

Economic capital – **Trends in** **implementation**

ERM Symposium

April 2006

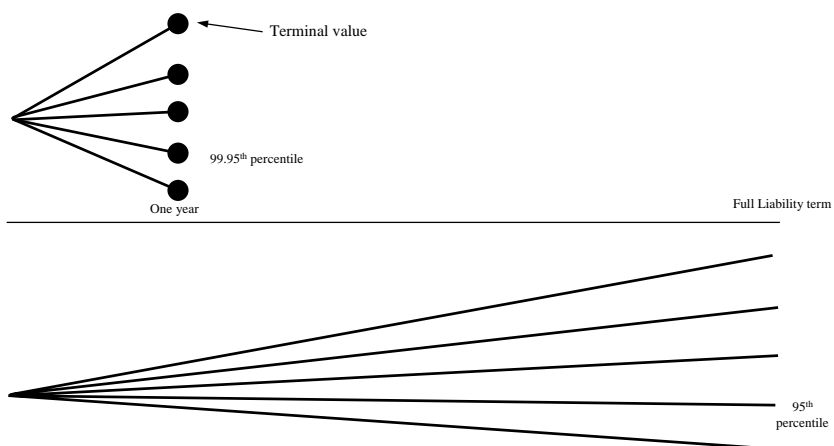
Agenda

- Methodology considerations
- Drivers for implementation of economic capital
- Current uses of economic capital and risk models

Methodology considerations

- Time horizon
- Terminal value calculation
- Aggregation / Diversification benefits

Economic capital definitions – projection horizon



One year vs Run-off

- **One year advantages**
 - less model risk
 - calibrate to bond defaults
 - run-time
 - no need to check intermediate solvency
- **Run-off advantages**
 - theoretically intuitive
 - allows more directly for long term risks
 - no need for target liability

Terminal Value

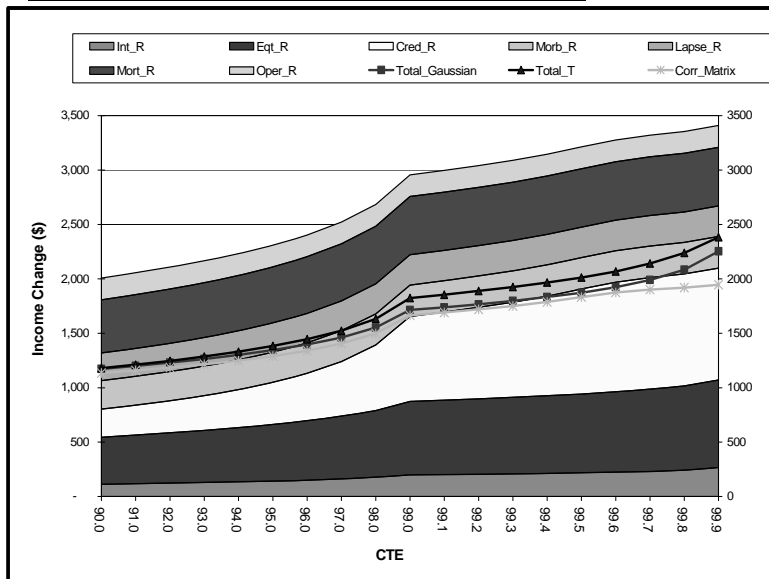
- **Risk neutral**
 - objective (....sort of)
 - consistent with banking definitions
 - some international approaches use this method
 - consistent with market cost to close out risk
 - non-market risks?
- **Real world**
 - more suitable for insurance industry?
 - subjective?
 - need to have a margin for prudence – how?

