MOODY'S ANALYTICS

Be Reasonable:
Creating Supportable Forecast Scenarios for CECL

Cristian deRitis PhD, Senior Director, Head of Consumer Credit Research

CECL requires “reasonable and supportable” forecasts

*“The measurement of expected credit losses is based on relevant information about past events, including **historical experience**, **current conditions**, and **reasonable and supportable forecasts** that affect the collectability of the reported amount. An entity must use judgment in determining the relevant information and estimation methods that are appropriate in its circumstances.”*

*“Amendments **allow** an entity to **revert to historical loss information** that is reflective of the contractual term (considering the effect of prepayments) **for periods that are beyond the time frame for which the entity is able to develop reasonable and supportable forecasts**.”*

Source: Page 3, Financial Instruments—Credit Losses (Topic 326), FASB, No. 2016-13, June 2016

What's "reasonable"? What's "supportable"?

- No definitions in the guidance.
- No technical or statistical definition of "reasonable and supportable" (R&S)

reasonable [rēz(ə)nəb(ə)l] *adjective*

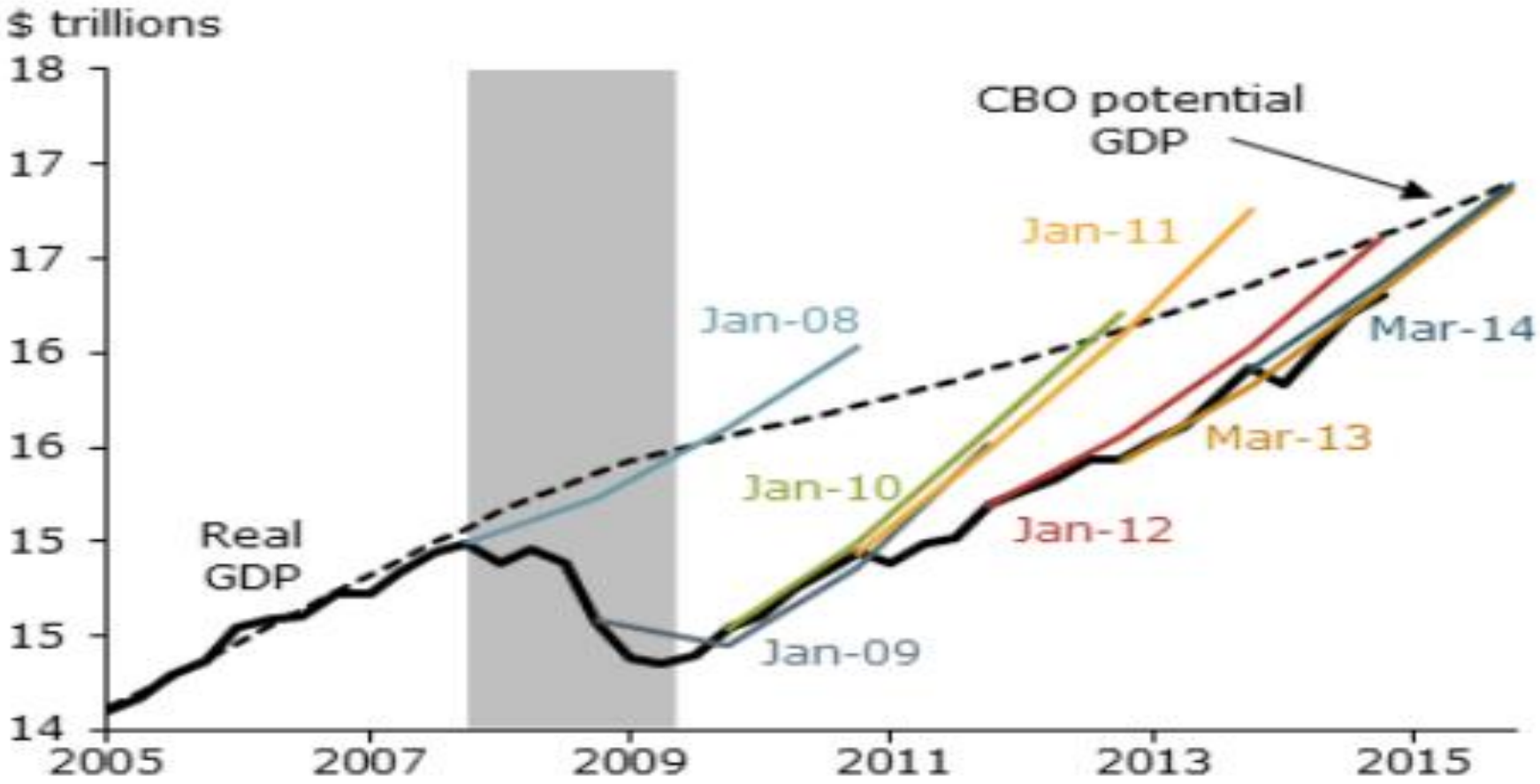
- based on good sense
- *synonyms:* sensible, rational, logical, fair, fair-minded, just

supportable [suh-pawr-tuh-buh l, -pohr-] *adjective*

- capable of being defended with good reasoning against verbal attack
- *synonyms*: defendable, defensible, justifiable, maintainable, tenable

