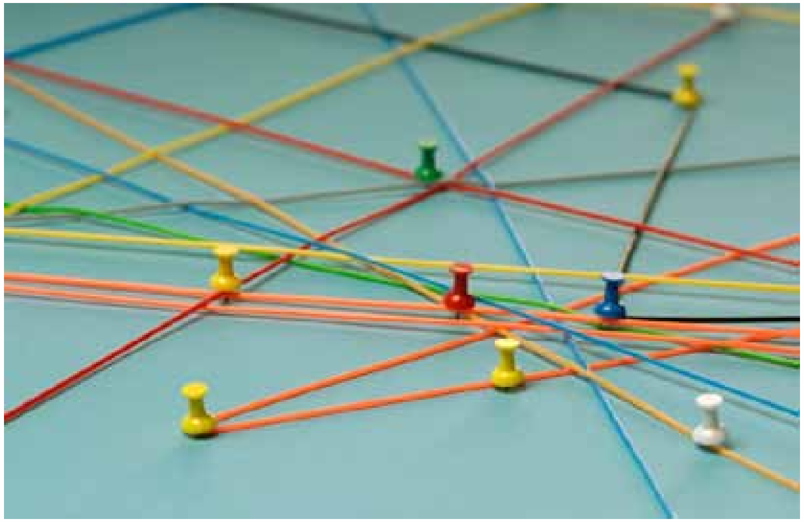
Managing Risk in the New World – Post Financial Crisis



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Chief Pricing Actuary, Life Asia

Munich RE

Agenda…

q **Lessons from the Global Financial Crisis (GFC)**

§ major 10 Lessons …

§ some others also relevant to the insurance industry

q **Enterprise Risk Management (ERM) & the GFC**

§identification, quantification and management of the major risks that an insurance company is exposed.

q **Risk Tools & References**

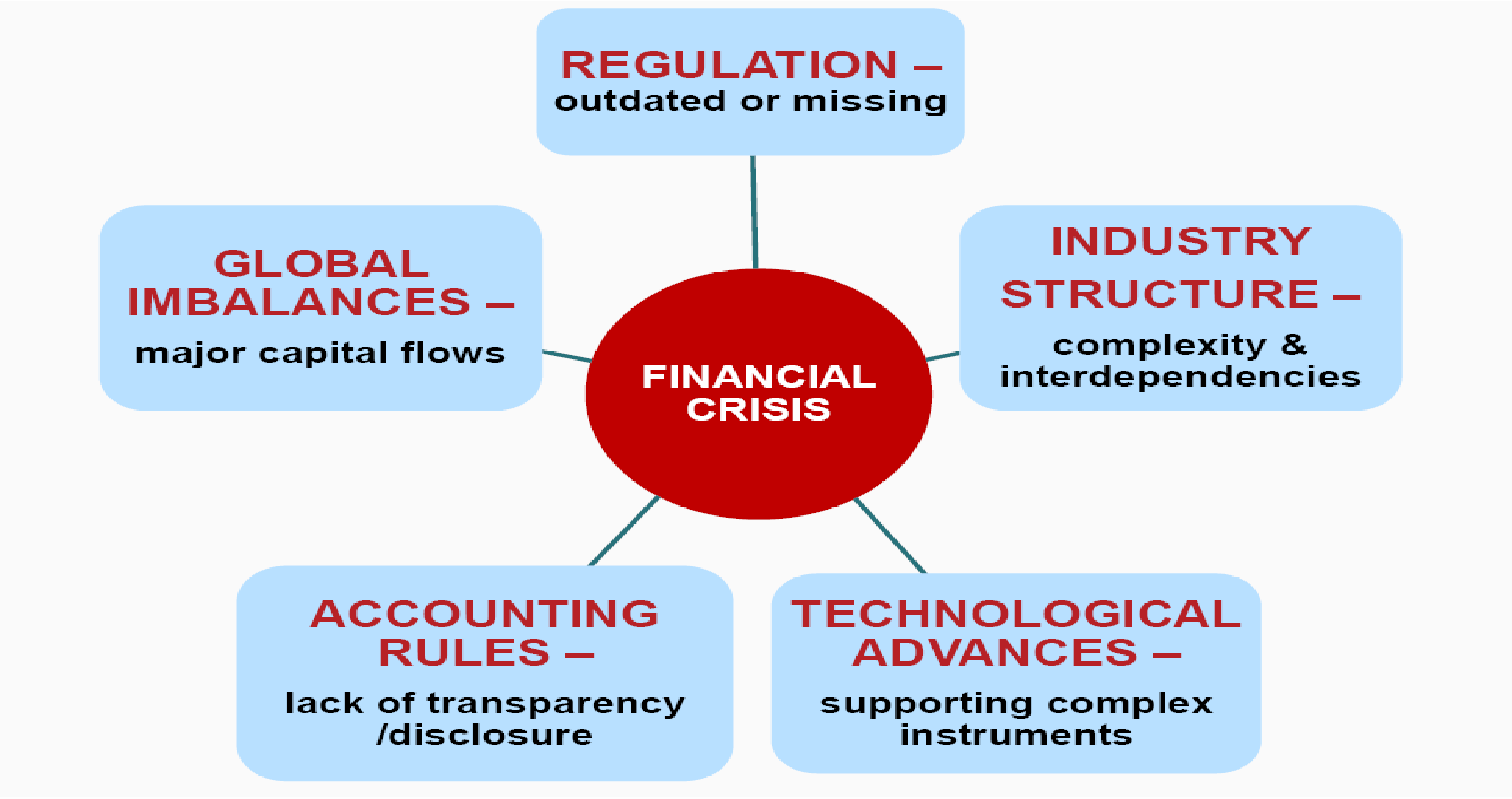
§SoA CERA perspective

Abstract

*The aim of this presentation will be to give a **framework** for the management of risk in the post financial crisis world. The talk will highlight **lessons** learnt from the financial crisis on issues such as systemic risk, etc. The presentation will attempt to summarize the **identification, quantification** and **management** of the major risks that an insurance company is exposed. The presentation will also try and synthesize the various **tools**, **topics** and **references** that risk managers of the future will need to be familiar with to effectively manage risks in an increasingly complex environment.*

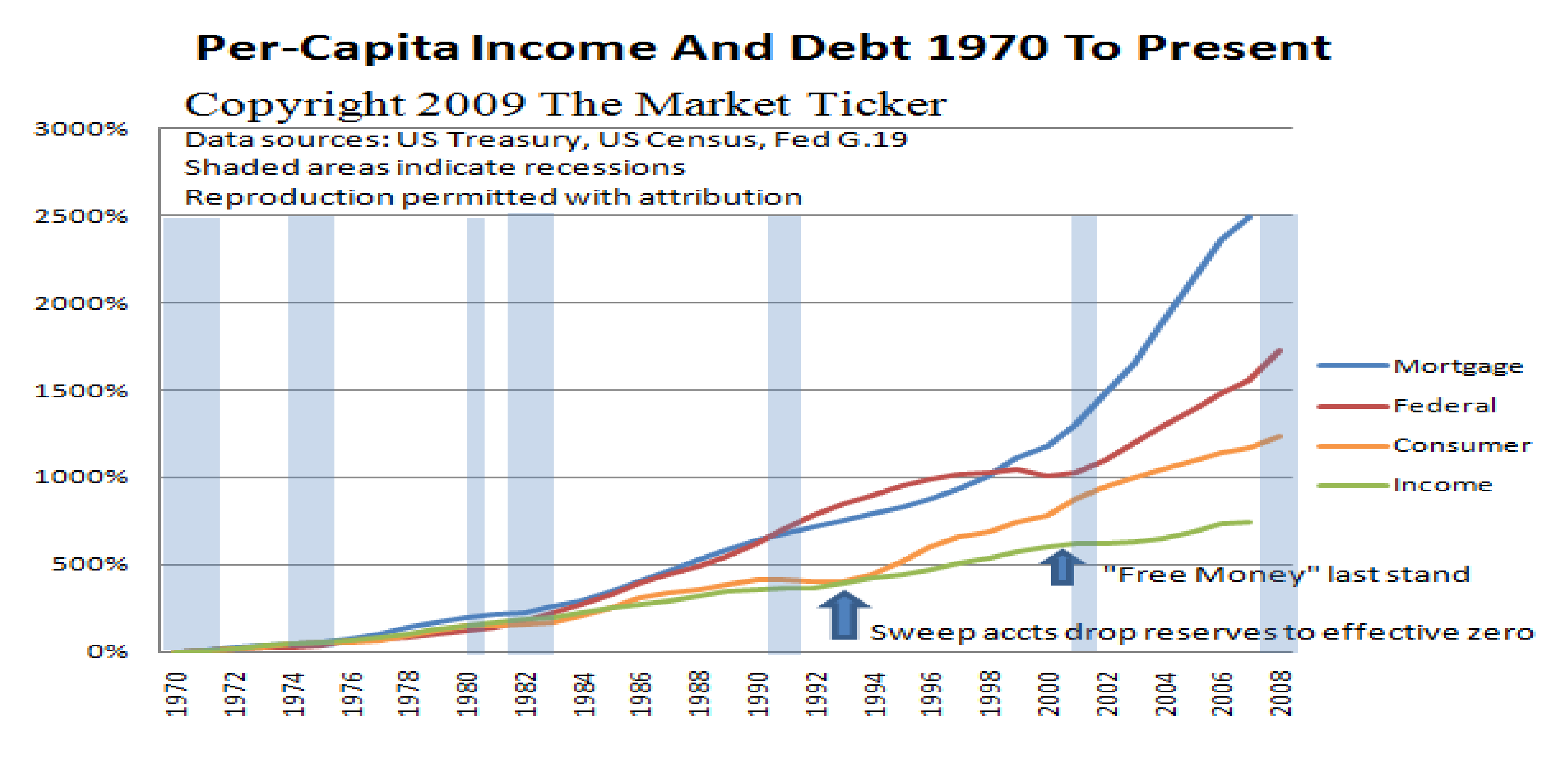
Lesson #1 – *Monitor* the Market Environment

