

Stressed EDF™ Credit Measures

Default Probabilities Under Stressed Macroeconomic Scenarios

Presenters:

Mark Zandi, Chief Economist, Moody's Analytics

Danielle Ferry, Senior Research Analyst, Capital Markets Research

U.S. Economic Scenarios

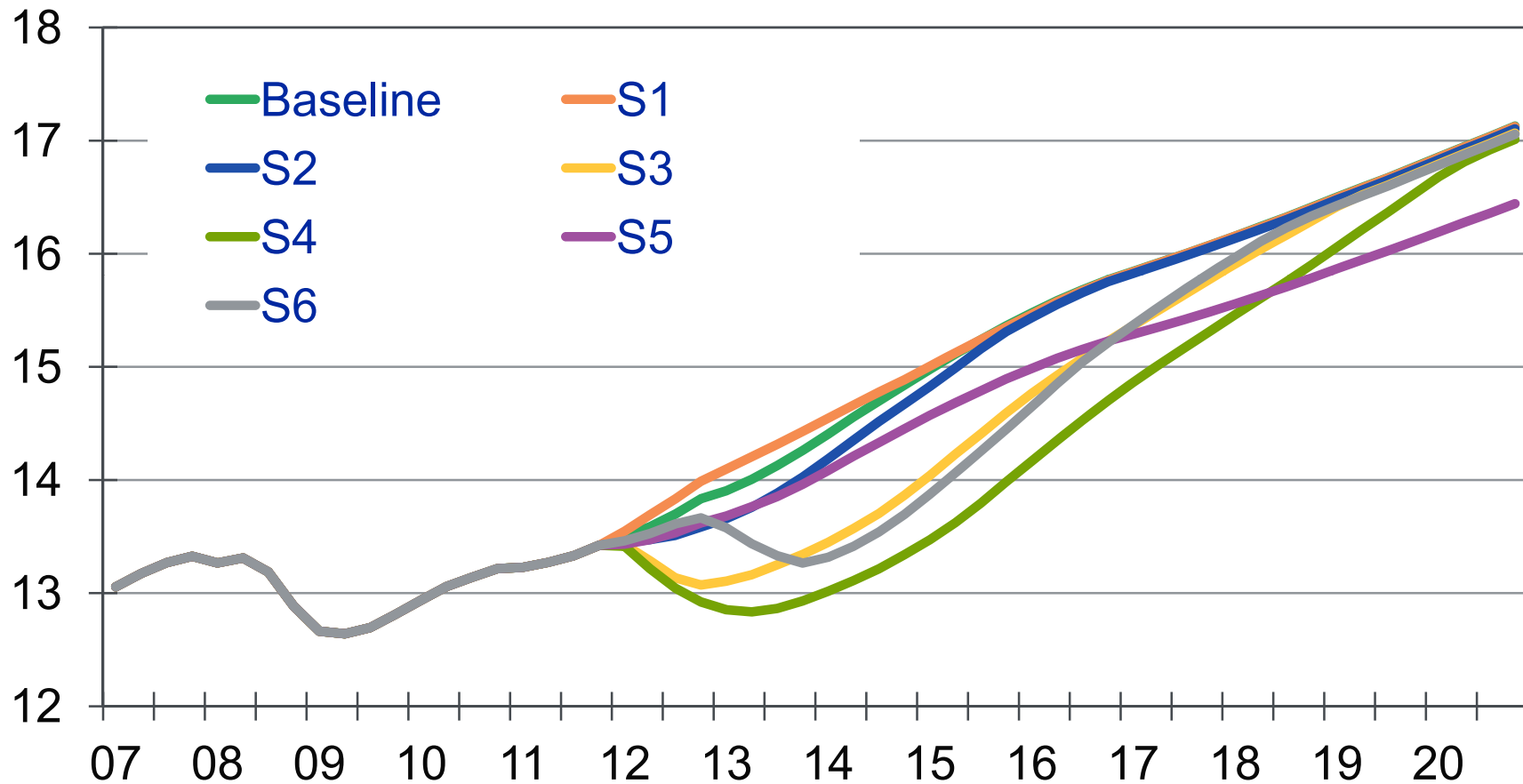
From Moody's Economy.com

Summary of US Economic Scenarios (March 2012)

SCENARIO		REAL GDP	MEDIAN HOME PRICE	Fed Funds	UNEMPLOYMENT
S1	Stronger Near-term Rebound 1-in-10 upside	Real growth of 3.4% in 2012, 3.2% in 2013	No further decline in 2012, slight increase	Begins rising in mid-2012	Declines in 2012, ends year at 7.0%
BL	Baseline Current	Real growth of 2.4% in 2012, 2.8% in 2013	Peak-to-trough decline of 28%, turnaround in early 2013	Near 0% through end of 2013, begins rising early 2014	Declines in 2012, ends year at 7.9%
S2	Slower Near-term Growth 1-in-4 downside	Real growth of 1.5% in 2012, 2.0% in 2013	Peak-to-trough decline of 30%, turnaround late 2012	Near 0% through end of 2014	Rises in 2012 back to 9.3%
S3	Double-Dip Recession 1-in-10 downside	Real growth of -0.3% in 2012, -0.4% in 2013	Peak-to-trough decline of 37%, turnaround late 2013	Near 0% through mid-2015	Rises to peak of 12.3% in third quarter of 2013
S4	Protracted Slump 1-in-25 downside	Real growth of -0.7% in 2012, -2.1% in 2013	Peak-to-trough decline of 41%, turnaround in 2014	Near 0% through end of 2015	Rises to peak of 13.7% in late 2013
S5	Below-Trend Long-Term Growth	Real growth of 1.7% in 2012, 1.7% in 2013	Peak-to-trough decline of 29%, turnaround in mid 2013	Near 0% through end of 2014, slower increase thereafter than baseline	Flat at about 8.5% during 2012 and 2013
S6	Oil Price Increase, Dollar Crash, Inflation	Real growth of 2.0% in 2012, -1.4% in 2013	Peak-to-trough decline of 35%, turnaround in late 2013	Sharp rise to above 4% in mid-2013	Delayed rise to a peak of at 11.7% in mid-2014