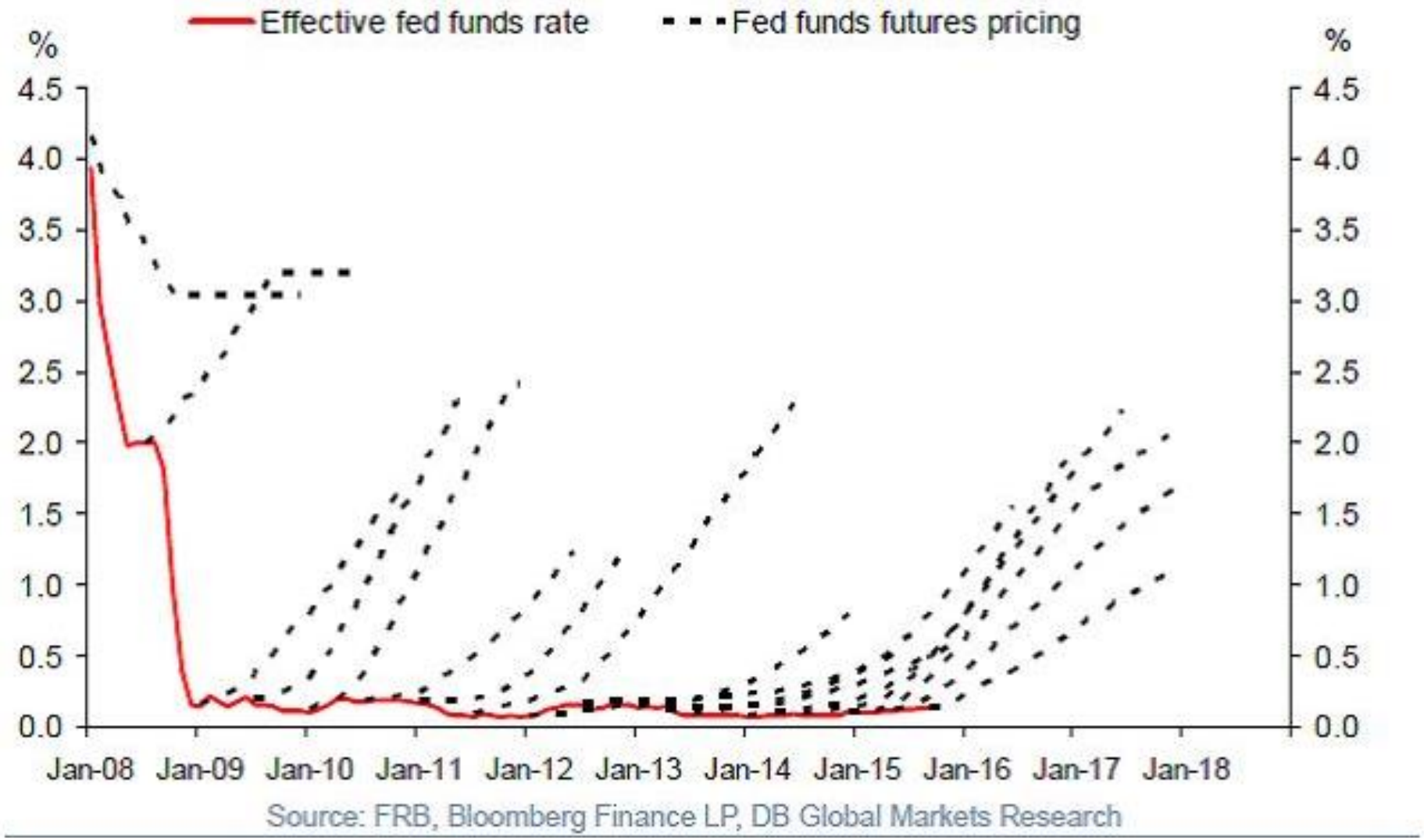
Federal Reserve: R&S but optimistic in retrospect

Real GDP paths implied by Summary of Economic Projects midpoint forecasts



Source: Federal Reserve Open-Market Committee Minutes, BEA, CBO, Moody's Analytics

Market Consensus: R&S but also subject to revision



MarketWatch

Accuracy is desirable but not required

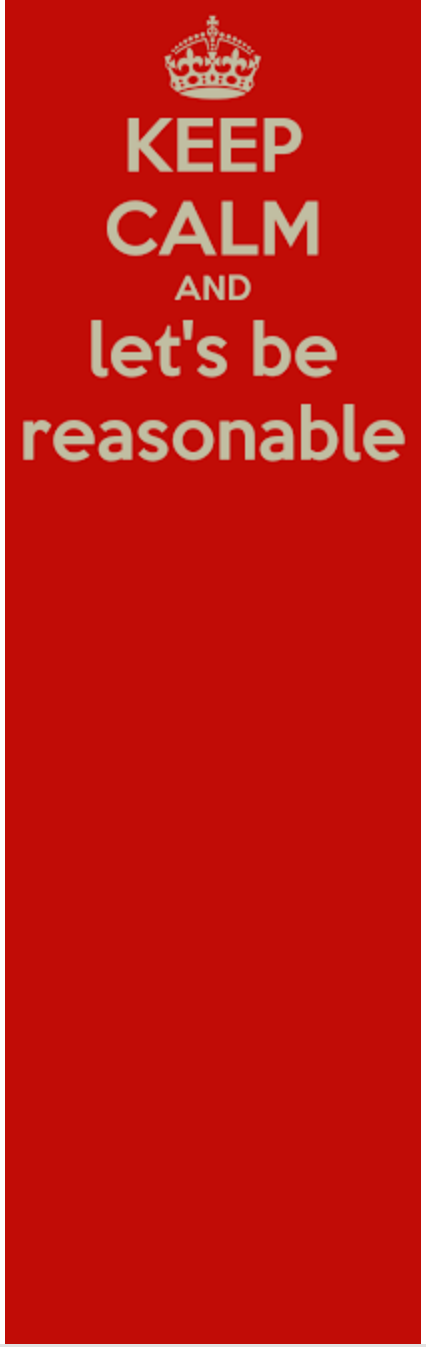
- Accuracy and audit risk
  - FASB does not expect clairvoyance

    *…using **terms such as reasonable and supportable does not imply a single conclusion** or methodology upon which an entity must base its estimate. Different parties using different methodologies do not make a particular estimate unreasonable.… **Estimates of credit losses may not precisely predict actual future events and, therefore, subsequent events may not be indicative of the reasonableness of those estimates**. (BC50)*
- Accuracy and investor relations
  - Want to avoid frequent, large revisions to loss allowance
  - Need to have a clear explanation when revisions do occur
- CECL is a different application from policy-making or trading
  - Federal Reserve needs to decide policy in real-time with limited information
- Setting a reserve is a longer-term process
  - Federal Reserve or other expert-driven forecasts may not be appropriate

What Makes an Economic Forecast Reasonable and Supportable?

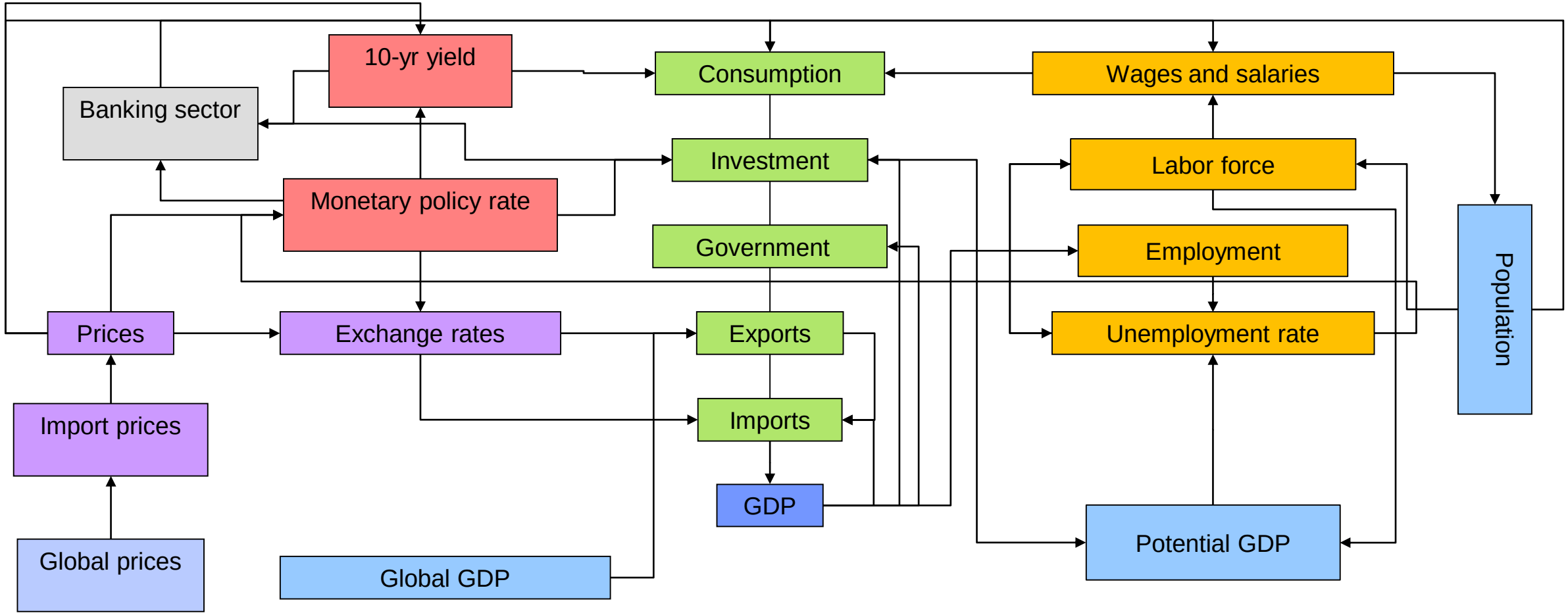
A R&S economic forecast should:

