



The Actuarial Profession

making financial sense of the future

The Financial Crisis - a 1 in 200 year event – or a one in 10 year event
Professor William Shaw, King's College, London and Ralph Frankland, Aviva UK Life

9th March 2010



2008 - a year in 200?

Agenda – Part 1 – An Actuarial Perspective

A personal perspective, not that of my employer, or the profession

- 2008 a special year?
- Ascribing probabilities to rare events
- A range of views about 2008
- Lessons to be learnt – is it about statistics or understanding risk?

2008 - a year in 200?

What do we mean by 1 in 200?

- At the start of 2008, was the probability that things would turn out as bad as they did more than or less than 0.5% (1 in 200)?
- Many of the “events” that were to happen in 2008 had already begun to unwind in 2007, i.e. we may need to be fluid about which 12 month period we are referring to.
- It may not even be a twelve month period that we are considering. How do you compare a slow drawn out fall, such as January 2000 to March 2003 with a sharper fall as in 1987 which happened over a few weeks.

2008 - a year in 200?

What features of the 2008 Financial crisis make estimating its probability difficult.

- The 2008 Financial Crisis was not a single event – it was a number of different events which affected different markets and different institutions in different ways.
- These events were not independent of one another.
- Understanding the connections between events is vital to understanding the crisis itself.

2008 - a year in 200?

How do we estimate 1 in 200?

- Market Consistent approach – pick an indicator e.g. credit spreads and then find the price of the outturn by comparing with the price of traded derivatives just before the crisis
- The historical approach – either pick an indicator and look at past experience of that indicator to estimate its distribution and therefore the half percentile
- Build an economic model to combine a number of metrics defined as in one of the two methods above and project forward deriving the probability from a number of such projections
- Sit a collection of experts in a room and ask them for their views

2008 - a year in 200?

Issues with these approaches?

- Market Consistent approach – markets not sufficiently deep and liquid, especially for extreme risks. But maybe an early warning!
- The historical approach – the classic approach employed by actuaries and regulators.
- Using a model is only as good as the model itself. Would we have modelled the chain from US property prices to UK banks? May be the way to understand interactions.
- The collection of experts – works if the experts are appropriately distributed!

2008 - a year in 200?

The historical approach - a bit more detail

- An approach which regulators have used to assist in the calibration of ICA tests (and presumably Solvency II tests)
- Choice between “Data Sampling” and “Distribution Fitting”
- Limited non overlapping data and short periods don't form random walks into longer periods
- How relevant are the experiences of the 1970's, 1930's, 1800's, and beyond to today? How many years data do you need?
- Beware (Be aware) of other prior beliefs – e.g. preconceptions over distributions, assumptions about markets, independence/homogeneity of international markets

2008 - a year in 200?

Alternative Views

- An extreme outlier – an event so unlikely that it should not occur even once in the history of the universe.
- A extreme event – 1 in 200 years
- A very bad year – once in 30 years – career worst
- A 1 year in 10 event
- The new paradigm – every year will have its problems. In 2008 it was the banks turn.

2008 - a year in 200?

An extreme outlier – an event so unlikely that it should not occur even once in the history of the universe?

- Claimed by some on the basis of successive daily movements in credit spreads
- Fails to take account of the dynamics of the market in stressed conditions
- Stressed markets become more stressed for various reasons – including fear, opportunism, trying to avoid a catastrophe

2008 - a year in 200?

A extreme event – 1 in 200 years?

- Overall 2008 did look bad from an historical perspective
- For many countries 2008 was a far worse year for equity markets than had been experienced for considerable time.
- Interestingly in the UK the 1973/4 experience had been worse for equities - and overall the first 13 quarters of the millennium produced a worse negative return on equities
- If it really was a 1 in 200 year event is that consistent with equity, the ultimate risk bearer, being so relatively undamaged, at least in the UK?

2008 - a year in 200?

A very bad year – once in 30 years – career worst?

- A plausible view, hard to dispute
- What about the impact of the changed nature of the financial institutions that dominated the market
- If the risk mitigation strategies were not working at the 1 in 200 level, were they working at any level, or were they actually at the heart of the problem, if so.....

2008 - a year in 200?

A 1 year in 10 event?