prior to GFC constellation...



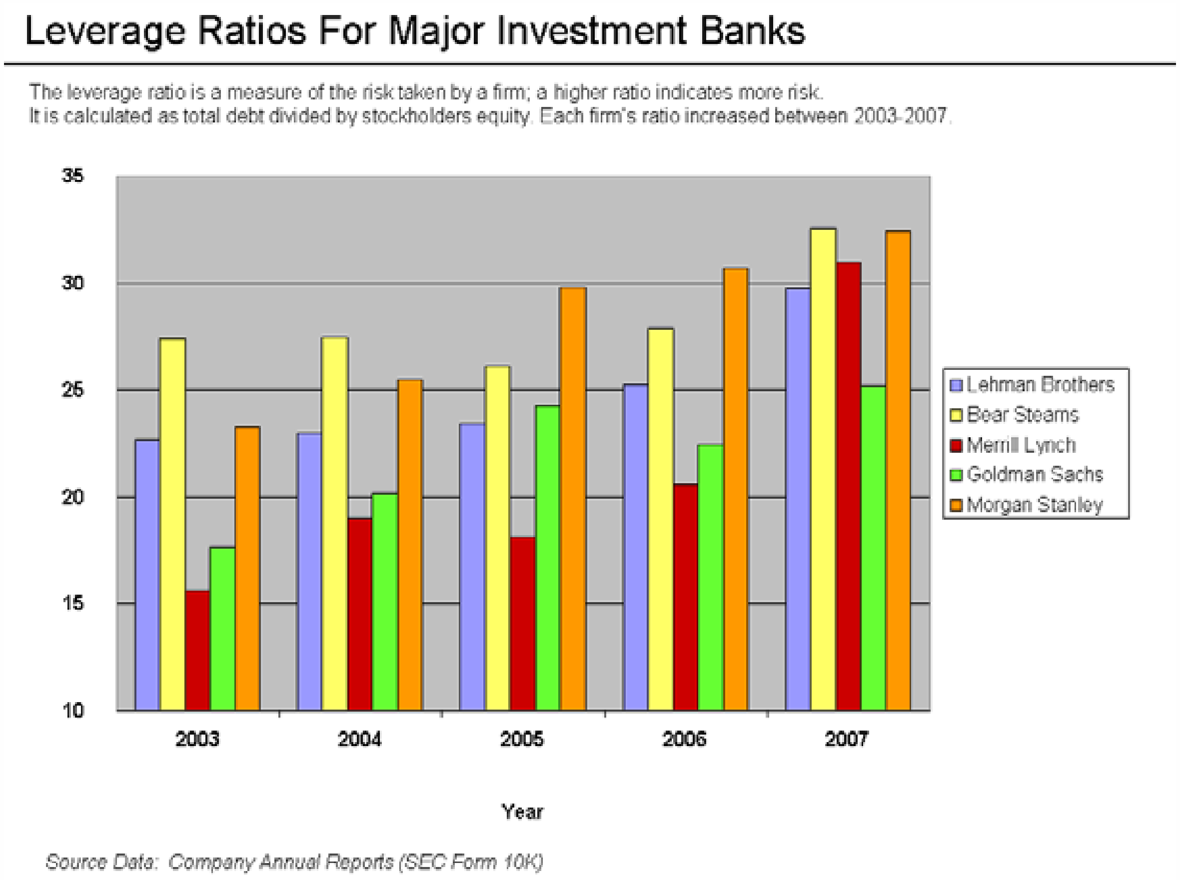
Lesson #2 – *Look* at Leverage

early indicator of risk...



Lesson #2 – *Look* at Leverage

early indicator of risk...



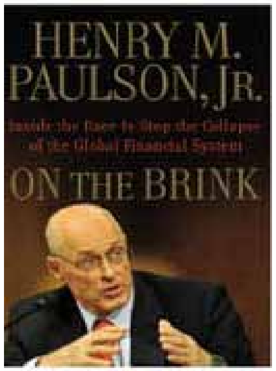
Date (2008)	Bank	Status
7-Sep	Fannie Mae	Nationalised
7-Sep	Freddie Mac	Nationalised
15-Sep	Lehman Bros	Collapsed
15-Sep	Merrill Lynch	Taken over
16-Sep	AIG	Part-nationalised
17-Sep	HBOS	Taken over
25-Sep	WaMu	Collapsed and sold
28-Sep	Fortis	Nationalised
29-Sep	Bradford & Bingley	Nationalised
29-Sep	Wachovia	Taken over
29-Sep	Glitnir	Nationalised
6-Oct	Hypo Real Estate	Rescue package
13-Oct	RBS	Part-nationalised
13-Oct	Lloyds TSB	Part-nationalised

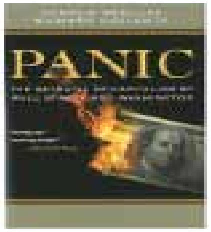
What are the Experts Saying...

excerpts from recent books on GFC...

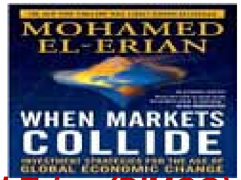
Paulson (former US Treasury Secretary):

1. The structural **economic imbalances** among the major economies of the world that led to massive cross-border capital flows are an important source of the justly criticized excesses in our financial system
2. Our **regulatory system** remains a hopelessly outmoded patchwork quilt built for another day & age
3. The financial system contained too much **leverage**, as evidenced by inadequate cushions of capital & liquidity. Much of the leverage was embedded in largely opaque & highly complex financial products.
4. The largest financial institutions are so **big** and **complex** that they pose a dangerously large risk.





