Credit Crisis Lessons for Modelers

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Subprime Mortgage Structure

- The subprime mortgage was a financial innovation designed to expand the home ownership opportunity to more riskier borrowers.

- Subprime mortgage - “2/28” or “3/27” structure
  - Low initial “teaser” fixed rate (typically in line with current standard mortgage rates)
  - Pre-payment penalty
  - Step up in rate at the end of the fixed period

Subprime Mortgage Structure

- Structure had two benefits
  - The pre-payment penalty improved the predictability of initial principle and interest payments.
    - Useful in the creation of mortgage backed securities
  - The step-up rate allowed for re-underwriting of riskier borrower in every 2-3 years

- Gary Gorton, “The Panic of 2007”, August 2008

  “the defining characteristic of a subprime mortgage is that it is designed to essentially force a refinancing after 2-3 years...a subprime mortgage contains an implicit embedded option on house prices for the lender. To the extent that this option is valuable, lenders may be more willing to lend to riskier borrowers.”

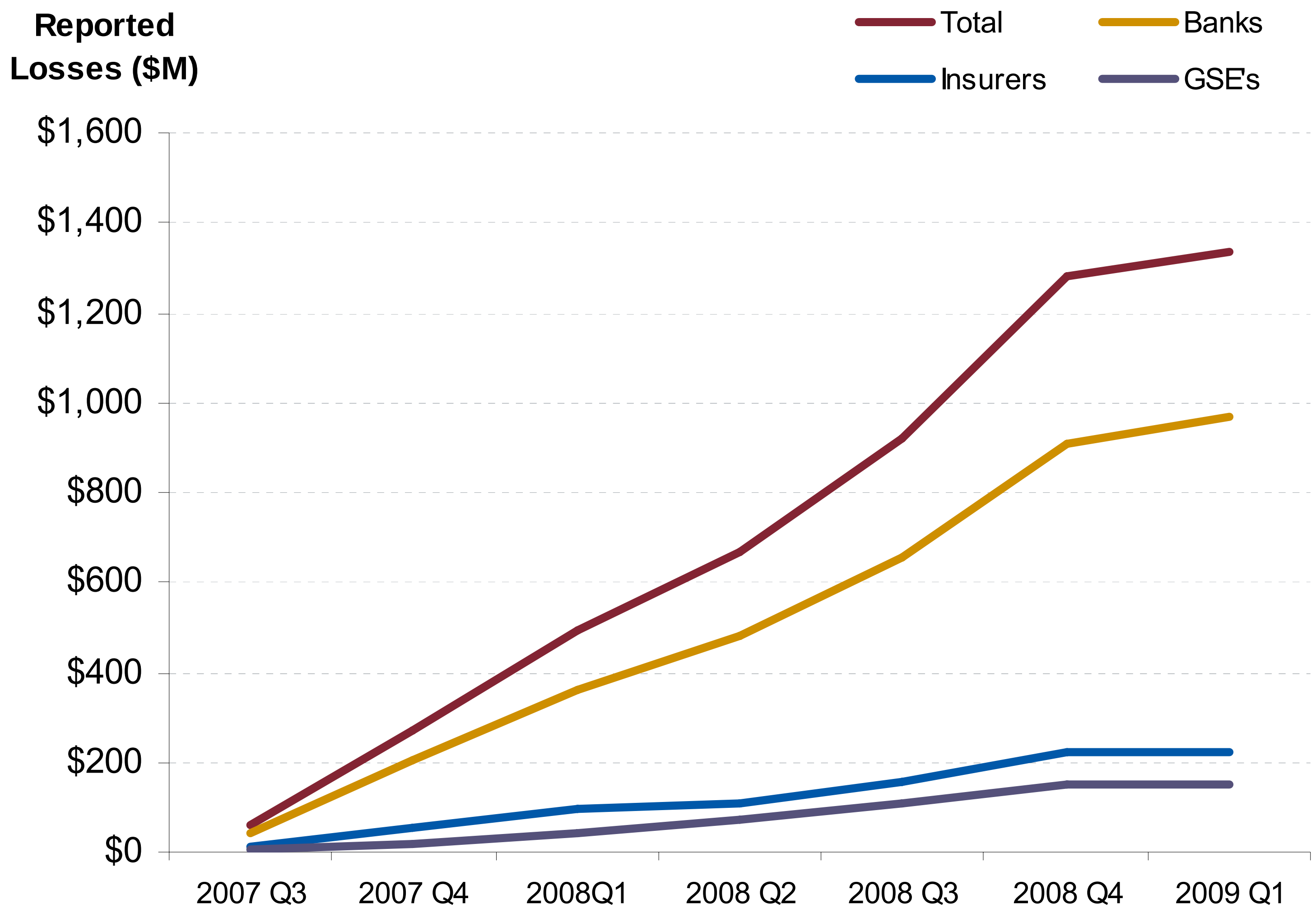
Subprime Mortgage Backed Securities

- Pitch to RMBS investors*
  - More reputable lenders using automated, transparent underwriting criteria
  - Less interest rate risk than standard MBS
  - Strong housing market minimizes the downside risk to subprime loans
- Lower rated tranches could be sold and rolled up into CDO's.
- Everyone wins!!....What could go wrong?

