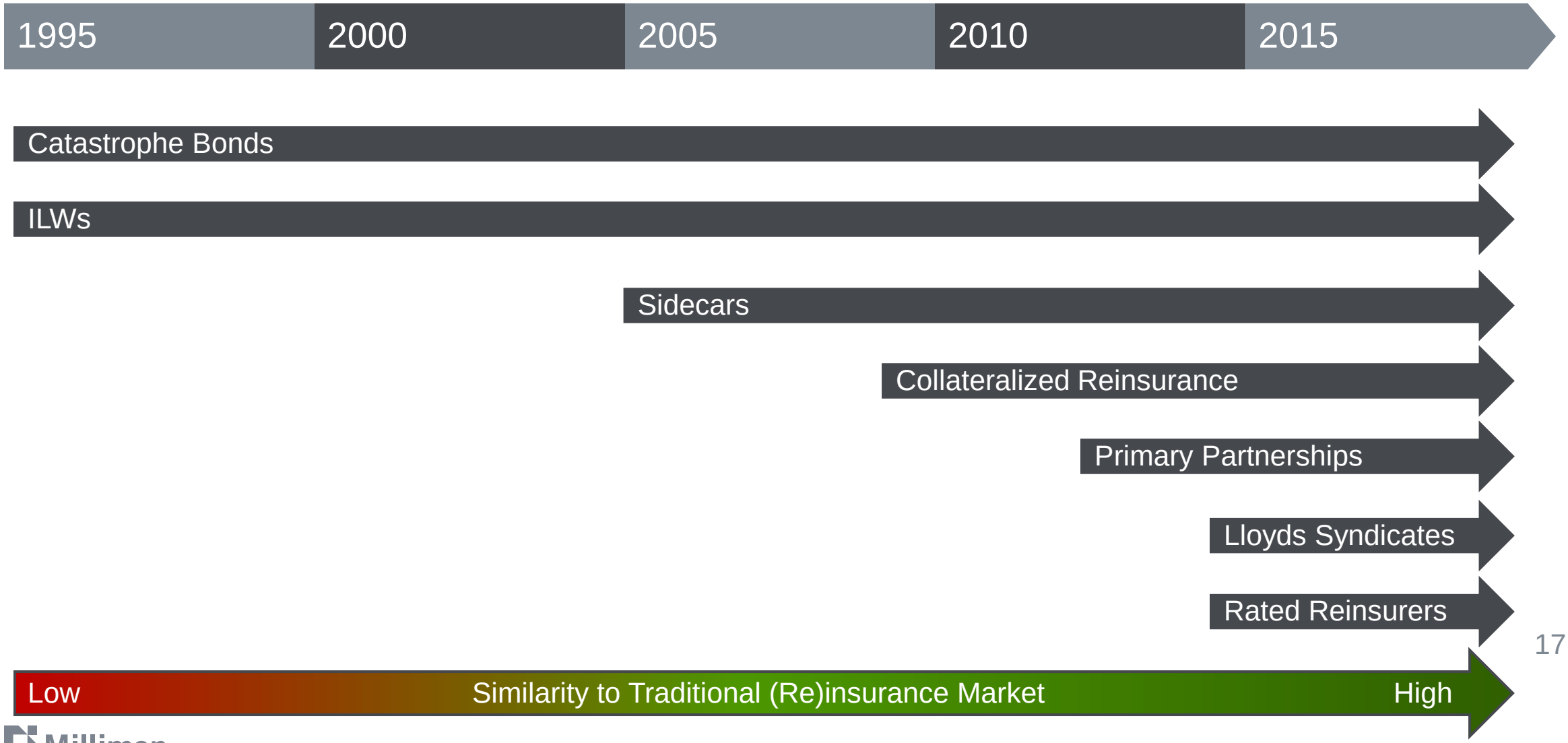
Alternative Capital Growth



A tale of two instruments

Catastrophe Bonds		Collateralized Reinsurance
Fully collateralized	=	Fully collateralized
Multiple-year period	≠	Usually one year period
Property Cat	≠	Cat, Other Property, and Specialty
Secondary market	≠	No secondary market
Generally high layers and lower chance of attachment	≠	Higher prevalence of working layers and lower attachments

Timeline: Development of ILS Instruments



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Reserving
(Valuation)

Pricing

Reinsurance vs Alternative Capital: Reserving/Valuation

What's Similar

(Increasingly) Similar Business

Need to Estimate and Hold Reserves

What's Different

Timeframes for Valuation

Framework of Valuation

Differences in Reserve Valuation Frequency

Description	20XX											
	J	F	M	A	M	J	J	A	S	O	N	D
Insurance - Annual Stmnt												
Insurance – Interim Reserve Reporting												
Stock Market	Continuous											
ILS Fund – Portfolio Valuation	Monthly: Potential Interpolation to Weekly or even Daily											

GAAP/Statutory Accounting versus Fair Value Accounting

GAAP/Statutory Accounting	Fair Value
–Historical framework for insurance regulation –Practical impacts: Linear earning of premiums, reserves often undiscounted	–"The amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties in an arm's length transaction" (IASB)

Avoid "Investor Arbitrage"

Fair Valuation Hierarchy

Overall Portfolio

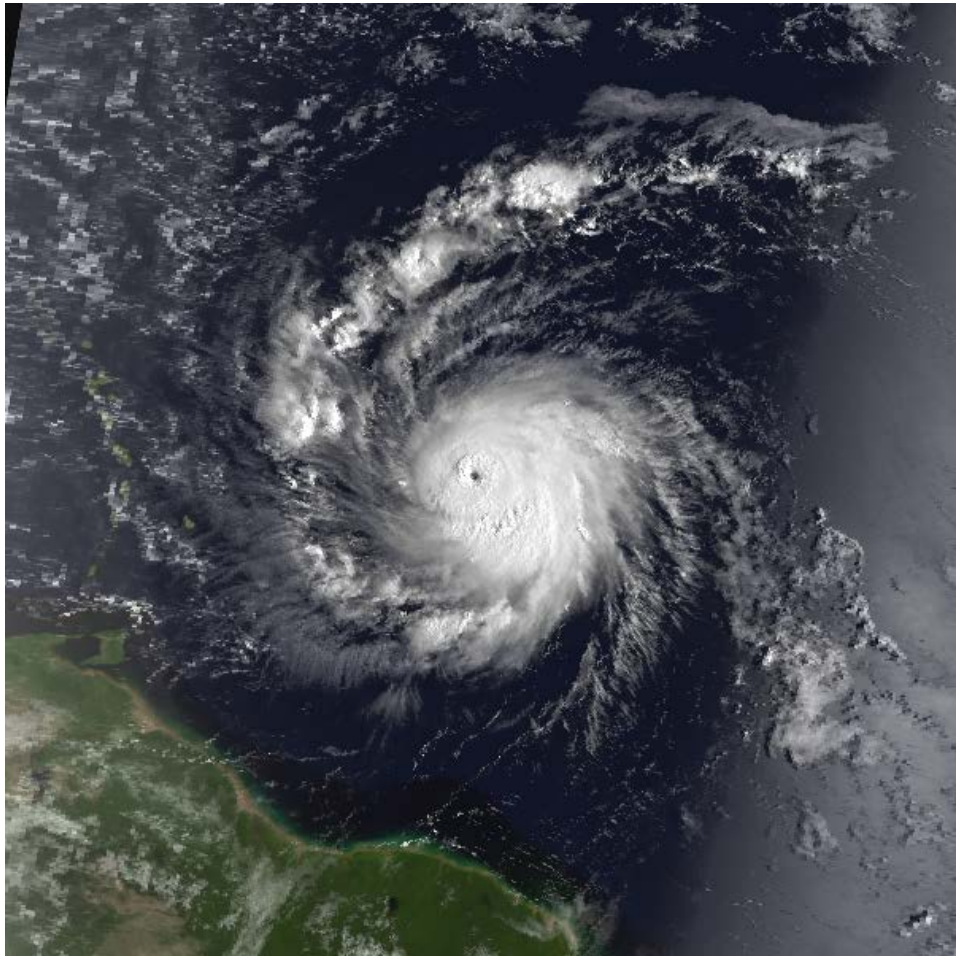
Valuation Type	Examples	Actuarial Involvement	Prevalence in Portfolio
1. Mark to Market - Direct	• Catastrophe Bonds • ILWs	Minimal	Stable to Falling
2. Mark to Market - Indirect		Low	Stable
3. Mark to Model	• Collateralized Re • Private Sidecars/QS	Moderate to High	Significantly Increasing

