

# Aligning ERM, Risk Models and Business Strategy

## 2016 ERM P&C Seminar

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# Today's agenda

1. Introduction
2. Linking ERM and Insurer Strategy
  - Risk management strategies
  - Company strategy & objectives
3. Designing risk models for strategic value
  - Model design choices
  - Using models for strategic decisions
  - Case studies
4. Risk management strategies for individual risks
5. Conclusion



# Quick plug

The Actuarial Standards Board recently approved an exposure draft of a proposed new actuarial standard of practice (ASOP) titled *Capital Adequacy Assessment for Insurers*.

The proposed ASOP will apply to actuaries involved in capital adequacy assessment work for property and casualty insurers (along with other types of insurers).

The comment deadline for the exposure draft is Jan. 31, 2017. Information on how to submit comments can be found in the draft.

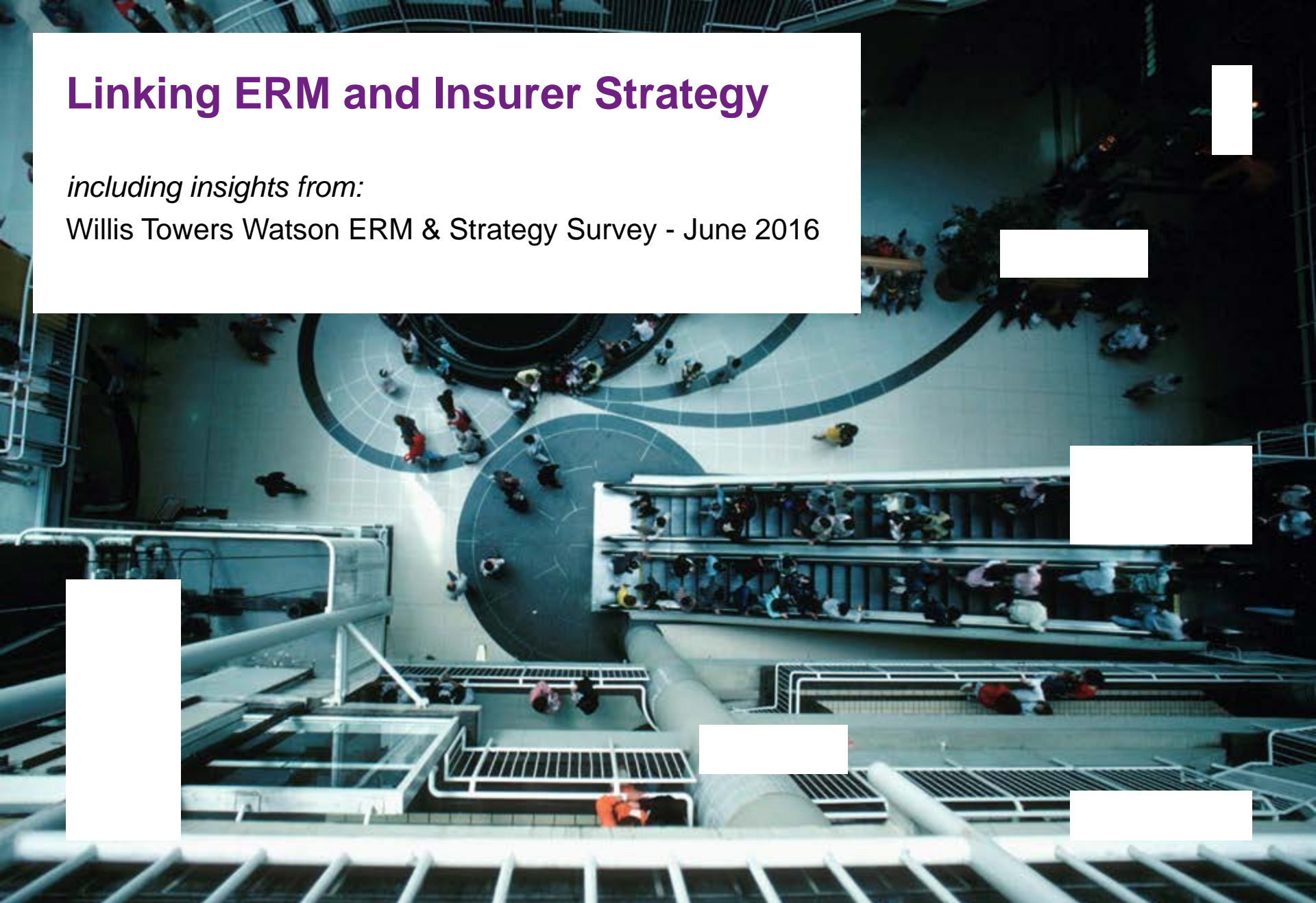
*We invite you to provide your feedback over the coming months!*



# Linking ERM and Insurer Strategy

*including insights from:*

Willis Towers Watson ERM & Strategy Survey - June 2016



Strategy is  
*“a pattern in a stream of decisions”*

Henry Mintzberg

# Business Planning

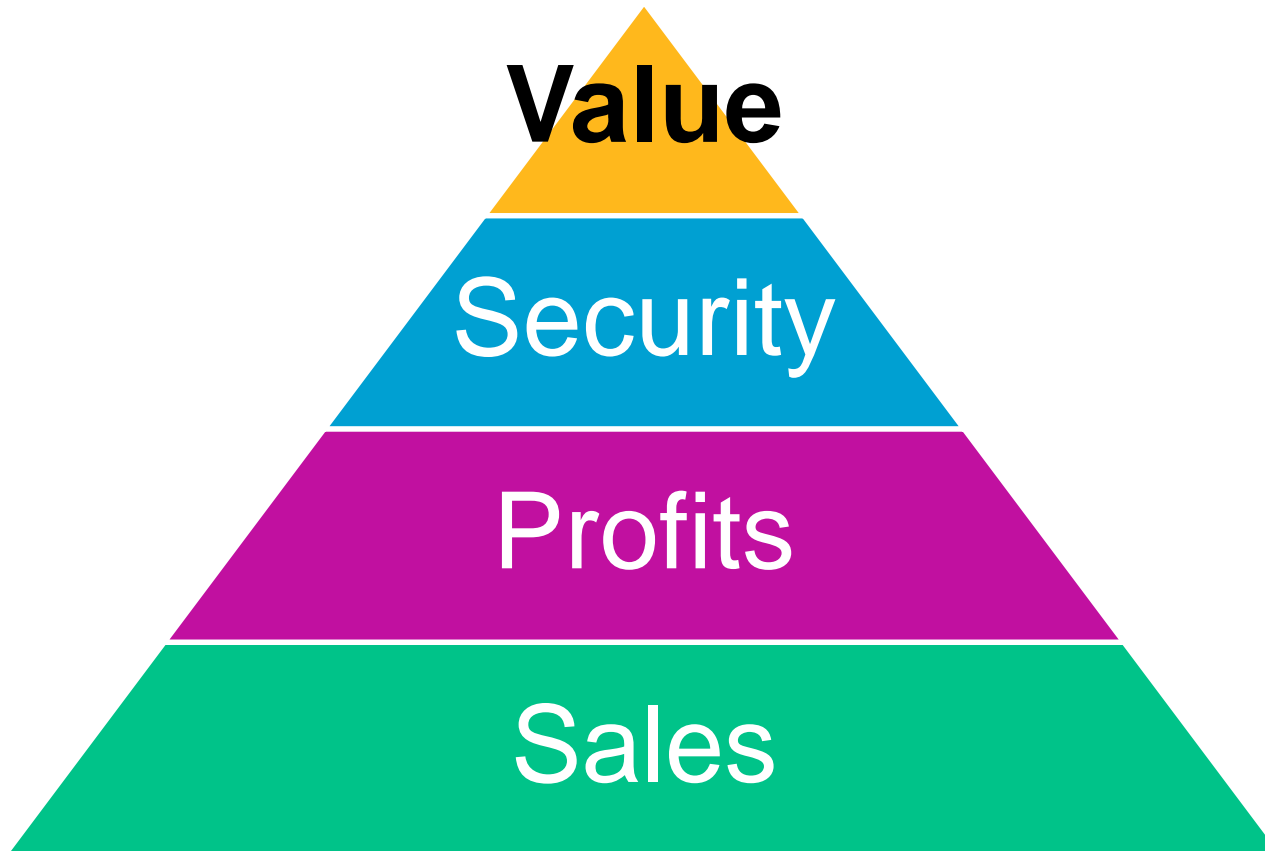


## Six Insurer Strategies

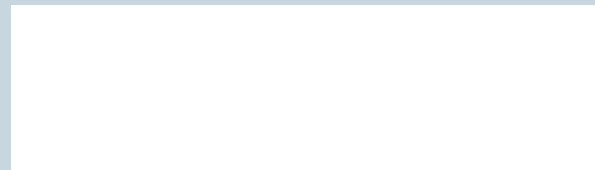
Strategy	Examples
Affiliation/Proximity	Farm Bureaus, Prof Liability
Judgment & Experience	Casualty, Specialty
Scale	Largest companies
Segmentation	Personal Lines, Small Commercial Lines
Service	WC State Funds, Medicaid/Medicare
Technical – Analytics & Models	Natural Catastrophe, Reinsurance



# Hierarchy of Corporate Needs



# Risk Management Strategies





## WTW Strategy & ERM Survey

	Insurance	Investment	Reserves	Operational	Enterprise
Exploit	18%	10%	0%	2%	9%
<b>Manage</b>	<b>61%</b>	<b>52%</b>	<b>58%</b>	<b>53%</b>	<b>70%</b>
Minimize	14%	26%	32%	36%	14%
Avoid	6%	12%	11%	9%	7%

In the Spring of 2016, Willis Towers Watson conducted a survey focused on issues related to the integration of insurer strategy and ERM. Responses were received from 58 North American Property and Casualty insurers.