* "Making Sense of the Subprime Crisis," Gerardi, Lehnert, Sherland, and Willen
http://www.frbatlanta.org/filelegacydocs/wp0902.pdf

AON BENFIELD

Credit Losses Reported to Date
Banks, Insurers, GSE's



Cumulative Writedowns Source: Bloomberg April 27, 2009

Subprime Mortgage Backed Securities

- Many analysts recognized the link to underlying home price appreciation, and the risk to RMBS built with subprime mortgages...
  - Quote 1 -
    - "Prepayments on subprime hybrids are strongly dependent on equity build-up and therefore on HPA. Slower prepayments extend the time a loan is outstanding and exposed to default risk."
  - Quote 2 –
    - "...the boom in housing translated to a build-up of equity that benefited subprime borrowers, allowing them to refinance and/or avoid default. This as been directly reflected in the above average performance of the 2003 and 2004 HEL ABS vintages."

Subprime Mortgage Backed Securities

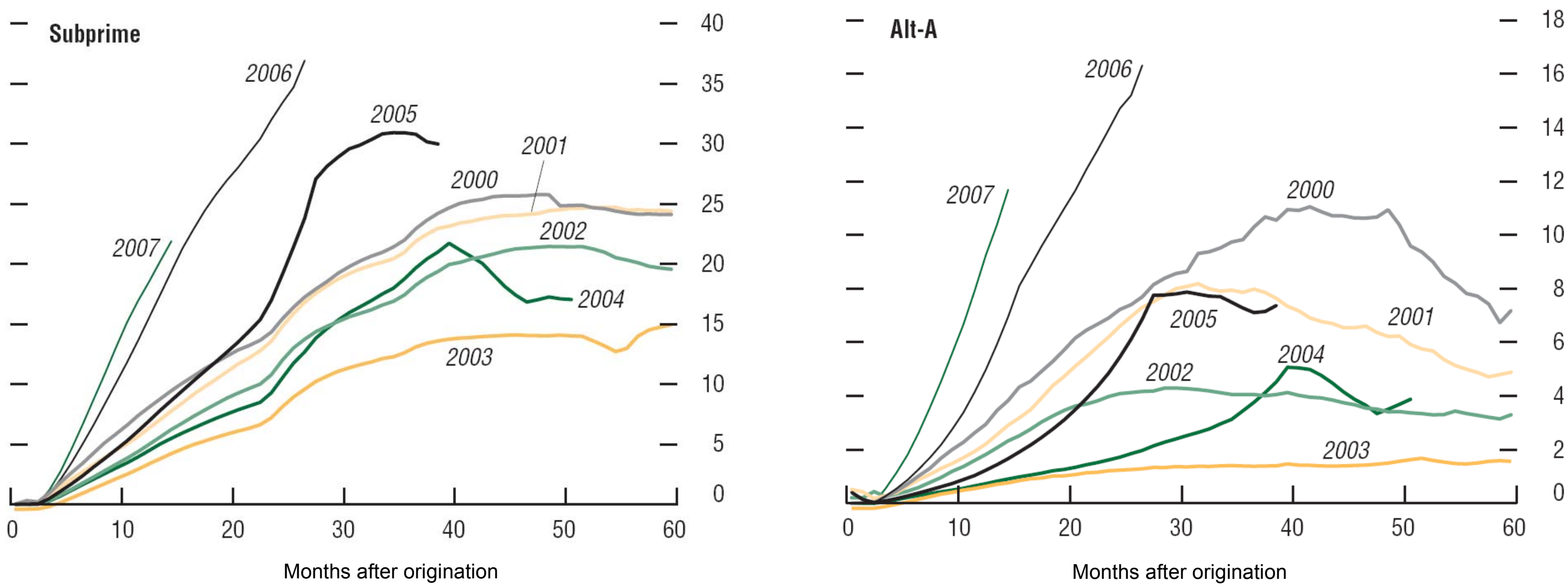
- ...although some were wrong on the probability of a housing price collapse.

  - Citigroup analyst, December 2005
    - "...the risk of a national decline in home prices appears remote. The annual HPA has never been negative in the United States going back at least to 1992."

Lesson for Actuaries/Modelers

- Even if our model accurately captures the severity of a risk, an incorrect estimate of the probability can still lead to the wrong conclusion.

US Mortgage Delinquencies by Vintage Year
(60+ day delinquencies, in % of original balance)



IMF Global Financial Stability Report, p. 12, Figure 1.8
http://www.imf.org/external/pubs/ft/gfsr/2008/02/pdf/text.pdf

Recommendations for Actuaries/Modelers

- Recognize our model ≠ real world
  - Complex models can hide the evidence that the entire range of indications being provided rely upon one or two key assumptions.
- Stress test key assumptions, especially correlation and the likelihood of tail events
- Acknowledge the limit of our ability to parameterize a model from a limited data sample and its corresponding implication for model precision