The Big Misunderstanding

Center for Interdisciplinary Studies
Bielefeld
Dinner Talk

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Center for Mathematical Economics

November 13, 2012

Outline

Another Look at the Structural Causes of the Financial Crisis

The Big Misunderstanding: Use and Misuse of Financial Mathematics

The Big Non–Understanding: Political Economics and Financial Mathematics

Consequences

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Typical Stories About the Crisis

- Subprime Crisis
- Casino Capitalism
- CDO's, ABS, CDS etc. ("Complex Credit Derivatives")
- Greed

Correct descriptions, not the structural cause of the crisis !!

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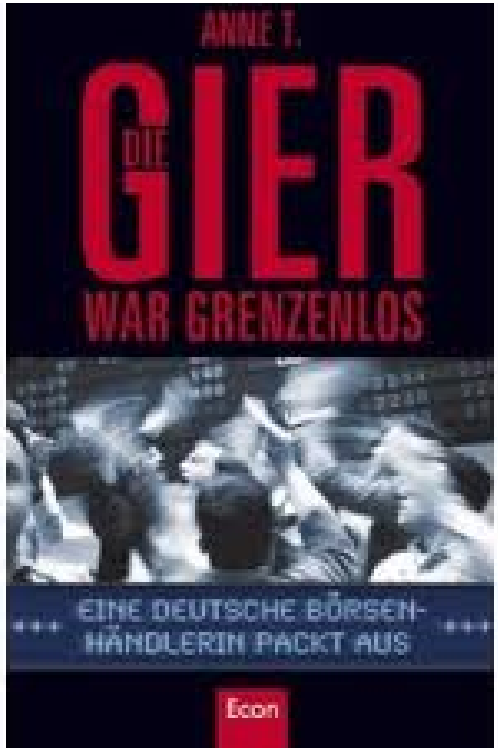

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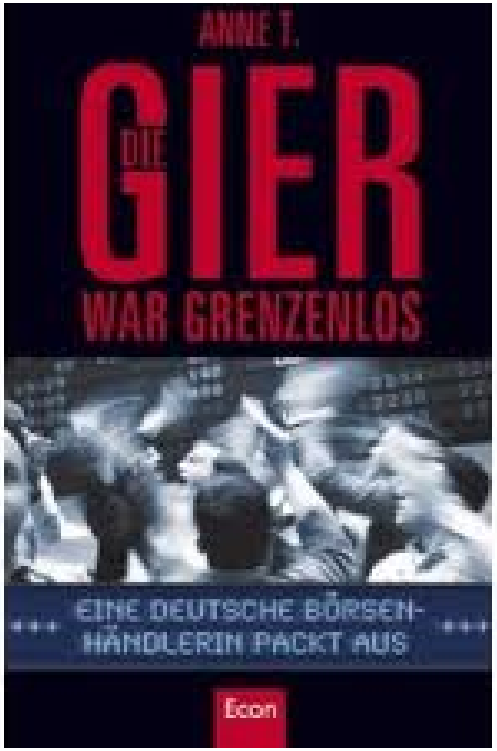
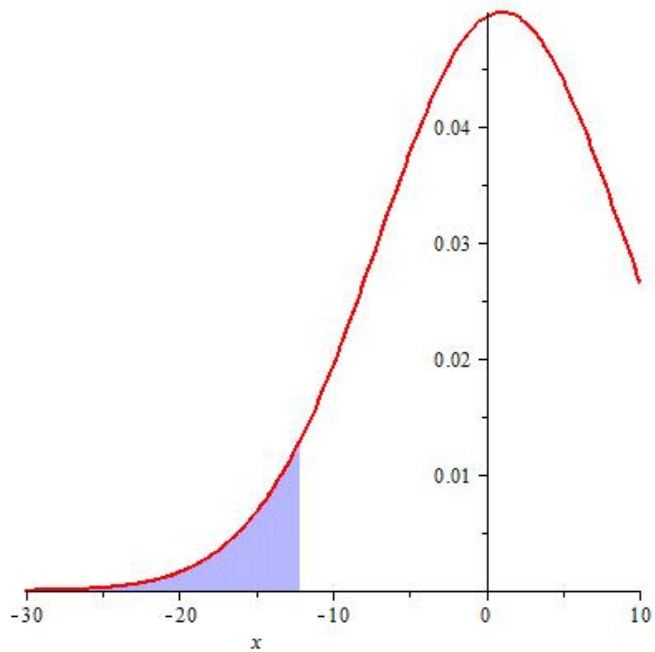


Correct descriptions, not the structural cause of the crisis !!