We did not ask whether management or the board were happy with various aspects of ERM. Instead, we focused on the risk related objectives of the insurer along with the ERM related actions of the insurer.

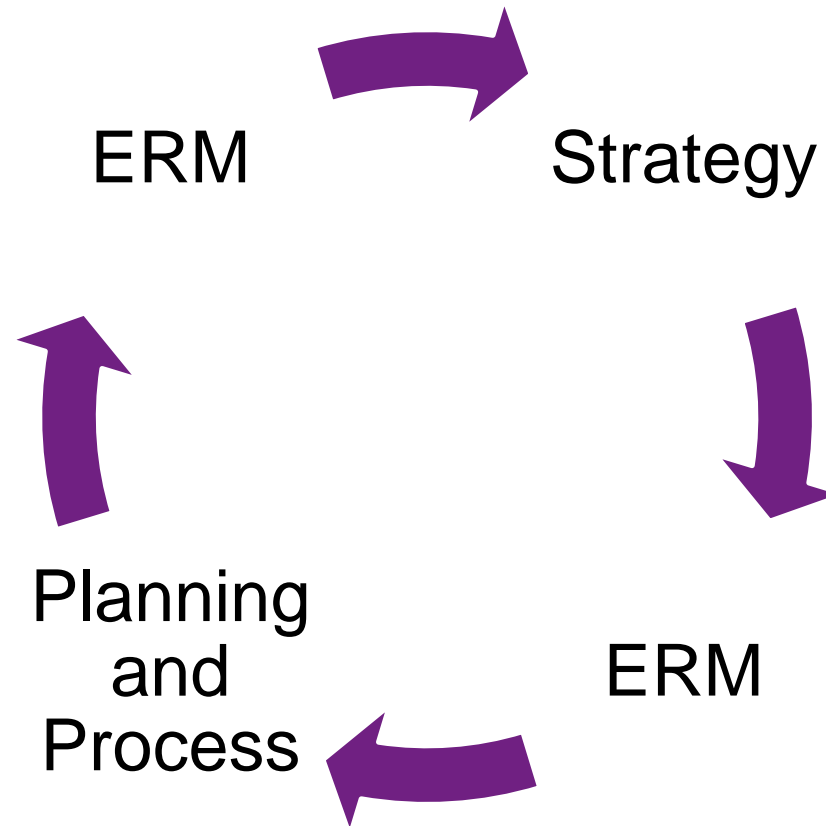
We believe that the answers to the survey questions tell us something about what actual alignment between strategy and ERM looks like.

## Risk strategy examples

Risk category	Sample risk strategy
Catastrophe	Tight control of aggregate
Underwriting risk	Calibrated pricing
Reserve	Conservatism in reserve setting
Credit	Minimize exposure
Equity	Take when there is excess capacity
Interest rate	ALM with intention to minimize
Operational	Minimize via Cost/benefit analysis
Strategic	Maintain A.M. Best rating

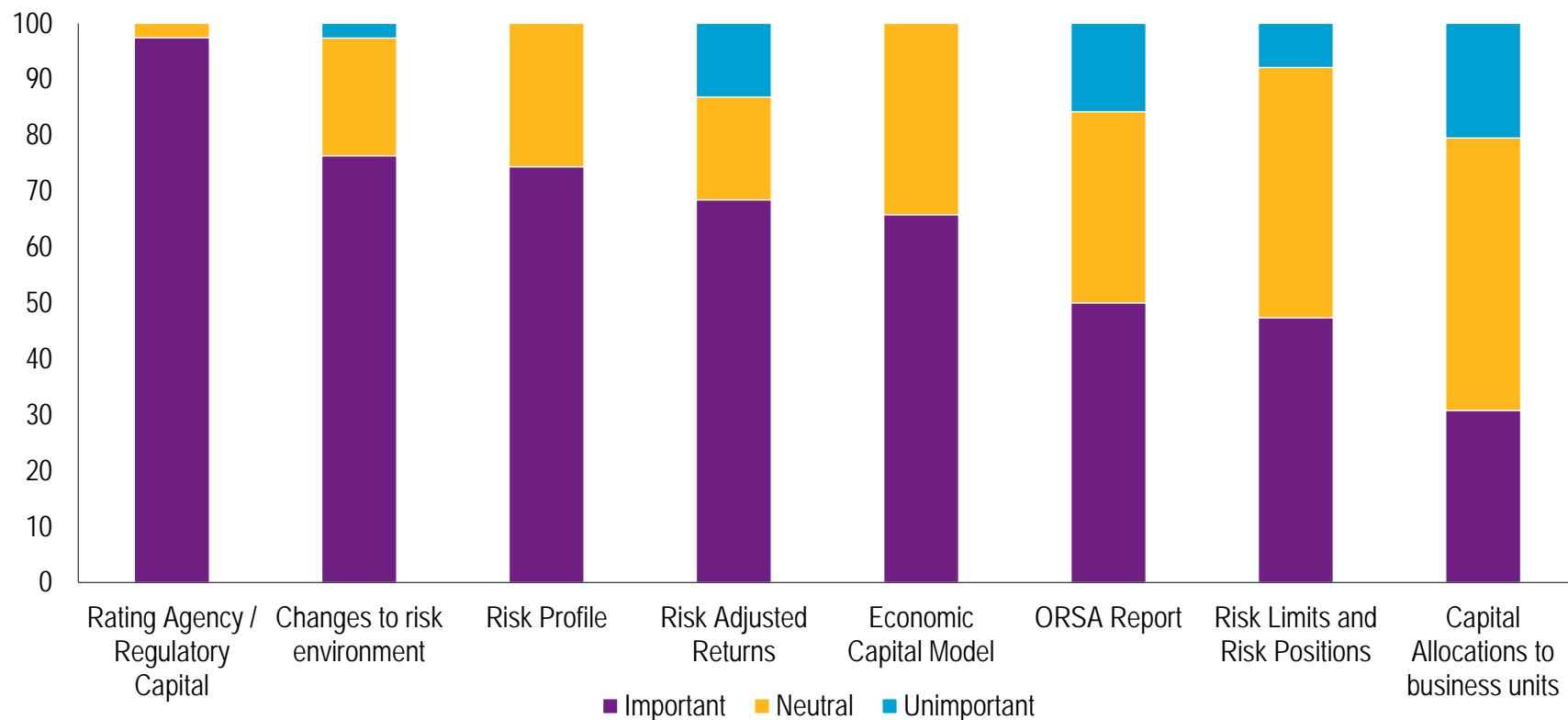
# Strategy and ERM

## Feedback Loop



# What information from ERM is important to the strategic planning process?

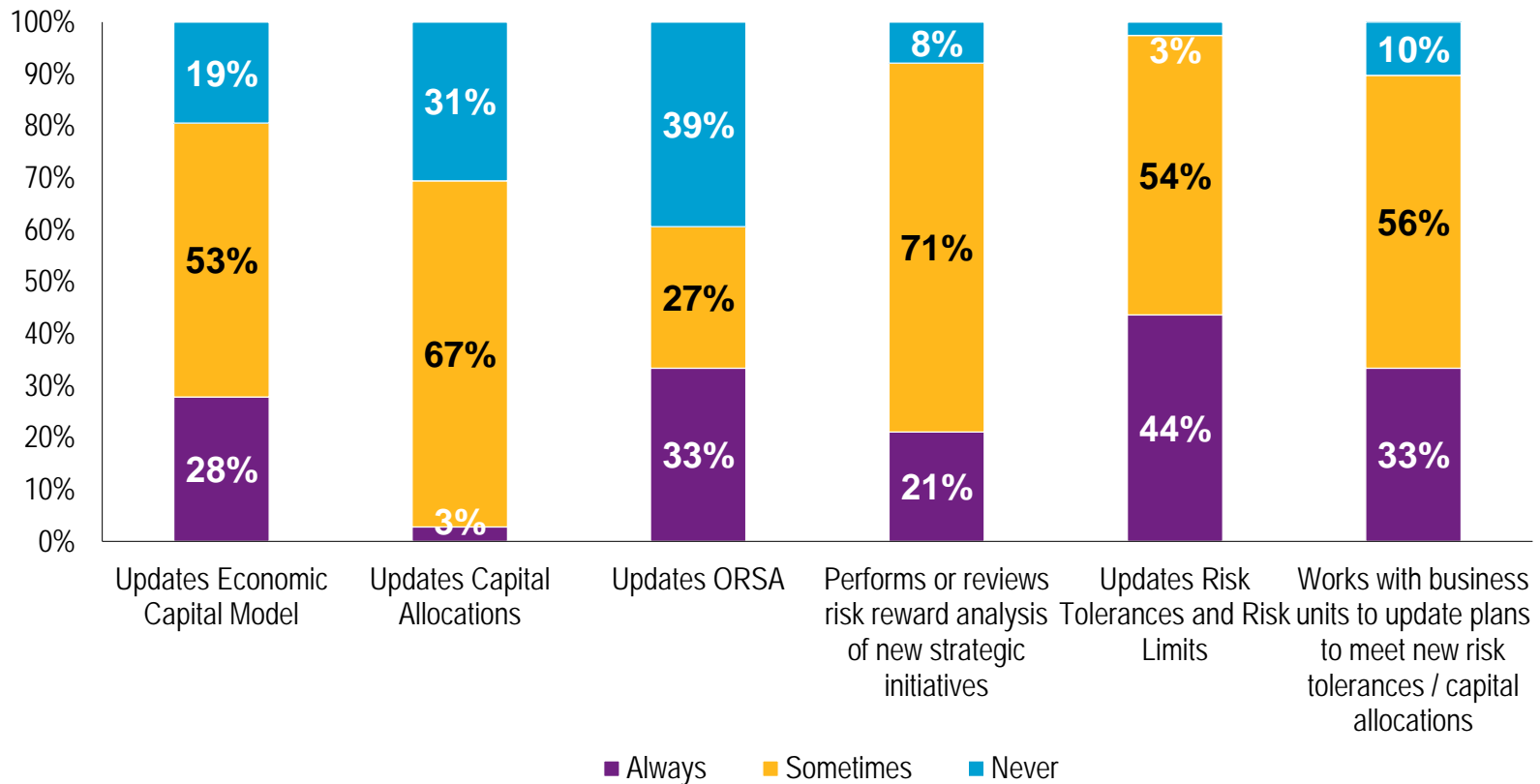
- Insurers are mostly concerned with rating agency and regulatory capital requirements
- Risk limits and tolerance levels are not as widely understood.



