



SOCIETY OF ACTUARIES

**Global Best Practices in ERM for
Insurers and Reinsurers Webcast
December 10 & 11, 2008**

**Session # 1A: Market-Consistent Risk
Management**

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**Moderator
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Global Best Practices in ERM for Insurers and Reinsurers



Session 1A: Market-Consistent Risk Management

Presenters: Hubert B. Mueller, CERA, FSA, MAAA
Dave Ingram, CERA, FRM, PRM

Moderator: Marc Slutzky, FSA, MAAA, CERA



Market-Consistent Risk Management

2008 Global ERM For Insurers and Reinsurers

Webcast

December 10, 2008

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Principal, Towers Perrin

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Overview

- How Market-Consistent Embedded Value (MCEV) differs from Traditional Embedded Value (EV)
- Latest CFO Forum Recommendations
- Link to Economic Capital (EC) / Enterprise Risk Management (ERM)

HOW MCEV DIFFERS FROM TRADITIONAL EV

Recap of Traditional Embedded Value (EV)

- Present value of distributable earnings
 - Underlying concept is dividend discount model
- Components of EV
 - Statutory net assets, plus
 - Present value of future statutory profits from the in-force business, less
 - Cost of required capital
- Widespread adoption in the late 1990s
 - Europe, UK
 - Canada
 - Australia, South Africa
- European Embedded Value (EEV)
 - Principles introduced by CFO Forum in 2004
 - Stochastic valuation of options and guarantees

HOW MCEV DIFFERS FROM TRADITIONAL EV

Traditional EV fails to address three key questions

- What is the correct risk discount rate (RDR)?
- What is the appropriate treatment of embedded financial options and guarantees?
- What is the “cost of capital”?

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HOW MCEV DIFFERS FROM TRADITIONAL EV

What is MCEV?

Market-Consistent Embedded Value (“MCEV”) is a development of traditional EV techniques...

... which attempts to give a more robust answer to the questions:

- How should we set the risk discount rate?
- How should we allow for the cost of financial options and guarantees?
- How should we allow for the cost of holding capital?

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HOW MCEV DIFFERS FROM TRADITIONAL EV

We can think of MCEV in two equivalent ways

MCEV = MCVIF + Net Worth

MV Assets (MVA)

Net Worth

Statutory Liabilities

MCVIF

MCEV

MCEV = MV Assets – MV Liabilities

MV Assets (MVA)

MV Liabilities (MVL)

MVM*

MCEV

* MVM = Market Value Margin

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HOW MCEV DIFFERS FROM TRADITIONAL EV

Several major insurance groups are adopting MCEV as their main internal performance measure

- Insurance cash flows are valued by reference to equivalent traded capital market instruments
 - Options and guarantees (“O&G”) are valued using option pricing techniques
 - High-risk assets are discounted at higher RDRs
- The cost of capital is assessed as the “agency cost”
 - Reflects cost of double taxation and frictional cost of holding capital
- Complex options depending on policyholder behavior are valued using stochastic modeling with risk-neutral scenarios, discounted at the risk-free rate
 - Risk-neutral scenarios are validated by replicating to current market prices of options and futures
 - Stochastic valuation of O&G using risk-neutral scenarios
- RDR varies based on the riskiness of the underlying products
 - Using risk-free rate for some products (e.g. term)

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HOW MCEV DIFFERS FROM TRADITIONAL EV

In an MCEV framework, selecting assets does not create value

Assume that the investor has capital of 20, borrows 80 (at 5% pa) and then invests 100 in equities (with an expected return of 7% pa)

	Day 1	One year on
Assets	100	107
Liabilities	(80)	(84)
Capital	20	23

- The actions of borrowing and investing do not create value on Day 1
- Using traditional EV techniques the 23 might be discounted at, say, 8%. This would give a value of 21.3 on Day 1
- Under MCEV the asset cash flows are discounted at 7% and the liability cash flows at 5%. This would give a value of 20 on Day 1. The effective risk discount rate is 15%

The discount rate is an output of the valuation, not an input

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HOW MCEV DIFFERS FROM TRADITIONAL EV

