Risk Management Beyond VaR

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Presented by

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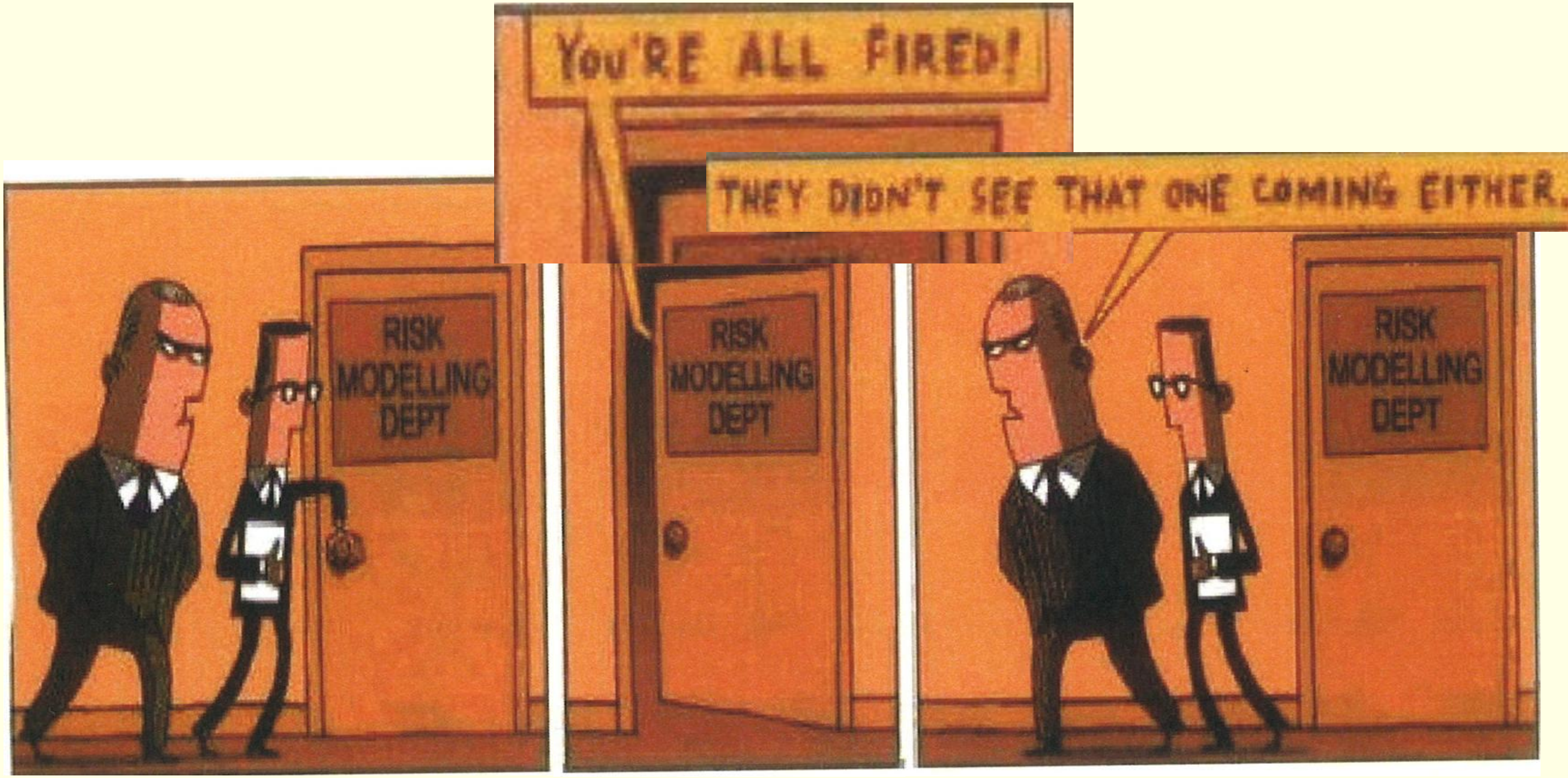
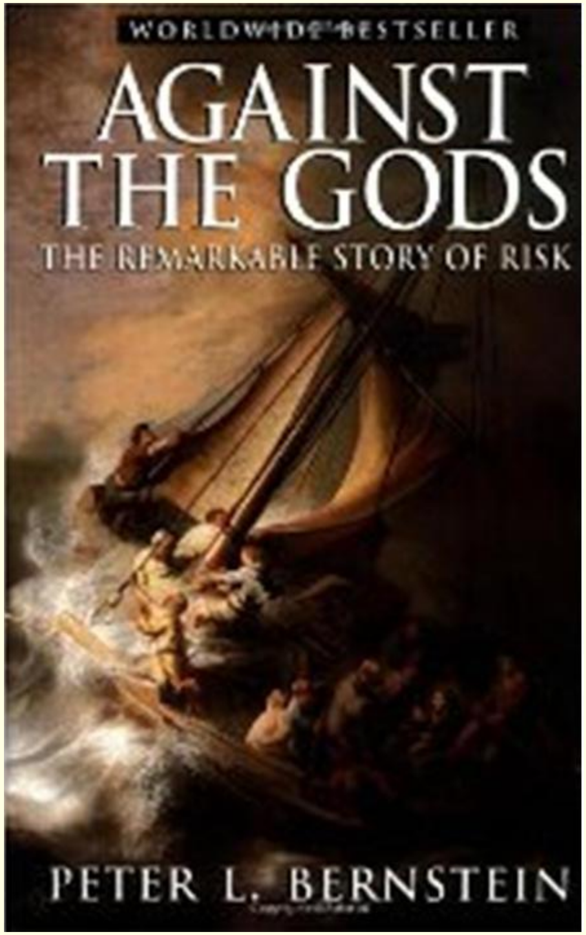
Why Risk Management Has Lost Credibility

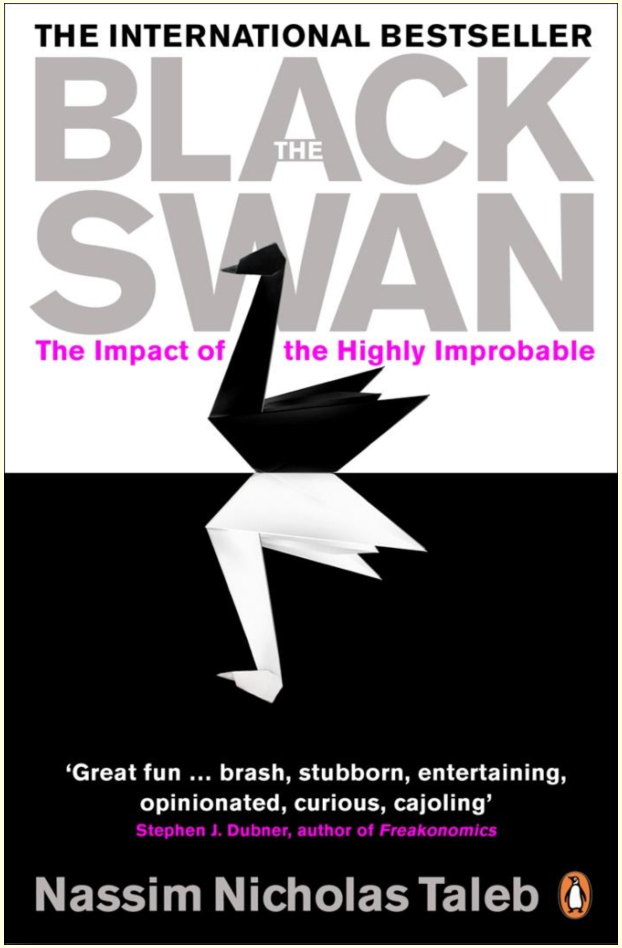


What a Difference a Decade Can Make!!