Andrew Redleaf



El Erian (PIMCO)

Lessons from GFC

Lesson #3 – *Crumbling* of Capital During a Crisis

capital has been depleted…

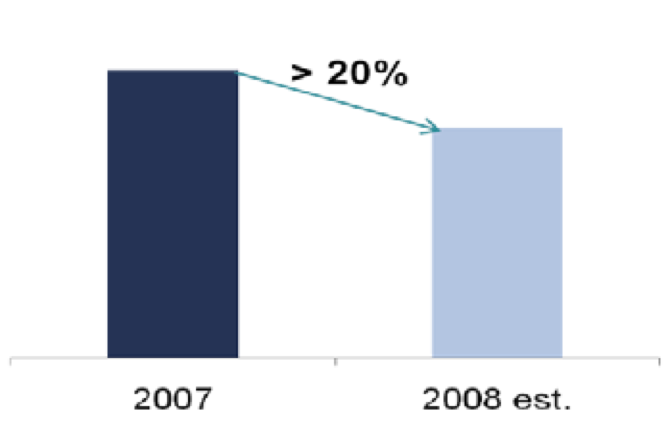
1. **Stock market** crashed
   - q Asset value dropped
   - q Liability increased (VA)
   - q EV decreased
2. **Corporate bond** spread increased
   - q Asset value dropped
3. **Volatility** increased
   - q VA can no longer be hedged at reasonable cost
   - q Reserve for VA increased
4. Yield on **risk free** assets drops
   - q Statutory reserve increases

Lesson #3 – *Crumbling* of Capital During a Crisis

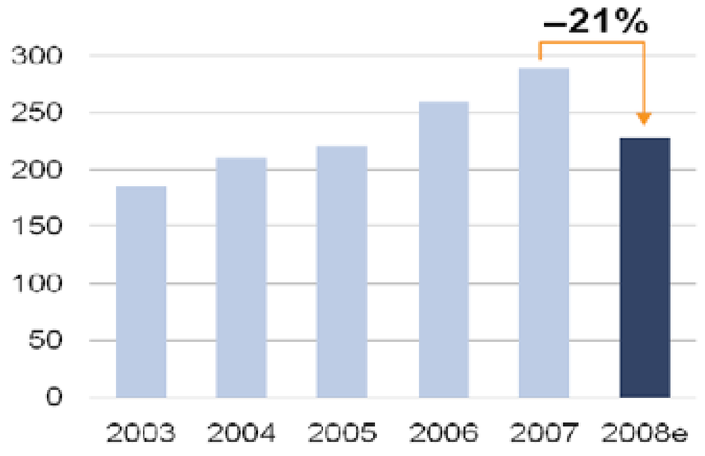
capital has been depleted…

Insurance sector capitalization (Accounting view)

Reduction in primary insurers capital[1]



Shareholders' equity of reinsurers is declining for the first time in years (year-end[2] US$ bn)



Main reasons for worsened capital situation of insurers:

- Realized and unrealized investment losses (responsible for ca. 90% of the capital reduction)
- Hurricanes Ike and Gustav (responsible for around 10% of the decline)
- Even more dramatic on an economic capital basis

[1] Aon Benfield estimate and Munich Re research, based on a sample of large global insurers w/o AIG

[2] Munich Re: Data 2003–07 based on financial reports of 35 global reinsurance companies (incl. some primary insurance business); 2008 estimate based on external assessments of the biggest 15 companies as at February 2009; development influenced by exchange rate effects. 8

Lesson #3 – *Crumbling* of Capital During a Crisis

actions to increase capital…

Reduction of capital requirements / Increase available capital:

Assets: **Reduce Required Capital**: De-risk	**Re-allocations within investment portfolios** ▪ Sale of participations ▪ Reduction of equity ratio
Liabilities: **Reduce Required Capital**: De-risk **Reduce Liabilities**	**Reduce business volume** ▪ Reduction of, or exit capital intensive lines of business **Restructure products & their management** ▪ Reduce product &/or mismatch risk, hedge **Risk transfer mechanisms** ▪ Reinsurance

Increase Capital	**Capital structure**
	▪ Increase equity, hybrids, subordinated debt – but expensive
	▪ Increase income
	▪ Life Insurers are EV rich but statutory capital poor
	  ▪ Reinsurance
	  ▪ Sale of blocks/companies

Lesson #4 – *Lack* of Liquidity During a Crisis

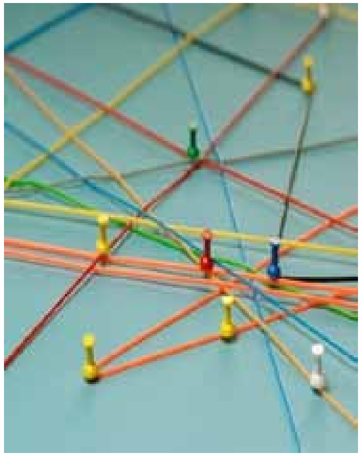
distinct from risk to capital adequacy…

- Liquidity risk is measure of probability that company's **cash resources** will be insufficient to meet current or future cash needs
- Valuable **capital assets** can become illiquid. Hence holding sufficient capital does not guarantee liquidity.
- During the GFC liquidity **disappeared** on most assets – cash became king
- Liquidity risk of **insurers** is fundamentally **different** from that of banks – due to long term funding; surrender penalties, etc.
- Liquidity risk management to rely on **scenario** testing
- **Run on the bank** type scenarios can occur…

Lesson #5 – *Sensitized* to Systemic Risk

also relevant for the insurance industry…

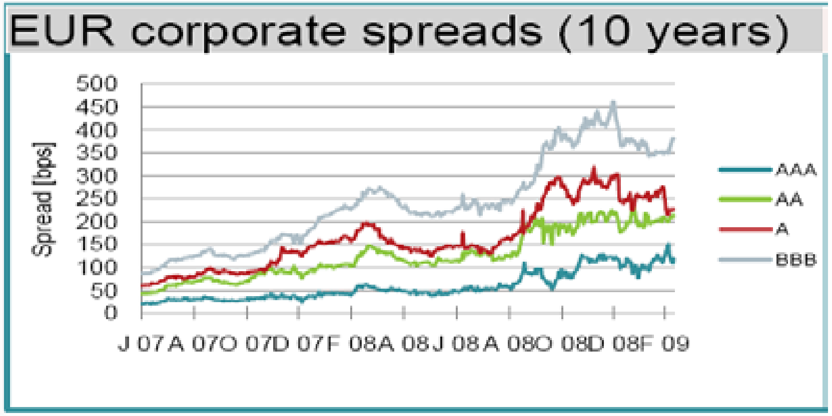
- Not a well-defined concept. Broadly defined as the risk of an event that would cause the **collapse of a market or financial system** (as opposed to the collapse of a single entity)
- Recent **regulatory** focus due to financial crisis
- Systemic risk **lower** compared to **banking** - fewer counterparties, nature of risks different; etc.
- But could emerge in :
  - **credit** or **market** risks
  - **insurance risks** - pandemics, catastrophes, longevity risk
- Risk management:
  - **non-systemic risk** – handled through diversification & risk capital
  - **systemic risk** – e.g. VA's – handled through hedging & securitization



Lesson #6 – *Consider Carefully* Counterparty Credit Risk

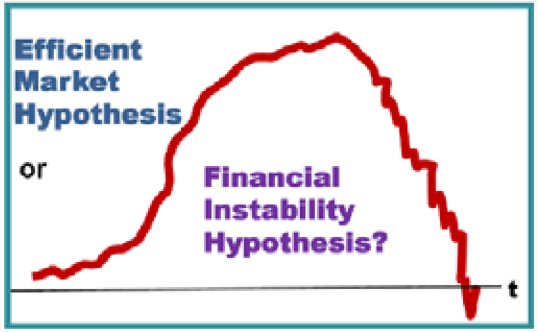
actuaries need to become more familiar with…

- Increased credit risk during GFC reflected in widening of **corporate spreads** & higher **CDS rates**
- **CDS** more dynamic versus **Ratings**
- Credit risk is **systemic**
- Need to understand **legal** framework & in particular **bankruptcy** procedures
- **Pricing & valuations** of insurance contracts need to consider:
  - default probabilities into cashflows
  - credit value at risk in capital amounts
  - shock lapses scenarios
- CDS market became very large & was **unregulated**…



Lesson #7 – *Tracing* the New Financial Theory
is the EMH still relevant?

- **Efficient Market Hypothesis (EMH)**
  - given us - **diversification**; alpha; etc.
  - based on numerous **assumptions** (e.g. rational behavior, symmetrical information, etc.)
  - Attacked by **critics** after GFC
- Alternative theories:
  - **Behavioral Finance** – application of psychology to finance
  - **Game Theory** – techniques have allowed insights into a number of empirical phenomena
  - **Adaptive Markets Hypothesis (AMH)** – reconciles market efficiency with behavioral alternatives by applying the principles of evolution, competition, adaptation, and natural selection to financial interactions.



