



Enterprise Risk Management in Banking  
(March 2007 )

Enterprise Risk Information Management

Dilip Krishna

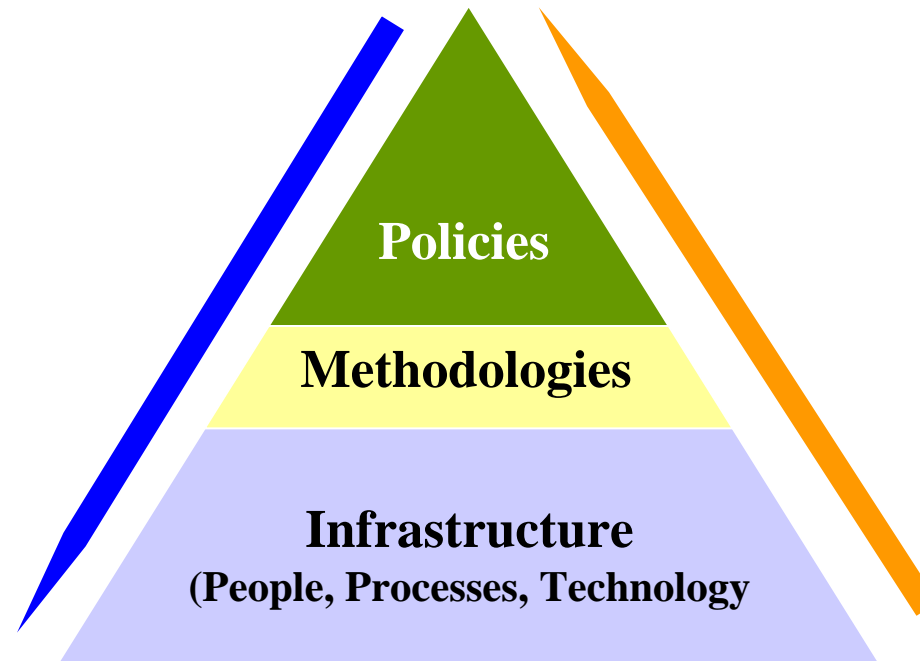
Teradata

647-988-2547

[Dilip.krishna@ncr.com](mailto:Dilip.krishna@ncr.com)



# Policies and Methodologies depend on Infrastructure



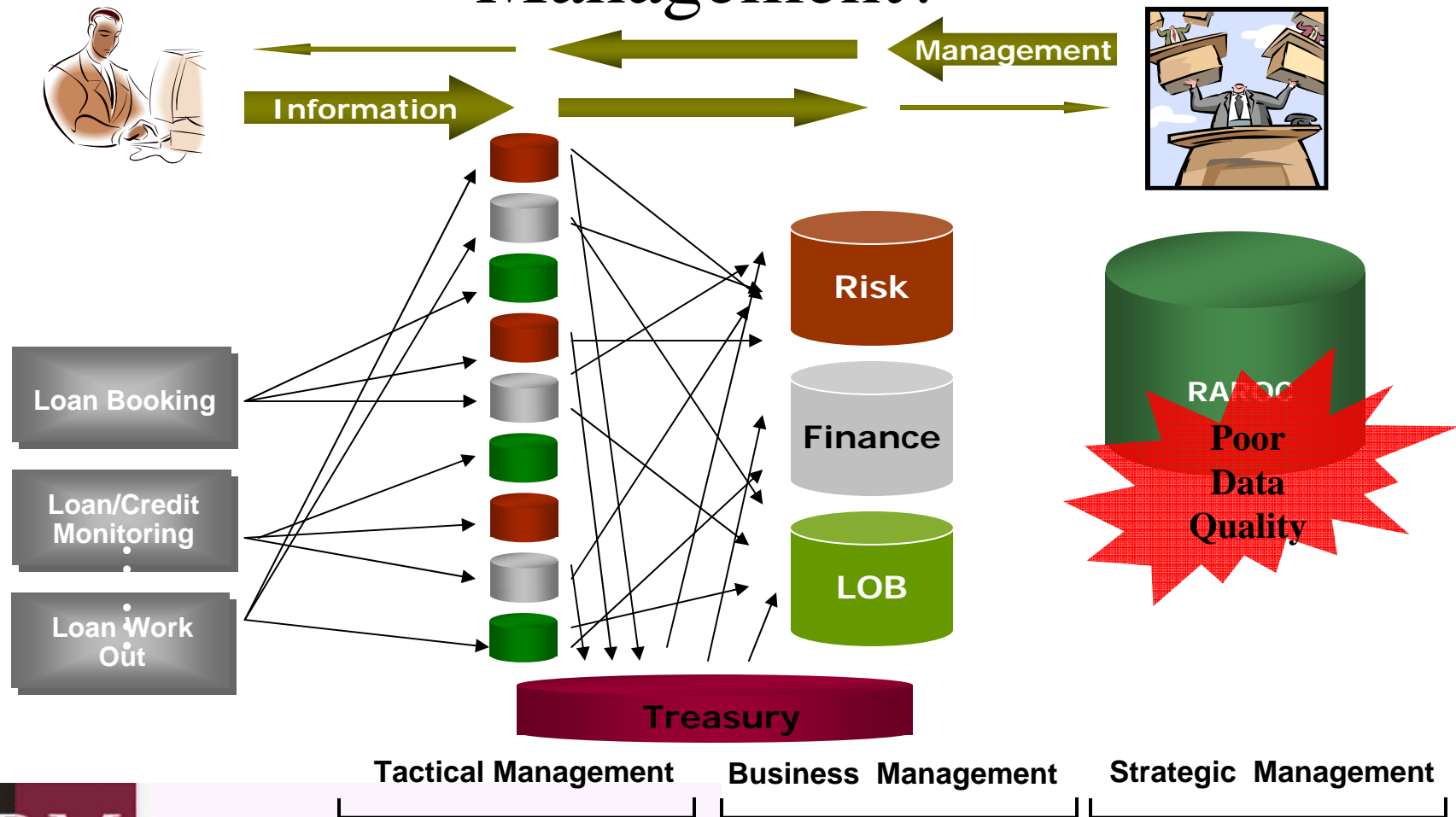


# Risk Policy and Methodology are Deeply Dependent on Data\*

- Policy Examples
  - Business Strategies
  - Risk Tolerance
  - Authorities
  - Disclosure (Transparency)
- Methodology Examples
  - Value at Risk (VaR)
  - Stress Tests and Scenario Modeling
  - Vetting, Validation, and Audit
  - Performance (Active Portfolio Management)

\*Source: Dr. Robert Mark,  
Black Diamond

# Why is information a challenge to Risk Management?





# What is “Data Quality”

My reports aren't *getting done in time!*

Why can't I get two reports to *reconcile??*



**Business**

We have great data quality processes, but the *ETL processes* aren't getting done on time, and *reference data* is being wrongly coded.

**Technology**



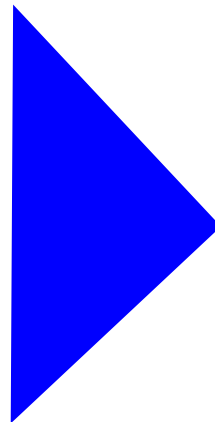


# Data Quality Evaluation

## Reconciling Business vs. Technology Views

### Requirements


- **Integration**
- **Integrity**
- **Completeness**
- **Accessibility**
- **Flexibility**
- **Extensibility**
- **Timeliness**
- **Auditability**



### Implementation

- **Data Modeling**
- **Metadata**
- **Data Security**
- **Master Data Management**
- **Data Quality**
- **Data Stewardship**
- **Data Governance**





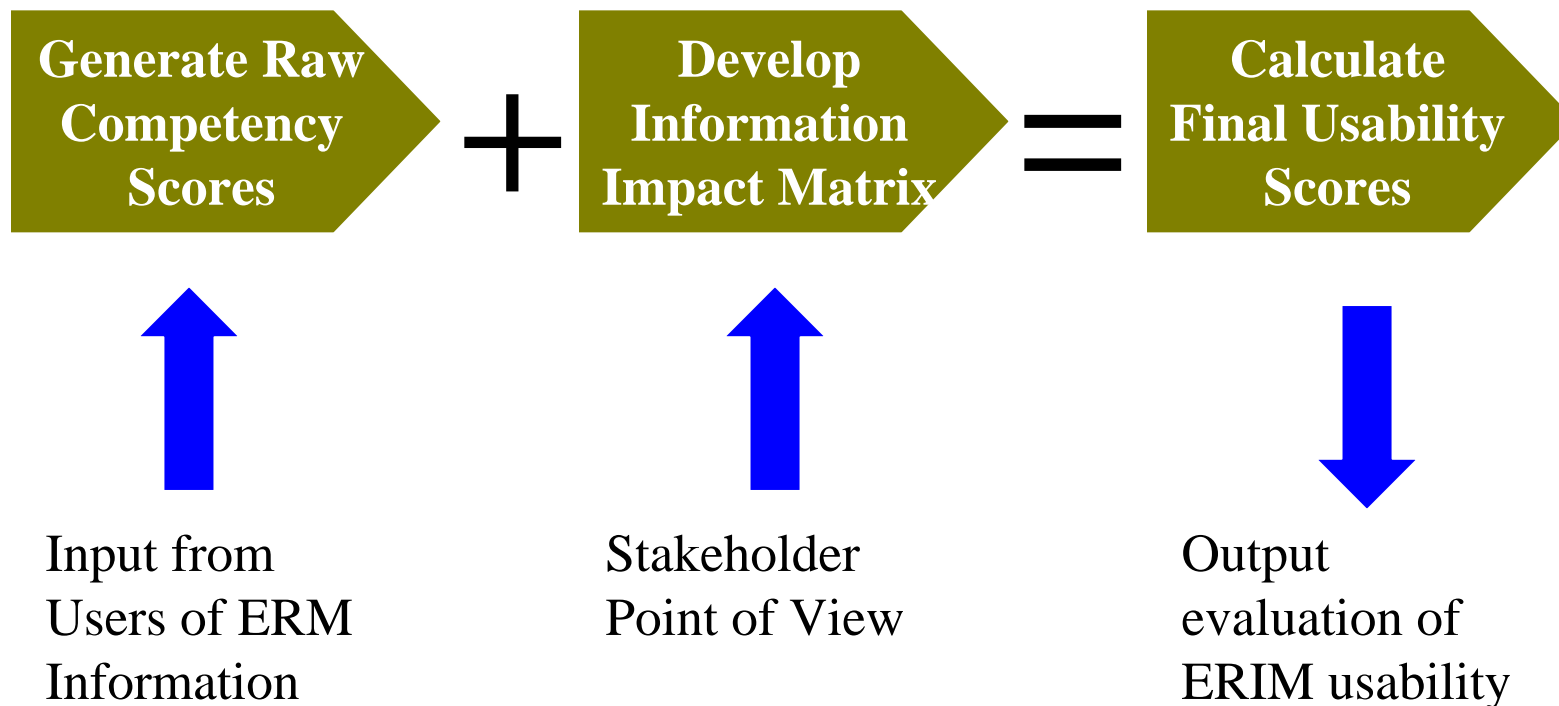
# Implementation vs. Requirements

## An Example

- Metadata can adversely affect many requirements
  - Data Integration: “Facility” vs. “Account”
  - Data Integrity: Aggregating “Outstandings” (without fees) and “Outstandings” (with fees)
  - Data Completeness: Imprecise definition of “Customer”
  - Auditability: Incomplete documentation of data lineage



# Evaluating Enterprise Risk Information Management



# Raw Competency Scores

	Business Strategies	Risk Tolerance	Authorities	Disclosure	Var	Stress Tests	Vetting & Valuation	Performance Measurement
Integration	4	2	2	1	1	1	2	1
Integrity	4	7	4	7	6	5	5	5
Completeness	6	3	2	8	4	1	1	1
Accessibility	3	3	4	6	4	2	2	1
Flexibility	1	3	2	7	1	1	2	4
Extensibility	1	2	3	1	2	2	2	1
Timeliness	1	1	1	7	3	5	7	1
Auditability	6	3	3	8	2	2	3	2

- Inherently subjective process
- Template-based maturity model for each business area to enhance objectivity

# Information Characteristic Impact Matrix

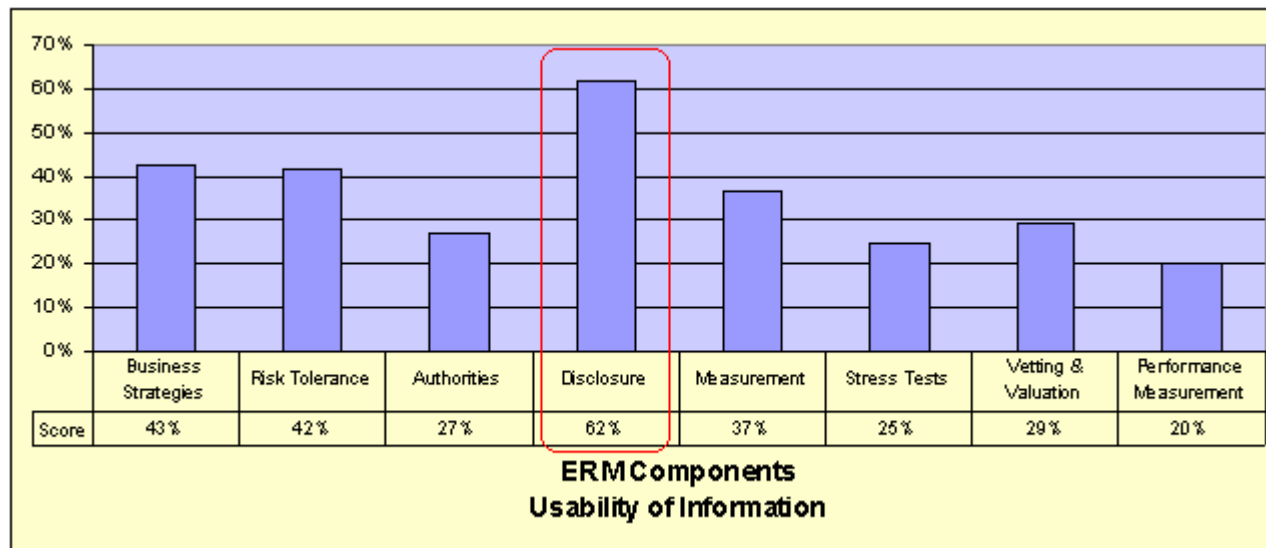
## Relative Importance of Risk Management Functions

