Capital Adequacy, Procyclicality and Systemic Risk

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Monitoring Systemic Risk:
Data, Models and Metrics

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Procyclicality

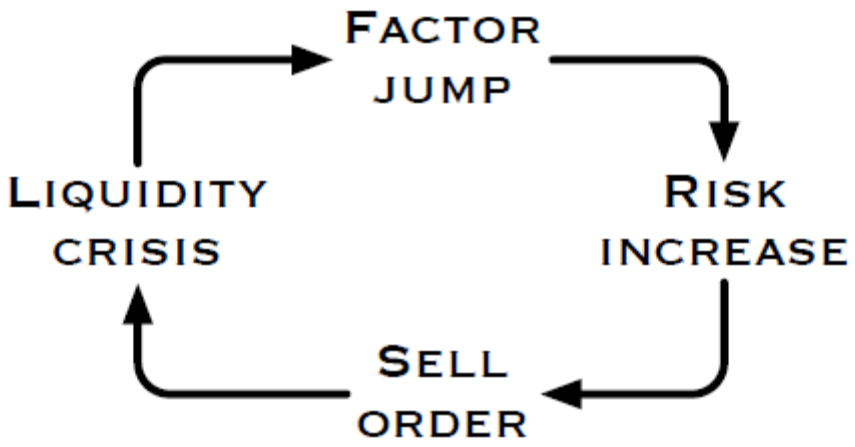


FIGURE 1: A cycle caused be a *reactive* risk measure.

Myopic Risk Estimation

> Probability distribution using recent past

- Asset Value = Discounted Expectation of future Cash Flows
- Derivatives depend on Volatility Estimates
- Credit spreads depend on Solvability and Asset value estimates

> Procyclicality

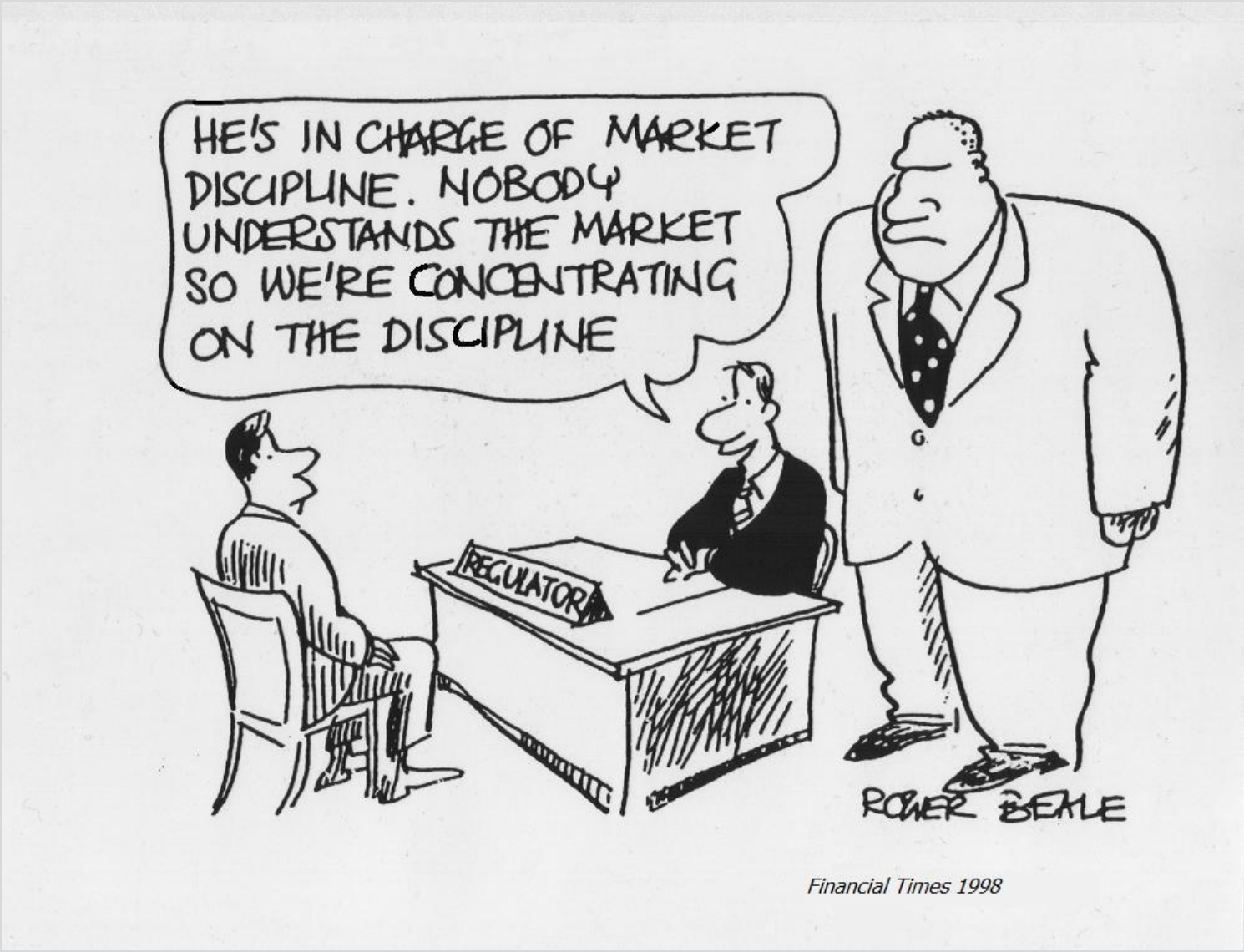
- Regulatory procyclicality:

  Drop in asset value ⇒ Increased put price ⇒ Increased volatility ⇒ Increased VaR ⇒ Sell-off ⇒ Drop in asset value…

- Minsky Instability Hypothesis

  Drop in asset value ⇒ Downgrading ⇒ Increased interest rates ⇒ Increased debt burden ⇒ Solvability at stake ⇒ Downgrading ⇒ Drop in asset value…

Market Discipline



Basel II Capital Adequacy

> Capital = *k* x VaR

- VaR is computed by the institution

> Back-test

- Count exceptions, regardless of size: *k* depends on results
- Verify “independence” of violations

⇒ No incentive to anticipate crises, violations occur simultaneously

> “Full control” tendency

- Send all your positions
- We compute risk for you

⇒ Unaccountability

Anticipative Capital Adequacy

> Risk is the product of 2 figures:

Risk = Risk factor shift x Sensitivity to risk factor

> Separation of roles

- Institution ought to know its sensitivity
- Regulator should have a view on factor shifts

> Anticipate bubbles

- Institutions report their *real* sensitivities to various factors
- Regulator can see over-exposed sectors and anticipate bubbles
- Regulator specifies higher factor shifts
- Higher capital requirement deflates bubble

Anticipative Capital Adequacy

> Regulator issues a list of Stress Scenarios

- For each factor: a whole *curve* of scenarios

Index	Stress++	Stress+	Stress0	Stress-	Stress--
S&P500	+20%	+10%	0%	–10%	–20%
TB Yield 10Y	+200bp	+100bp	0bp	–100bp	–200bp
BAA Credit Spread	+500bp	+200bp	–10bp	–100bp	–200bp
…					

> Institutions compute corresponding Stress Tests

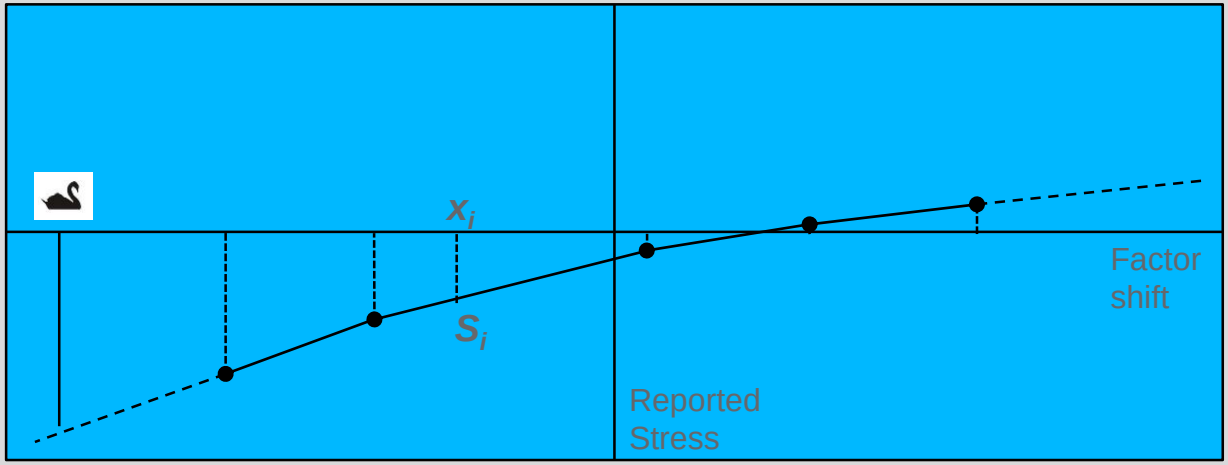
> Capital Adequacy = *k* x Worst Stress Test i.e. “Stress VaR”