Pace of Recovery Varies Across Scenarios

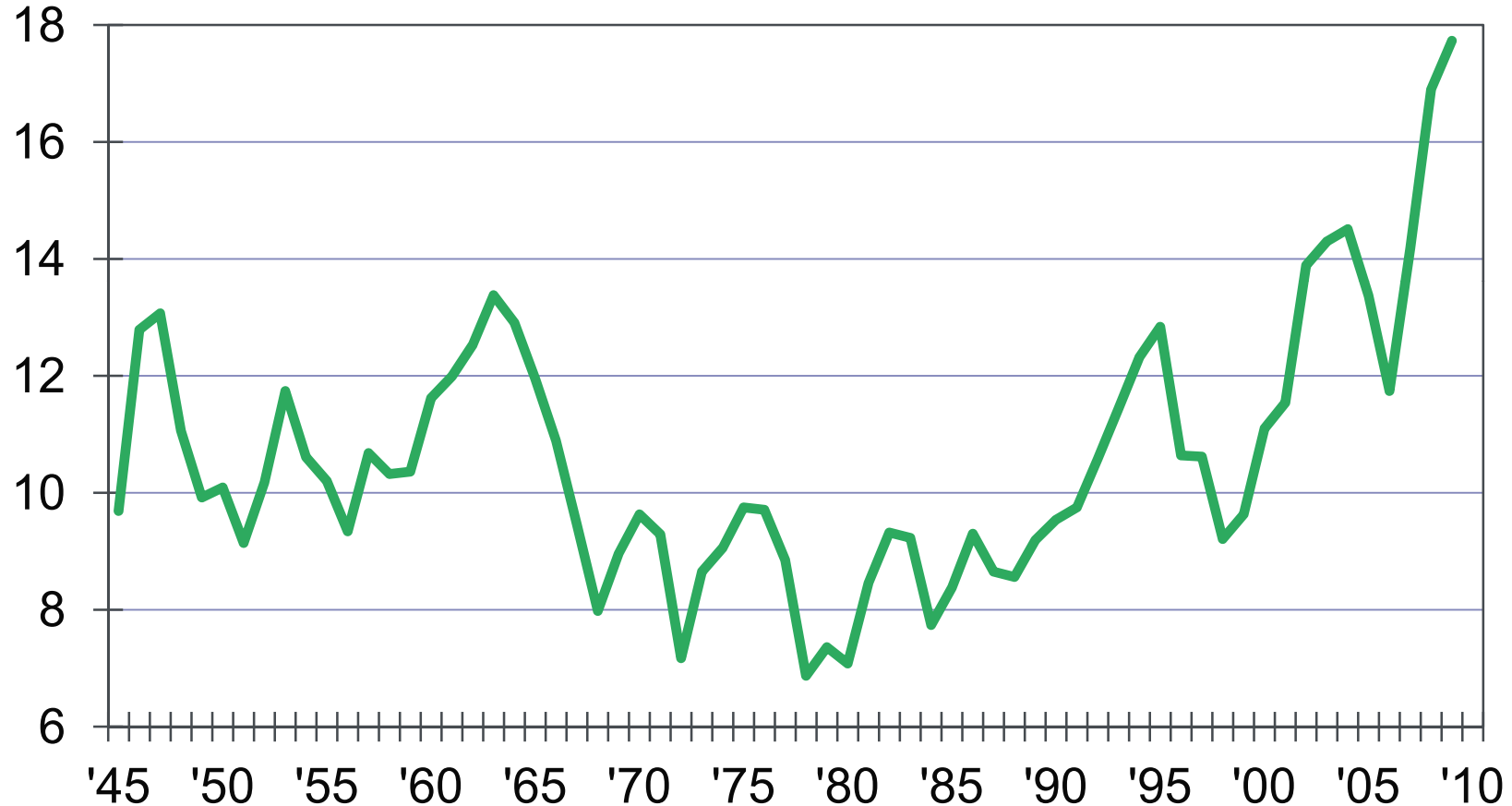
Real GDP, \$ tril



Sources: BEA, Moody's Analytics

U.S. Businesses Have Never Been as Profitable...

