

(Credit) Risk Management: The Next Wave

$$\begin{aligned}\frac{\partial}{\partial a} \ln f_{a, \sigma^2}(\xi_1) &= \frac{(\xi_1 - a)}{\sigma^2} f_{a, \sigma^2}(\xi_1) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\frac{(\xi_1 - a)^2}{2\sigma^2}\right\} \cdot \frac{(\xi_1 - a)}{\sigma^2} \\ T(x) \cdot \frac{\partial}{\partial \theta} f(x, \theta) dx &= M\left(T(\xi) \cdot \frac{\partial}{\partial \theta} \ln L(\xi, \theta)\right) \int_{\mathbb{R}^n} \frac{\partial}{\partial \theta} \ln L(\xi, \theta) f(\xi) d\xi \\ T(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta)\right) \cdot f(x, \theta) dx &= \int_{\mathbb{R}^n} T(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta)\right) \cdot f(x, \theta) dx \\ \frac{\partial}{\partial \theta} M T(\xi) &= \frac{\partial}{\partial \theta} \int_{\mathbb{R}^n} T(x) f(x, \theta) dx = \int_{\mathbb{R}^n} \frac{\partial}{\partial \theta} T(x) f(x, \theta) dx\end{aligned}$$



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Algorithmics

October 2008

Algorithmics



Agenda

1. Surprises or Non-Surprises
2. Five Deadly Sins
3. The Next Wave
4. The Future

Surprises or Non-Surprises: The Lessons of History

- Risks are interrelated. Sudden shocks do happen
- Lack of transparency amplifies market failure
- Virtuous circles can reverse rapidly

“Unprecedented” Market Conditions ...

“Insufficient oversight, poor corporate governance, and limited financial transparency together prevented the correct assessment of risks. Credit markets shifted from excess borrowing to excess credit rationing, resulting in a severe liquidity crisis.”

Bisignano (2000)

“Ready access to the [interbank] market increases the incentive to underinvest in liquid assets. Hence a “free rider” problem results, all banks believing that they can turn to the interbank market when faced with a sudden demand for liquidity which, because of lack of coordination among them, can at times be in serious short supply.”

Bernard and Bisignano (2000)

Lack of Transparency Amplifies Market Failure

“Liquidity crises may be increasingly common. In the face of an unanticipated shock, the interbank market might collapse.”

Bernard and Bisignano (2000)



Lack of Transparency Amplifies Market Failure

“Two of the failures involved institutions that played an active role in subprime mortgage lending. The institutions grew at higher rates than their peers and, instead of savings, they used securitization and short-term financing to fuel their lending activity.

There were major problems with how they valued their portfolios. In addition, these cases include allegations that the regulators were too slow to detect problems within the faltering institutions.”

Lack of Transparency Amplifies Market Failure

Lehman, Northern Rock, HBOS or Wachovia?



Continental Illinois (1984) and Superior Bank (2001)

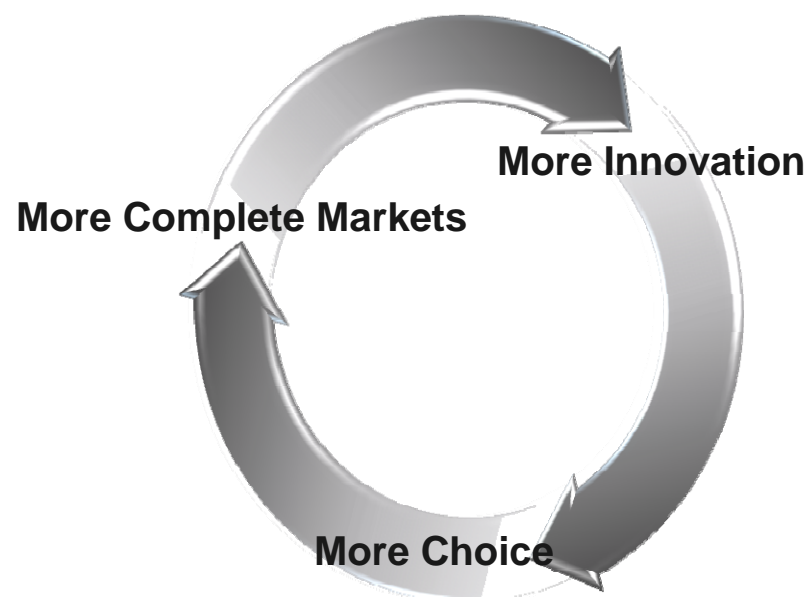
Algo First Newsletter May 2008

Virtuous Circles Can Reverse Rapidly

Before the Storm

“Indeed, liquidity-fueled innovation has made markets substantially more “complete”-- that is, more risks are more readily priced and traded without significant diminution in value than in prior periods.”

Governor Kevin Warsh (2007)



Virtuous Circles Can Reverse Rapidly

During the Storm

“A panic seized upon the public, such as had never been witnessed before: everybody begging for money, but money was hardly on any condition to be had. It was not the character of the security that was considered: but the impossibility of producing money at all.”