Aggregation

- Covariance matrix
- Copulas
- Integrated models

- Problems
 - distribution shape
 - correlation in the tails
 - calibration

Diversification benefit

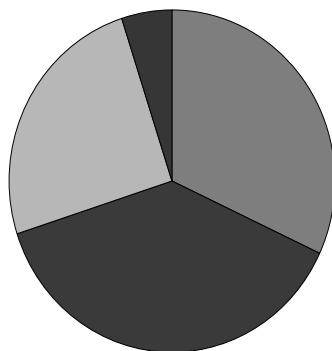


Drivers for economic capital development

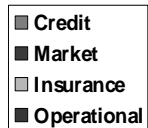
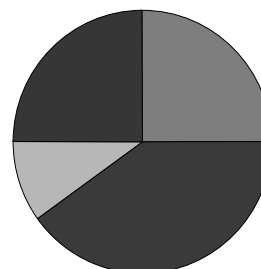
- A common currency for risk
- Increasing need to focus on economic measures
- More detailed modelling of diversification and correlation impacts
- Regulatory developments

Regulatory vs. Economic: Risk Distribution - Illustrative

Regulatory



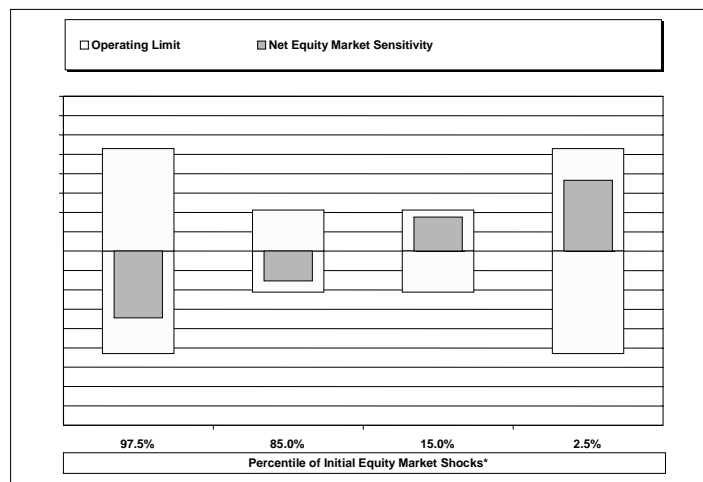
Economic



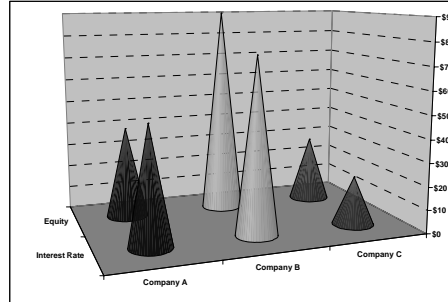
Current uses

- Executive Risk Committee receives quantitative reports on risks exposures on a quarterly basis
- Reports measure exposures against tolerances defined by Company policies
- Methodologies embedded into business units
- Measures currently mostly earnings focussed
- Aggregation across risks using a consolidated stochastic generator
- Effectiveness of hedging programs regularly analysed

Monitoring income sensitivity at the Company level



Earnings at risk



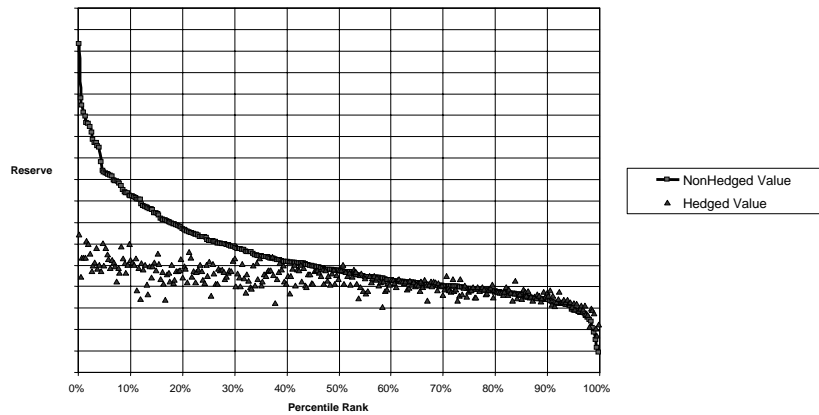
* Units in Millions	\$Cdn					
Risk Contributor	Interest Rate	Equity	Currency	Uncorrelated Total	Correlation Effect	Total EaR
Company A	\$50	\$40	\$0	\$90	(\$10)	\$80
Company B	\$75	\$90	\$15	\$180	(\$50)	\$130
Company C	\$21	\$29	\$4	\$54	(\$5)	\$49
Uncorrelated Total	\$146	\$159	\$19	\$324	(\$65)	\$259
Correlation Effect	(\$30)	(\$17)	(\$3)	(\$50)	\$13	(\$37)
Total EaR	\$116	\$142	\$16	\$274	(\$52)	\$222