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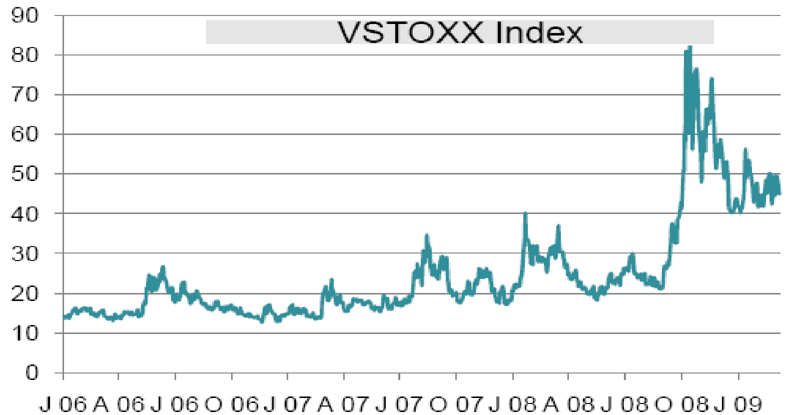
Lesson #8 – *Mindful* of Financial Models

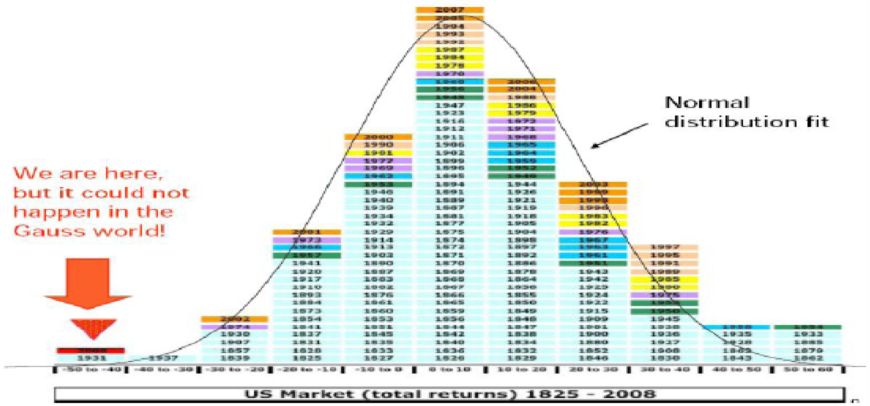
over-reliance on models - need to apply common sense & judgement…

Constant Variance Models – vs. RSLN; ARCH & GARCH time series models



Normal Distribution vs. Fat Tails; Extreme Value Theory

Extreme Value Theory; Fat Tails; etc.



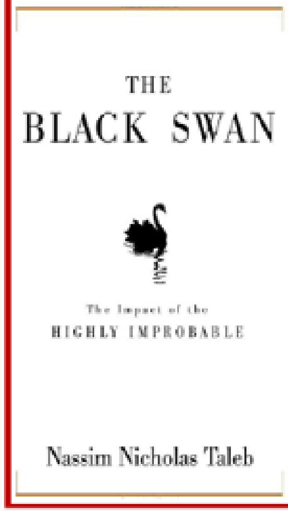
1952	Mean Variance	Markowitz
1958	Indifference Theory	Modigliani & Miller
1960's	Capital Asset Pricing Model (CAPM)	Sharpe
1973	Options-Pricing Model	Black, Scholes & Merton
1976	Arbitrage Pricing Theory	Ross
1979	Binomial Option Pricing Model	Cox
1980's	ARCH Time Series	Engle & Granger
1990's	Dynamic Hedging	Hull, *et al*
2000	Regime-Switching Lognormal (RSLN)	Hardy

Source: Harvard Business Review, September 2008: "The New Arsenal of Risk Management" modified (red indicates Nobel Prize winning topics)

Lesson #9 – *Beware* of the Black Swans

still many unknowns…

- Black Swans – the "**unknown unknowns**"
- **Data risk** – is the past a good guide to the future – very relevant to actuaries
- The (6) **Mistakes** Executives Make in Risk Management (*Taleb, et al*):
  1. we think we can manage risk by predicting extreme events – need to insure/hedge against them
  2. we are convinced that studying the past will help us manage risk – predicting major changes is difficult; etc.
- Risk management techniques are relatively **new** & we're still learning…look for **signs…**



"the absence of evidence

is not

an evidence of absence"

Additional References

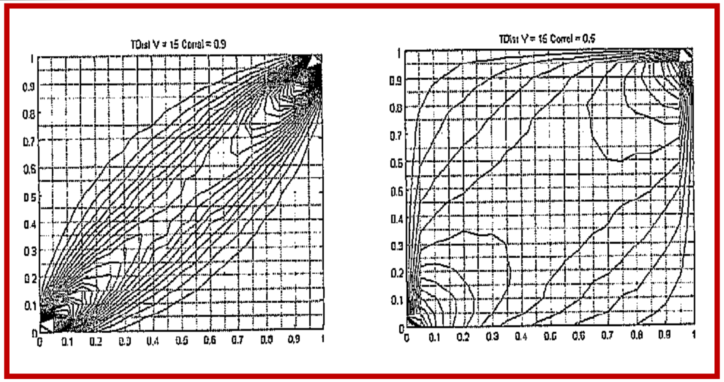
- **"Black Monday and Black Swans," J. Bogle, Financial Analysts Journal, 64:2(30-40) 2008.**
- **"The 6 Mistakes Executives Make in Risk Management", N. Taleb *et al*, Harvard Business Review, October 2009;**

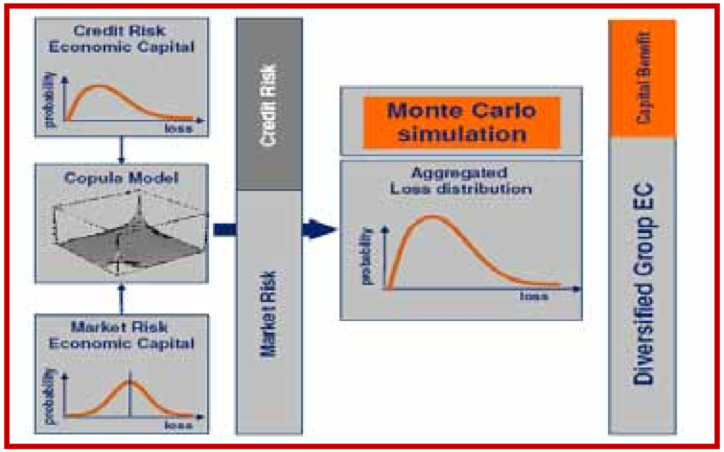
Lessons from GFC

Lesson #10 – *Careful* of Contagion & Tail Correlation

many interdependencies…

- When risks are **uncorrelated**, sufficient diversification drives volatility towards zero
- When risks are **correlated**, no amount of diversification will eliminate risk
- In Life Insurance - **deaths** are fairly **uncorrelated**
- **Business risks** are usually **correlated** e.g. credit risk is systemic
- **Interdependency** & correlation of risks is complicated – especially in the tail e.g. credit & market risk
- Can use sophisticated techniques like **Copulas** to model some of the non-linear dependencies – but still have modeling risk





Source: DFine Consulting

Summary: 10 Lessons from the GFC…

- **Lesson #1 – *Monitor* the Market Environment**
- **Lesson #2 – *Look* at Leverage**
- **Lesson #3 – *Crumbling* of Capital During a Crisis**
- **Lesson #4 – *Lack* of Liquidity During a Crisis**
- **Lesson #5 – *Sensitized* to Systemic Risk**
- **Lesson #6 – *Consider Carefully* Counterparty Credit Risk**
- **Lesson #7 – *Tracing* the New Financial Theory**
- **Lesson #8 – *Mindful* of Financial Models**
- **Lesson #9 – *Beware* of the Black Swans**
- **Lesson #10 – *Careful* of Contagion & Tail Correlation**

Other Lessons from GFC - for the Insurance Industry

- **Moral Hazard**
  - securitization
  - government
- **Policyholder Behavior**
  - difficult to model
  - restore public confidence & trust
- **Information Asymmetry**
  - need to underwrite
- **Alignment of Interests**
  - incentives of management to take risks - agency costs
  - broker mis-selling
  - avoid greed, fear & complacency!
- **Product Complexity**
  - complexity vs simplicity & transparency.
  - embedded options & guarantees - sensitized