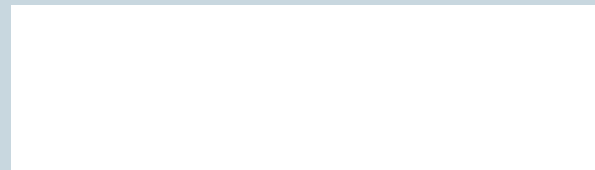
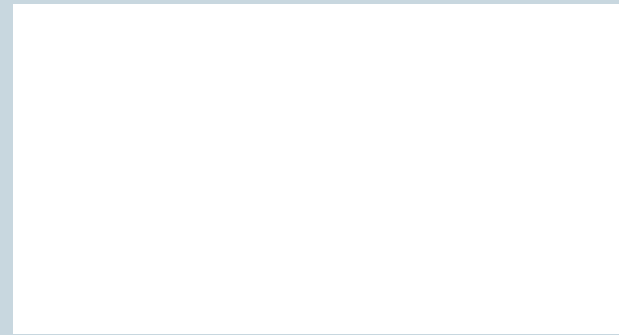
# What role does ERM play

## WTW Strategy & ERM Survey

### Importance of ERM to Strategy



# Company Strategy & Objectives

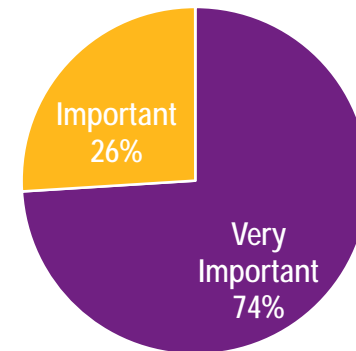




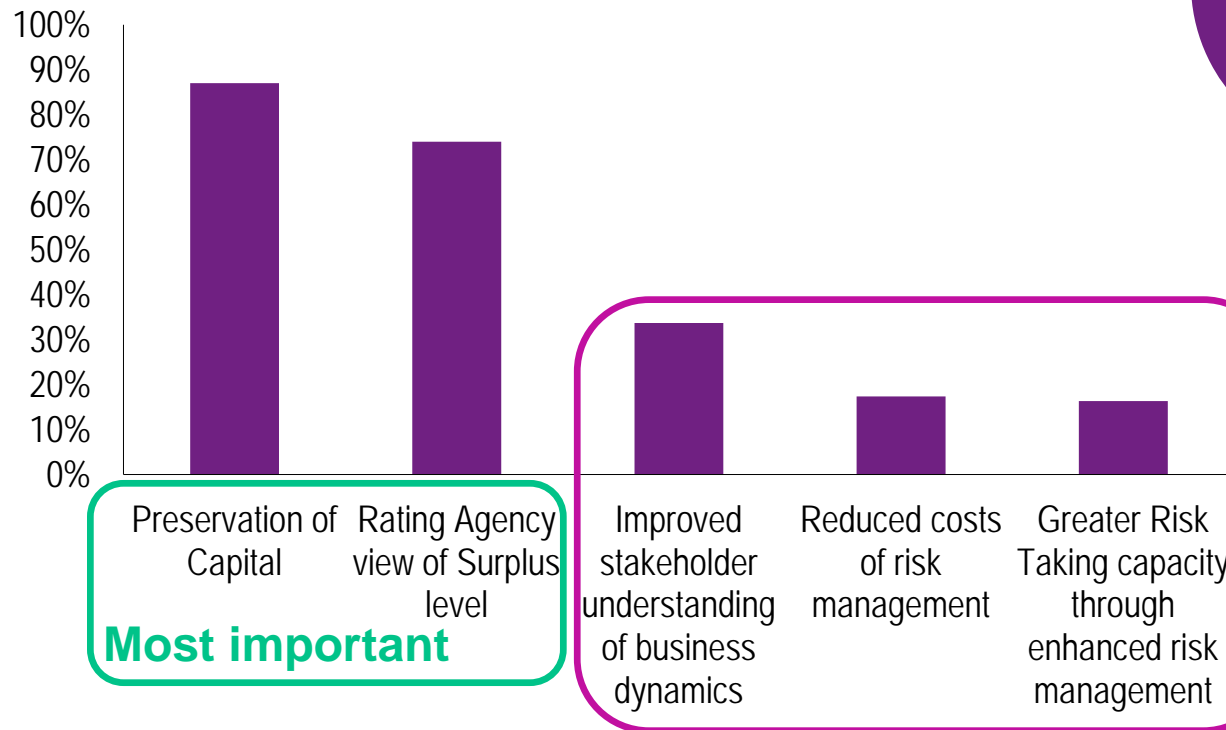
# Importance to company strategy

## WTW Strategy & ERM Survey

### Preservation of Capital - Responses



### Importance (% of Max Score)



**Most important**

**Least important**

## Importance to company strategy

### WTW Strategy & ERM Survey

Seven other strategic statements were the differentiators:

Managing  
Peak  
Exposures

Managing  
through the  
cycle

Return for  
Risk Taking

Risk taking  
within  
tolerance

Regulatory  
view of ERM

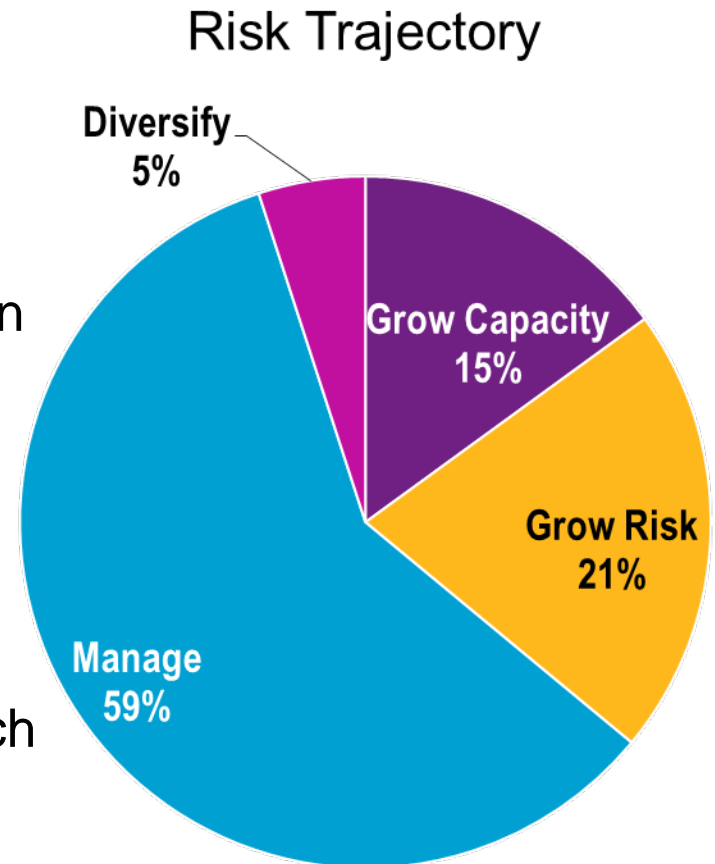
Rating  
Agency view  
of ERM

Reduction of  
losses  
experienced

## ERM Objective: Risk Trajectory

### Many different ways of looking at risk strategy

- Focus first on growth...
  - Grow Risk – increase risks faster than capital
  - Manage – balance risk growth and surplus growth
  - Grow Capacity – increase capital faster than risk
  - Diversify – if you cannot be sure which of the above is best



# Ways that ERM links to Strategy & Plans

Risk Profile

Risk Appetite &  
Tolerance

Diversification /  
Concentration

Risk Reward  
Optimization

Risk Adjusted  
Pricing

Risk Capital  
Base

# Linking ERM with Corporate Strategy and Plans



# Designing risk models for strategic value

*including insights from:*

EY North American CRO Survey – Oct 2016

# Model uses in ERM

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- ▶ Key uses of risk quantification models (including stress testing) in ERM include:
  - ▶ Assessing capital adequacy
  - ▶ Capital allocation, for risk-adjusted performance monitoring
  - ▶ ORSA (including prospective solvency assessment)
  - ▶ Setting / monitoring risk tolerances and risk limits
  - ▶ Analyzing reinsurance purchase
- ▶ Such models are less mature in their used for helping the business in broader strategic decision-making.
- ▶ With proper consideration in the design and planning stage, risk models can be used to unlock valuable insights to allow better informed decisions to be made by business leaders on the strategic direction of the insurer.