Components of a Mark-to-Model Valuation

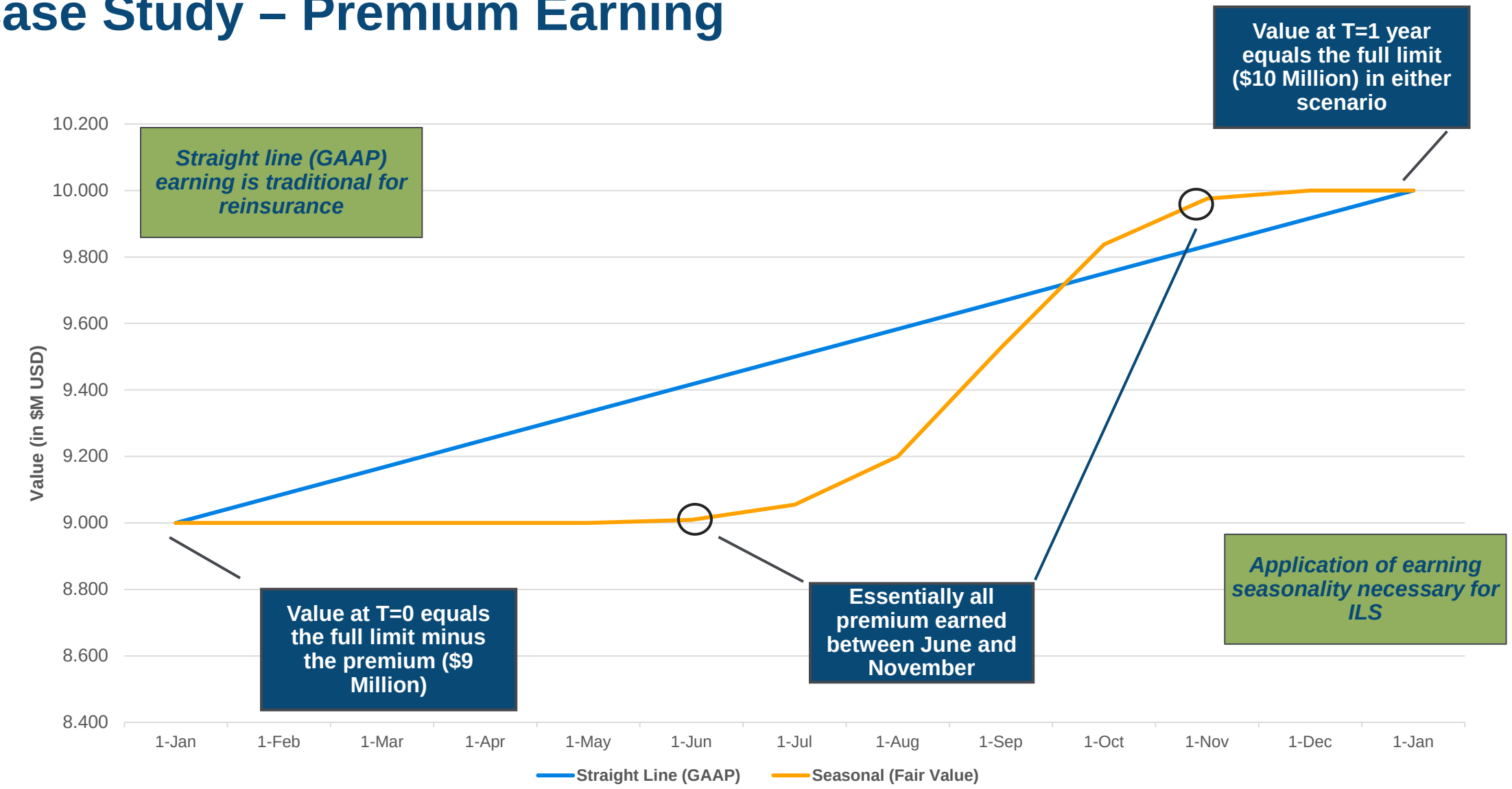
Total Value V(t)	=	Limit L	-	Premium P(t)	-	Losses L(t)	-	Other Provisions O(t)
		– Full amount of collateral – V(1) = L if contract is “clean”		– Unearned Premium – Adjusted by market rates(?)		– Losses **through** time = t – Uncertainty margin (?)		– Expense provisions – Claims-free bonus – Etc.

Sample Contract – Catastrophe XoL

One year, incepting 1/1/16 *Length*	**$10 million** *Limit*
$1 million *Premium*	**US Hurricane** *Losses Covered*