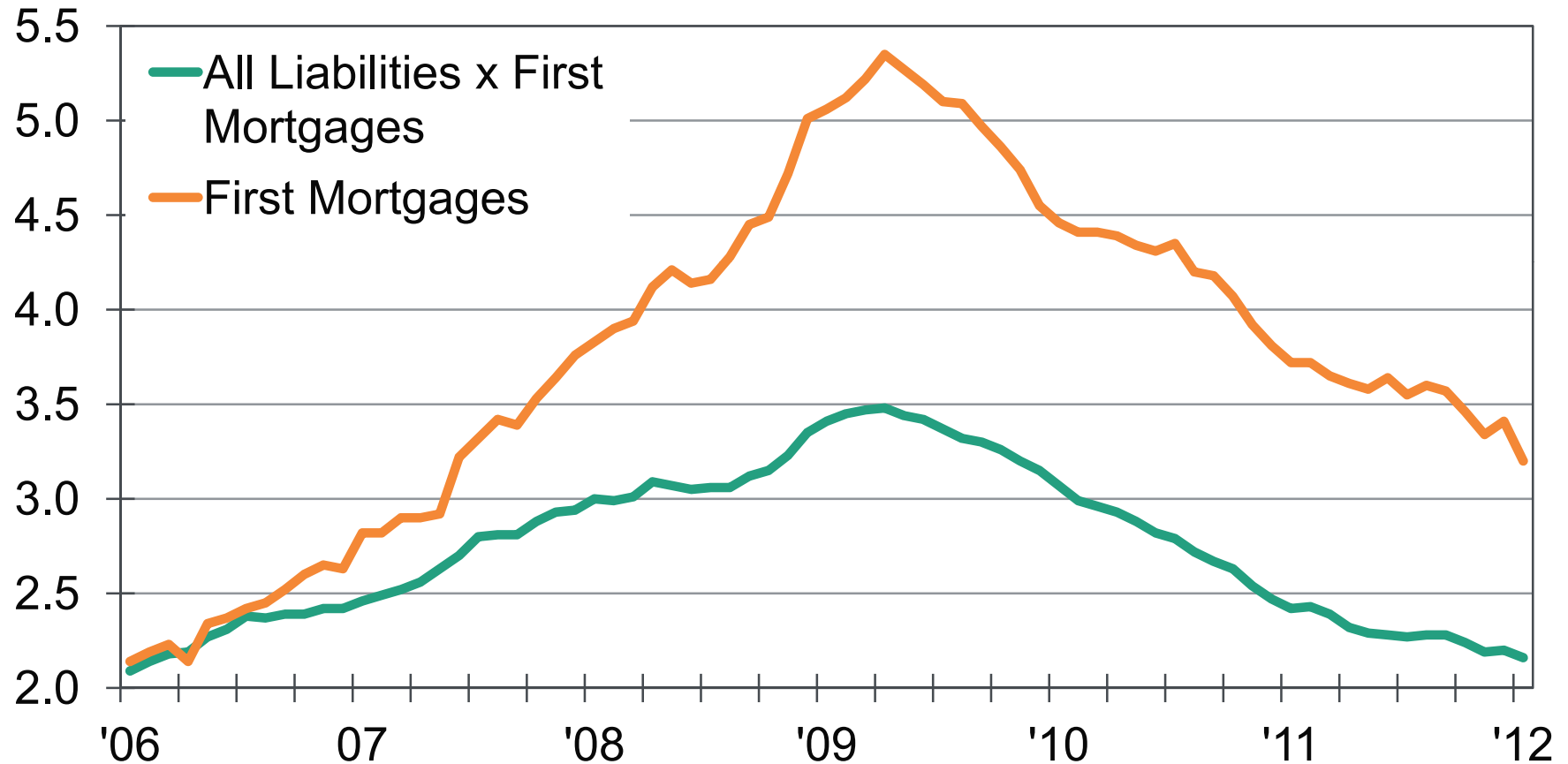
After-tax corporate profit margin, %



Sources: BEA, Moody's Analytics

...and the Deleveraging Process is Ending

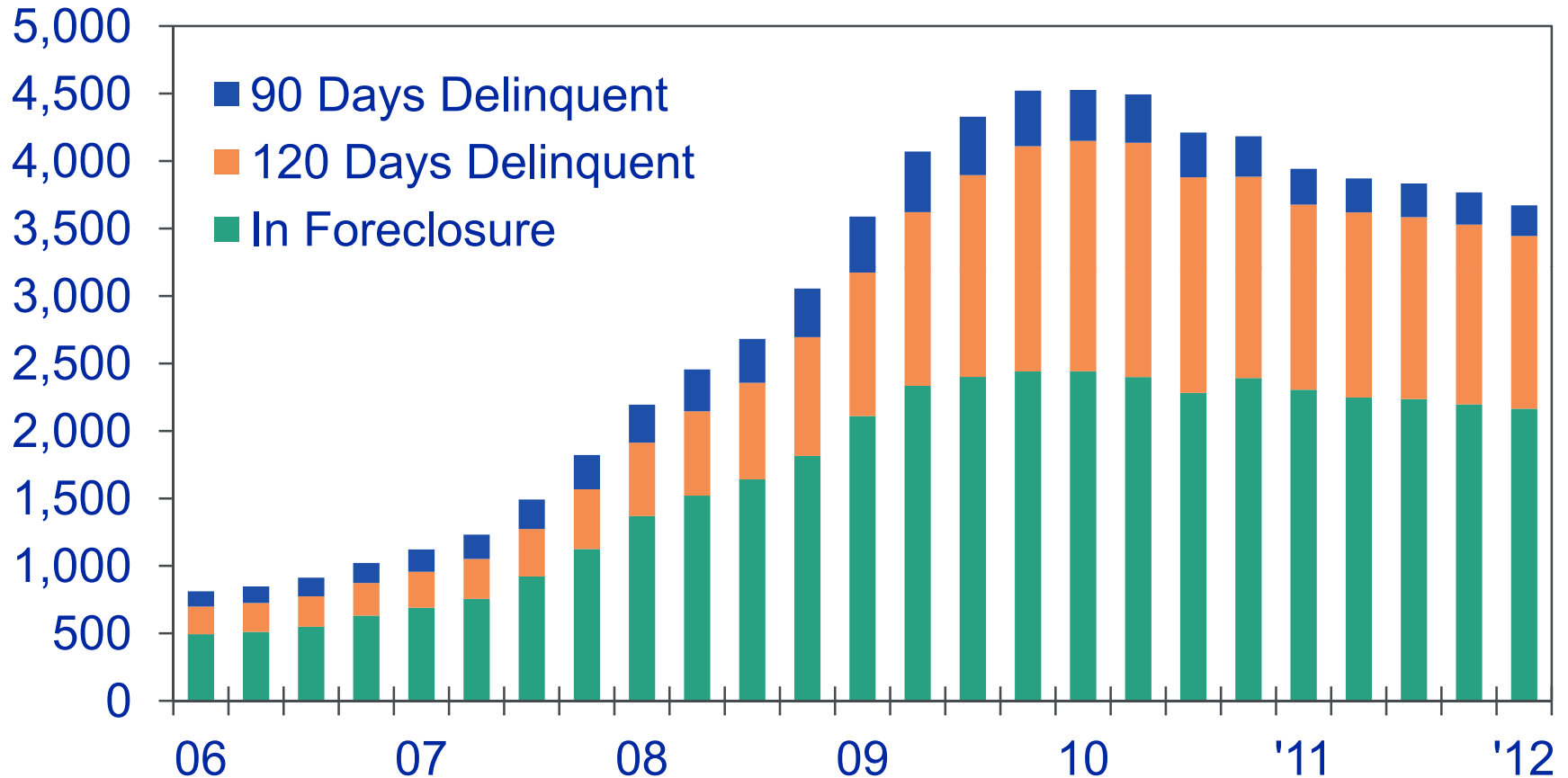
30-90 Day Delinquency Rate, % of \$, SA



Sources: Equifax, Moody's Analytics

A Mountain of Distressed Property...

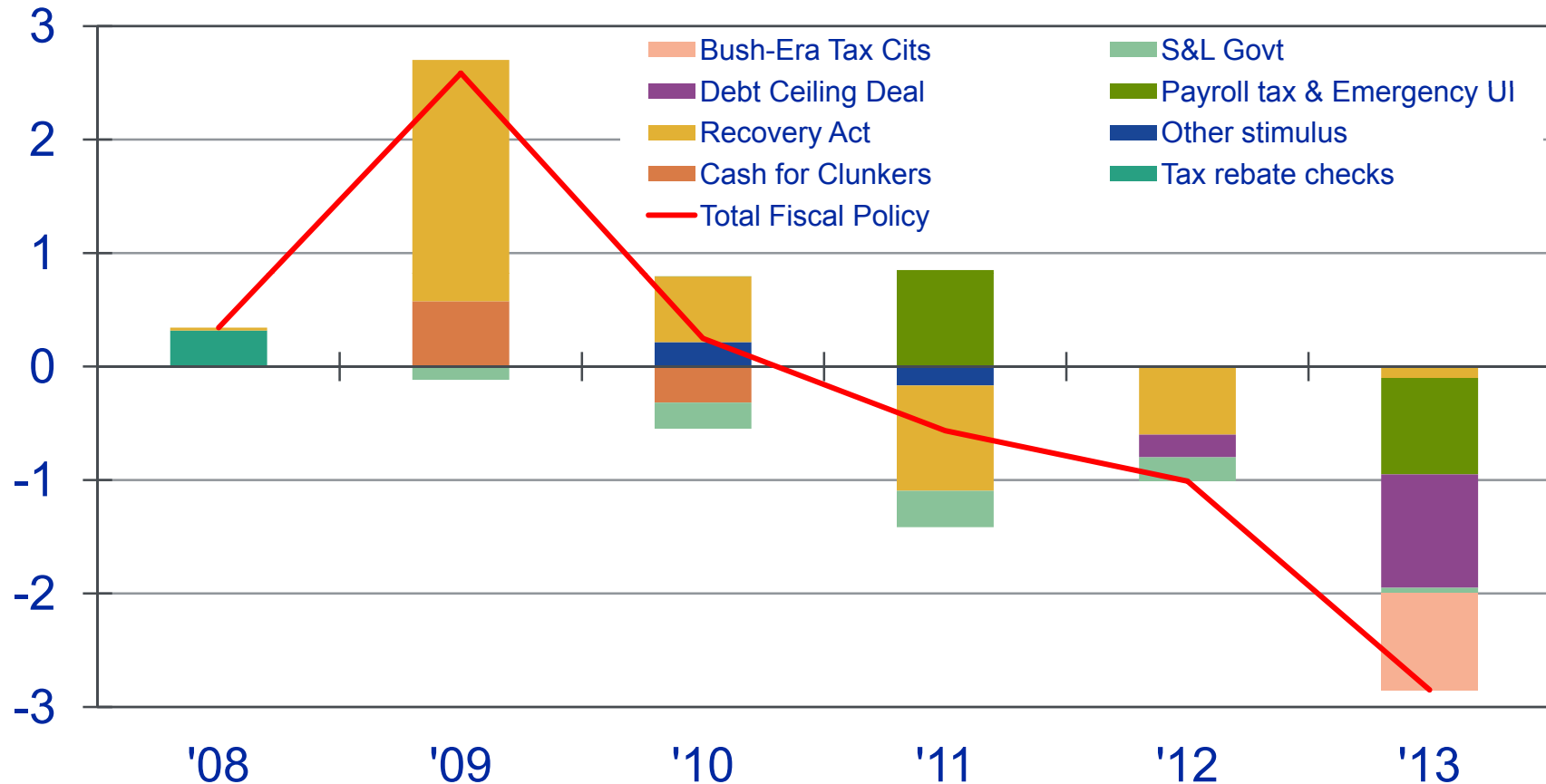
First mortgage loans, Thousands



Sources: Equifax, Moody's Analytics

...and the Federal Fiscal Drag Intensifies

Contribution to real GDP growth under current law, %



Source: Moody's Analytics

Stressed EDF Overview

Stressed EDF Overview

Stressed EDF measures ARE ✓

- » Firm-level, conditional PDs
- » Based on structural relationships between the economy and DD
- » Derived from plausible, narrative-based macroeconomic scenarios
 - Intuitive
 - Realistic
 - Context-driven
- » Grounded in sound econometric modeling fundamentals