Business Strategies	Risk Tolerance	Authorities	Disclosure	Var	Stress Tests	Vetting & Valuation	Performance Measurement
12.50%	12.50%	12.50%	20.00%	12.50%	6.00%	12.00%	12.00%

## Information Characteristic Impact Matrix

	Business Strategies	Risk Tolerance	Authorities	Disclosure	Var	Stress Tests	Vetting & Valuation	Performance Measurement
Integration	1.25%	1.25%	2.50%	4.00%	3.13%	1.20%	2.40%	1.80%
Integrity	3.38%	4.38%	3.38%	5.40%	3.75%	1.62%	3.24%	2.40%
Completeness	4.38%	3.13%	3.13%	5.00%	3.13%	1.50%	3.00%	2.40%
Accessibility	1.00%	1.25%	1.00%	1.40%	1.25%	0.48%	0.96%	1.80%
Flexibility	0.75%	0.75%	0.75%	0.00%	0.25%	0.36%	0.72%	0.72%
Extensibility	0.38%	0.38%	0.38%	0.00%	0.25%	0.18%	0.36%	0.48%
Timeliness	0.75%	0.75%	0.75%	0.20%	0.75%	0.36%	0.72%	1.80%
Auditability	0.63%	0.63%	0.63%	4.00%	0.00%	0.30%	0.60%	0.60%

# The Result: ERIM Usability Scores





# Incorporating Stakeholder Point of View

Stakeholder	Goals and Points of view
Regulators	Stability of economic system (profit focus only till threshold)
Ratings Agencies	Assessment of company financial strength
Senior Management	Maximize shareholder value and risk-adjusted stock growth
Lines of Business	Maximize unit profitability based on senior management measures
<i>Technology</i>	<i>Minimize cost and delivery uncertainty</i>

Each stakeholder will assign different weights to the Information Characteristic Impact Matrix



# Uses

- Prioritization/Business Case development for infrastructure remediation
- Raise awareness of data as a corporate asset
- Infrastructure component of ratings agency and supervisory evaluation



# Questions?



# Appendix



# Definitions of Information Characteristics

- **Integration:** It draws on integrated data from across the enterprise.
- **Integrity:** The data has integrity that inspires confidence in those who use it.
- **Completeness:** The information completely describes risk in the enterprise.
- **Accessibility:** Users have rapid access to all the data they need.
- **Flexibility:** Users can flexibly analyze data, and drill down wherever necessary to answer deeper questions about risk.
- **Extensibility:** The overall data structure must be able to easily accommodate new data.
- **Timeliness:** Data is available soon after the transaction that produced it is completed.
- **Auditability:** Data is traceable and verifiable all the way back to the source.



# Definition of Data Management Dimensions

- **Metadata** is used to define business terminology, data definitions and physical characteristics of data.
- **Data Quality** (as opposed to business information quality) is the set of technologies and processes responsible for ensuring the integrity of data within the organization.
- **Master Data Management (MDM) or Reference Data** is all the data that are relatively static such as customer information, product masters and organizational hierarchies and is the basis of all analysis.
- **Data Security** is important from the perspective of intellectual property as well as from regulatory and reputation risk considerations. While there are a number of technologies to better secure access to data all these mechanisms can be defeated in the absence of a strong processes and policies in this regard.
- **Data Governance** function which lays out policies for data management including funding for process and technology changes
- **Data Stewardship** organization which will address day-to-day data related issues.



# How to Calculate and Implement RAROC

**Michel Crouhy**

IXIS Corporate and Investment Bank

**Enterprise Risk Management Symposium**

**ERM in Banking**

*Chicago, March 28-30, 2007*

**ERM**

2007 ENTERPRISE RISK MANAGEMENT SYMPOSIUM



## *Agenda*

1. *What Purpose Does Risk Capital Serve?*
2. *RAROC – Risk-Adjusted Return On Capital*
3. *RAROC in Practice*
4. *Conclusion*



# 1. *What Purpose Does Risk Capital Serve?*



## *What Purpose Does Risk Capital Serve?*

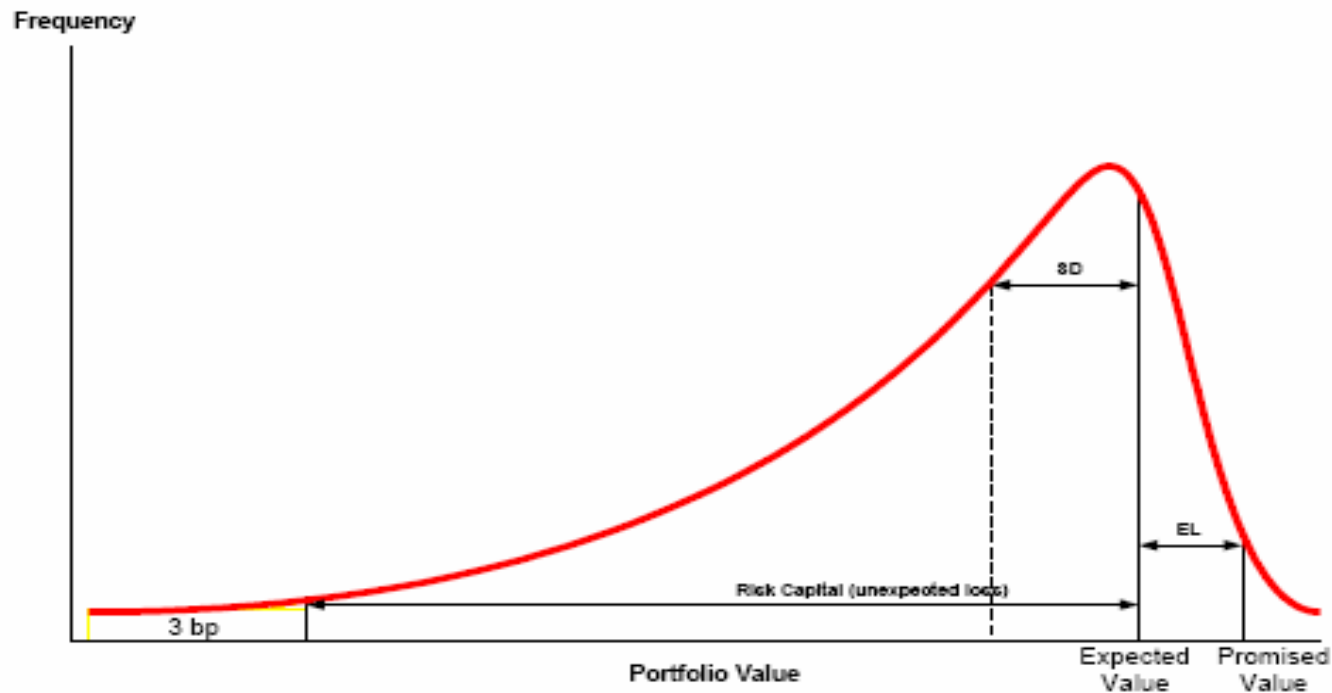
- Risk capital is the cushion that provides protection against the various risks inherent in a corporation's business, so that the firm can maintain its financial integrity and remain a going concern even in the event of a near catastrophic "worst case" scenario.
- Risk capital provides confidence to stakeholders: suppliers, clients and lenders (industrial firm), or depositors and counterparties (financial institution), as well as rating agencies, on the financial health and viability of the firm

**Risk capital acts as a buffer to absorb large unexpected losses**

- Risk capital is different from:
  - Book capital
  - Regulatory capital

# Risk Capital

- **EL**: Expected Loss (average probability of default X loan amount at default)
- **SD**: 1 standard deviation in value (volatility)
- **Risk Capital (Unexpected loss)** : A loss amount determined by the probability of default of the lender





## *What Purpose Does Risk Capital Serve?*

- Risk Capital is derived from VaR type of risk calculation methodologies: what is different is the confidence level and the time horizon.
- Confidence level is generally associated with a target credit rating, say, 99.97% for AA.
- Alternative to VaR: Expected Shortfall (ES)

$$ES = E(L \mid L \geq VaR_{\alpha}(L))$$

- Coherent risk measure
- But, does not correspond to the standard definition of capital



## ***Emerging Uses of Risk Capital Numbers***

- How much capital is required for the firm to remain solvent?
- Performance evaluation and incentive compensation at the firm, business-unit and individual levels.
- Active portfolio management for entry/exit decisions and capital management: How much value will be created if we allocate resources to a new or existing business, or alternatively if we close down an activity?
- Customer / product selection
- Pricing transactions: Risk-based pricing.

***Problem: A single measure of risk capital cannot accommodate these 5 different purposes.***



## *Capital Allocation*

- In addition to measuring Risk Capital (RC) for the firm as whole, emerging uses of RC require to allocate it equitably among:
  - Business units / books,
  - Products,
  - Transactions,
  - Clients (obligors, counterparties)



# Capital Allocation

- **Stand-alone capital:** diversification benefits not passed down to sub-portfolios/business units – each one is expected to operate on a stand alone basis and be evaluated for its own merits.

Non-additive: sum of stand-alone capital for individual activities/sub-portfolios may exceed the total RC for the firm/portfolio as a whole

- **Fully diversified capital:** allocation of capital when diversification benefits are allocated down – measure the risk contribution of the activity/sub-portfolio to the overall firm/portfolio.

The sum of diversified capital for all sub-portfolios is equal to the total RC for the firm/portfolio

- **Marginal or Incremental capital:** difference between RC for the portfolio and RC for the portfolio without the sub-portfolio.

Captures the capital released (added) if the sub-portfolio were sold (added) – natural measure for evaluating the risk of divestitures or acquisitions

Non-additive



## 2. *RAROC – Risk-Adjusted Return On Capital*



## **RAROC – Risk-Adjusted Return On Capital**

- **Generic RAROC equation:**

$$RAROC = \frac{\textit{After-Tax} \cdot \textit{Expected} \cdot \textit{Risk-Adjusted} \cdot \textit{Net} \cdot \textit{Income}}{\textit{Economic} \cdot \textit{Capital}}$$

- **RAROC in practice:**

$$RAROC = \frac{\textit{Expected} \cdot \textit{Revenues} - \textit{Costs} - \textit{Expected} \cdot \textit{Losses} - \textit{Taxes} + \textit{Return} \cdot \textit{on} \cdot \textit{Risk} \cdot \textit{Capital} + / - \textit{Transfers}}{\textit{Economic} \cdot \textit{Capital}}$$

- **Ex-ante vs. Ex-post**



## **RAROC – Risk-Adjusted Return On Capital**

- ***EVA: Economic Value Added***

EVA, or NIACC (net income after capital charge), is the after-tax adjusted net income less a capital charge equal to the amount of economic capital times the after-tax cost of equity capital.

Activity is deemed to add shareholder value (EVA positive) when its NIACC is positive.

***EVA > 0*** is equivalent to ***RAROC > hurdle rate***

*However maximizing RAROC is not equivalent to maximizing EVA:*

- *RAROC is a ratio while EVA is a \$ difference.*
- *A firm can maximize RAROC by earning a small income on a very small amount of risk. In contrast, maximizing EVA requires the maximization of net income after taking into account the cost of risk.*



## RAROC – *Risk-Adjusted Return On Capital*

- *Expected revenues* – assuming no losses
- *Costs*: direct expenses (e.g., salaries, bonuses, infrastructures,...)
- *Expected losses* from default (loan loss reserves), operational risk,... : they are priced-into the transaction – no need for risk capital as a buffer
- *Taxes* – effective tax rate of the firm
- *Return on risk capital* – assuming it is invested in risk-free securities such as government bonds
- *Transfers* – transfer pricing mechanisms, primarily between the business units and the Treasury group (funding cost *assuming 100% debt funded* – requires to adjust business income statements, hedging cost,...)
- *Economic Capital* = *Risk capital* + *Strategic risk capital*



## **RAROC – Risk-Adjusted Return On Capital**

- **Risk capital** is the common “currency” to measure risk across all risk types that the firm faces:
  - Market risk
    - Trading market risk
    - Accrual (ALM) interest rate risk
    - Proprietary investment risk
  - Credit Risk
    - Corporate lending risk
    - Counterparty risk
    - Retail credit risk
  - Operational Risk
  - Business volume risk (risk of customer revenues not covering fixed expenses)



## **RAROC – Risk-Adjusted Return On Capital**

- **Risk capital** is defined as the *potential unexpected loss of economic value over one year*, calculated at a very high confidence level, e.g. 99.97%, corresponding to a target rating, e.g. AA.

To compare returns on economic capital across businesses we need to apply a *consistent definition* of risk capital.

