CREDIT SUISSE

Risk Stream SAS-Forum Schweiz – 2014

Development and Application of Stress Testing Models

Operative Challenges

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Stress Testing – Why Should We Care?

External Requirements

- Repetitive stress testing requests from regulators
- Increased frequency for ad-hoc stress testing requests (surveys from FINMA, National Banks, etc)

Internal Requirements I
(internal scenarios of economy)

- Internal views of the economic downturn potential might deviate from regulators
  - Need for internal stress tests
  - Strategic business plans
  - etc.

Internal Requirements II
(portfolio steering analysis)

- Assessment of business development measures, e.g.
  - Increase margin requirements
  - Release collateral thresholds
  - Earnings@Risk Analysis

Profound understanding of the portfolio risk drivers & sensitivities

Stress Testing

Top-down Approach: Leveraging historical Relationships

- Regression – Based Approach

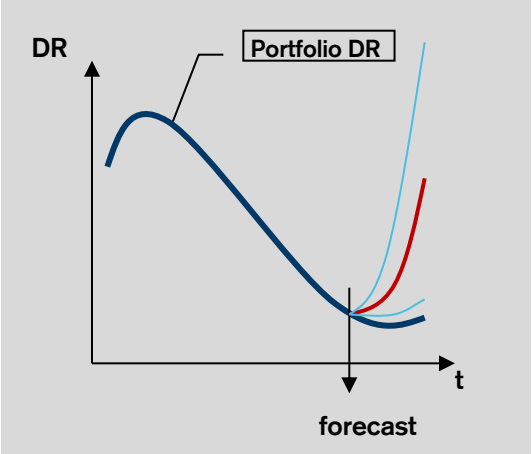
  - Model the variable of interest as a function of stress(-able) macro risk drivers

    $$DR = F(GDP, UE, IR, \ldots)$$

  - Use stressed value / forecast of the relevant risk driver for T+1 and calculate the stressed DR value in the next year

  - Account for statistical error bands before making your conclusion

  - Always ask for expert opinions → good forecasts are always a combination of statistics and common sense

