

Quantitative Risk Management: Reminiscences and Outlook

Paul Embrechts

Department of Mathematics

RiskLab and Risk Center, ETH Zurich

Senior SFI Chair

www.math.ethz.ch/~embrechts

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Alternative title:

Basel III, SST/Solvency II and
Beyond: A Critical Appraisal

The Basics of Basel II (and Solvency II/SST)

$$\text{Capital Ratio (Solvency)} = \text{Capital/RWA}$$

An important request by industry, i.e. the use of **Internal Models**, was granted, with the aim of achieving greater **Risk Sensitivity**. The calculation of **Risk W**eighted **A**ssets through internal models became widely accepted. This led to what I would like to refer to as **Model-Darwinism**:

“Let the best model win”/“The survival of the fittest model”

Initially, **Solvency II** as well as the **Swiss Solvency Test** wanted to follow this route. A near causal consequence was the increase in **Model Risk** throughout the banking and insurance risk landscape.

Solvency Capital, Risk Weighted Assets (RWA) and Leverage:

- Under Basel II-III, **regulatory capital** is calculated as a **percentage** of **RWA**; both the **numerator (capital)** as well as the **denominator (RWA)** allow for “**interpretation**”. At the level of **capital** “creative accounting” and tax constructions (may) enter. At the level of the **RWA**, financial engineering may be (mis-)used to come up with lower numbers. Two examples of such practices are:
 - At the level of **capital**: e.g. the **REPO 105** accounting “trick” was used by Lehman Brothers prior to the default in order to come up with lower leverage numbers.
 - At the level of **RWA**, the JP Morgan Chase **London Whale** case (2012) offers a chilling example.

Current discussions on regulation:

- We need to **redefine** the regulatory landscape for **banking** and **insurance** as well as the business model for **banking**
- Overall there is a clear move **away from excessive complexity**, and this both at the level of regulatory documents/procedures and products, as well as at the level of company structures
- The **pendulum** swings from the use of internal models increasingly back towards less complex **standard models**; this is a development to be looked at in a constructively **critical** way!
- Always beware of **regulatory arbitrage** and **shadow** insurance/banking

Some comments on **Principle Based Regulation** versus a Rules Based one

Market Consistent Valuation (MCV)

- MCV → risk sensitivity
- A statutory approach → stability
- (René Schnieper, formerly FINMA) “... **scenarios** ... !!!”
- (P.E.) “**Which scenarios?**”
- An **ideal** regulatory regime would **combine internal** as well as **standard** models, and look carefully at **significant differences: EXPLAIN THESE!**

On risk-sensitivity:

The quest for risk-sensitivity in the Basel framework, while sensible in principle, has generated problems in practice. It has spawned startling degrees of complexity and an over-reliance on probably unreliable models. The **Tower of Basel** (sic) is at risk of over-fitting – and over-balancing. It may be time to rethink its architecture. A useful starting point might be to take **a more skeptical view of the role and robustness of internal risk models in the regulatory framework. These are the main source of opacity and complexity.**

(A. G. Haldane & V. Madouros (BoE): The dog and the frisbee (Jackson Hole Speech, 31/8/2012))

We currently find ourselves at several **crossroads**:

- A **crossroad** between standardised and internal models
- A **crossroad** between complexity and heuristics
- A **crossroad** between quantitative and qualitative
- A **crossroad** between rational and behavioural
- And (e.g. **USA**) a **crossroad** between more versus **less** regulation

But much more importantly:

- As an industry we are at a **crossroad** when it comes to **products, data, economic environment, political and demographic shifts, ...**
- Most of these **changes** demand for **a strong quantitative actuarial function** being able to capture emerging risks via well-chosen and wisely-guided **internal models!!!**

And **changes** do present themselves,
here are **four examples**:

The Allianz Risk Barometer 2016:

“The fifth annual Allianz Risk Barometer identifies **the top corporate perils for 2016** and beyond, based on the responses of more than 800 risk experts from 40+ countries around the globe.

(1) Business interruption (incl. supply chain disruption), **(2) market developments** (volatility, intensified competition and market stagnation) and **(3) cyber incidents** are the top three global business risks. **Business interruption (BI)** is top for the fourth year in succession.

