



FINANCIAL SERVICES

Applying Integrated Risk and Performance Management: A Case Study

KPMG LLP

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Our Discussion Today

Background

What is Integrated Risk and Performance Management: Economic Theory Perspective

Review of material from last session

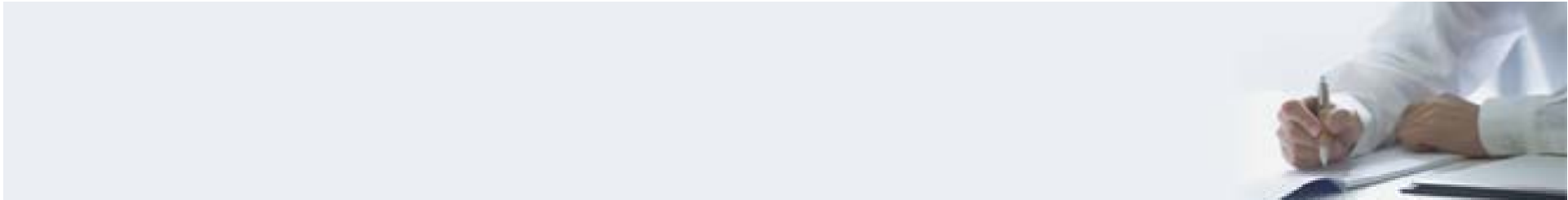
Putting Theory into Practice: Practical Considerations

We tested our approaches by applying the model to an industry composite specialty lines insurer

Discussion of decisions, considerations, approaches

A Simple Example: Specialty Lines Model

Applying the IRPM Technique



Background:

Integrated Risk and Performance Management (IRPM)

What is it?

“Integrated Risk and Performance Management” Defined: Utilizing the Company’s ERM and ECM processes within the Company strategic, tactical, and operational management processes in order to achieve increased returns and more efficient use of capital

Observations:

It’s a management and governance process

It’s a vision to which an effective ERM and ECM process is a prerequisite

If design of ERM and ECM processes don’t begin with IRPM process as an objective or vision, it is unlikely they can be utilized when built to execute an effective IRPM process

To effectively operate an IRPM process, it needs to be embedded into critical management processes, such as, (and more):

- Strategic planning
- Operational planning
- Performance monitoring
- Critical decisions, such as reinsurance purchases
- Incentive programs

Buy-in is required throughout the organization for IRPM to operate effectively

The demands this would place on the economic capital modeling process would exceed the ability of most of those operating today:

- Such as systematic evaluation of a wide range of possible actions
- Quality and stability of the model

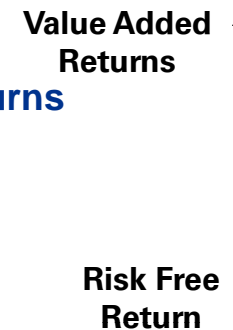


What is Integrated Risk and Performance Management:

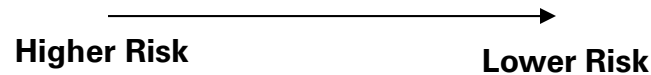
Economic Theory Perspective

Moving to More Efficient Capital Usage – Building the Efficient Frontier

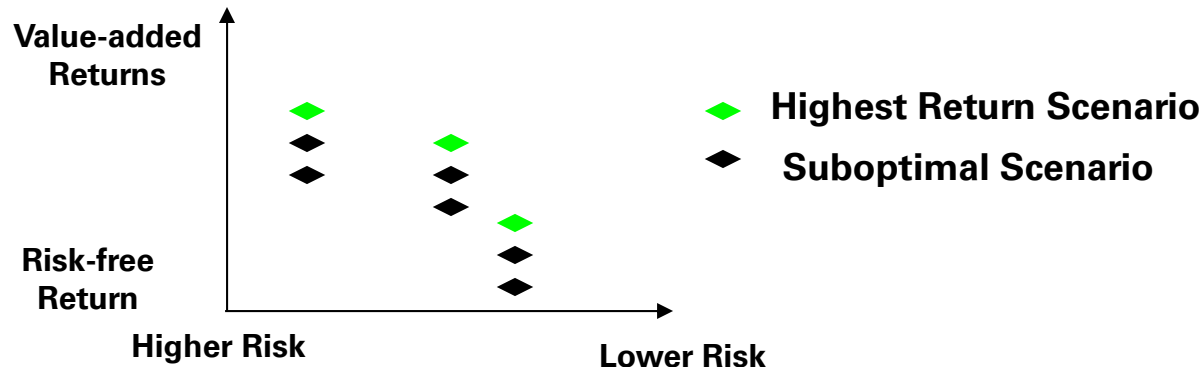
Business management and planning is often focused on seeking higher returns



- And ERM often is focused on defining and mitigating risk, moving from higher risk to lower risk

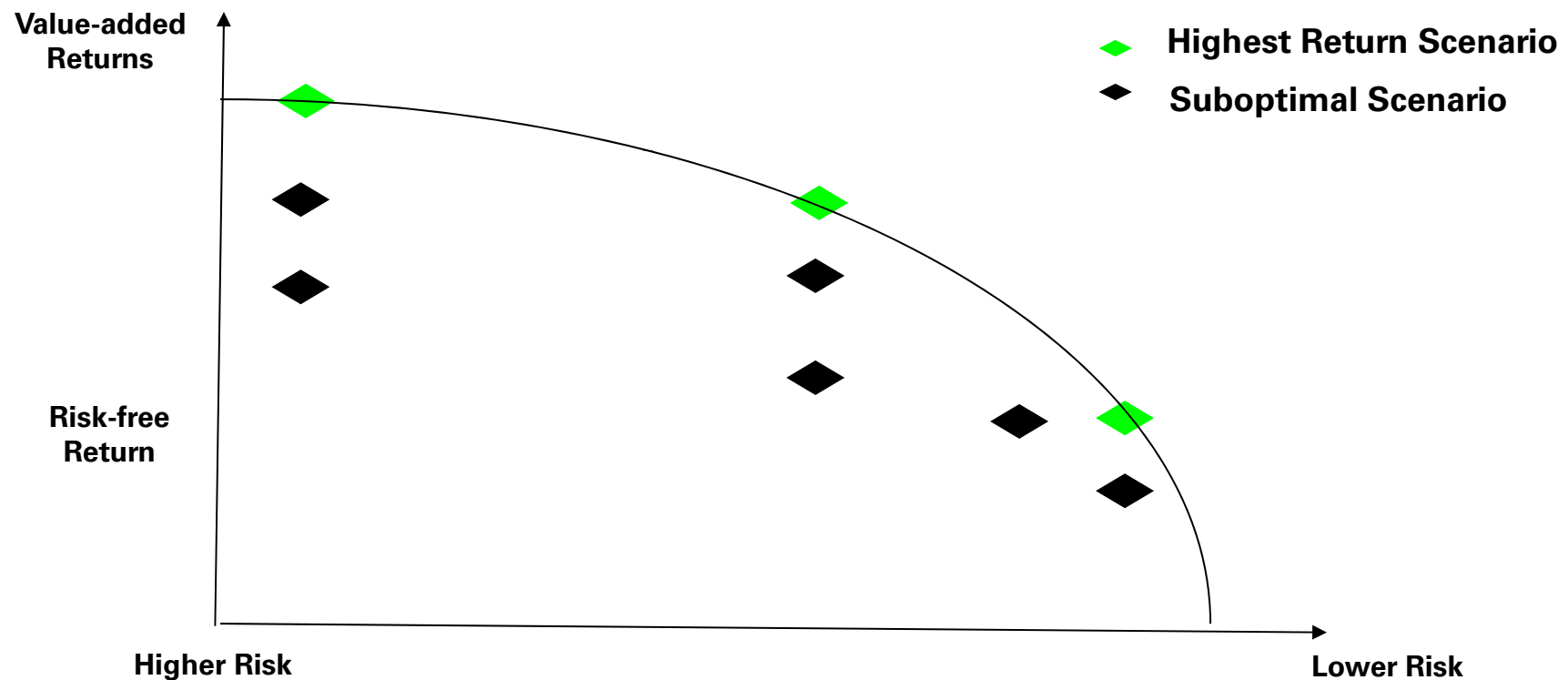


- IRPM can be thought of as the process of defining the optimal level of return for a given risk tolerance
- Scenarios can be run to obtain the highest return for a given level of risk