Case Study – Premium Earning



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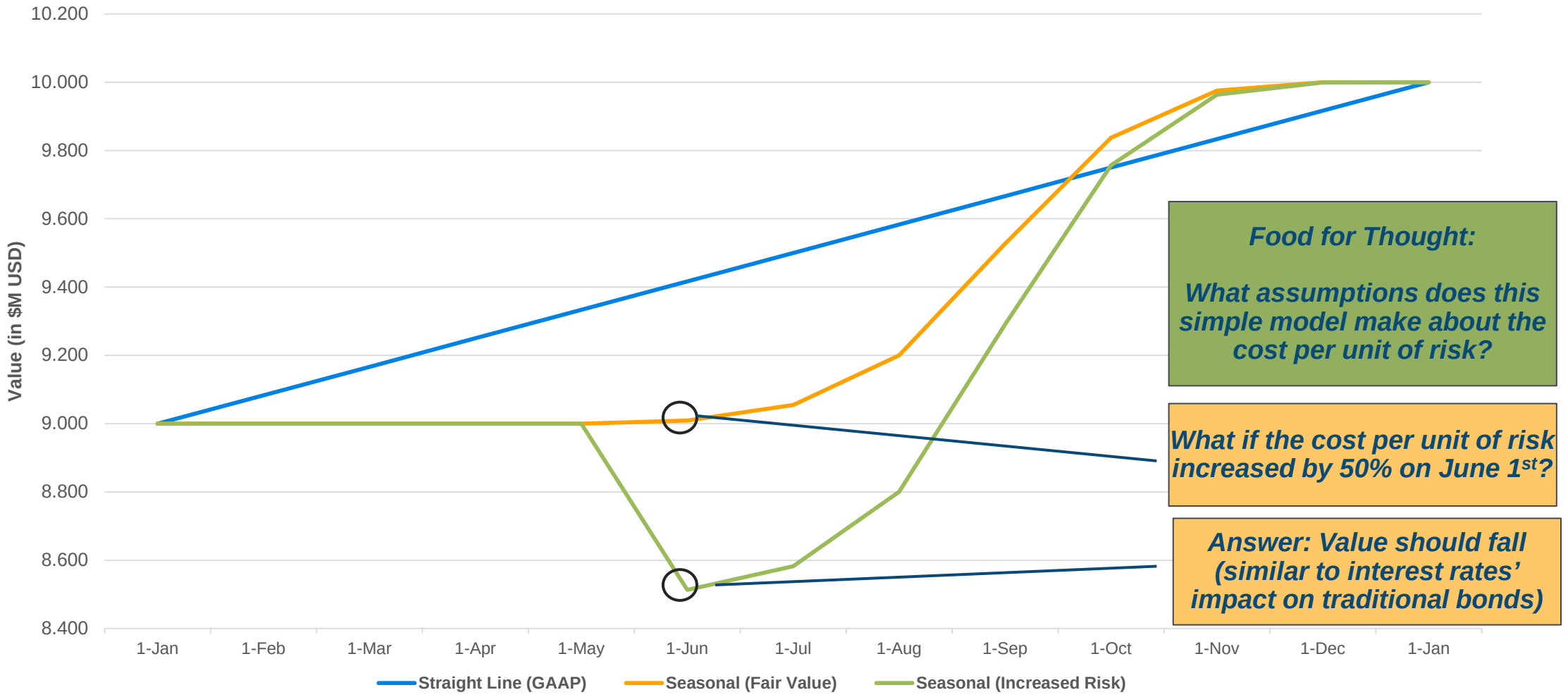


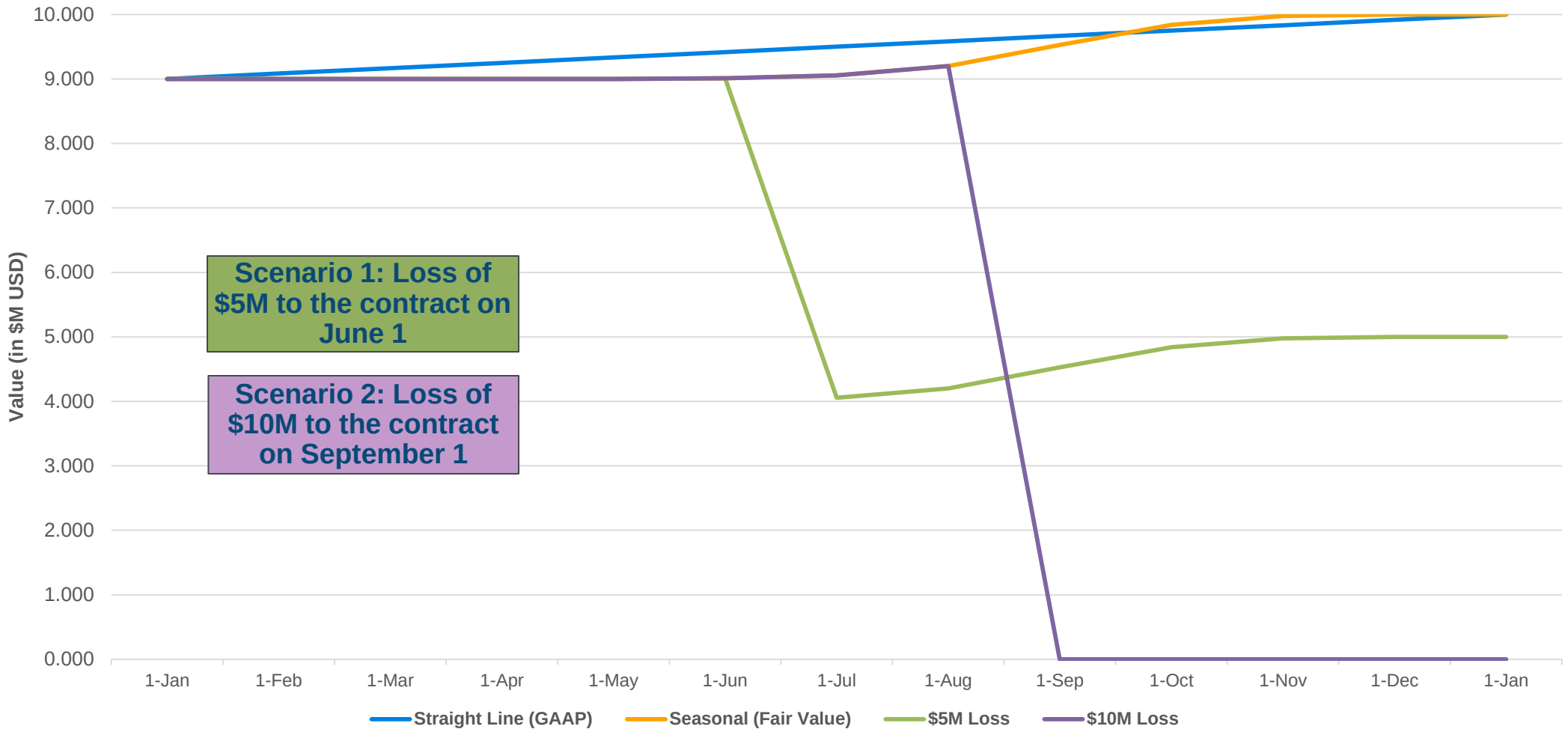
Food for Thought:

What assumptions does this simple model make about the cost per unit of risk?

What if the cost per unit of risk increased by 50% on June 1st?

