Financial Modeling after the crisis

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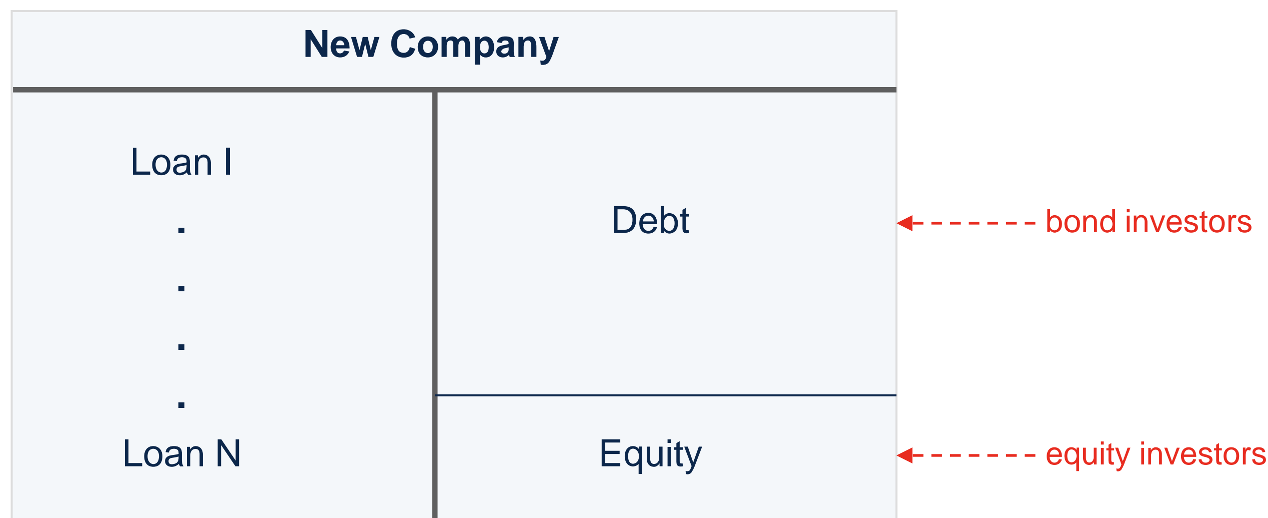
Itinerary

- Models don’t kill, people do
- Profession, principles, organization
- The risk management balance of power
- New regulation, new danger
- Back to basics
- The risk managers’ diagnostic

Models don’t kill, people do

- A major propagator in the credit crisis has been the Structured Asset Backed Security product (RMBS, CMBS, CLO, CDO, ….)
- Credit default modeling of these products depends on a correlation model
- Let us look at a simple Collateralised Loan Obligation (CLO)

Credit Modeling of a CLO



- Loans produce interest income
- Debt investor require an interest coupon
- Equity investors require a dividend
- The equity absorbs the first loss
- Fort this illustration assume:
  - 10.000 loans
  - EUR 10 million each
  - PD = 2 % for each loan
    (i.e. each loan Credit Rating BB-)
  - LGD = 50% for each loan
  - Default correlation 12 %