Hedging programs

- Guaranteed minimum death benefits – risk of equity market fall
- Guaranteed minimum income benefits – risk of equity market fall and interest rate decrease
- Fixed annuity and universal life – risk of interest rate increase or decrease
- Combination of dynamic hedging and static hedges
- Monitored on a regular basis

Example: Universal Life – hedge analysis

- Canadian GAAP reserves based on amount of assets required to meet liabilities under a variety of scenarios.
- By hedging using floors and swaps, the sensitivity of the reserve to interest rate shocks is significantly reduced



Conclusions

- Senior management, Board, external stakeholders becoming more focused on economic capital
- No standard methodology and technical complexity makes communication a challenge
- ...but the payoff is worth it

Economic Capital – Trends in Implementation

The Society of Actuaries, CAS and PRMIA
ERM Symposium April 25, 2006



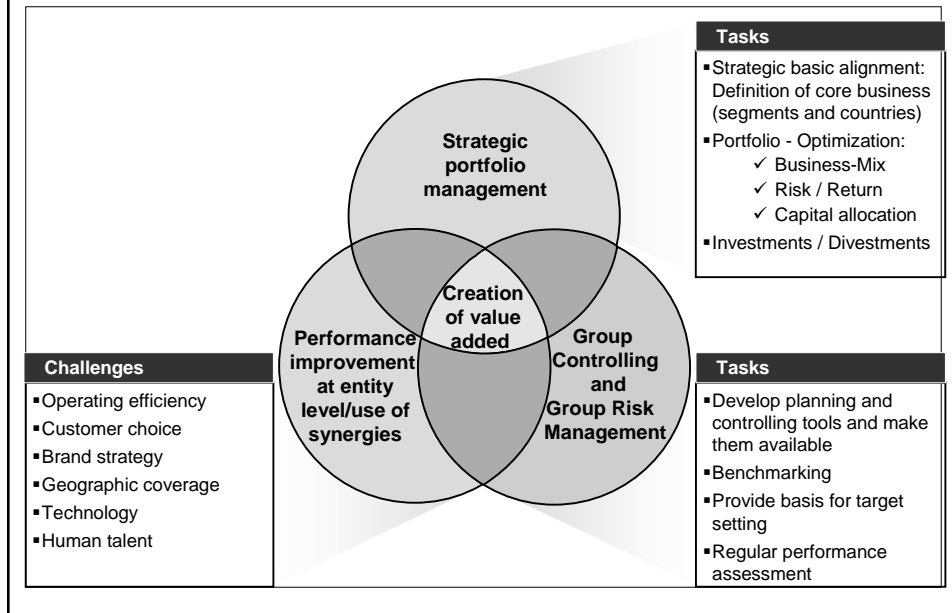
Risk governance and risk management tools ensure implementation of our strategic goals

	Key elements
Strengthening risk culture and awareness	<ul style="list-style-type: none">▪ Risk adequate organization▪ Risk based strategy (risk tolerance/appetite)▪ Risk policy and minimum standards▪ Operational Risk Management (ORM) and Top Twenty Risk Assessment (TRA)
Protecting the capital base	<ul style="list-style-type: none">▪ Internal risk capital▪ Capital stress tests▪ Life Asset-Liability-Management (ALM) and evaluation of options & guarantees▪ Limit system
Supporting value creation and decision making	<ul style="list-style-type: none">▪ Integration of risk/capital into management dialogue▪ Transaction/product analysis/review▪ Risk reward balance (risk based resource allocation)▪ Risk and capital reports▪ Pre-emptive risk decision and follow-up