Defining the Possibilities for Most Efficient Use of Capital

- The collection of points with the most efficient usage of capital can be determined, often called the “efficient frontier” or “performance frontier”

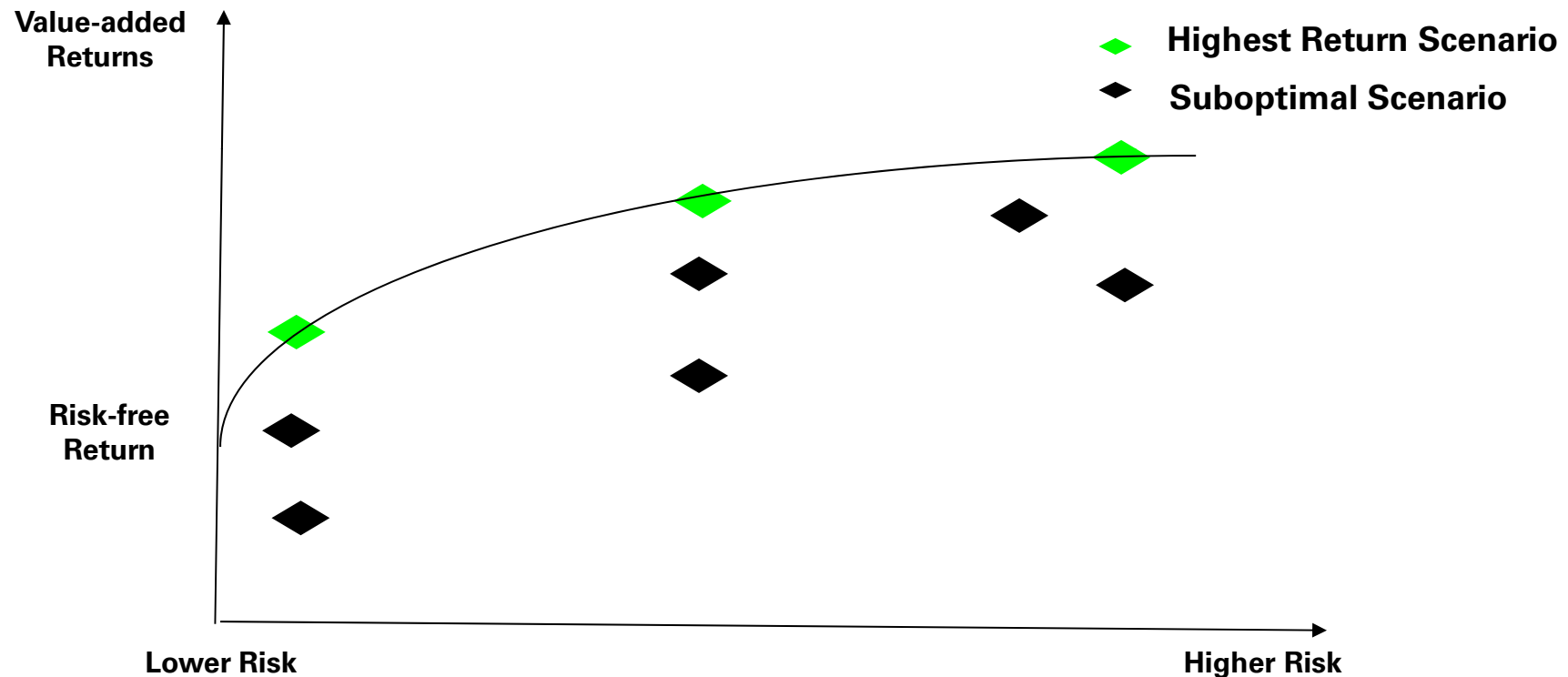


- Note the diagram above shows two factors, risk and return, for simplicity. In actual modeling, many variables, including capital, risk tolerance, returns by segment, premium volumes, and so forth, are considered; and the most favorable scenarios are determined based on managements criteria.

Defining the Possibilities for Most Efficient Use of Capital

Note that sometimes this diagram is shown with the s-axis reversed

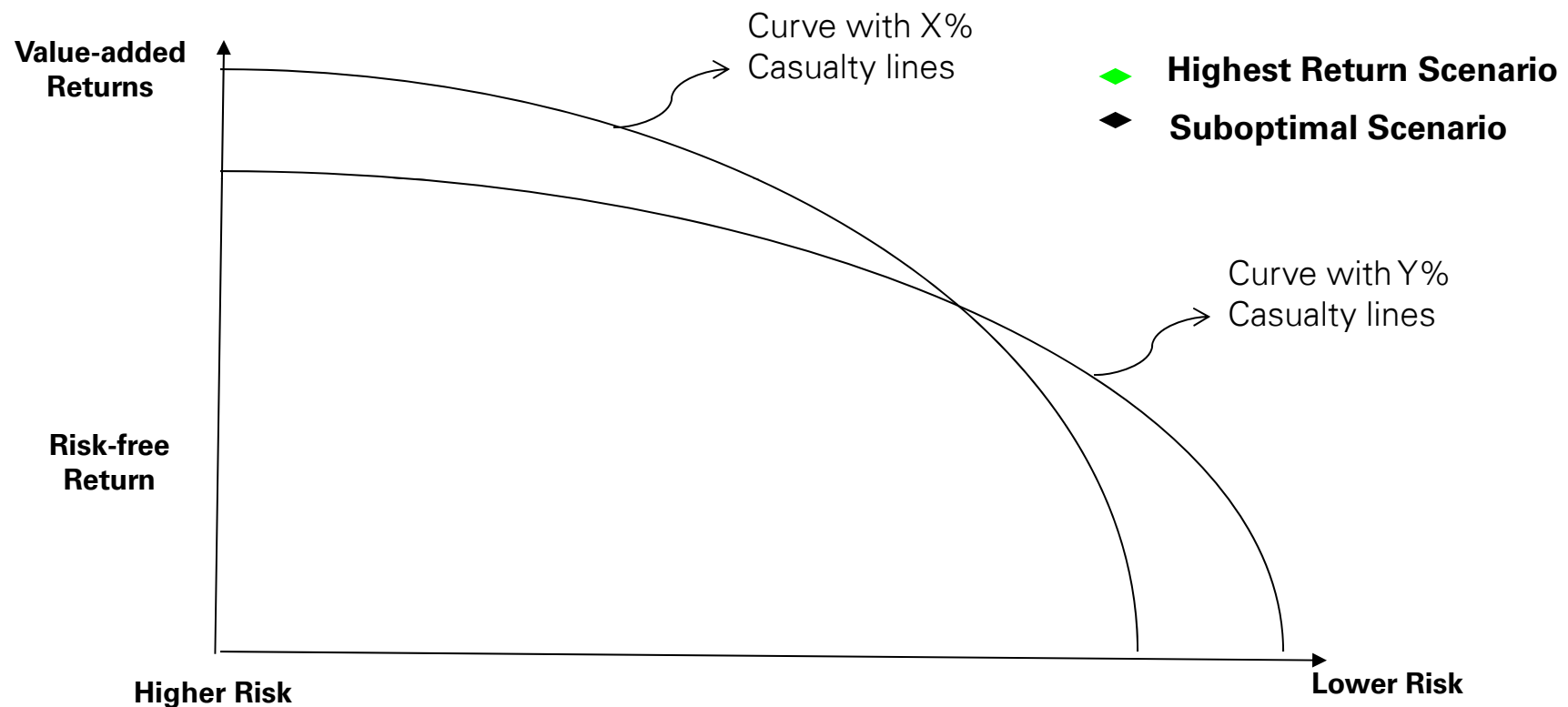
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Note this frontier is not fixed, but depends on many underlying variables