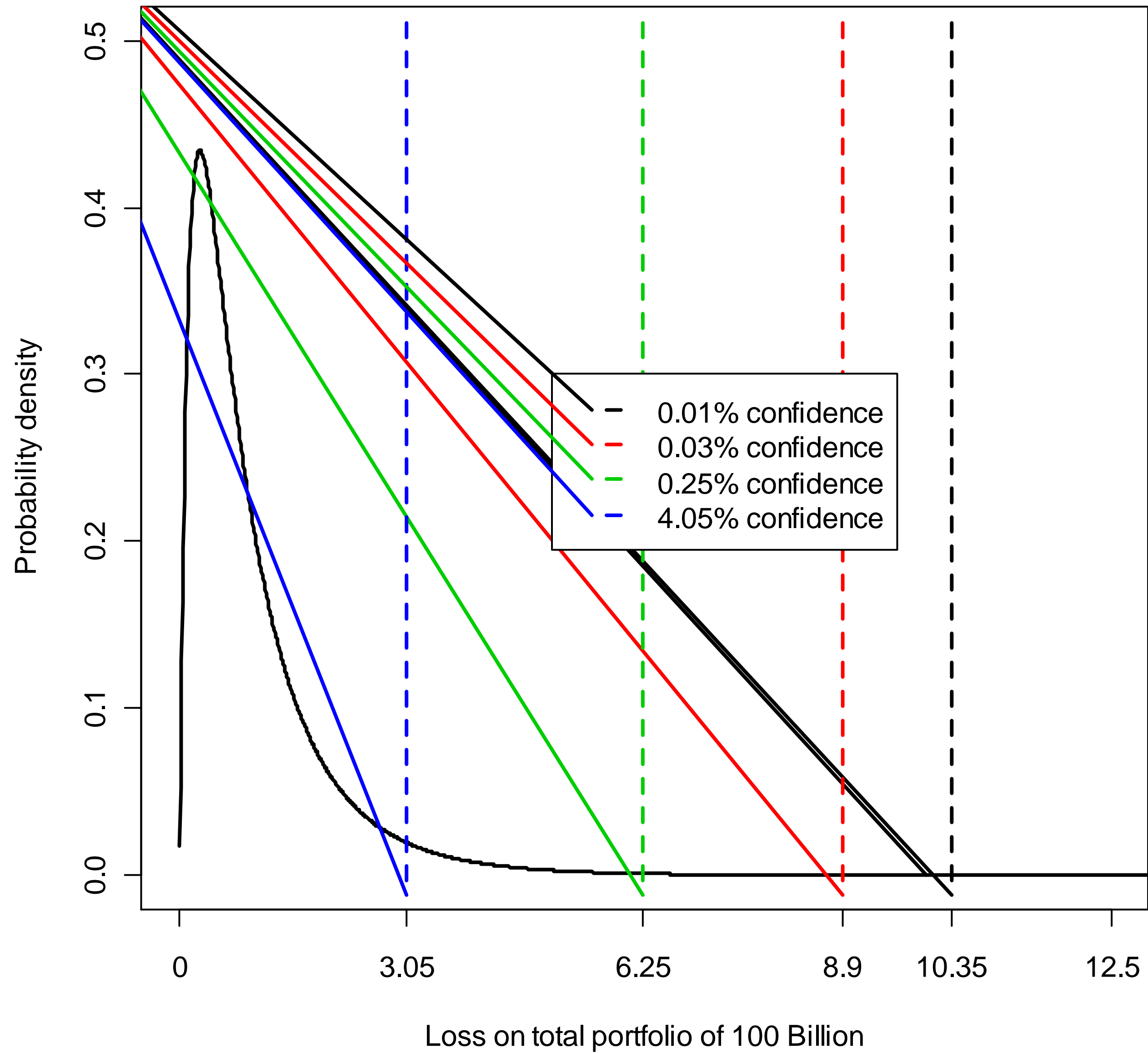
Credit Modeling

New Company	
Loan I	
.	AAA
.	AA
.	BBB
.	B
Loan N	Equity

- Financial Market specialists create debt of different “seniority”. The Equity absorbs the first loss, then (in this illustration) the B bonds, then the BBB bonds etc.

Reminder:

Credit Rating	PD
AAA	0.01 %
AA	0.03 %
BBB	0.25 %
B	4.05 %


Probability density
0.0
0.1
0.2
0.3
0.4
0.5
0.01% confidence
0.03% confidence
0.25% confidence
4.05% confidence
0
3.05
6.25
8.9
10.35
12.5
Loss on total portfolio of 100 Billion