# Model design choices





# Model design choices

**“You get what you measure!”**

- ▶ In developing a risk quantification model for an insurer, there are a number of model design choices that need to be made at the outset.
- ▶ Often these are overlooked or rushed through without giving proper thought to the intended uses of the model and which choices best meet those needs.

*Example of model design choices:*

Valuation Basis	Time Horizon	Risk Measure	Confidence Level	Risk Types	Quantification Methodology	Aggregation
Statutory	Ultimate run-off	TVaR / CTE	90.0%	Insurance	<i>Factor-based:</i> Apply factors to approximate risk impact	Additive
				Credit		
GAAP	1 year	VaR	95.0%	Market	<i>Stress testing:</i> Apply deterministic shocks to calculate change in surplus	Variance / covariance matrix
IFRS				Operational		
Economic	N years	Risk of Ruin	Other	Liquidity	<i>Stochastic modelling:</i> Full distribution of change in surplus is produced	Copula-based
				Strategic		

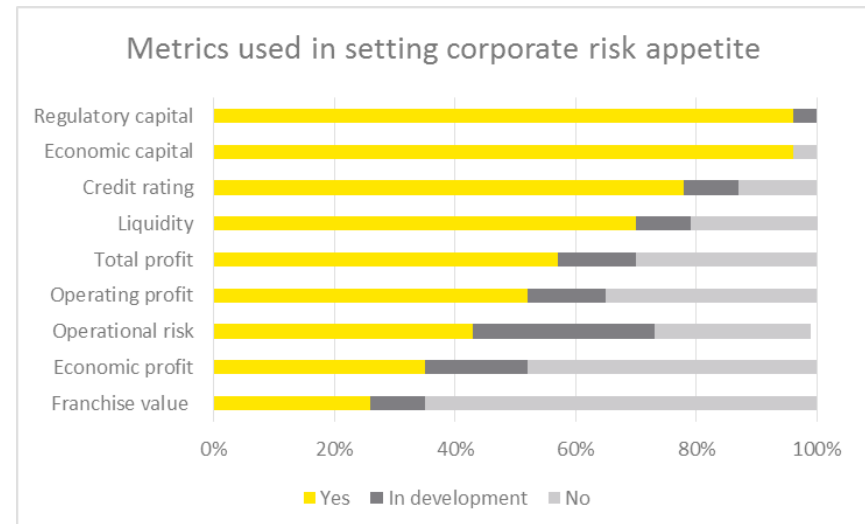
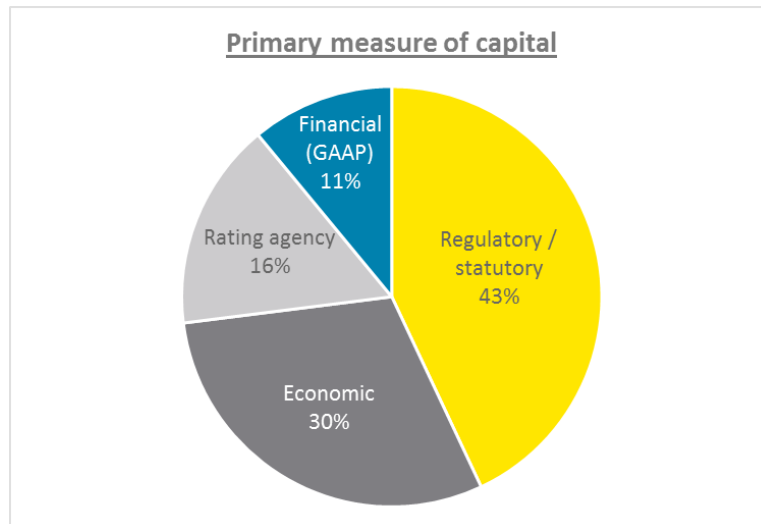
**Note:** Partial / hybrid models are often found in practice, blending multiple features within each category

# Model design choices

## Model valuation basis

Valuation Basis			
Statutory	GAAP	IFRS	Economic

- ▶ An important starting point in designing a risk model is which accounting basis will be used to value assets and liabilities.
- ▶ This defines the lens through which the company wants to manage capital.
- ▶ Within the US there is a wide diversity in approaches to viewing capital...



Source: EY 2016 Chief Risk Officer Survey

# Model design choices

## Quantification methodology

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Quantification methodology		
Factor-based	Stress testing	Stochastic

- ▶ A fundamental choice for the model is the quantification methodology of the risk:
  - ▶ **Factor-based** – simple proxy approach where predetermined factors are used to define the level of risk associated with a given exposure
  - ▶ **Deterministic stress test** – individual scenario run based on specific pre-determined events
  - ▶ **Stochastic model** – thousands of simulations run using statistical distributions and appropriate dependency assumptions to develop full range of outcomes
- ▶ Key considerations in this decision include:
  - ▶ Level of detail / complexity required to meet business needs
  - ▶ Number of assumptions required to parameterize
  - ▶ Availability / cost of modeling platform
  - ▶ Model run-times and agility to produce reliable results in a timely manner
  - ▶ Key considerations in this decision include:

# Model design choices

## Time horizon & risk measures

Time horizon		
Ultimate run-off	1 year	N years

Risk measure			
TVaR	VaR	Risk of Ruin	
Confidence level			
90.0%	95.0%	99.0%	Other

- ▶ Time horizon:
  - ▶ **One year** – one year movement in assets and liabilities (balance sheet-to-balance sheet)
  - ▶ **Ultimate run-off** – all risks contemplated until all liabilities are extinguished
  - ▶ Often a hybrid approach is taken: e.g. one year new business, run-off to ultimate, with one year market risk
  
- ▶ Risk measure:
  - ▶ **VaR** – a simpler measure which can be easily read off simulation output, corresponding to a particular percentile of the distribution
  - ▶ **TVaR** – averages across all simulations in excess of a given threshold. This is used where events in the tail are more meaningful to the insurer, for example Catastrophe-exposed reinsurers.
  
- ▶ Confidence levels:
  - ▶ **Lower percentile** (e.g. 90%) – represents a more frequent occurrence (90% is 1-in-10 year) closer to the “body” of the distribution, which may be useful for the business to evaluate the likelihood of earnings events
  - ▶ **Higher percentile** (e.g. 99.0%) – represents a more extreme event in the tail of the distribution (99% is 1-in-100 year), which may be useful to test financial resiliency of the insurer under most foreseeable scenarios
  - ▶ Multiple confidence levels may be used from the same model. However it is important that the model is fit for purpose if this is the case – often calibration is targeted at a particular level of severity.

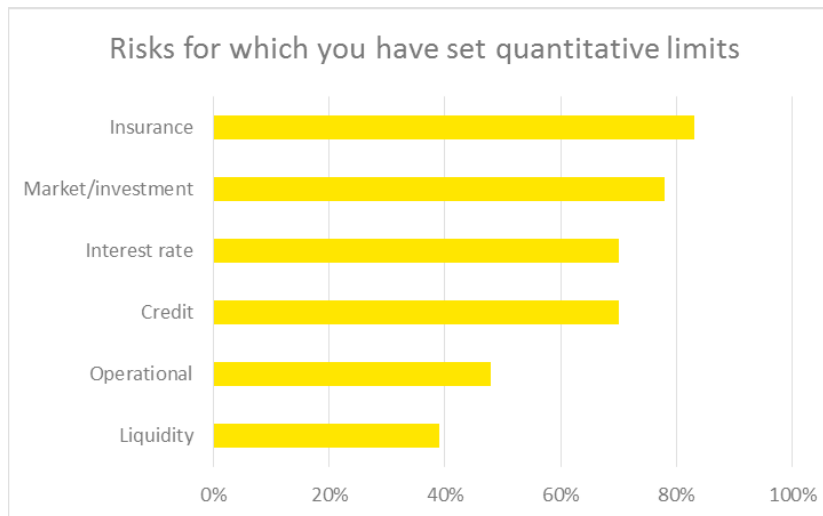
*Note that certain regulatory regimes around the world are using **99.5% VaR** and **99.0% TVaR** with some level of equivalency (e.g. Solvency II and Bermuda)*

# Model design choices

## Risk types



- ▶ Which risk types to include will depend on the nature of the business of the insurer:
  - ▶ **Insurance Risk** - Premium & Reserve Risk likely to always be significant for insurers; Catastrophe Risk
  - ▶ **Credit Risk** – use of reinsurance may determine whether this is a material risk
  - ▶ **Market Risk** – depends on the nature of the investment portfolio (and to some extent the insurance liabilities also)
  - ▶ **Operational Risk** – often left as a simple add-on at end, but should not be ignored
  - ▶ Other risks may be applicable depending on the insurer (*Life/Health Risks, Bank Risks, Pension Risks*)
  - ▶ **Strategic** and **Liquidity Risks** are usually not quantified in a capital adequacy model, since holding capital is not the ideal way to mitigate these risks



Source: EY 2016 Chief Risk Officer Survey

# Example quantification methodologies

## Individual risk types

- ▶ The following table gives examples of how each risk type may be quantified in a deterministic and stochastic modeling environment.