*Expected loss* should be covered by *reserves and/or pricing* – no need to hold capital against expected loss.



## **RAROC – Risk-Adjusted Return On Capital**

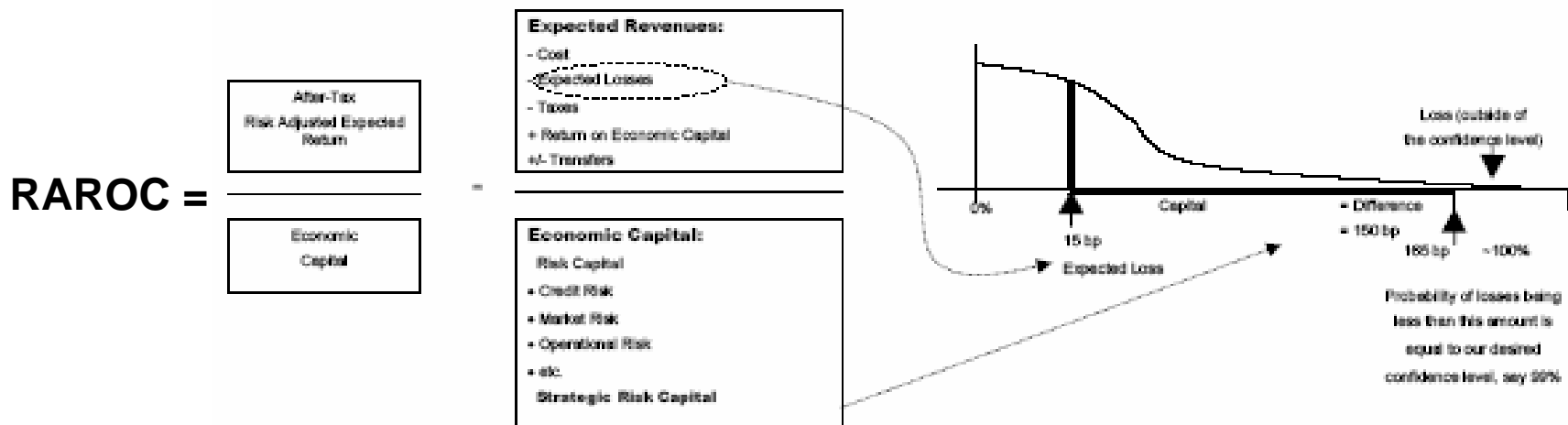
- **Strategic risk capital** refers to the risk of significant investment whose success and profitability are highly uncertain.

Current practice: **goodwill** and **burned-out capital**

Strategic risk capital should be viewed as an allocation of capital to account for the **risk of strategic failure** of recent acquisitions or other strategic initiatives built organically.



# RAROC Equation





- **Example:** RAROC of a \$1 billion corporate loan portfolio (return of 9%).

The bank has an operating direct cost of \$9 million per annum, and an effective tax rate of 30%.

Assume that the portfolio is funded by \$1 billion of retail deposits with an interest charge of 6%. Unexpected losses associated with the portfolio is such that economic capital is set at \$75 million (i.e., 7.5 percent of the loan amount) against the portfolio (invested in risk-free securities) and the risk-free interest rate on government securities is 7%.

The expected loss on this portfolio is assumed to be 1% per annum (i.e., \$10 million).

- **If we ignore transfer price considerations, then the after-tax RAROC for this loan is thus:**

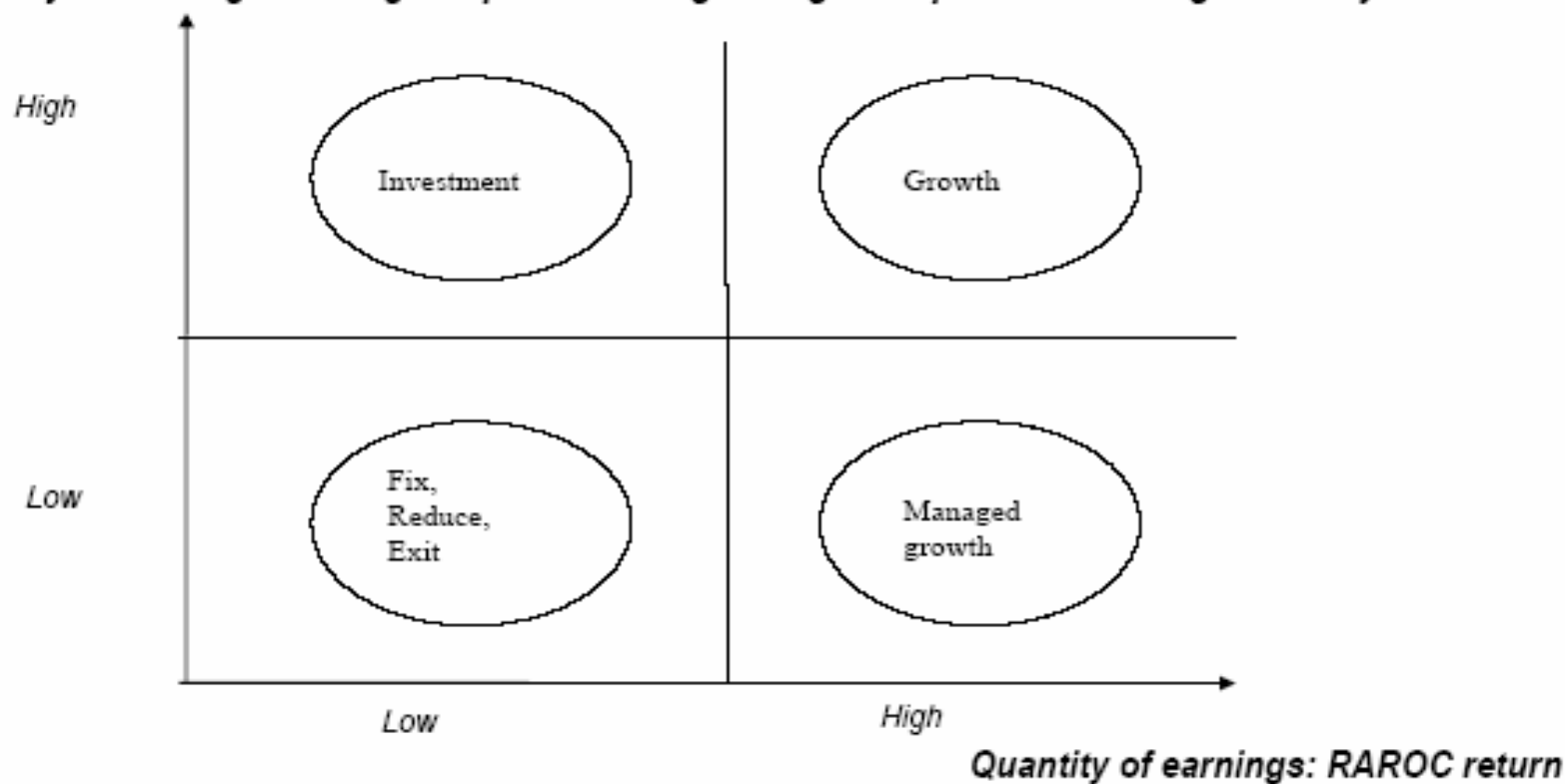
$$RAROC = \frac{(90 - 9 - 60 - 10 + 5.25)(1 - 0.3)}{75} = 0.152 = 15.2\%$$



### **3. *RAROC in Practice***

# Active portfolio management for entry/exit decisions

*Quality of Earnings: Strategic importance/long-term growth potential/earnings volatility*





## *Risk-Based Pricing of Transactions*

RAROC / Risk contribution of the transaction to the overall portfolio

- Stand-alone capital
- Fully diversified capital



## RAROC for Performance Measurement

- Ex-Post vs. Ex-Ante
- RAROC Horizon: usually 1 year – length of time to re-capitalize if suffering major unexpected loss.
- Confidence level
- Hurdle rate and capital budgeting decision rule:

$$h_{AT} = \frac{CE * r_{CE} + PE * r_{PE}}{CE + PE}$$

$$r_{CE} = r_f + \beta_{CE} (\bar{R}_M - r_f)$$



## *Risk Types and Time Horizon*

- Credit risk – CreditVar over a 1-year horizon
- Market risk – MarketVaR over a 1-day horizon

**Problem:** How to translate risk over a short-term horizon into capital over a 1-year horizon at a higher confidence level (CL)?

- Core risk level
- Time to reduce

**Example:**

- Daily VaR = 68 at the 99% CL
- Core risk level = 34
- Time to reduce = 21 days (risk reduction of 2.38 per day)
- Number of business days per year: 252
- Risk capital calculated at the 99.97% CL



## *Risk Types and Time Horizon*

- **Scaling factor to transform a 99% CL one day VaR to a 99.97% CL one day VaR:**
  - $K1 = 1.47$  – default assumption assuming normality of daily loss distributions. If loss distributions are fat tailed need to select a higher  $K1$ .

Example:  $VaR_{99.97} = VaR_{99} * 1.47 = 68 * 1.47 = 100$

Core risk level<sub>99.97</sub> = Core risk level<sub>99</sub> \* 1.47 = 34 \* 1.47 = 50

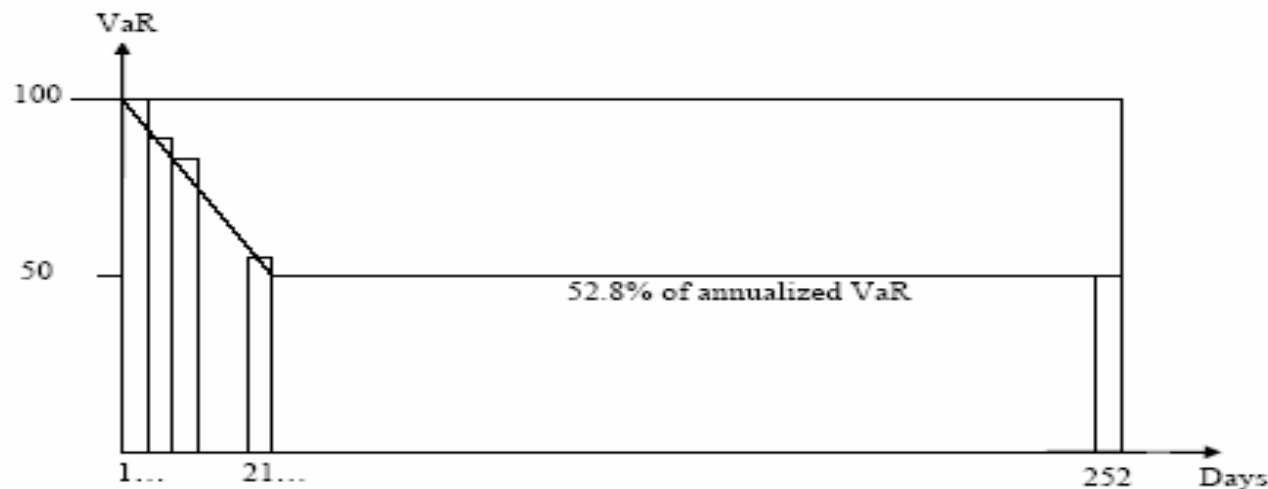
- To avoid traders to game the system use the root mean square daily VaR over the last three months instead of last day VaR:

$$VaR_{adj} = \sqrt{\frac{1}{N} \sum_{k=1}^N VaR_{dayk}^2}$$

with  $N$  number of business days in the prior three month period

## Risk Types and Time Horizon

- How to translate risk over one day into capital over a 1-year horizon?
  - Core risk level = 50
  - Time to reduce = 21 days



$$\begin{aligned}\text{Risk capital} &= \text{Square root}[\text{Sum of squares}(100,97.62,95.24,\dots,52.38)+50^2 \times 231] \\ &= 839 = 52.8\% \times 100 \times \text{square root}(252) \\ &= 52.8\% \times \text{annualized VaR}\end{aligned}$$



## *Diversification and Risk capital*

- Risk capital for a business unit within a firm is usually determined on a stand-alone basis, using the top-of-the-house hurdle rate.
- Intuition, however, suggests that risk capital for the firm should be less than the sum of the stand-alone risk capital of the individual business units – returns are correlated.
- Common practice is to run risk models of business units at lower confidence level: e.g. top-of-the-house at 99.97% and business units at 99.5%

### **Example:**

**Market risk: \$200**

**Credit risk: \$700**

**Operational risk: \$300**

**Perfect correlation: aggregate risk is \$1,200**

**Zero correlation: aggregate risk is \$787**



## *Diversification and Risk capital*

- How to allocate capital at the activity level within a business unit?