- ☑ **Be theoretically sound, transparent and reproducible**
  - Based on generally accepted economic and statistical theory
- ☑ **Be consistent**
  - Incorporate inter-relationships and feedback effects among variables such that a shock to one factor impacts all other factors over time
- ☑ **Provide broad coverage**
  - Cover a variety of economic indicators
  - Provide information at varying levels of geographic aggregation to capture local economic effects
- ☑ **Quantify uncertainty**
  - Provide alternative scenarios to quantify uncertainty of the forecasts for varying forecast horizons



Structural Forecast Model Methodology

Approach used by Federal Reserve, IMF, Central Banks



Example: 10-Year Treasury Forecast Equation

Information for

FRGT10Y_US

Summary

Scenario: U.S. Macro Baseline [C...

Title	Interest Rates: 10-Year Constant Maturity Securities
Code	FRGT10Y_US
Units	% p.a., NSA
Dependent Variable	FRGT10Y_US
Estimation	LS
Sample	1978Q4 to 2016Q1
Add Factor Type	Residual Shift
Historical	IRGT10YD.IUSA

Specification

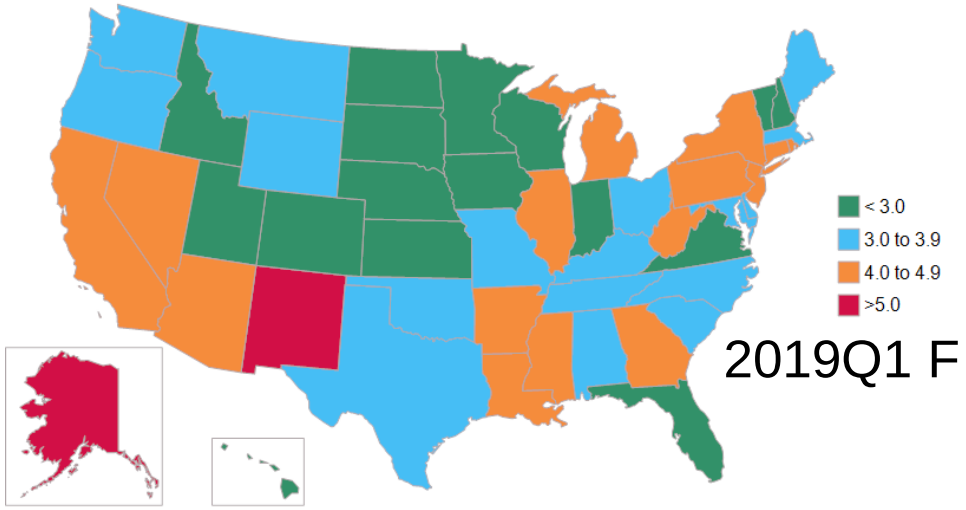
	Coefficient	Std. Error	t-Statistic
FRGT10Y_US(-1)	0.8205226657	0.0300129370	27.338966
FRFED_US	0.1592807393	0.0250811886	6.350605684
FSPVOL_US	-0.0960001261	0.0756213260	-1.269484829
100*(FGTSOPTQ_US(-1)/FGDP_US(-1))	0.0106221149	0.0032119966	3.30701306
@MOVAV(100*(FXMRXQ_US(-1)/FGDP_US(-1)),4)	-0.0242458038	0.0157929954	-1.535225153