Risk Type	Deterministic Scenario	Stochastic
<b>Premium &amp; Reserve Risk</b>	Specified deteriorations in reserves / loss ratios	Distributions fit based on variability in claims history (e.g. using bootstrap approach)
<b>Catastrophe Risk</b>	Individual Catastrophe event (e.g. repeat of Hurricane Katrina)	Vendor catastrophe model tailored to own exposures
<b>Credit Risk</b>	Default of largest reinsurer	Modeling of reinsurer default rates and recovery percentages
<b>Market Risk</b>	Specified market shock (e.g. repeat of 2008 financial crisis)	Use of Economic Scenario Generators
<b>Operational Risk</b>	Specified large operational loss events	Simulation built up from operational loss scenarios
<b>Strategic Risk</b>	Loss of largest / most profitable account	<i>Not usually modeled stochastically</i>
<b>Liquidity Risk</b>	Occurrence of large, short term funding need	<i>Not usually modeled stochastically for P&amp;C insurers</i>

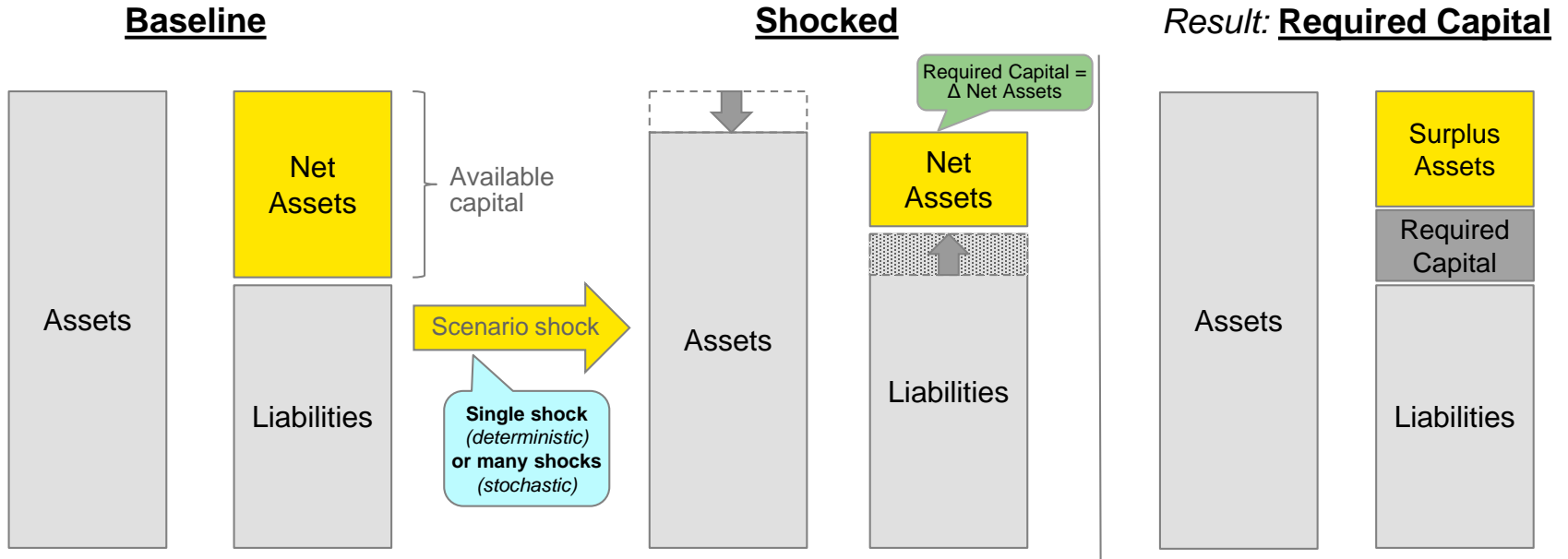
# Using models for strategic decisions



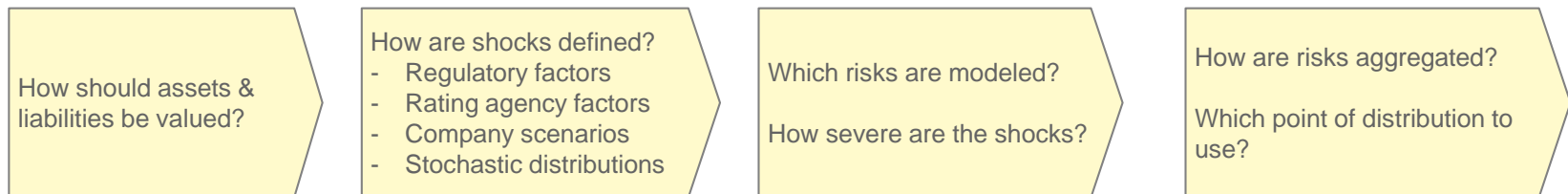
# Using models for capital adequacy

## Determining level of required capital

Insurers typically determine their required capital by applying shocks to assets & liabilities:



### Key questions

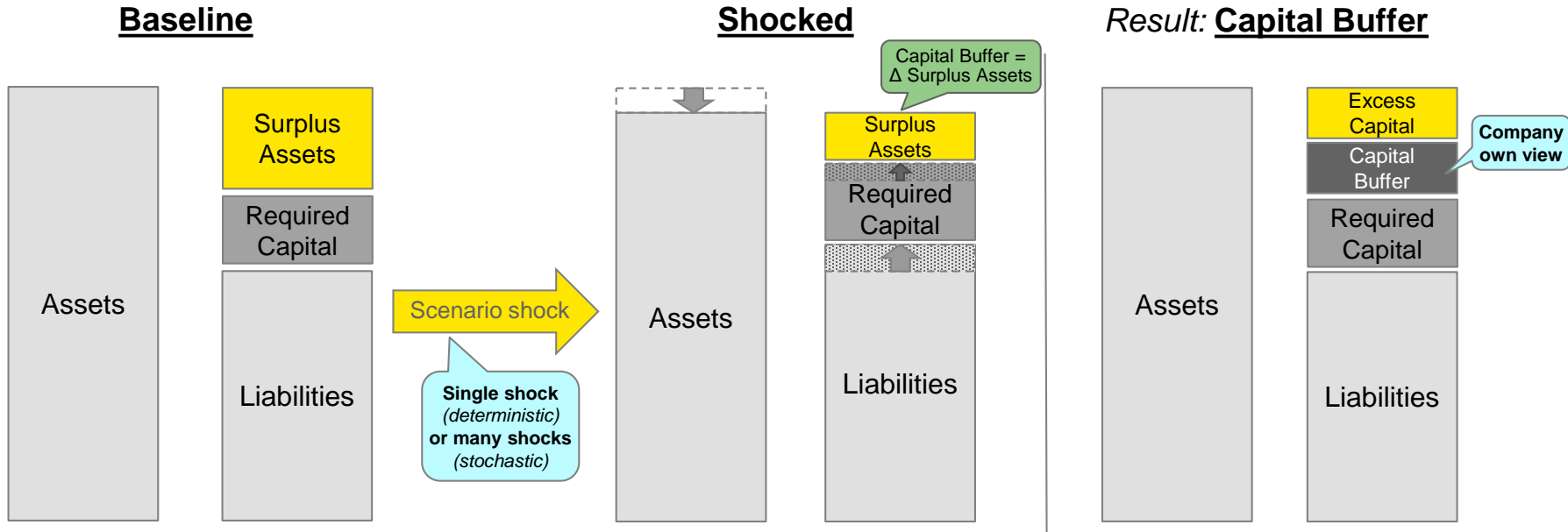




# Using models for capital adequacy

## Setting level of capital buffer

Insurers also typically want to determine a “buffer” level of capital to hold in addition to this.



### Key questions

Internal or external view of required capital?

How are shocks defined?

- Company scenarios
- Stochastic distributions

Which risks are modeled?

How severe are the shocks?

How are risks aggregated?

Which point of distribution to use?

# Using models for capital adequacy

## Industry examples

- ▶ There is a diversity of practice seen in the market to setting the capital requirement and buffer. A few examples are highlighted below.

