

Financial Risk Management – past, present and future

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What to cover?

- VaR
- Dark Risk
- Liquidity
- The geeks

VaR – why is it so popular? - I

- VaR's great appeal, and its great selling point to people who do not happen to be quants, is that it expresses risk as a single number!
- VaR is however not one model but rather a group of related models that share a mathematical framework. In its most common form it measures the boundaries of risk in a portfolio over short time-horizons, assuming a "normal" market. One reason for VaR to become so popular was that it is the only commonly used risk measure that can be applied to just about any asset class
 - It can take into account a huge number of variables, including diversification effects, leverage and volatility

VaR – why is it so popular? - II

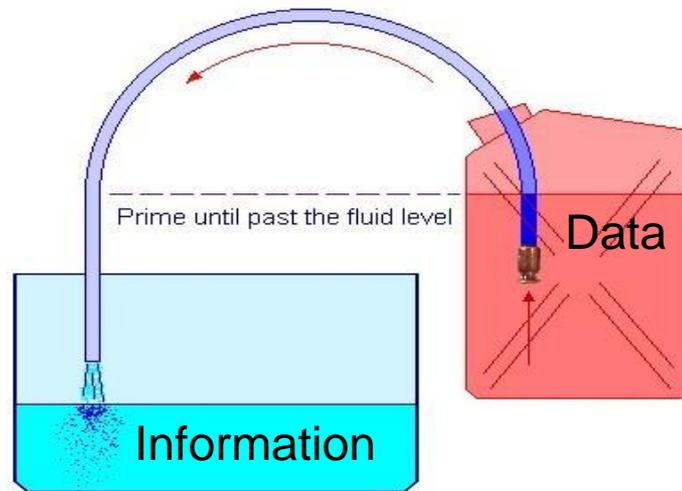
- Another reason VaR is so appealing is because it can measure both individual risks and firmwide risk. Top executives usually know their firms daily VaR number short after the market's close
- Risk managers are using VaR to quantify their firms risky positions to the board. The Basel Committee further validated VaR by saying that firms and banks could rely on their own internal VaR calculations to set their capital requirements

Some remarks....after

- *“Risk modelling did not help as much as it should have”, says Aaron Brown (former risk manager Morgan Stanley)*
- *“VaR is a limited tool”, says Marc Groz (Risk Consultant)*
- *“This is like an air bag that works all the time, except when you have a car accident”, says Nassim Taleb*
- *David Einhorn (founder of Greenlight Capital) has recently written that VaR was “relatively useless as a risk management tool and potentially catastrophic when its use creates a false sense of security among senior managers and watchdogs”*

Fact!

- 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



Extreme confidence

AAA
AA
A
BBB
BB
B
CCC

→ 1 annual default every 10,000 years!