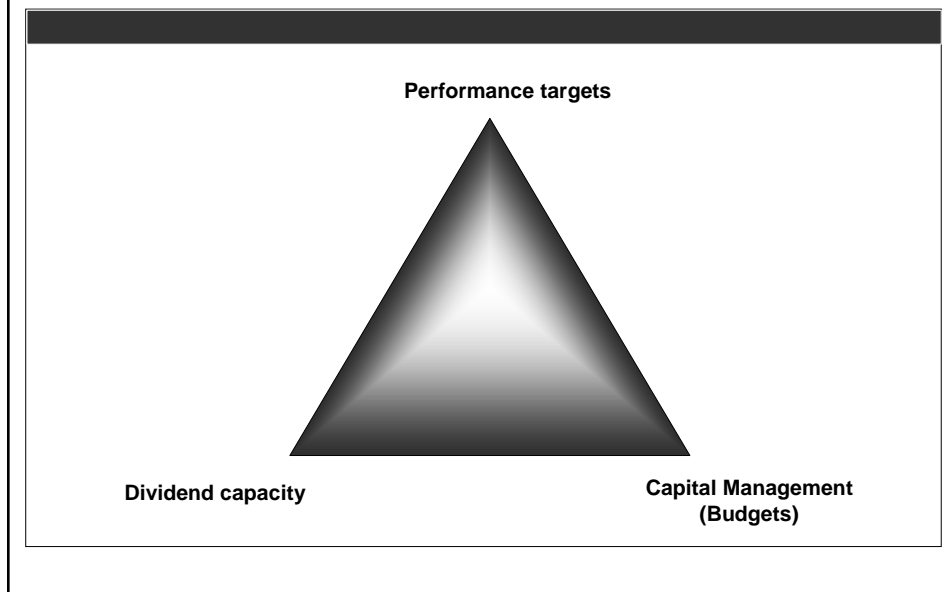
Assure efficiency and integrity of risk management