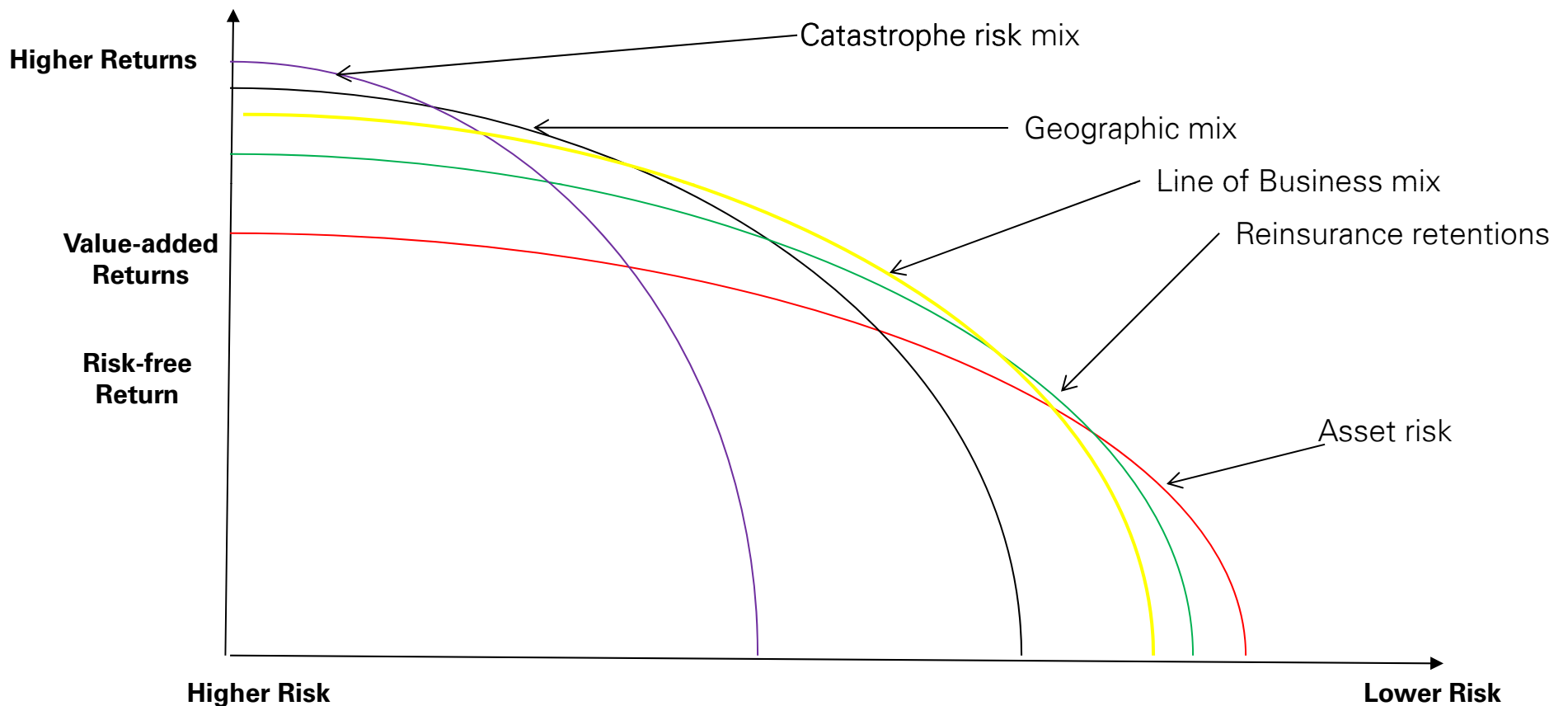
- For mathematicians, it is a two-dimensional slice of a multidimensional surface, hence there are infinite possible curves



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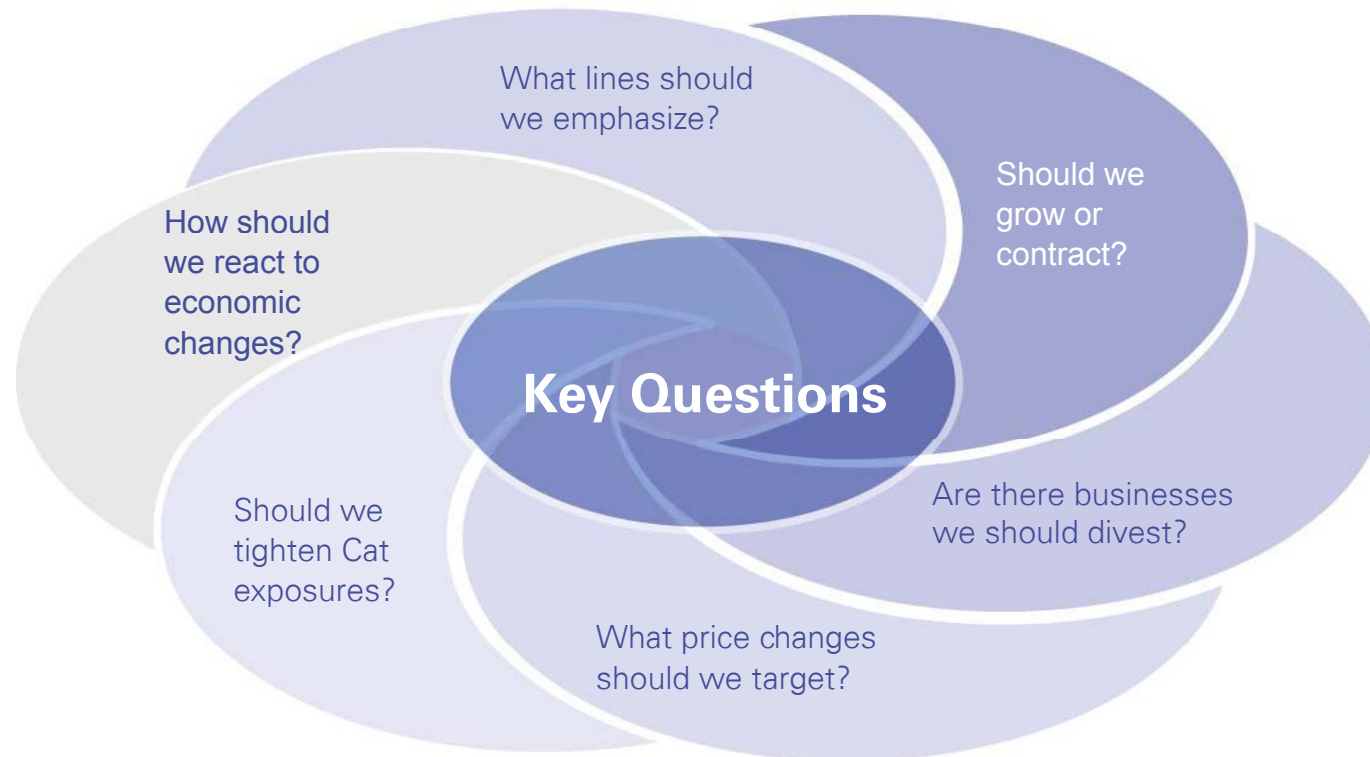
The possible combinations are infinite – Most effective combinations define the efficient frontier

- Assume these axes describe one variable, maybe line of business mix. Different curves can be described by varying catastrophe risk, reinsurance retentions, geographic mix, asset risk, currency risk, or many other variables



- The efficient frontier for the enterprise is described by the efficient frontier of many different variables

Uses of IRPM – Example 1: Implementing Effective Business Plans (1/2)





Putting Theory into Practice: Practical Considerations

Business Performance Metrics – Considerations in Designing the Model and Reporting

As use of an integrated risk/performance approach becomes more accepted, the main metrics can change
New metrics become important, possibilities include:

RORAC – Return on Risk
Adjusted Capital:

$$\frac{\text{Net Income}}{\text{Allocated Capital}}$$

ROCAR – Return on
Capital at Risk:

$$\frac{\text{Net Income}}{\text{Economic Capital}}$$

RAROC – Risk Adjusted
Return on Capital:

$$\frac{\text{Net Income} \times \text{Risk Adj.}}{\text{Capital}}$$

ROCAR or RORAC is straightforward in practice:

- Returns come unadjusted from other financial documents
- Capital allocations come from the model

- Whichever basis is selected, it can be mapped back to commonly used measures
 - Operating ratio, Combined ratio, Net income
 - Investment income on capital and/or technical reserves can be included, or segregated to a separate division (sometimes called the “investment division”)

Defining the Axes: What is Economic Capital? What is Risk? What is Return?