Top 10 Global Business Risks for 2016





(* 2011 Thailand flooding

- due to rainfall
- EL 30 bi USD (4th)
- EIL 12 biUSD (record)
- Chao Phraya Riverbasin
- 20 mio people (30%)
- Manufacturing industry
- Topography

Historical records (1985-2012):

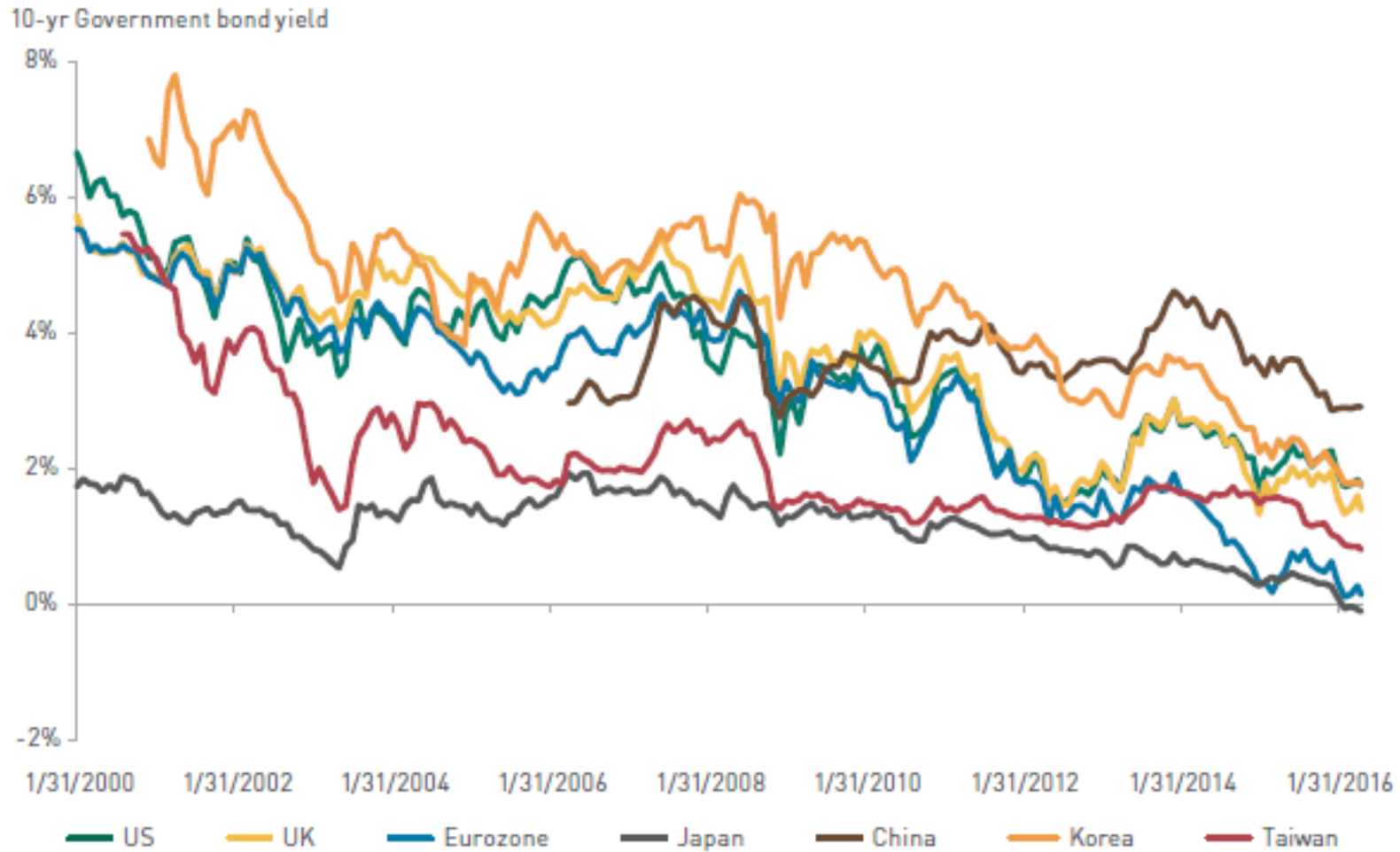
- Flood magnitude (7.9): 5th
- Flood duration (158 days): 1st
- 10-20 years return period
- If → What If ...

(a)