### Example:

Business	Econ. Capital	Marginal Econ. Cap.
X + Y	\$100	
X	\$60	\$30
Y	\$70	\$40

Diversification effect: \$30



## *Diversification and Risk capital*

### ■ *Stand-alone capital*

- X: \$60
- Y: \$70

### ■ *Fully diversified capital*

- X: \$46 ( $\$60 - \$30 \times 60 / 130$ )
- Y: \$54 ( $\$70 - \$30 \times 70 / 130$ )

### ■ *Marginal (incremental) capital*

- X: \$30
- Y: \$40

Choice of a capital measure depends on the desired objective:

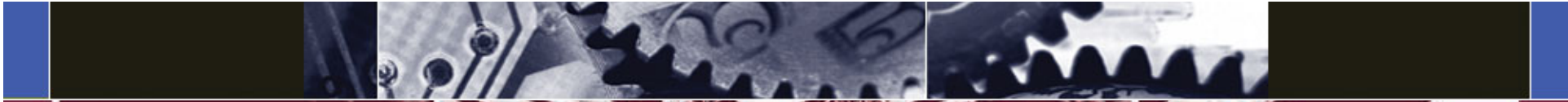
- **Assessing solvency of the firm and minimum risk pricing:** Fully diversified capital
- **Active portfolio management and business mix decisions:** marginal risk capital
- **Performance measurement:** stand-alone capital for incentive compensation and fully diversified risk capital to assess extra performance from diversification



## 4. *Conclusion*



- **Establish a consistent and comprehensive risk management tool:**
  - Quantify all major risk types
  - Apply across all businesses and regions
  - Consistent with Basel II requirements but more comprehensive
  
- **Establish a consistent and comprehensive return on economic capital framework:**
  - Consistent risk-adjusted measure of business performance for internal growth
  - Client selection and product management
  - Optimize investment of capital – short-term and long-term
  - Disciplined approach to acquisitions and divestitures
  - Balance growth and returns to maximize long-term shareholder value



# Enterprise Risk Management in Banking (March 2007 )

## Introduction: The Core of Superior ERM Solutions

Dr Robert Mark

Black Diamond Risk Enterprises

(925) 212-7348

ERM

2007 ENTERPRISE RISK MANAGEMENT SYMPOSIUM

BLACK  
DIAMOND  
RISK

[bobmark@blackdiamondrisk.com](mailto:bobmark@blackdiamondrisk.com)

1

# “Characteristics” which are at the “Core of Superior ERM Solutions”

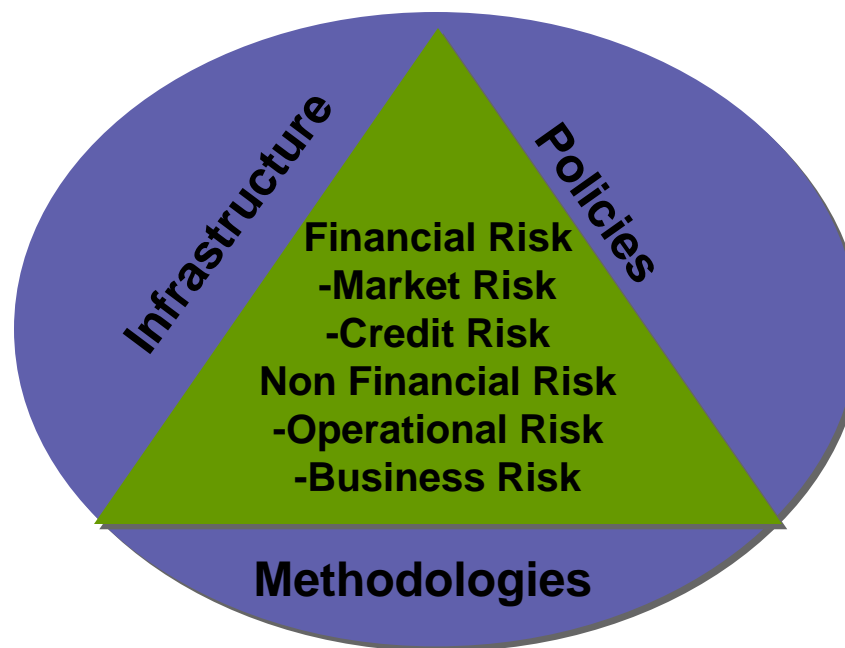
- *The ability to efficiently integrate all the components of risk on a \*portfolio basis as well as to effectively operate in complex \*markets*
- *while serving \*customers as well as satisfying \*regulators is a direct function of the quality of the policies, methodologies and infrastructure*

**Regulators**

\* **Rating Agencies**

**Equity Analysts**

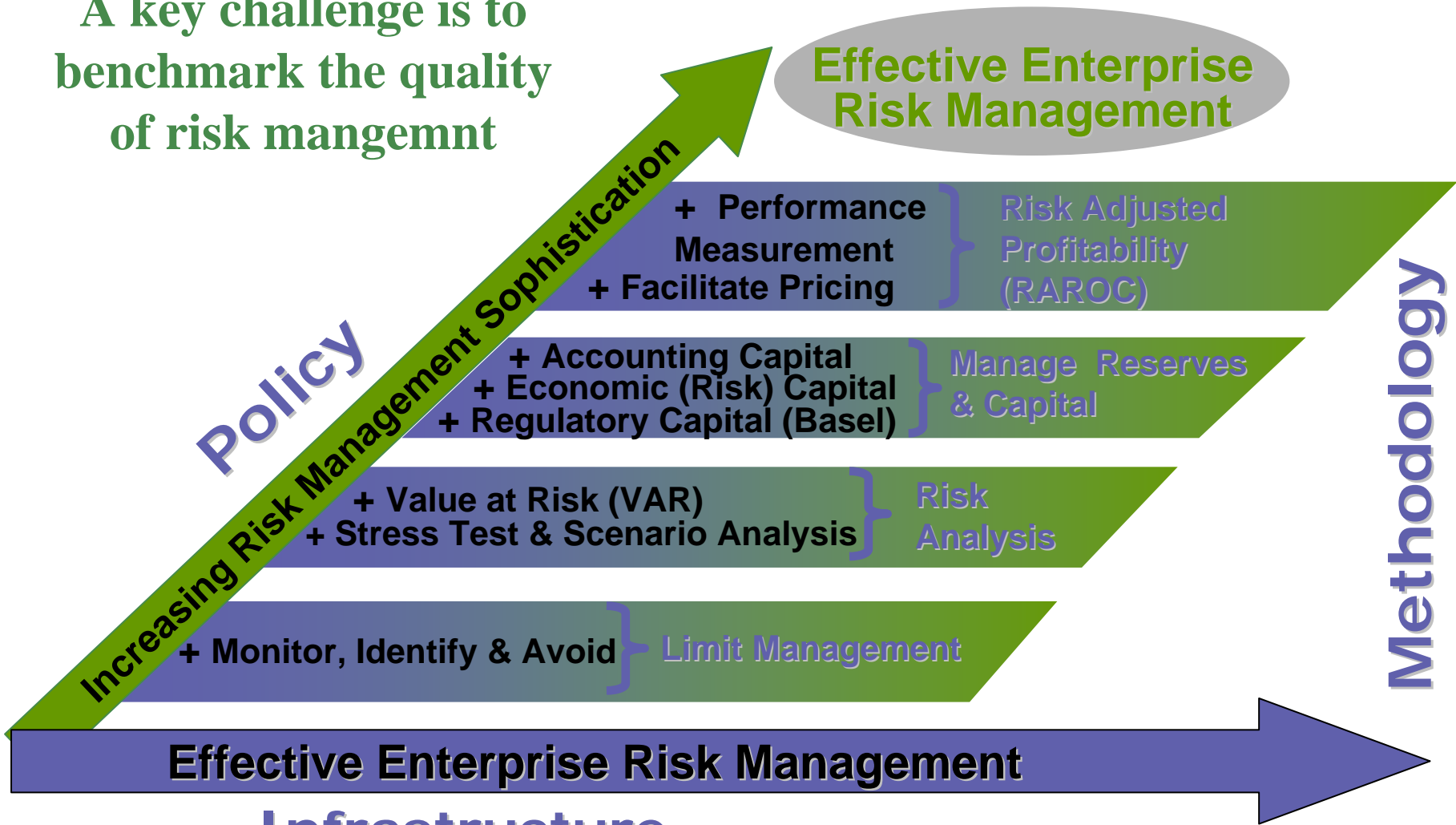
\***Customers**  
**Investors**



\***Markets**



A key challenge is to benchmark the quality of risk management

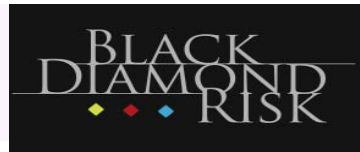


Effective Enterprise Risk Management



2007 ENTERPRISE RISK MANAGEMENT SYMPOSIUM

Infrastructure



bobmark@blackdiamondrisk.com



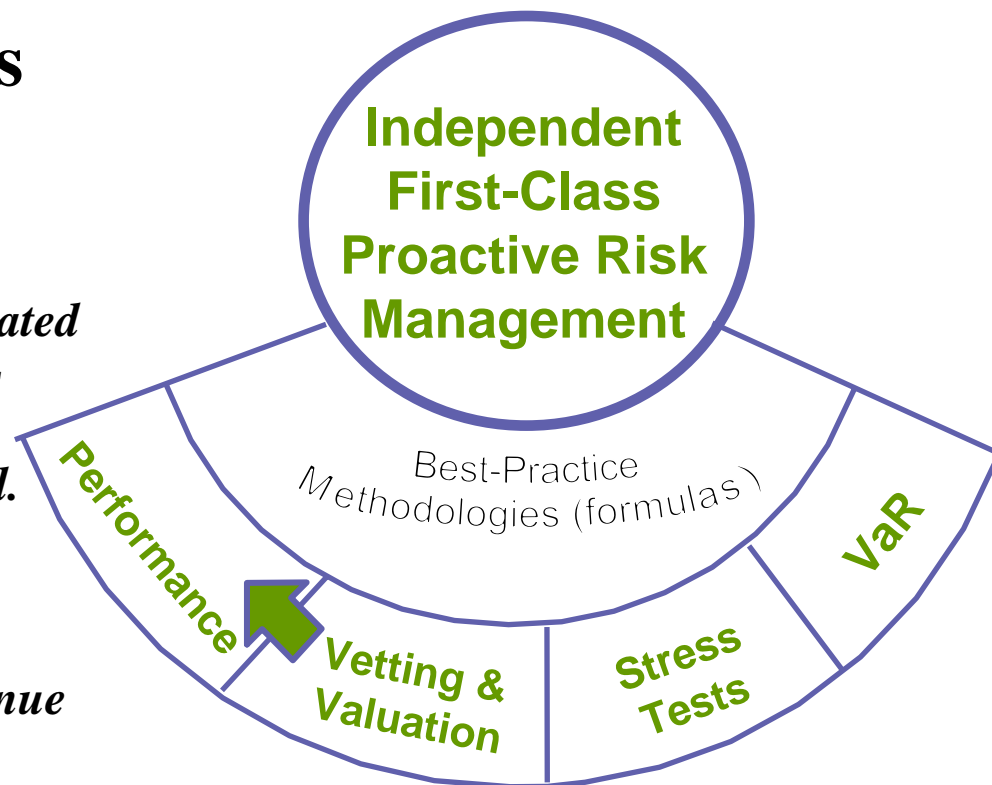
## Characteristics of Policies at the Core of Superior ERM Solutions

- *The tolerance for risk (financial and non financial) is integrated and consistent with the Business Strategies (and visa versa)*
- *Risk measures are backtested, authorities are expressed in meaningful terms and reflect a desired tolerance for risk*
- *Risk is properly disclosed (e.g. a hit parade of risks) internally and externally on a drill down and integrated portfolio management basis*



# Characteristics of Methodologies at the Core of Superior ERM Solutions

- *VaR and Stress Test methodologies are predictive of the actual losses and integrated across all risks and all books of business*
- *Mathematical models are properly vetted.*
- *Positions are properly valued*
- *Risk methodologies are used by the revenue generators (eg tied into pricing and performance measurement ) and becomes a bigger deal with SOX.*

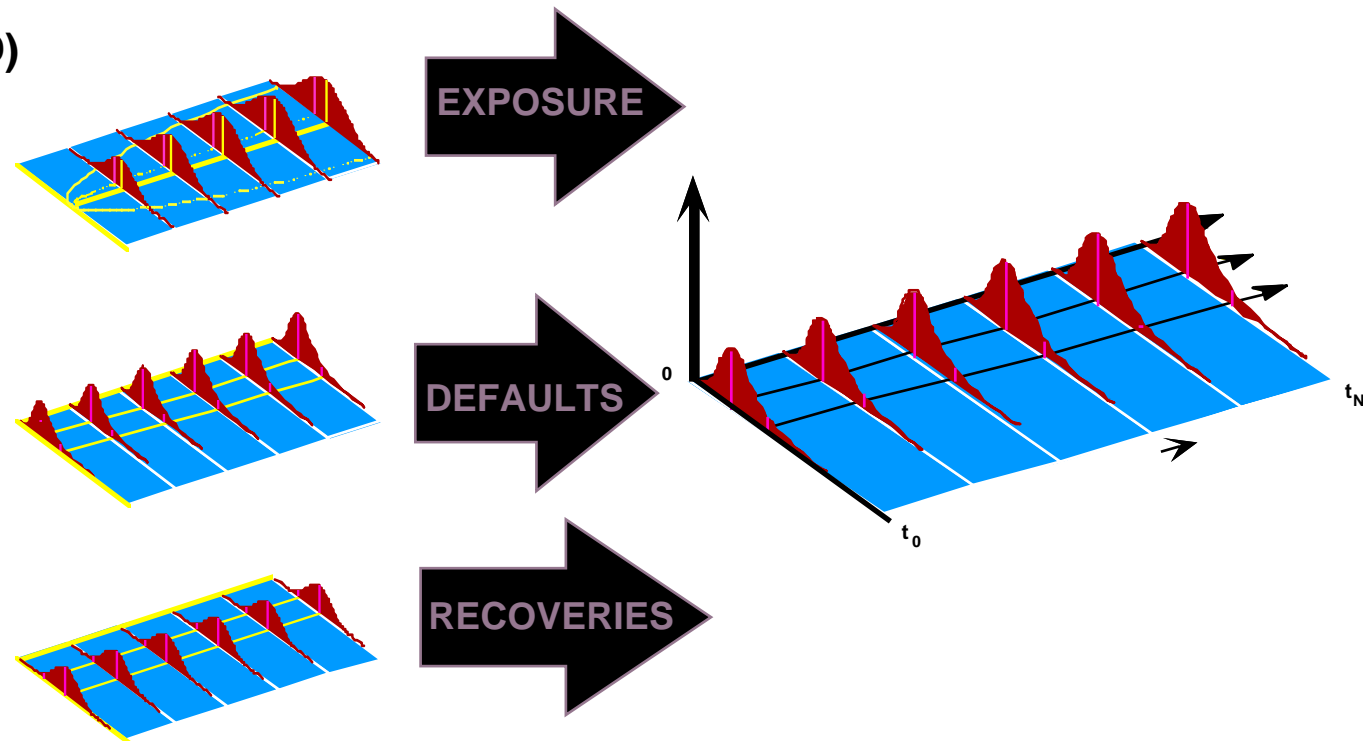




## Credit VaR Example:

A key challenge is to translate the credit risk exposure (E) calculation into a credit loss (L) calculation