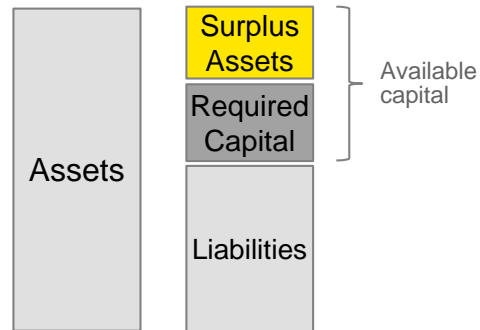
	Capital requirement	Buffer	Comments
1	Regulatory (RBC)	Deterministic stress tests	Impact of company-derived scenarios on RBC ratios analyzed to assess capital adequacy
2	Higher of regulatory / rating agency	Deterministic stress tests	Company-derived scenarios are run, giving attention to the binding external capital constraint (regulatory / rating agency)
3	Regulatory (RBC)	Stochastic model	RBC requirements are built in to stochastic model and considered as a cost of operating the business
4	Stochastic model	Stochastic model ( <i>different percentile</i> )	Same model provides two different percentiles to determine a minimum capital and optimal capital level (i.e. including buffer)
5	Stochastic model	Stochastic model ( <i>reuse distribution</i> )	Model gives capital requirement at given capital metric Buffer determined as an additional 1-in-X year event derived from same model

# Using models for strategic decisions

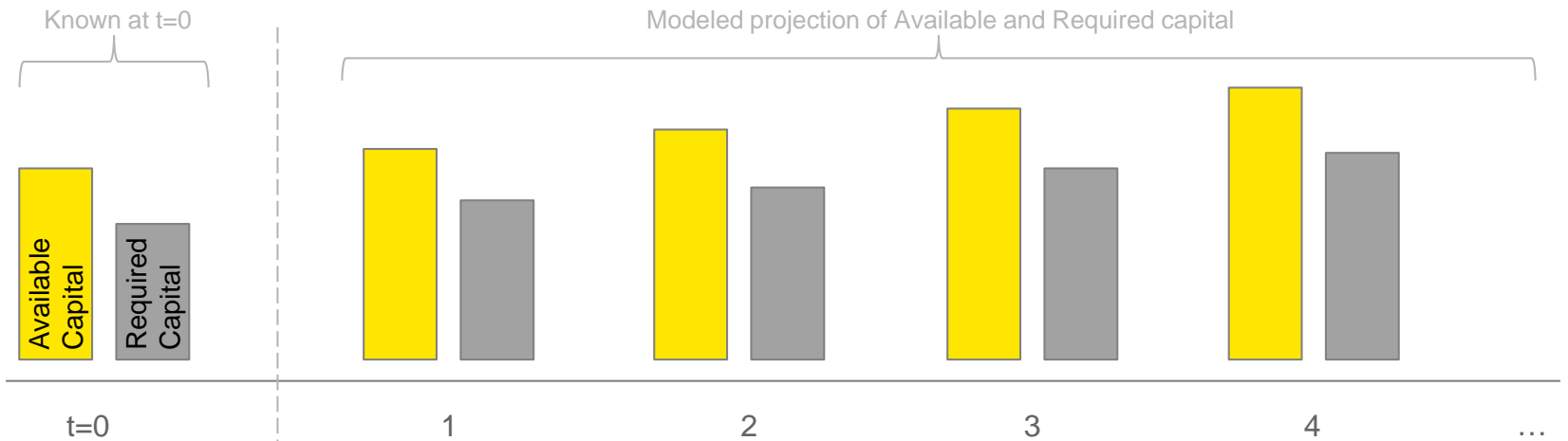
## Baseline position

Risk models can be used to help business owners with better informed strategic decision making.

The starting point is to establish the baseline position for both available and required capital, using the valuation basis and other modeling choices selected by the insurer.

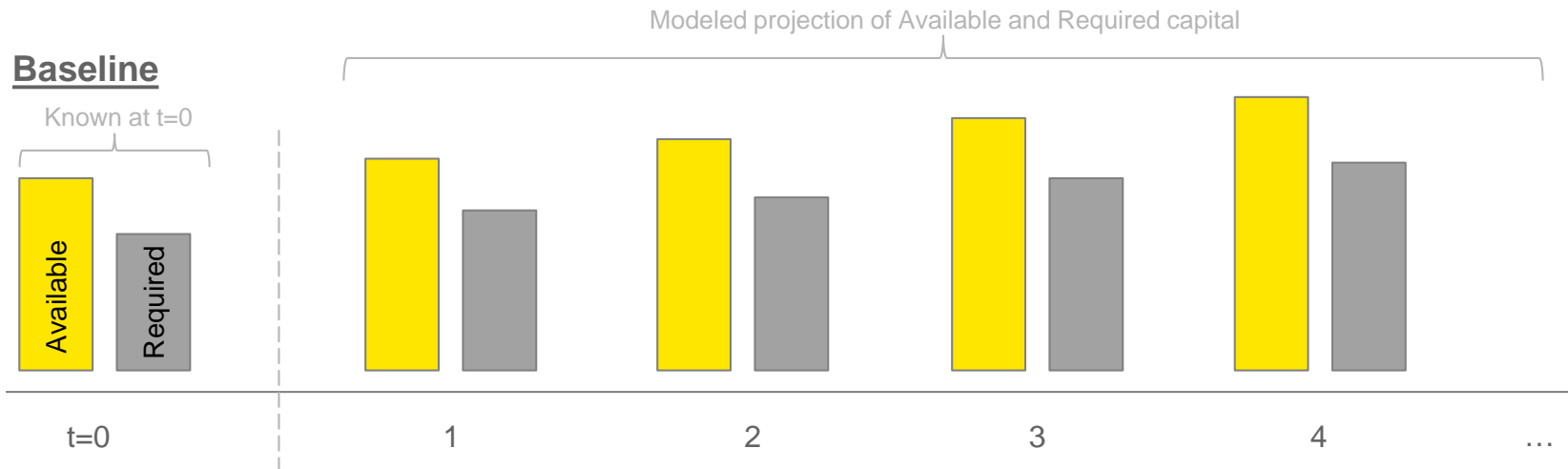


These amounts can then be projected out for each future year, following business plan growth assumptions.



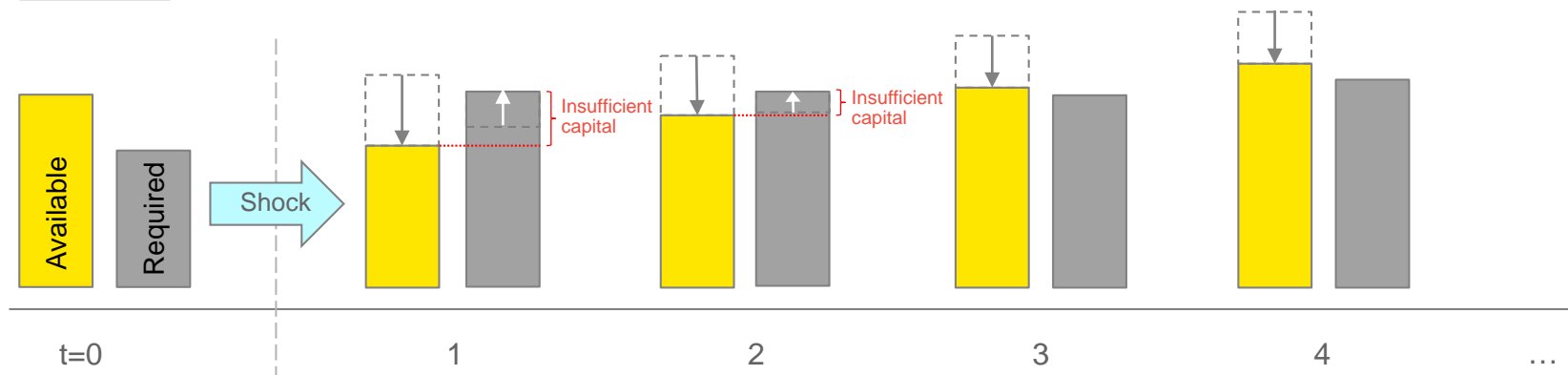
# Using models for strategic decisions

## Impact to business



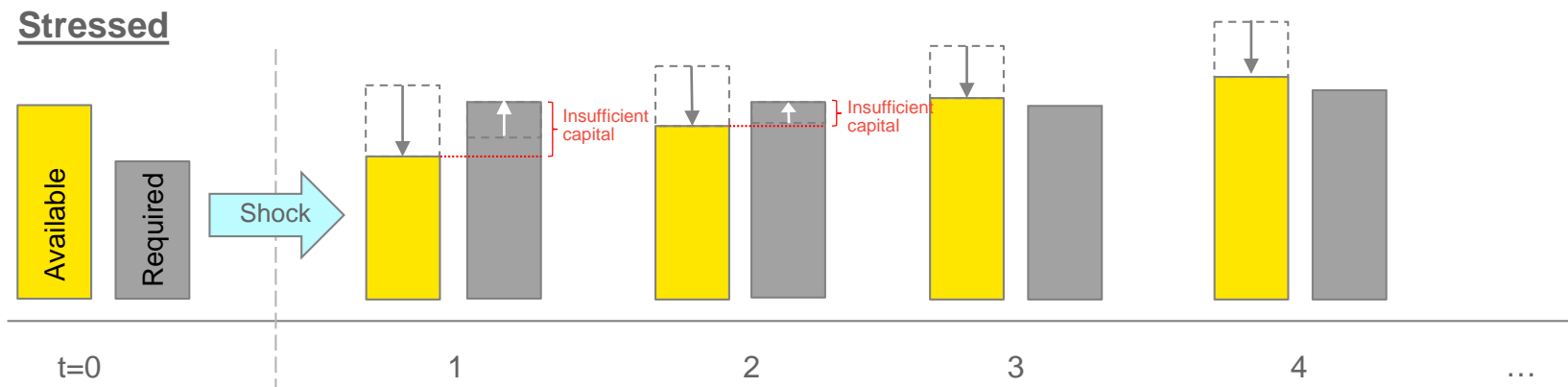
Various shocks can be applied to see the impact on the business. These shocks can be internal (e.g. change in strategy away from business plan) or external (e.g. spate of large claims / financial crisis).

### **Stressed**



# Using models for strategic decisions

## Management response



Once the shocks have been measured, management can then evaluate various mitigation strategies where outcomes are unfavorable.