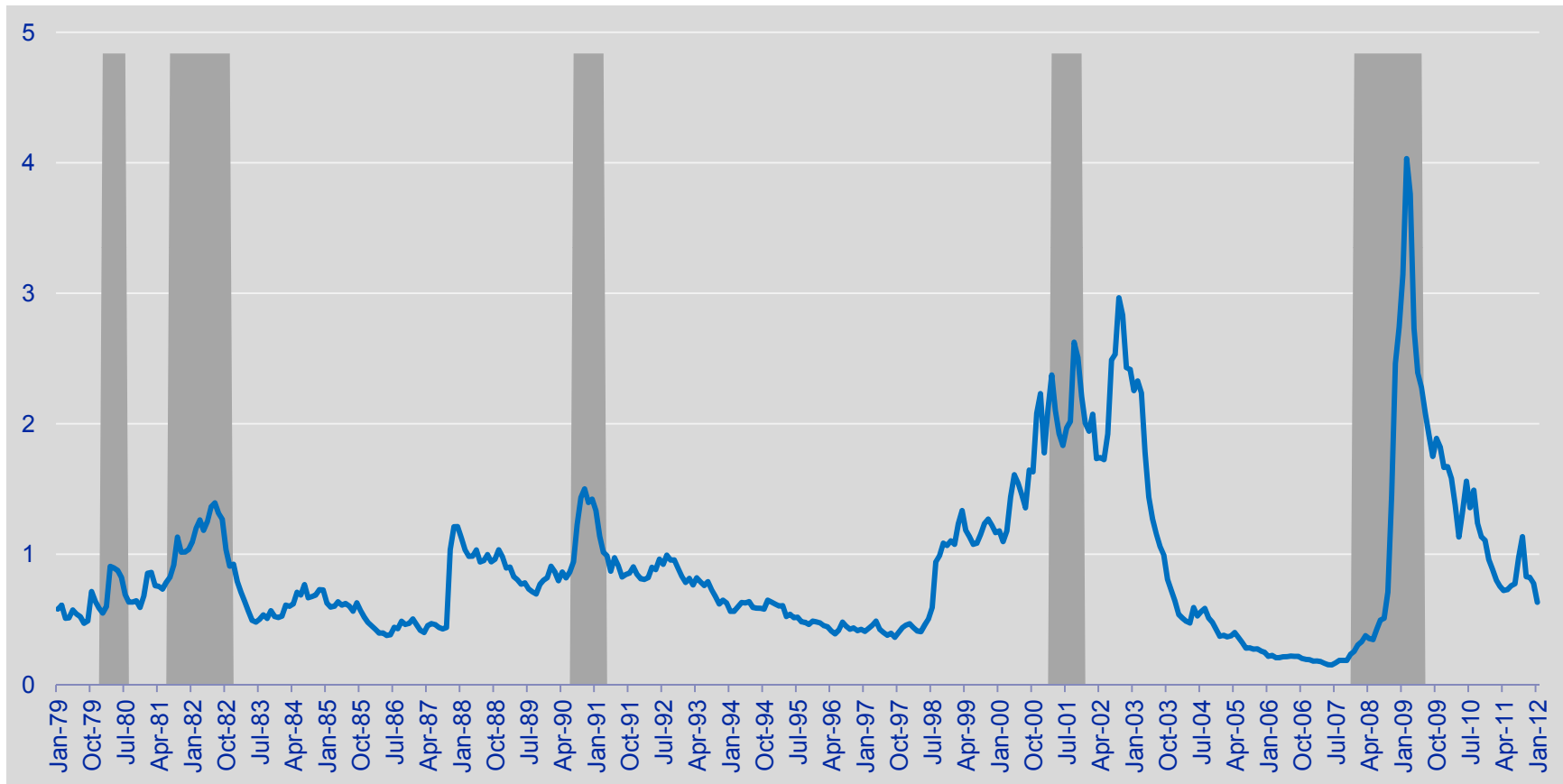
Stressed EDF measures ARE NOT ✗

- » Forecasts
- » Statistical model-based paths of PDs
 - Non-intuitive
 - Not always based in reality
 - Not context-driven

Stressed EDF Intuition

Credit Risk Is Correlated With the Business Cycle

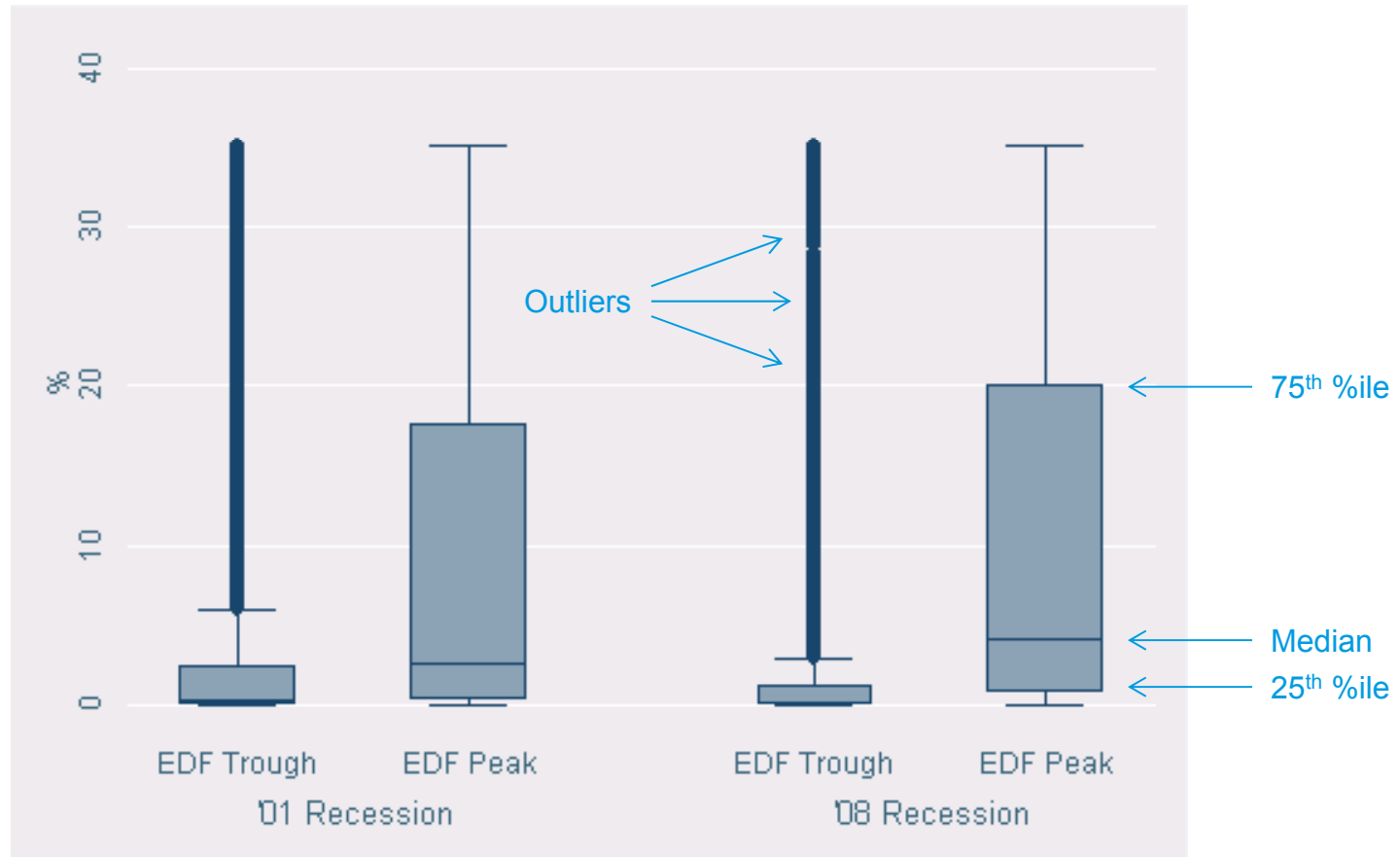
Median EDF, %



Source: Moody's Analytics

Notes: Shaded areas represent NBER recessions. Sample includes all North America firms.

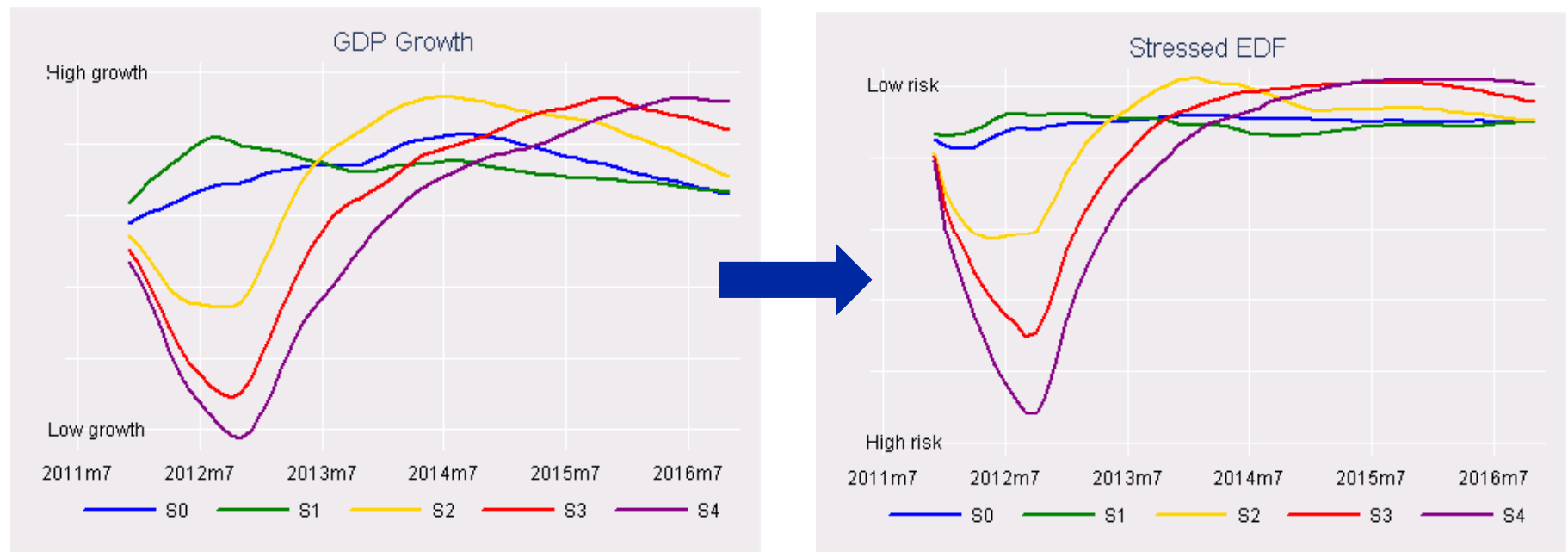
EDF Distribution Shifts With the Business Cycle



Source: Moody's Analytics

Notes: Cyclical troughs in median EDF occurred in Sep/97 and Jun/07. Cyclical peaks in median EDF occurred in Sep/02 and Feb/09. Sample includes all North American firms.