> *k* = 1 unless penalized

Anticipative Capital Adequacy

> Back-test control of reporting quality

- Regulator cannot check each individual reported stress test
- Principle: each loss should be explained by at least one “stress curve”
- Actual factor F_i shift = $x_i \Rightarrow$ Inter-/extrapolated stress test S_i
- If Loss > max($|S_i|$) then penalized k = Previous k x Violation ratio
  - > Dampening mechanism back to 1 when no violation



Anticipative Capital Adequacy

> Implementation

- Institutions can use additional factors not considered by the regulator if they are exposed to. In this case, they define their own scenarios.
- Stress test computation should account for “extreme correlations” to fully represent the impact of a given factor shift
- Possibility to split institution into parts and add stress tests of the various “divisions”

> Possibility to include extra margin for unaccounted risks

- Operational: can be a specific “division”
- Counterparty: report netted portfolio with a given counterparty in the same way
- Liquidity: include slippage in non-linear stress function
- Default: account for market impact of possible defaults

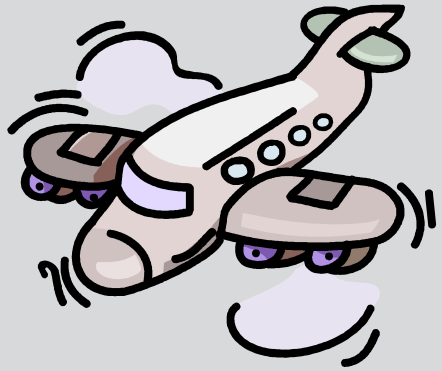
Eliminating Pro-cyclicality

- Regulator decides for the stresses to apply, hence is in a position to smoothly impose deleveraging before it becomes an unsolvable problem. This is why the regulator must have an anticipative measure of factor risks and, in particular, of systemic risk.
- Risk reporting is not a figure, but a *function* of markets hence violations are not due to markets swings but to misreporting of extreme risks. If institutions correctly report their extreme exposures, there is no reason why they would more violate their assessment during a crisis than during normal periods.
- Reasons for failure of this proposition
  - The Regulator fails to anticipate systemic risks
  - Institutions fail to correctly estimate their exposures to extreme market conditions