Summary Statistics

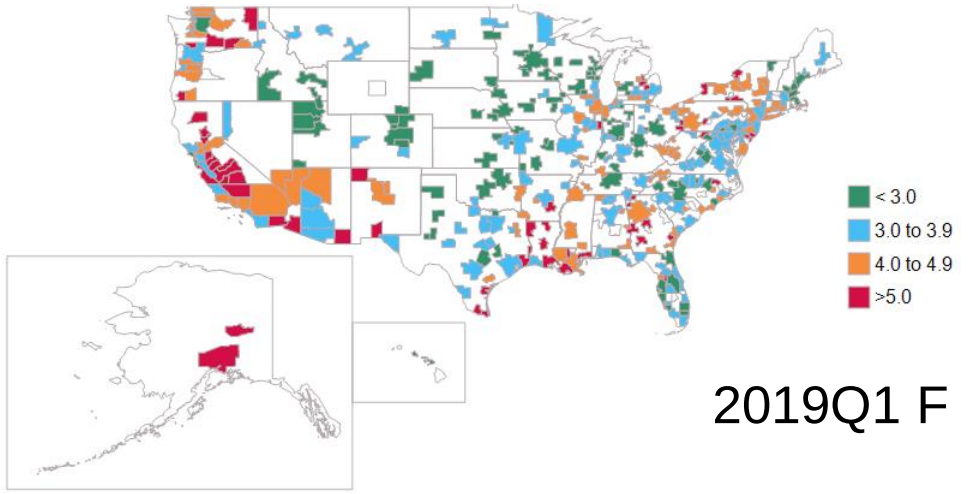
R-squared 0.9786676043

Integrated National, State and Metro-level Forecasts

State



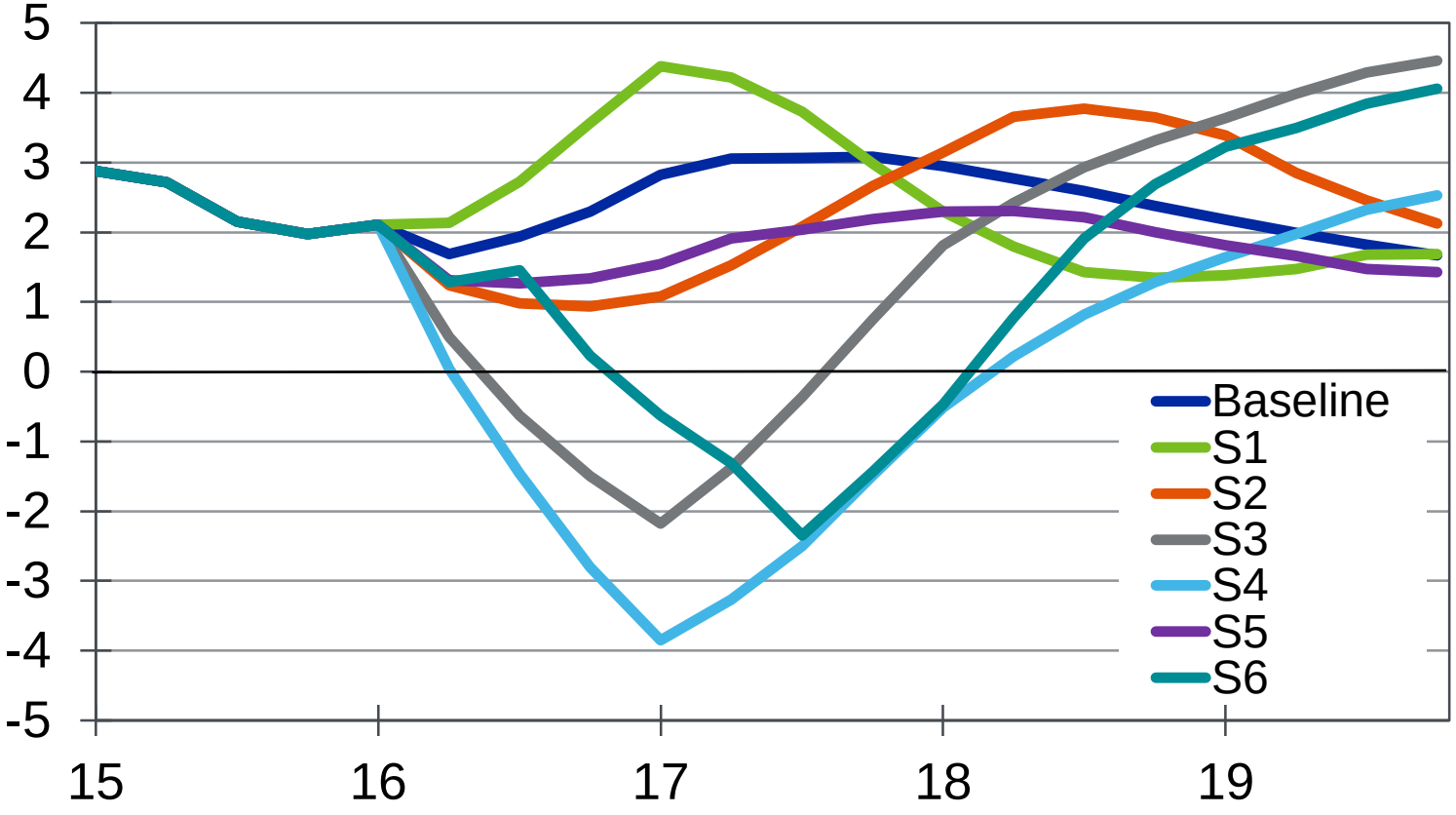
Metro



Scenarios Covering A Range of Outcomes

Monthly updates with narratives and probability weights

Real GDP, % change yr ago



Source: Moody's Analytics

Scenario Inventory

BAU/CECL-Driven

BL Baseline Forecast (50th pctile)
CB Consensus Baseline
S0 Strong Upside (4th pctile)
S1 Stronger Near-Term Rebound (10th pctile)
S2 Slower Near-Term Recovery (75th pctile)
S3 Moderate Recession (90th pctile)
S4 Protracted Slump (96th pctile)
S5 Below-Trend Long-Term Growth
S6 Stagflation
S7 Next-Cycle Recession
S8 Low Oil Price
CS Constant Severity
CB Consensus Baseline

Compliance-Driven

FB Fed Baseline
FA Fed Adverse
FS Severely Adverse Scenario

BC Bank-Specific Scenario

Should We Use Customized or Standard, Off-the-Shelf Scenarios?

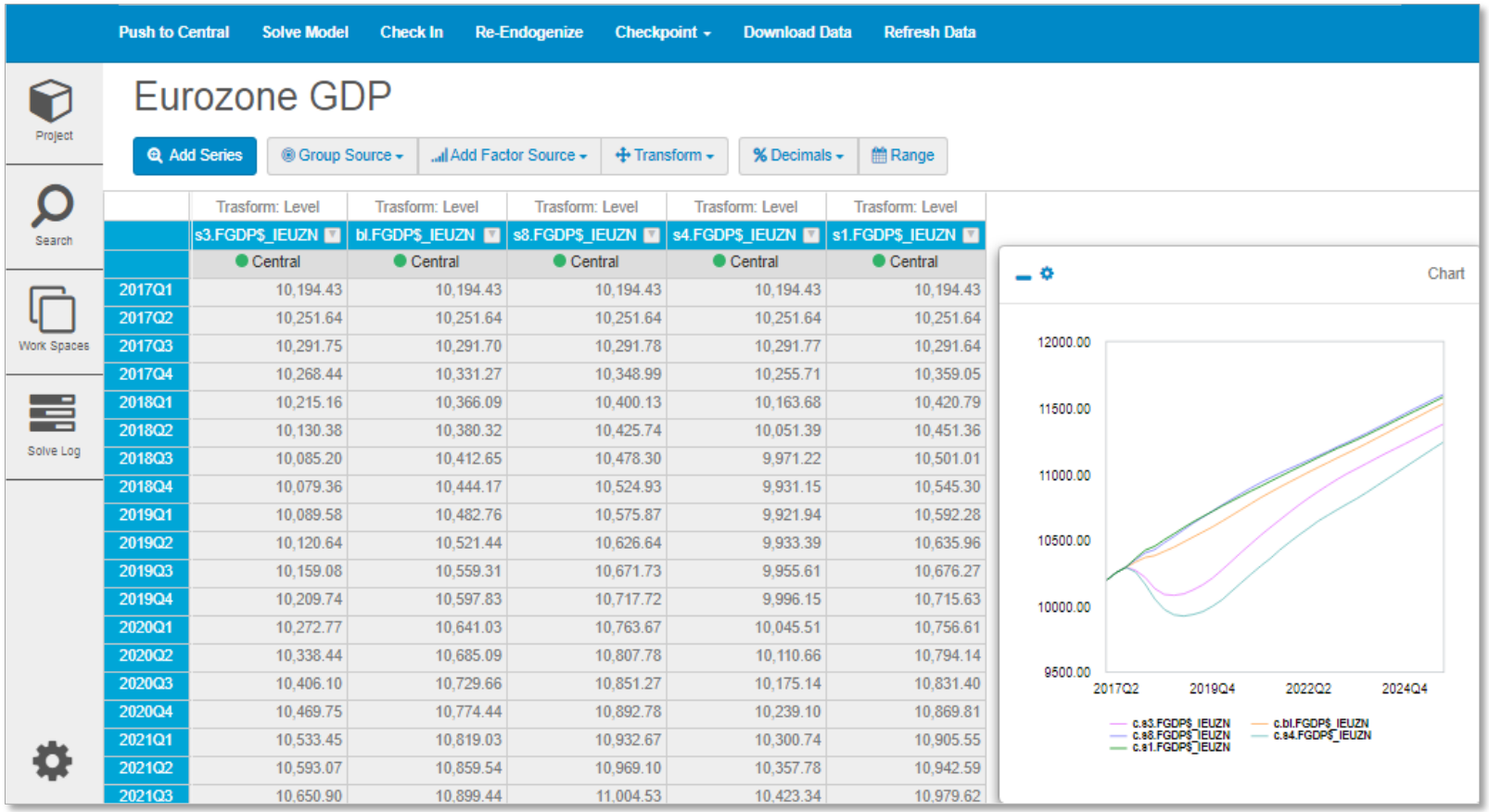
- **No specific recommendations** in the guidance.