Considered choices in the context of short term planning cycle, with held surplus relatively fixed

Other choices might work better for longer term uses, such as investment banking

Our Selection of Economic Capital:

We selected 75% of the 1/40 year plus 1/100 year plus the 1/200 year worst cases over one year

Corresponds to 1/200 chance of a year so poor that it causes major disruption, or business withdrawal

- Although it varied by scenario, think of this as about a 1/5000 chance of bankruptcy

We note many non-cat adverse business trials may be multi-year events (asset crash, inflation)

Corresponds to Direct Premium to Economic Surplus of about 1.14 to 1 for our specialty lines insurer Base Case with reinsurance

The industry composite for Specialty Carriers is .8 to 1, indicating excess capacity

Selected the ratio of economic capital to held surplus as our measure of Risk:

But restrict to 100%, can't let economic capital to go over the carried surplus

Selected Income/Held Surplus as our measure of Return

Note these choices are both expressed as a ratio to held surplus

But approach and shape of the graph wouldn't change if we used dollars of income and economic capital

***Source for composite is AM BEST Aggregates and Averages**

Practical Constraints

We hypothesized growth choices facing the company, in order to bound the decision

We used a limit of 10% growth overall, and no more than 40% growth or decline in any line

Constrained Binding Authority property and casualty premium changes to move in tandem.

Similar to choices facing companies in reality, if acquisitions are not considered

Non-renewals usually restricted by law

Reinsurance can be used to divest risk, but we considered only limited use

Reasoning is our insurer would avoid building a dependence on reinsurance availability

- Reinsurers can non-renew treaties, but direct insurers may be stuck on significant risk

Illustrates many considerations are not mathematical issues



A Simple Example: Specialty Lines Model

A Simple Example

To create a public facing test to demonstrate these approaches, we created an industry composite insurer

Created a practical example of our approaches

However, this composite doesn't represent any actual insurer, or the lines, since every company differs in:

Pricing & underwriting approaches and appetite, catastrophe exposure, limits provided, line of business mix, reinsurance, and so forth

Used public and internal information modeled on an insurer that has 3% market share writing specialty lines:

Liability lines D&O, Lawyers, Umbrella, Brokerage Casualty and Binding Authority Casualty

Property lines Brokerage Property and Binding Authority Property

Used data at 12/31/2010, ran scenarios, built the efficient frontier to 2013

Some scenarios were “possible”, fit growth constraints

Others were “notional”, to see direction.

- For example, “write only Umbrella” isn't a possible scenario, but it was interesting to see the outcome

Modeling the Loss Ratio (1)

Modeled Loss, Defense, and Cost Containment with three models, (1) Aggregate Loss Ratio, (2) Individual Claim, (3) Major catastrophe

Aggregate Loss Ratio Model–

Starting point based on industry and internal studies

Variation based on CV of historical on level loss ratios, and lognormal distribution

Individual Claim Model –

Starting point based on industry size of loss curves by line

Modeled as a Poisson Frequency and Lognormal severity

Future severity indexed to inflation, future frequency indexed to exposure volume

Modeling the Loss Ratio (2)

Major Catastrophe (named storms) – Starting point

Modeled by discrete events

Approximate frequency and severity based on observed history and other public information

- Storms for last 100 years, seismic events since 1700

In practice, Companies would usually use the event set coming from Catastrophe models

D & O Catastrophe event load

Modeled by discrete events

Approximate frequency and severity based on observed history and other public information

- Shareholder Lawsuit Events for last 20 years

Sources for Other Assumptions in the Model (1)

Expenses

Assumed all variable, and based on industry Insurance Expense Exhibit

Includes Adjusting and Other expense

Did not add a stochastic component

Premium Volume

One of the most significant variables in running scenarios

Otherwise modeled based on assumed exposure growth

Assets

Assumed enough assets to support premium to surplus discussed above

Modeled a portfolio of cash, stocks and bonds consistent with the surplus lines composite

Duration of portfolio is five years

Returns based on model economic scenario generator

Return if no ongoing insurance business is 3.6%

Sources for Other Assumptions in the Model (2)

Reserve runoff

Modeled approximately 3% of industry reserves. Reserves from each line developed by applying payout patterns and ELRs to flat prior year exposures

Payout patterns from Industry and internal sources

Modeled reserves to be adequate using an “expected value of cash flows” approach as the central estimate (no expected profit or loss from nominal runoff)

Selected reserve runoff CV's Based on internal sources

Catastrophe Reinsurance availability

Considered highly reinsured options, less reinsured options, and no use of reinsurance

Priced the options to about 50% combined ratio for catastrophe reinsurers and 95% combined ratio for per risk reinsurers

Base Case Policy Year Product Assumptions

Policy Year 2011 Underlying Assumptions

Product	Modeled Loss&DCC Components							
	Written Premium	Aggregate Loss Ratio	Individual		Total Loss Ratio	AOE Ratio	Expense Ratio	Combined Ratio
			Claim Loss Ratio	Catastrophe Loss Ratio				
D&O	94,117		34.5%	22.5%	57.0%	5.0%	28.0%	90.0%
Binding Casualty	68,951	57.0%			57.0%	6.0%	32.0%	95.0%
Binding Property	113,607		42.4%	16.6%	59.0%	4.0%	31.0%	94.0%
Brokerage Casualty	96,640	59.0%			59.0%	6.0%	31.0%	96.0%
Brokerage Property	75,738		29.1%	29.9%	59.0%	4.0%	31.0%	94.0%
Umbrella	34,035		65.0%		65.0%	5.0%	28.0%	98.0%
Lawyers	50,679		73.0%		73.0%	5.0%	26.0%	104.0%
Total	533,767				60.1%	5.0%	29.9%	95.0%
Held Surplus	895,804							
Premium /Surplus	59.6%							

Correlations

Instead of relying on a correlation matrix, we modeled directly the loss inflation process leading to correlation

Calculated empirical correlations in actual history

History does not provide a stable estimate

Back tested model correlations against empirical expectations

Allowed residual correlations to come through correlation matrix of individual loss models



Applying the IRPM Technique

Building the Efficient Frontier

Considered the main planning variables:

Growth by line restricted to 10% overall, 40% up or down by line

Use of Reinsurance depending on the scenario, high use, medium use, no use

- Cost at 50% combined ratio to catastrophe reinsurers and 95% combined ratio to per risk reinsurers

