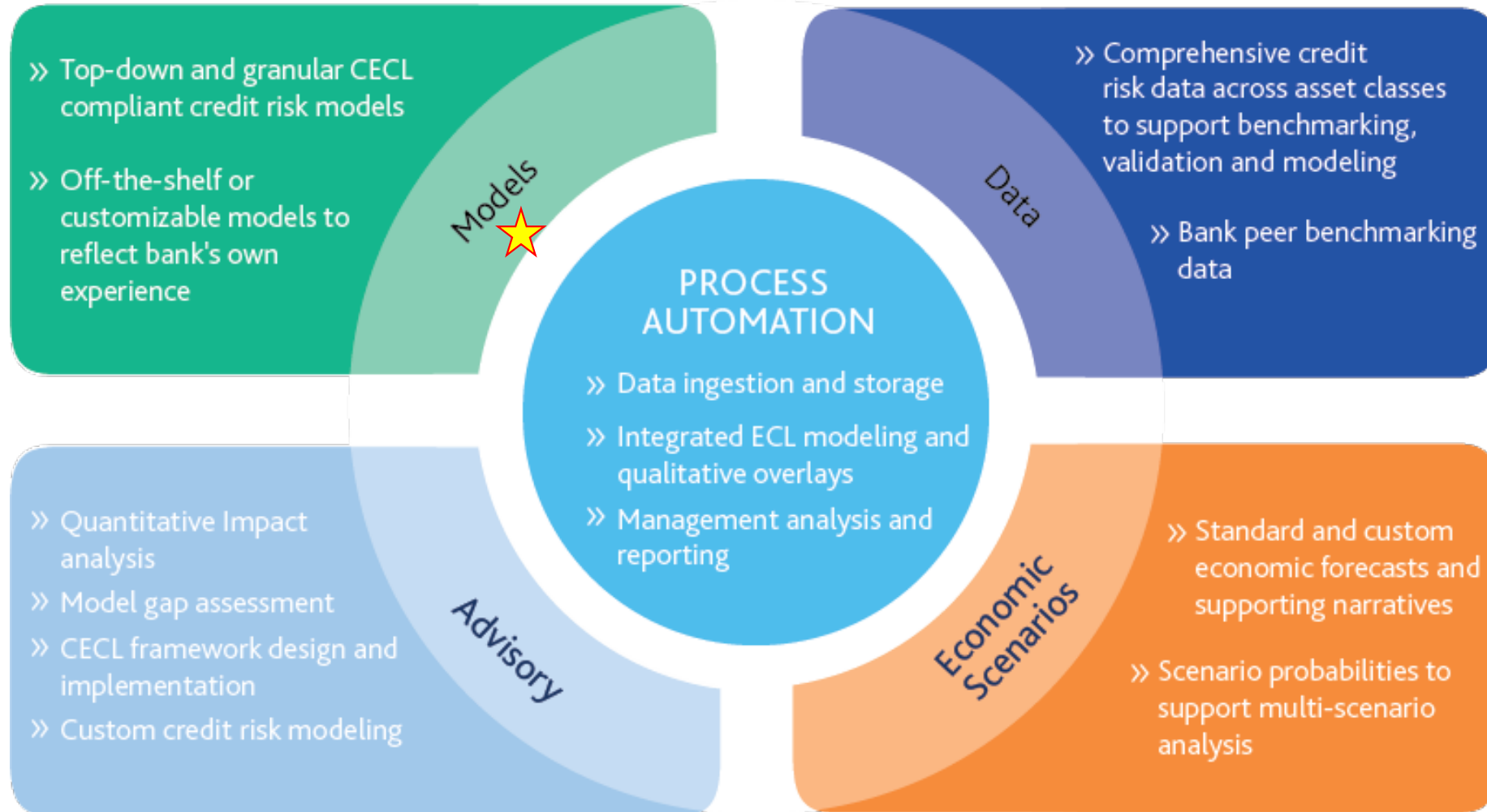


# CECL Impact Analysis for Consumer Lending Portfolios

**Deniz Tudor, PhD, Director, Consumer Credit Analytics**  
**Tim Daigle, Economist, Consumer Credit Analytics**  
**Timothy Daly, Senior Director, Moderator**

**MAY 2018**

# Moody's Analytics CECL Solution Suite



# Presenters



## **Deniz Tudor**

Director, Consumer Credit Analytics

Deniz Tudor is a Director with Moody's Analytics. Deniz specializes in U.S. consumer credit trends and leads the development of custom and industry-based econometric credit loss models for clients.



## **Tim Daigle**

Economist, Consumer Credit Analytics

Tim Daigle is an Economist specializing in the development of consumer credit models for stress-testing and CECL.

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## Moderator



## **Timothy Daly**

Senior Director, Business Development

Tim Daly is a Senior Director who manages the sales team for the Economics & Consumer Credit Analytics group at Moody's Analytics. Tim is focused on helping institutions meet their regulatory, accounting and risk management needs.

# Agenda

1. CECL Introduction
2. Solutions for CECL Challenges for Consumer Portfolios
3. Case Studies: Industry Impact Analysis for Mortgage & Auto
4. Bank/Credit Union Specific Analysis

1

CECL Introduction

# CECL in a



## What's it all about?

- » The CECL standard will change how firms estimate their allowance for loan and lease losses.
- » Replaces the current “incurred loss” standards—commonly known as FAS-5 and FAS-114.
- » Addresses “too little too late” loss provisioning that occurred during the financial crisis.
- » Applies to any entity issuing credit (banks, credit unions and holding companies).
- » CECL in effect starting December 15, 2019, for public business entities that are U.S. SEC filers.