- Our IFRS 9 experience revealed a **mix of approaches**
  - Small to mid-size banks opted to use **multiple, standard scenarios**
  - Larger institutions used **custom and standard scenarios** to test sensitivity

- **Transparency and applicability of scenarios is critical**
  - Need to understand the scenarios and defend choices to auditors and regulators

How Can We Confidently Create Our Own Scenarios?

Moody's Analytics Scenario Studio



	Trasform: Level	Trasform: Level	Trasform: Level	Trasform: Level	Trasform: Level
	s3.FGDP$_IEUZN	bl.FGDP$_IEUZN	s8.FGDP$_IEUZN	s4.FGDP$_IEUZN	s1.FGDP$_IEUZN
	Central	Central	Central	Central	Central
2017Q1	10,194.43	10,194.43	10,194.43	10,194.43	10,194.43
2017Q2	10,251.64	10,251.64	10,251.64	10,251.64	10,251.64
2017Q3	10,291.75	10,291.70	10,291.78	10,291.77	10,291.64
2017Q4	10,268.44	10,331.27	10,348.99	10,255.71	10,359.05
2018Q1	10,215.16	10,366.09	10,400.13	10,163.68	10,420.79
2018Q2	10,130.38	10,380.32	10,425.74	10,051.39	10,451.36
2018Q3	10,085.20	10,412.65	10,478.30	9,971.22	10,501.01
2018Q4	10,079.36	10,444.17	10,524.93	9,931.15	10,545.30
2019Q1	10,089.58	10,482.76	10,575.87	9,921.94	10,592.28
2019Q2	10,120.64	10,521.44	10,626.64	9,933.39	10,635.96
2019Q3	10,159.08	10,559.31	10,671.73	9,955.61	10,676.27
2019Q4	10,209.74	10,597.83	10,717.72	9,996.15	10,715.63
2020Q1	10,272.77	10,641.03	10,763.67	10,045.51	10,756.61
2020Q2	10,338.44	10,685.09	10,807.78	10,110.66	10,794.14
2020Q3	10,406.10	10,729.66	10,851.27	10,175.14	10,831.40
2020Q4	10,469.75	10,774.44	10,892.78	10,239.10	10,869.81
2021Q1	10,533.45	10,819.03	10,932.67	10,300.74	10,905.55
2021Q2	10,593.07	10,859.54	10,969.10	10,357.78	10,942.59
2021Q3	10,650.90	10,899.44	11,004.53	10,423.34	10,979.62

- Web-based application to develop scenarios
- Uses Moody's Analytics macro models
- Collaborate with colleagues or Moody's Analytics economists on the same forecast
  - Simultaneous read/write access
- Forecast governance built into the application
  - Audit trail of edits to assumptions
  - Test edits in a sandbox environment before committing them to the "official" forecast
  - Transparency of equations and assumptions

How Many Scenarios Do We Need for CECL?

- **No specific guidance**

- Could use IFRS9 experience as a guide
  - **IFRS9 requires multiple, probability-weighted scenarios**

- Measuring losses under **multiple scenarios is a best practice**
  - “Average” economic forecast won’t generate the “average” level of losses
  - Multiple scenarios approximate the loss distribution

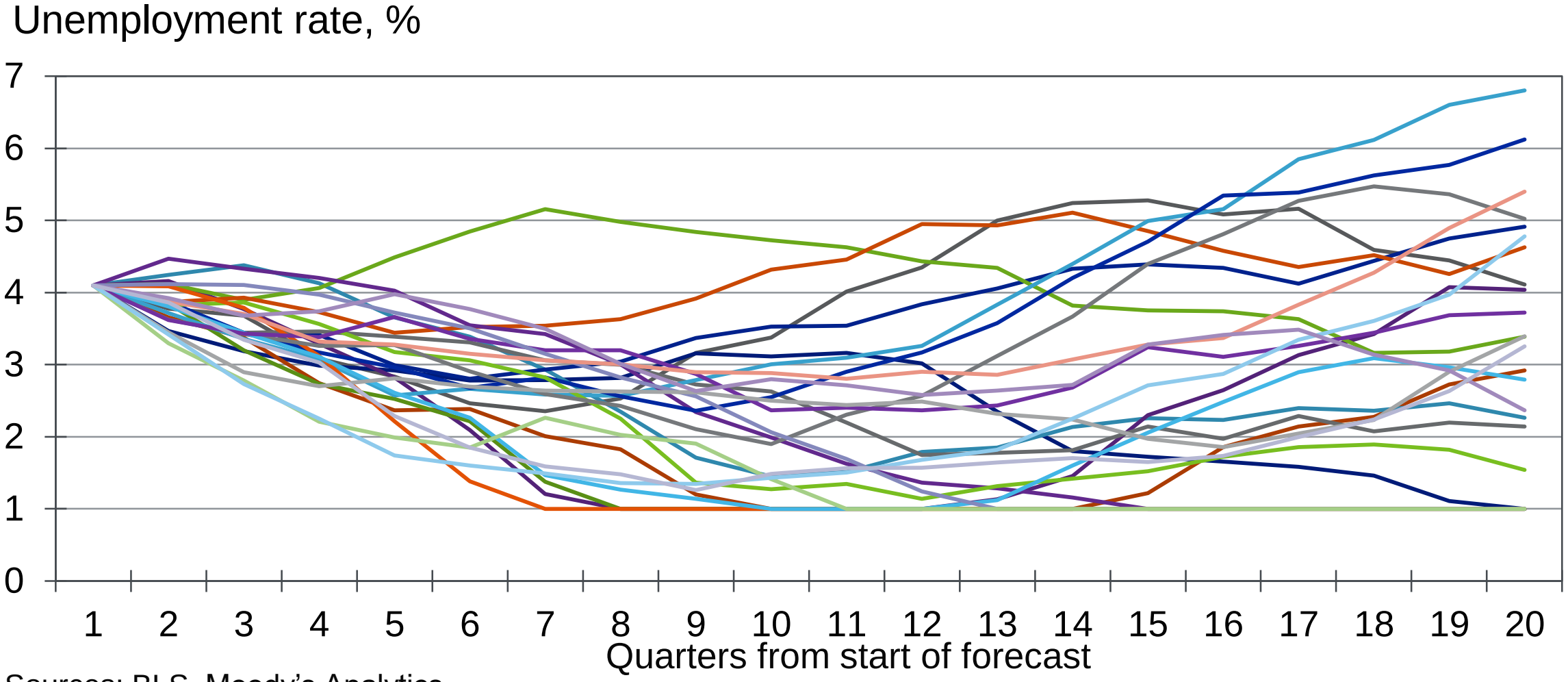
Consider an experiment…

Given no constraints, how would we forecast credit losses?