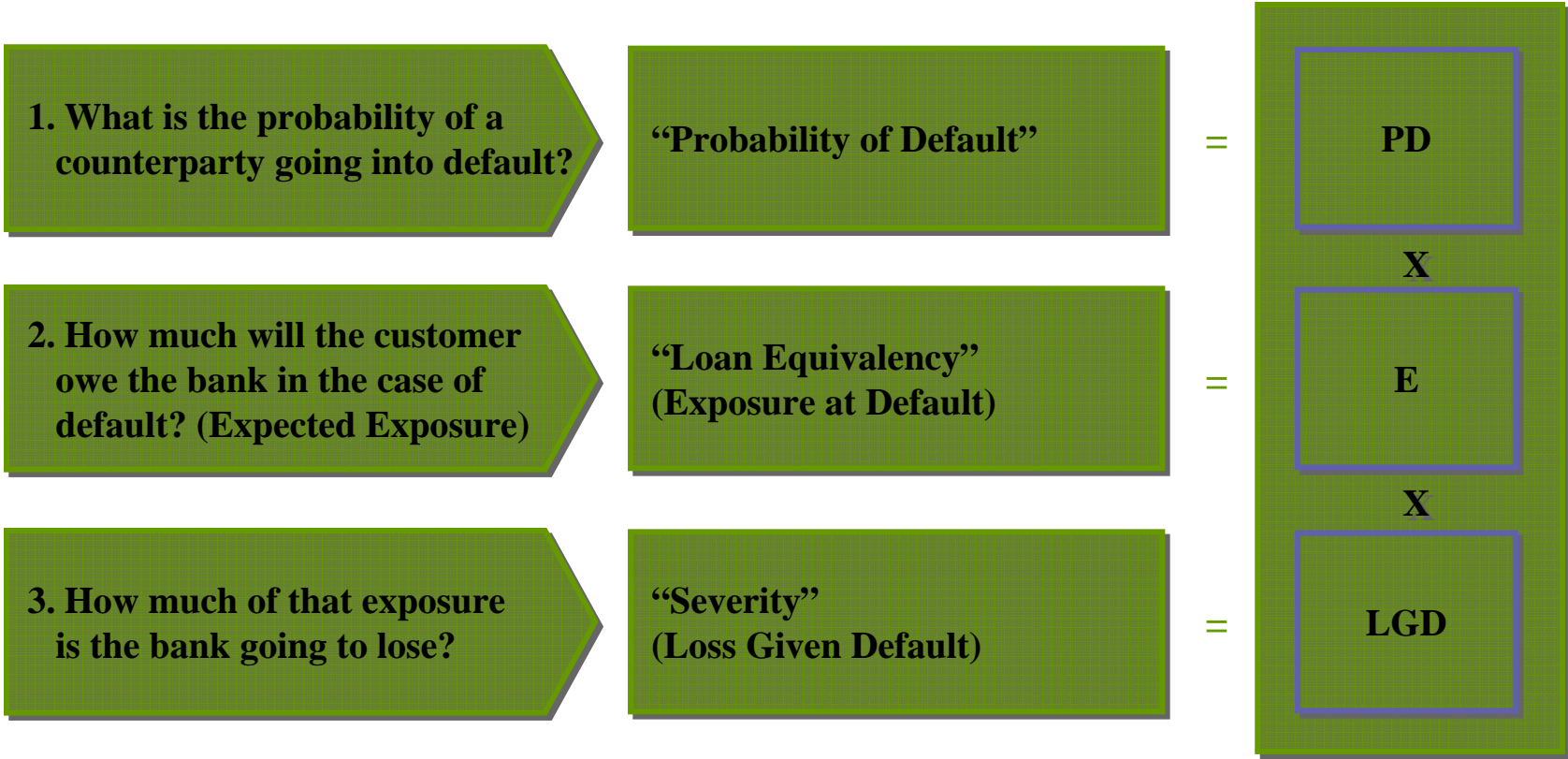
$$f(L)=f(E,PD,LGD)$$





Use Test Example: Utilize PD,E and LGD to predict EL

- A key challenge is to pass the use test





**Example: A key challenge is to measure, price and mitigate operational risk (OR)**

- 1. Internal Fraud**
- 2. External Fraud**
- 3. Employment Practices and Workplace Safety**
- 4. Clients, Products & Business Practices**
- 5. Damage to Physical Assets**
- 6. Business Disruption and System Failures**
- 7. Execution, Delivery & Process Management**



## Measuring Model Risk

Example : Factor Correlations Model

Note: OR Level 1 = "Event Type 4"

OR Level 2 = "Product Flaws"

### First level:

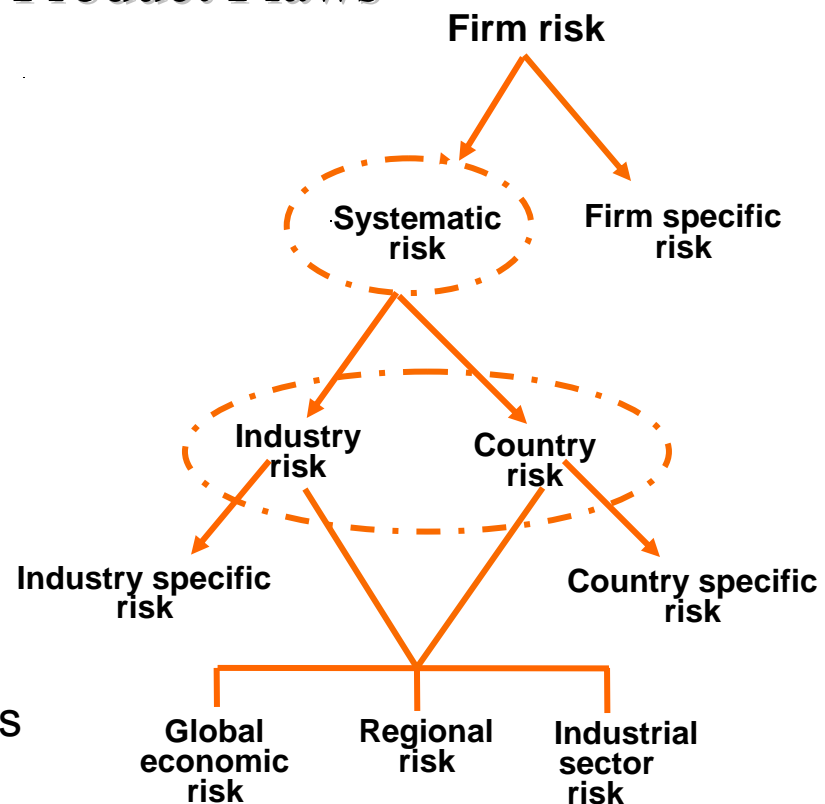
- Composite factor

### Second level:

- Country and industry factors

### Third level:

- Global, regional and sector factors



# Op VaR Example: Predicting Operational Risk

A key Challenge is to prove that the KRI's (say based on a Monte Carlo Simulation ) are predictive

$$\text{OpVaR} = f(\text{KRI's}) = f(\text{SD}, \text{\#E}, \text{DQ}, \text{\#T})$$

SD: Systems Down Time (Minutes)  
 #E: Number of Employees  
 DQ: Data Quality  
 #T: Number of Transactions

Major Stats Outputs		KRIs		Average
Expected Loss	\$100,000	Systems Down Time		4.98
Severe Loss*	\$23,305	# of Transactions		100002.87
Catastrophic Loss	\$13,823	Data Quality		94.97
Average loss per day	\$100,136	# of Employees		19.99

Severe Loss +  
Catastrophic Loss =  
Unexpected Loss

Minor Stats Outputs			
0.1 percentile	\$69,715	Maximum	\$137,128
1 percentile	\$75,804	Minimum	\$68,839
5 percentile	\$84,583		
10 percentile	\$87,645		
90 percentile	\$112,568		
95 percentile	\$117,093		
99 percentile*	\$123,305		
99.9 percentile	\$135,182		

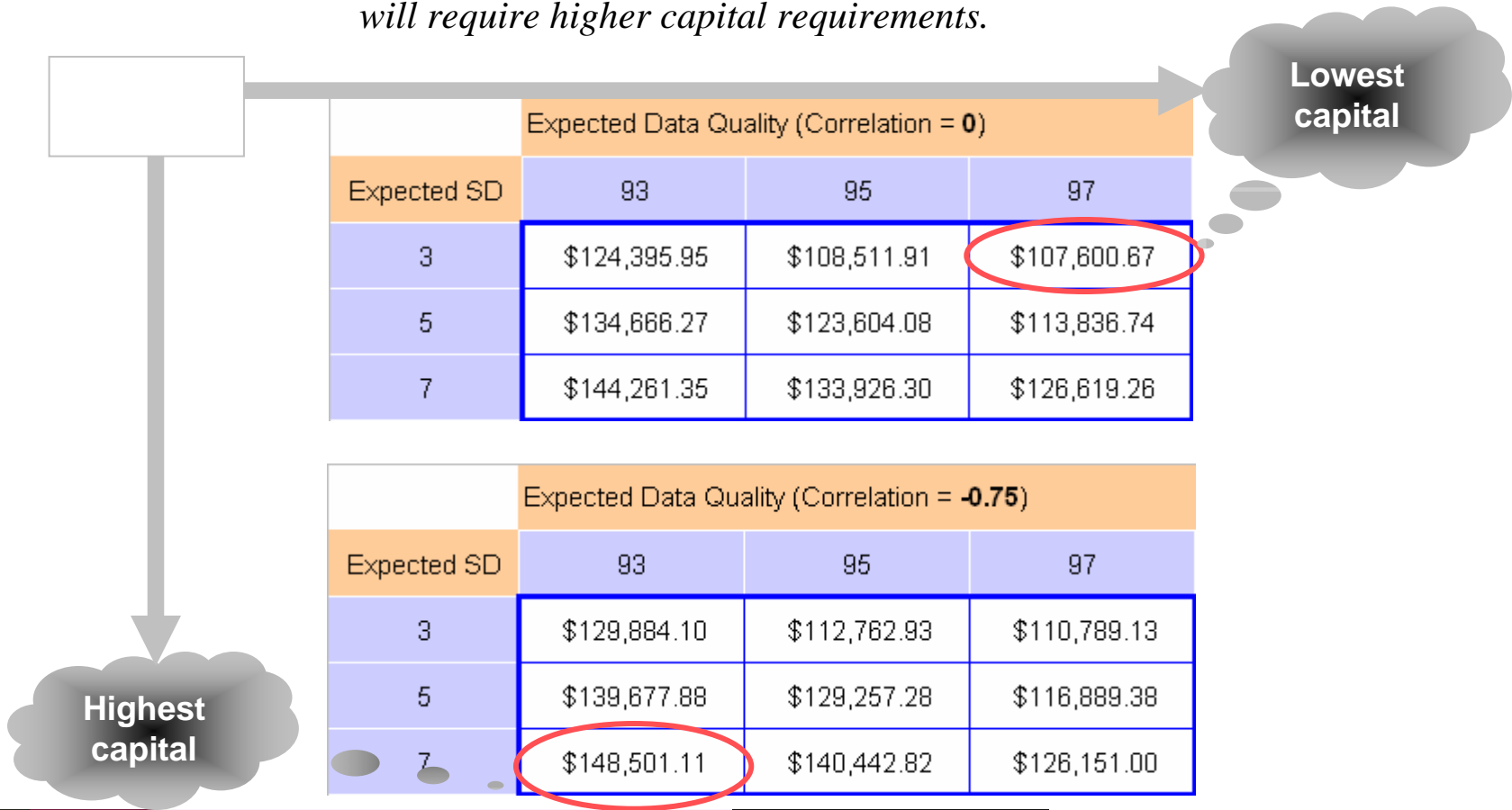
Calculation of Catastrophic Loss:

\$137,128  
 -) \$123,305  
 \$13,823

Calculation of capital requirement  
 (expected loss + severe loss) =  
 99 percentile loss amount