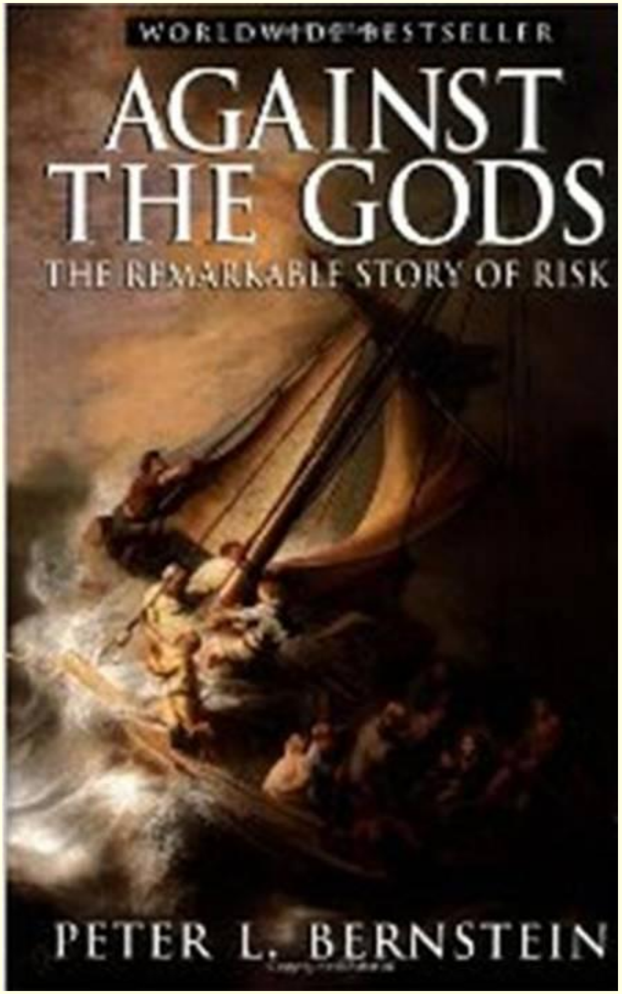
Published: 1996



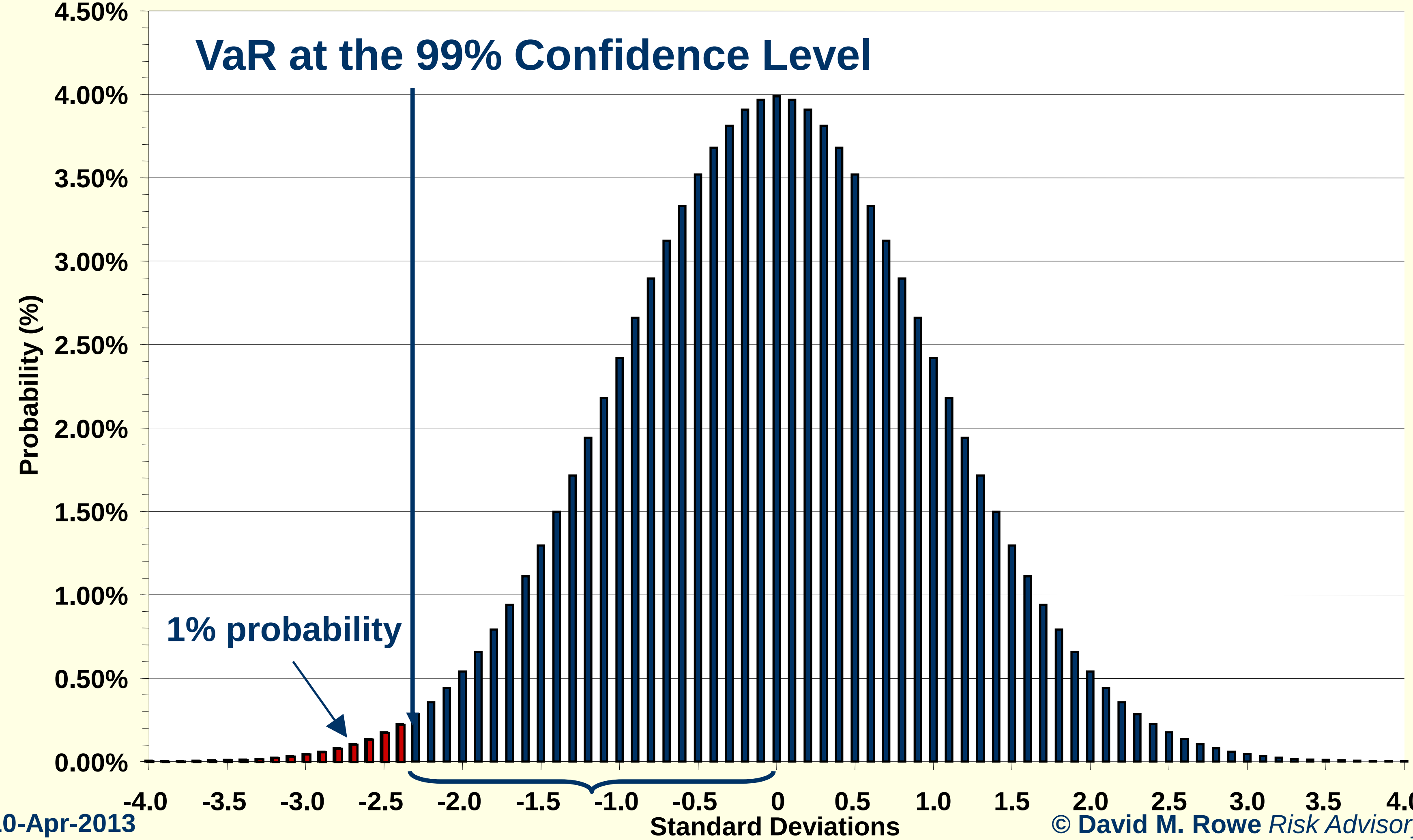
Published: 2007



Against the Gods – The Remarkable Story of Risk



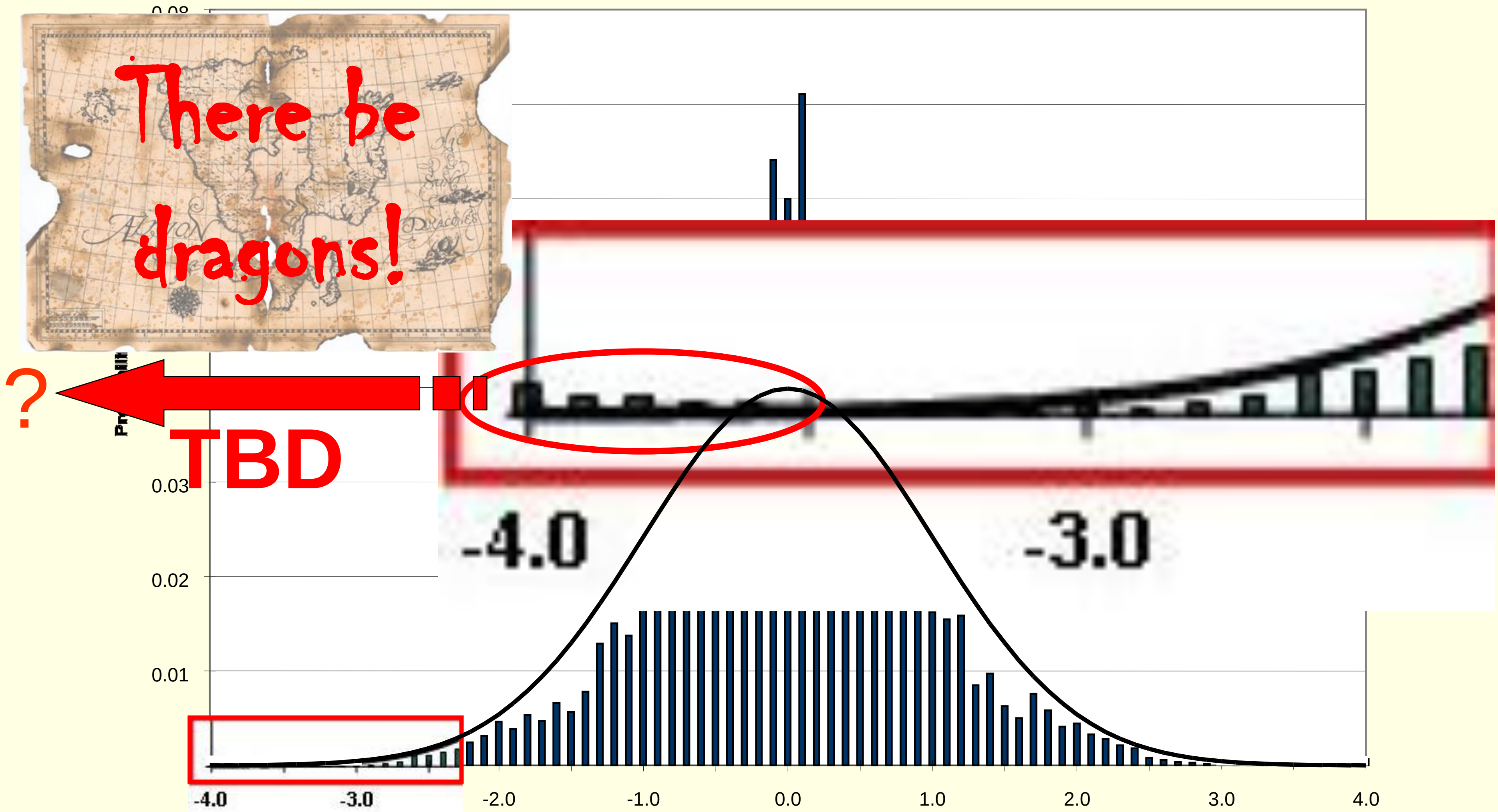
The Limits of Distributional Analysis



The Central Limit Theorem

The mean of a sufficiently large number of independent random draws from a stable distribution, with finite mean and variance, will be approximately normally distributed.

The Limits of Distributional Analysis



Risk analysis | September, 2004 Issue of *Risk*

Op risk and Black Swans

Scarce data is a well-recognised problem for the assessment of operational risk. In such circumstances, David Rowe argues, it is necessary to blend professional judgement with the available data. In doing so, however, it is crucial to counter some well-documented psychological biases in our subjective estimates of probability – and a healthy dose of humility is also advisable

Nassim Nicholas Taleb (2004) makes an interesting distinction between what he calls type 1 and type 2 environments.[1] He defines a type 1 environment as one where most of the contribution to randomness[2] comes from the body of a distribution (let's say the middle 99.9%). This broadly characterises randomness in the physical world, where the normal distribution is common. A type 2 environment is one where most of the contribution to randomness comes from a small number of extreme events in the tails. Taleb argues that our social environment increasingly resembles his type 2 classification.