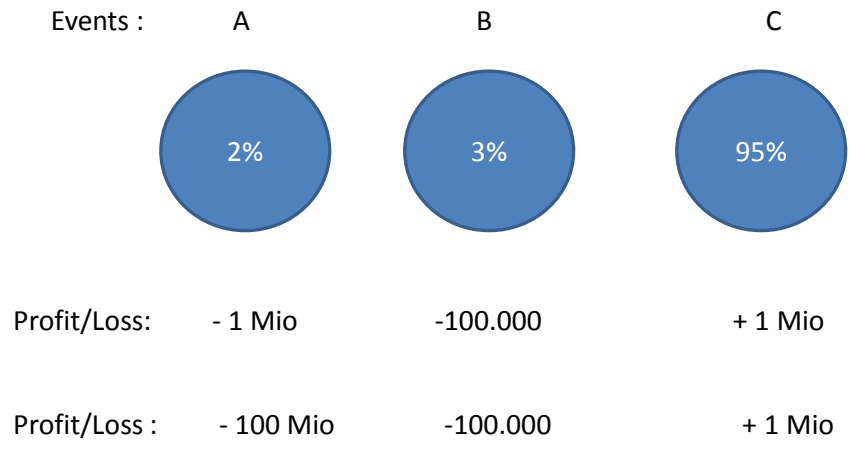
A "Technical Detail" as Cause: Value at Risk

- 90's: new quantitative risk management
- invented by JP Morgan:
- Value at Risk
- implemented by the Basel Committe for Banking Supervision
- Value at Risk became the rule



Gaming Value at Risk

- Value at Risk ignores small probability events
- Risk is endogenous in financial markets
- make a huge bet on a small probability event
- market pays a (huge) premium
- leverage



The proposed regulations fail to consider the fact that risk is endogenous.
Value-at-Risk can destabilise an economy and induce crashes when they would otherwise not occur.

Why did nobody react?

- Above quote from An Academic Response to Basel II, 2001; Bielefeld Center for Mathematical Economics part of the "anti–Value at Risk"–literature
- Mainstream did not want to hear it
  - Jorion, textbook author of *Value at Risk, The New Benchmark for Risk Managing Financial Risk*: There is no doubt, however, that VAR–based portfolio models of credit risk should, in theory, provide better allocation of capital.
  - Value at Risk was a big industry, even in science (interesting statistical problem)
- Alan Greenspan:

  In many cases, regulatory arbitrage acts as a safety–valve for allocating alleviating adverse effects of regulatory capital requirements that are well in excess of the levels warranted by a specific activity's underlying risk.

Basel II, Rating Agencies, and the Perfect Scheme

Basel Committee Adopts Value at Risk and more

- Identification of small probability events difficult in general
- Basel II: "objectivation" of ratings by agencies
- BB = objective ruin probability
- CDS, CDO's etc. are just bets on these small probability events
- wrong regulation allows to hide huge long–term risks with short–term gains

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A Scientific Revolution

- up to 1950's: Finance = collection of simple rules
- Paul Samuelson, Fisher Black: Stochastic Analysis + Finance
- analysis of "atomic details" of risk

- Black started out to understand the Capital Asset Pricing Model
- as by magic, all subjective parameters disappeared
- option price v

$$rv = \frac{\partial v}{\partial t} + rx\frac{\partial v}{\partial x} + \frac{1}{2}\sigma^2\frac{\partial^2 v}{\partial x^2}$$

- a partial differential equation with observable parameters for the price of an option: interest rate r, volatility σ, time to maturity T

The Atom of Finance

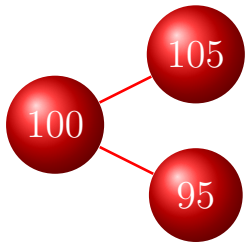


Figure 0.1: Model of Share Price

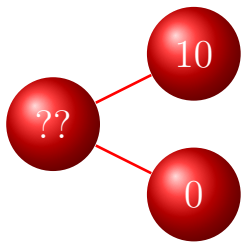
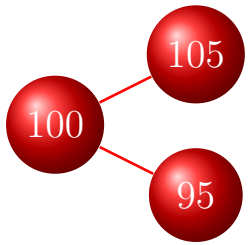


Figure 0.1: Payoff Digital Call

The Atom of Finance



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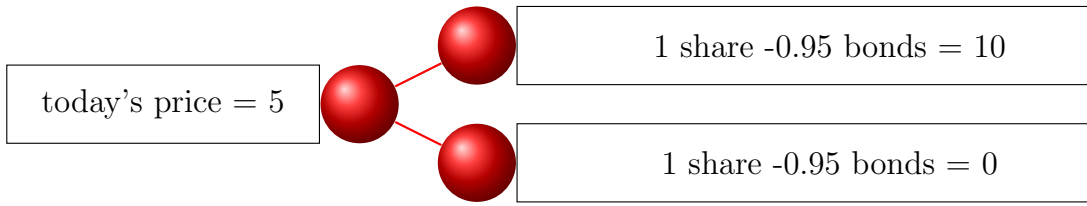
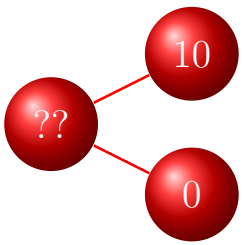


Figure 0.1: The Duplicating Portfolio for the Digital Call.