The risk discount rate needs to reflect each product's or product line's risks

Cash flow known with certainty → Risk free rate

Cash flow is uncertain, but that uncertainty is not systematic → Risk free rate

Where uncertainty is systematic → Additional risk premium

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HOW MCEV DIFFERS FROM TRADITIONAL EV

MCEV in practice

- For cash flows without any embedded options, in practice MCEV means using the certainty equivalent approach
 - All gross earned rates equal the risk discount rate, which equals the gross risk free rate
- For cash flows with certain easily identifiable embedded options, in practice MCEV means using the certainty equivalent approach plus closed form, Black-Scholl type, option valuation formulae
- For everything else it typically means Monte Carlo simulation, using a risk neutral or equivalent Economic Scenario Generator (ESG)
 - Stochastic models must be calibrated to current market conditions

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HOW MCEV DIFFERS FROM TRADITIONAL EV

Under MCEV, the cost of capital (CoC) reflects frictional costs to shareholders

- Frictional tax costs
 - Retaining invested assets in the corporation exposes shareholders to tax on invested income
 - Investment expenses
 - Investment expenses incurred on surplus assets
 - Example:
 - Risk-free rate = 5%
 - Tax rate = 35%
 - Investment expenses = 0.1%
- ➔ $\text{CoC} = (0.05) * (0.35) + (0.001) = 1.85\%$ (each year)

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LATEST CFO FORUM RECOMMENDATIONS

European Insurance CFO Forum Market-Consistent Embedded Value Principles ("MCEV Principles")

- Published June 4 2008
- 17 key Principles
- 145 areas of Guidance
- Commentary on Principles & Guidance (Basis for Conclusions)
- Available from www.cfoforum.nl

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LATEST CFO FORUM RECOMMENDATIONS

The 17 MCEV Principles: main changes from EEV

ILLUSTRATIVE

<ul style="list-style-type: none"> 1. What is MCEV 2. Coverage 3. Allowance for risk 4. Free surplus 5. Required capital 6. Value of in-force 7. Financial options and guarantees 8. Frictional costs 9. Residual non-hedgeable risks 	<ul style="list-style-type: none"> 10. New business and renewals 11. Non-economic assumptions 12. Economic assumptions 13. Market-consistent discounting 14. Reference rates 15. Stochastic models 16. Participating business 17. Disclosure
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Key

■ Little change	■ Some changes	■ New / significant changes
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LATEST CFO FORUM RECOMMENDATIONS

Principle 3 Allowance for risk

MCEV represents the present value of shareholders' interests ... after sufficient allowance for the aggregate risks in the covered business. The allowance for risk should be **calibrated to match the market price** for risk where reliably observable.

- **G3.3** [...] **most insurance liabilities are illiquid and not traded.** As assets are generally traded with an observable market price, **asset cash flows that most closely resemble the insurance cash flows (from the shareholders' perspective) are used.**

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LATEST CFO FORUM RECOMMENDATIONS

Principle 14 Investment Returns And Discount Rates

The *reference rates* used should, wherever possible, be the swap yield curve appropriate to the currency of the cash flows.

- **G14.4** No adjustments should be made to the swap yield curve to allow for liquidity premiums or credit risk premiums.

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LATEST CFO FORUM RECOMMENDATIONS

Principle 15 Stochastic Models

[...] Volatility assumptions should, wherever possible, be based on those **implied from derivative prices** rather than the historical observed volatilities of the underlying instruments.

- **G15.2** The calibration of the model should be based on market values such as equity option implied volatilities, swaption implied volatilities and the initial swap rate curve for market traded contracts that are as similar as possible in nature to the option and guarantees contained within the liabilities.

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LATEST CFO FORUM RECOMMENDATIONS

Summary of CFO Forum MCEV Principles

<p>Key areas of consistency:</p> <ul style="list-style-type: none"> ■ Allowance for market risk ■ Allowance for non-hedgeable risk (NHR) ■ Risk-neutral value of new business ■ Analysis of movement ■ Prescribed sensitivities ■ Other EEV areas that have been tightened 	<p>Areas of potential divergence:</p> <ul style="list-style-type: none"> ■ Approach where no market ■ NHR methodology/disclosures ■ VNB assumptions ■ AoM: expected return ■ Credit spread sensitivity ■ Other EEV areas continuing to allow discretion
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LINK TO ECONOMIC CAPITAL/ERM