If this view is correct, it has some disconcerting implications for our ability to apply classical statistical methods to social and financial data. In particular, studying the bulk of observations in the 'body' of

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before an event occurred. This fosters overconfidence in how much we actually do know looking forward. The result is a systematic tendency to underestimate the potential for extreme values to occur.

Embrace humility

In the end, it is necessary to estimate a required capital amount on the best basis possible. One reasonable way to proceed is to use actual observed losses on an industry-wide basis as a starting point for the potential range of possible adverse outcomes. This means avoiding the temptation to accept the "It can't happen here" attitude. Certainly, people at Barings or Allied Irish Bank would have said the same thing before their well-publicised losses occurred. Where judgement may be useful is in assessing the quality of an organisation's control struc-

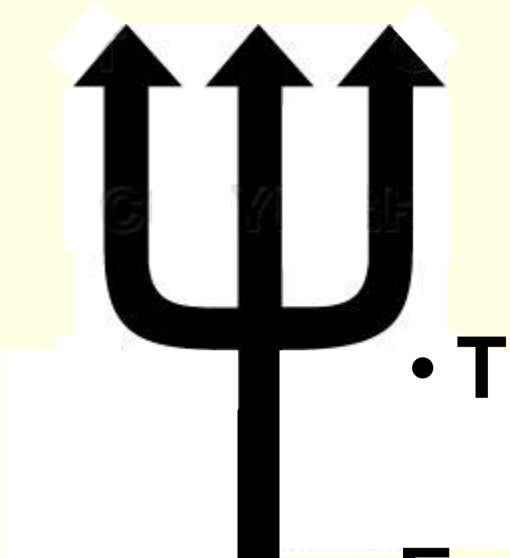
Nassim Taleb's Main Point

Projecting far into the tails of a theoretical distribution estimated to fit the middle 99% or 99.9% of the data is not a valid procedure.

Imposing a mathematically tractable distribution on the problem imposed the hidden assumption of rapid attenuation in the tails.