England 1825

Contemporary Sources, Kindleberger (1996)

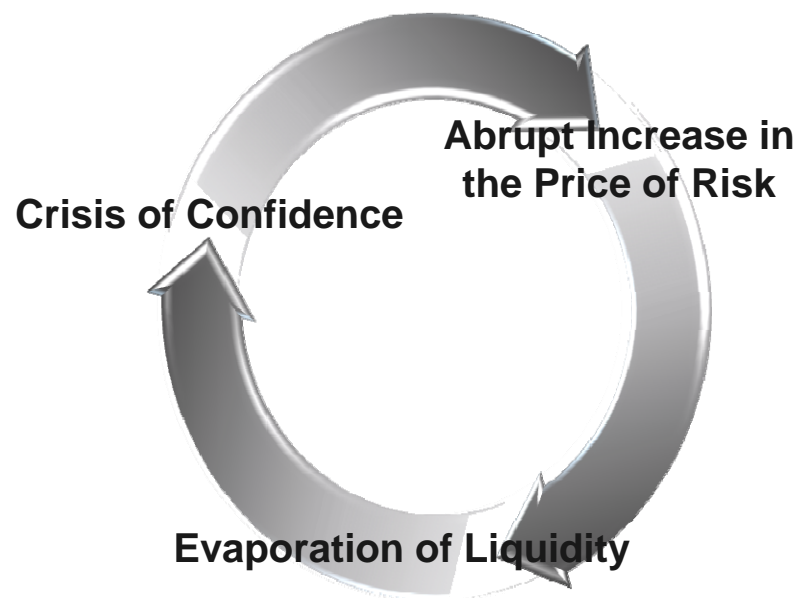


Virtuous Circles Can Reverse Rapidly

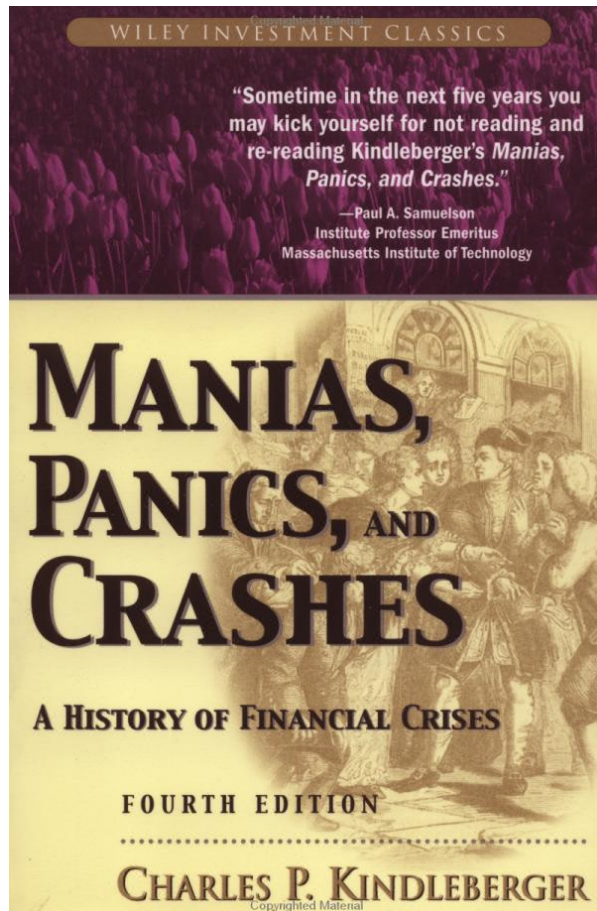
The Fallout

“The sleepy complacency of a bygone era seemed rudely interrupted by a liquidity shock last August. A global margin call on virtually all leveraged positions began. What some originally read as a short story punctuated by a liquidity shock evolved into a longer narrative. Credit is threatening to displace liquidity as the primary antagonist.”

Governor Kevin Warsh (2008)