Answer: Value should fall (similar to interest rates' impact on traditional bonds)

Case Study – Basic Loss Impacts



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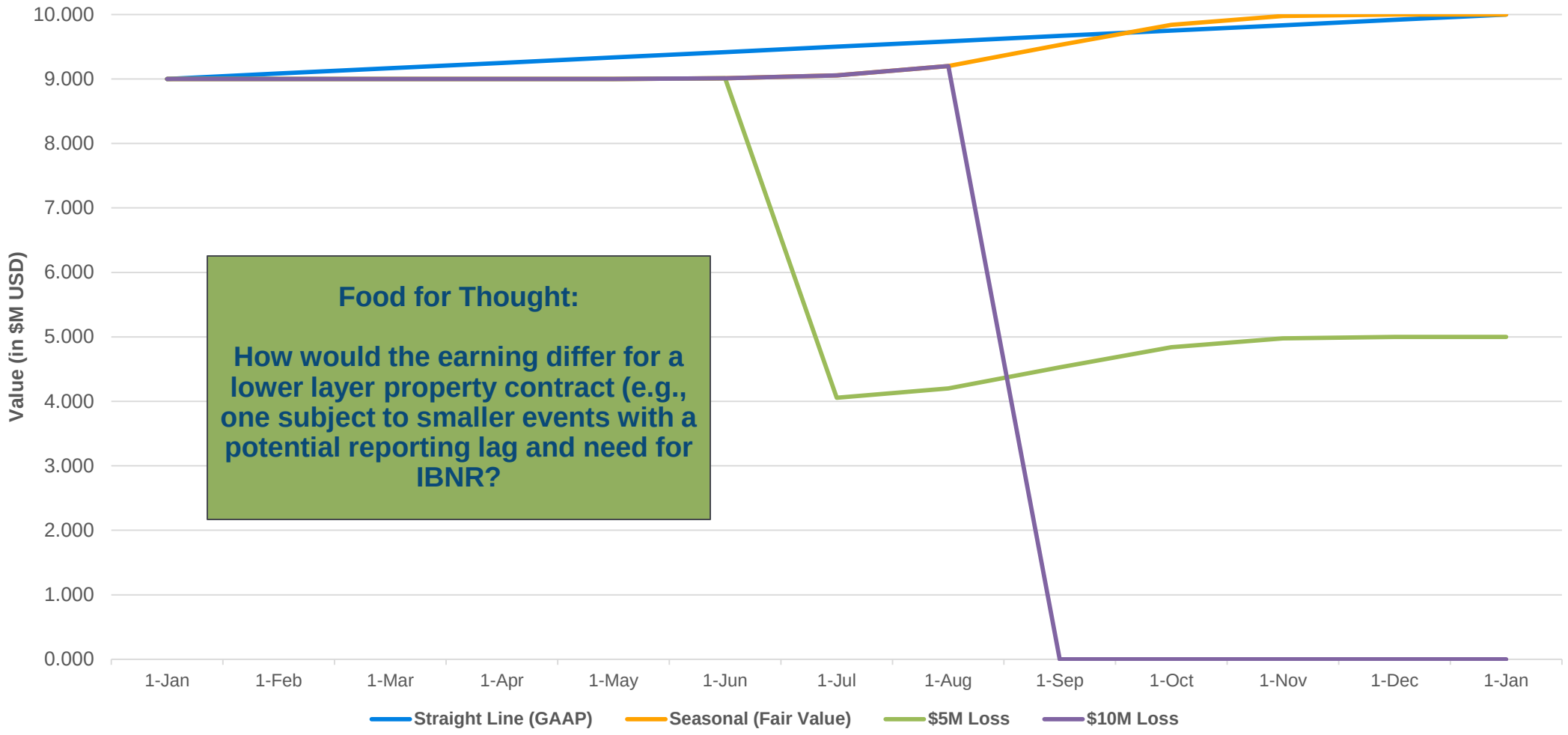
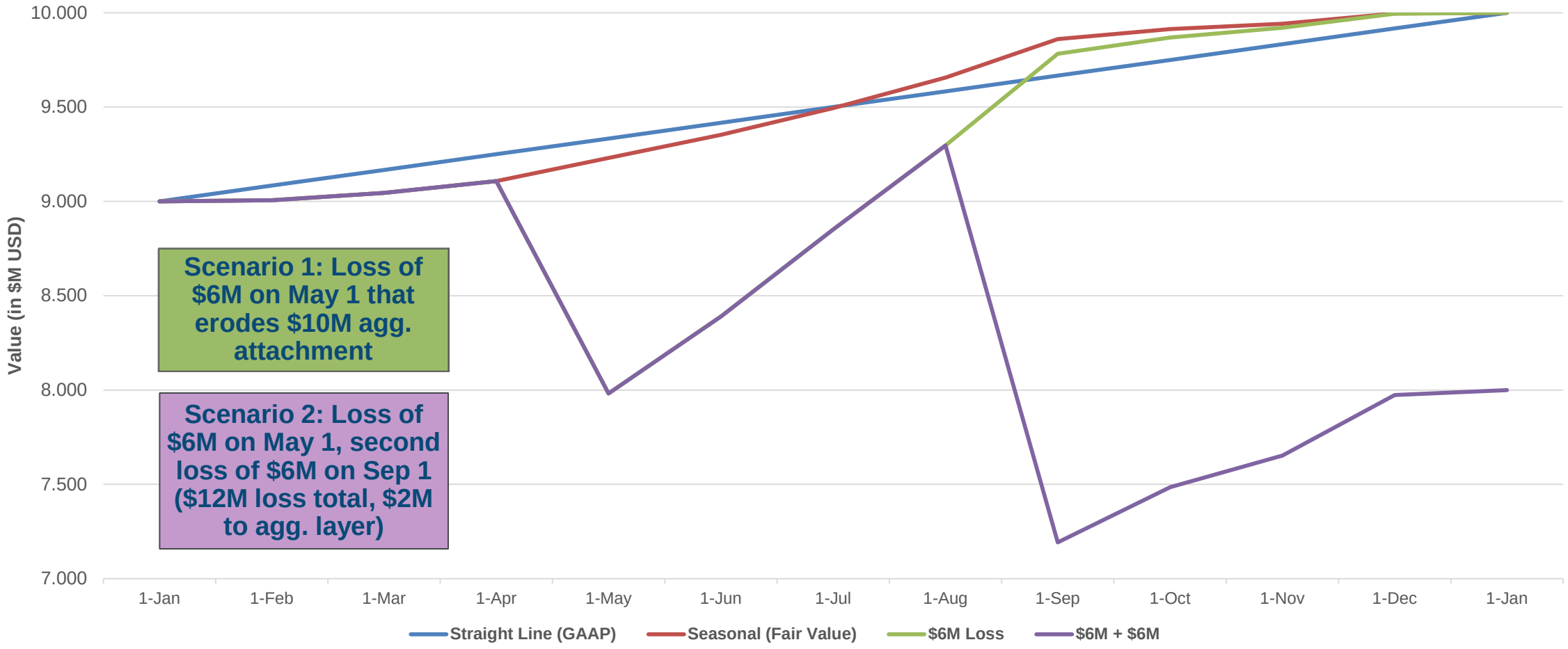


Sample Contract – Aggregate XoL

One year, incepting 1/1/16 *Length*	**$10M xs $10M in the aggregate** *Limit*
$1 million *Premium*	**US Convective Storm (franchise deductible $2M)** *Losses Covered*

Case Study – Aggregate Loss Impacts



Reserving
(Valuation)