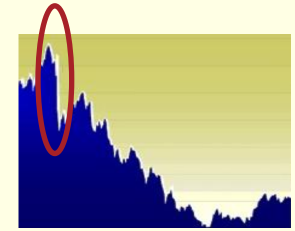
This is what makes it mathematically tractable.

Assessing the impact of stress events

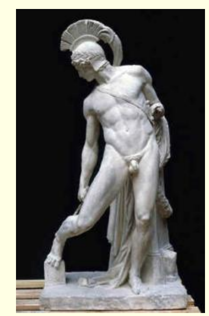


The Stress Testing Trident

- The market's greatest hits.



- Endogenous stress scenarios (Achilles Heel approach)

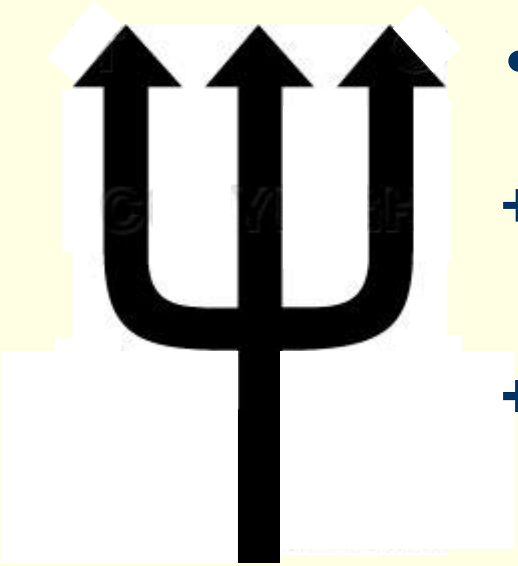


- Imagination

Some of The Market's Greatest Hits

- Oct 1973 First OPEC Oil Shock
- 1979 Iranian Revolution & Second OPEC Oil Shock
- Aug 1982 Mexican Debt Crisis
- Sep 1985 The Plaza Accord to weaken the USD
- Oct 1987 Black Monday in US Stocks
- Sep 1992 Speculative Attack on the European ERM
- Feb 1994 Dramatic Federal Reserve Tightening
- Jul 1997 Thai Baht Collapse → Asian Currency Crisis
- Aug 1998 Russian Default → Emerging Market Debt Crisis
- Sep 1998 Long-Term Capital Management Failure
- Jan 2002 Argentine Peso Devaluation
- Mar 2008 Bear Stearns Rescue
- Sep 2008 Lehman, AIG, FNMA & FHLMC Collapse
- Apr 2010 Greece Sovereign Downgrade → Euro Crisis

The Stress Testing Trident



- **The market's greatest hits.**

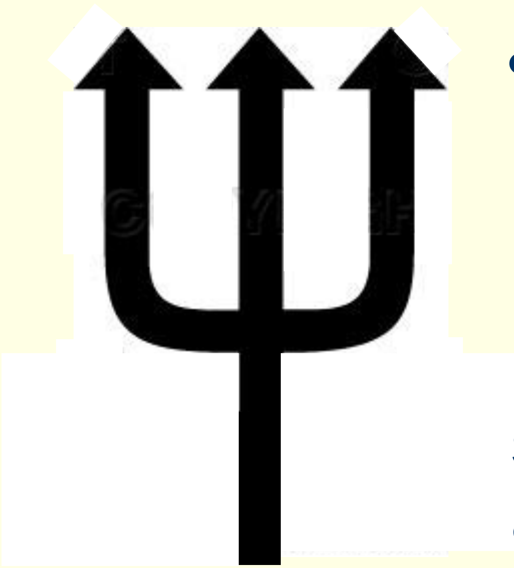
+ Addresses concerns of management who remember past crises

+ It is not credible to say "This couldn't happen," because it has

- Is backward not forward looking

- May not reflect the CURRENT portfolio's vulnerabilities

The Stress Testing Trident



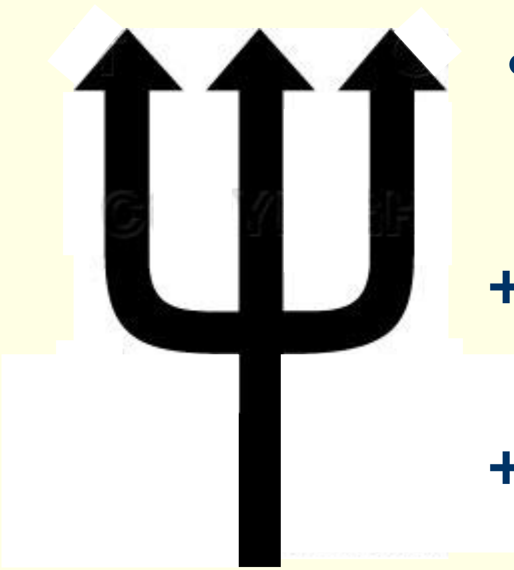
- **Endogenous stress scenarios (Achilles' heel approach)**

…a bank should also develop its own stress tests which it identifies as most adverse based on the characteristics of its portfolio…

International Convergence of Capital Measurement and Capital Standards: A Revised Framework – Comprehensive Version, June 2006, para. 718(LXXXiii)

Endogenous Stress Scenarios

The Stress Testing Trident



- **Endogenous stress scenarios (Achilles' heel approach)**

+ Focuses on the vulnerability of current positions

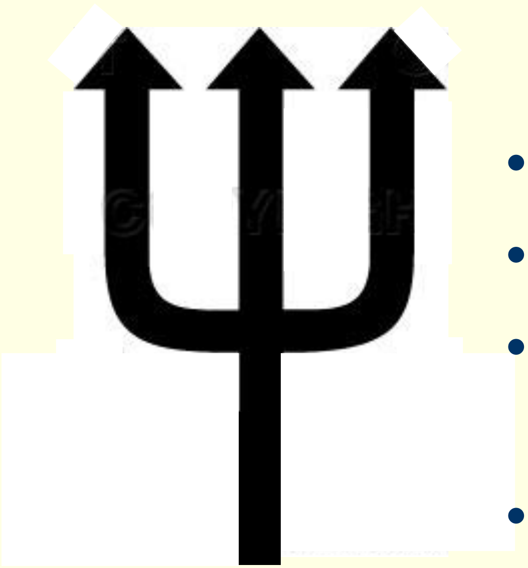
+ Allows judgmental definition of stress scenarios

