

# Financial Modelling

## Theoretical Models and Practical Implications

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# Caesar's Quote

"... When this business was finished, he decided to appoint assessors, since credit had become difficult all over Italy and debts were not being paid; these assessors were to make valuations of landed and other property at the prices ruling for individual items before the war, and such property was to be handed over to creditors. Caesar thought this would be the most appropriate measure, both to remove or reduce the fear of a general cancellation of debts, and to protect the value of debtors' assets." Caesar, The Civil War, Book III

# Some well-known bubbles

The Tulipmania (1634-1638)

The Mississippi Bubble (1720)

The South Sea Bubble (1720)

The Railroad Mania (1840)

The Bull Market of the Roaring Twenties (1924-1929)

The Japanese "Bubble Economy" (1984-1989)

The DotCom Bubble (2000)

The Subprime Bubble (2002-2007) and creation of the parallel banking system

# Some well-known explanations

Qualitative explanations of crises are well-known but not always palatable

Adam Smith

David Ricardo

Karl Marx: underconsumption, anarchy of production, etc.; average business cycle of 7.5 years

John Maynard Keynes

Hayman Minsky

Financial crises are "birthmarks" of capitalism, however, socialism is much worse!

# Current intellectual debates

Current intellectual debates are "subprime"

Main controversies:

"Salt Water" vs. "Fresh Water"

Monetary vs. Fiscal

Black Swan (BS) vs. Black Scholes (BS)

Gaussian vs. non-Gaussian return distributions

VAR vs. common sense

# Constituent parts

Investors

Pension funds

Asset managers

Banks

Insurance companies

Hedge funds

Various supporting players, i.e., custodians, credit rating agencies, etc.

# Purposes of investing

Wealth preservation

Wealth creation

Life-time wealth transfer

Intergenerational wealth transfer

"The importance of money essentially flows from it being the link between the present and the future." John Maynard Keynes

# Mathematical models

Stochastic nature of financial time series and their non-stationarity

Different time scales of modern finance: from milliseconds (finance at the speed of light) to decades

Different intellectual sources for model building: probability theory, numerical methods, statistics, economics (the weakest link).

Main difficulty: "fallacy of the historical data series"

Main purposes of the models: investing, trading, risk-management, speculation.

Important point: risk-neutral probability vs. real-world probability pricing of derivatives

# CDS figure

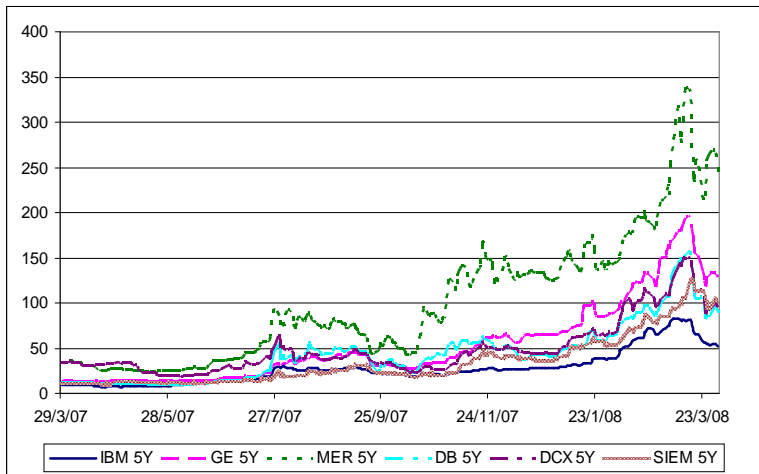
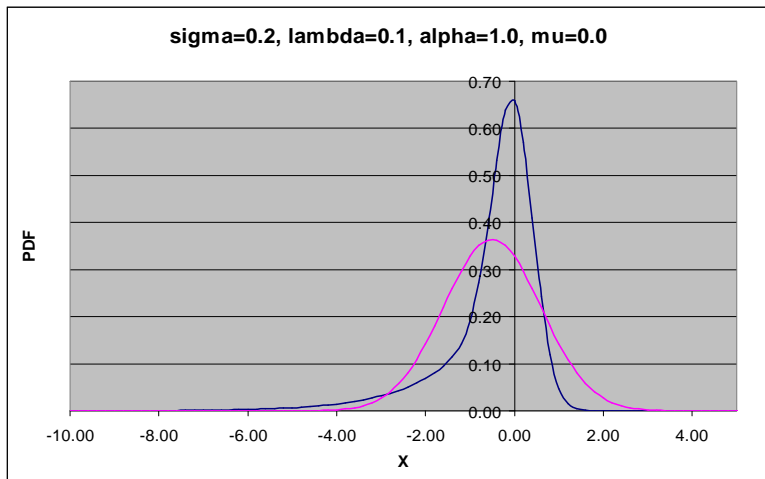
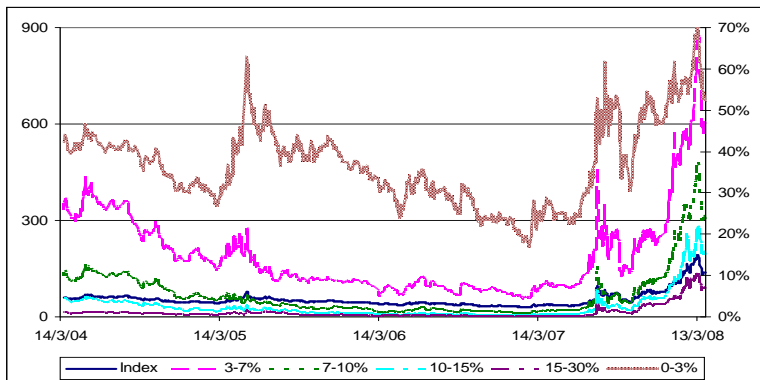


Figure: Time series of 5Y CDS spreads (in bps) for 6 typical companies (IBM, GE, Merrill Lynch, Deutsche Bank, Daimler, and Siemens). Source: Merrill Lynch.