Pricing

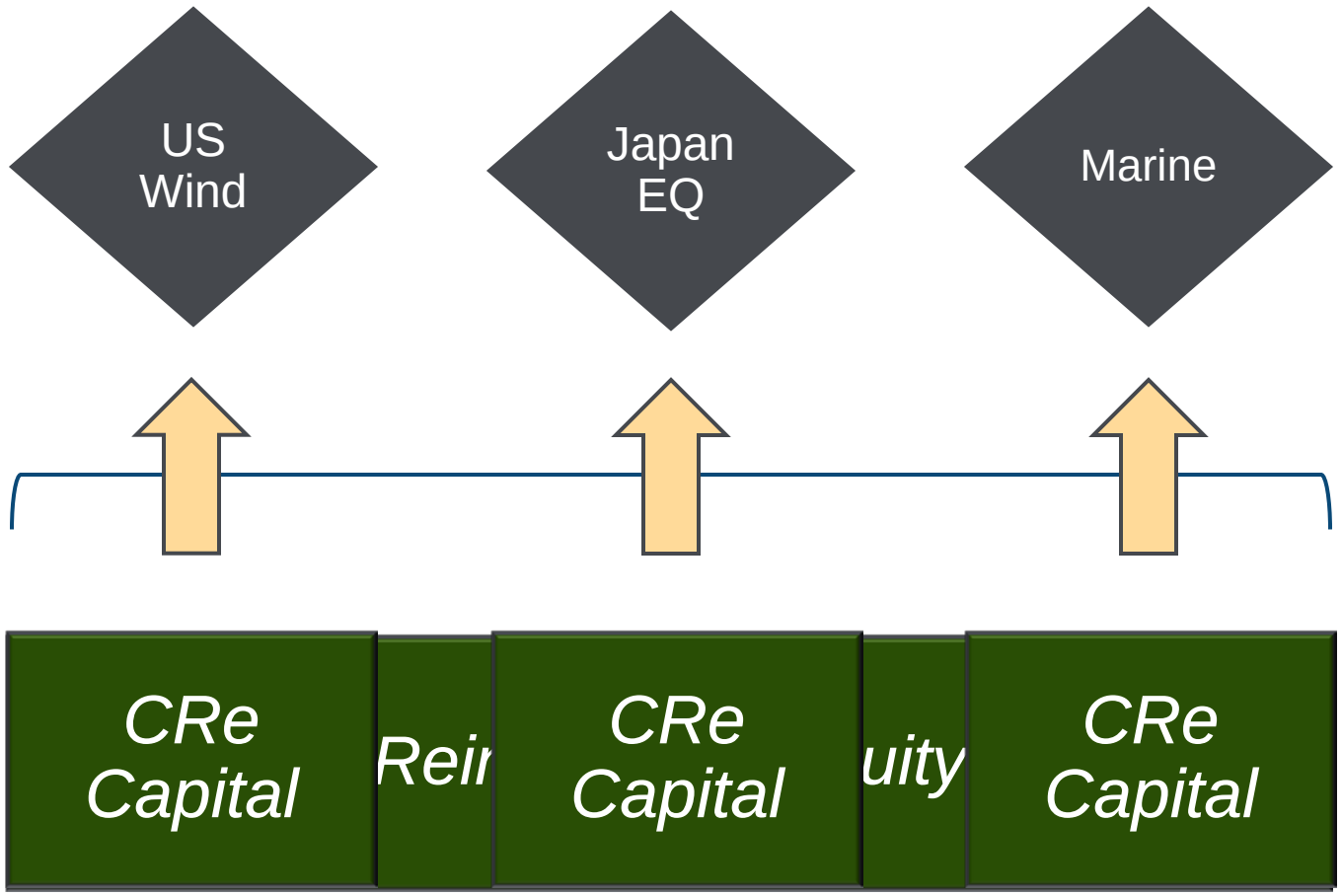
What Does Alternative Capital Cover?

	Property Catastrophe XoL	Cat Aggregate XoL Specialty XoL Prop./Spec. Quota Shares	Liability/Casualty Business
Typical Instrument	Catastrophe Bond, ILW, Collateralized Re	Collateralized Re, Sidecar	TBD
Modeling	Structural	Combination of structural and actuarial	Combination of economic and actuarial
Loss Development	Short-tail	Medium-tail	Long-tail
Historical Involvement	Long-term	Recent	TBD
Current Market Share	~2/3	~1/3	~0%

Low actuarial involvement

High actuarial involvement

Pricing – The Impact of Full Collateralization



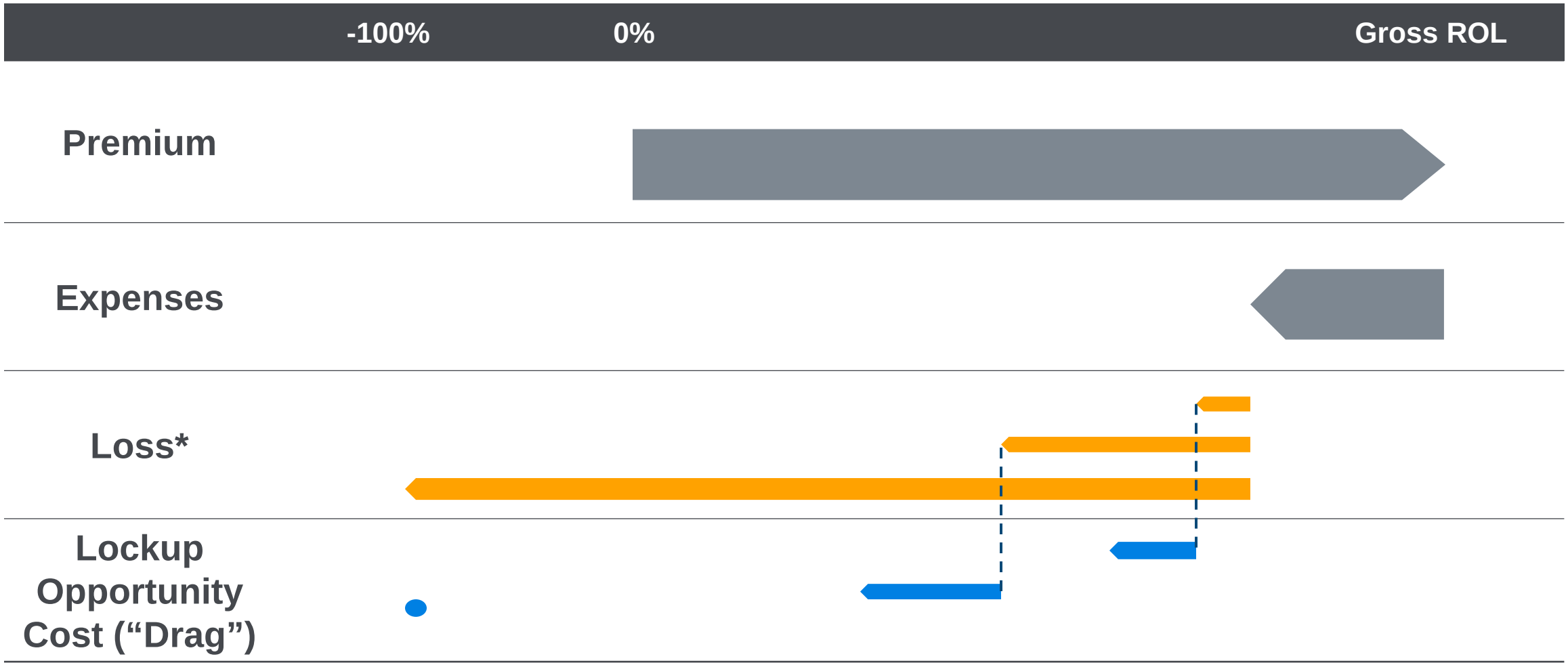
Reinsurance

- *Equity supports all of the deals simultaneously.*
- *Result = Leveraging effect on returns*