+ Leverages output of Monte Carlo VaR estimates

- May not capture every possible vulnerability

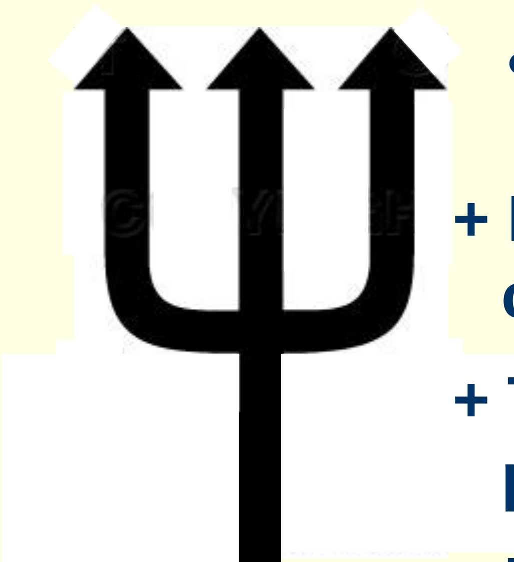
Assessing the impact of stress events

The Stress Testing Trident



- **Imagination**
  - **Euro crisis (Italian or Spanish Default)**
  - **Political upheaval in Russia or China**
  - **Closure of the Straits of Hormuz or an attack on the Saudi oil fields**
  - **A nuclear device goes rogue or Kim Jong Un loses it completely**
  - **A volcanic collapse in the Canary Islands creates a mega tsunami on the U.S. East Coast.**

The Stress Testing Trident



- **Imagination**

+ Is explicitly forward looking based on current geo-political and market conditions

+ The resulting scenarios may appear more plausible

+ Thinking out loosely causal scenarios can highlight early warning signals to watch

- May not reflect the current portfolio's vulnerabilities

Beyond Comparative Statics

"The only reason for time is so that everything doesn't happen at once." - Albert Einstein

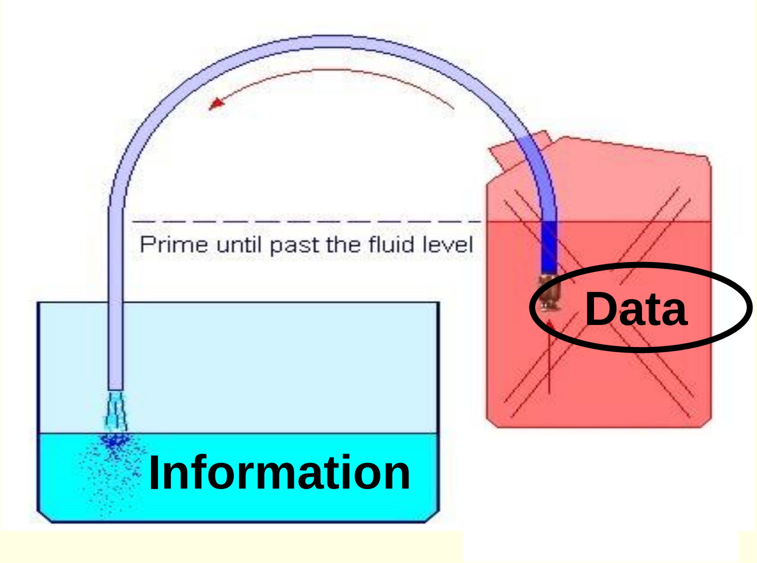
- **Too often we don't think beyond Comparative Statics. (Indeed, the discussion so far falls into that mode.)**
- **Real systemic crises don't happen overnight. They develop and unfold over time.**
- **Certainly the crisis starting in 2008 did so.**
- **Brainstorming loosely causal sequences of events and potential reinforcing feedback loops is an essential part of the Imagination approach to Stress Testing.**
- **The military does this quite effectively in what are known as war games.**

Beware of Statistical Entropy

Statistical analysis can *extract* information from data, it *cannot create* information not already contained in the data.

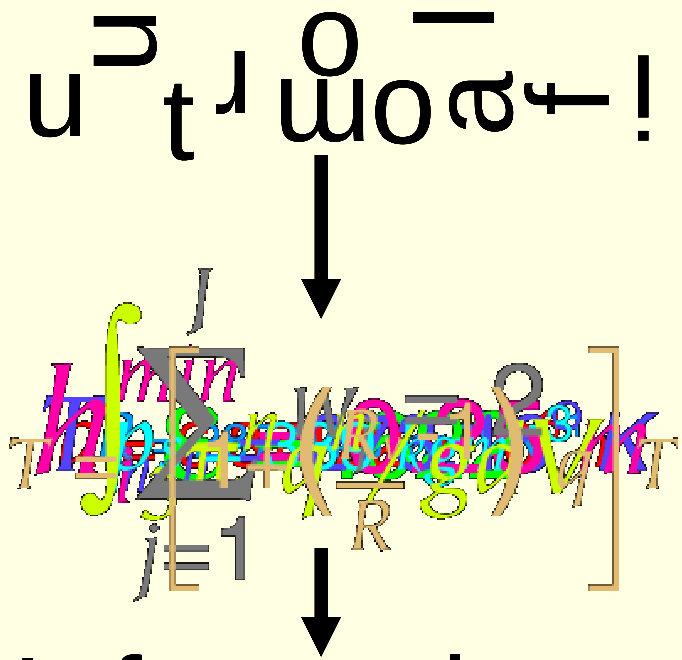
Stated more casually:

Like water, information cannot rise higher than its source.



Beware of Statistical Entropy

Data



Information

EVERYWHERE and ALWAYS, this is extraction of information. It can NEVER create information.

Self-Referential Feedback – The Subprime Boom

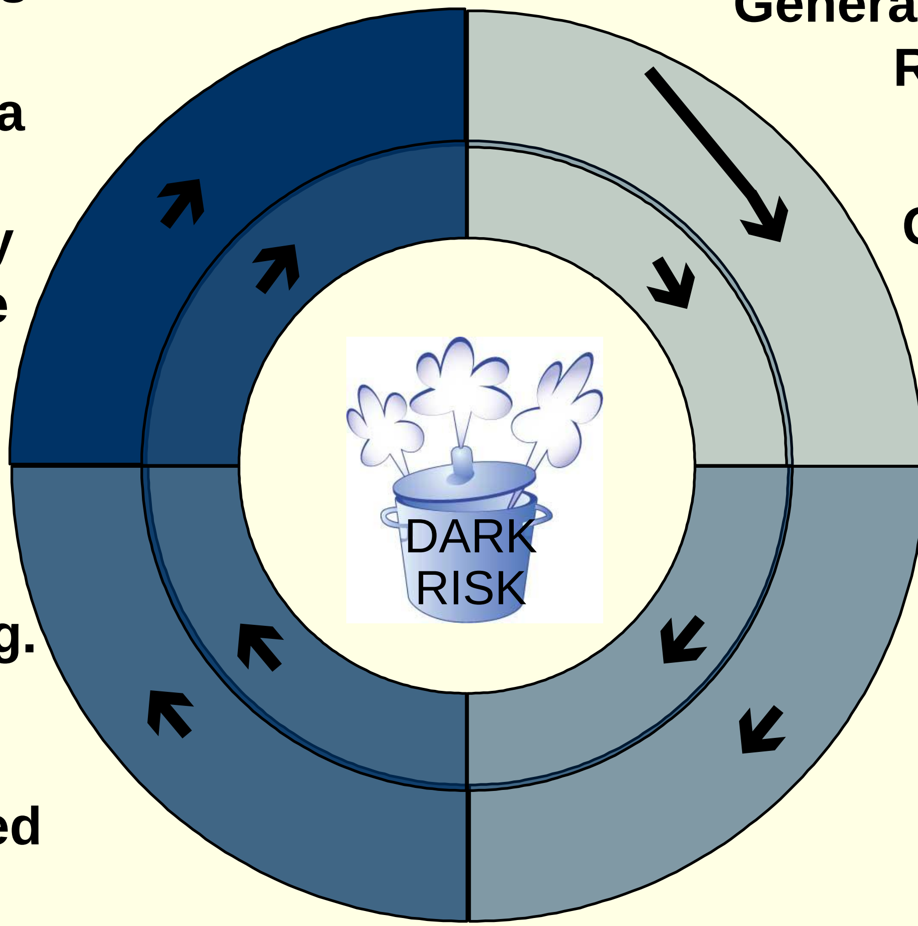
A Unique Innovation Generated Attractive Returns