- Suppose we run a hot new FinTech that is offering consumers 5 year personal loans
- We want to estimate credit losses in order to set interest rates on our loans
  - Need to charge enough to cover: Expected Loss + ρStress Loss + Servicing/Admin Cost
- Suppose there are no recoveries in the event of a default
- Assume default is a function of the unemployment rate (+) and GDP growth (-)
- Generate a distribution of potential losses

1. Simulate 1000 paths of unemployment and GDP
2. Compute Probability of Default under each path to generate a distribution
3. Compare distribution results to losses under specific economic scenarios

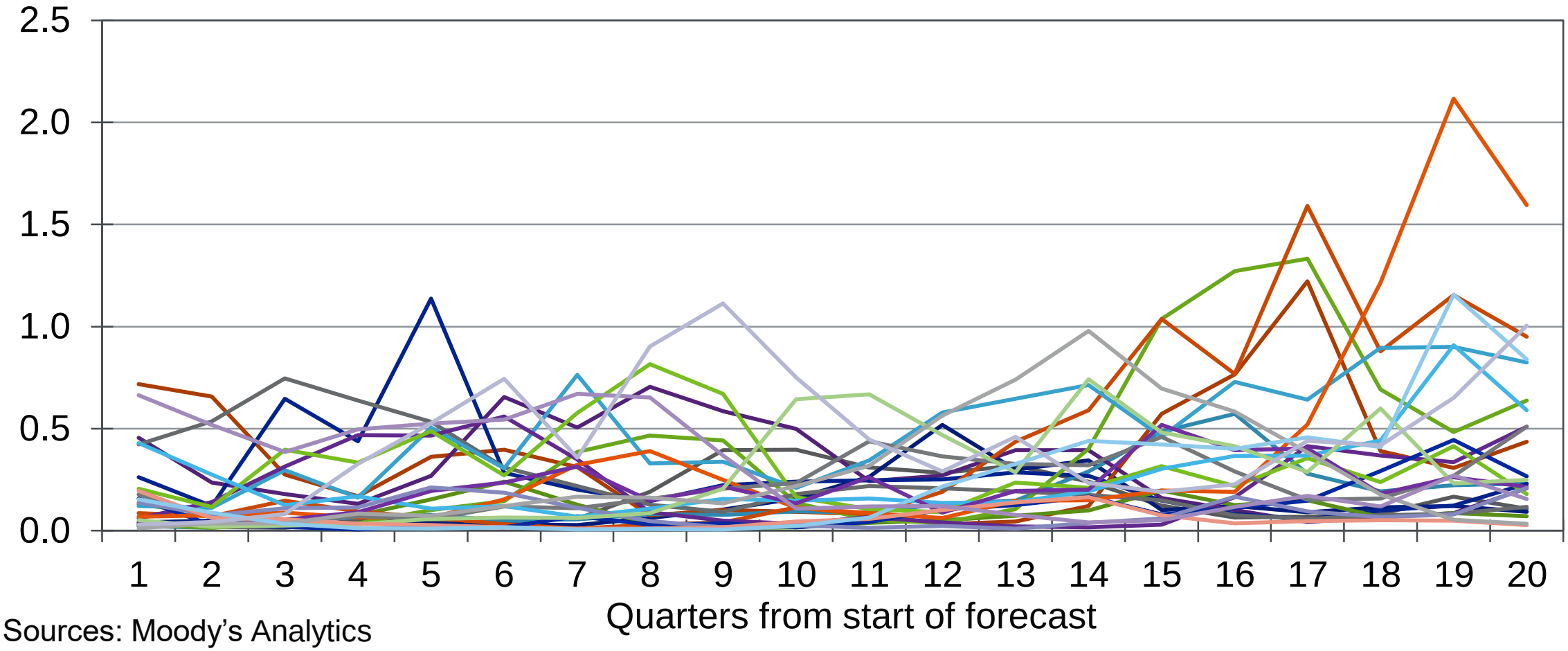
Unemployment Rate Simulations (25 out of 1000)



Sources: BLS, Moody's Analytics

Estimated Prob of Default Simulations (25 out of 1000)

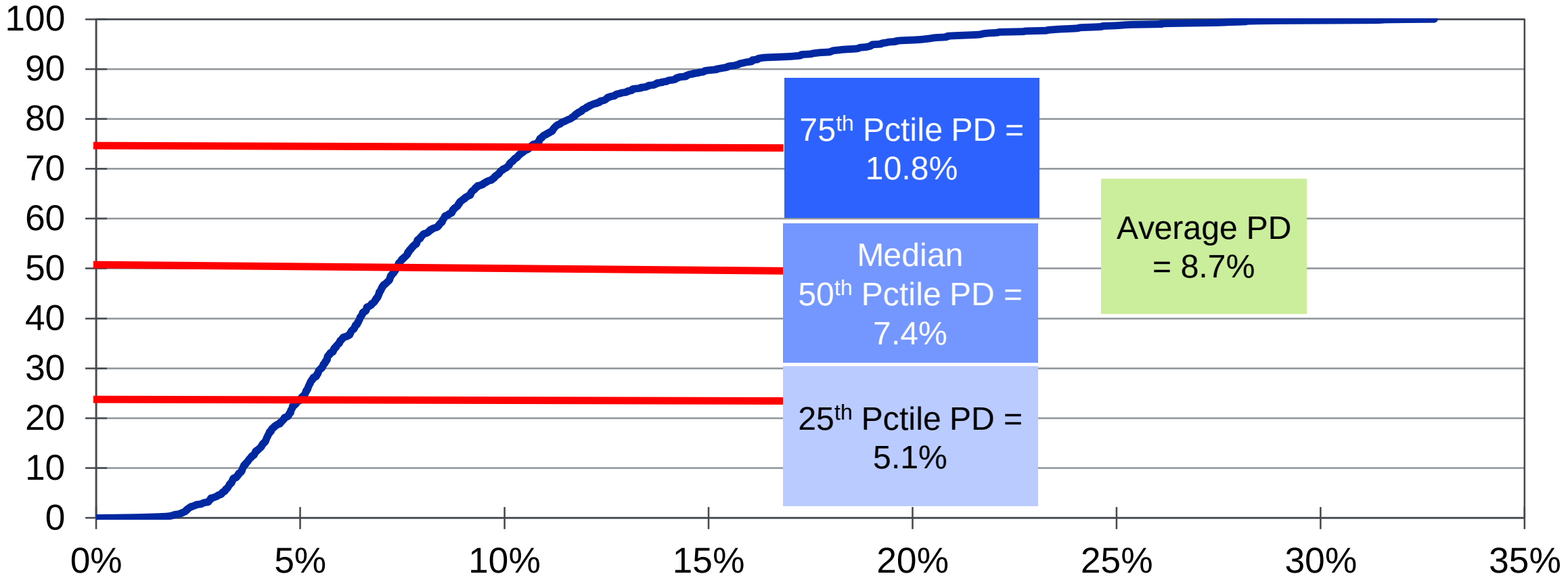
Quarterly conditional probability of default, %