Stressed EDF Scenarios Should Mirror Economic Scenarios In the Aggregate



S0 = Baseline (most likely) **S1** = Stronger near-term rebound

S2 = Mild second recession **S3** = Deeper second recession **S4** = Protracted slump

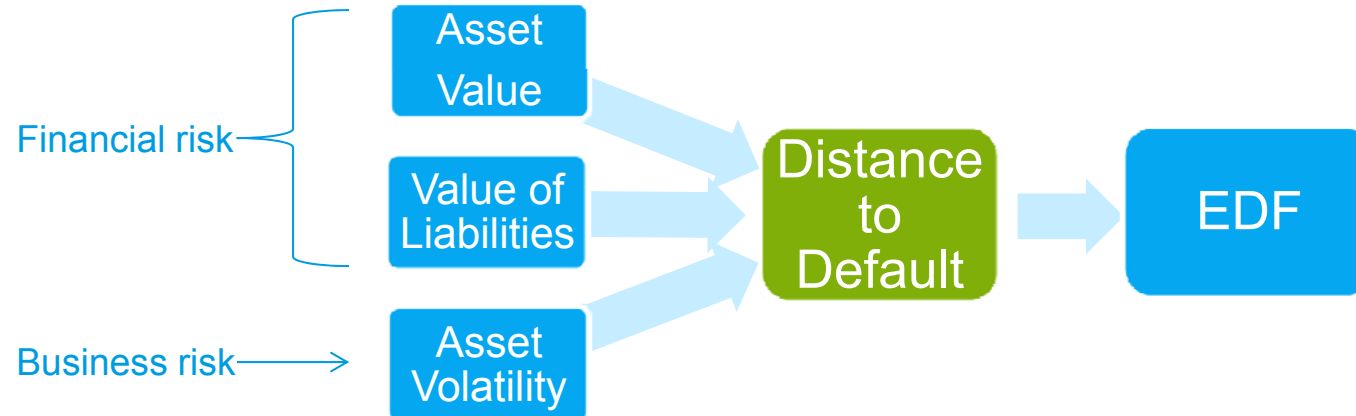
Stressed EDF Methodology

Moody's Analytics Public EDF Model

- » Asset value = value of equity + value of liabilities
- » The two key drivers of the EDF model are:
 - Financial risk: measured by a firm's market leverage = value of liabilities / asset value
 - Business risk: measured by the volatility of a firm's assets
- » Distance to default (DD):
 - Financial risk and business risk combine to form DD
 - Represents how far away a firm's asset value is from the value of liabilities that would trigger a default (scaled by the firm's asset volatility)
- » An EDF measure = 1% means that out of a portfolio of 100 firms, we would expect one default by the end of the year

$$DD \approx \frac{\ln(A) - \ln(X)}{\sigma}$$

Modeling Object: Distance to Default



» Why not model the drivers?

- They evolve interdependently
- They combine in a nonlinear fashion
- DD synthesizes the credit information contained in the drivers

» Why not model EDF?