Alternately

AAA									
AAA									
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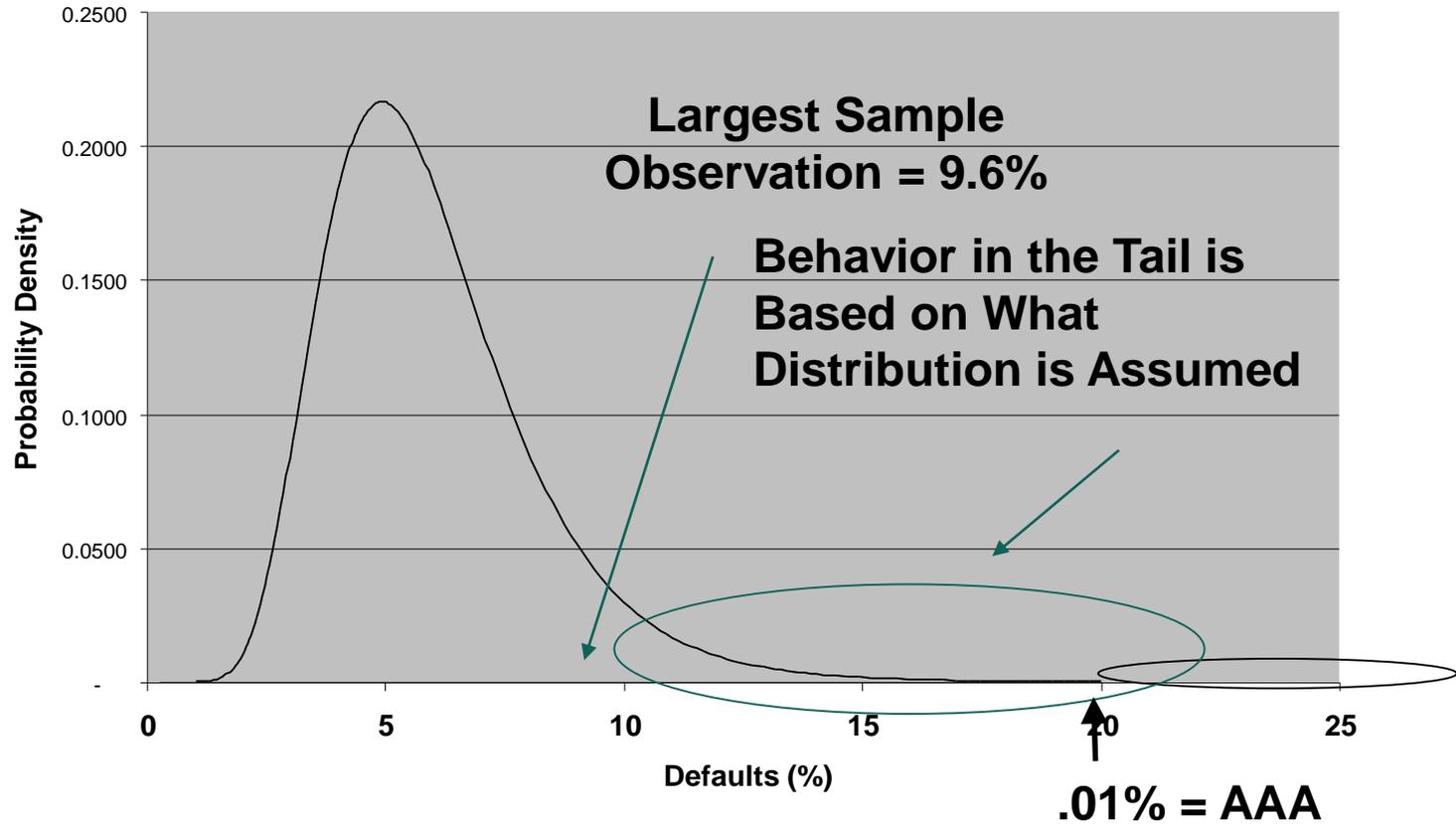


1 annual default every century

Super-senior tranches of subprime mortgage-backed securities were rated AAA (or BETTER!!)
What was the empirical basis for these ratings?

Hypothetical Detachment Point

Hypothetical Subprime Default Probability Density



Credit Ratings

- Credit ratings attempt to estimate a long-run default probability (failure to meet all legal obligations in a timely fashion).
- They say nothing about:
 - Loss given default
 - Potential for future revisions to the rating
 - Co-variability with other ratings
 - Market driven contingencies affecting the issuers legally obligated payments
- They are a metric from the early 20th century with limited applicability to many 21st century assets.