▶ **Achieve “No Surprises” and full transparency**

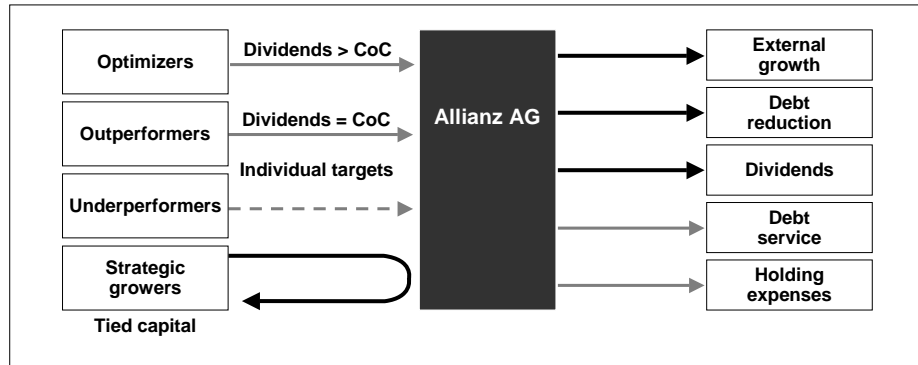
Value creation approach of Allianz AG



The Group sets three kinds of targets for its operating entities

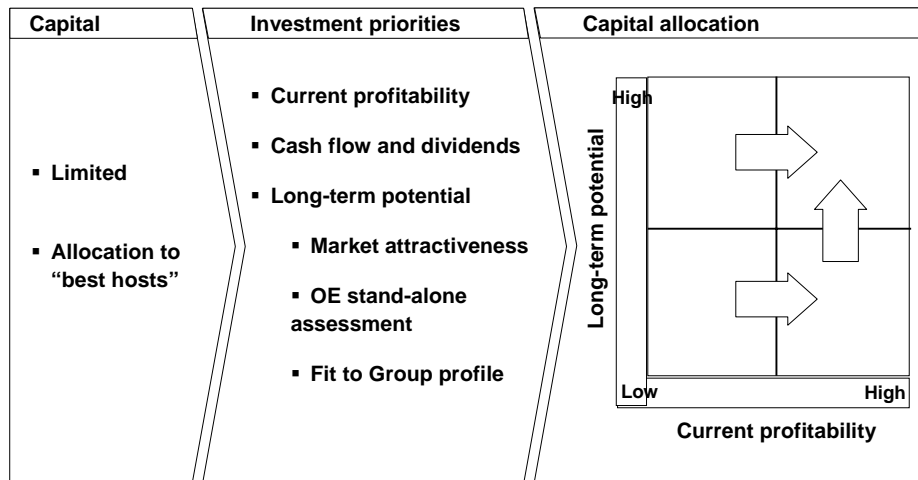


Allianz Group demands dividends corresponding to CoC from its OEs

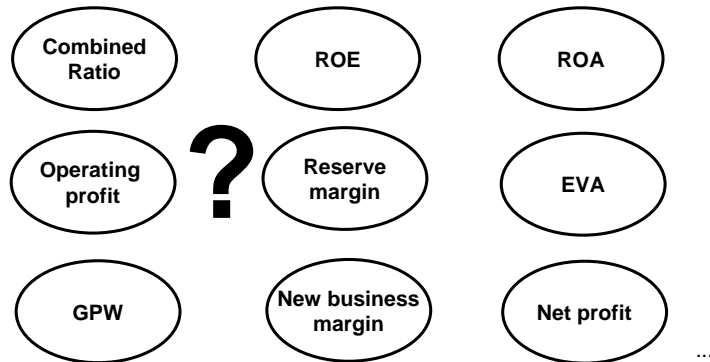


- Clear dividend targets for all Group companies
- Minimum required dividend = tied capital x cost of capital
- Any profits in excess of this to be retained only by OEs with satisfactory internal growth
- Individual targets for early-stage growth segments and turnaround cases
- Effective from fiscal year 2004 onwards

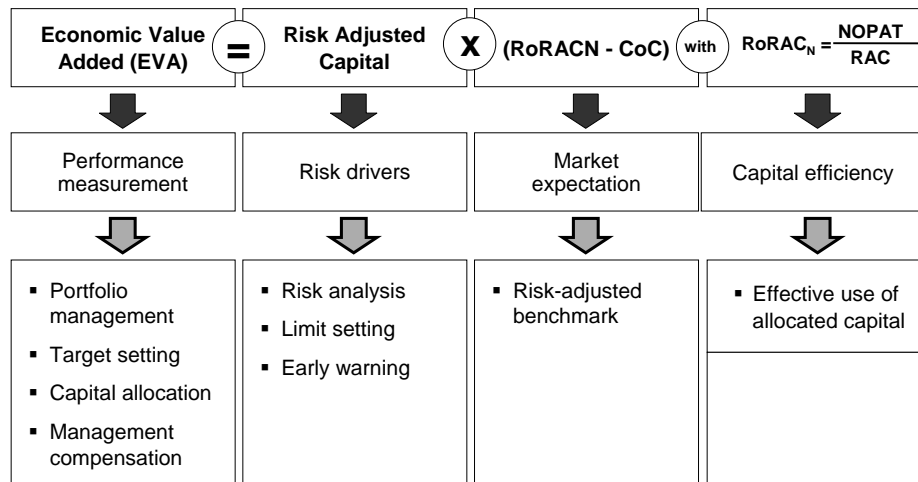
Comprehensive capital allocation decision takes both, long- and short-term considerations into account