- 1:1 mapping of DD:EDF
- EDF is bounded, DD is not

Broad Factor Set Describes Each Economic Scenario

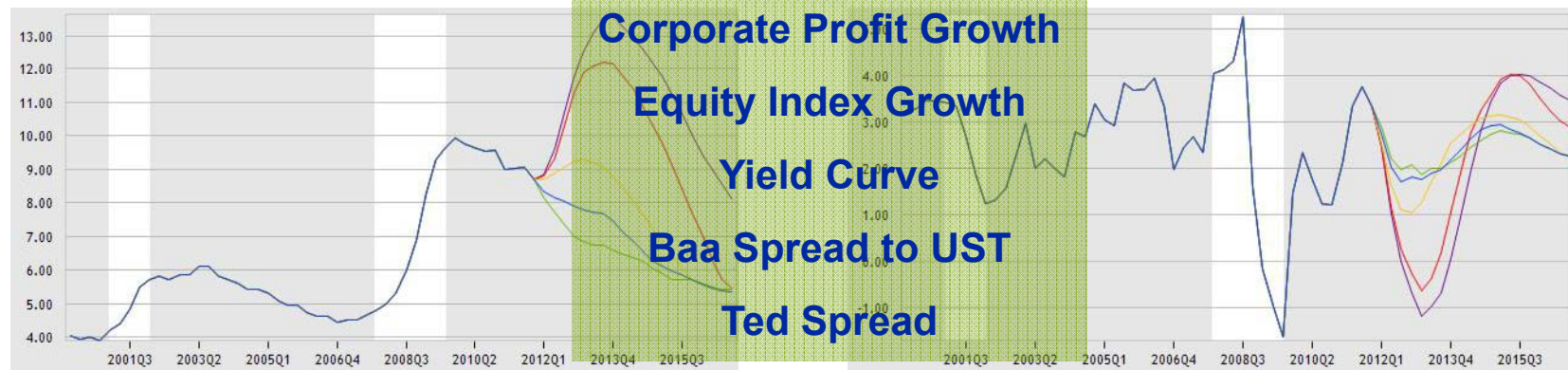
Real GDP Growth, %

S&P 500, Index



Unemployment Rate, %

Consumer Price Inflation, %

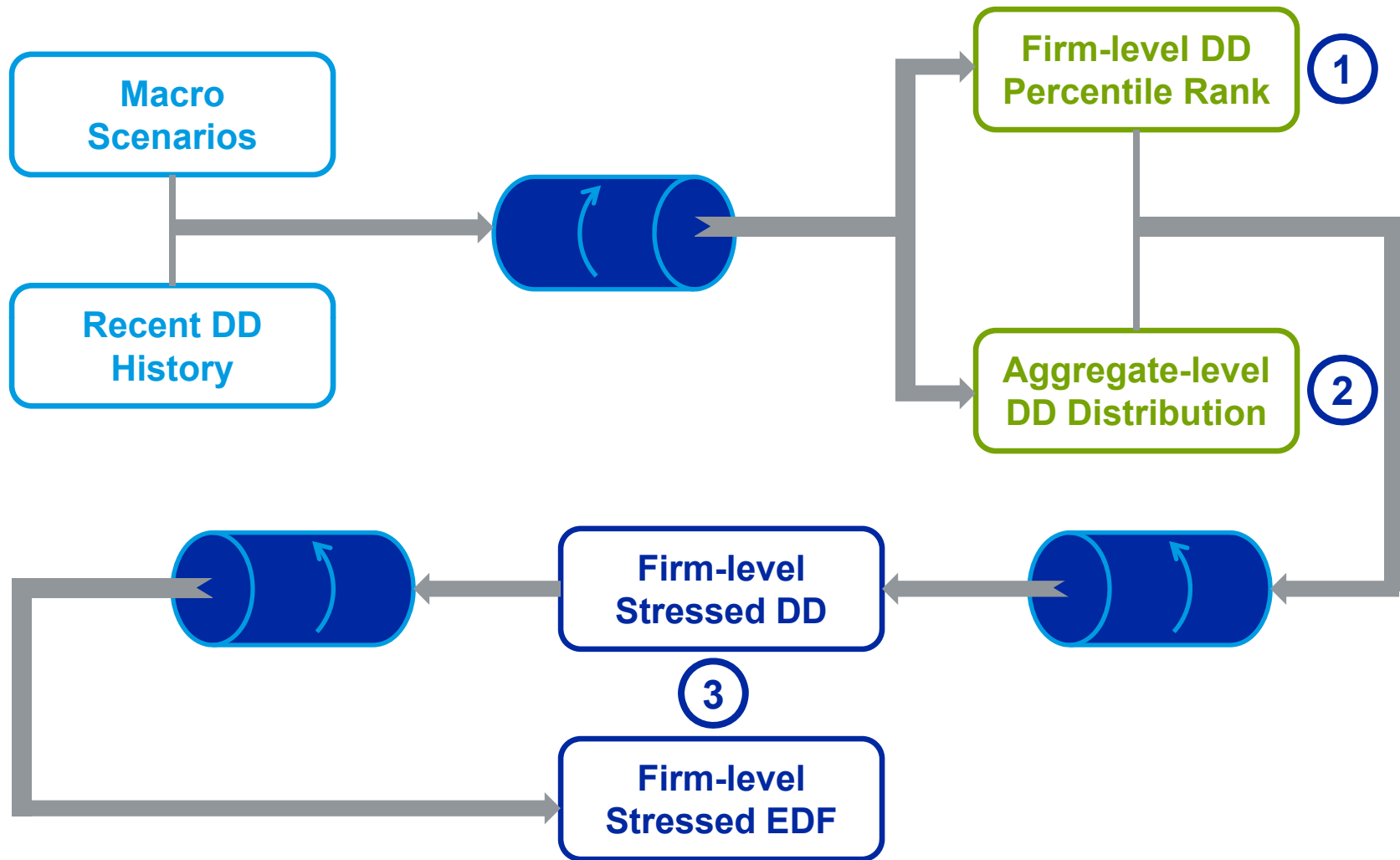


S0 = Baseline (most likely) **S1** = Stronger near-term rebound

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Note: Forecasts are as of March 2012.

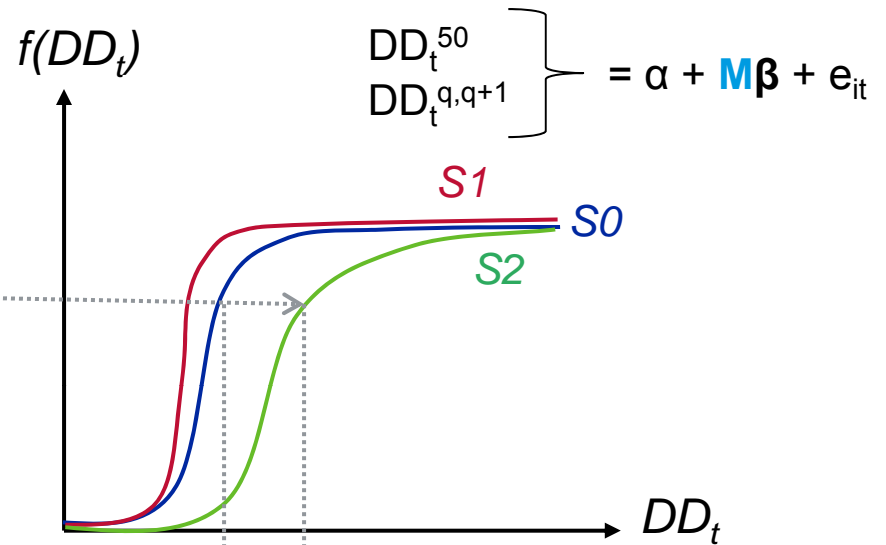
Stressed EDF Methodology In A Nutshell



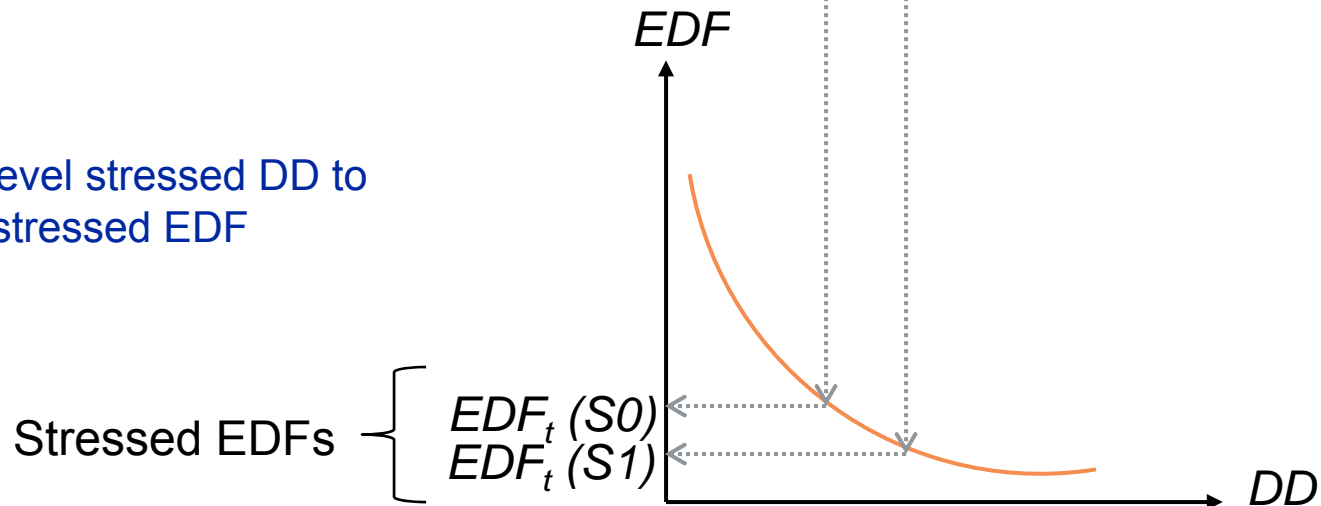
Stressed EDF Methodology in a Beach Ball

- A** Map firm-level stressed DD percentile rank to aggregate distribution of stressed DD

$$\Delta DD_{it} = \alpha + D\rho + M\beta + IND\gamma + IG\delta + e_{it}$$

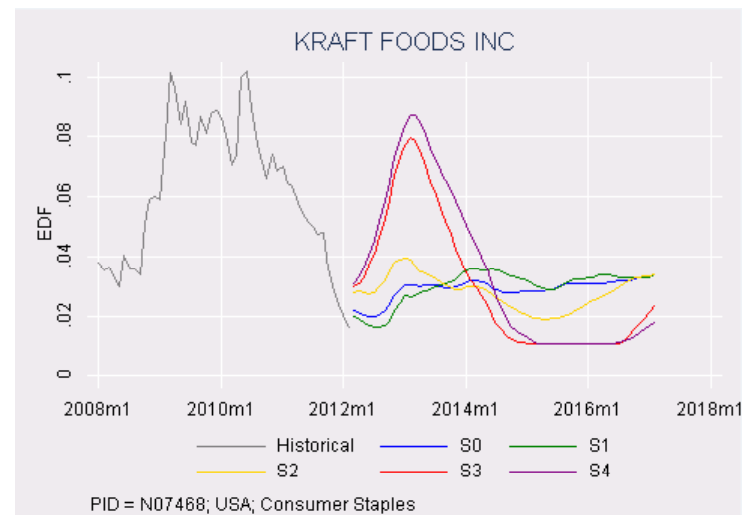
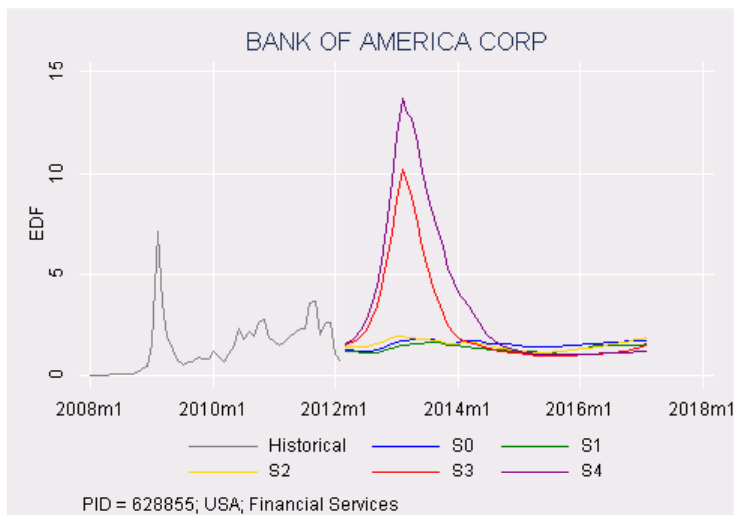
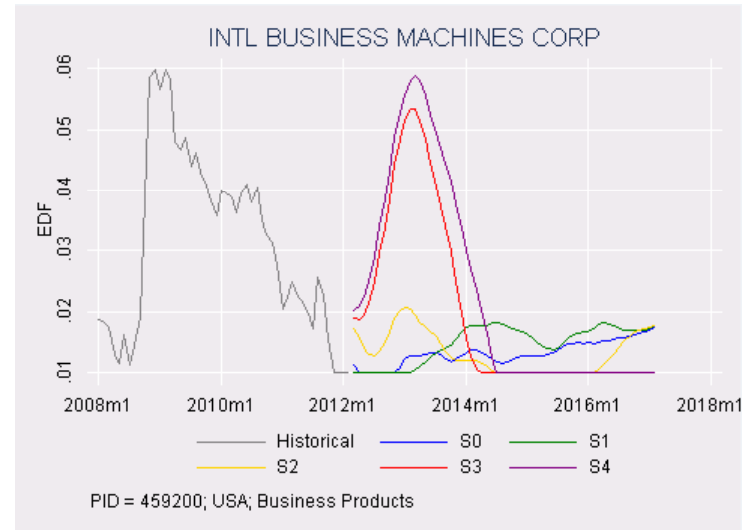
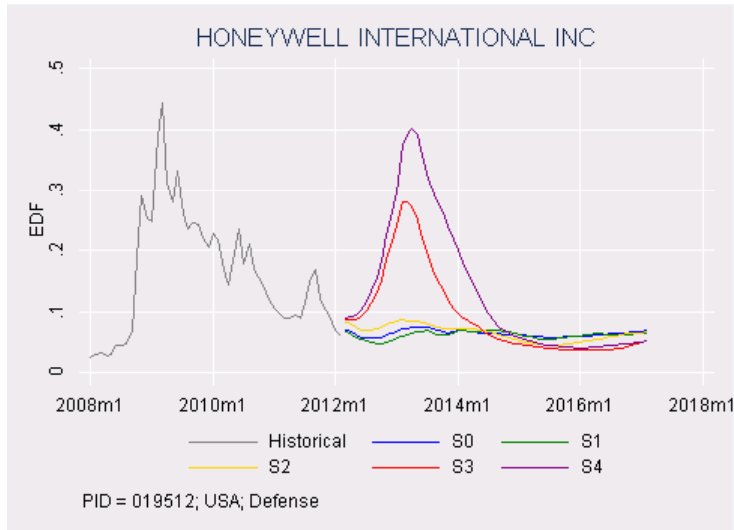