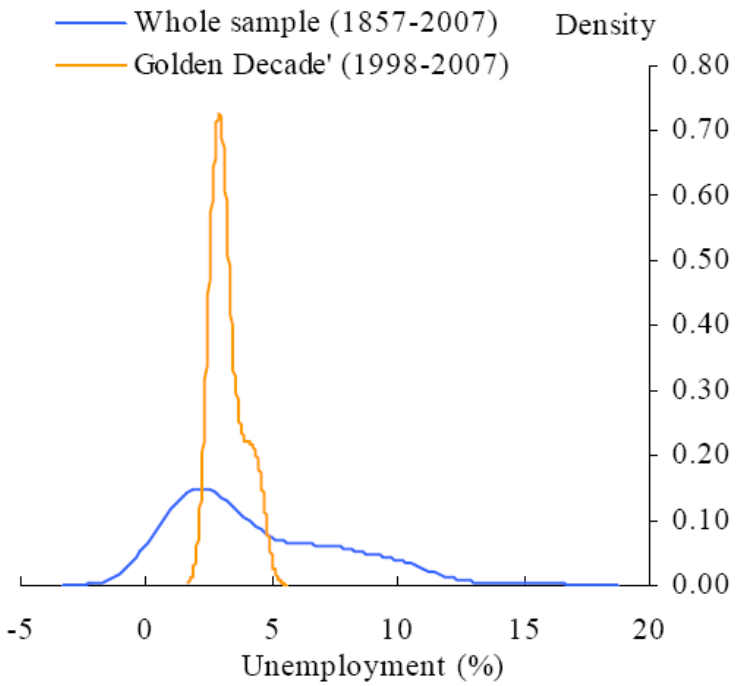


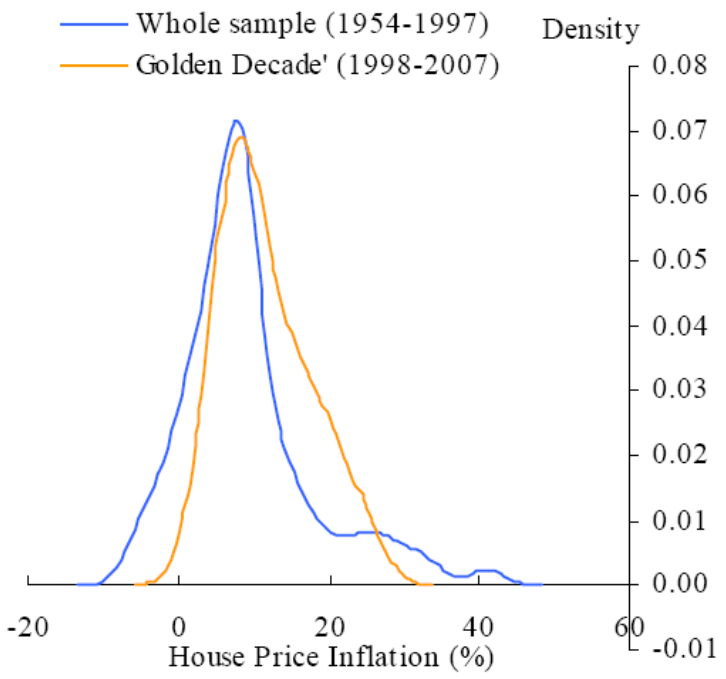
- Forecasts are often quite extreme
  - any portfolio specific change over time is fully depicted by the risk drivers
  - empirical fit is 'biased' by portfolio effects

- Error bands are usually wide
  - data history is often limited (especially for annual data)

(What) Can We Learn From History?

Sensitivities for stress models are often defined by looking at historical simulations





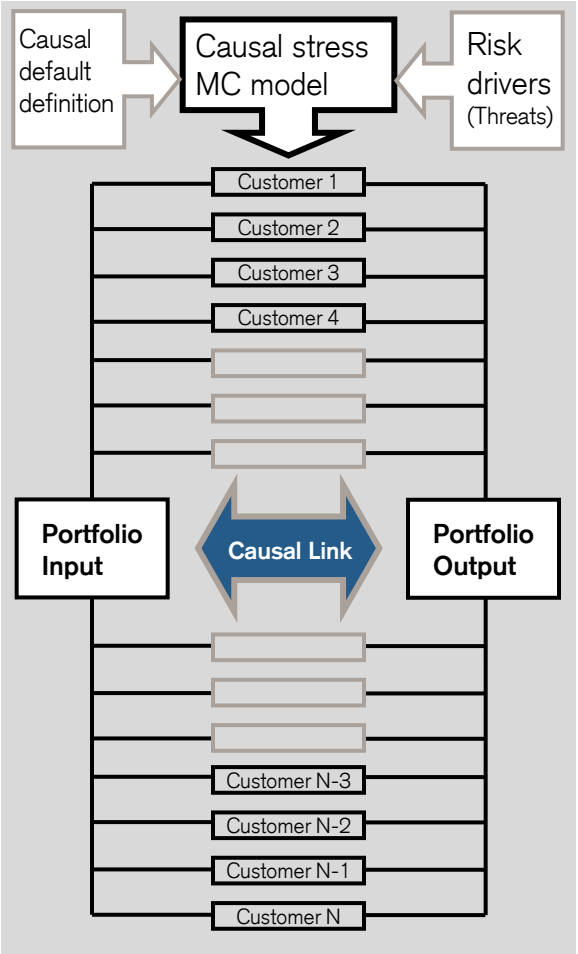
Time horizon is decisive and sometimes misleading

(A.G.Haldana, Marcus-Evans Conference on Stress-Testing, Feb 2009)

Bottom-up Approach: Leveraging in-house Information

Causal Models

- Single obligor perspective
  - Client or firm specific credit worthiness is assessed
  - 0/1 perspective: obligor fails to fulfill minimum obligations or not → no probabilistic assessment
- Direct link between risk driver and obligor
  - Change in risk driver affects solvency or quality of the customer
- Data requirements
  - Detailed information about the current income situation (tax statement, balance sheet, collateral information, etc.) is required



Bottom-up Approach: Mechanics

Scenarios

Relevant for PK and FK

ER Main	GDP	3m Libor	UE rate
Year 1	1.5%	0.1%	3.0%
Year 2	1.7%	0.3%	3.2%
Year 3	1.8%	0.6%	3.3%
Year 4	1.8%	0.9%	3.4%
Year 5	1.8%	1.2%	3.4%

