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Stress Test Design: Market Risk

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We Know That …

- Trading book risk profile changes continuously
- Liquid risks move in and out rapidly, directional exposures tend to be small, non-linear risks are managed dynamically
- Illiquid risks can cause large losses especially when related to non-linear and wrong-way risks
- Credit products and counterparty risks caused large trading losses in 2008 crisis
- Crisis dynamics and systemic risks are very important

Design Elements

- Liquidity of the risks
- Reverse stress test
- Probability of the stress test
- Counterparty risk
- Endogenous crisis dynamics

Liquidity

Key elements to capture

- Liquid market risks tend to move fast
- Illiquid risks don’t move fast; they can cause large losses that accumulate over extended periods

Recommendation

- Stress test needs to differentiate the liquidities of the risks
- Liquid risks: small shocks
- Illiquid risks: large shocks

The problem with large shocks to liquid risks

Suppose that the trading positions and stress test shocks are:

- Long $200mm ABS, stress shock **-35%**
- Short $100mm WTI, stress shock **-70%**

Stress Test Results

- ABS loss -$70mm
- WTI gain +$70mm
- The NET stress test result is **ZERO**

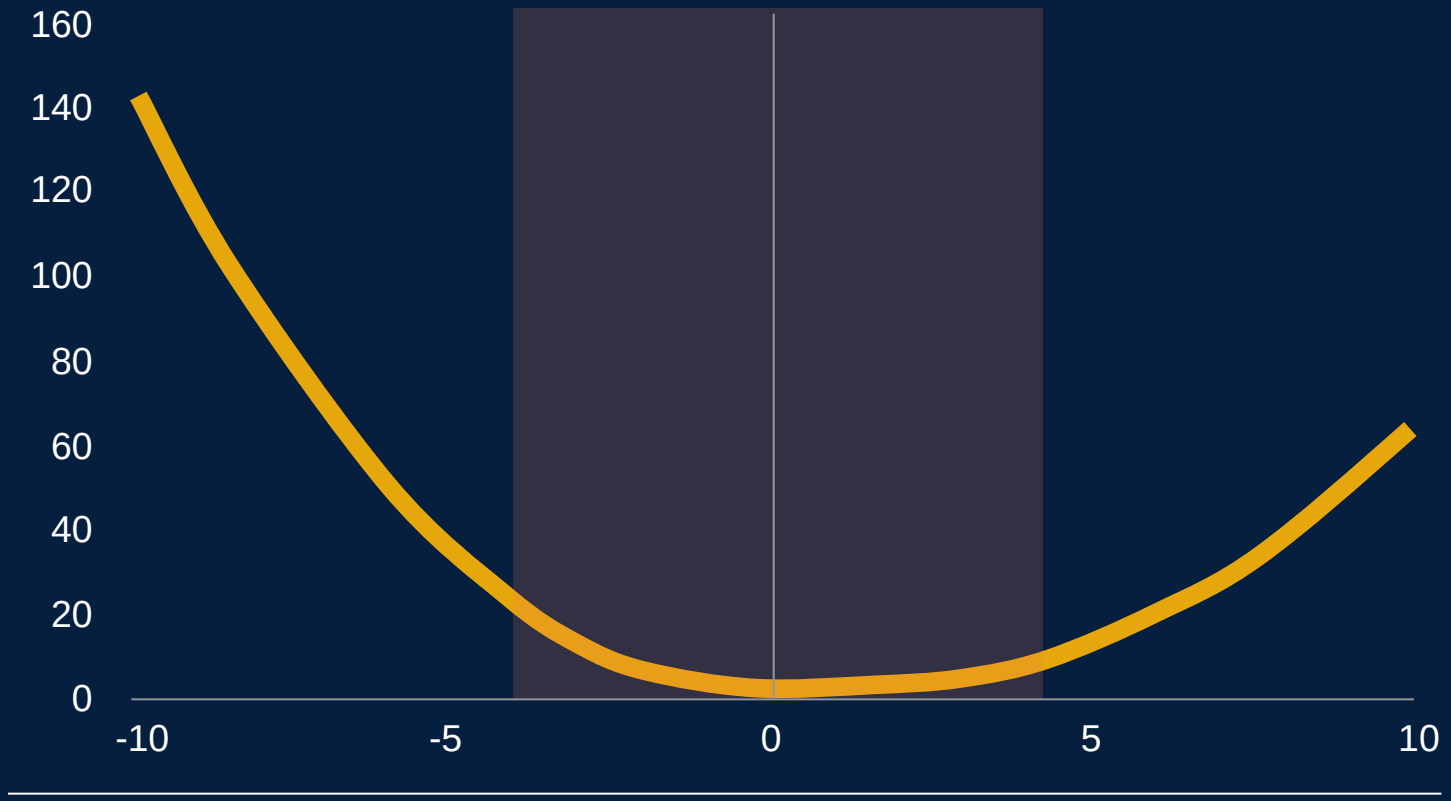
In reality, the WTI position is liquid and it is likely to be closed quickly.

The ABS position is illiquid and it cannot be hedged, the bank

is likely to lose **-$70mm**

Another issue with large shocks to liquid risks

Continuous delta-hedging of liquid risks will adjust the risk profile over time and the positive convexity gains will not be realized



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Systematic Reverse Stress Test

Key elements to capture

- Market prices respond to ‘news’
- Price changes may not directly relate to the current macroeconomic environment
- Directional trading risks are mostly hedged
- Residual basis risks may be difficult to identify *ex ante*

Recommendation

- Systematic reverse stress test with multiple and innovative scenarios
- At a minimum, up/down shocks in each risk class to capture the risks of short/long positions

Probability

Key elements to capture

- It is useful to have a measure of the probability (severity) of the stress test
- To inform risk analysis
- To inform risk management actions

Recommendation

- Stress test scenarios should be associated with some notion of their probability

Counterparty Risk

Key elements to capture

- Complex, non-linear risks: **CVA = (Exposure) • (Spread)**
- Sometimes the risks are wrong way and illiquid
- Dynamic hedging costs can be large, especially in volatile and illiquid market

Recommendation

- Mark-to-market stress test (price shocks)
- Jump-to-default stress test (IDR)
- Hedging-cost stress test (simulations of hedging strategies)

Endogenous Dynamics

Key elements to capture

- Endogenous market dynamics during market crises are difficult to forecast
- De-risking, de-leveraging, fire sales, connectedness, contagion, etc…
- Those dynamics may be a key determinant of the severity of market crises

Recommendation

- Need to understand the accumulation of systemic risks
- This is difficult for any single institution to achieve by itself
- Data aggregation and network analysis