

Stress Scenario Design: Challenges and Principles

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June 2014

Presentation at Boston Stress Test Conference

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Goals of BHC Scenario Design

- ▶ Why are BHC scenarios necessary?
 - ▶ Regulatory scenarios capture macro-risks shared across banks.
 - ▶ Regulatory scenarios may miss BHC-specific risks.
- ▶ Main Objectives for BHC scenarios.
 - ▶ **Ensuring Capital Adequacy:** Identify stressful scenario(s) such that if the BHC is well capitalized against the stress scenario(s), it will be well capitalized with high probability against the other plausible scenarios that could affect the BHC.
 - ▶ **Risk Vulnerability Identification and Planning:** Identify key vulnerabilities that affect the BHC in order to develop strategies to address them.
- ▶ Objectives imply:
 - ▶ Scenario design should account for all material risks that affect the BHC.
 - ▶ White Paper Guidance on BHC scenarios calls for stress-scenarios to be tailored to key vulnerabilities, idiosyncratic risks, asset mix, etc.

- ▶ Choose primary variables to stress:
 - ▶ Macro and financial variables: GDP, interest rates, ...
 - ▶ Idiosyncratic firm-specific risks
- ▶ Design the scenario:
 - ▶ Create paths for primary variables in stress-scenario.
 - ▶ Secondary variables are set to their expected losses given primary variables.
- ▶ Compute losses in scenario.
- ▶ Assess capital adequacy.

- 1. Capital Adequacy:** Ensuring capital adequacy against other plausible scenarios requires some knowledge of other plausible scenarios.
 - ▶ **Challenge:** Evaluating many scenarios with full repricing is costly.
 - ▶ **Challenge:** How to incorporate information on many scenarios in scenario design.
- 2. Vulnerability Identification / Variable Selection:** Which variables should be selected to capture firm vulnerabilities.
 - ▶ **Challenge:** Which variables capture “systematic (widespread) risk” in bank’s portfolios?
 - ▶ **Challenge** How should “systematic risks” be stressed? By how much ? In what directions?
- 3. Idiosyncratic Risk:** How should idiosyncratic risks be accounted for?
 - ▶ For capital adequacy?
 - ▶ For vulnerability identification?
 - ▶ How to avoid overconservatism ?

▶ **A New Approach:** Multiple Scenarios with Approximate Repricing.

1. Generate many random scenarios using many variables.
2. Approximate P&L in each scenario.
3. Identify the primary variables x that drive P&L and its extremes.
4. Use x to create risk-factors F based on their ability to explain P&L
5. Create a stress-scenario:
 - ▶ Choose F to generate losses at targeted capital adequacy quantile.
 - ▶ Set all variables to their forecasted values given F .
6. Evaluate the scenario using full repricing.
7. Assess capital adequacy.

▶ **Advantages of New Approach**

1. **Capital Adequacy:** The scenario targets a capital adequacy quantile.
2. **Variable selection:** Primary variables are based on importance for P&L.
3. **Stress Directions:** Stresses to F are important risk directions.
4. **Idiosyncratic Risk:** Automatically part of capital adequacy computation.

- ▶ Thinking tool to aid in scenario design.
- ▶ Not a substitute for human judgment, but a tool to inform it.
- ▶ Approach's accuracy depends on:
 1. Approximations in repricing.
 2. The methods used to randomly generate scenarios.
- ▶ **Disadvantages of New Approach**
 1. Idiosyncratic risks are not a part of final stress-scenario.
 2. But, for Cap Adeq, choice of F is more severe to account for idiosyncratic risk.
 3. Richness of idiosyncratic risks is not captured.

Modeling Idiosyncratic Risk in A Stress Scenario

- ▶ Why is modeling idiosyncratic risk in stress-testing difficult?
 - ▶ Can be too pessimistic:
 - ▶ **Example:** Suppose bank has 9 idiosyncratic businesses with $P\&L \sim \mathcal{N}(0, 1)$.
 - ▶ Shocking a business down by 2 is reasonable (probability a business loses more is 2.3 percent).
 - ▶ Shock all businesses down by 2 is too conservative (probability of this or greater losses $< 10^{-9}$).
- ▶ Conclusions: Its overly conservative to shock all idiosyncratic exposures by large amounts.
 - ▶ For Cap. Adeq., more severe F to account for idiosyncratic risks may be sufficient.
 - ▶ For risk vulnerability planning, explicit focus on idiosyncratic risk scenarios is required.

- ▶ Designing stress-scenarios is difficult:
 - Which variables should be stressed? By how much? Which directions?
 - How do we know our scenario assures capital adequacy?
- ▶ I have suggested a multiple approximate scenario approach to address these questions.
 - ▶ The method uses information from many approximately priced scenarios.
 - ▶ Uses full and accurate pricing for chosen scenario(s).
 - ▶ The method chooses stress scenarios for capital adequacy.
 - ▶ Important risk directions and variables are identified.
- ▶ Related issues to think about:
 - ▶ How should time varying positions be incorporated?
 - ▶ How should uncertainty about probability distributions be incorporated?