Implications of Financial Crisis – according to CRO Forum

Integrated risk governance	• Sound and comprehensive internal risk governance • Risk management needs to be preemptive, independent and empowered • Clearly articulating and monitoring the company's risk tolerance • Compensation should be based on risk-adjusted performance
Risk models	• Indispensable tools for variety of reasons, increasingly used for regulatory purposes • But they can never be a substitute for common sense • Require regular improvement in the light of experience and need the complement of sound management judgment to be effective
Liquidity risk manage-ment	• Liquidity risk distinct from risk to capital adequacy • Liquidity risk management to rely on scenario testing • Liquidity risk of insurers is fundamentally different from that of banks
Valuation and risk disclosure	• Renewed market confidence requires accurate valuation and the prompt disclosure • Market-consistent valuation of both assets and liabilities should become the principle that underpins financial information and prudential oversight in insurance • Rating agencies should be brought under supervision • Use of ratings in financial regulation should be curtailed
Group supervision	• Crisis emphasizes the need for international cooperation among regulators • Principle and economic risk-based approach for the supervision of groups needed • Efforts of the IAIS should be strengthened by introducing binding standards that would accelerate regulatory convergence

Source: CRO Forum, April 2009

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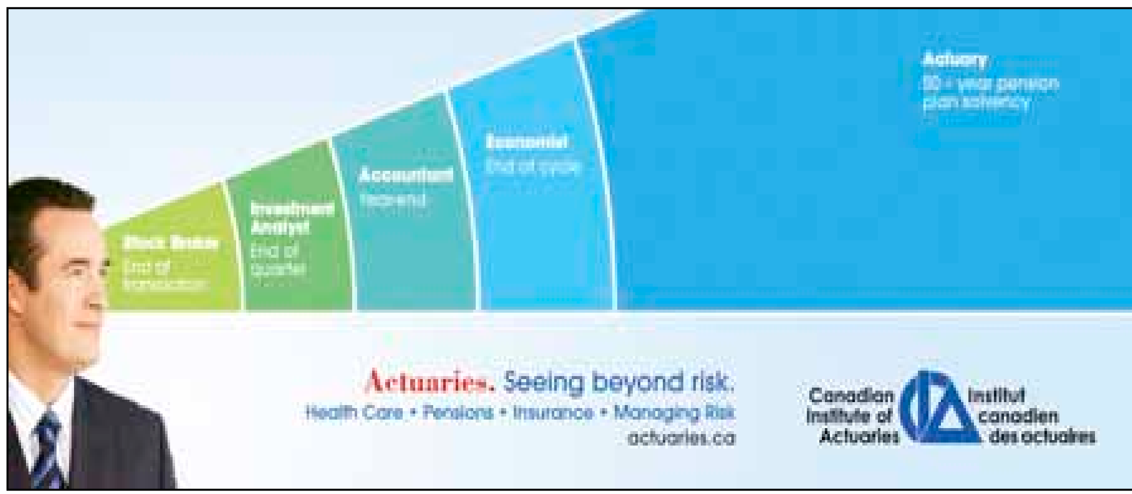
The Evolution of the Actuarial Profession...

The Evolution of the Actuary	Emergence	Description	Time to Emerge
Actuary of the 1st kind	17th century	**life insurance** actuaries using deterministic methods	
Actuary of the 2nd kind	20th century	**casualty** actuaries using probabilistic methods	250
Actuary of the 3rd kind	1980's	**investment** actauries applying financial economics (Bühlmann)	70
Actuary of the 4th kind	current	actuaries working in **ERM** (Embrechts)	25

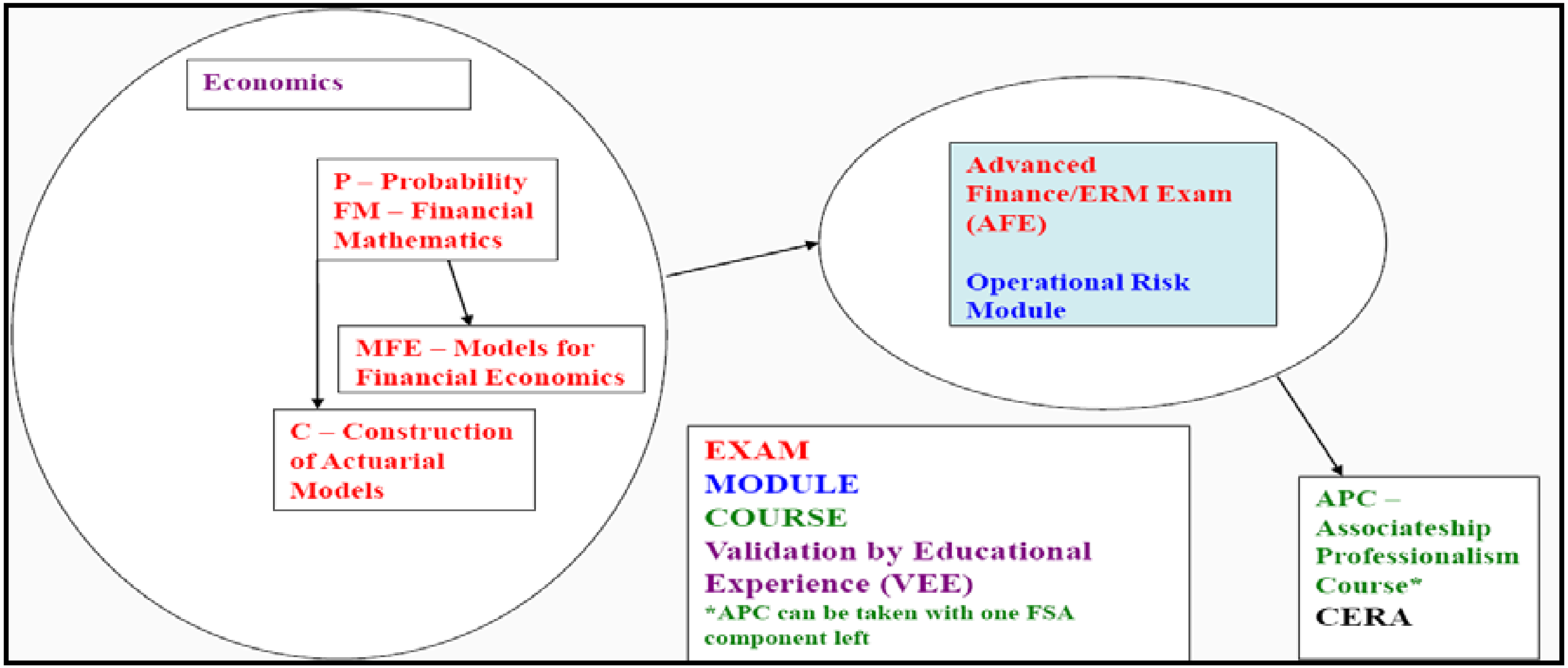
Source: Stephen P. D'Archy, CAS Presidential Address, 2005

SoA tagline: "Risk is Opportunity"
(www.imageoftheactuary.org)