Growth in Volume

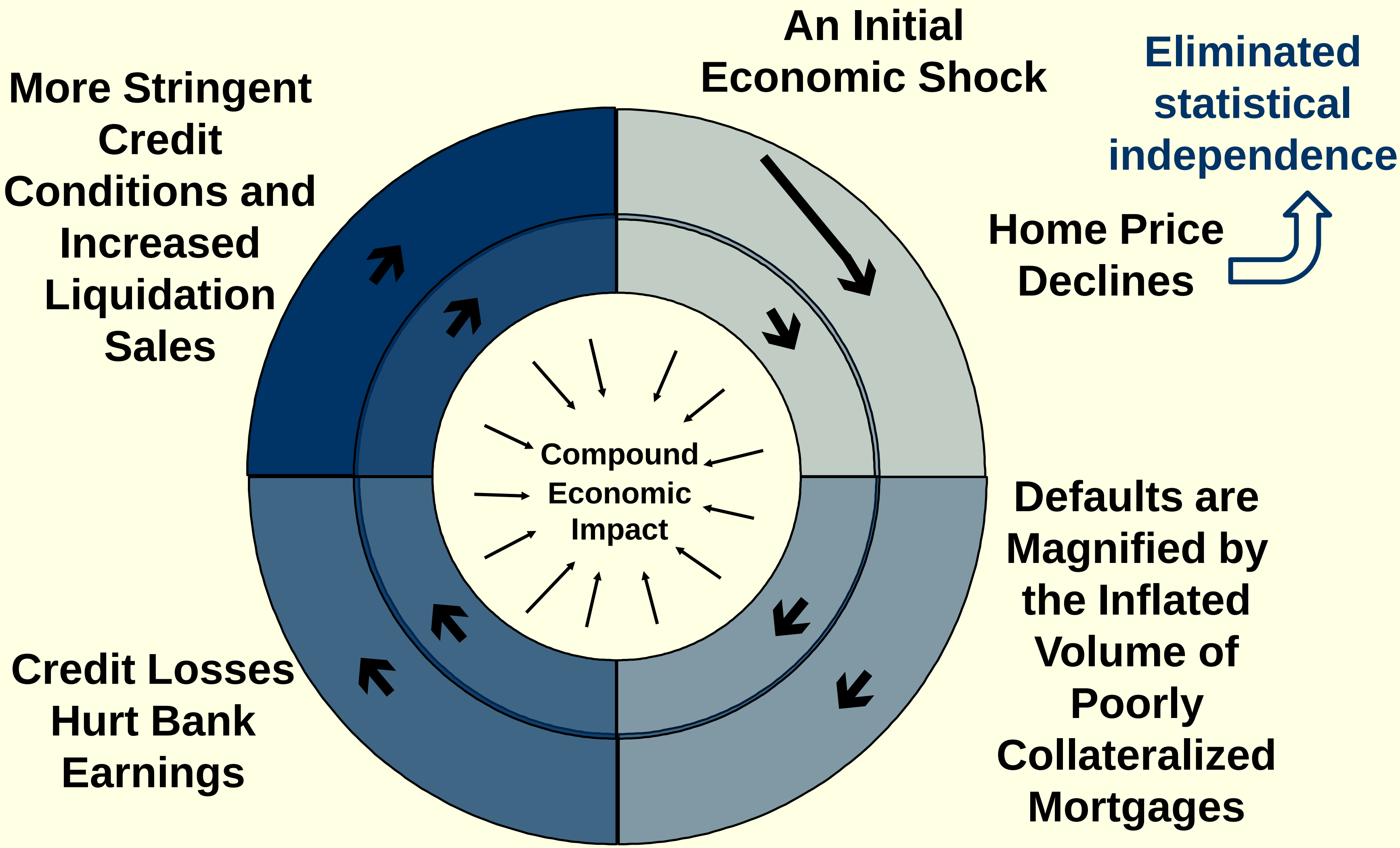
Achieving Greater Volume Required Relaxing Underwriting Standards

Further Innovations (e.g. Compound Repackaging, CDO^2) Increased Complexity

Risk Estimates Based on Historical Data Become Progressively Less Reliable



Self-Referential Feedback – The Subprime Bust



Some Points In Passing

- The role of supernodes:
  - in promoting stability in normal times but creating vulnerability to periodic crisis
  - as a conduit for spreading contagion
- Complexity breeds opacity and, thus uncertainty
  - When it's dark outside – SLOW DOWN!
- History doesn't repeat itself, but it does rhyme
  - From LIBOR^2 to CDO^2
- Not all prices are created equal
  - Consider how value could be determined if liquidity fails

Is risk management playing the wrong game?

Most financial risk management measurement is based on classical statistical techniques.

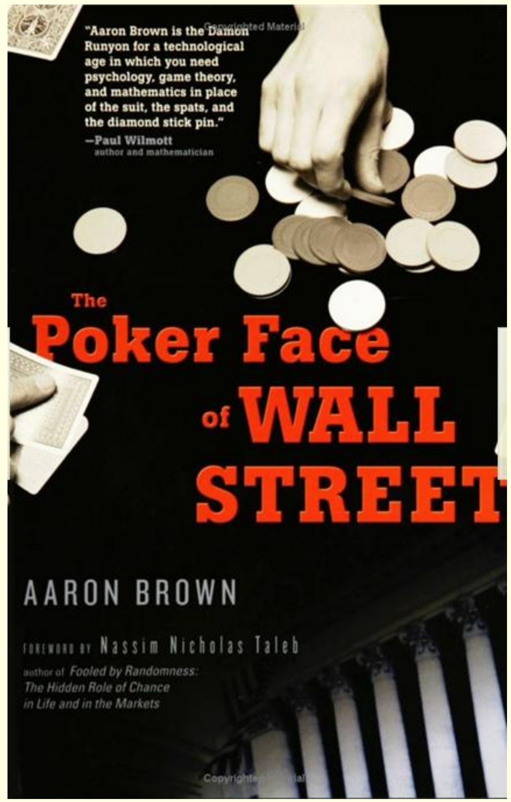
Central to classical statistical theory is the concept of a Stable Random Distribution

Does this apply here?