Sources: Moody's Analytics

Estimated Cumulative Probability of Default Across Paths

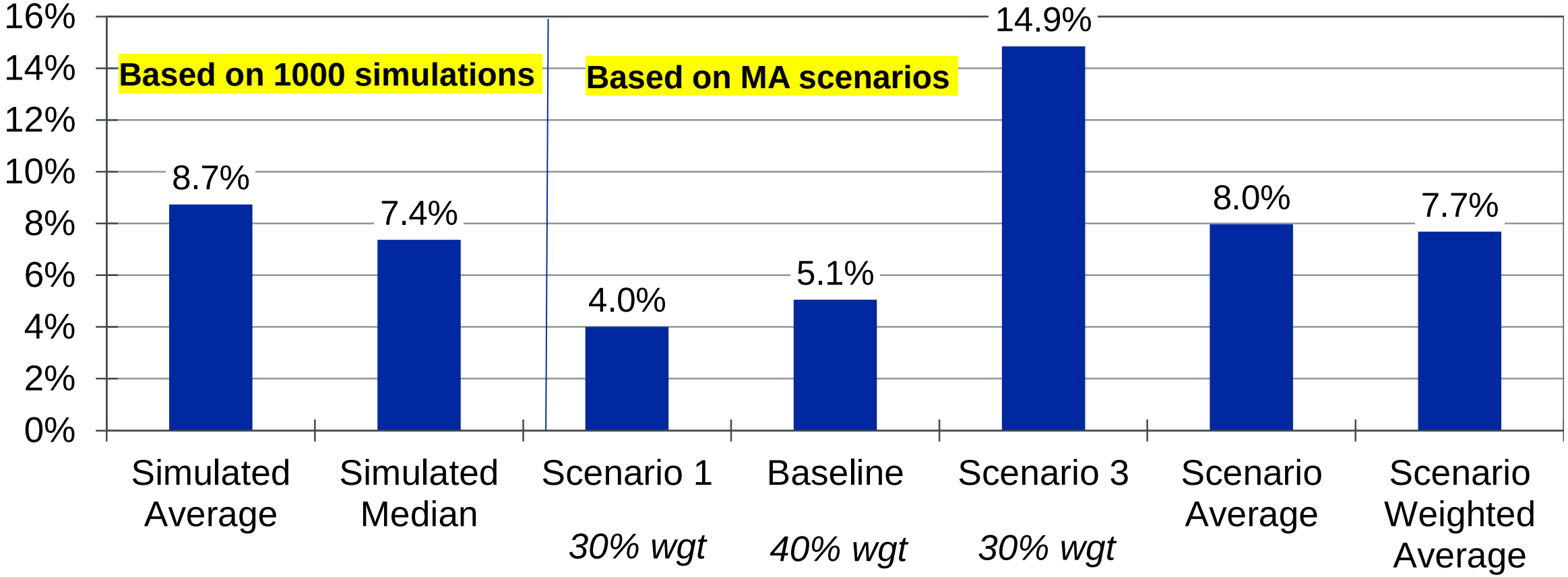
Probability of Default (x-axis) vs. cumulative percent of population (y-axis)



Source: Moody's Analytics

Comparing Cumulative Probability of Default

Probability of Default under different scenarios/simulations



Source: Moody's Analytics

Why Might You Want to Run More Than One Scenario?

- **Credit losses are nonlinear**:
  - Scenario 1 (4.0% Loss) < Baseline (5.1% Loss) << S3 (14.9% Loss)

- According to **Jensen's Inequality** and our experiment:
  - PD in an average economy < Average PD across all economies

- Loss estimates under **single scenarios can be more volatile** than probability weighted estimates

- If you do run just one scenario, Baseline or Consensus **may understate losses**. Either:
  - Make an on-the-top qualitative adjustment
  - Select a more downside scenario such as Scenario 2 to approximate the nonlinearity

What's the Appropriate Forecast Horizon for CECL?

Depends on BOTH the credit loss models and the economic scenario inputs

Credit Loss Estimates

- Is the length of observed historical performance sufficient to project losses?
- Is observed history of performance relevant for the future time horizon?
- Is the methodology used reasonable and supportable over the time horizon?

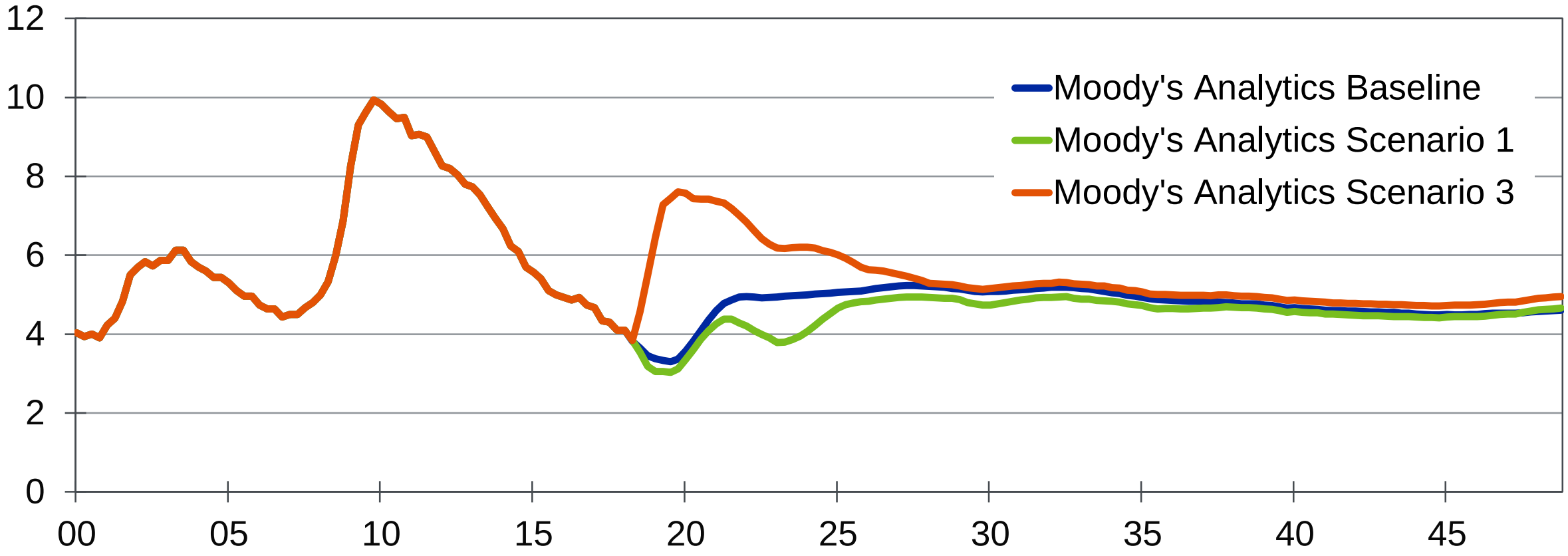
Economic Forecasts/Scenarios

- Are forecasts for forward-looking drivers econometrically determined?
- Are data with limited history being extrapolated?
- Are economic cycles being forecasted in a reasonable fashion?