- B** Map firm-level stressed DD to firm-level stressed EDF



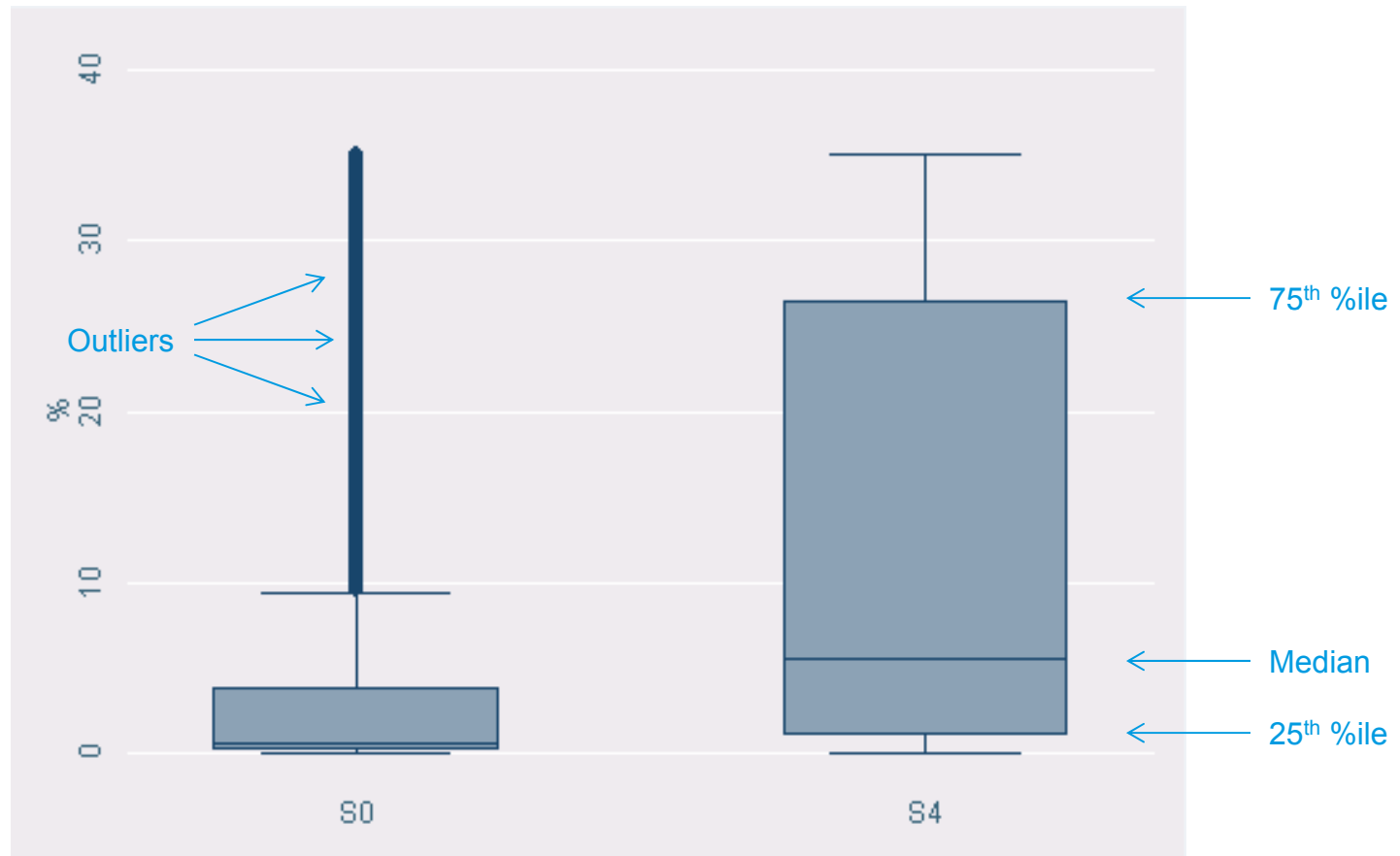
Stressed EDF Examples & Applications

Firm Examples



Note: Results shown are as of February 2012 EDF data.

Stressed EDF Distribution



Note: Results shown are as of March 2012 EDF data.