Surprises or Non-Surprises: The Lessons of History



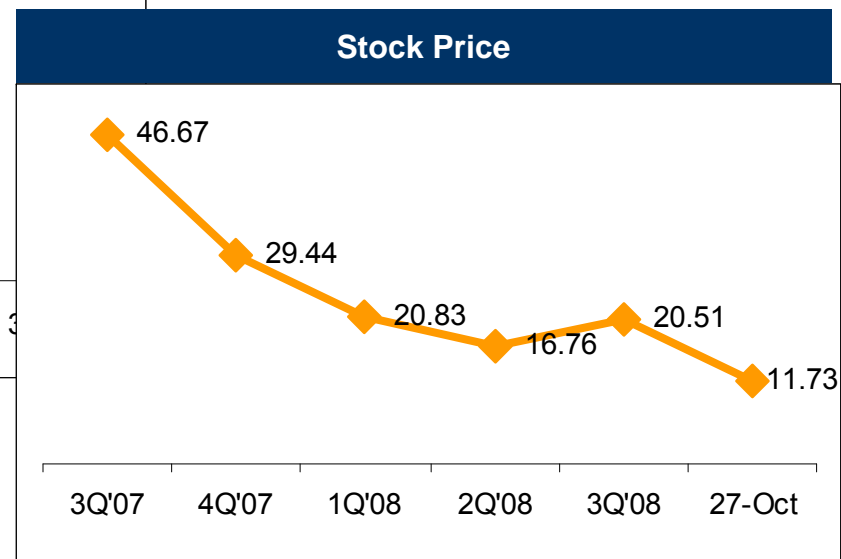
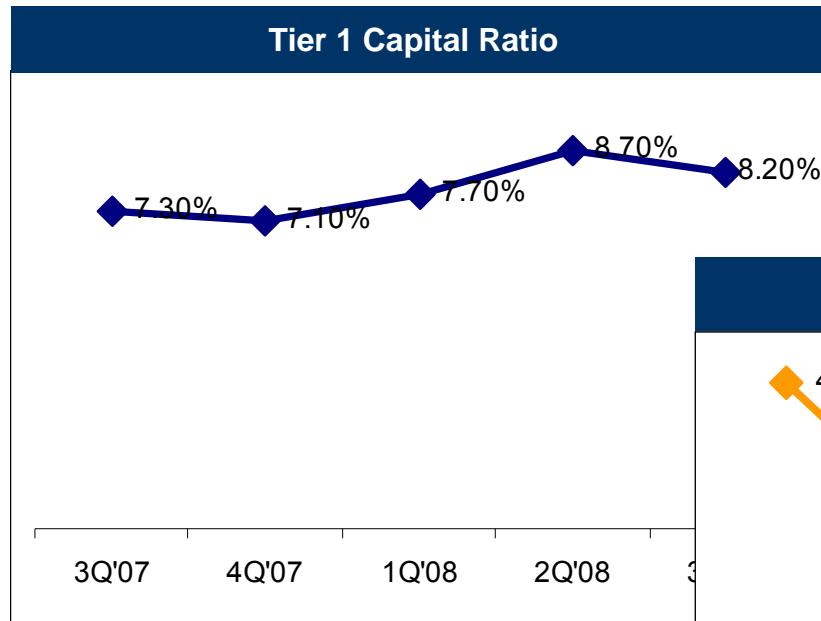
1. Speculative Manias
2. Fueling the Flames: Monetary Expansion
3. The Emergence of Swindles
4. The Critical Stage
5. Domestic Contagion
6. International Contagion
7. Letting it Burn Out, and Other Devices
8. The Lender of Last Resort
9. The International Lender of Last Resort

Five Deadly Sins

1. Leaving stakeholders undefined
2. Disregarding intrinsic subjectivity
3. Viewing absence of evidence as evidence of absence
4. Modeling A. Validating B
5. Managing risk and not reward

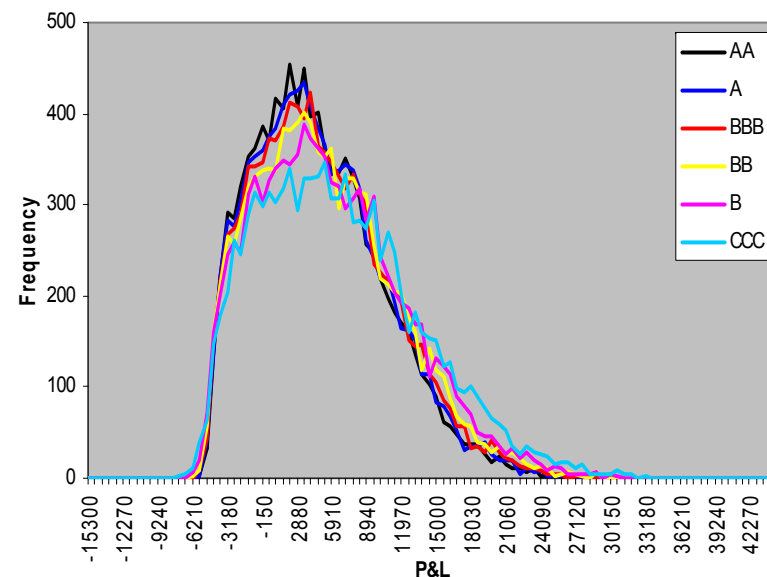
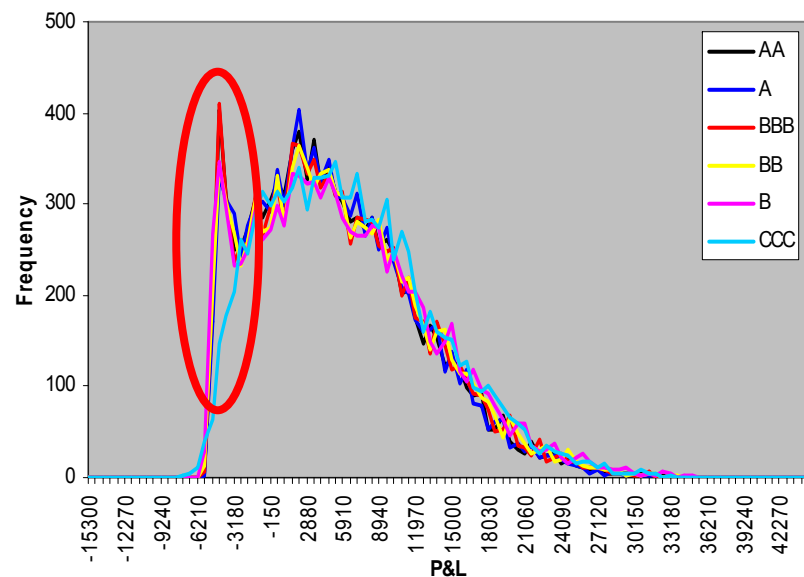
1. Stakeholders: Who are we trying to protect?