Collateralized Reinsurance

- *Equity supports each deal individually, is "trapped" in the form of collateral for each deal*

Analyzing Deal Returns



Thought Experiment

A new investment fund

Aaron's Excellent Investment Fund

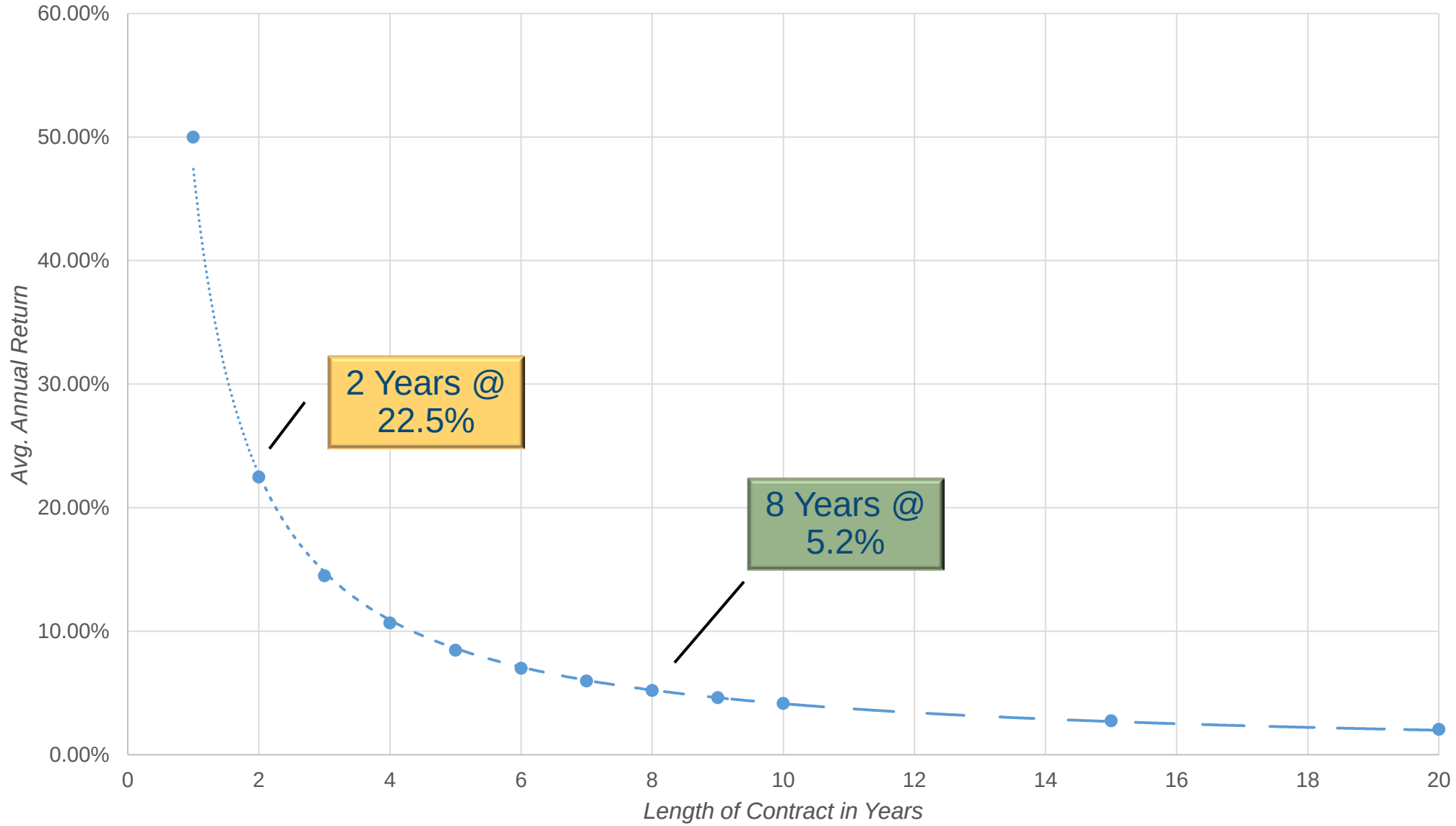
Investing for the Future, in the Present

We construct portfolios that balance risk, return, and our inherent desire to build complicated models.

Select Language: English | Actuarial-ese

Our investment strategy:

“We invest in one contract – and the expected return is 50% of the capital/collateral you contribute”


60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Avg. Annual Return
2 Years @ 22.5%
8 Years @ 5.2%
0
2
4
6
8
10
12
14
16
18
20
Length of Contract in Years

Conclusion:

When returns are fixed, time matters

The shorter the contract, the bigger the relative impact of unforeseen delays in returning capital

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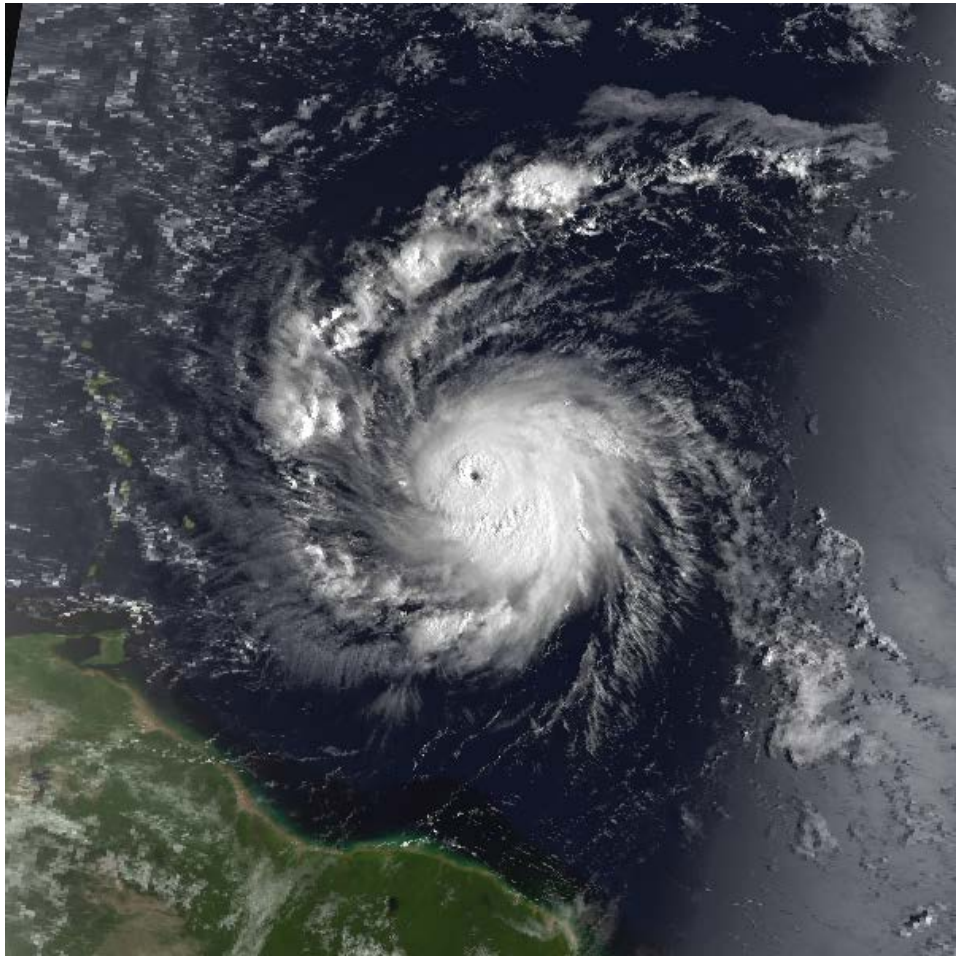