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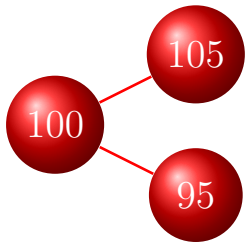

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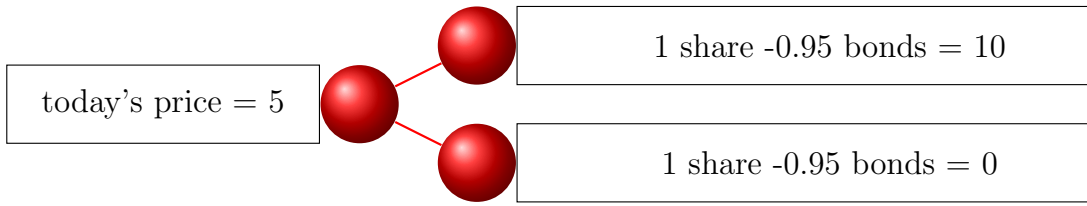

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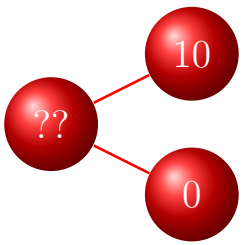

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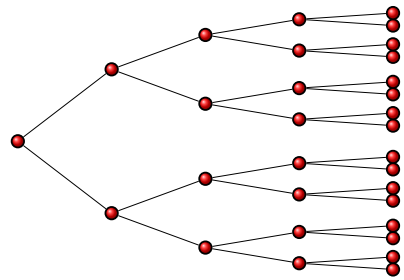
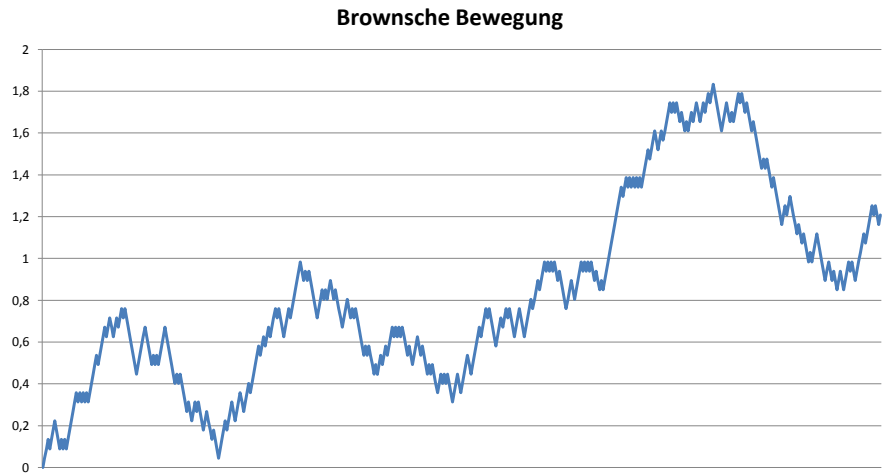
Is it so simple? Yes, it is!

- Job of mathematics:
  - iterate
  - build complicated trees
  - pass to the limit: Brownian motion
- inherent limit: only these diffusion models work well





Good Finance is Sophisticated Insurance Mathematics

What Finance is Not

- Prediction of Prices
- Calibration of complex models
- Betting

What Good Finance is

- Computation of Today's Prices (Backwards not Forward)
- How much do I have to pay to insure myself against a future risk?
- Hedging Strategies

Bad Finance and Scientific Mis–developments

Misdevelopments

- good finance model fits only to diffusion markets (no jumps)
- in particular, not to credit risk!
- move away from hedging
- just pricing
- find one possible price, instead of find the only possible price
- models with many unknown parameters, plus calibration

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Historic Split between Finance and (Political) Economics

- Self–Misunderstanding: Black and Scholes did not understand the conceptual background of their formula
- Finance went into mathematics
- business learned to use mathematics, just as a tool
- economists turned away from “deep” mathematics
- separation of financial engineering and (macro)economics

The Blindness of Political Economists

- Lisa Nienhaus
- Most political economists concerned with prediction
- Astronomy with one star
- Simplified economic models (with one agent!)
- . . . no financial markets
- . . . no taxes, no central bank etc.

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Regulation of Financial Markets

- Value at Risk must disappear
- Replace by "non–exploitable" risk measures
- simple, robust regulation rules
- Aufklärung: finance is insurance (good), or speculation and gaming (ok for individuals, not ok for banks)

Economics as a Science

- good economics must integrate mathematical finance into their core curriculum
- combine finance and strategic interaction (game theory)
- analysis of economic institutions against exploitation
- use mathematics to understand the limitations of your own models
- refrain from prediction if the model is not validated

Political Economics

- refrain from "prediction"
- focus on design of rules and markets
- move closer to institutions and practice