We get what we ask for ...



1. We get what we ask for ...

Which risk-return profile would you prefer ...

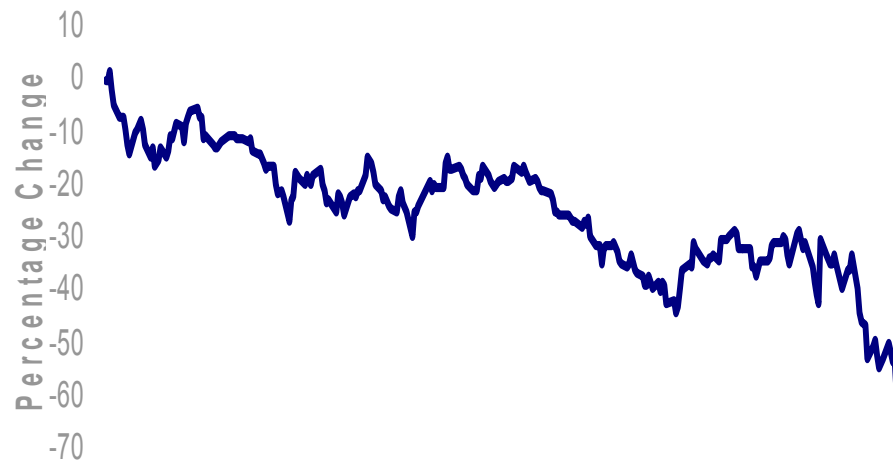


... from a debt-holder perspective?

... from an equity-holder perspective?

1. We get what we ask for ...

FTSE 350 Banks Index



Oct 29 2007 - Oct 27 2008

“Racy balance-sheets
looked great in the go-go
years, but not any more”

Economist, April 2008

2. Risk Management is Subjective

Would you take the following bet?

- 60:40 in your favor over 1000 tries
- 20 times your annual salary

Almost certain
to win

Assume there were a 15% uncertainty around the 60:40 estimate, and therefore ...

- What if the odds were truly 45:55?
- What if they were either 75:25 or 45:55?

Almost certain
to lose

Equal chance of
winning or losing

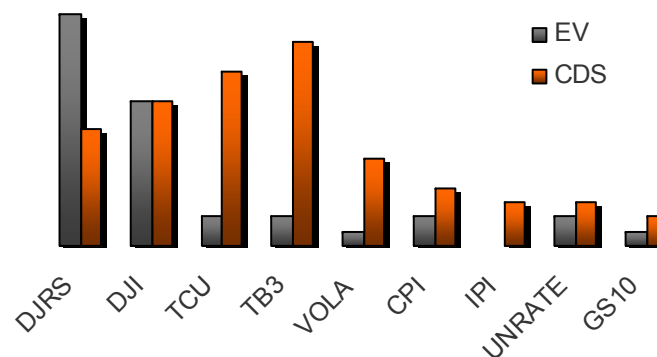
Rebonato (2007)

2. Risk Management is Subjective

Facts or opinions?

- Capital for a portfolio of 1000 exposures and estimated with 120 months of data can have an error of as much as 30%
- Equity implied correlations are 24% and CDS implied correlations are 13% on average

Significant Risk Drivers - CDS vs EV



TUM and Algorithmics (2008)

Tarashev and Zhu (2006 and 2007)

2. Valuations are Subjective



16 October 2008

IASB and FASB create advisory group to review reporting issues related to credit crisis

15 October 2008

IASB proposes improvements to financial instruments disclosures

14 October 2008

IASB provides update on applying fair value in inactive markets

13 October 2008

IASB amendments permit reclassification of financial instruments

There is No Law of One Price

- Valuations require forward-looking risk measurement. They are not uniquely and objectively defined
- “Heisenberg uncertainty principle” applied to financial and risk reporting: the very act of measurement affects what is being measured, given information and market imperfections

Borio and Tsatsaronis (2006)

3. Absence of Evidence \neq Evidence of Absence

Specification by hind-sight ...

“The biggest challenges may not be related to modeling, but [for example] the **complete identification of risks** [and] the collection of **relevant data**.”

Federal Reserve Bank of New York (2008)

“[The Committee] decided to expand the scope of the capital charge to capture not only price changes due to defaults but also **other sources of price risk**, such as those reflecting credit migrations and significant moves of credit spreads and equity prices [combined with] the loss of liquidity.”

Basel (2008)

4. Validating what we Meant to Validate ...

Has Value-at-Risk Failed?

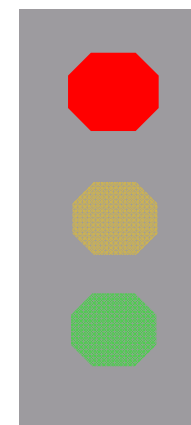
16 VaR exceptions in one quarter!