Collateral Release Provisions
Sample Contract Language

25.2 Collateral will be released to the Reinsurer where the Collateral Release Calculations identify that amounts are held in excess of the Adjusted Loss Amount.

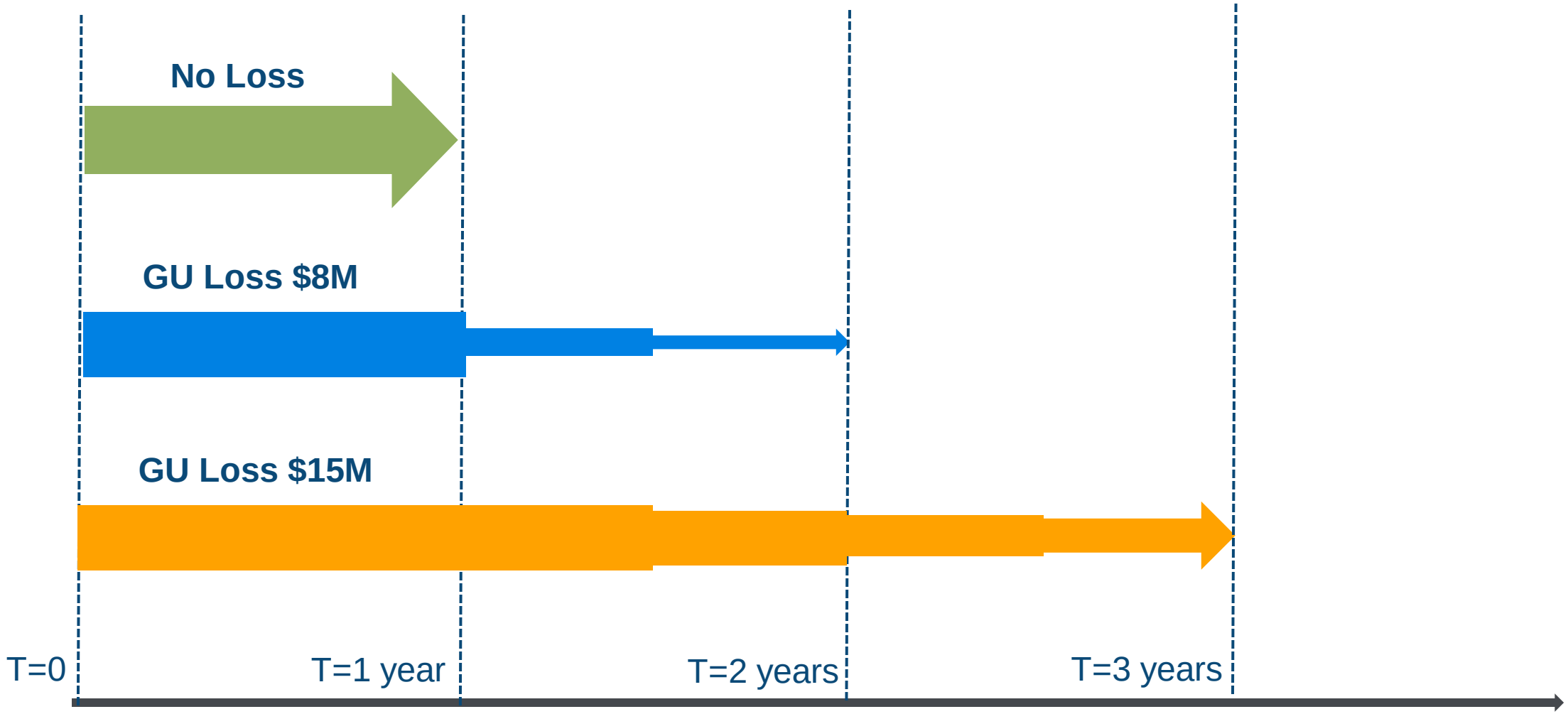
25.3 The Reinsured will calculate a Buffered Loss Amount by multiplying the relevant Ultimate Net Loss by the appropriate Buffer Loss Factor, based upon the number of months which have elapsed since expiry of the Treaty Period. The product of this calculation is known as the Buffered Loss Amount.