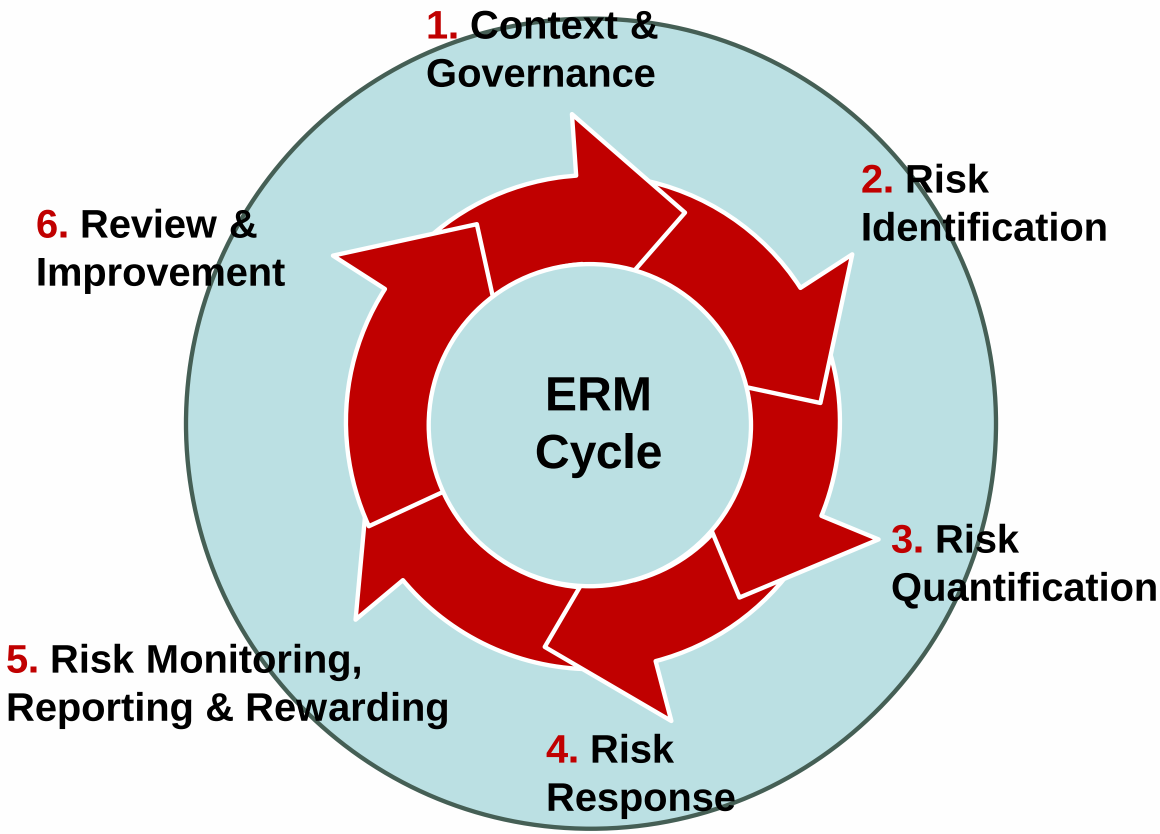


CERA Curriculum – a Subset of the FSA

- Chartered Enterprise Risk Analyst (CERA) – relatively new credential from the SoA
- approximately **3-4 years** to obtain the CERA credential
- includes **actuarial science**, **ERM principles** and **professionalism**:

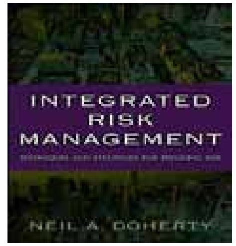


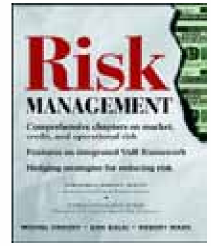
The ERM Cycle



ERM & GFC

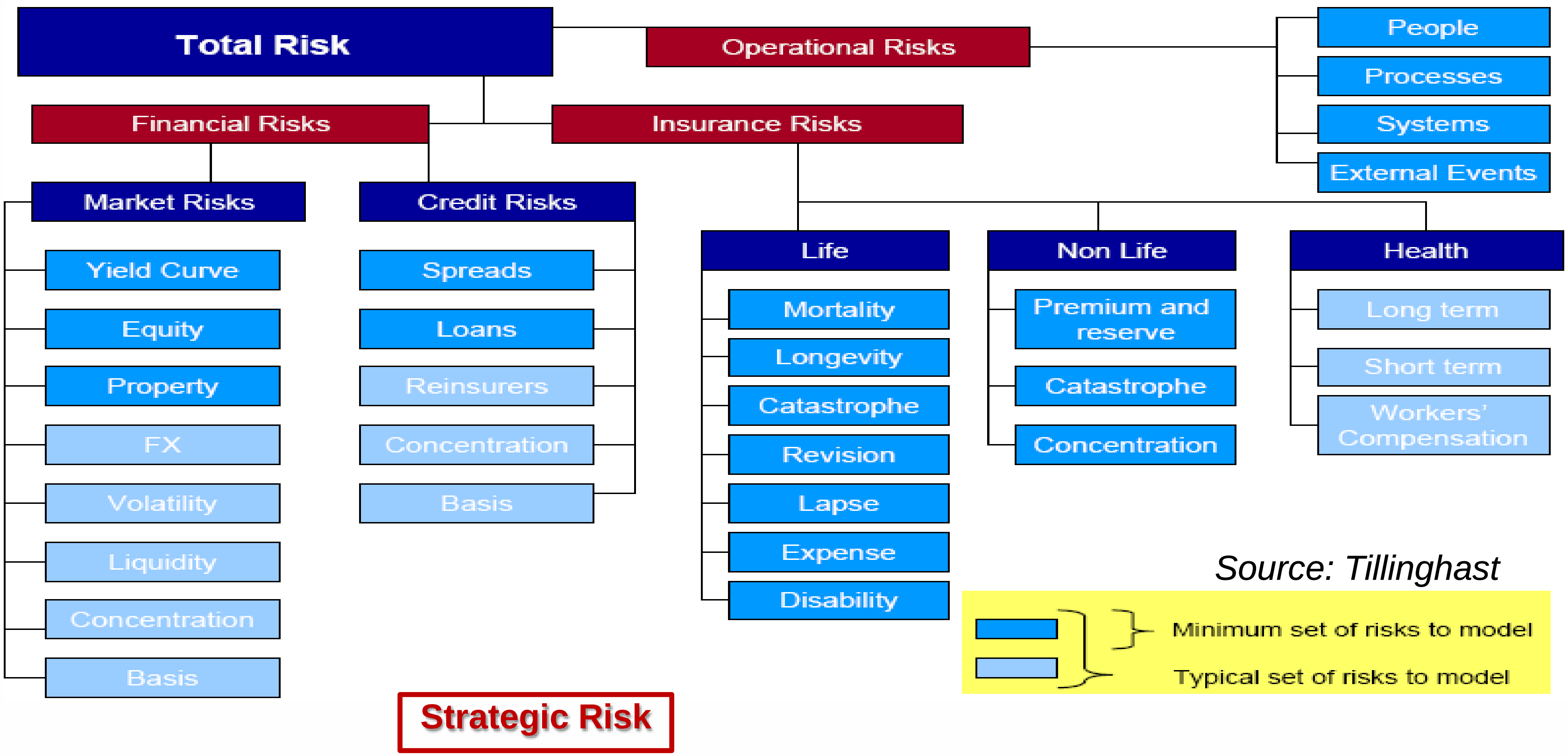
ERM References…





1. Risk Context & Governance ***(AFE References)***	**ERM Risk Strategy**	- Doherty, Integrated Risk Management, Ch. 1, The Convergence of Insurance Risk Management & Financial Risk Management Ch. 7, Why Is Risk Costly to a Firm? Ch. 8, Risk Management Strategy: Duality and Globality - Moody's: No Assurance of Good Governance: Observations on Corporate Governance in the U.S. Insurance Sector
	Enterprise Risk Management Framework	- SoA: Enterprise Risk Management Specialty Guide, 2006 - Crouhy, Galai, & Mark, Risk Management, 2001, Ch. 3, Structuring and Managing the Risk Management Function in a Bank - SoA: Dynamic Financial Condition Analysis Handbook, Ch. 1 (background only), 8 and Appendix A - CAS: Dynamic Financial Models of Property-Casualty Insurers - Wharton: “Risk Measurement, Risk Management and Capital Adequacy in Financial Conglomerates” - Babbel & Fabozzi, Investment Management for Insurers, 1999 - Ch. 1, “Risk Management by Insurers: An Analysis of the Process”,
	ERM Regulatory/Industry Perspective	- Crouhy, Galai, & Mark, Risk Management, 2001, Ch. 2, The New Regulatory and Corporate Environment” Ch. 3, Structuring and Managing the Risk Management Function in a Bank Ch. 17, Risk Management in the Future - UK: Internal Control – Guidance for Directors on the Combined Code - Basel: Principles for the Management of Interest Rate Risk - OSFI (Canadian): Supervisory Framework – 1999 and Beyond - COSO: ERM Integrated Framework - SoA: “Actuarial Aspects of SOX 404”, The Financial Reporter, Dec. 2004 - SoA: “Responsibilities of the Actuary for Communicating Sarbanes-Oxley Controls” The Financial Reporter
	ERM Rating Agency Perspective	- S&P: Insurance Criteria: Refining the Focus of Insurer Enterprise Risk Management Criteria - Best Rating: Risk Management and the Rating Process for Insurance Companies, January 2008. - Moody’s Looks at Risk Management and the New Life Insurance Risks

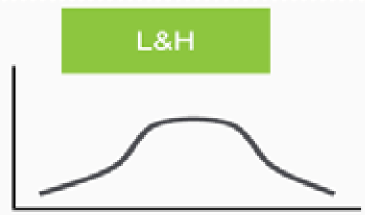
ERM Step #2: Risk Identification – The Risk Landscape…