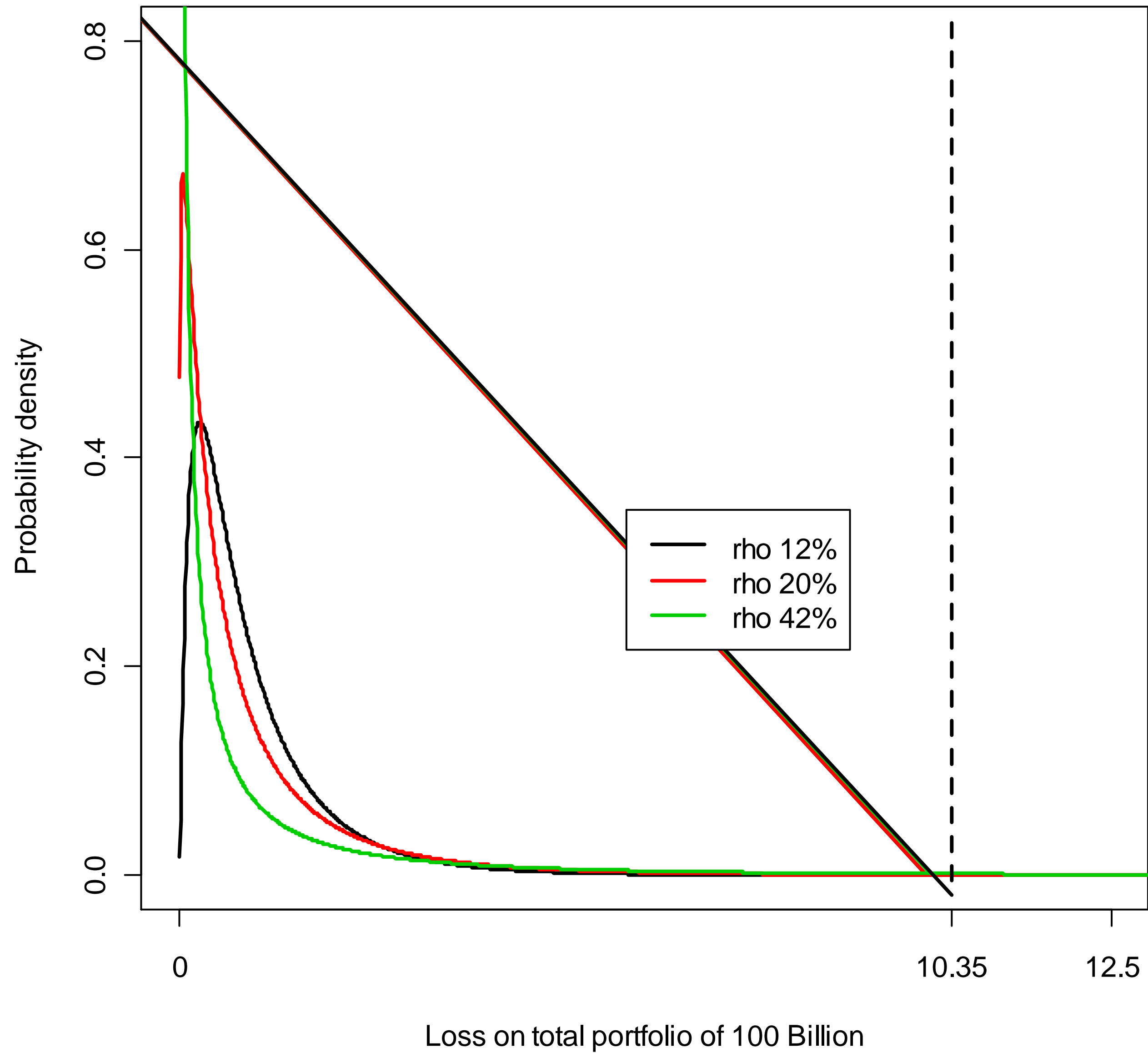
Credit Modeling

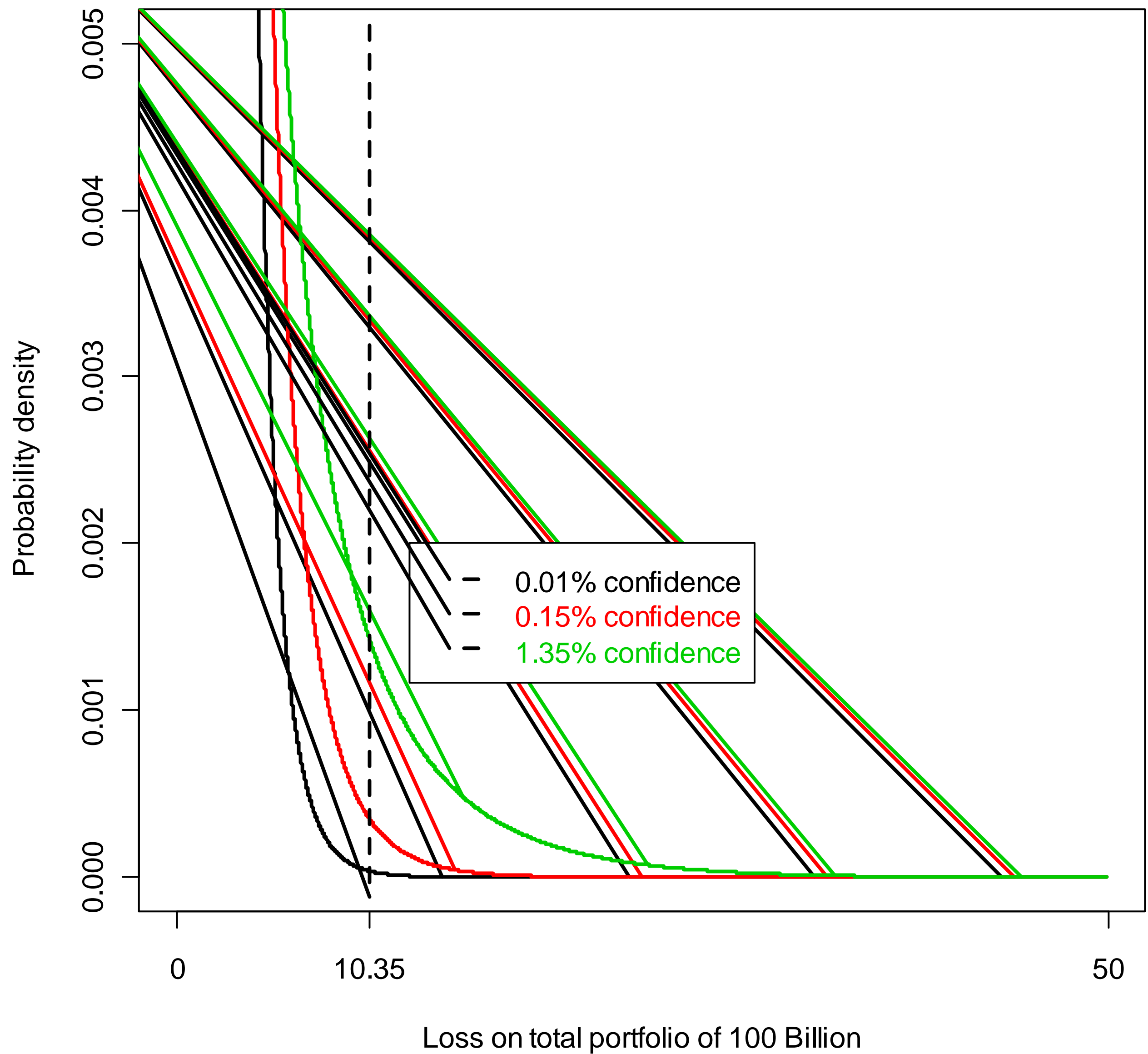
New Company	
Loan I	AAA
.	AA
.	BBB
.	B
.	Equity
Loan N	

10.35
8.9
6.25
3.05

specialised investors

- Each debt rating requires its own return, depending on supply and demand in the market.
- This approach is named securitization


Probability density
0.0
0.2
0.4
0.6
0.8
rho 12%
rho 20%
rho 42%
0
10.35
12.5
Loss on total portfolio of 100 Billion


Probability density
0.000
0.001
0.002
0.003
0.004
0.005
0
10.35
50
Loss on total portfolio of 100 Billion
0.01% confidence
0.15% confidence
1.35% confidence

Credit Modeling

The effect of correlation at 42%

New Company	
Loan I . . . . Loan N	~~AAA~~ BB Equity

10.35

- In this illustration 1 in 70 “AAA” bonds will fail

The CLO drama

- AAA rating of most senior CLO tranche was correct, based on historical correlations
- In times of crisis correlations increase and the most senior tranche is much riskier
- If you know this, you don't invest in them
- If you follow the AAA rating, you lose your shirt
- An investor in CLO's needs to understand correlation modeling

Are correlation models dangerous?