Another Perspective:

Multiplication Factor of 3 (or more) because ...

- The past is not always a good predictor for the future
- There may be 'fat tails'
- Correlations may be incorrect
- There may be insufficient market liquidity

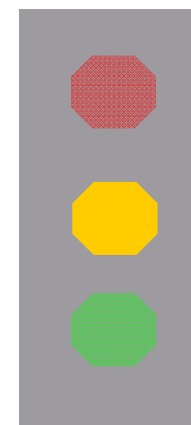
Basel Committee (1995)



4. Validating what we Meant to Validate ...

Another perspective

- 16 VaR exceptions in one quarter
- It follows that there is a greater than 50% probability that $3 \times \text{VaR}$ has one exception or less
- If there were one such exception, the probability of rejecting a correct model would be almost 50%



We cannot reject a $3 \times \text{VaR}$ approach with high confidence!

4. Validating what we Meant to Validate ...

“Validation of Economic Capital models for other purposes, such as risk management or pricing, do not necessarily connote applicability for Economic Capital usage.”

Federal Reserve Bank of New York, Capital Adequacy Conference (2008)

5. Managing Risk = Managing Reward



The Next Wave: Major Implications I

Risk management = Decision making under uncertainty

- Focus on the stakeholders
- Acknowledge uncertainty
- Challenge assumptions
- Be imaginative and creative

Risk is more than one number

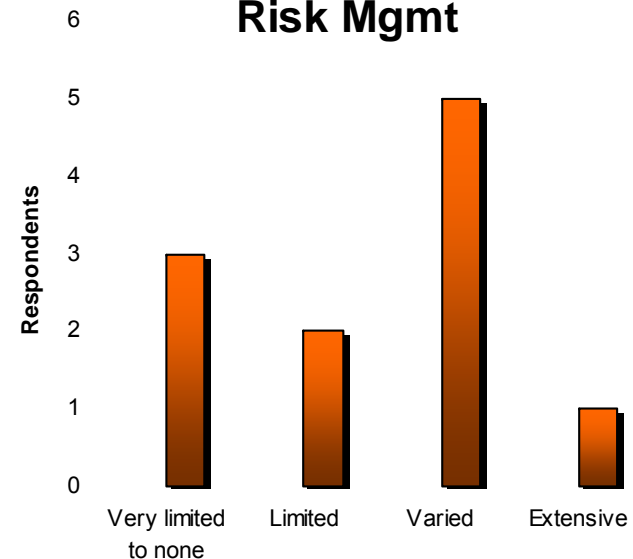
Focus on the Stakeholders

Establishing risk tolerance
- consistently

“Each institution [must] ensure that [its] **risk tolerance** is established by the **highest levels** of **management** and shared with the board.”

Corrigan Report (2008)

Economic Capital used for Risk Mgmt

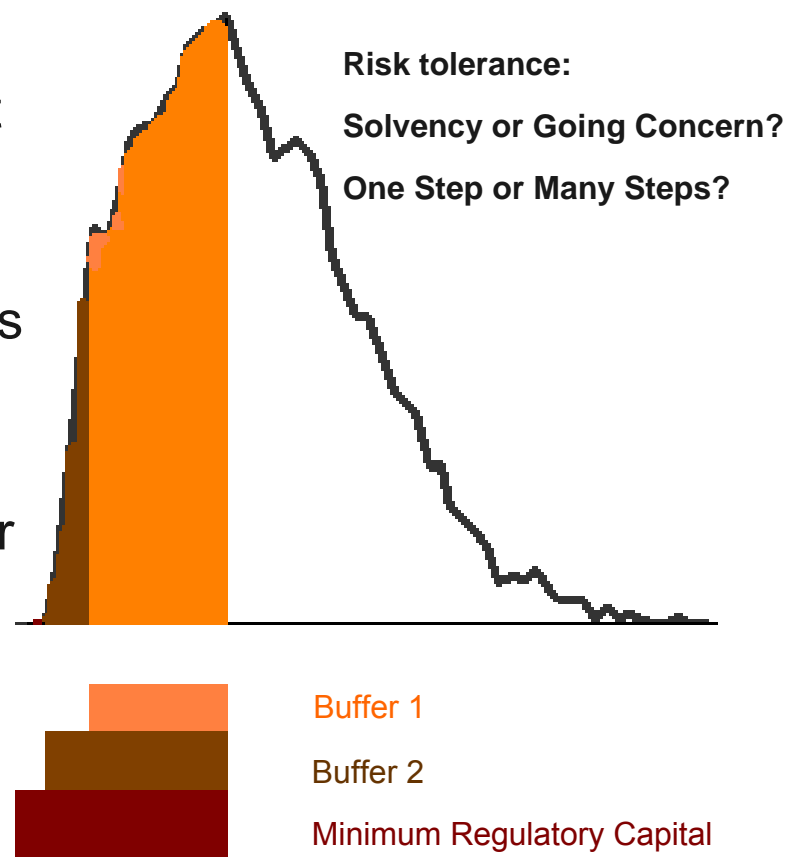


Federal Reserve ECH Review (2007)

Focus on the Stakeholders

“The choice of a confidence level might differ based on the question. **High confidence levels** reflect the perspective of creditors, rating agencies and regulators - to minimize **bankruptcy** risk. On the other hand, banks use **lower confidence levels** for **management** purposes to allocate capital to business lines.