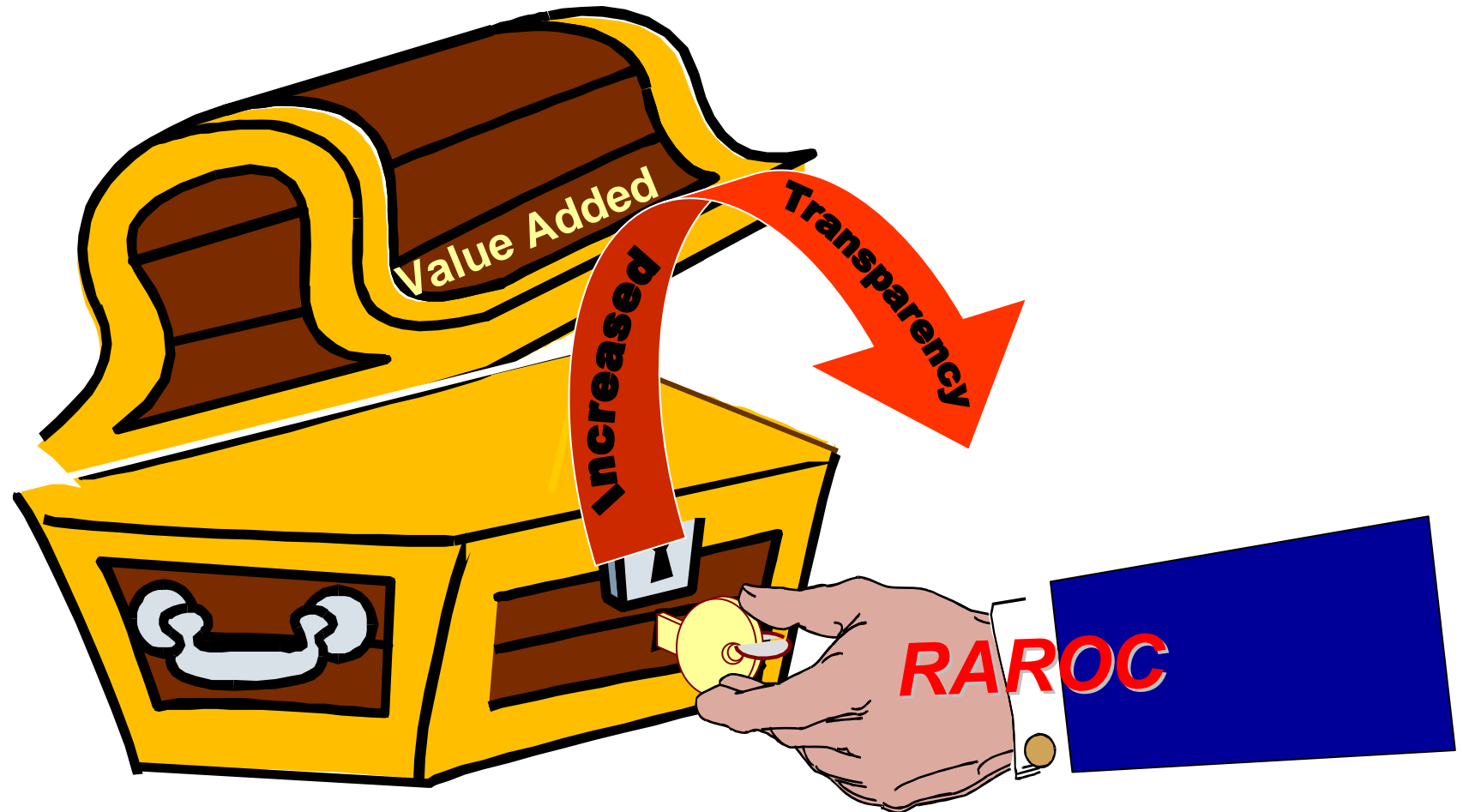
Example: A key challenge is to calculate the sensitivity of the KRI's and correlation on economic capital

*Note: Higher Systems Downtime and lower Data Quality will require higher capital requirements.*



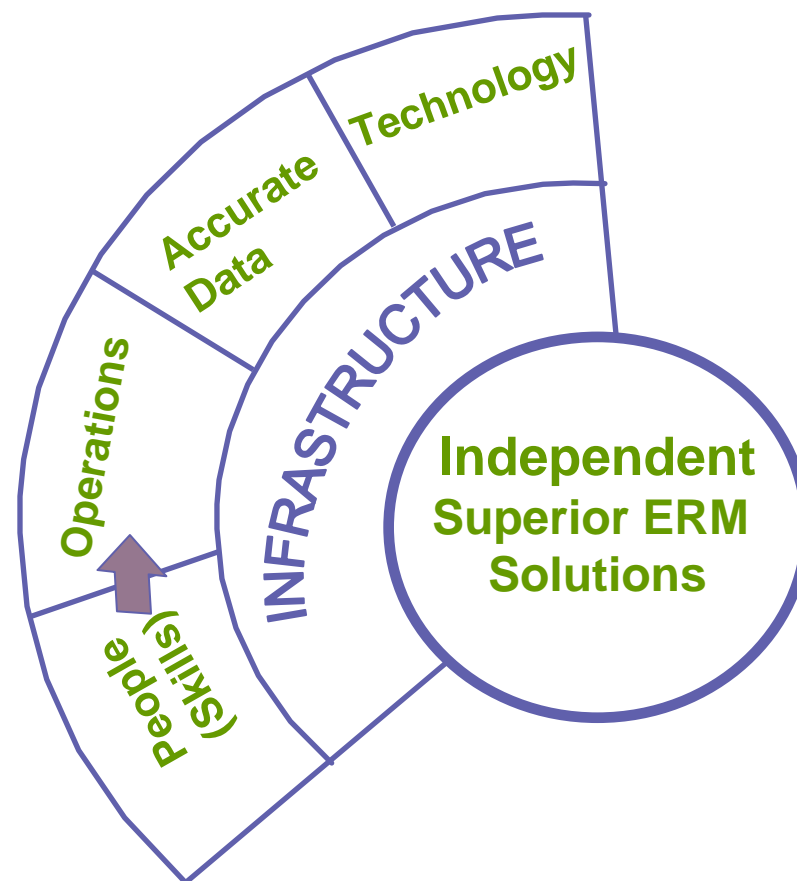


**Example: A key challenge is to calculate RAROC**  
**RAROC = f (net profit, TP, MR, CR, OR, BR, RR, SR, etc)**

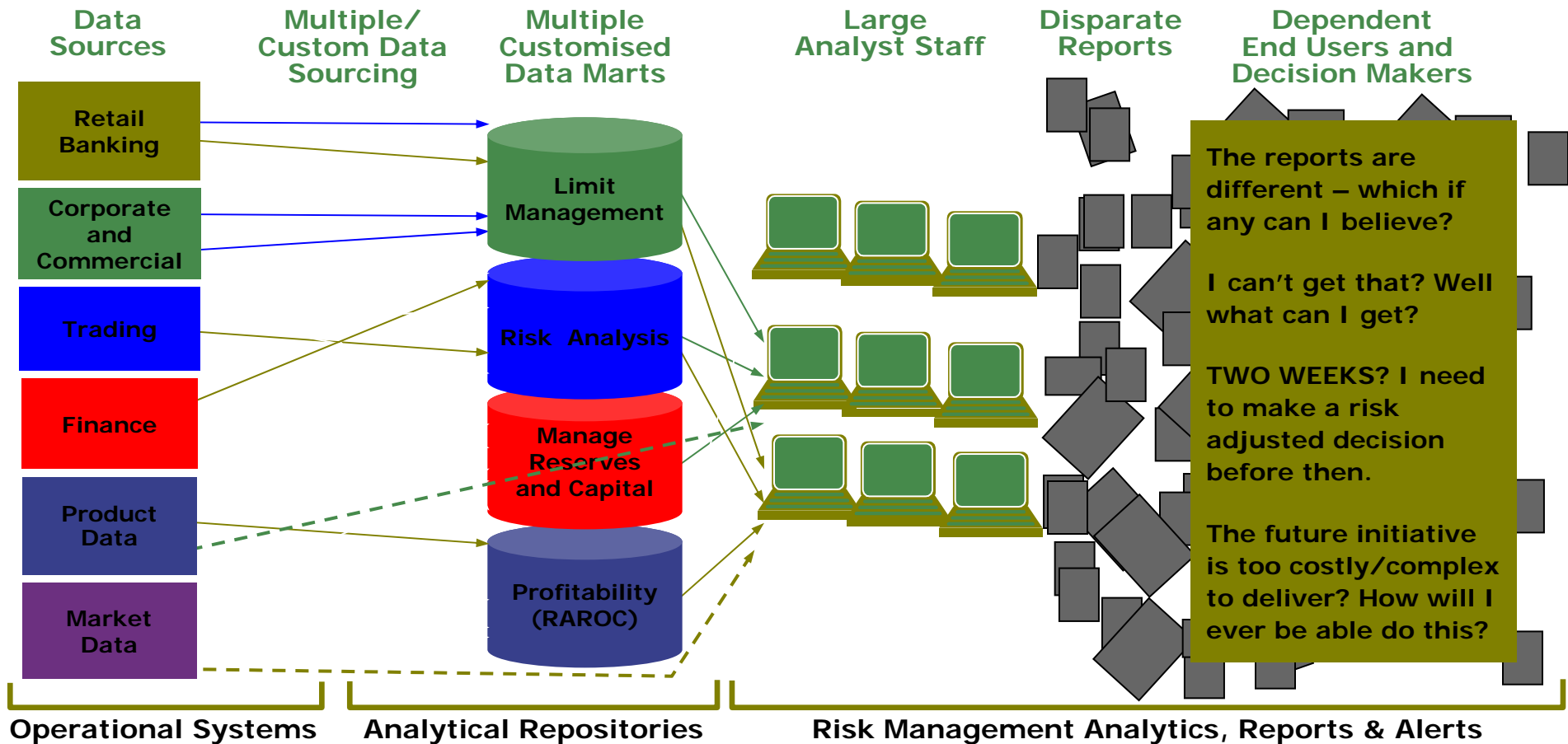


## Characteristics of Infrastructure at the Core of Superior Risk Solutions

- *The appropriate people in place with the right skills , competitive compensation and attractive career path*
- *An integrated risk operational infrastructure*
- *An integrated risk data infrastructure*
- *Near real time access to data (e.g. market data, transaction data, legal data ,etc)*



## A key Challenge is avoid a fragmented Risk Data Infrastructure



The reports are different – which if any can I believe?

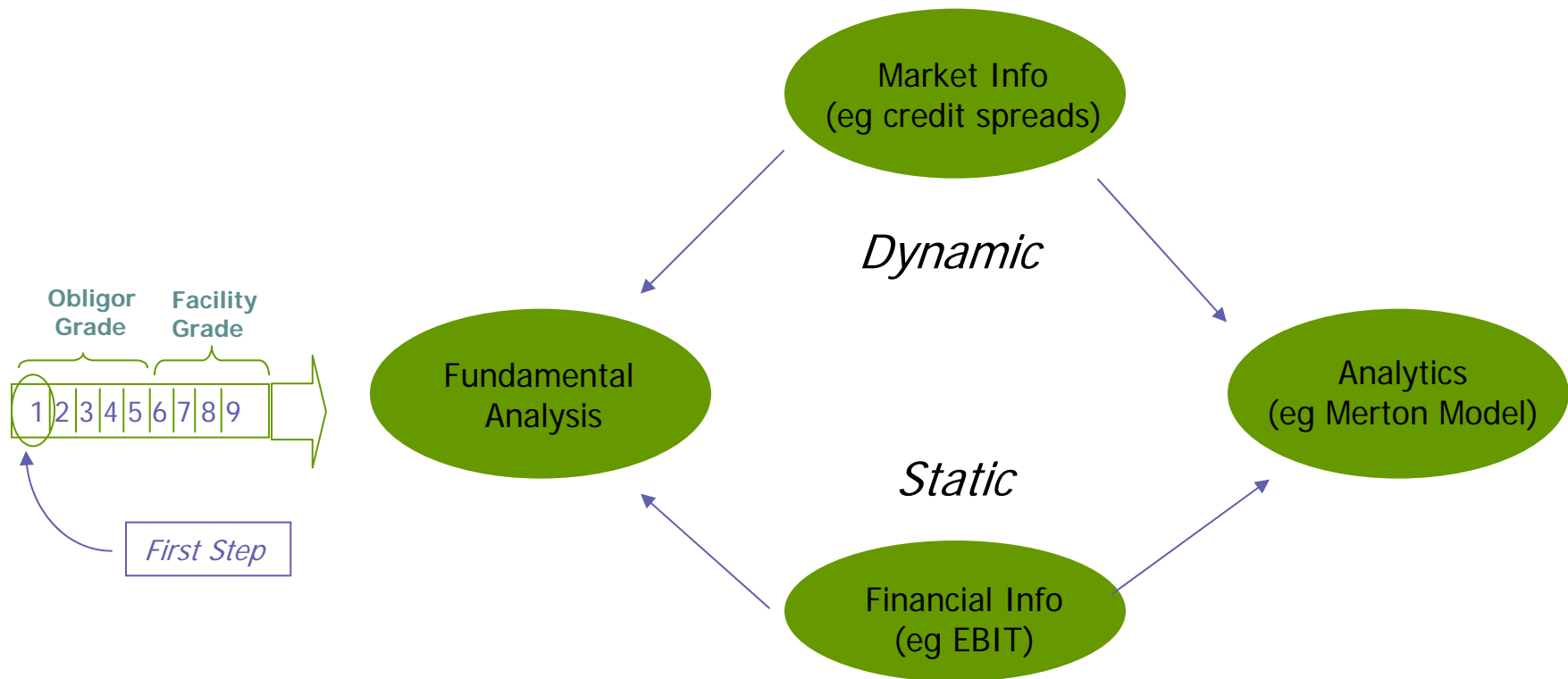
I can't get that? Well what can I get?