MCEV implications for North American products and companies are numerous

- Assets earn swap rate (bad)
- Profits discounted at swap rate (good)
- “Cost of capital” reduces to frictional investment expense and tax costs (good)
- Allowance for non-hedgeable risk (bad)
- MCEV can have significantly different impacts on EV and VNB by company depending on several factors including:
 - Product mix and split of fixed vs. variable/segregated fund business
 - Level of guarantees
 - Amount of asset risk (e.g., credit quality of assets)
- **All companies reporting on an EEV basis need to convert to MCEV by year-end 2009**

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LINK TO ECONOMIC CAPITAL/ERM

MCEV profit margin effects we have observed on typical North American products

- Term insurance
 - Margins increase, as lower discount rate (and lower cost of capital) dominates lower earned rate on assets, and no significant guarantees
 - Products with longer term periods (but not long enough to require significant reserves) benefit most
- Single Premium Immediate Annuity (SPIA)
 - Margins decrease a lot, when asset risk premiums removed
- Fixed annuities
 - Varies depending on whether asset risk is transferred to policyholders
 - Generally positive impact due to lower CoC
- Variable annuities/segregated funds
 - Little change for basic product, but large increase in cost of guarantees
 - Generally negative impact, due to cost of guarantees
- Universal Life (UL)
 - Depends on whether UL product's orientation is accumulation or protection, level COI or YRT, how fund values are invested (fixed vs. indexed/seg.) and level of guarantees
 - Typically, effect is in between term and fixed annuities regarding asset risk and CoC

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LINK TO ECONOMIC CAPITAL/ERM

Market-consistent balance sheet approach is becoming most common method to calculate EC

Economic Capital ("EC") is...

- Measured as the difference in "market-consistent net assets" between normal conditions and stressed conditions
 - A set of stress tests is applied for each risk, calibrated to a probability level over a one-year time horizon, consistent with the company's financial strength rating
 - For AA-rated companies, 99.95% is often used
- Separate stresses are applied to cover a variety of market, credit and insurance risks that might occur over the projected one-year time horizon
- Using a set of market-consistent scenarios
- Results are aggregated using a correlation matrix

Commonly used in Europe, increasingly used among life insurers in North America

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LINK TO ECONOMIC CAPITAL/ERM

EC is a key metric for quantifying risk in an ERM framework

```

    graph TD
      Identify[Identify] --> Quantify[Quantify]
      Quantify --> Solve[Solve]
      Solve --> Execute[Execute]
      Identify --> Q1[What are the risks? Who is watching?]
      Quantify --> Q2[How much do risks weigh? What is their impact?]
      Solve --> Q3[What can be done about risks? How to decide?]
      Execute --> Q4[How to take action? What value does it create?]
      Q2 --> EC[EC is the metric for quantifying risk]
  
```

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LINK TO ECONOMIC CAPITAL/ERM

Leading-edge companies are leveraging EC and other market-consistent methods to connect risk and value

- Increased focus on allocation of capital for performance management purposes
 - EC as required capital for EEV/MCEV calculations
 - EC as component in a market-consistent financial management framework
 - Use of EC as a metric for short-term/long-term incentive plans
- Use of EC for business planning/investment allocations
 - Principles-based capital uses a real-world run-off approach
 - Once EC is calculated, free surplus is often used as the limit for alternative investments
- Use of EC in market-consistent pricing
 - Principle-based regulation (PBR) requires projection of EC at annual intervals
 - In practice, factor-based shortcuts are still predominant
- EC is seen as a key component of ERM framework
 - Rating agencies are increasingly considering proprietary EC models when assessing capital adequacy
- NAIC is reconsidering methodology for PBR
 - Link with international developments on Fair Value/Solvency II
- SEC introduced a roadmap for implementing IFRS

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LINK TO ECONOMIC CAPITAL/ERM

Calculating EC via stress testing: Five stages to implementing the EC approach

Step 1	Develop an initial economic balance sheet for the business	Economic assessment of assets and liabilities
Step 2	Identify key risks and specify stress tests	List of calibrated stress events for key risks
Step 3	Determine EC requirement for each risk	Stressed balance sheet calculated for each risk
Step 4	Calculate total EC requirement	Correlations lead to aggregate EC result
Step 5	Review and establish next steps	Analyzed EC results and refined longer term EC plan