Basel Committee (2008)



Acknowledge Uncertainty

“Violations of key **assumptions** of the Asymptotic Single-Risk Factor model are **virtually inconsequential**.”

“By contrast, plausible small-sample **estimation errors** or popular rule-of-thumb values can lead to **significant inaccuracies** in measures of portfolio credit risk.”

Tarashev and Zhu (2007)

Challenge Assumptions

“All models use assumptions and those **assumptions** can have a **material impact** on the model outcomes. However, most models do not specifically acknowledge what assumptions they are making. “Industry standard” alone is insufficient rationale for choice.”

Federal Reserve Bank of New York Capital Adequacy Conference (2008)

“**Alternative measures** should be presented to demonstrate the sensitivity of the calculated metrics to **changes in underlying assumptions**”

Corrigan Report (2008)

Be Imaginative and Creative

“Firms [must] think **creatively** about how stress tests can be conducted including the idea of a reverse stress test.”

Corrigan Report (2008)

“Stress tests should also capture the implications of **wider disruptions** and the combination of idiosyncratic and market-wide shocks which incorporate the **behavioral responses** of other affected banks.”

Basel Committee (2008)

Risk is More than One Number

“Managers at better performing firms relied on a **wide range of measures** of risk. Many were able to **integrate** their measures of **market risk and counterparty risk** across businesses.”

Senior Supervisors Group (2008)

“Firms that suffered significant losses tended to depend on a **narrow range** of risk measures and on measurement processes that were **difficult to alter** once it became apparent that the underlying assumptions were wrong.”

The President's Working Group on Financial Markets (2008)

The Next Wave: Major Implications II

Discover the Unknown, Don't Perfect the Known

Risk Management:

- Pro-active
- Firm-wide and holistic
- Transparent
- Part of the firm's governance

Integrate risk and reward management

Discover the Unknown, Don't Perfect the Known

“Methodology can convey a false sense of precision” ⁽¹⁾

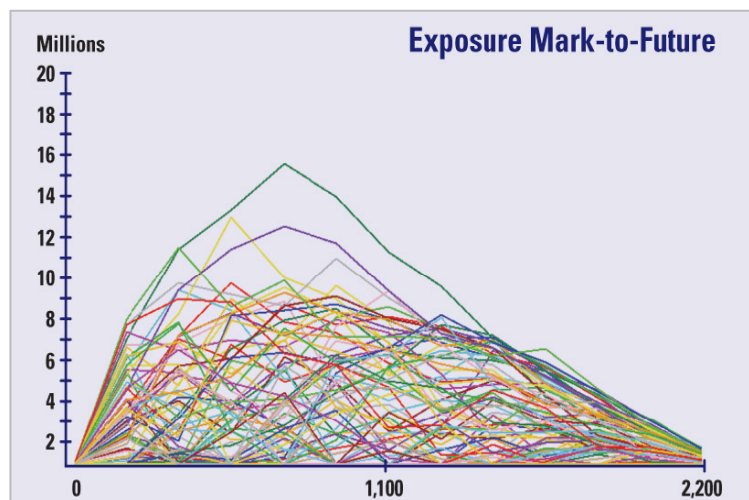
“Firms that experienced more significant problems tended to apply a **“mechanical”** risk management approach.” ⁽²⁾

“Firms that tended to avoid significant challenges assessed risk positions drawing on **different underlying assumptions.**” ⁽²⁾

⁽¹⁾ Federal Reserve Bank of New York (2008)

⁽²⁾ Senior Supervisors Group (2008)

Pro-active Risk Management



“[Firms] must have the capacity to **monitor risk concentrations** to asset classes as well as exposures to institutional counterparties **in a matter of hours** and provide effective and coherent reports to senior management.”

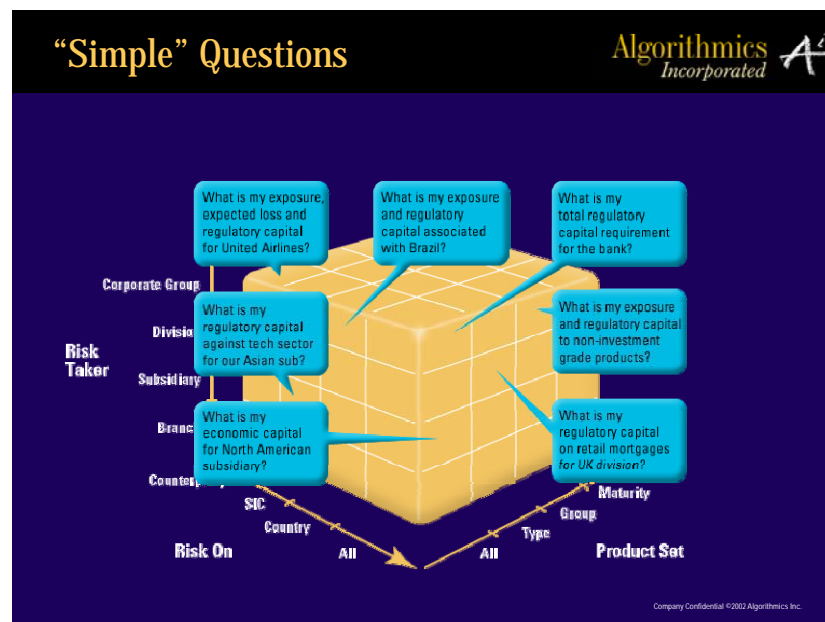
Corrigan Report (2008)

Firm-wide Risk Management

“Firms that understood quickly the risk they faced relied on information from **many parts of their businesses** and communicated that information both up to senior management and across businesses.”