ER Main	ΔMV residential	ΔMV commercial
Year 1	5.0%/ 6.0%	6.0%/ 6.0%
Year 2	4.0%/ 6.0%	5.0%/ 2.0%
Year 3	3.0%/ 3.0%	4.0%/ 2.0%
Year 4	0.0%/ 0.4%	3.0%/ 4.0%
Year 5	-2.0%/ 0.0%	2.0%/ 4.0%

Simulation

Private Clients

Steps per loop

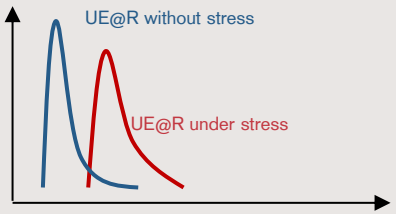
Set x% of the portfolio to the unemployment state

Calculate the stressed disposable income for debt service

Check whether debt service can be fulfilled

Sum up unsecured exposure of all counterparties who fail to pay

unsecured exposure @risk per loop



Stressed interest burden

Monte Carlo simulation of

a) vacant objects in IPRE

b) unemployment state of clients

c) balance sheet and P&L shock of firms

Corporate Clients

Shock assets and liabilities of the firm and check negative equity

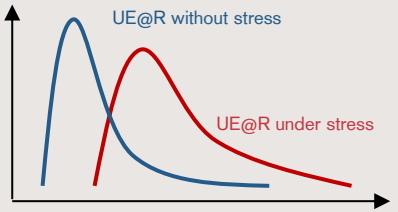
Shock turnover of the firm and calculate stressed EBITDA

Account for increase in interest burden of the firm (EBTDA)

Sum up unsecured exposure of all firms that fail either in negative equity or EBTDA stress

unsecured exposure @risk per loop

Steps per loop



Modeling & Data Requirements

- Level of counterparty information low
- Parameterization level high

- Strength
  - Applicable almost everywhere
  - Well documented / established
  - Limited dependency on existing internal infrastructure

- Weaknesses
  - Strong dependency on historically observed relationships
  - Single-name stress impossible
  - Limited use for daily risk management

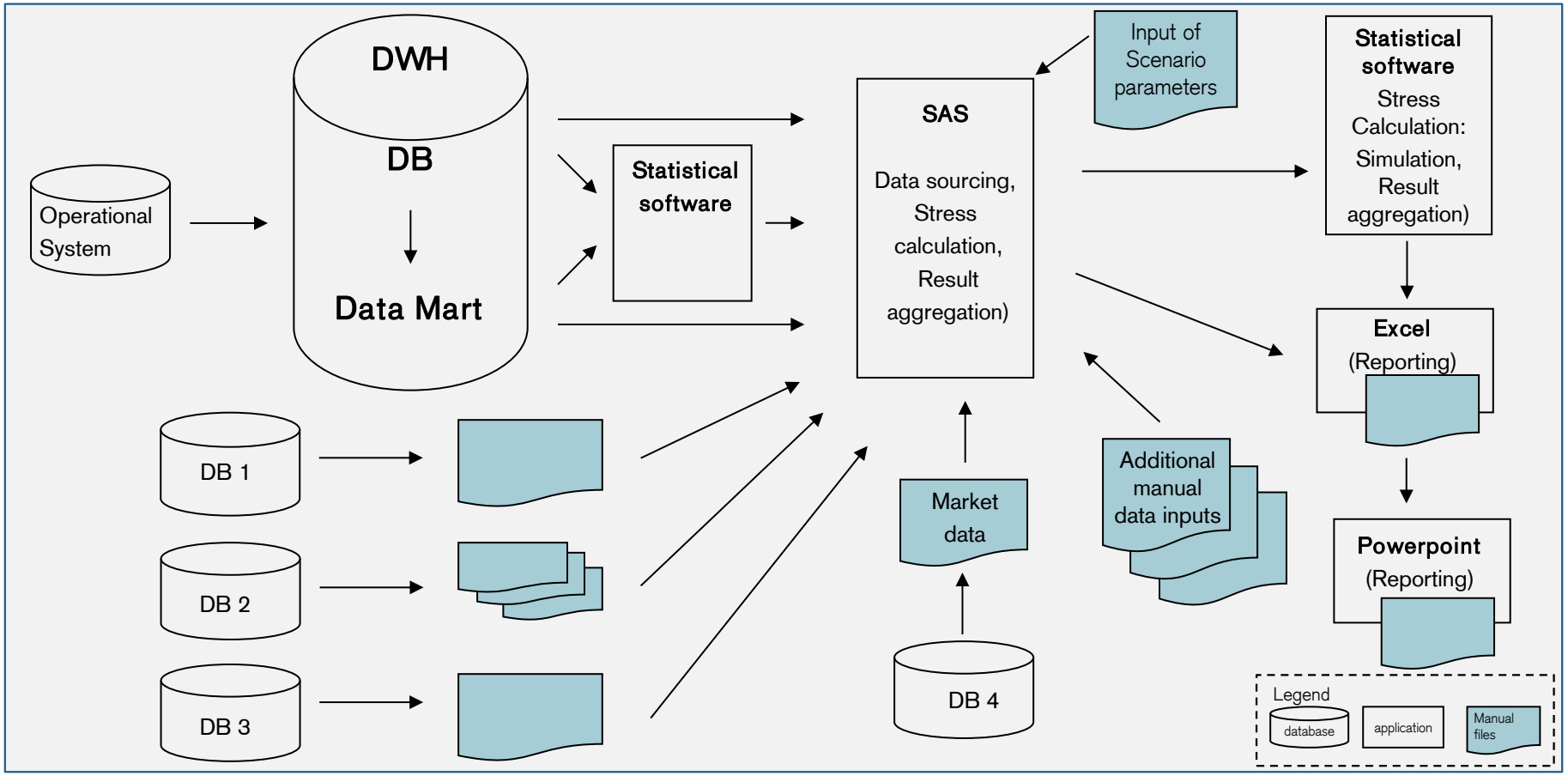
- Level of counterparty information high
- Parameterization level low

