Toy Stress Testing with Python

What is this CCAR thing? Comprehensive Capital Analysis and Review (CCAR) is an exercise carried out every year by the Federal Reserve to make sure that the biggest banks in the US have the capital reserves to weather economic and financial downturns and that they also have the processes and procedures in place to do good capital planning.

DFAST is a component of the Federal Reserve's CCAR process, and particularly relates to the quantitative stress test part.

What inspired it? Well, the failures during 2007-2009 of Bear Stearns, Merrill Lynch, Wachovia, American Home Mortgage, and other large US banking and financial institutions. Lots of non-US banks also failed! What's the definition of a bank failing? Can't cover its debts/losses.

Ok, CCAR is for big banks. What about smaller ones? If you have less than $10 billion, you don't need to do CCAR or DFAST. If you've got between $10 billion and $50 billion, you just need to participate in DFAST but not the more difficult CCAR stress tests.

What if my bank fails CCAR? Then your bank can't make any capital distributions (pay out dividends, for instance) until it addresses whatever problem made it fail. Now, this problem could be in the reporting (quantitative analysis and modeling or qualitative justifications for modeling decisions) or in actual lack of capital.

Is there an international version? The Basel III capital and liquidity standards are voluntary and international. The Fed adopted Basel III standards and made them part of the Dodd-Frank Act requirements, and some Basel III standards are also part of CCAR.

Kaisa Taipale, Aug 24; take this as an analogue of Cliff Notes and expect the corresponding grade if you try to use this on the test!

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Ok: time for the broad outline!

- Calculate risk-weighted assets (RWA) under 3 scenarios
- Calculate Tier 1 capital, the bank's core equity, under 3 scenarios
- Calculate the Tier 1 capital ratio (Tier 1 capital/RWA), under 3 scenarios
- If your ratio is good enough, you have enough capital! You probably pass. Currently 6% minimum but check http://www.bis.org/bcbs/basel3/basel3_phase_in_arrangements.pdf for details.
- If not, you fail!

Risk-weighted assets:

- Standardized approach: add up credit risk RWA and market risk RWA
- Advanced approach: add up credit risk RWA, operational risk RWA, and market risk RWA
- In either approach, market risk RWA might not be applicable; if not, leave it out

From the Fed:

> "BHCs that have sizeable trading operations may incur significant losses from such operations under a stress scenario due to valuation changes stemming from credit and/or market risk, which may arise as a result of moves in risk factors such as interest rates, credit spreads, or equity and commodities prices, and counterparty credit risk owing to potential deterioration in the credit quality or outright default of a trading counterparty."[37] You can find this at http://www.federalreserve.gov/bankinforeg/stress-tests/ccar/August-2013-Estimation-Methodologies-for-Losses-Revenues-and-Expenses.htm

2016 Adverse scenario from
http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20160128a2.pdf

> "The global market shock component for the adverse scenario simulates an extended low-growth environment and muted market volatility across most asset classes and term structures. Domestic interest rates move lower, particularly for longer-maturity securities, with lower volatility. Due to reduced demand, global commodity prices decline moderately. MBS and credit spreads widen moderately. Internationally, yield curves move lower and flatten while sovereign credit spreads widen moderately. Select

currency markets also experience small flight-to-quality moves. Equity markets experience a mild correction with a measured increase in volatility."

In addition to this description, the Fed then provides numbers in csv files, which you can get by clicking on "2016 Macro Scenario Tables (.csv)" at http://www.federalreserve.gov/newsevents/press/bcreg/20160128a.htm. Once you have a model that relies on macroeconomic variables, you can plug in the scenario values given by the Fed and see what happens.