Additional Uncertainty for Sub-Prime Mortgage CDOs

- The empirical foundation for estimating default probabilities differs greatly across securities
- Standard corporate CDO valuation models rely on CDS prices for estimates of $PD * LGD$
- For sub-prime mortgage-backed CDOs, even this foundation for valuation is lacking
 - Only limited current market or historical data are available to support the estimates
- Co-variation assumptions are even more speculative
 - The viability of zero-equity mortgages is heavily dependent on continued economic growth and continued increases in home prices
 - In an economic downturn, default correlations are likely to spike dramatically
 - This can significantly lengthen the tail of the loss distribution

Agency Risk and Adverse Incentives

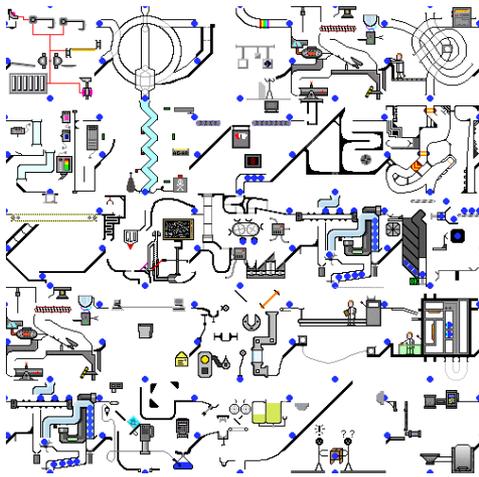
- Credit standards may not be as strict if the obligations are only warehoused and not held to maturity
- Credit agencies have been generating a significant portion of their income from rating CDO tranches
- This market developed in an environment characterized by intense thirst for yield
 - Some emerging market debt spreads had gone from 400bp to 100bp with little reason to think that the risk has fallen correspondingly

Recap of the sub-prime mortgage crisis

- Pricing models for CDOs are worryingly simplistic.
- Co-variation of credit quality across obligors is notoriously unstable, especially in a crisis (and it certainly is not equal for all pairs of names!)
- Untested assets (e.g. subprime mortgages) in a portfolio add a further level of uncertainty
- The result is instability in rating estimates
- Combined with leveraged investing, this can be an explosive combination

Complexity and Dark Risk

Complexity

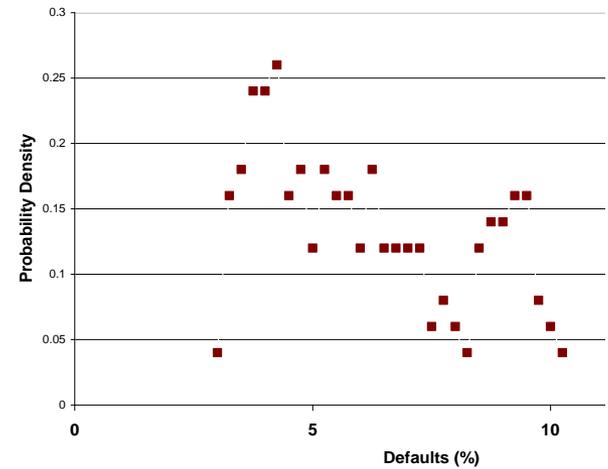


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Dark Risk



Limited Data



What this crisis a Black Swan?



Risk Puzzle – prior 2008



Risk Puzzle – after 2008



Liquidity.....

- Universal in world of finance:
 - Corporations, Hedge funds, Pension funds, Households, Governments
- It has traditionally received the least focus, but has the capacity to do the most damage because of the relationship to systemic risk (herd mentality)
 - Price-based measures of risk increase (decrease) as prices fall (rise)
- *“If money isn’t loosened up, this sucker could go down”*
George W. Bush Oct 2008

Liquidity versus Solvency

- Liquidity
 - Ability to convert assets into timely money
- Solvency
 - Ability to pay off or dissolve outstanding liabilities
- The good news: A liquidity crisis can almost always be resolved
- The bad news: A solvency crisis is more serious and requires some irrevocable loss of economic value
- Remark: Can be difficult to differentiate

Herd mentality



Who can resist when everyone is having so much fun?