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LINK TO ECONOMIC CAPITAL/ERM

Link EC – MCEV

- Use Economic Balance Sheet (“EBS”) to derive EC and MCEV
- Definition of required capital in MCEV is typically the greater of:
 - EC less Value of In-Force
 - Regulatory capital
 - Rating agency capital
- Non-hedgeable risks (NHR) measured in MCEV are using EC results
 - Risks include insurance and operational risks
 - Recalibrated to a 99.5% one year confidence level
- Market value margin (MVM)
 - Added to MVL, to account for NHR
 - Following guidance in CRO Forum Paper on MVL (July 2008)

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LINK TO ECONOMIC CAPITAL/ERM

Successful companies are able to maximize value by relating a firm’s decisions on the risks they take to decisions on the capital they use

Towers Perrin’s ERM Risk-Value Framework

Operating the Business (THEORY) → Portfolio of Enterprise Risks
Financing the Business (THEORY) → Portfolio of Capital Resources
 Return on Risk (THEORY) IN EXCESS OF Capital Costs (THEORY) → Economic Value
 Operating income less expenses (PRACTICE) MINUS Costs of equity, debt, insurance (PRACTICE)

ERM helps you find better ways to operate and finance your business

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Market Consistent ERM

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Topics

- What is important?
- 14 Cautions from the Credit Crisis

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What is important?

Two Investing Styles:

- Growth – What is the market going to think about the value of this?
- Value – What do I think about the value of this?

Both Make Sense.

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Apply to Risk Management

- Market Value of Risk
 - Market Prices
 - Market Implied Vols
(includes risk premium & cost of capital)
- Inherent Value of Risk
 - Modeled Expected losses
 - Modeled Cost of Capital
 - Subjective risk premium (or not)

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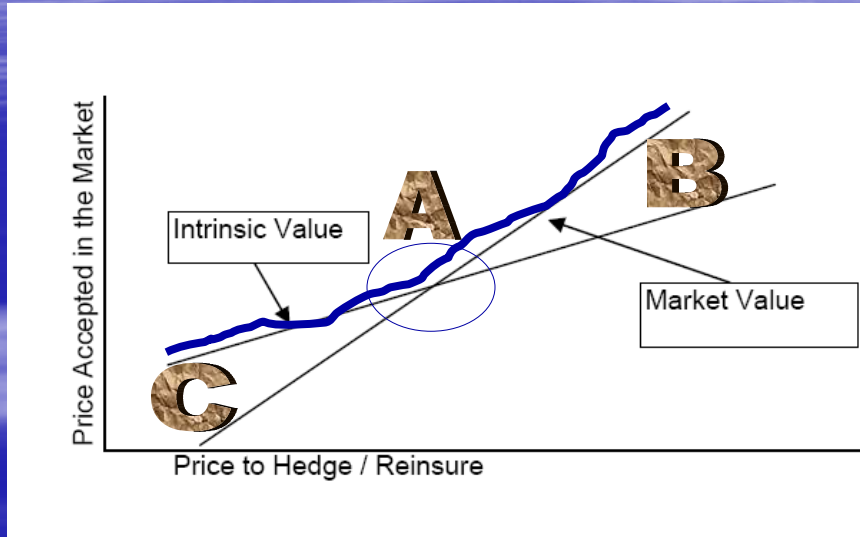
Compare Risk Values

Market Value > Inherent Value	Market Value < Inherent Value
Try to hold on to risk & Seek to increase Price received for Taking Risk to Market Value	Lay off risk in the market & Try to hold Price at Inherent Value