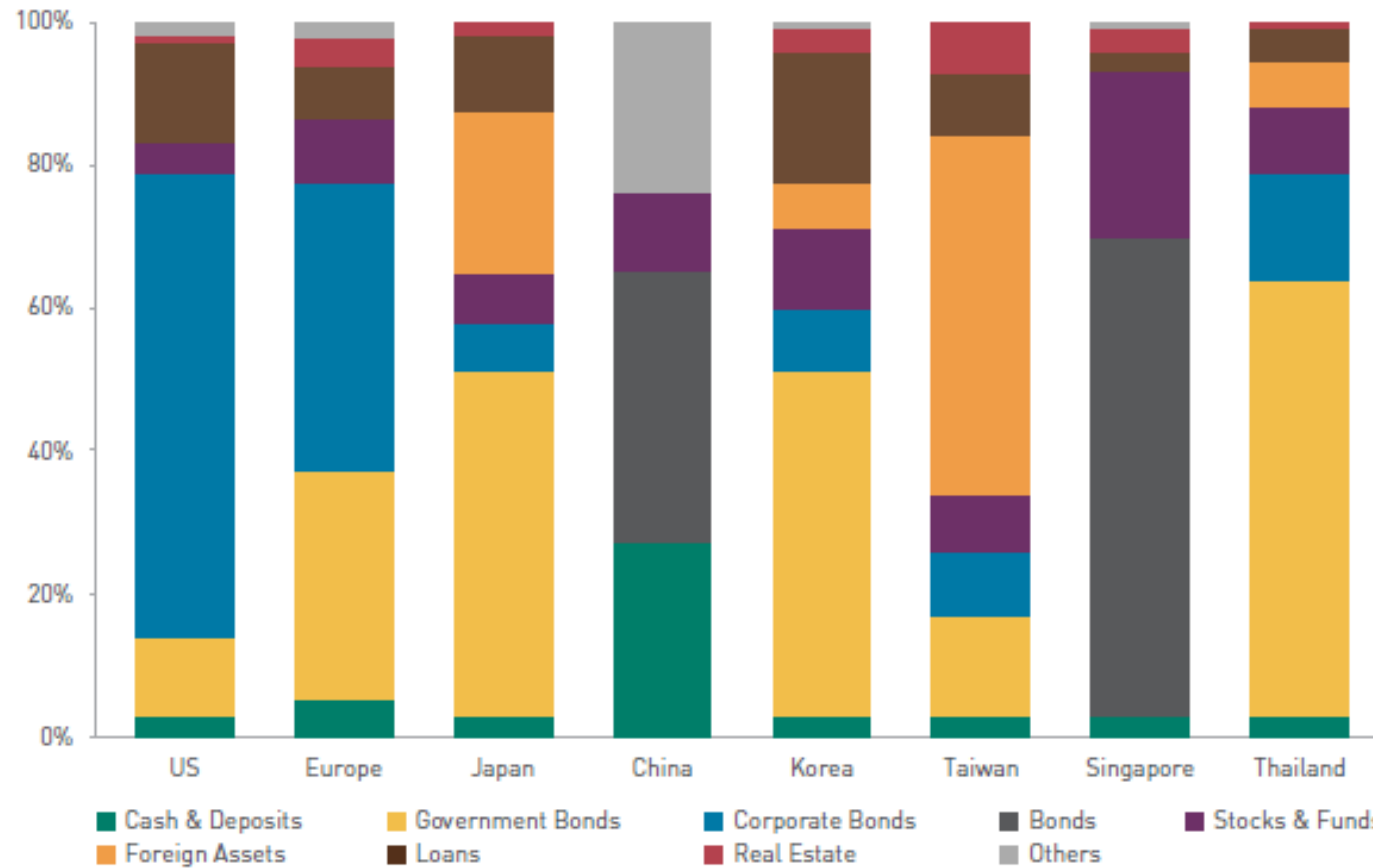
(b)





<https://www.pinebridge.com/images/insights/thought-papers/charts/insurance-historical-10-year-government-bond-yields.gif>