- Possibly, had feedback loops been built into business models with lending driving up the price of property whilst keeping down the crucial loan to “value/price” ratios that a small subsequent fall in property prices could trigger a series of events which would lead to further larger falls triggering worse events?
- Anecdotal evidence suggests this may have been, at least, in part the case and that the use of certain asset backed securities to manage risk may have compounded the problem.
- In which case was the financial crisis an ambush waiting for the first minor reversal in property prices.

2008 - a year in 200?

A 1 year in 10 event?



Dominoes do fall over, but unless you line them up carefully they don't usually all fall over together

2008 - a year in 200?

A 1 year in 10 event?



Dominoes do fall over, but unless you line them up carefully they don't usually all fall over together

Was the crisis an accident waiting to happen?

2008 - a year in 200?

The new paradigm – every year will have its problems?

- ?

2008 - a year in 200?

A few observations and lessons

- Hopefully we learn from the past
- 1 in 200 year events happen every day
- Risk management and Donald Rumsfeld
- In business it is very easy to take on risk – difficult and costly to remove it.
- Testing to Destruction/Killer Scenarios/Reverse Stress testing

2008 - a year in 200?

Rumsfeld on Risk

“Reports that say that something has not happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don’t know we don’t know”.

2008 - a year in 200?

Rumsfeld on Risk

Risks
unimagined

Unknown unknowns
Risks of which we are not even aware and which are not understood/quantified

Risks
known
to exist

Known knowns
Risks of which we are aware and which are understood

Known unknowns
Risks of which we are aware but which are not understood/quantified

That which is known

That which is not known

2008 - a year in 200?

Risks unimagined	Unknown knowns Risks of which we are not aware and yet which are understood/quantified	Unknown unknowns Risks of which we are not even aware and which are not understood/quantified
	Known knowns Risks of which we are aware and which are understood	Known unknowns Risks of which we are aware but which are not understood/quantified
That which is known		That which is not known

2008 - a year in 200?

Unknown knowns

Risks of which **we** are not aware and yet which are understood/quantified.

A CRO's nightmare

Unknown unknowns

Risks of which we are not even aware and which are not understood/quantified.

Risks managed statistically

Known knowns

Risks of which we are aware and which are understood.

Well managed Risks

Known unknowns

Risks of which we are aware but which are not fully understood.

Typically close managed Risks

2008 - a year in 200?

Unknown knowns

Risks of which **we** are not aware and yet which are understood/quantified.

A CRO's nightmare

Someone in the organisation knew about the risk and may have even quantified it

or

Everyone (presumably except the CRO) was aware of the risk, and anyone could have done something about it, but no one did

or

Everyone knew about the risk, but either thought it was highly unlikely, or else not very significant

2008 - a year in 200?

Risk Reduction

In business it is very easy to take on risk – difficult and costly to remove it without taking on other risks, for example:

- An investor may buy equities and be exposed to downside equity risk.
- They may, at a price buy downside protection risk in the form of a put option.
- In doing so they may take on credit risk to the counterparty, basis risk if the option does not exactly match the equity exposure they have an operational and/or a liquidity risk depending on how they manage their collateral.

2008 - a year in 200?

Risk Reduction

- Prior to the 2008 financial crisis was risk reduction activity well managed? Did it exacerbate some of the risks? Were the risks taken on (including liquidity) less risky than the risks eliminated?
- Certain short term contracts were assumed to be renewable/replaceable which they proved not to be.
- In an industry that relies on confidence, what happens when that confidence is **slightly** dented? Did the risk mitigation strategy itself over rely on that same confidence?

2008 - a year in 200?

New Ideas in Regulation

- Testing to Destruction/Killer Scenarios/Reverse Stress Testing – the importance of Thinking the Unthinkable
- What would it take to destroy the company? What can we do to avoid that?
- Is this the cure for the CRO's nightmare?
- A cautious “maybe” – only if the CRO has enough imagination and talks to enough people and if enough people listen to the CRO!
- Understanding the business - better management of Capital Procyclicality/Contra Cyclicity. Is this a new idea?

2008 - a year in 200?

In retrospect

- It is suspected by some that the 2008 Financial Crisis was triggered by an event which in itself was not particularly unlikely. However, in recent years certain aspects of the banking industry had developed in such a way that a plausible event triggered a chain of events which led to the Crisis.
- It is possible that had the trigger occurred at some other time the Crisis may have been more or less severe depending on the sensitivity of mechanism underlying the chain of events.
- We may never know for sure! Though hopefully we shall all learn from the experience.