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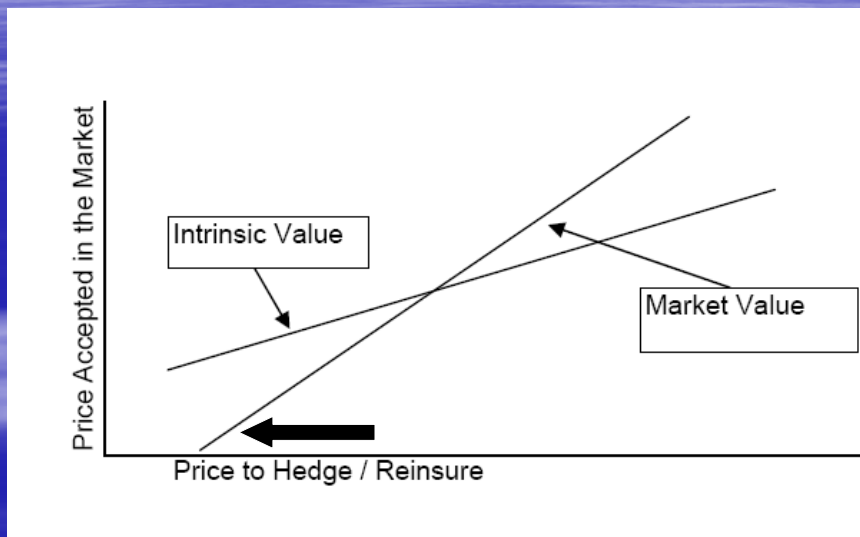
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Good to Know



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Cautions from the Credit Crisis



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When the Market Falls. . .



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Deciding when it is safe to Cross the Street

1. Read a study showing the percent of the time it was safe to cross the street over the past 75 years
2. Ask the person next to you on the corner
3. Ask the person who is just stepping onto the curb
4. Look at the light
5. Build and run a computer simulation model of cars and pedestrians
6. Look both ways and cross when there are no cars coming

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Cautions About the Use of Market Consistent Values

(with examples from the current crisis)

1. "The market knows"
2. Marginality
3. Leverage
4. Counterparty
5. Output observation based models
6. Diversification vs. Correlation
7. Holding Period
8. Law of One Price and replication
9. Excess complexity
10. Reliance on third party risk evaluations
11. Implicit Assumptions can be wrong too
12. Pricing Risk is not the same as Extending the price of traded risks
13. Overreliance on models designed by physicists
14. Equilibrium is a fantasy

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1. "The Market Knows"

- Are increased market values of risk indicative of more risk
Or are they contra-indicative?
- The current crisis was preceded by historically low risk spreads on almost all risks!

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2. Marginality

- Most risk pricing is done marginally
 - *What is the price of the next transaction?*
- But What happens to the analysis if the whole market shifts?
 - *What is true for the next transaction is often not true for the whole market!*

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3. Leverage

- Many holders of CDO securities were highly levered
 - Market was not concerned about the amount of leverage
- Leverage increases sensitivity to shifts in cashflows
 - High Leverage greatly increases sensitivity

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4. Counterparty

- Transferring risk to a Counterparty
- Takes their balance sheet onto yours!
 - Not their past balance sheet
 - Not their current balance sheet
 - But their balance sheet when the loss occurs
- Need to understand counterparty risk taking strategy

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5. Output Observation Based Models

Table 2: National Subprime Foreclosure Rates by Origination Year*

Foreclosure Rates in Origination Year and Subsequent Years	Origination Year								Year to July 2007
	1999	2000	2001	2002	2003	2004	2005	2006	
Origination Year	1.30	1.50	1.85	1.07	0.82	0.86	0.97	2.56	3.01
1st year	6.33	6.86	7.17	5.51	4.14	3.93	6.38	7.69	
2nd year	5.46	6.01	5.81	4.55	3.11	3.66	4.66		
3rd year	4.85	3.35	4.23	2.37	2.23	1.85			
4th year	2.29	2.49	1.88	1.56	0.83				
5th year	2.05	1.19	1.17	0.59					
6th year	0.79	0.71	0.48						
7th year	0.56	0.30							
8th year	0.24								
Total Number of Foreclosures From Origination through September 2007	188,026	165,801	140,195	124,781	127,100	176,729	231,360	140,278	13,272
Total Number of Originations	787,420	739,749	620,945	797,625	1,143,037	1,716,141	1,925,780	1,368,706	440,934
Foreclosure Rate through September 2007	23.88	22.41	22.58	15.64	11.12	10.30	12.01	10.25	3.01

*Foreclosure rates are based on the number of loans starting foreclosure.