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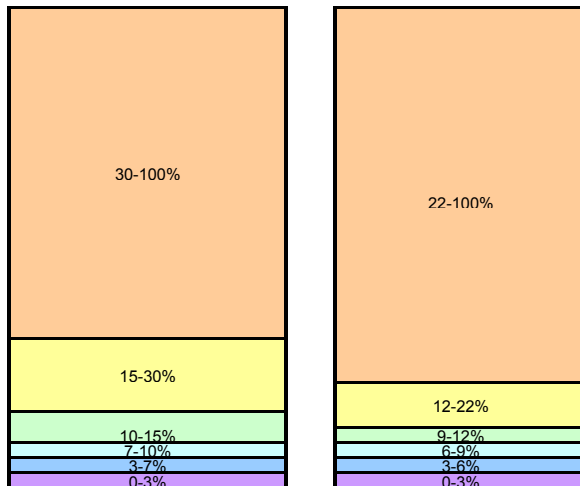


- Standardized indices and their behavior, CDX index and tranches 5Y:



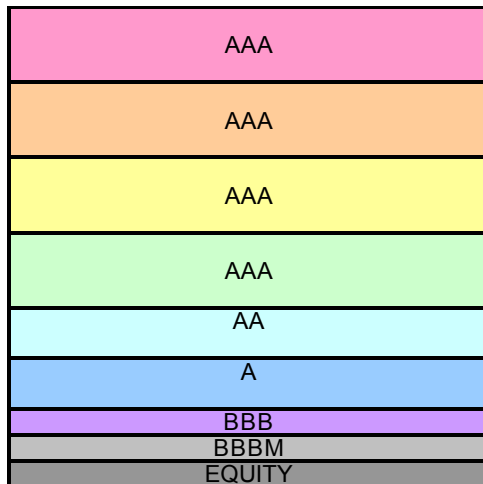
**Figure:** Time series of spreads (in bps, left axis) for 5Y on-the-run CDX index and its mezzanine and senior tranches; and upfront payments (in percent, right axis) for the equity tranche. Source: Merrill Lynch.

# CDX and ITX structure



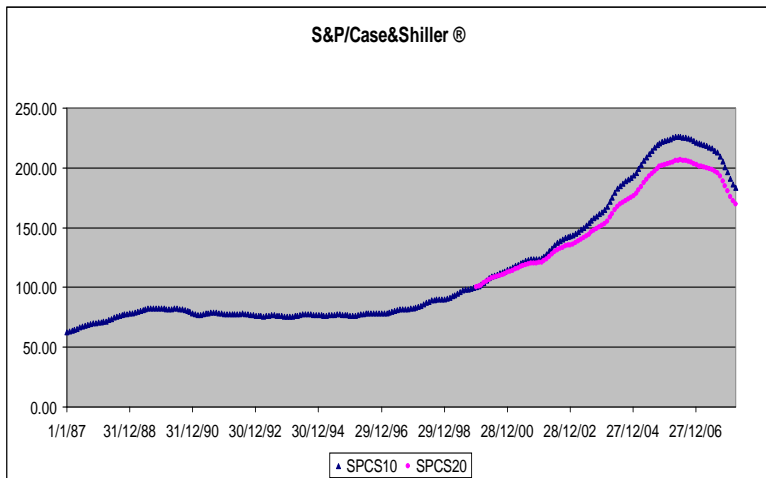
# ABS pools structure

- The structure of the mortgage pool is as follows



# SPCS figure

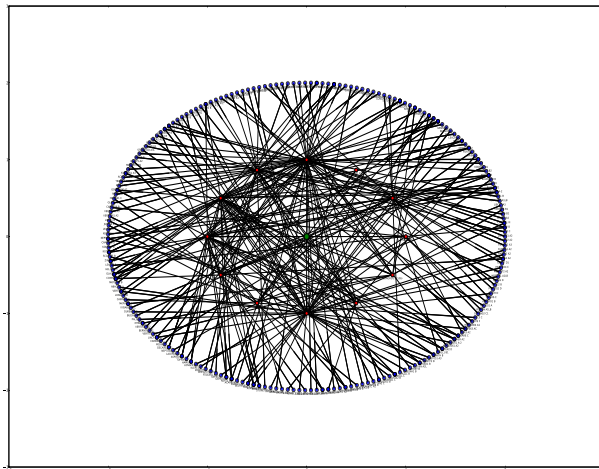
- Black Swan or lack of common sense?



# ABX price figure



# ABS CDO graphs



Investors have to lower their sights and have realistic expectations: losses and gains are interconnected!

Permanently lower ROI for the foreseeable future

Simplification and standardization of financial instruments

Better regulation

More reasonable monetary policy going forward