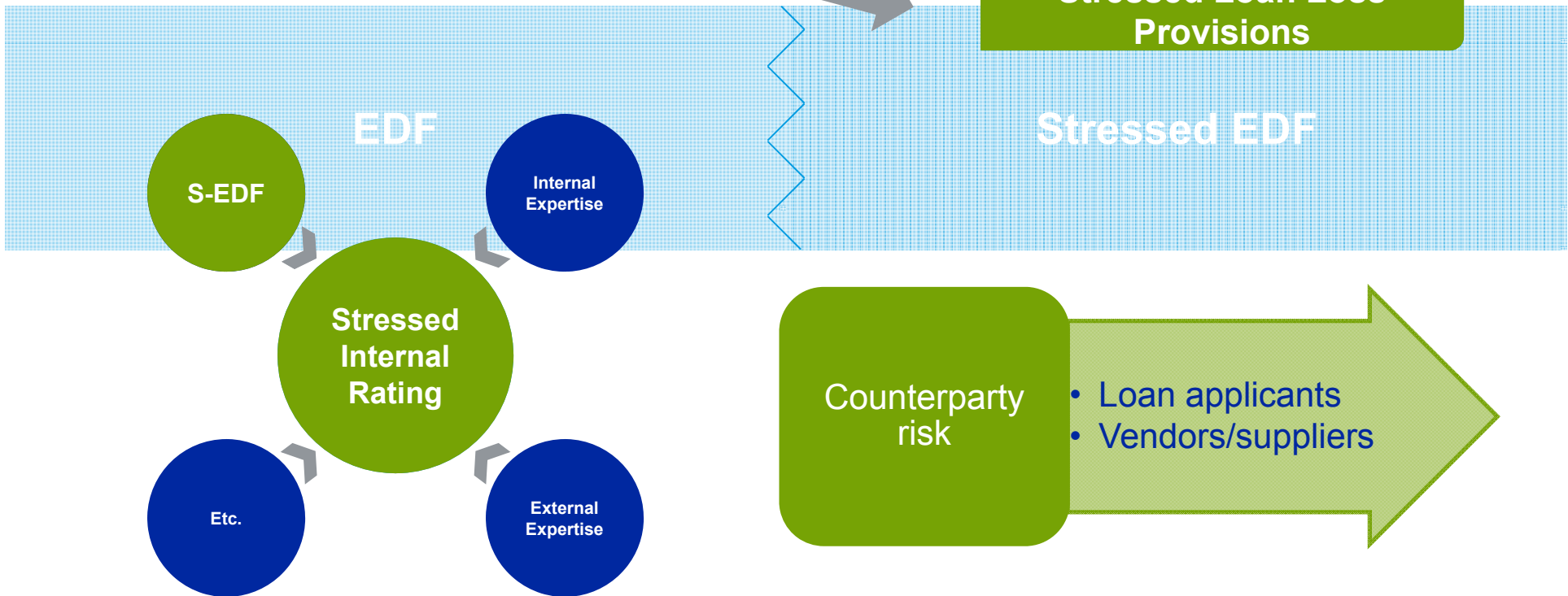
Stressed EDF Applications

$$E[\text{Loss}] = \text{S-EDF} \times \text{LGD} \times \text{EAD}$$

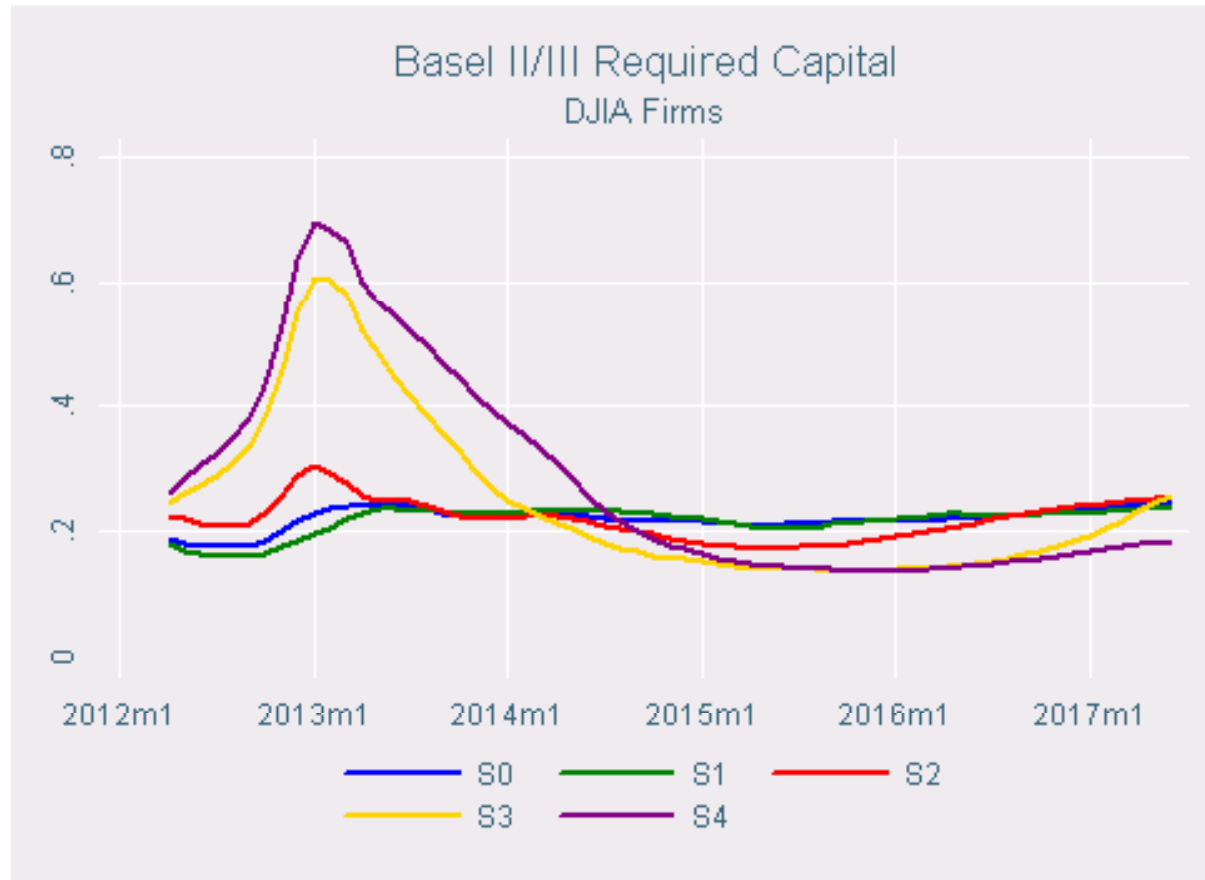
Stressed Economic Capital

Stressed Regulatory Capital

Stressed Loan Loss Provisions



Portfolio Example: Calculating Regulatory Capital



Note: Results shown are as of March 2012 EDF data.

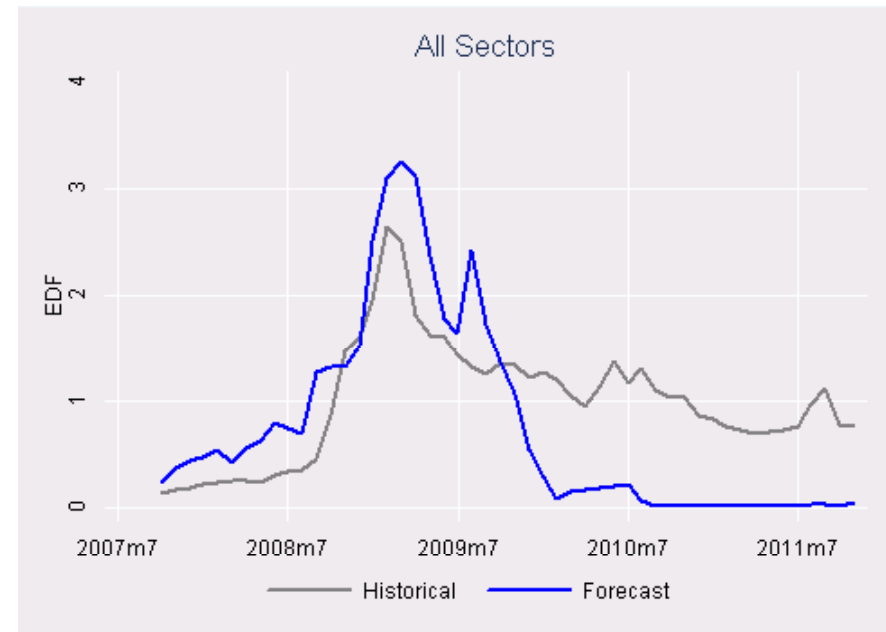
Stressed EDF Validation

Goal Is To Produce Stressful Scenarios

Perfect Foresight Exercise

- » Procedure:
 - Replicate the methodology using only the information available as of September 2007
 - Assume at that time we had perfect foresight with respect to the economic future
 - Compare the stressed EDFs this would have produced with realized EDFs leading up to, during, and after financial the crisis

How Did We Do?



Summary

Summary

- » Stressed EDF measures are conditional, one-year PDs
 - Forward-forward-looking, five-year horizon
 - Moody's Analytics macroeconomic scenarios + Fed scenarios
 - Updated monthly
- » Using the 2008 recession as a benchmark, Stressed EDF measures under the most adverse scenario are sensible
- » Perfect foresight exercise validates the methodology
- » Can be used in place of traditional EDF metrics for stress testing / scenario analysis
 - Regulatory and economic capital
 - Loan loss provisions
 - Inputs into internal rating systems and scorecards
 - Counterparty risk
- » Because they are based on bottoms-up, narrative scenarios, Stressed EDF measures provide intuition, context, and clarity that top-down, statistical stress testing approaches lack

For Stressed EDF-related inquiries, please contact:

Maria.Pieretti@moodys.com

(212) 553-2990

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