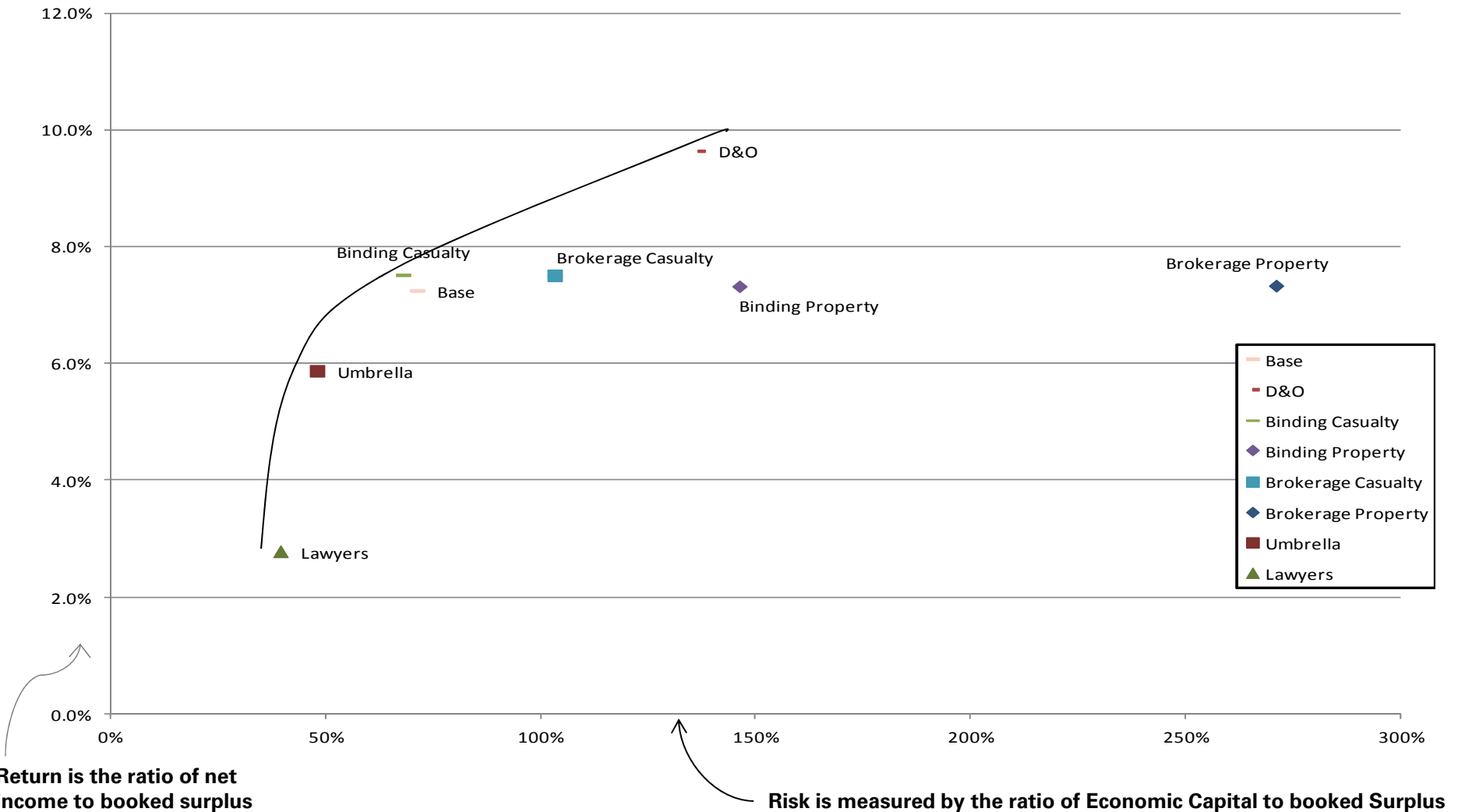
Ran “directional” or “notional” scenarios to understand marginal movements

Ran scenarios based on hypothesized efficient frontier

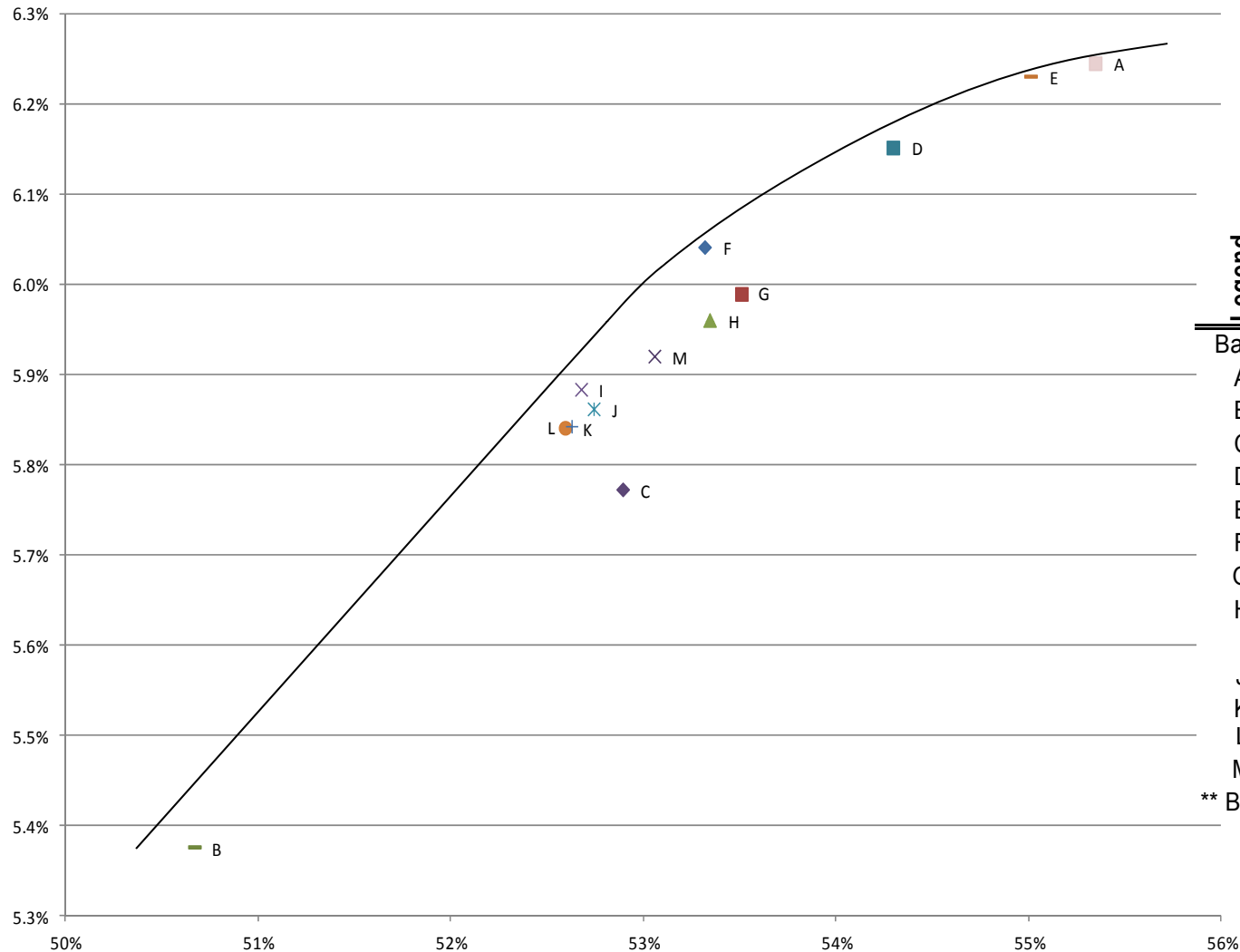
Evaluated results, designed additional scenarios, ran these scenarios and repeated the process

Single Product – Calculating Notional points to Observe Directions

If the Company could Write the Same Volume, in all one product



Varying Reinsurance Structures For the Base Scenario



Per Risk Reins Attachment (Millions)

Legend	Cat Reins	D&O	Property	Umbrella	Lawyers
Base	None	None	None	None	None
A	120	None	None	None	None
B	60	None	None	None	None
C	120	1	0.5	1	1
D	120	10	None	None	None
E	120	None	None	10	None
F	120	5	5	5	5
G	120	5	1	5	5
H	120	5	1	5	2
I	120	2	1	2	2
J	120	2	1	2	1
K	120	1	1	2	1
L	120	2	1	1	1
M	120	2	1	10	2