These can be preventative measures to reduce the likelihood of the scenario materializing, or planned responses to lessen the impact if it does occur.

### Key questions

- ▶ Is this scenario outcome acceptable? If there is a breach in capital position, how quickly does the insurer need to recover to get back to an acceptable position?
- ▶ What strategies are available to management to in this situation? (e.g. raise additional finance; increase reinsurance protection; change composition of investment portfolio)
- ▶ What is the impact of each of these management actions? Which is most effective?
- ▶ What preventative actions / early warning signs can management put in place to reduce the risk of this occurring? (e.g. underwriting guidelines / risk limits; regular risk monitoring)
- ▶ What other actions can management take to reduce / mitigate this risk?

# Case studies



# Case study 1

## Capital adequacy assessment

- ▶ Internationally active reinsurer writing significant catastrophe-exposed business wants to hold sufficient capital to be able to fulfil all its policyholder obligations.

*Potential model design :*

Valuation Basis	Time Horizon	Risk Measure	Confidence Level	Risk Types	Quantification Methodology	Aggregation
Statutory	Ultimate run-off	TVaR / CTE	90.0%	Insurance	<i>Factor-based:</i> Apply factors to approximate risk impact	Additive
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IFRS						
Economic	N years	Risk of Ruin	Other	Liquidity	<i>Stochastic modelling:</i> Full distribution of change in surplus is produced	Copula-based
				Strategic		

# Case study 2

## Setting risk limits

- ▶ CEO wants to measure volatility in GAAP earnings over the next year.
- ▶ Would like to use the model to set risk limits such that earnings do not fall below zero more than one in every 10 years.

*Potential model design :*

Valuation Basis	Time Horizon	Risk Measure	Confidence Level	Risk Types	Quantification Methodology	Aggregation
Statutory	Ultimate run-off	TVaR / CTE	90.0%	Insurance	Factor-based: Apply factors to approximate risk impact	Additive
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Economic	N years	Risk of Ruin	99.0%	Liquidity	Stochastic modelling: Full distribution of change in surplus is produced	Copula-based
				Other		



# Case study 3

## Analysing different strategic options

- ▶ Insurer measures the “value” of the company as present value of funds held in excess of regulatory capital requirements for each of the next 5 years.
- ▶ Company wants to evaluate what strategies it can pursue to restore “value” to the business in the event that it loses it’s largest insurance account.

### Potential model design :

Valuation Basis	Time Horizon	Risk Measure	Confidence Level	Risk Types	Quantification Methodology	Aggregation
Statutory	Ultimate run-off	TVaR / CTE	90.0%	Insurance	<i>Factor-based:</i> Apply factors to approximate risk impact	Additive
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# Risk management strategies for individual risks

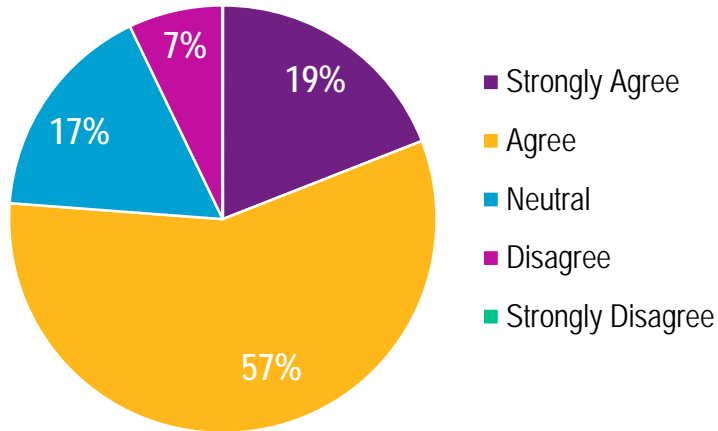


# Insurance Risk

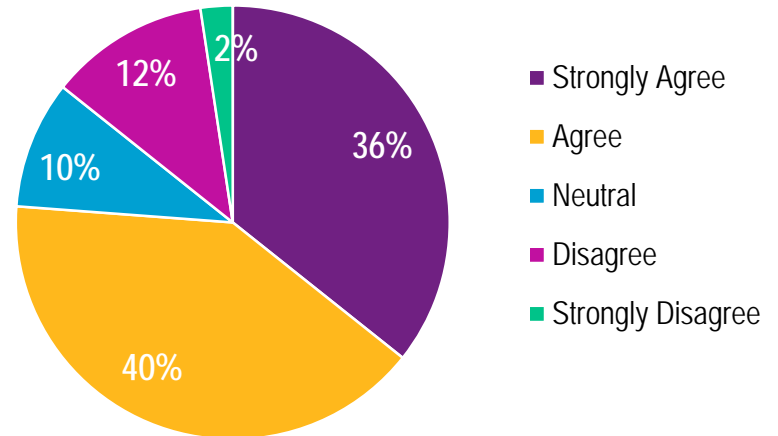
## The key focus of insurer risk management policies

- A clear majority of respondents
  - have well established underwriting policies and leave important decisions to top management
  - A centralized approach to risk management is often coupled with strict risk appetite and tolerance statements
- However, respondents also rejected a siloed view of risk management
  - Even if major decisions are made at corporate headquarters, clients value a cohesive ERM approach between territories and lines of business

**Underwriting policies and procedures are very clearly documented**



**Major decisions are always made at corporate headquarters**

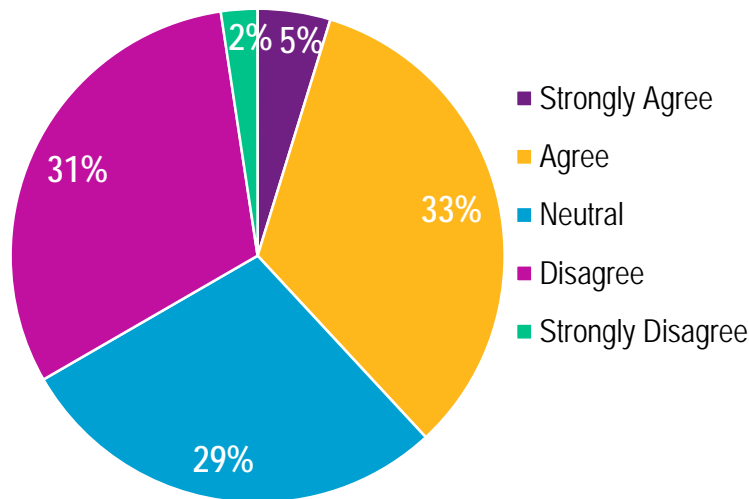


# Insurance Risk

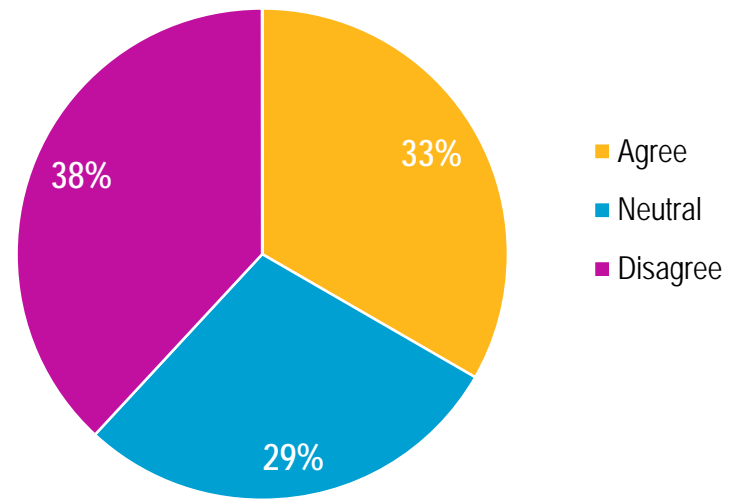
## The key focus of insurer risk management policies

- Most insurers supported the value of models, But many acknowledged that models are not always consulted for risk related decisions
  - Some companies might lack the resources for that
- Participants did not all agree on the nature of risk limits (strict vs. flexible)
  - This result may be due to differences in risk appetite and tolerance

**Models are consulted for most risk related decisions.**



**Consider risk limits to be very hard, no exceptions or breaches are expected**

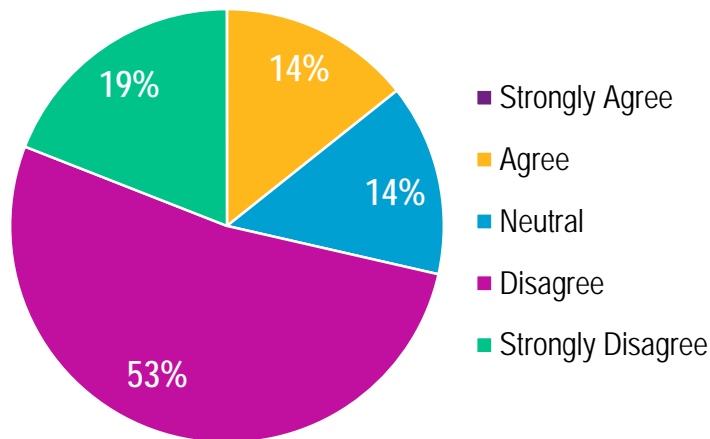


# Investment Risk

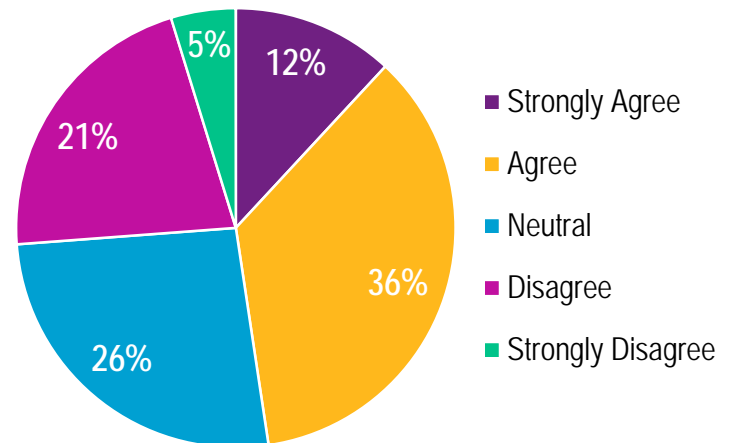
## Conservative risk taking with stable strategy