TWO WEEKS? I need to make a risk adjusted decision before then.

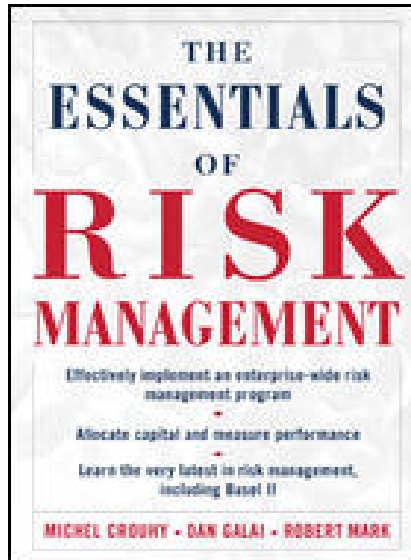
The future initiative is too costly/complex to deliver? How will I ever be able to do this?

End users have poor ability to access information, low confidence in the integrity of the information, and often cannot get the information needed from this environment.

- Example: A key challenge is to benchmark the quality of your risk information



# Recommended Value Added Unbiased References



- **Comprehensive user friendly description of Risk Management**
- **No Math**
- **Detailed technical description of Risk Management**
- **Deeply analytical**



# Bio of Dr. Robert M. Mark

- **Dr. Robert M. Mark is the Chief Executive Officer of Black Diamond which provides corporate governance, risk management consulting, software tools, and transaction services. He serves on several Boards. He also serves and on Checkpoint's Investment Committee. He was awarded the Financial Risk Manager of the Year by the Global Association of Risk Professionals (GARP). He is on the board and is the Vice Chairperson of The Professional Risk Managers' International Association (PRMIA)**
- **Prior to his current position, he was the Senior Executive Vice-President and Chief Risk Officer (CRO) at the Canadian Imperial Bank of Commerce (CIBC). Dr. Mark was a member of the Management Committee. Dr. Mark's global responsibility covered all credit, market and operating risks for all of CIBC as well as for its subsidiaries.**
- **Prior to his CRO position, he was the Corporate Treasurer at CIBC. Prior to CIBC, he was the partner in charge of the Financial Risk Management Consulting practice at Coopers & Lybrand (C&L). The Risk Management Practice and C&L advised clients on risk management issues and was directed toward financial institutions and multi-national corporations. This specialty area also coordinated the delivery of the firm's accounting, tax, control, and litigation services to provide clients with integrated and comprehensive risk management solutions and opportunities.**
- **Prior to his position at C&L, he was a managing director in the Asia, Europe, and Capital Markets Group (AECM) at Chemical Bank. His responsibilities within AECM encompassed risk management, asset/liability management, research (quantitative analysis), strategic planning and analytical systems. He served on the Senior Credit Committee of the Bank. Before he joined Chemical Bank, he was a senior officer at Marine Midland Bank/Hong Kong Shanghai Bank (HKSB) where he headed the technical analysis trading group within the Capital Markets Sector.**
- **He earned his Ph.D., with a dissertation in options pricing, from New York University's Graduate School of Engineering and Science, graduating first in his class. Subsequently, he received an Advanced Professional Certificate (APC) in accounting from NYU's Stern Graduate School of Business, and is a graduate of the Harvard Business School Advanced Management Program. He is an Adjunct Professor and co-author of "Risk Management" (McGraw-Hill), published in October 2000 and the "Essentials of Risk Management" in December 2005 (McGraw-Hill). He also served on the board of ISDA as well as the Chairperson of the National Asset/Liability Management Association (NALMA).**



# Standard & Poor's Analytic Methodology for Assessing ERM Practices of Financial Institutions

**ERM Summit  
Chicago, March 28<sup>th</sup> 2006**

**CONFIDENTIAL AND PROPRIETARY.**

Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.  
Copyright © 2005 Standard & Poor's, a division of The McGraw-Hill Companies.  
Copyright (c) 2006 Standard & Poor's, a subsidiary of The McGraw-Hill Companies, Inc. All rights reserved.

# Standard & Poor's Objective

---

*Risk management is at the heart of what S&P does. S&P assesses financial institutions' risks and how risks are managed*

- **To enhance processes by increasing our analytical focus on financial institutions' risk management practices**
- **We have put in place a systematic framework to evaluate firms ERM capabilities on a globally consistent basis**
- **Currently, only qualitative credit given to risk management practices and models**
- **Ultimately, may give some quantitative recognition to these models, but only where models are robust and underlying risk management framework is sound.**

CONFIDENTIAL AND PROPRIETARY.

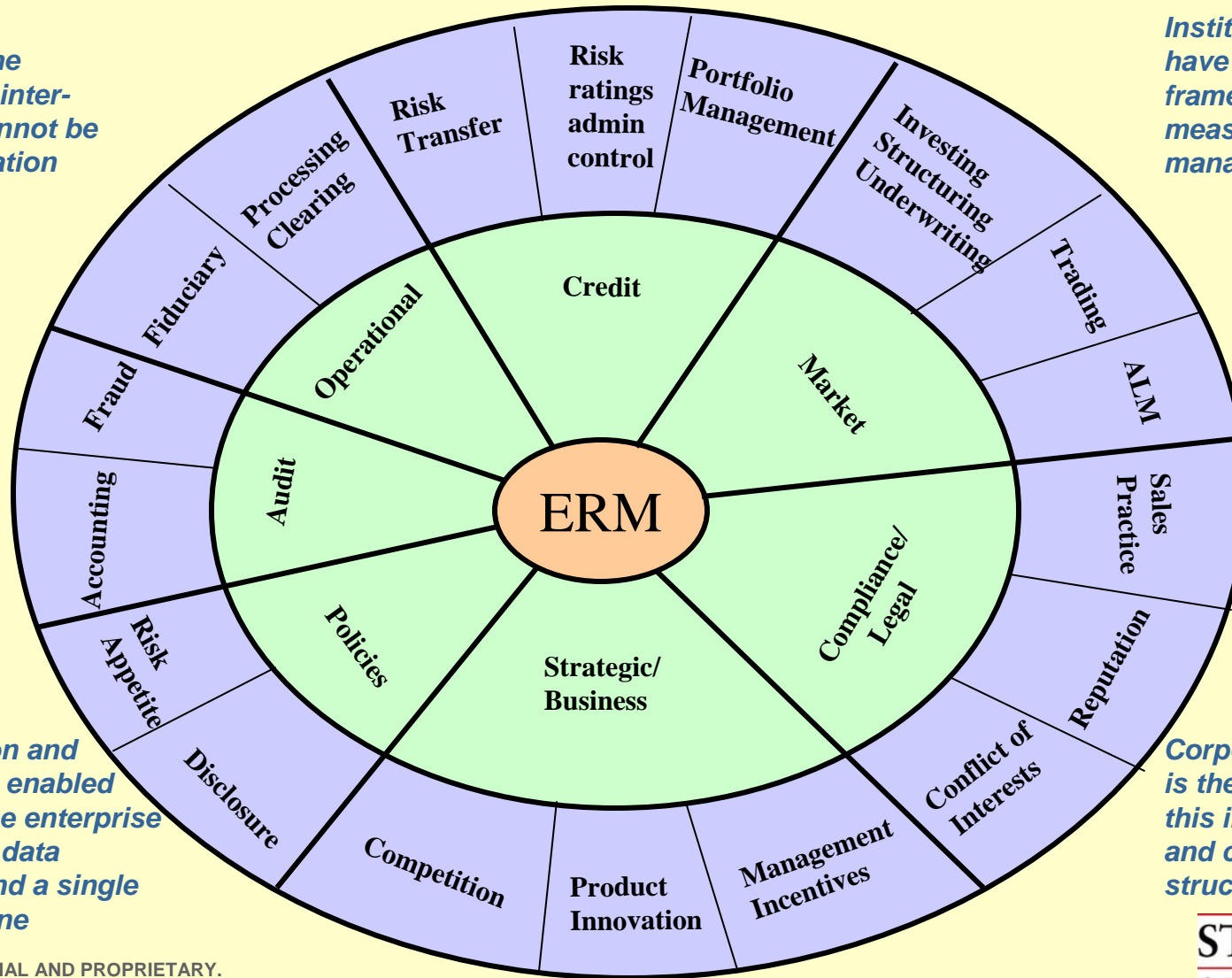
2. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# The Holistic ERM Umbrella Of The Future

*Risks within the enterprise are inter-related and cannot be viewed in isolation*

*Institutions will have a unified framework for measuring and managing risks*



*Risk integration and aggregation is enabled through-out the enterprise via a common data architecture and a single valuation engine*

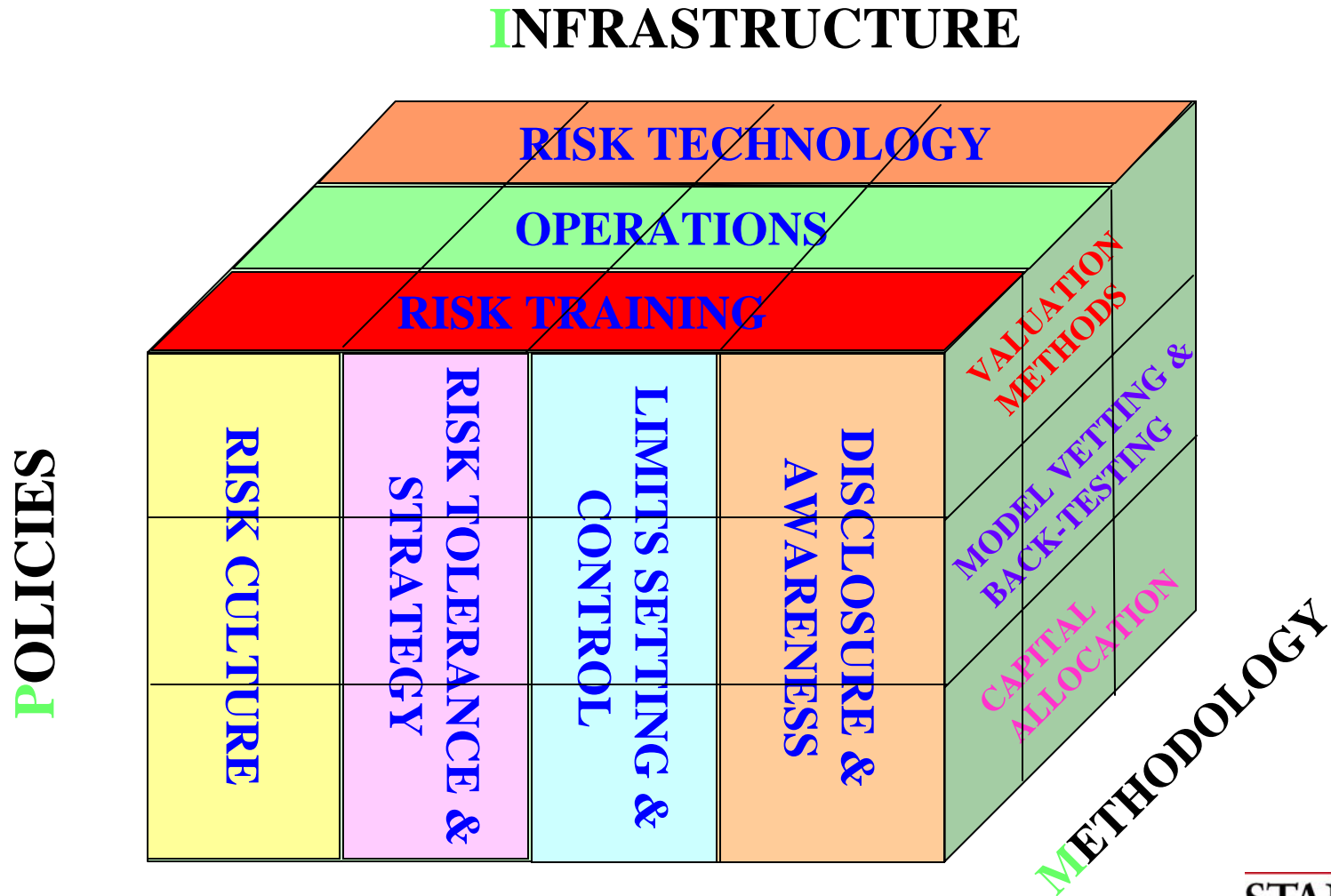
*Corporate governance is the glue that binds this into a consistent and coherent structure*

CONFIDENTIAL AND PROPRIETARY.

3. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# Assessing ERM: The PIM approach

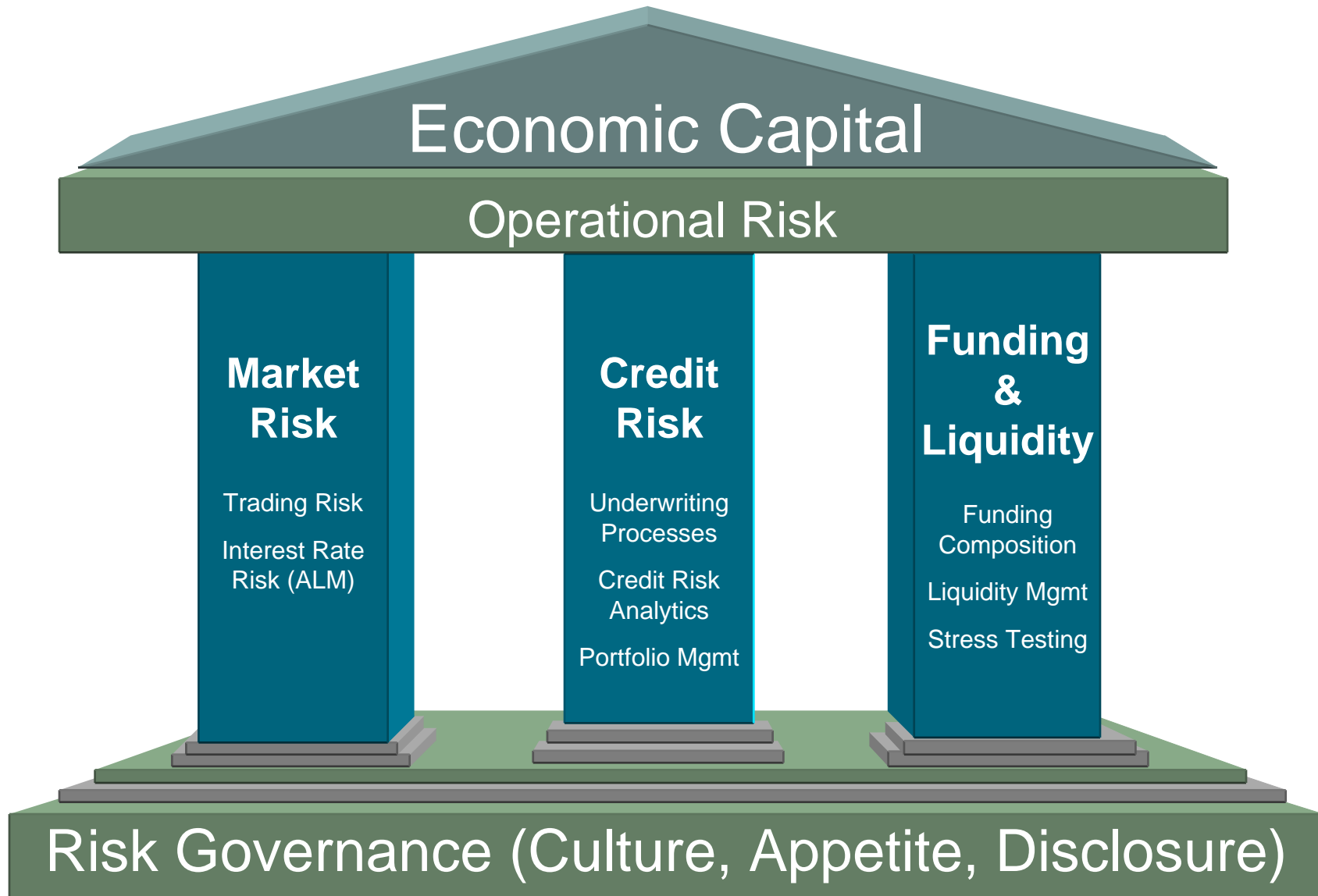


CONFIDENTIAL AND PROPRIETARY.

4. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# ERM Evaluation Components for Financial Institutions

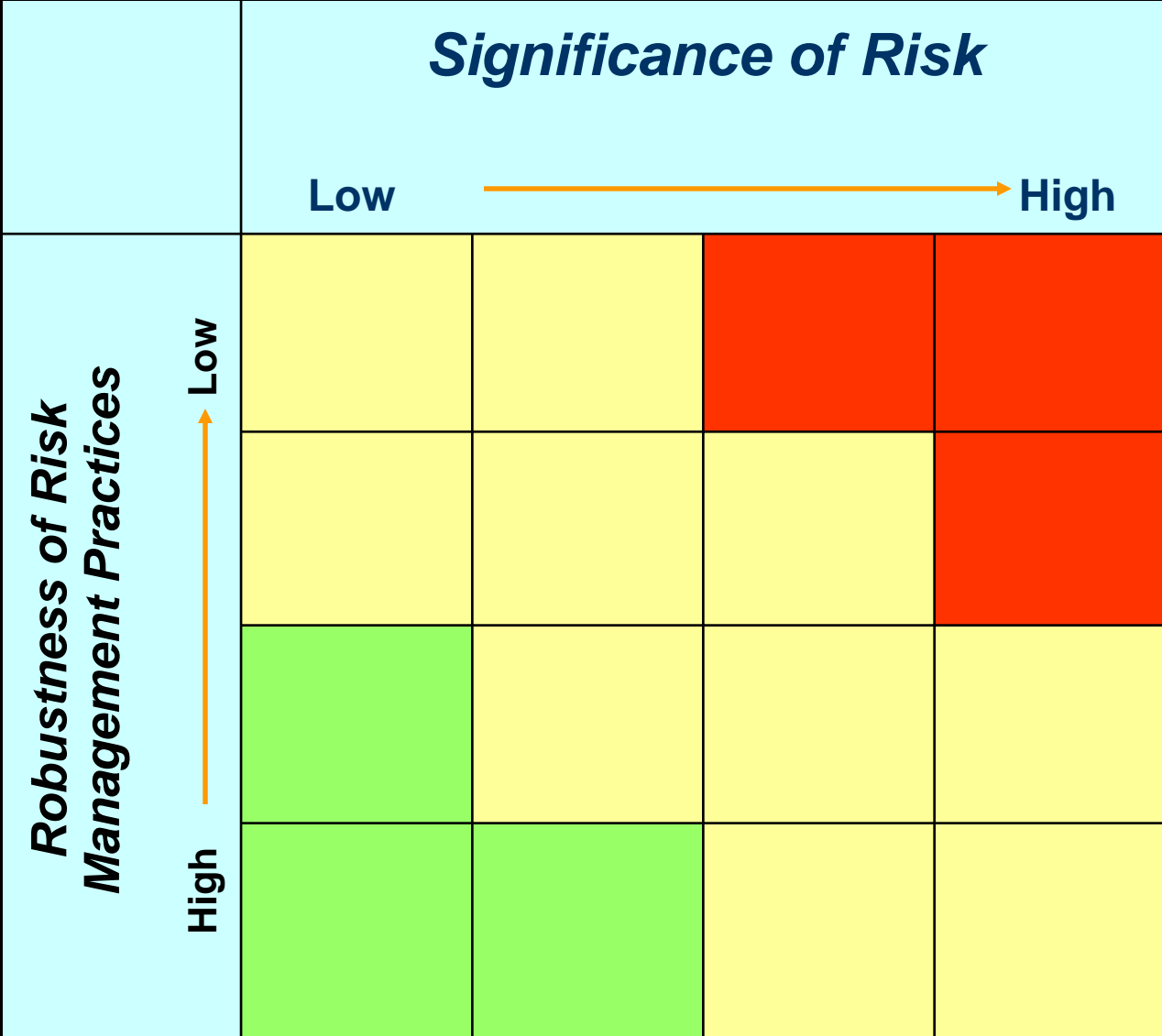


CONFIDENTIAL AND PROPRIETARY.

5. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# ERM Evaluation – Heat Map Focus



CONFIDENTIAL AND PROPRIETARY.

Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.



# Risk Governance

---

*Risk Culture: What is being assessed?*

***When we speak of culture, we are assessing the stature of the risk function within the organization and its role and relationship with the business units.***

CONFIDENTIAL AND PROPRIETARY.

7. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# Risk Governance

---

*Risk Appetite: What is being assessed?*

***We want to understand how the risk appetite at the aggregate level is established? Who gets involved in this process and what role does RM play. Is it consistent with the business strategy? How does the firm translate that appetite into a tangible quantitative metric?***

CONFIDENTIAL AND PROPRIETARY.

8. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# Operational Risk

---

*Definition & Categorization: What is being assessed?*

*How does the ORM function of the institution define operational risk? Is this definition consistent across business lines? What educational programs are in place to ensure this consistency of understanding?*

*What is the process that the institution employs to understand and analyse its operational risks? How does it differentiate between cause, event and impact (or effect) of the loss event?*

*What are the different components of operational risk that the institution has categorized as material to the ORM process? How does this map in with the cause, event and impact process that is employed by the institution? Is there a clear mapping of Legal/Compliance and Reputational risks?*

*Does the ORM function of the institution have a well defined process for prioritizing the components of OR? Is there a cost benefit analysis (CBA) in prioritizing both external and internal events?*

CONFIDENTIAL AND PROPRIETARY.

9. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# Market Risk

---

*Trading: What is being assessed?*

*How is the market risk tolerance for the firm established? Is it consistent with the business strategy? Is there a well defined process for the approval of new products?*

*How do risk limits get assigned? Who assigns them? At what levels are the limits set? (e.g. Region, Desk, Book, Portfolio, Trader). What type of limits are used? Who has the authority to grant exceptions?*

*Do pricing models exist for all transactions? How are complex transactions valued? How frequently are models reviewed? How is CPY credit exposure as it relates to the trading book calculated? Are credit derivatives integrated into the exposure measurements? How are stress tests constructed? How frequently is stress testing conducted and revised? Can adhoc/"what-if" scenarios be run through the daily process if required?*

CONFIDENTIAL AND PROPRIETARY.

10. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

## Credit Risk

---

*Underwriting Process and Portfolio Management: What is being assessed?*

*Clarity of underwriting policies and the process for establishing the relative risk appetite. What is the degree of segregation between origination and underwriting staff/processes? What are the criteria and internal approval structures that the institution has adopted in the delegation of its underwriting processes?*

*What is the structure of on- and off-balance sheet exposures? What is the process for monitoring outstanding exposures for early warning signals of potential problems? What is the level of diversity in the portfolios (by geography, collateral, maturity, borrower type, etc)? What is the tolerance for large exposures to individual names and/or sectors and the process for collections and recoveries?*

CONFIDENTIAL AND PROPRIETARY.

11. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

## Liquidity & Funding Risk

---

*Composition, Management, Stress Testing: What is being assessed?*

*Are there well-established and documented funding policies? Does the institution place a premium on maintaining diverse funding sources (by product, investor type, geography, etc)?*

*How is this managed and monitored? How does the institution monitor and manage its day-to-day funding position? To what extent has it conducted behavioral analysis of its assets and liabilities?*

*How does the institution model the expected impact of a liquidity crunch? How severe/realistic are the liquidity stress scenarios and the net outflows that would result from them? Does the institution maintain sufficient liquidity capacity (liquid assets, secured bank facilities, etc) to raise emergency liquidity?*

CONFIDENTIAL AND PROPRIETARY.

12. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD**  
**POOR'S**  
*Standard & Poor's*

# ERM Evaluation Template and Committee Process

Institution Name		Assessment & Comments			
		1=Weak 2=Adequate 3=Strong 4=Excellent			
<b>Overall ERM Assessment</b>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>A.</b>	<b>Risk Governance</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Risk Culture</i> <i>Risk Appetite</i> <i>Risk Quantification/aggregation</i> <i>Risk Reporting and Disclosure</i>					
<b>B.</b>	<b>Market Risk</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Trading</i> <i>ALM</i>					
<b>C.</b>	<b>Credit Risk</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Underwriting Processes</i> <i>Portfolio Management</i> <i>Credit Risk Analytics/Modeling</i> <i>Reserving &amp; Risk Mitigation Policies</i>					
<b>D.</b>	<b>Operational Risk</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Definition</i> <i>Measurement</i> <i>Managing &amp; Reporting</i> <i>B/O Infrastructure &amp; Operations</i>					
<b>E.</b>	<b>Funding &amp; Liquidity Risk</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Funding Composition</i> <i>Day-to-day Liquidity Management</i> <i>Liquidity Stress Testing</i>					

CONFIDENTIAL AND PROPRIETARY.

13. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# ERM Quality Classifications

<p><i>Excellent</i></p>	<ul style="list-style-type: none"> <li>▪ Advanced capabilities to identify, measure, manage all risk exposures within tolerances</li> <li>▪ Advanced implementation, development and execution of ERM parameters</li> <li>▪ Consistently optimizes risk adjusted returns throughout the organization</li> </ul>
<p><i>Strong</i></p>	<ul style="list-style-type: none"> <li>▪ Clear vision of risk tolerance and overall risk profile</li> <li>▪ Risk Control exceeds adequate for most major risks</li> <li>▪ Has robust processes to identify and prepare for emerging risks</li> <li>▪ Incorporates risk management and decision making to optimize risk adjusted returns</li> </ul>
<p><i>Adequate</i></p>	<ul style="list-style-type: none"> <li>▪ Has fully functioning control systems in place for all of their major risks</li> <li>▪ May lack a robust process for identifying and preparing for emerging risks</li> <li>▪ Performing good classical "silo" based risk management</li> <li>▪ Not fully developed process to optimize risk adjusted returns</li> </ul>
<p><i>Weak</i></p>	<ul style="list-style-type: none"> <li>▪ Incomplete control process for one or more major risks</li> <li>▪ Inconsistent or limited capabilities to identify, measure or manage major risk exposures</li> </ul>

CONFIDENTIAL AND PROPRIETARY.

## Ok, How Does This Impact Ratings?

---

***If an institution falls short of, or exceeds, expectations, would it warrant a downgrade or an upgrade?***

***If there are material weaknesses or significant strengths sure, it could impact rating! If ERM is stellar, it may change our view of management in general and push us towards an upgrade.***

CONFIDENTIAL AND PROPRIETARY.

15. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**

# Assessing ERM Practices at Financial Institutions

---

*Q&A?*

[www.erm.standardandpoors.com](http://www.erm.standardandpoors.com)

CONFIDENTIAL AND PROPRIETARY.

16. Permission to reprint or distribute any content from this presentation requires the written approval of Standard & Poor's.

**STANDARD  
& POOR'S**