Possible performance measures for an insurance company

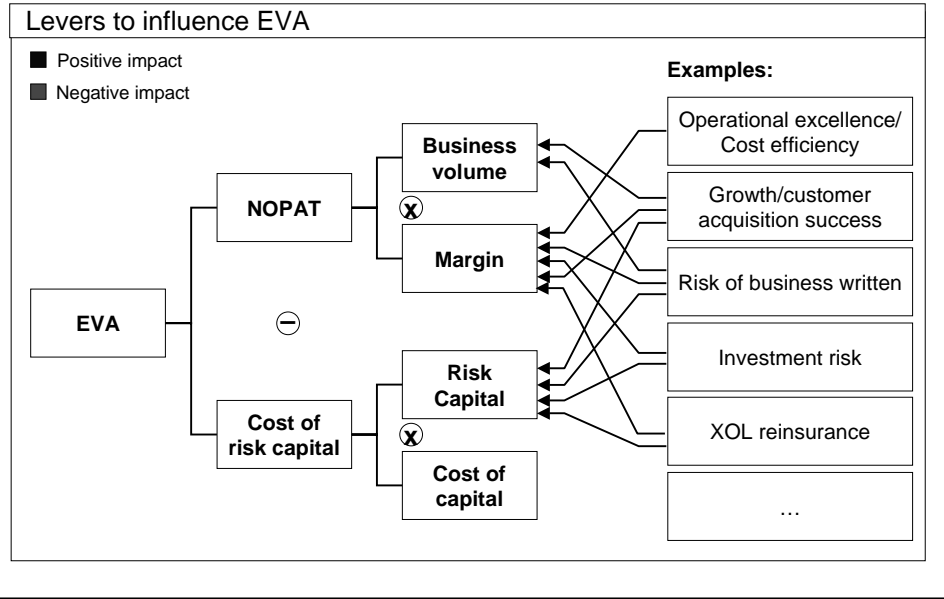


EVA - Key Performance Metric



Value creation has to focus on profitability and challenged against the required cost of capital

OE has numerous levers to increase performance, however, trade-offs have to be thoroughly analyzed



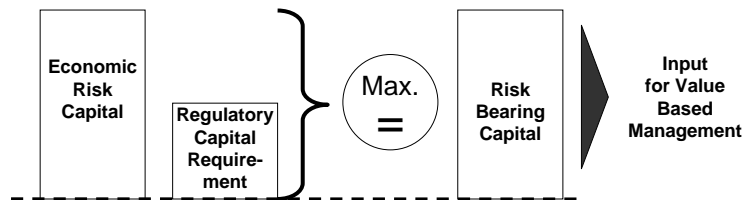
Cost of capital has to be included in pricing

EVA for insurance	EVA for credit
+ Gross premiums earned	+ Interest income
- Premiums ceded	- Interest expense
+ Investment income	+ Fee income
- Operating cost/commissions	- Operating cost
- Ultimate loss (best estimate reserves)	- Expected loss
- Capital charge	- Capital charge
= EVA	= EVA

▶ Calculate break-even combined ratio
▶ Calculate break-even margin

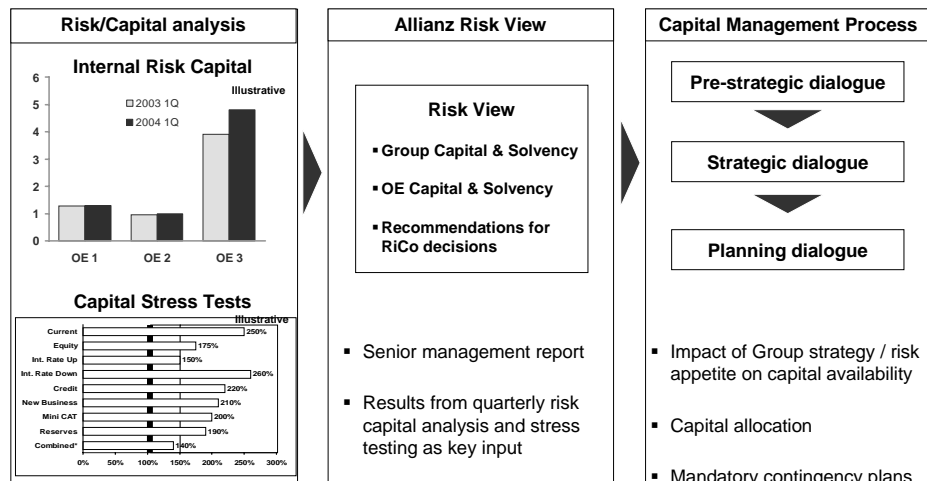
Capital definition used for value based management needs to accommodate for different capital requirements