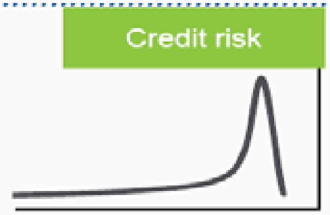


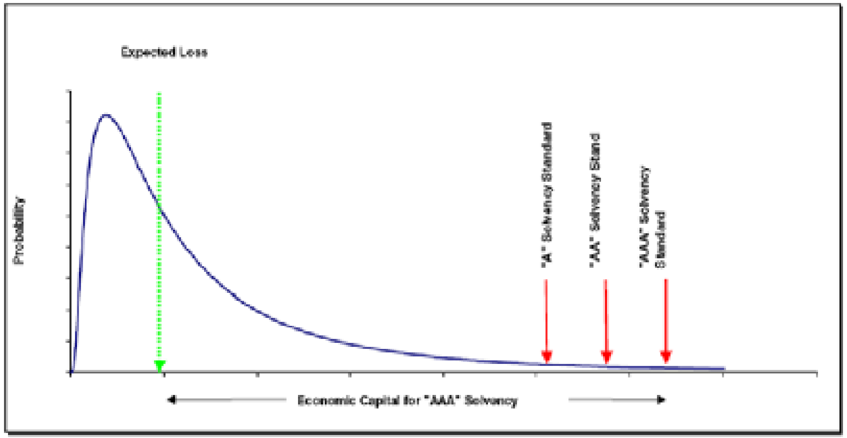
2. ERM Risk Identification *(AFE Reference)*	q AAA: Mapping of Life Insurance Risks, Report to NAIC

ERM Step #3: Risk Quantification…

- key modern technique is **E**conomic **R**isk **C**apital (**ERC**)
- using **VaR**; **CTE**; etc, techniques
- increasingly **stochastic** modeling but also scenarios & factors
- VaR is well established for financial risks (Jorian, etc.)
- one year view sometimes difficult to apply for business with long term **insurance** risks
- Also use "**Greeks**" to quantify risk inherent in hedging platforms







3. ERM Risk Quantification *(AFE References)*	❑ SoA: Economic Capital for Life Insurance Companies, Monograph, 2008 ❑ Artzner: Coherent Risk Measures, NAAJ ❑ Song Zhang: "Risk Aggregation for Capital Requirements Using the Copula Technique", RM Newsletter ❑ CSFB: Credit Portfolio Modeling Handbook – Ch. 4 "Demystifying Copulas" ❑ SoA: "Actuaries, Stochasticity and Risk Management: The Real Lessons of LTCM

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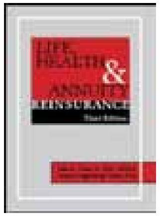

ERM Step #4: Risk Response…

Avoid	not accept the risk - e.g. exit the business
Accept	accept the level of risk and take no further action to minimize it further
Transfer	transfer the risk - e.g. to a reinsurer or the capital markets (securitization)
Mitigate	take action to manage risk through natural hedges or other controls

	Reinsurance	ILS
Credit risk	Will depend on rating of the reinsurer	Cat bonds avoid credit risk to the issuer
Basis risk	None – as reinsurance is based on company's actual portfolio	Significant – as insurer pays own losses but receives payoff on index
Moral Hazard	Primary firm may be lax in uw – reinsurer needs to align interests	Defining ILS on index controls moral hazard
Size & Costs	Could be done for smaller deals & on a less costly basis.	Need to be of a certain size to be economically viable. Costly.
Capacity	Limited capacity	Independent capacity
Price Dependency	Prices may depend on market cycle	Limited dependency on insurance market cycle

4. Risk Response ***(AFE References)***	**Reinsurance**	Tiller, Life, Health and Annuity Reinsurance, 3rd Edition., 2005, Ch. 5, "Advanced Methods of Reinsurance" Ch. 16, "Assumption" Ch. 17, "Special Purpose Reinsurance Companies"
	Securitization	Wharton: Securitization of Life Insurance Assets and Liabilities

ERM Step #5: Risk Reporting & Rewarding…

- ❑ Market Consistent pricing – **risk management** @ point of sale
- ❑ **Explicit** risk capital (CoNHR) & frictional charges
- ❑ Also values **options & guarantees** – optionality.
- ❑ Value added can be used for **value based** management.

VANB = PVFP – CoNHR – PV_TaxCoC – PV_IExpCoC

Allowance for non-hedgeable risks

Cost of non-hedgeable risks

Annual charge	Economic risk capital for non-hedgeable risk × Non-hedgeable risk rate
Cost of non-hedgeable risk	Present value of annual charge discounted at risk-free interest rate

Approach to calculating cost of non-hedgeable risk entirely in line with Munich Re's risk capital model

TaxCoC	Reflects the fact that the investment return on the assets backing RC is subject to taxation twice
IExpCoC	Reflects the expenses related to the investment of the assets backing RC

4. Risk Reorting & Rewarding *(AFE References)*	**Economic Measures**	❑ Stern Stewart: "EVA and Strategy" - ❑ Staple Inn Actuarial Society: "Modern Valuation Techniques," ❑ Babbel: "Fair Value – Financial Economics Perspective", NAAJ ❑ AAA: "Fair Valuation of Insurance Liabilities: Principles and Methods," Monograph ❑ H. Mueller: "An Overview of Embedded Value" , Financial Reporter ❑ Wallace: Performance Measurement Using Transfer Pricing ❑ Crouhy: Ch 14 Capital Alloc. & Performance Measurement ❑ Ho: Total Return Approach to Performance Measuremen ❑ Ho: Risk Mgmt the Total Return Approach ❑ Willis: Maximizing Value
	Accounting Measures	❑ Fridson: Ch. 1-4 & 13 of Financial Statement Anaysis ❑ Tilman: Ch. 24 Acc Stds & Requirements ❑ FASB: Summary of Statement 157 ❑ CIA: Stochastic Techniques Under Canadian GAAP

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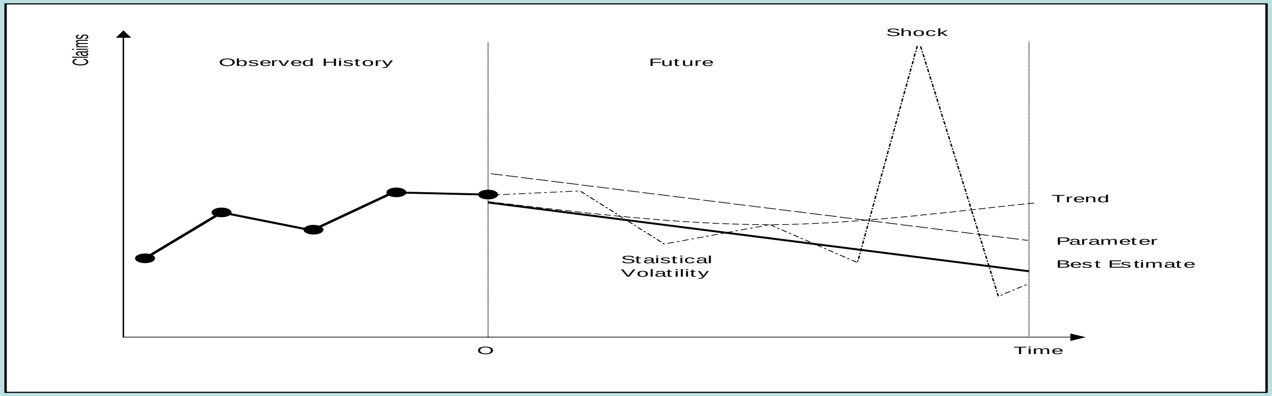
APPENDIX: Insurance Risk References

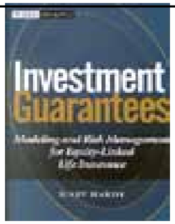
Insurance Risk Identification	Insurance Risk Quantification	Insurance Risk Management
q mortality risk q morbidity risk q lapse risk q product risk, and q embedded options look at components - level, volatility, trend, shock	Economic Capital  	margins capital reinsurance, securitization
References	q Atkinson & Dallas, Life Insurance Products and Finance mortality risk, morbidity risk · FE-C169-09: Ch. 3, Pricing Assumptions · FE-C151-08: Ch. 13 Annuity and Investment Products q Max Rudolph: "Influenza Pandemics: Are We Ready for the Next One", RM section newsletter q SoA: "Death Benefit Focused UL", PD newsletter, April 2003 q Tilman, Asset/Liability Management of Financial Institutions, 2003 Ch. 16 - Understanding Options Embedded in Insurers' Balance Sheets, by L. Rubin	