A new economic lever

> Current Monetary Policy

- Money printing
- Banks credit lines
- Lending and repo rates



> No longer works

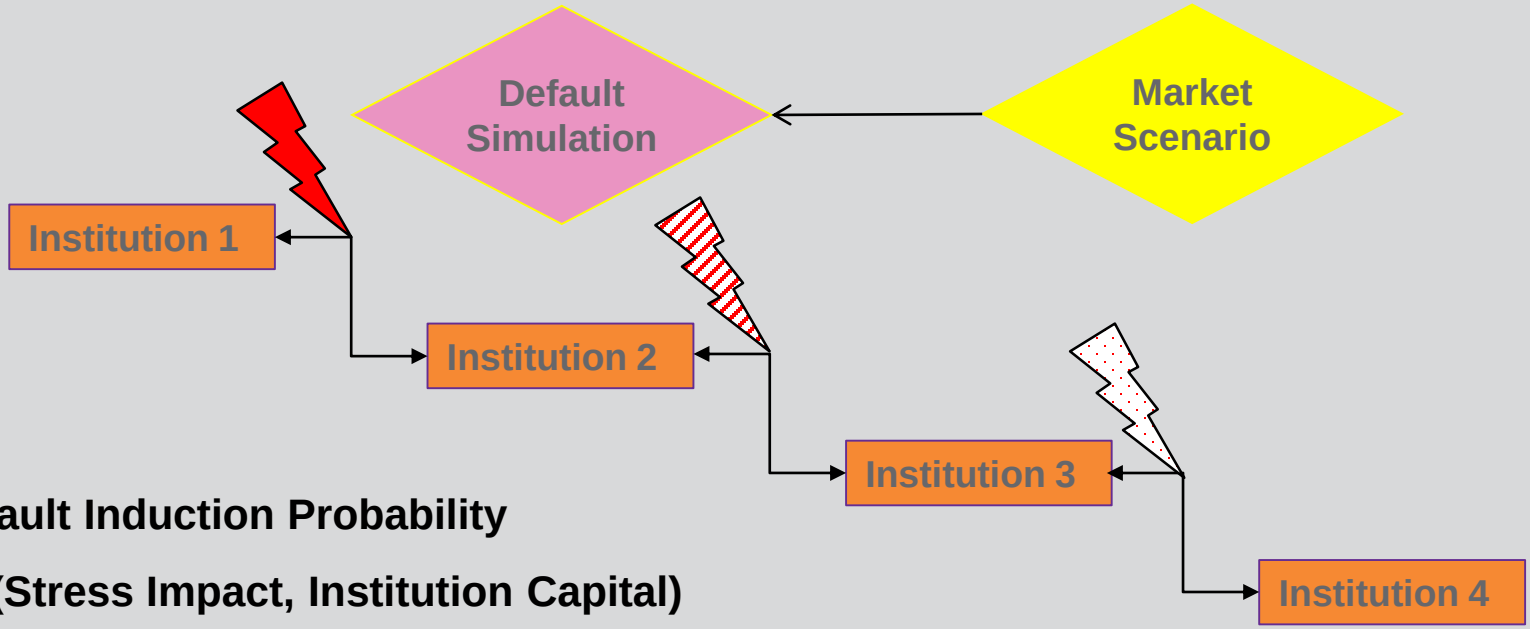
- Maximum Quantitative Easing
- Interest rates = 0

> With proposed Capital Adequacy

- Balance cost of investing in various segments
- Smoothly deflate appearing bubbles
- Create incentives to orient capital towards where needed: innovation…

Contagion

> With sensitivity info, Regulator can simulate the impact across the industry of a given stress scenario



Default Induction Probability

= F(Stress Impact, Institution Capital)

Monte-Carlo simulation of Stresses and Defaults

⇒ **Global System Risk Measure GSVaR**

⇒ **For each institution: Marginal-GSVaR = Contribution to Systemic Risk**

Contribution to Systemic Risk

- System of n Banks $B_1,\ldots, B_n$ with "capacity" x_k
- SVaR of individual banks: $V_k(x_k)$
- Global System Risk: $S(x_1,\ldots,x_n)$
- Assume homogeneity: $V_k(\lambda x_k) = \lambda V(x_k)$

$$S(\lambda x_1,\ldots, \lambda x_n) = \lambda\, S(x_1,\ldots,x_n)$$

- Assume Central Bank increases B_k capacity
  - Marginal risk contribution $C_k = x_k\, \partial S/\partial x_k$
  - $S(x_1,\ldots,x_k) = \sum C_k$
  - Relative Systemic Risk $\rho_k = C_k / V_k$