Moody's Analytics scenarios revert to historical trends in the long-run.

Unemployment Rate Scenario Reversion

Unemployment rate, %



Sources: BLS, Moody's Analytics

How should we handle mean reversion after the forecast horizon to estimate life time losses?

- Guidance directs institutions to "***revert to historical loss information***" after reasonable and supportable forecast period.

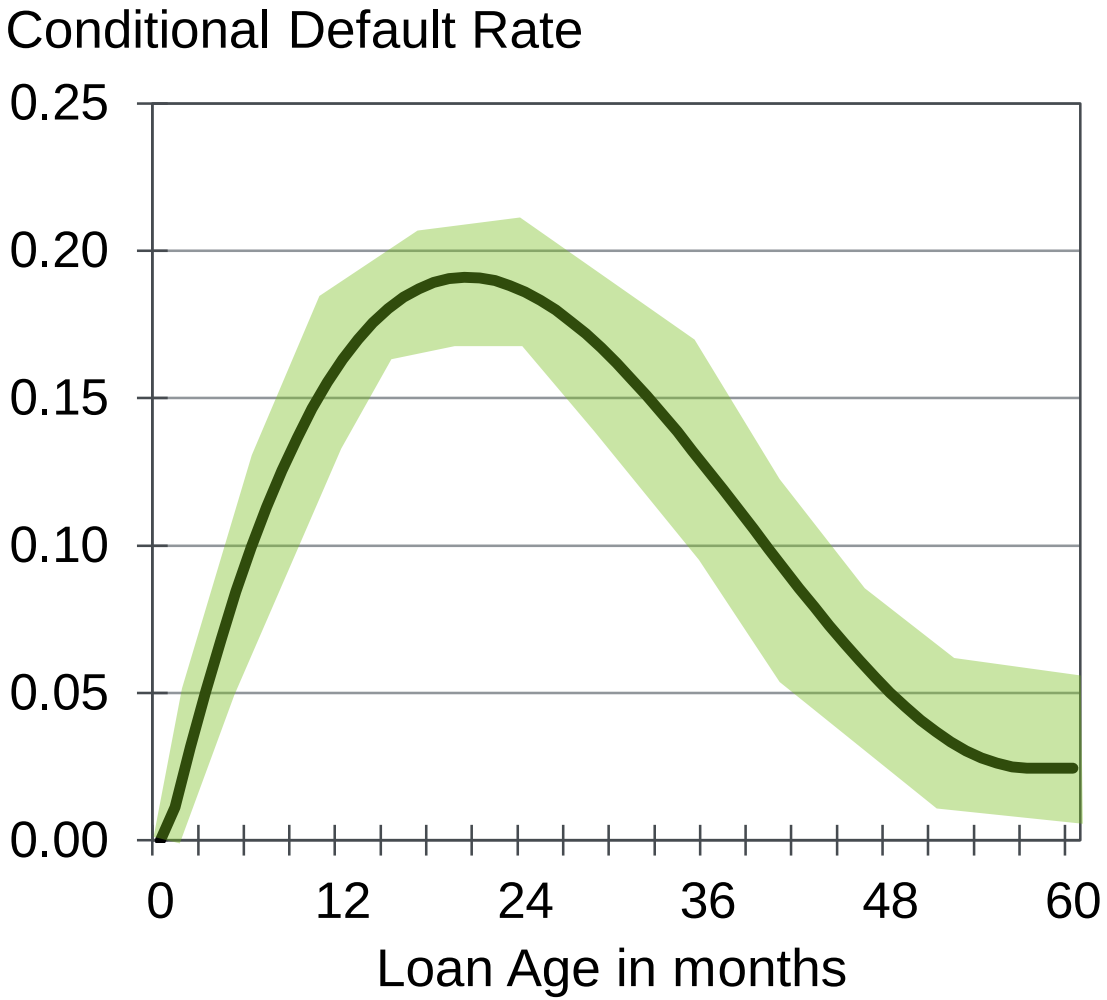
- What is this directive addressing?
  - Forecast uncertainty. This can be addressed in several ways including multiple scenarios.

- **Options**
  - **Option 1:** No need to revert **externally** if the loss forecasting model extrapolates to long term trends
  - **Option 2**: Revert to historical loss rates **immediately** after the determined forecast horizon
  - **Option 3**: Revert to historical loss rates **gradually** after the determined forecast horizon

- How should "historical loss information" be defined? Over which time period? Controlling for credit quality? Product? Age? Etc.
  - May be easier and more efficient to incorporate controls in the ECL model than through an external reversion process.

A Reasonable and Supportable Forecast Horizon

- **Lenders have needed to project lifetime losses** before CECL
- **Many econometric techniques**
  - Account-level survival analysis such as discrete-time hazards with competing risks
  - Vintage-level i.e. “loss curves”
- Well-specified models **project the full lifecycle**
  - May **extrapolate where data are thin** in an unbiased fashion
  - **Confidence intervals widen but forecasts remain “reasonable and supportable”**



Topic 326's Comments on Reversion

*…**for periods beyond which the entity is able to make or obtain reasonable and supportable forecasts of expected credit losses, an entity shall revert to historical loss information** …An entity shall not adjust historical loss information for existing economic conditions or expectations of future economic conditions for periods that are beyond the reasonable and supportable period. **An entity may revert to historical loss information at the input level or based on the entire estimate**. **An entity may revert to historical loss information immediately, on a straight-line basis, or using another rational and systematic basis** (326-20-30-9)*

*…**some entities will use this reversion technique, while others may have the systems and processes in place to forecast over the estimated life of the financial asset on a reasonable and supportable basis**. (BC53)*

For More Information…

www.moodysanalytics.com/cecl

MOODY'S ANALYTICS

United States
121 North Walnut Street
Suite 500
West Chester PA 19380
+1.610.235.5299

United Kingdom
One Canada Square
Canary Wharf
London E14 5FA
+44.20.7772.5454

Australia
Level 10
1 O'Connell Street
Sydney, NSW, 2000
Australia, +61.2.9270.8111

Prague
Washingtonova 17
110 00 Prague 1
Czech Republic
+420.22.422.2929

moodysanalytics.com