Goldman Sachs

Fourth Annual Federal Reserve Stress Test Modeling Symposium

Designing A Coherent Stress Testing Framework

June 26, 2015

Finance Division

Designing a Coherent Stress Testing Framework
Consistency

To illustrate the importance of consistency across the Balance Sheet, Capital and Risk Weighted Assets, consider a simple mortgage instrument following the FRB Severely Adverse asset path in a banking book (Example 1) and the same mortgage in a trading book (Example 2).

In both examples the capital ratio decreases. In the banking book the decrease is due to the increase to the SSFA Haircut and decrease in Capital, while Market Value remains the same. The RWA is simply the SSFA Haircut times the Market Value times 12.5.

Example 1: Subprime Resi Bond in Banking Book

	Carrying Value	SSFA Haircut[1]	RWA	Capital[2]	Capital Ratio
Start	6,084,641	22.4%	17,026,258	4,000,000	23%
Trough	6,084,641	47.0%	35,756,425	2,876,120	8%

[1] using SSFA instead of SFA to simplify comparability

[2] change in Capital arises from ALLL impact

In the trading book, the decline in asset value will be recognized impacting the Market Value and Capital. The trading book will also experience the same SSFA Haircut increase as the banking book. With these inputs, the RWA is given and while the RWA decreases the Capital Ratio still goes down driven by the change in Capital.

**Example 2: Subprime Resi Bond in Trading Book** (assume 30% tax rate)

	Market Value	SSFA Haircut	RWA	Capital	Capital Ratio
Start	6,084,641	22.4%	17,026,258	4,000,000	23%
Trough	860,976	47.0%	5,059,530	343,435	7%

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Granularity

To illustrate the importance of granularity, consider an example where we compute a haircut-based specific risk capital charge on a portfolio of two securities, one debt and one equity. The capital charge is a function of the haircut and the market value of the securities. Since the haircut is constant, changes to the Risk Weighted Assets (RWA) are driven entirely by changes to the Balance Sheet. Therefore, one would expect that the RWA, Balance Sheet ratio will be constant. The total portfolio RWA / Balance Sheet ratio is shown below in blue.
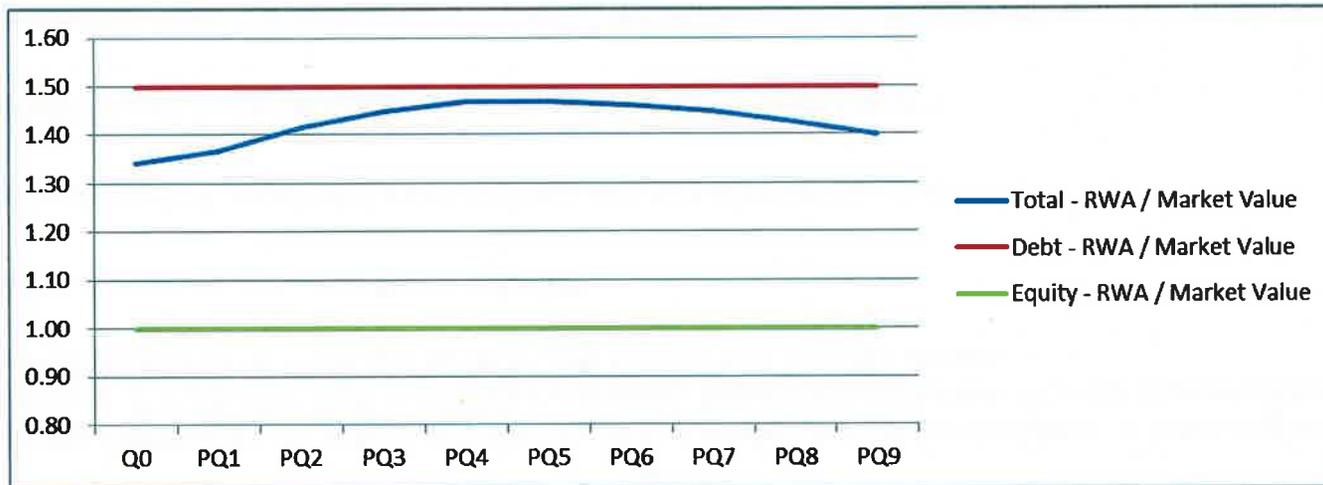
The scenario shocks for equity and debt are not identical. As a result the percentage contribution of debt and equity to the total portfolio is changing. When debt and equity are examined in isolation the expected behaviour is observed.

	Debt (12% Haircut)		Equity (8% Haircut)		Total		
	Market Value	RWA	Market Value	RWA	Market Value	RWA	RWA / MV
Start	37,288,020	55,932,030	17,217,273	17,217,273	54,505,293	73,149,303	1.34
Trough	17,794,364	26,691,547	1,208,032	1,208,032	19,002,396	27,899,579	1.47

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Consistency & Granularity

A more nuanced example of the importance of consistency and granularity is provided by Modelled Market Risk Weighted Assets (MRWAs). MRWAs are comprised of Value-at-Risk (VAR), Stressed Value-at-Risk (SVaR), the Incremental Risk Charge (IRC), and the Comprehensive Risk Measure (CRM).

All four of the modelled MRWA components are well defined by Basel rules. Like in the prior examples, given the scenario asset path and the projected balance sheet, MRWAs can be computed.

In practice computing the MRWAs can be difficult and it is natural to consider whether the complexity of executing so many computations is necessary. It is tempting then to simplify the problem through approximation. If using approximations it is critical to achieve the right level of granularity, no more and no less. Key questions to consider include:

- Do the calculations operate on the same Balance Sheet?

- Will changes to market values impact the Balance Sheet and how will that impact MRWAs?

- What are the market inputs to the calculations and which ones are most significant?

- How will the calculations react to a riskier (higher volatility) market environment? Will SVaR and IRC, which are stressed measures by construction, react?