Source: LoanPerformance

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6. Diversification vs. Correlation

- Correlation is a measure of linear relationship between two sets of data
- Market agreed that regional mortgage default rates had low correlation
 - And they did, for a long historic period
- However, regional mortgage default rates have moved completely in tandem in recent months

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7. Holding Period

- Many treated CDO's as traded securities
 - When they were actually each unique deals
- Analysis often done in terms of how will an XX rated fixed income security trade
- With freeze of market, became HTM (or for sale at 75% discount)

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8. Law of One Price & Replication

- Replications with Other Securities

But Also . . .

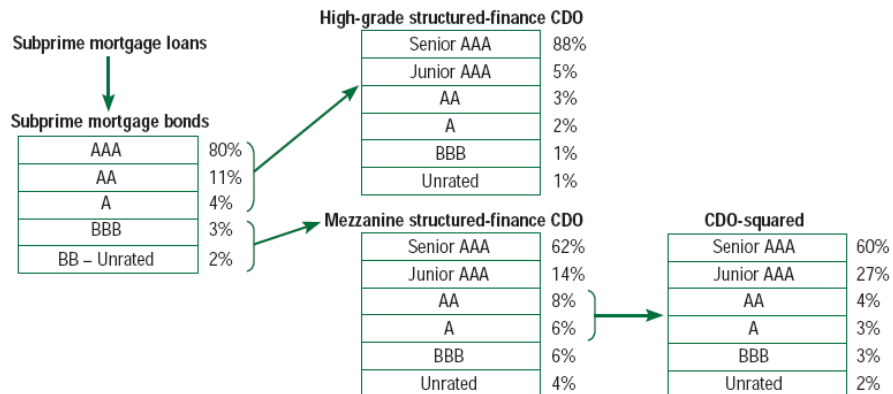
- Replication with the underlying Borrower Earnings
- Replication with the underlying Real Estate

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9. Excess Complexity

Matryoshka — Russian Doll: Multi-Layered Structured Credit Products



Source: IMF staff estimates.
 Note: CDO = collateralized debt obligation.

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10. Reliance on Third Party Risk Evaluations

- Banking Book – Must do own credit evaluation
- Trading Book – Can rely on ratings

Banks came to treat more and more risks as tradable – and stopped underwriting

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11. Implicit Assumptions Can be Wrong

- Most models include some implicit assumptions
- When you use market consistent models, you may not even be aware of the implicit assumptions
- *Until they go wrong!*

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12. Pricing Risk vs. Extending Prices

- Textbooks describe B-S model as a pricing model
- In fact, it is almost solely used as a tool to extend prices

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13. Models from Physicists

- Laws of Physics are generally immutable
- Laws of markets change all of the time
- Law of Parsimony

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14. Equilibrium is a Fantasy

Law of Risk and Light
*Risks in the light shrink,
Risks in the dark grow*

Corollary

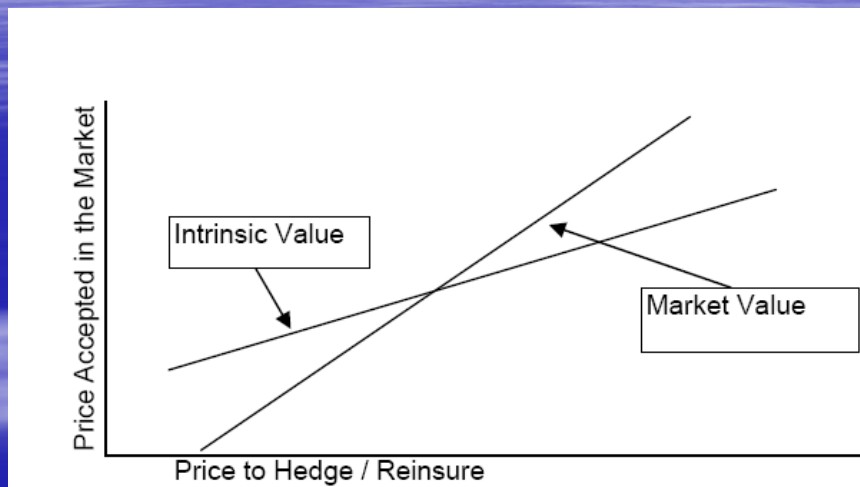
*Return for Risks in the light shrinks faster than the Risk
Return for Risks in the dark does not grow as fast as Risk*

The Dark Ages was the last extended period of equilibrium.

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Be Careful



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