- Strengths
  - Very transparent & intuitive ("causal" models)
  - Portfolio results as a function of single name outputs
  - Results can be used in day to day risk management processes

- Weaknesses
  - Data requirements high
  - High sensitive to data quality gaps

Current Stress Testing Infrastructure

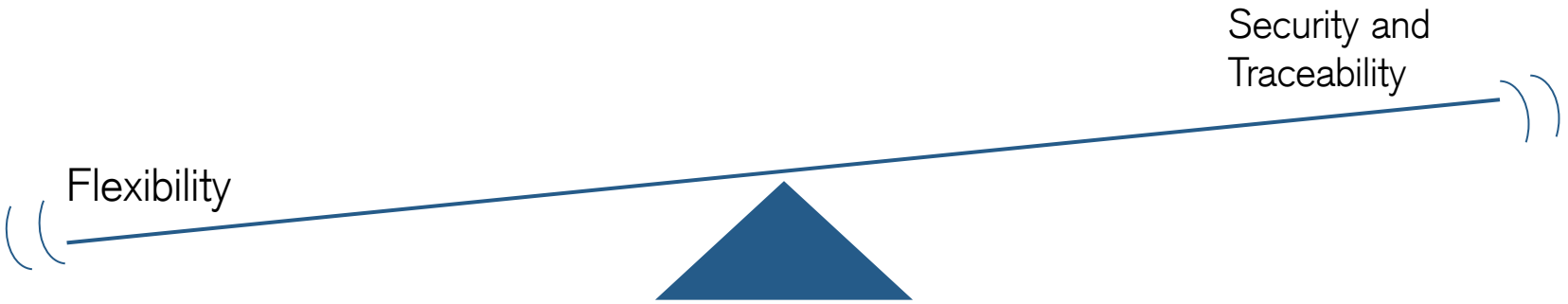
Stress testing is still in the research and development phase and has grown historically, i.e. different databases, data formats, software and applications are used which finally need to be aligned. The resulting infrastructure is quite complex and might continue to grow.



Flexibility and a simple and efficient linkage between the different systems is key !!!

Challenges and requirements to the systems

- Global position based stress testing requires
  - an enormous data volume which needs to be handled, aligned, processed and stored
  - a very flexible and comprehensive infrastructure which has to satisfy high security and traceability requirements at the same time



Standard and ad-hoc reporting require the infrastructure to enable the bank to easily

- change the stress mechanism and data linkages
- extend or include new stress elements
- integrate of new data sets, formats and structures
- implement of new reporting and analysis views

Given regulatory guidance, the infrastructure and systems need to satisfy high security requirements:

- Results need to be reproducible
- Traceability of methodology or processing changes
- High degree of automatism to ensure low operational risk
- Restrictive and differentiated access rights and access control functions


Some think
everything
has been said.
We think you
might have some
questions.