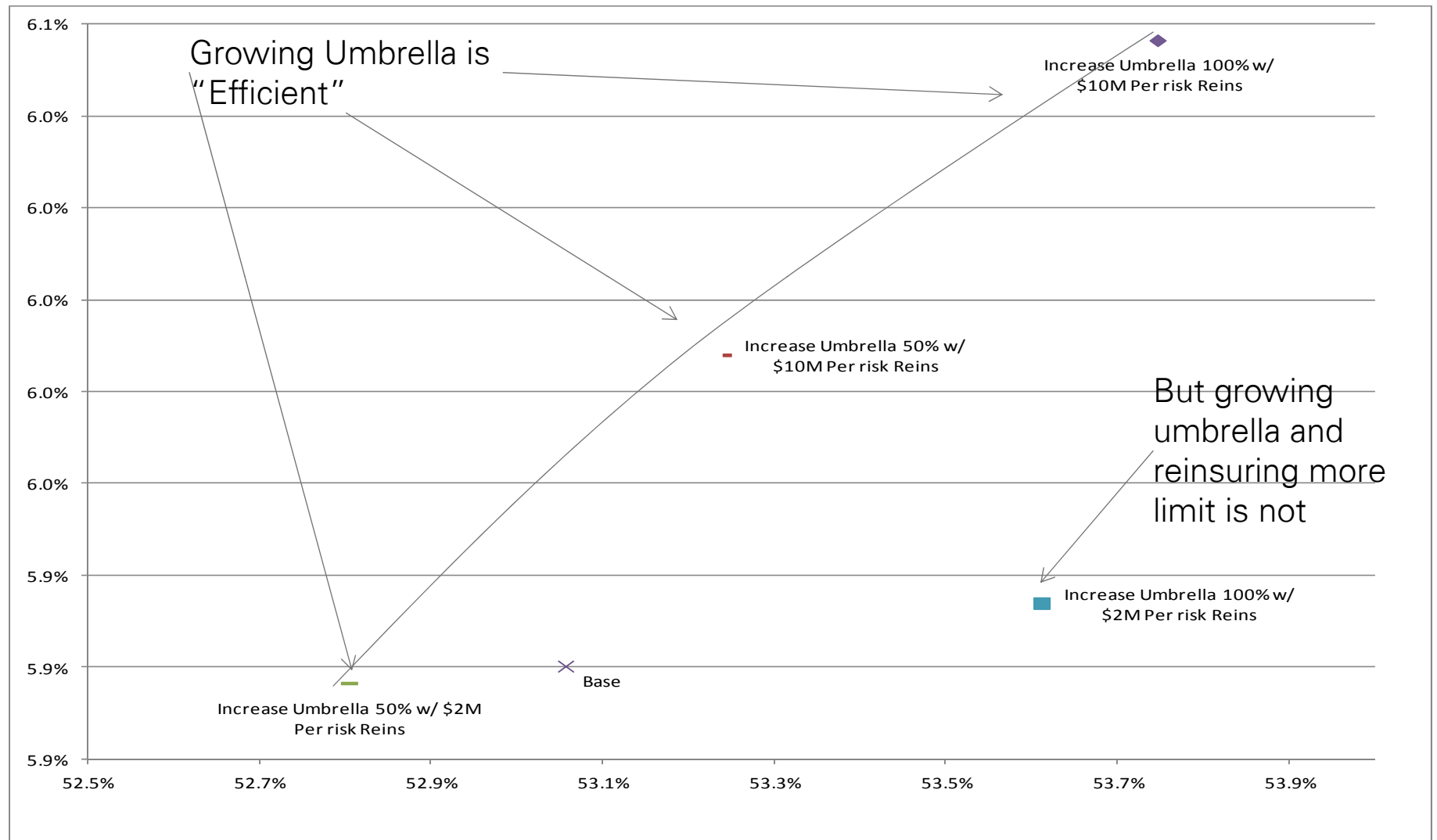
** Base (no reinsurance) 71% risk, 7.2% return

Marginal Rates Can be used to evaluate the Reinsurance options

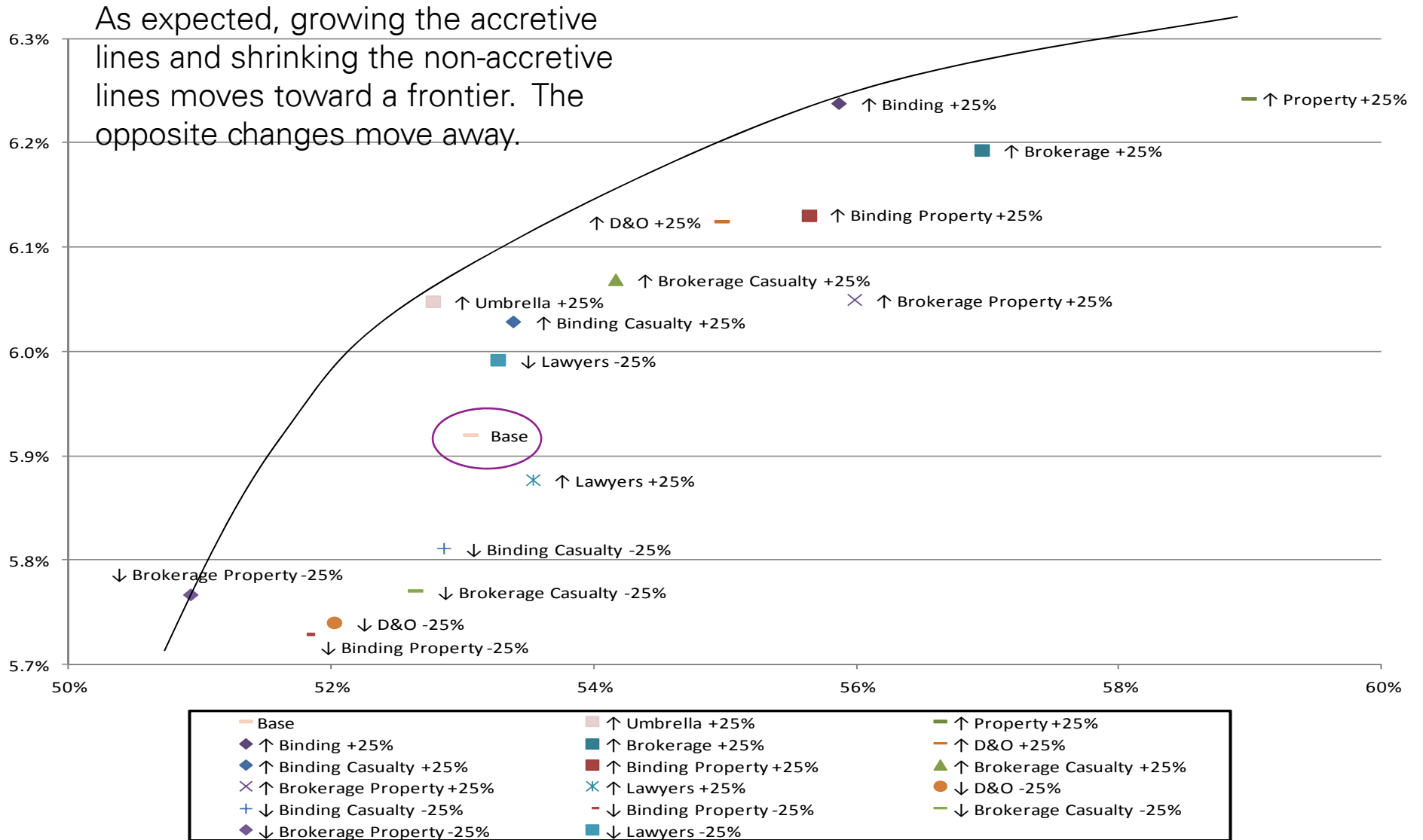
Legend	Cat Reins	Per Risk Reins Attachment (Millions)				Return on Surplus	Return on Required Surplus	Marginal Rate of profit ceded as a percent of the reduction to required surplus
		D&O	Property	Umbrella	Lawyers			
Base	None	None	None	None	None	7.2%	10.2%	
A	120	None	None	None	None	6.2%	11.3%	6.7%
B	60	None	None	None	None	5.4%	10.6%	9.2%
C	120	1	0.5	1	1	5.8%	10.9%	8.3%
D	120	10	None	None	None	6.2%	11.3%	6.8%
E	120	None	None	10	None	6.2%	11.3%	6.6%
F	120	5	5	5	5	6.0%	11.3%	7.1%
G	120	5	1	5	5	6.0%	11.2%	7.4%
H	120	5	1	5	2	6.0%	11.2%	7.5%
I	120	2	1	2	2	5.9%	11.2%	7.6%
J	120	2	1	2	1	5.9%	11.1%	7.8%
K	120	1	1	2	1	5.8%	11.1%	7.8%
L	120	2	1	1	1	5.8%	11.1%	7.8%
M	120	2	1	10	2	5.9%	11.2%	7.6%