“In contrast, the existence of **organizational silos** appeared to be **detrimental** to performance during the turmoil. Business areas [made] decisions in isolation and in ignorance of other area’s insights.”

Senior Supervisors Group (2008)



Holistic Risk Management

A case for a Bayesian approach?¹

“Risk management must rely heavily on **judgment, communication** and **coordination**, spanning the organization and reaching to the **highest levels of management.**”²

“Risk management professionals must recognize the **limitations of mathematical models**, and that the tendency to overly formalize arcane aspects of an analysis can often detract from an understanding of the bigger picture. The **salient risk points** must be drawn out and made apparent, especially to senior management.”²

¹ OCC at the FRB New York (2008)

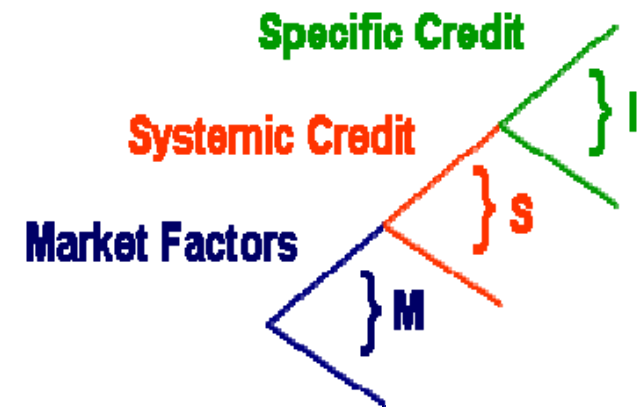
² Corrigan Report (2008)

Holistic Risk Management

Capture all relevant risks and their interdependencies

“[Recent] events **emphasized the links** between market and funding liquidity, between funding liquidity risk and credit risk, and the fact that liquidity is a key determinant of banking sector soundness.”

Basel Committee (2008)

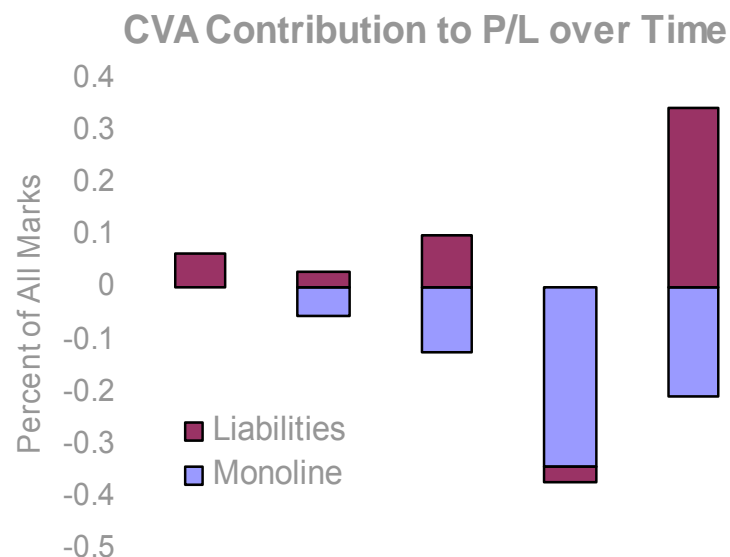


Radical Transparency

Disclose uncertainty - within and outside

“Banks must establish and maintain procedures for calculating an **adjustment to the current valuation** of less liquid positions, whether the position is marked to market using market prices or observable inputs, third-party valuations or marked to model.”

Basel Committee (2008)



What are the underlying assumptions?

- Price of credit
- Risk factor scenarios underlying PFEs
- Netting or not?

... all impacting liquidity and model risk!