Contribution to Systemic Risk

- Systemic Risk is not Sub-additive

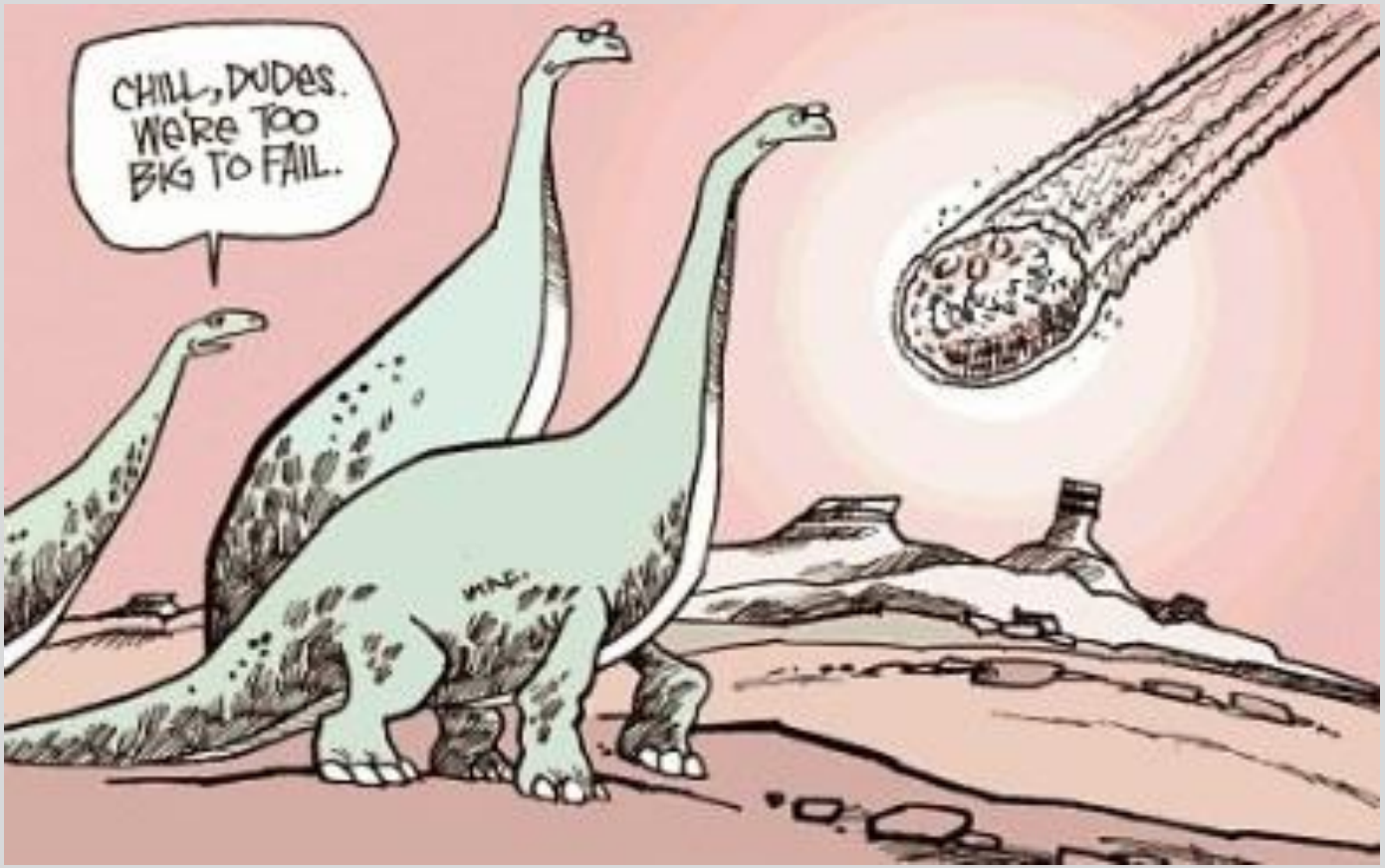
$$S(x_1,\ldots,x_n) \geq \sum V_k \Rightarrow \rho_k \geq 1$$

- The Relative Systemic Risk measure represents the "tragedy of the commons" in risk: if capital adequacy in based on V_k , not C_k , then $S(x_1,\ldots,x_n) - \sum V_k$ is a risk that is supported by the central bank, not accounted for in Basel III
- Dynamic and contagion effects have a strong impact on S, hence on C_k
- Regulations should take into account the monitoring of ρ_k

System Optimization

- Measure of benefit G
  - Growth
  - Employment
  - Purchasing power
- Bank contribution to benefit $G_k = x_k \, \partial S/\partial x_k$
- Profitability ratio: $R_k = G_k / C_k$
- Regulations, capital adequacy rules, lists of eligible assets should be dictated in light of maximizing R_k !!!

Know your risk…



Болшой Спасибо !