- Yes, for the rating-based investor
- No, (non-) correlation is the basis of diversification, the foundation of banking and insurance

It just depends how knowledgeable the user is.

“ Models don’t kill, people do”

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1: Footnote

Profession, principles, organization

- Traditional Risk organization:
  - Market Risk (PVBP, VaR, …..)
  - Credit Risk (LTV, Debt/Ebitda, …….)
- To Credit Risk Managers, a senior CLO tranche is not a loan
- To Market Risk Managers, a senior CLO tranche (was/is?) a highly rated bond
- In many banks, CLO’s went through the gap between Market and Credit Risk (see e.g. UBS’ report to shareholders)

Profession, principles, organisation

- Financial Markets constantly produce innovative products with new Credit Risk aspects
  - Swaps netting (early ’90’s)
  - CSA’s (late ’90’s)
  - Repo’s
  - Hedge funds (late ’90’s)
  - ABS and other structured products (mid 00’s)
  - CVA (late 00’s)
  - …….

Profession, principles, organization

- The principles of proper risk management of these innovations are often missed by the pure Market Risk or Credit Risk professions
- Even if the risks are correctly identified, departmental territories inhibit comprehensive risk management
- The only way to establish credibility for Financial Markets Credit Risk Management is to establish a separate dedicated department

Profession, principles, organisation

- Creating a separate FM-Credit Risk department costs money but is a vital defense for banks
- Like any Risk discipline, it can not be acquired but needs to be grown in order to become part of the internal Risk Culture

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The Risk Management balance of power

- Number one danger to the Financial System: herd behaviour
- Also called: “market conform risk management”
- Dynamics of interaction between Risk and Front office: a blend of cooperation, opposition and escalation
- It is essential to have experts up the management ladder
- Education of management and appointment of knowledgeable managers is a top priority

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New regulation, new danger

- Some of the “seeds” of the credit crisis were already sown in Basel I
- E.g.: No capital charge for undrawn loans under1 year
  - Hundreds of billions of 364-day “CP-back up facilities” to Receivable Conduits
  - Contributed significantly to liquidity crisis

New regulation, new danger

- We have to be cautious not to introduce new “seeds” into the new post-crisis regulation
- The new “Leverage Ratio” needs to be scrutinized for this
- Limiting nominal exposure is a perfectly acceptable way to restrain complex, difficult to model risk
- But the Leverage Ratio also drives low risk assets (government bonds, mortgages) off the balance sheet, leading banks up the risk ladder.
- This may also be one of the reasons the spread of mortgages over swaps in recent years stays at a historically high level

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Back to basics

- Just prior to the credit crisis the Structured Credit product development was taken (much) too far:
  - CDO^2
  - Defaulted loans as underlying
  - ……….
- Development of next generations of product complexity now has been largely halted.

Back to basics

- Old arbitrages between on- and off balance products have become defunct
- Curve building and cash flow discounting need a new foundation
- This is typical for mathematical sciences: when an inconsistency is met, the basis of the theory needs to be overhauled
- At the same time the modeling of familiar risks is refined (IRC, CVA, ….)
- The financial models building at the moment does not get up higher, but the foundation is broadened and strengthened.

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The risk managers diagnostic

- Risk management is about
  - Identifying risk
  - Quantifying risk
  - Controlling risk
- One could say the credit crisis was caused predominantly by failure in the risk identification phase
- How to spot risk where no theory or precedent exists?

How to spot new and uncharted risks

I. Size. Large portfolio's, especially when they do not meet an obvious external customer need, are suspicious

II. Profit. New business lines with seemingly attractive profitability often contain mispriced risks

How to spot new and uncharted risks

III. Fast influx of highly rated (and paid) front office professionals into a new business area indicates the banking “herd” is competing

IV. Unusually high number of clashes between traders and front-line market risk managers – indicates hot tempers and high stakes

How does a medical doctor diagnose an inflammation?

- Rubor
- Calor
- Dolor
- Tumor

How does a risk manager diagnose an inflammation?

- Rubor   Red hot profits
- Calor   Inflow of talent (new blood)
- Dolor   Clashes with Risk
- Tumor   Growing size of new portfolio

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