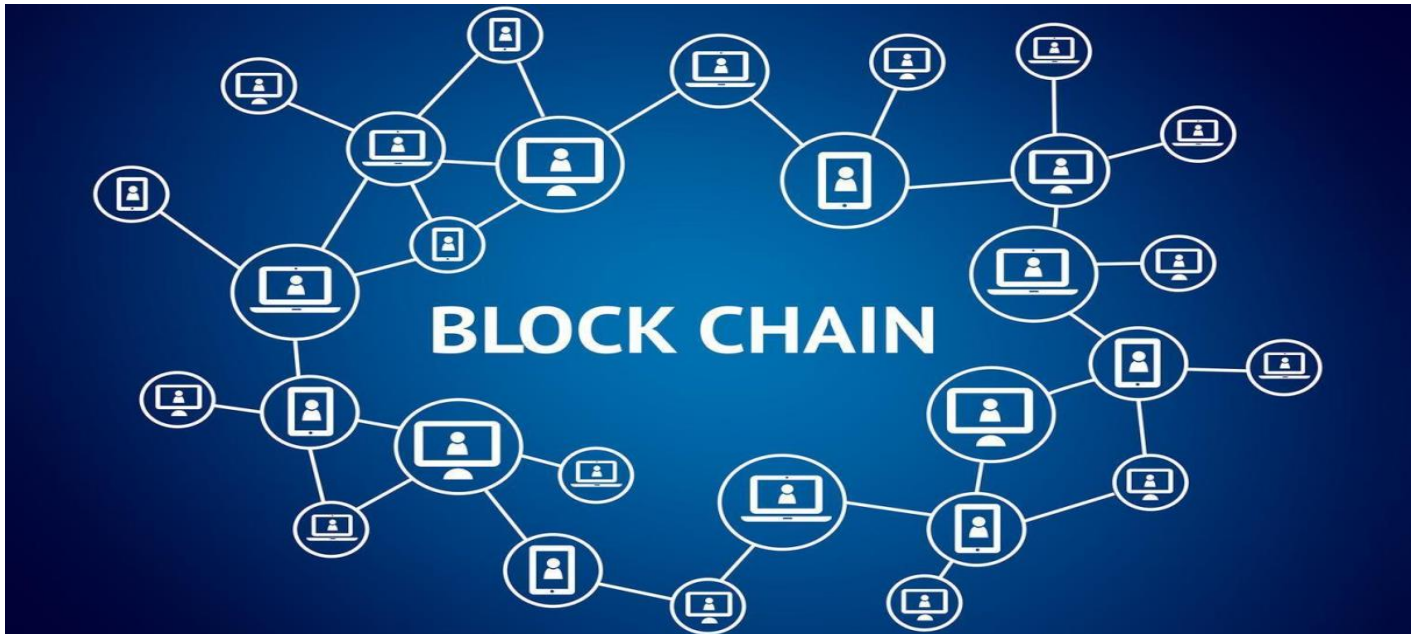
Asset Allocation of Life Insurers



<https://www.pinebridge.com/images/insights/thought-papers/charts/insurance-asset-allocation-of-life-insurers.gif>

ALM challenges under ($r < 0$) - constraints

- Always: solvency -, political -, market -, policyholder constraints
- Classical ALM does not work (there ($r > 0$) as a pre-condition)
- Relevant models from finance? **(More research needed!)**
- Need for intellectual and regulatory flexibility
- Important to compare and contrast internationally («laboratory»)
- Industry and regulation are in need of **strong risk management functions**; the current move «away from internal models» may destroy potential RM skills just when we need them more than ever



A bitcoin bubble?



Quote on August 31, 2017, 09:12:00

4'613.02554 USD

One year **low/high**:

570.75200/4'629.22935

Check <https://www.lykke.com/>

- For **Blockchain based technology**: no doubt there exists considerable **upside potential** but with non-negligible **downside risk**
- **Beware of over-enthusiasm** (see also recent Wharton study)
- The market went well beyond Bitcoin, e.g. Ethereum, Lykke,...
- Number of **cryptocurrencies** as of July 2016: **more than 700!** (**CRIX**)
- Emerging cryptocurrency **derivatives** markets, e.g. BitMEX, OKCoin, Bitfinex, ... **Regulation?**
- Beware of potential for **cyber-risk** and **fraud**: e.g. Bitcoinica (2012, 28Mi.\$), **Mt Gox** (28/2/14, **350**), 2016: Cryptsy (10), **DAO (50)**, Bitfinex (65), ...
- Theory in early stages: e.g. 50% - , 33% - , 25% Theorems
- **Who** and **geographically where** are currently the main market players?
- Brainstorm on potential influence of blockchain based technology to current market structures, products and participants. Winners? **Losers?** Are we facing an example of **Disruptive Technology** (Bower-Christensen) also referred as **Digital Disruption** (Fujitsu, in The Actuary, March 1, 2017)?

CRIX: CRypto IndeX (W. Härdle et al., H-U Berlin)



The future: “**In** (computer) **code we trust**”?



And then there is of course the Data
Science (**Big Data**) (r)evolution!

ETH Zurich course, Spring Semester 2018:
M. Wuethrich & ...

What are the consequences for the
actuarial profession?

The Actuary of the n^{th} kind

- Actuary of the **first** kind: the **life actuary** (since 17th Century)
- Actuary of the **second** kind: the **non-life actuary** (in 20th Century)
- Actuary of the **third** kind (Hans Buehlmann, ASTIN Bulletin, 1989)
for actuaries with skills on the **investment** side of the balance sheet
- Actuary of the **fourth** kind: the **ERM** actuary (S.P. D'Arcy, Presidential address, November 14, 2005) ← Paul Embrechts presentation
- Actuary of the **fifth** kind: F. Chan & F. Devlin, "B.A.U. for actuaries: **Big data**, Analytics & Unstructured data",
Singapore Actuarial Society Big Data Working Party, 3 March, 2016

Because of **kind 5** we definitely have to rethink the actuarial **education** and **research** agenda: **Data Science** and its various intersections with Computer Technology, AI and Social Networks are having a considerable impact on society at large and hence as a consequence on insurance products needed in this changing landscape.

In many ways, going from **1** to **5**, we are coming back home: the word **actuary** comes from the Latin **actuarius** (+/- 1550s) meaning copyist, account-keeper ... hence surely someone strongly linked and helpful in reaching **business decisions based on data**.

Modern society will no doubt need **tomorrow's actuary** (whether life or non-life) to go back to this early cradle of our profession, that is as **a data driven and model guided financial decision maker in a world governed by uncertainty.**



Thank You!