

THE ESSENTIALS OF RISK MANAGEMENT

Third Edition (EoRM3)

ONLINE CONTENT FOR CHAPTER 16

Box 16-1, Appendix 16-1 of EoRM2

From pp. 567–568 of *The Essentials of Risk Management, Second Edition* (EoRM2)

BOX 16-1

STRESS VAR AND CAPITAL REQUIREMENTS

Following the financial crisis of 2007–2009, regulators required banks to add “stress VaR” (sVaR) to their regulatory capital calculations for market risk in an amendment to the rules known as Basel 2.5 (see also Chapter 3 of EoRM2).*

These new rules to derive regulatory capital could lead to the absurd situation where the amount of regulatory capital is greater than the exposure of the portfolio. Indeed, the new rules to calculate the amount of regulatory capital in the trading book can be summarized by the formula:

$$\text{Capital} = \max \{(\text{VaR}, k \times (\text{average VaR over 60 days}))\} + \max \{(\text{StressVaR}, k \times (\text{average StressVaR over 60 days}))\} + \text{IRC}$$

where k is a multiplier with minimum value of 3, VaR is measured at the 99 percent confidence level over a 10-day period, StressVaR is computed using data from a stressful period such as 2007–2008, and IRC (incremental risk charge; see Chapter 3 of EoRM2) is the CreditVaR over a one-year period at the 99.9 percent confidence level.

Assuming for illustrative purposes that volatility under stressed market conditions is three times the volatility of a normal market environment, and returns are normally distributed, StressVaR is three times NormalVaR (neglecting IRC for the purpose of the exercise).

Now suppose that the portfolio has an annualized volatility in normal market conditions of 10 percent. Then, over 10 days, the standard deviation is 2 percent. The 10-day standard deviation in stress conditions is thus 6 percent, according to our (not unreasonable) assumption. The sum of these—that is, 8 percent—must be multiplied by the 99 percent standard normal critical value of 2.33, and then by a multiplier of at least 3. Assuming a “green zone” model—that is, a multiplier of 3—regulatory capital under the new rules (and ignoring the IRC) is $2.33 \times 3 \times 8\% = 56\%$ of the portfolio exposure.

* Basel Committee on Banking Supervision, *Revisions to the Basel II Market Risk Framework*, July 2009.

Note that under our simple, but illustrative, assumptions the new regulatory capital charge will always be four times the capital charge without the stressed component. For instance, with a well-diversified and partially hedged portfolio, having an annualized volatility of 5 percent and an “old” regulatory capital of 7 percent of the exposure, the new charge will be 28 percent. But with a partially diversified and lightly hedged portfolio having a normal volatility of 15 percent and a stress volatility of 60 percent, the new rules lead to a capital charge of 105 percent of the size of the portfolio, which, if the positions are long, is higher than the maximum loss that could be incurred on this portfolio.

Regulatory capital levels were initially described as a function of a desired confidence interval to protect the institution against default. The post-crisis incorporation of stress testing considerations to determine the required amount of capital seems logical, but could lead to requirements for excessive amounts of capital—making the bank unattractive to any investor.

From pp. 581–582 of *The Essentials of Risk Management, Second Edition* (EoRM2)

APPENDIX 16-1

The 2023 Dodd-Frank Severely Adverse Scenario¹ *[Updated]*

“The supervisory severely adverse scenario is characterized by a severe global recession accompanied by a period of heightened stress in commercial real estate and corporate debt markets. The U.S. unemployment rate rises nearly 6 1/2 percentage points from the starting point of the scenario in the fourth quarter of 2022 to its peak of 10 percent in the third quarter of 2024. The sharp decline in economic activity is also accompanied by increases in market volatility, widening of corporate bond spreads, and collapse in asset prices, including a nearly 38 percent decline in commercial real estate prices. The international component of the scenario features deep recessions in four countries or country blocs followed by declines in inflation and large swings in the value of the U.S. dollar against those countries’ currencies.

“Banking organizations with large trading operations are tested against a global market shock component that stresses their trading, private equity, and certain other fair-valued positions. Furthermore, banks with substantial trading or custodial operations are tested against the default of their largest counterparty.”

The scenario starts in the first quarter of 2023 and extends for 13 quarters through the first quarter of 2026. The Fed communicates to the banks participating to the supervisory stress test the history and the trajectories of 28 variables that define the scenario over the period 2023–2026. Actually, to assess the impact of the scenario on regulatory capital banks need to generate the trajectories of many more

1. Source: <https://www.federalreserve.gov/publications/2023-Stress-Test-Scenarios.htm>.

variables that impact their activity (trading and credit losses, net revenue, and regulatory capital), in a way which is consistent with the scenario provided by the Fed. This is a very challenging exercise.

“The variables describing economic developments within the United States include:

- Six measures of economic activity and prices: quarterly percent changes (at an annual rate) in real and nominal gross domestic product (GDP), real and nominal disposable personal income, the Consumer Price Index for all urban consumers (CPI), and the level of the unemployment rate of the civilian non-institutional population aged 16 years and over.
- Four aggregate measures of asset prices or financial conditions: indexes of house prices, commercial real estate prices, equity prices, and stock market volatility.
- Six measures of interest rates: the rate on 3-month Treasury securities; the yield on 5-year Treasury securities; the yield on 10-year Treasury securities; the yield on 10-year BBB-rated corporate securities; the interest rate associated with conforming, conventional, 30-year fixed-rate mortgages; and the prime rate.

The variables describing international economic conditions in each scenario include three variables in four countries or country blocs:

- The three variables for each country or country bloc: quarterly percent changes (at an annual rate) in real GDP and in consumer price indexes or local equivalent, and the level of the U.S. dollar exchange rate.
- Four countries or country blocs: the euro area (the 20 European Union member states that have adopted the euro as their common currency); the United Kingdom; developing Asia (the nominal GDP-weighted aggregate of China, India, South Korea, Hong Kong Special Administrative Region, and Taiwan); and Japan.”

In 2022, 34 large banks were required to participate in the 2022 supervisory stress test. U.S. bank holding companies (BHCs), savings and loans companies (SLHCs), and intermediate holding companies of foreign organizations (IHCs) with \$100 billion or more of assets are subject the Board’s supervisory stress test.