- Allianz uses “Risk Bearing Capital” as key capital definition for value based management (EVA)
- Risk Bearing Capital needs to accommodate for regulatory and economic capital requirements while being suitable for value based management
- Risk Bearing Capital is defined as the maximum of Regulatory and Economic Risk Capital



Typically, Economic Risk Capital is higher than Regulatory Capital

Risk management is a top management priority



Embedding risk mgmt. into existing business processes is a key to success

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Economic Capital Models and Methods

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Corporate Risk Management
April 25, 2006

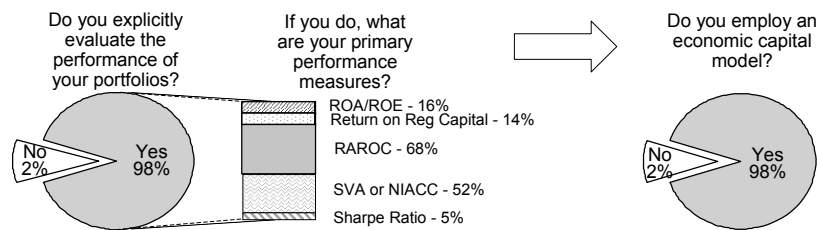
Agenda

- **Economic Capital “real”?**
- **Building the Framework**
 - *Purpose of the process/model*
 - *Risks to include*
 - *Degree of integration*
 - *Shape of value distribution*
 - *Technique for estimating value distribution*
 - *Attributing economic capital to individual business units, products, ...*
- **Models**
- **Successful Implementation**

Is Economic Capital “real”?

Reliance on Economic Capital

Essentially, all of the large, sophisticated banks rely on economic capital.



Source: 2004 Rutter Associates Survey of Credit Portfolio Management Practices

But, the results from recent survey suggest that only about **half** of the insurance companies do...

Reliance on Economic Capital

For insurance companies headquartered in North America, it appears that economic capital is taking root

- **Economic capital models/processes "in place" for more than 5 years** **40%**
- **Economic capital models/processes "in place" for less than 5 years** **25%**
- **Economic capital models/processes "in place" for part of the firm** **10%**
- **Economic capital models/processes "under development"** **25%**

Source: Confidential interviews commissioned by MetLife

Building the Framework

The economic capital process and questions to be answered

- For what purposes will economic capital be used?
- What risks will be reflected in economic capital?
- To what degree will the risks be integrated?
- What is the shape of the value distribution?
- How is the value distribution obtained?
- How will risk be attributed to transactions?

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For what purposes will economic capital be used?

Insurance companies headquartered in North America appear to be using economic capital for the same purposes as their European peers

	Number of interviewees that mentioned this use	Towers Perrin Tillinghast, "Adding Value through Risk and Capital Management"	Mercer Oliver Wyman, "Benchmarking of Economic Capital and ALM Frameworks," April 25, 2005	Chief Risk Officers Forum, "Principles for Regulatory Admissibility of Internal Models," 10 June 2005
Allocate (Attribute) GAAP equity to business units (Strategic Asset Allocation)	5	66% currently do or plan to	67% currently do 83% do or plan to	7 of 13 "in use" 3 of 13 "in partial use"
Pricing	4	78% currently do or plan to	43% currently do 71% do or plan to	5 of 13 "in use" 4 of 13 "in partial use"
Measure performance of individual business units and/or individual products	5	65% currently do or plan to	14% currently do 43% do or plan to	5 of 13 "in use" 4 of 13 "in partial use"
New Product Development	1		43% currently do 57% do or plan to	
Set Limits	1		14% currently do 29% do or plan to	

Other purposes may include: track capital adequacy, evaluation on acquisition activities, performance of business unit managers

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How do banks use economic capital for?

Economic Capital measure used to

- **Track capital adequacy**
 - Basel II regulation based on Economic Capital
 - Compare to peers
- **Set prices (ex., loans)**
- **Set Limits**
- **Examine profitability of individual transactions and customers**
- **Measure performance of individual business units or products**
- **Determine compensation for managers**

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What risks will be reflected in economic capital?
To what degree will the risks be integrated?