- Around two-thirds of insurers do not favor an earnings-focused investment strategy
- A more conservative approach to investment, with few major changes year-on-year, is the preferred approach
- Companies, however, do not agree on whether they were willing to exploit investment risk or to minimize/avoid it

**Favor higher return / higher risk investment strategy**



**Do not want to lose any money from taking investment risk.**



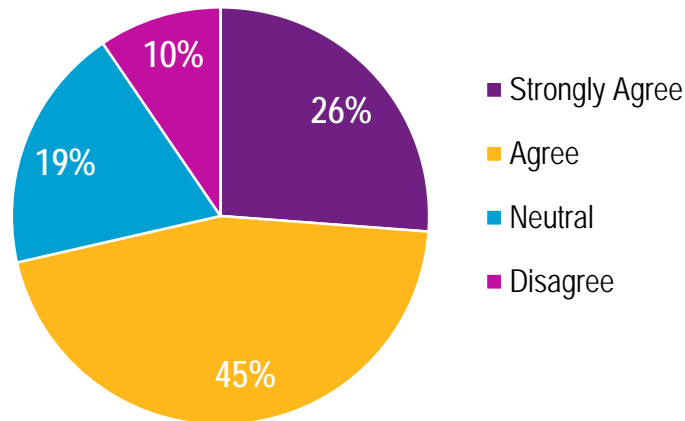
# Reserve Risk

## Want little to no reserve strengthening

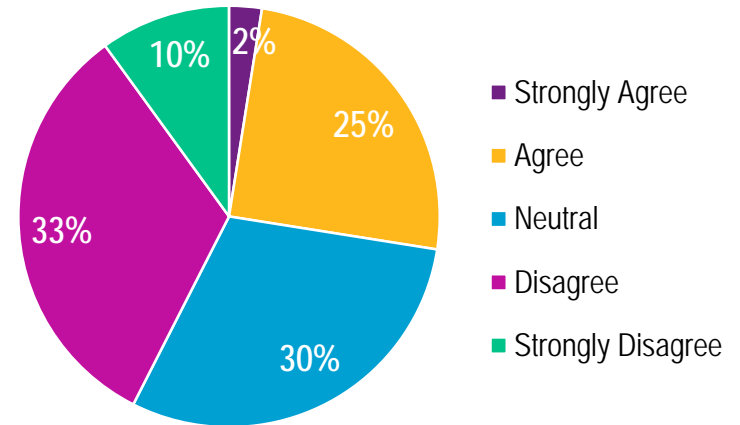
- Only 10% of insurers do not think it is important to set conservative initial reserves
- On a similar note, a majority of clients value having very little or no reserve strengthening

- Responses to the statement recognizing a connection between pricing assumptions and reserving are divided
- The degree to which companies are confident in their underwriting guidelines will determine how they are used in setting reserves

**Important to set initial reserves very conservatively.**



**Will tend to set initial reserves close to pricing assumptions**

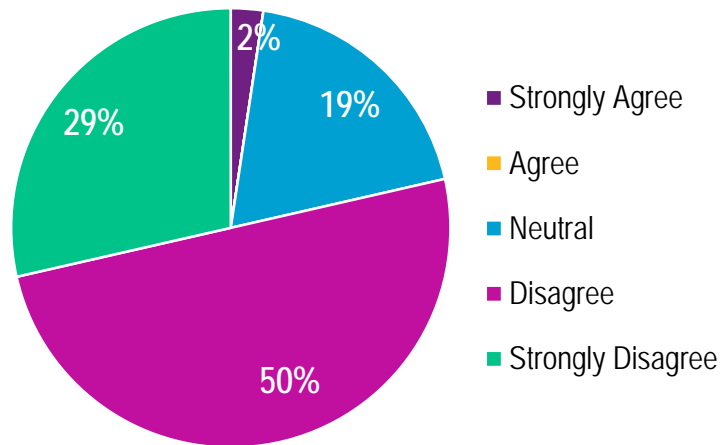


# Operational Risk

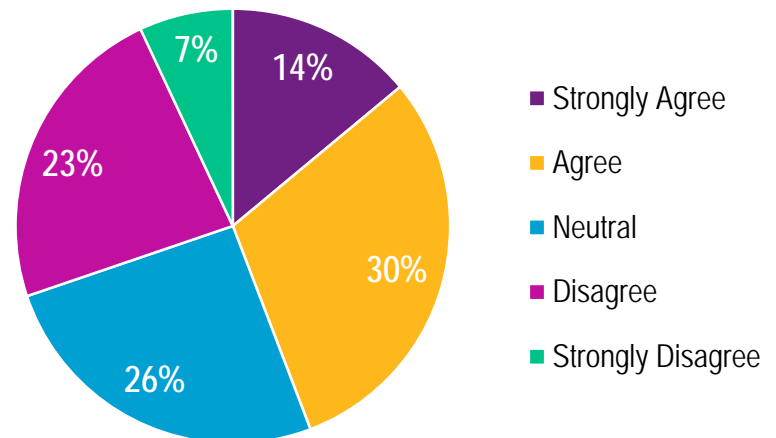
May need to better link strategies and objectives

- Only one insurer gives internal audit full responsibility for operational risk
- Consensus is for involvement from diverse segments of the corporate structure, including top management and internal audit
- Clients were almost evenly split when tasked with describing their system for managing operational risk
- Although companies are most eager to minimize or avoid operational risk, the approaches do not seem to be consistent

**Handled by Internal Audit. Little attention from top management**



**Extensive Operational Risk Management System with dozens of identified risks, KRIs, etc.**

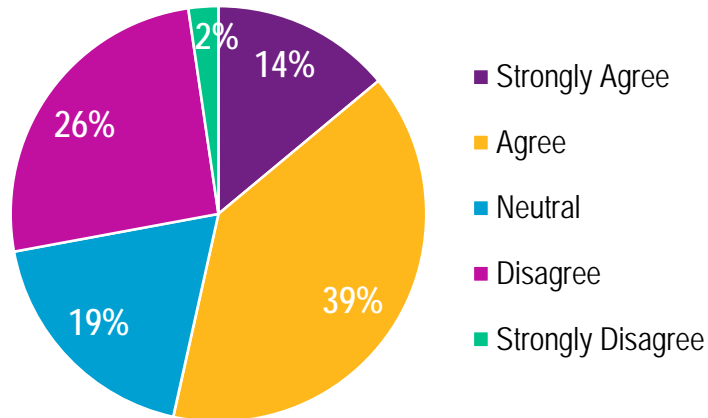


# Enterprise Risk

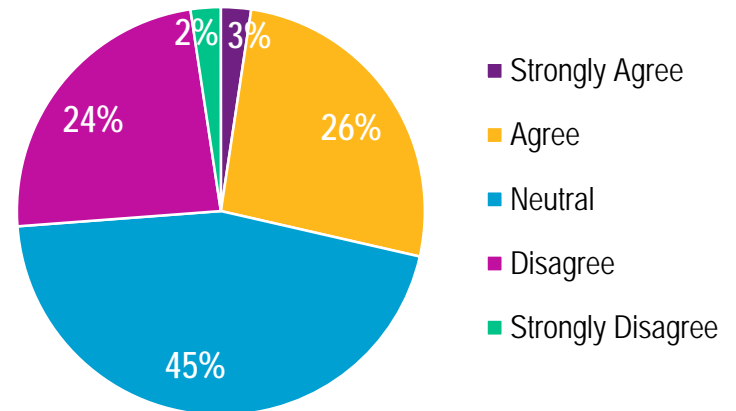
## Insurers use both rating agency and economic capital to drive ERM

- Most companies have a capital model as part of their ERM program
  - Still, around a fifth of clients are lacking one
- An increasing use of economic capital models is an indicator of a well-established ERM program
- The extent to which rating agency criteria play a role on risk capital levels seems to be a matter of corporate preference
- Almost half of respondents are neutral to the statement below, which could indicate that companies prioritize the influence of rating agencies differently

**Will have a formal economic capital model and capital budgeting process**



**Main focus is on rating agency restrictions on risk capital**





# Conclusions

*Key Points regarding integrating ERM and Strategy...*

- 1. Understand strategy and objectives**
- 2. Affirm Basic Risk Management Strategies for major risks**
- 3. Economic Capital modeling choices must tie to business use**
- 4. Risk models can be used for strategic decision making too!**
- 5. Assess and Adapt Risk Plans for Individual Risks**



# Thank you!

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