Table 1: Buffer Loss Factor

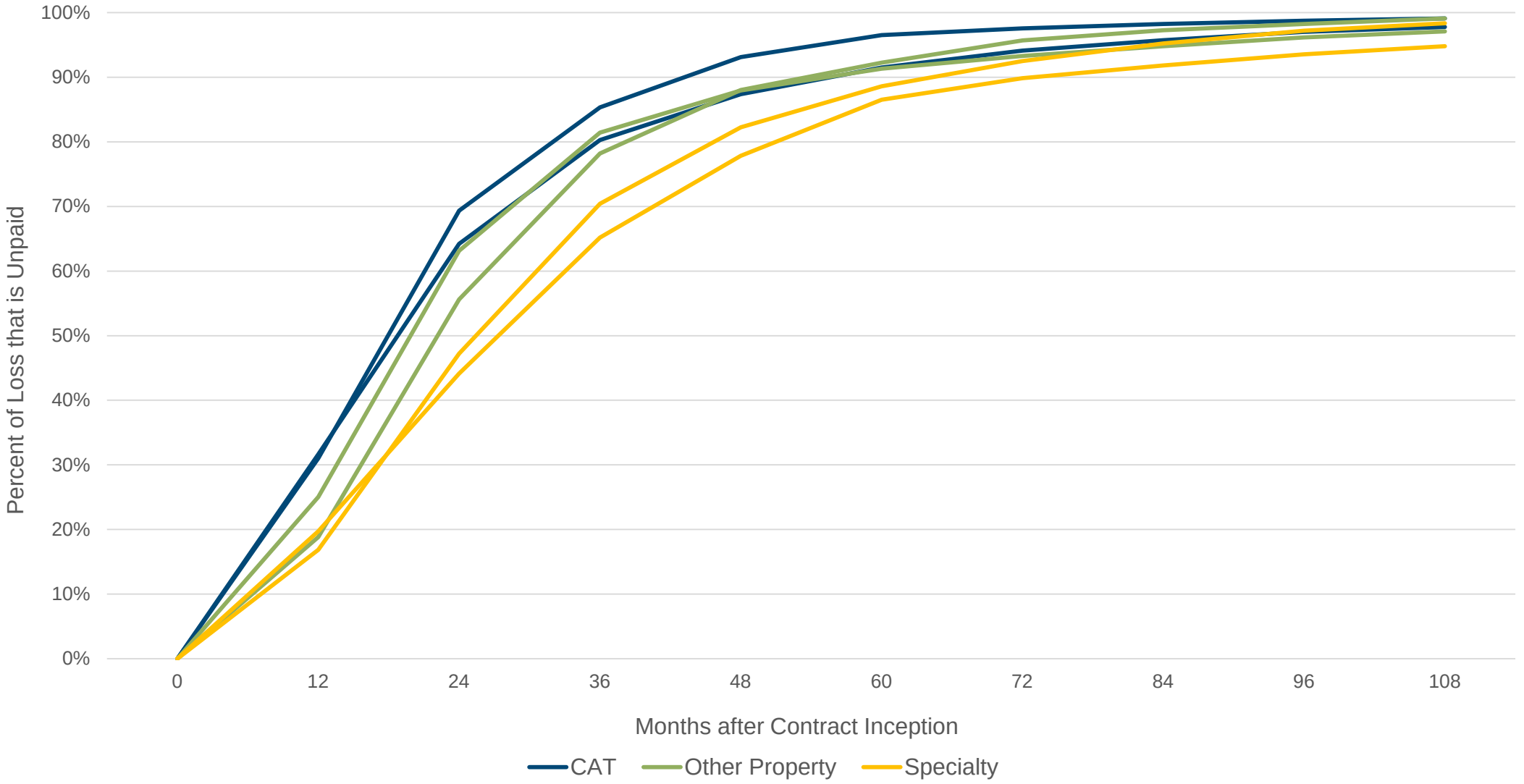
Number of Calendar Months Since Expiry of Treaty Period	Buffer Loss Factor
0 to 6	50%
> 6 to 12	25%
> 12 to 18	15%
Thereafter	5%

Length of Collateral Lockup, Various Loss Scenarios

10M xs 10M Coverage



Percent of Unpaid Loss at Various Ages



Where is Locked Collateral most relevant?

1	Higher chance of nonzero loss / Higher ROL	↑
2	Longer development tail (e.g., specialty)	↑
3	More conservative loss “buffer” contractual terms	↑
4	Commutation provisions	↓

Impact on Costs from Locked Collateral

A tale of two instruments (Part 2)

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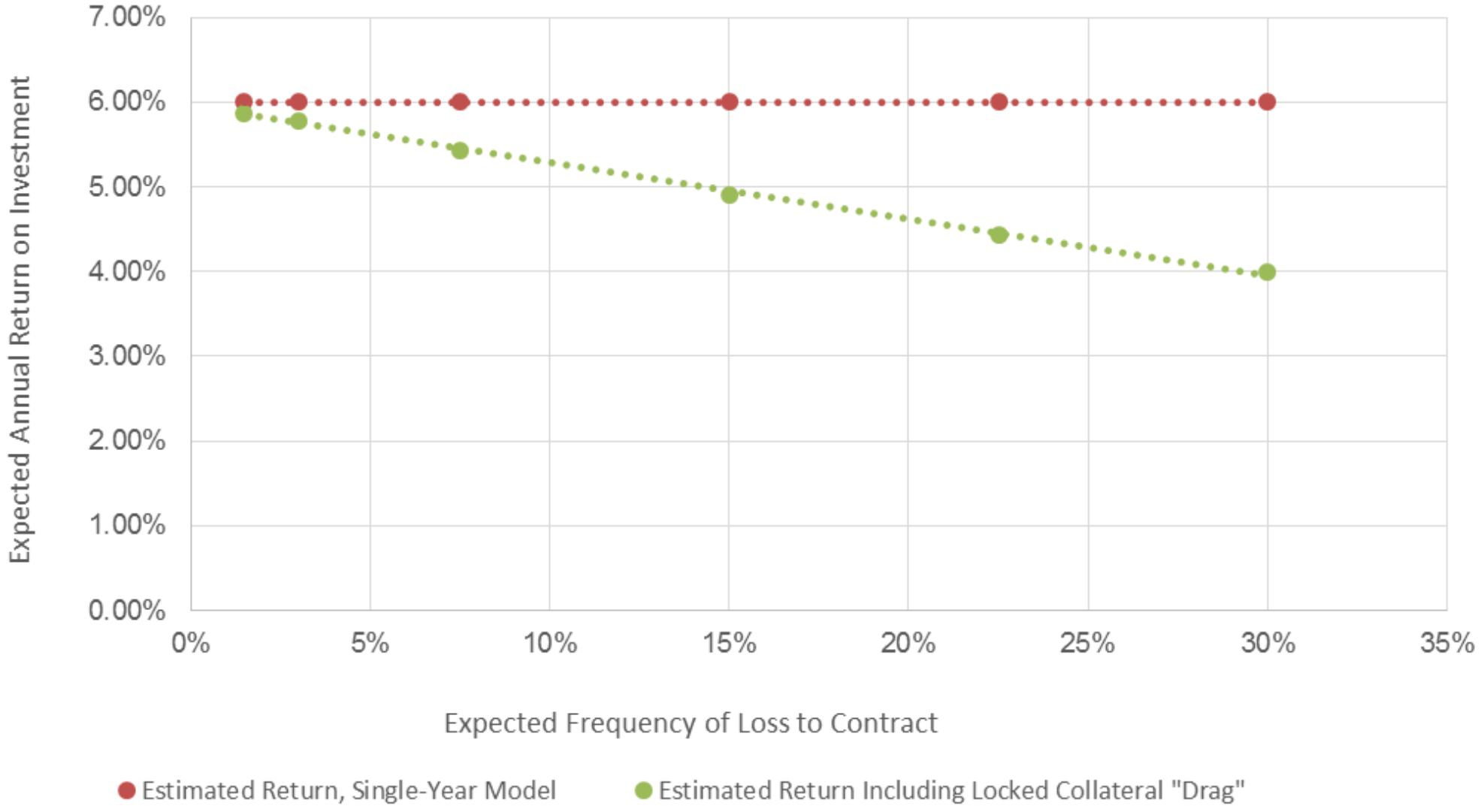
Pricing Collateral Lockup



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1. Alternative capital represents:
   - 20% of property catastrophe market
   - ~11% of overall reinsurance market

2. The outlook for future growth is strong, as alternative capital continues to evolve into new coverages and structures

3. However, the use of new tools and forms of capital introduces new challenges, many of which will require actuarial expertise to meet.

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Thank you

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Questions?