APPENDIX: Interest Rate Risk References

Interest Rate Risk Identification	Interest Rate Risk Quantification	Interest Rate Risk Management
Interest rate level	Duration; convexity; VaR; CTE; etc.	Treasuries; Hedge - interest rate derivatives; Treasury & Eurodollar options
Yield curve shape	Key rate durations; scenarios; VaR; etc.	Above + structured notes
Volatility	Volatility durations; VaR	Swap-options; caps; floors; etc.
Credit spread	Spread duration; VaR; holding limits	Interest rate swaps; credit default swaps; etc.
AFE References	q Tilman: Asset/Liability Management of Financial Institutions, Ch. 1, The Task of Asset/Liability Management q Briys: Life Insurance Pricing and the Measurement of the Duration of Liabilities (interest rate risk) q Ho: Key Rate Durations: Measures of Interest Rate Risks q SoA: Fixed Annuities in Low Interest Rate Environment", Product Development newsletter, April 2003	q Swiss Re: Asset Liability Management for Insurers q Glacy: Asset/ Liability Management, IASA Handbook q Rubin: Hedging with Derivatives in Traditional Insurance Products q Rubin: Long-Term Economic and Market Trends and Their Implications for Asset-Liability Management of Insurance Companies q Basle: Principles for the Management of Interest Rate Risk q Tilman, Asset/Liability Management of Financial Institutions, 2003 - Ch. 25, Implications of Regulatory and Accounting Requirements for Asset/Liability Management Decisions, by Hida, Habayeb, Yetis, & Sethi.

APPENDIX: Other Market Risk References

Market Risk Identification	Market Risk Quantification	Market Risk Management
Equity - guarantees retained by the company	Betas; VaR; CTE; stress testing	hedge, ALM - Equity derivatives dynamic hedging
Commodity	Notional exposures; VaR; stress testing	Commodity futures & options
Foreign exchange	Notional exposures; VaR; stress testing	Forward rate agreements; foreign excahenge options; currency swaps; etc.
Reinvestment	Cash flowprojections; scenario analysis	Forward contracts
AFE References	q Brizeli: Variable Annuity – “No Loss” Propositions q Hardy, Investment Guarantees, 2003 (equity risk) Ch.1, Investment Guarantees, Ch. 6, Modeling the Guarantee Liability Ch. 8, "Dynamic Hedging" Ch.9, “Risk Measures” Ch.10, “Emerging Cost Analysis” Ch.11, “Forecast Uncertainty” Ch.11, “Guaranteed Annuity Options” q SoA: “Managing Variable Policyholder Behavior Risk”, PD newsletter, March 2005 q SoA: “Whither the Variable Annuity”, PD newsletter, November 2003 q Crouhy, Galai, & Mark, Risk Management, 2001 Ch.5, “Measuring Market Risk: The VaR Approach Ch.6, “Measuring Market Risk: Extensions of the VaR Approach q Moody's: Hedging the Bet, Variable Annuity Bells and Whistles. q Evans: Variable Product Hedging Practical Considerations	



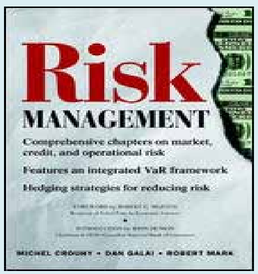
APPENDIX: Credit Risk References

Credit Risk Identification	Credit Risk Quantification	Credit Risk Management
Credit spreads	Spread duration; VaR; CreditMetrics	interest rate swaps; credit default swaps; total return swaps
Default risk	Credit ratings; KMV	credit default swaps; structured products; Ratings; capital
Counter-party risk **Receivables**	Credit limits default probabilities	credit derivatives, diversification, concentration limits, and credit support agreements. due diligence and aggregate counter-party exposure limits.
References	q Crouhy, Galai, & Mark, Risk Management, 2001 Ch. 7, Credit Rating Systems Ch. 8, Credit Migration Approach to Measuring Credit Risk Ch. 9, The Contingent Claim Approach to Measuring Credit Risk Ch. 10, Other Approaches: The Actuarial and Reduced-Form Approaches to Measuring Credit Risk Ch. 12, Hedging Credit Risk q Tilman, Asset/Liability Management of Financial Institutions, 2003 - Ch. 9, “Measuring and Marking q CSFB Credit Portfolio Modeling Handbook – Ch. 2, "The Default No Default World and Factor Models" q CSFB Credit Portfolio Modeling Handbook – Ch. 9 “Risk measures: how long is a risky piece of string?” q Fitch: Role and Function of Rating Agencies in the Operation of Securities q US Senate: Financial Oversight of Enron: The SEC and Private-Sector Watchdogs (pp. 97-127 only) q C. Smithson, Credit Portfolio Management - Ch. 1, The Revolution in Credit – Capital Is the Key	

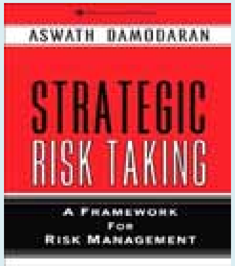
APPENDIX: Liquidity Risk References

Liquidity Risk Identification	Liquidity Risk Quantification	Liquidity Risk Management
Forced selling & margin calls	Stress testing	sizing of liquid versus liiliquid positions
Inability to satisfy liabilities	Scenario analysis	cash flow management
cashflow strain run on the bank hidden callable options	liquidity ratios; scenarios; etc.	diversification surrender charges contract design
AFE References	q Green: General American Life Can't Pay Investors, Looks at Suitors q CIA: "Liquidity Risk Measurement," CIA Educational Note q Brunnermeier: Deciphering the Liquidity and Credit Crunch q SoA: Dynamic Financial Condition Analysis Handbook, Ch. 1 (background only), 8 and Appendix A	

APPENDIX: Operational Risk References

Operational Risk Identification *The risk of direct or indirect loss resulting from inadequate or failed* internal processes, people, systems or from external events…	q Market Conduct (e.g., sales practices) q HR risk, e.g., productivity, talent management, employee conduct q Process risk, e.g., supply chain, R&D q Technology risk, e.g., reliability, external attack, internal attack q Judicial risk, e.g., litigation q Compliance risk, e.g., financial reporting q Internal and External fraud q Execution risk q Governance risk q Supplier/partner risk q Disaster risk, e.g., natural disaster, man-made disaster q MODEL Risk
Operational Risk Quantification	Economic Capital (diificult)
Operational Risk Management	COSO Guidelines SoX …
AFE References 	q Shah: Insurance OP Risk: The Big Unknown q SoA: "Operational and Reputational Risks: Essential Components of ERM", Risk Management, Dec 2006. q SoA: Enterprise Risk Management Specialty Guide, 2006 q Rebonato : "Theory and Practice of Model Risk Management" q Crouhy, Galai, & Mark, Risk Management, 2001 Ch. 13, Mananging Operational Risk Ch. 15, Model Risk q G30: Derivatives: Practice and Principles (pp. 13-24 and 43-52) q Khan: "Why COSO Is Flawed," Jan 2005.

APPENDIX: Strategic Risk References

Strategic Risk Identification *The risk of direct or indirect adverse impact on the operating results or value of the business unit as a result of the strategies not being optimally chosen, implemented or adapted to changing conditions…*	q Product sustainability risk q Distribution sustainability risk q Consumer preferences and demographics q Geopolitical risk q Competitor risk q External relations risk q Legislative/Regulatory risk q Reputation Risk q Sovereign risk
Strategic Risk Quantification	ERC, MCEV, RAROC, IRR, etc.
Strategic Risk Management	Risk Analysis & Quantification Tables
AFE References  	q HBR: "Countering the Biggest Risk of All" by Slywotzky and Drzik, April 2005 q "Moody's Looks at Terrorism Risk in the U. S. Life Insurance Industry," q Damoradan, Strategic Risk-Taking, 2006(?) · Ch. 9, Risk Management: The Big Picture · Ch. 10, Risk Management: Profiling and Hedging · Ch. 11, Strategic Risk Management · Ch. 12, Risk Management: First Principles

Thank you very much for your attention

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