To smart for your own good - I

- "Beware of geeks bearing formulas", Warren Buffet 2008
 - "If it looks like a loan, acts like a loan, and performs (at least in the beginning) like a loan, it's probably a loan", unknown origin
- If Institution A makes a loan, a certain amount of capital is required to support that loan – the amount of capital should be related to the likelihood of repayment of the loan
- If Institution A offloads that loan to Institution B, regardless of how this offload is structured, the same amount of capital (at least) is still required to support that loan
- If Institution B breaks up the loan into little pieces and packages the pieces with pieces of other loans it has required and then sells the package to institution C, the same amount of capital (at least) is still required to support that loan

To smart for your own good - II

- If Institution C, and all other Institutions that end up with pieces of the loan originated by Institution A, repackage all or part of their respective shares, recharacterize the resulting whatcha-ma-call-its, rename those same whatcha-ma-call-its, and resell them to Institution D, the same amount of capital (at least) is still required to support that loan
- You get the idea! No matter how the original loan is sliced, diced, packaged, wrapped and marketed, the same amount of capital (at least) is still required to support that loan
- Somewhere in the CDS assembly line that little piece of fact was lost, ignored or re-defined out of existence. The lesson of the current debacle ought to be that the risk inherent in a financial transaction cannot be made to go away by the mere act of repackaging that transaction and renaming it!
 - The sow's ear is still a sow's ear, despite all attempts to make it otherwise

The Financial Modelers's Manifesto

- The Financial Modelers's Manifesto (Derman and Wilmott 2009)
 - *I will remember that I didn't make the world, and it doesn't satisfy my equations*
 - *Though I will use models boldly to estimate value, I will not be overly impressed by mathematics*
 - *I will never sacrifice reality for elegance without explaining why I have done so*
 - *Nor will I give the people who use my model false comfort about its accuracy. Instead, I will make explicit its assumptions and oversights*
 - *I understand that my work may have enormous effects on society and the economy, many of them beyond my comprehension*

Just after the crisis....

- There has been some claims that the financial crisis is a failure of risk-management, here are some examples:
 - Maurice Greenberg, former chairman and CEO at AIG, blamed AIG's 2008 meltdown on the failure of internal risk management (see also next slide)
 - Robert P. Hartwig president of Insurance Information Institute, lashed out at the current enterprise risk management frameworks when he said that *"the financial crisis is the result of a failure of risk management [in the banking and securities markets] on a colossal scale... We may literally have to tear up the manual of enterprise risk management and start over. How did so many major financial players miss or overlook such huge, systematic exposures?"*

Just after the crisis....continued

- Some limit the "attack" claiming that it is the failure of **quantitative** risk management, here are some examples:
 - On "algotrades", Richard Dooling wrote: *"Somehow the genius quants – the best and brightest geeks Wall Street firms could buy – fed \$1 trillion in subprime mortgage debt into their supercomputers, added some derivatives, massaged the arrangements with computer algorithms and – poof! – created \$62 trillion in imaginary wealth"*
 - AIG again... The problem for AIG was that the internal risk models did not include market risk – it was focused on the likelihood of default
 - *"We would like society to lock up quantitative risk managers before they cause more damage"*, Taleb said.

Sound Advice

- **Learn from the mistakes of others you'll never live long enough to make them all yourself.**
- **It's also less painful than learning from your own mistakes**

The next crisis...I

- To big to fail....is that an issue?
 - If then how to best handle it?
- Complexity and the Geeks...
 - After the crash of 1987 we got smiles (higher price for out-of-the-money put options (Crashophobia)
 - After 2008...we got violation of the spot-forward relationship....multiple tenors => multiple yield-curves
- The evolution of risk management
 - An organisational view...
- The human nature
 - "We have met the enemy and he is us", Walt Kelly (1970), [http://en.wikipedia.org/wiki/Pogo_\(comics\)](http://en.wikipedia.org/wiki/Pogo_(comics))
- The role of rating agencies....
- The risk of regulatory over-reaction....

Litterature

- Nassim Taleb
 - The Black Swan
- Scott Patterson
 - The Quants
 - How a new breed of Math Whizzes Conquered Wall Street and Nearly Destroyed It