Ignoring other considerations, option E is the most efficient of the reinsurance options presented

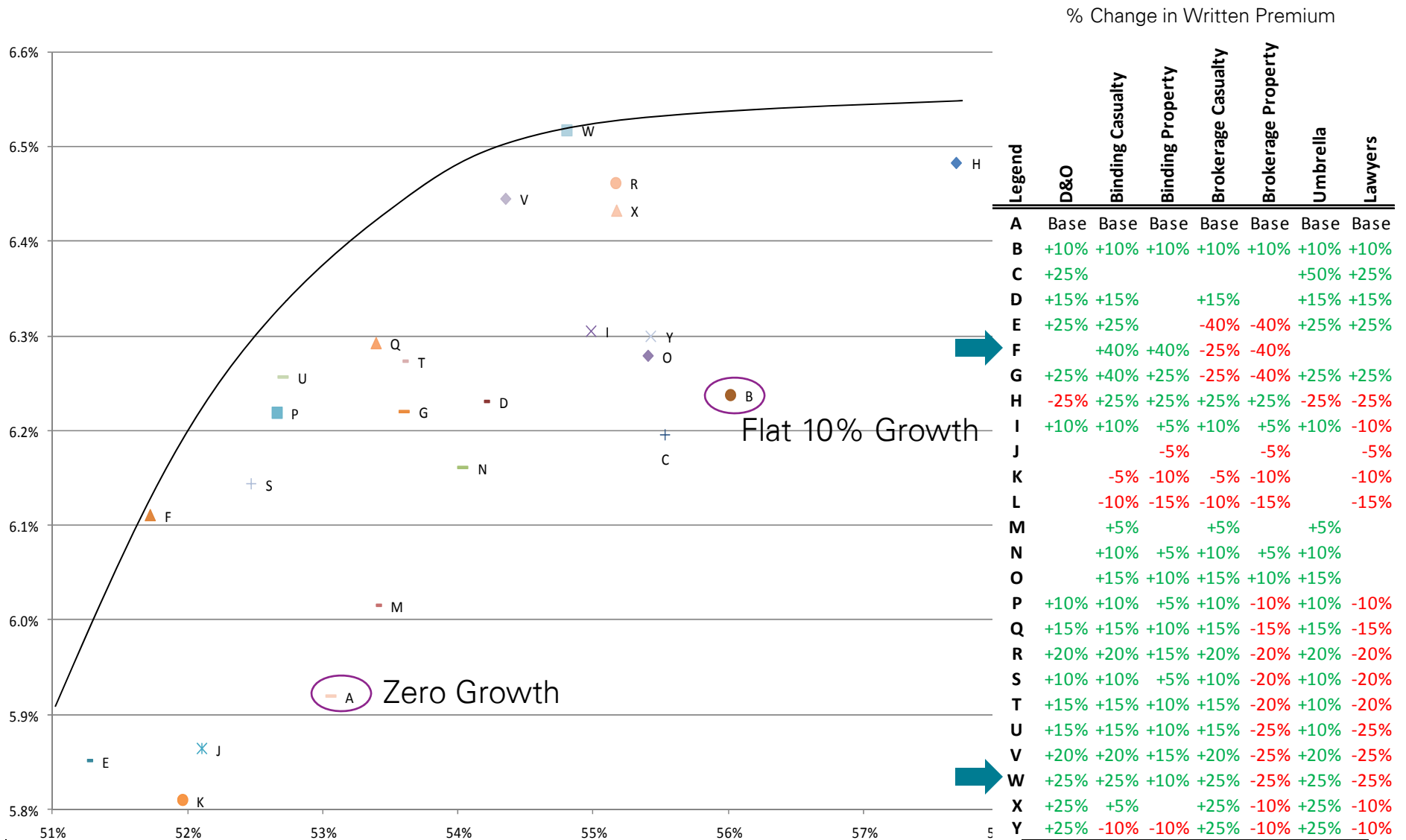
Umbrella Growth Scenarios with varying Reinsurance Attachments



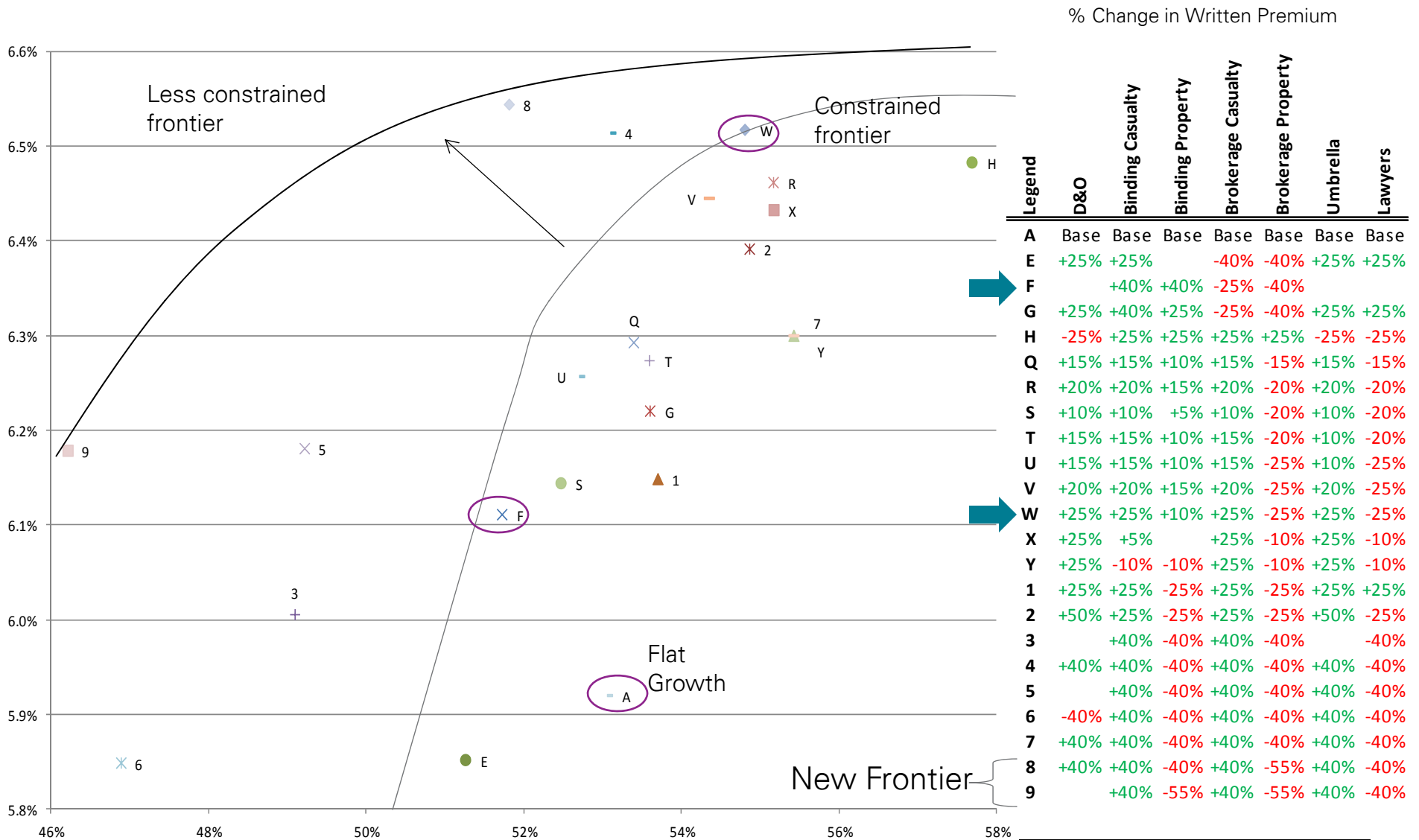
25% growth in each product line – Which lines move toward the efficient frontier?