Is risk management playing the wrong game?

A better
analogy

Is risk management playing the wrong game?

Is risk management playing the wrong game?

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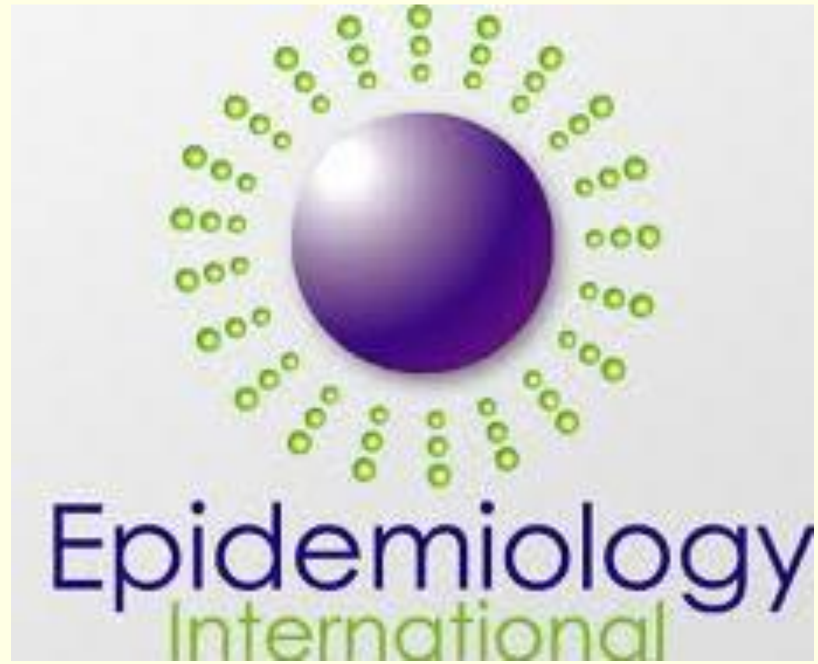


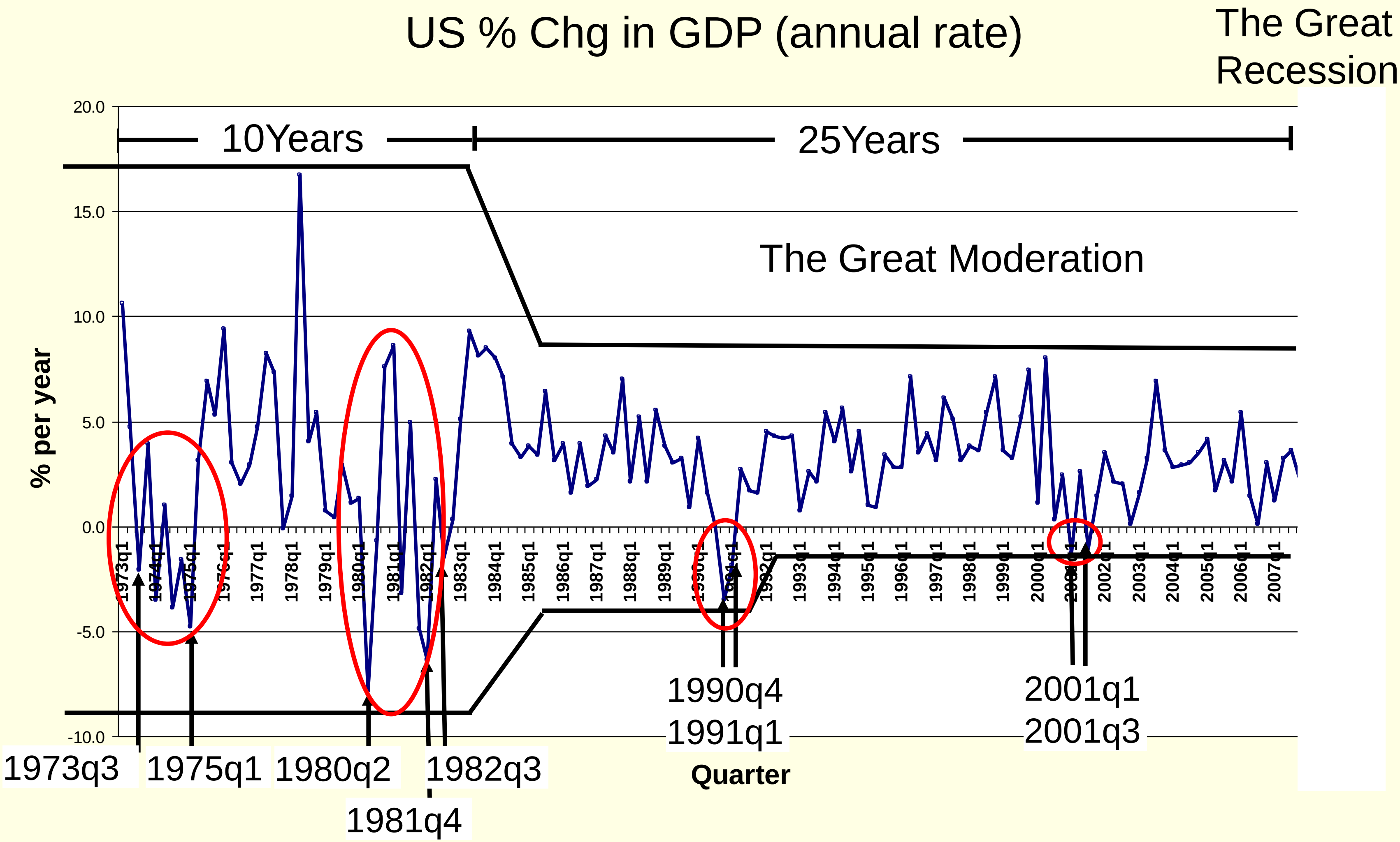
Is risk management playing the wrong game?