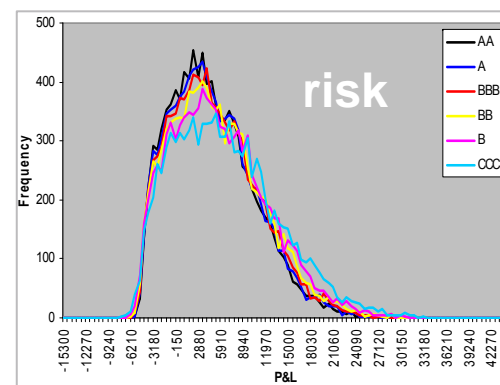
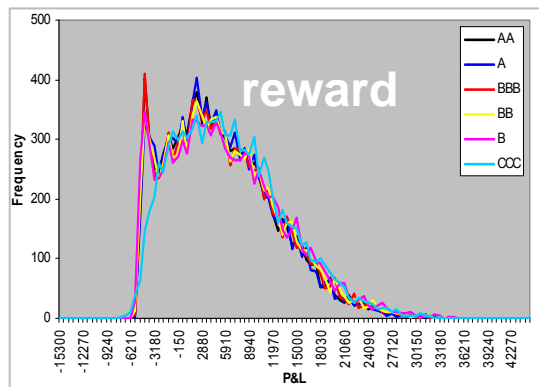
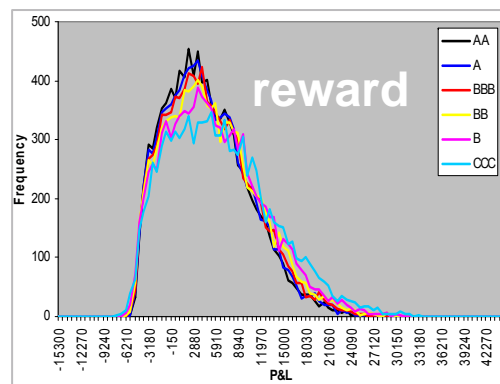
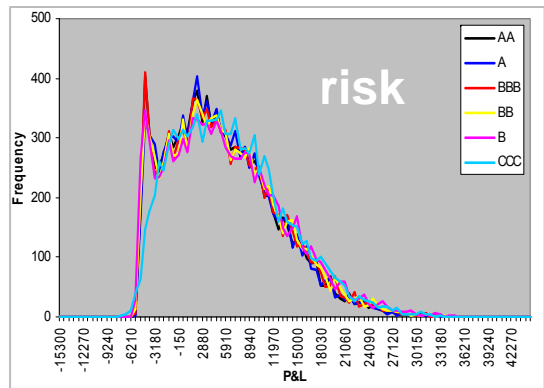
Culture of Risk Governance

Show risk estimates with a “denominator”

“Senior management should actively encourage **ongoing discussion** with **board members** in order to improve the quality, coverage and utility of information made available to the board.”

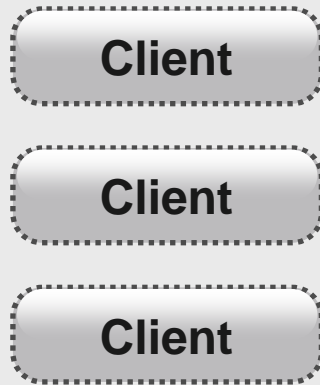
Corrigan Report (2008)

Manage Risk and Reward Together



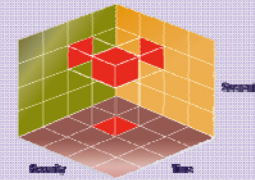
The Future of Innovation I

Past: Trust



Products

Financial Firm



Future: Transparent customization

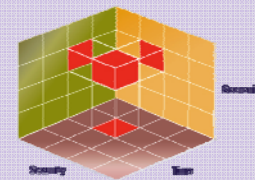


Products

Products

Products

Financial Firm

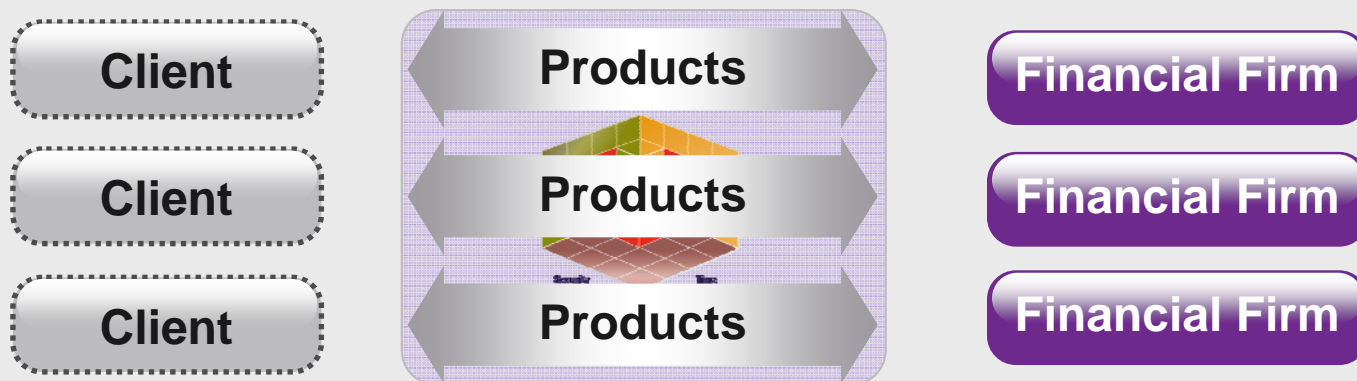


The Future of Innovation II

Past: Trust



Future: Transparent co-creation



The Future of Risk Management

Black Swans will happen

- Start with the stakeholders' risk appetite
- Draw out major, firm-wide risks holistically
- Challenge assumptions creatively
- Offer full transparency. Acknowledge uncertainties
- Enable pro-active decisions on risk and reward

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