Market Risk (financial prices)

Interest rates
Foreign exchange rates
Equity prices
Commodity prices
Credit spreads

Default Risk

Liquidity Risk

Insurance Risk

Mortality
Morbidity
Underwriting
Catastrophe
Lapse/Surrender

Operational Risk

Different risks types integrated into one model:

Market, Default, Liquidity, Insurance and Operational risks included in one model → Correlations between risks embedded in the model (at transaction level)

Separate models for risk types:

Market risk ↔ VaR model
Default risk ↔ Credit Capital model
Liquidity risk ↔ Process model
Insurance risk ↔ Actuarial model
Operational risk

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Bank's Typical Economic Capital Model

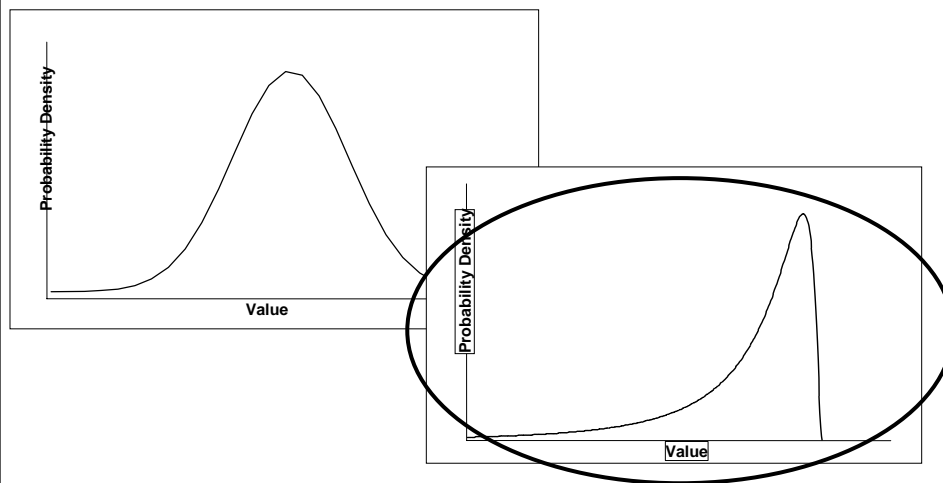
- **Separate Economic Capital models for different types of risk**

- Market risk
- Credit risk
- Operational risk
- Business risk

Total economic capital for the firm may or may not include a credit for the fact that these risks are not perfectly, positively correlated.

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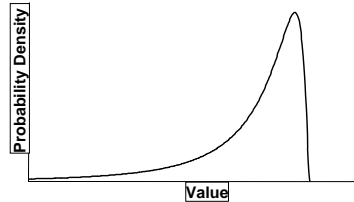
What is the shape of the value distribution?



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How is the value distribution obtained?

How can the firm obtain “believable” estimates of the shape of the tail of the distribution



- Analytical [closed-form] models – e.g., assume the shape of the value distribution to be Poisson
- Historical simulation – i.e., changes in the values of the stochastic variables are the same as in the past
- ✓ • Monte Carlo simulation
- Extreme Value Theory

Borrowing techniques from engineering and physics to obtain “full MC” results with shorter run times.

The idea is appealing; but, so far, a compelling application has not appeared.

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How will risk be attributed to individual transactions?

- “Risk Contributions” based on a standard deviation measure
- “Tail Based Risk Contributions”

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To what level do banks attribute the economic capital?

- **Economic capital is attributed to business units, product lines, products and customers**
- **Market risk economic capital is attributed to business units, individual trading desks, and individual traders**
- **Credit risk economic capital is attributed to individual transactions**
- **Credit Portfolio Management Practices Survey 2004 says**
 - 41% reported use standard-deviation-based risk contributions
 - 32% reported use tail-based risk contributions

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Successful Implementation

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Successful Implementation

- Economic capital is increasingly important tool for guiding risk based decision making.
- Insurance companies face unique challenges
- Variations among emerging practices
- Recommend centralized oversight, but strong “ownership” lines of business