A better

analogy

Adaptation

Some Relevant History



FEDERAL RESERVE BANK *of* ATLANTA

Some Relevant History

25 years of

– comparatively stable markets due, in part, to the entry of something like a billion people into the global labor force

– public policy reinforced this stability by successfully preventing all but the smallest corrections

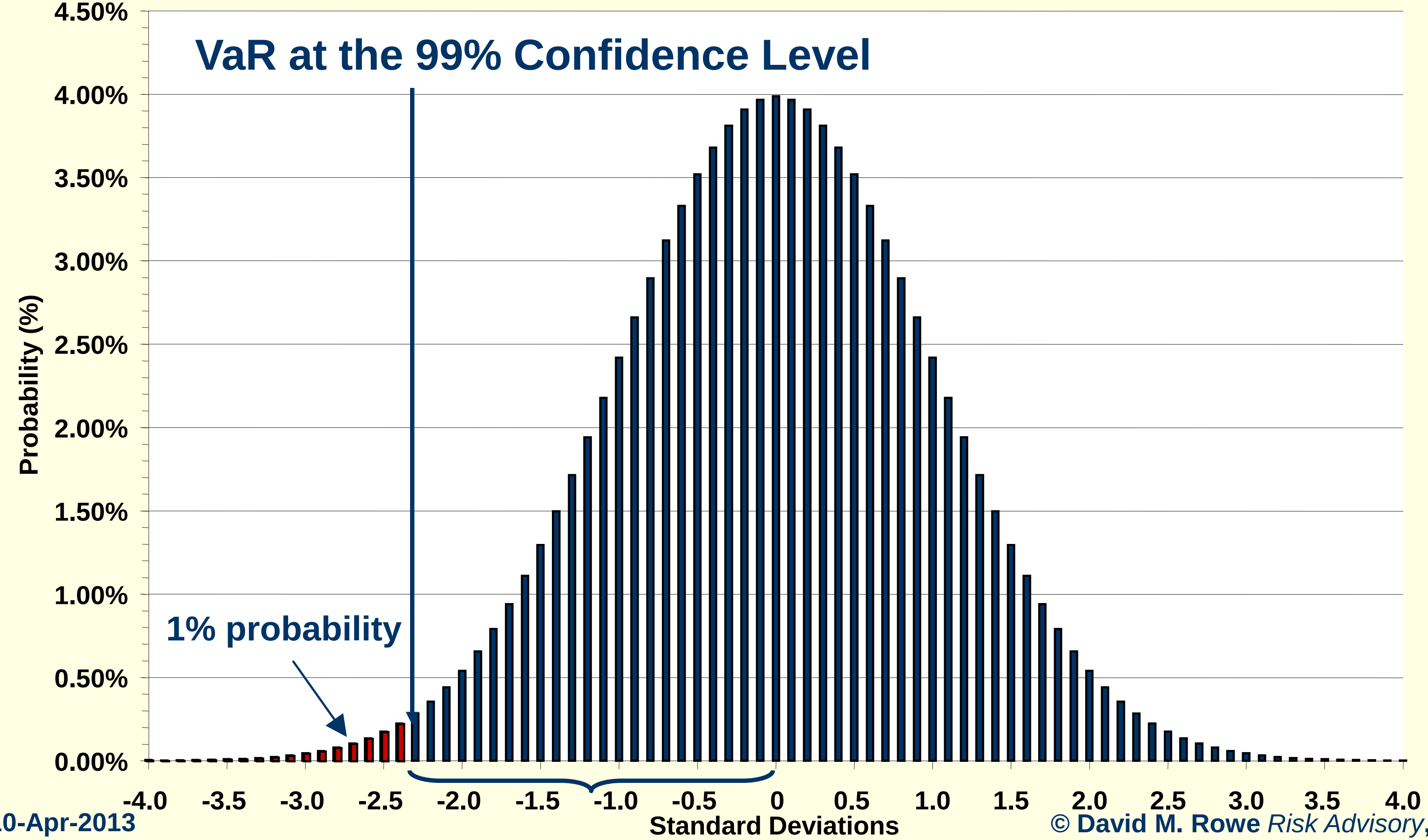
bred complacency toward risk

The result was excessive leverage and vulnerability to a loss of market confidence

"History has not dealt kindly with the aftermath of protracted periods of low risk premiums."

Alan Greenspan (2007)

The Adaptation of Traders

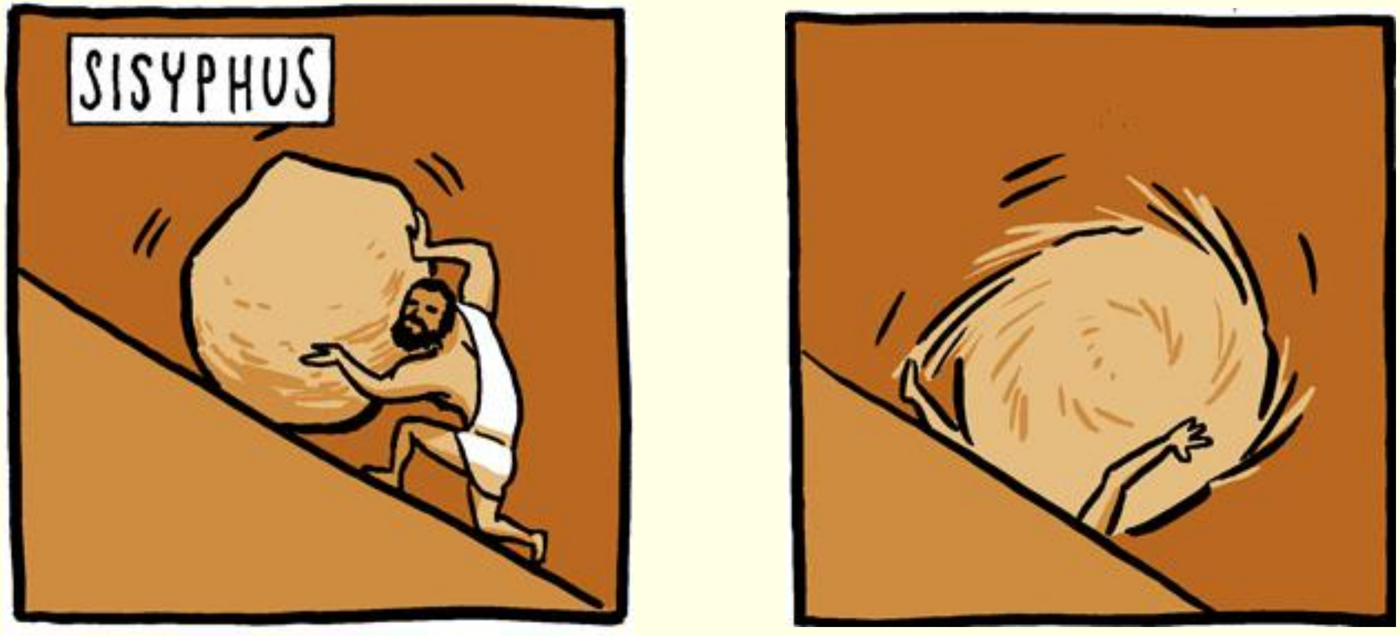


The Adaptation of Traders

- Once VaR became the almost universal metric for measuring market risk, traders had incentives to sell out-of-the-money options to generate returns
- These had little impact on VaR as long as markets were fairly stable, but…
- They represented a significant threat of huge losses in a genuine systemic crisis
- The system we are trying to manage adapts to the measure we put in place to control it.

One Final Thought

- **It's Epidemiology – <u>Not</u> Roulette**



One Final Thought

- **As Larry O'Brien said about politics, so is it true of risk management – there are**