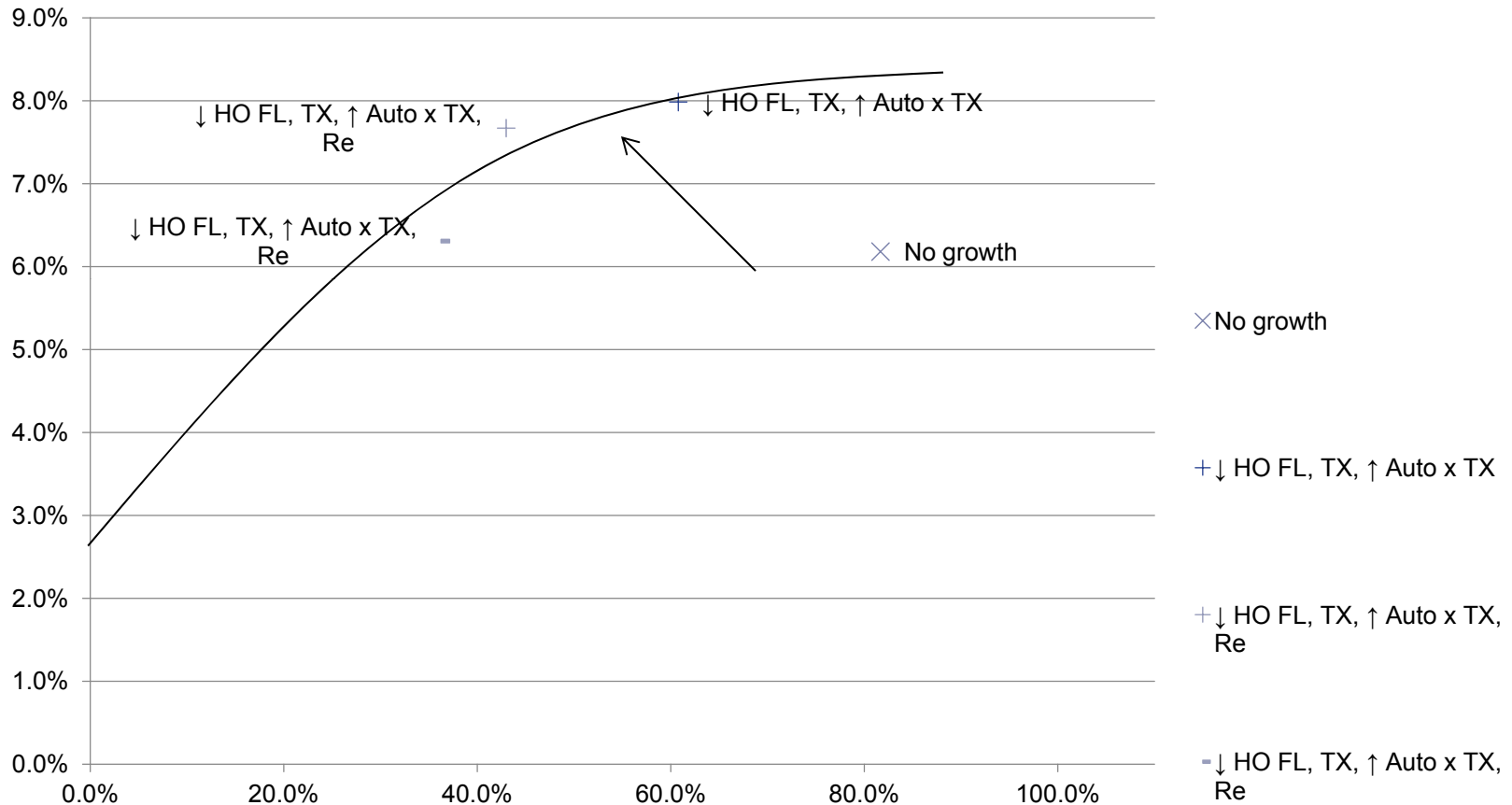
Using the analysis to construct alternative business mix scenarios



Using Property Quota Share Reinsurance to Overcome Constraints and Reduce Catastrophe Exposure



Similarly Cutting Back on Catastrophe Exposure moved the efficient frontier in our Previous Personal Lines Case Study (See last years presentation)



Risk and Return: The Efficient Frontier May Not Be Obvious

Legend	% Change in Written Premium							Return on Surplus	Return on Required Surplus
	D&O	Casualty	Property	Casualty	Property	Umbrella	Lawyers		
Base No Reinsurance								7.2%	10.2%
W	+25%	+25%	+10%	+25%	-25%	+25%	-25%	6.5%	11.9%
H	-25%	+25%	+25%	+25%	+25%	-25%	-25%	6.5%	11.2%
R	+20%	+20%	+15%	+20%	-20%	+20%	-20%	6.5%	11.7%
V	+20%	+20%	+15%	+20%	-25%	+20%	-25%	6.4%	11.9%
X	+25%	+5%		+25%	-10%	+25%	-10%	6.4%	11.7%
I	+10%	+10%	+5%	+10%	+5%	+10%	-10%	6.3%	11.5%
Y	+25%	-10%	-10%	+25%	-10%	+25%	-10%	6.3%	11.4%
Q	+15%	+15%	+10%	+15%	-15%	+15%	-15%	6.3%	11.8%
O		+15%	+10%	+15%	+10%	+15%		6.3%	11.3%
T	+15%	+15%	+10%	+15%	-20%	+10%	-20%	6.3%	11.7%
U	+15%	+15%	+10%	+15%	-25%	+10%	-25%	6.3%	11.9%
B	+10%	+10%	+10%	+10%	+10%	+10%	+10%	6.2%	11.1%
D	+15%	+15%		+15%		+15%	+15%	6.2%	11.5%
G	+25%	+40%	+25%	-25%	-40%	+25%	+25%	6.2%	11.6%
P	+10%	+10%	+5%	+10%	-10%	+10%	-10%	6.2%	11.8%
C	+25%					+50%	+25%	6.2%	11.2%
N		+10%	+5%	+10%	+5%	+10%		6.2%	11.4%
S	+10%	+10%	+5%	+10%	-20%	+10%	-20%	6.1%	11.7%
F		+40%	+40%	-25%	-40%			6.1%	11.8%
M		+5%		+5%		+5%		6.0%	11.3%
Base with Reinsurance								5.9%	11.2%
J			-5%		-5%		-5%	5.9%	11.3%
E	+25%	+25%		-40%	-40%	+25%	+25%	5.9%	11.4%
K		-5%	-10%	-5%	-10%		-10%	5.8%	11.2%
L		-10%	-15%	-10%	-15%		-15%	5.7%	11.1%

Efficient points may show up as high returns on surplus, but others may not.

The arrows



denote scenarios mapped to the efficient frontier.

Conclusions from the Demonstration

- **IRPM approaches such as determining the marginal efficiency of changes in reinsurance structure, or the marginal contributions of growth, can result in real improvements to decision making processes**
- **Use of IRPM approaches can also provide input into the characteristics of acquisition targets that would be more or less accretive to economic capital**
- **Using an “efficient frontier” is an effective way to communicate the actionable outputs of the capital model**
- **It is also useful in understanding what accepted constraints have the most impact on business objectives**
- **Without utilizing Capital Modeling tools, more efficient solutions may be missed**
 - IRPM approaches help to balance capital commitments against the returns gained
 - IRPM approaches are not needed to find the maximum return, nor the minimum risk, but are effective in deciding efficient trade-offs between the two

Access to the Integrating Risk and Performance White Paper

Access KPMG's IRPM White Paper:

<http://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/A-method-integrating-risk-performance.pdf>



Questions/Comments?



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