# Biggest Change: Forecasting Losses

- » CECL is a **lifetime loss estimate**.
  - Forecast losses over a *reasonable and supportable* horizon
  - Extrapolate beyond this horizon using historical averages over the remaining life
- » CECL standards are **principles-based**.
  - Not prescriptive in how institutions address specific modeling challenges
  - Flexibility to account for firms of different size and complexity
- » Require increased **transparency** in assumptions and more **disclosures** to support the allowance estimate.
- » Selection of forecasts and assumptions will need **quantitative** support.
- » Under CECL standard, we need to estimate and account for the potential losses from **all loans**.

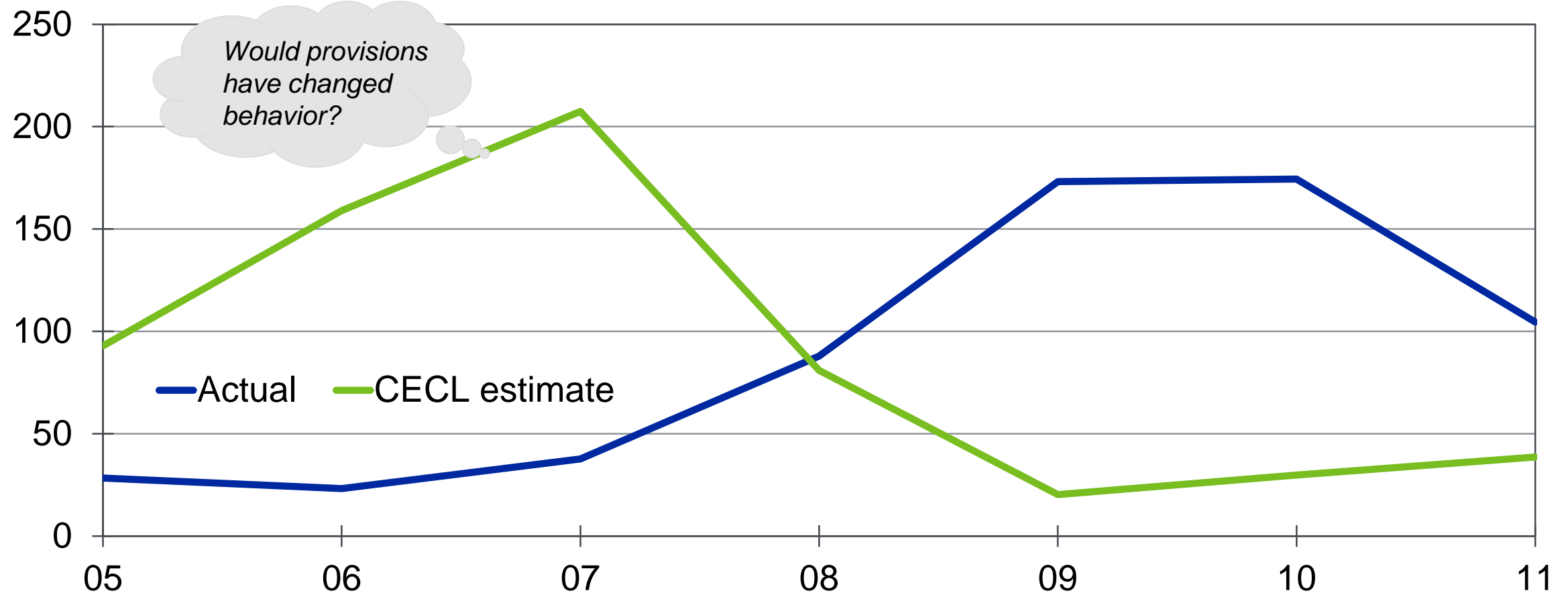
# How Will CECL Impact a Bank's Loss Allowance?

- » Depends on a number of factors including
  - Portfolio composition (longer-dated loans impacted more)
  - Credit quality
  - Geography
  - Scenario assumptions
  - Stage of economic cycle
  
- » As an exercise, consider using industry performance forecasts
  - Use residential mortgage and auto vintage performance to calculate lifetime loss performance for CECL
  - Caution: Lender-specific results will vary!



# Provision Expenses Front-Load With CECL

Provision for loan and lease losses at commercial banks, \$ bil



# 2

## Solutions for Solving CECL Challenges

# Solutions for Consumer Credit Portfolios

## CreditForecast.com

Industry performance forecasts based on Equifax Consumer Credit data

- » Leverages extensive historical data covering most recent business cycle and all segments of consumer credit asset classes (First Mortgage, Home Equity, Auto, Student, etc.)
- » Aggregated cohort data on 220 million consumer records each month
  - Segmentations include Risk Score, Origination Date, Geography, Loan term cohorts

## Expected Consumer Credit Losses (ECCL) Service

ECCL provides industry forecasts of Expected Credit Loss (ECL) under reasonable and supportable macroeconomic scenarios

- » Computes lifetime ECL values for user inputted portfolio footprint
- » Easy to use interface for sensitivity analysis (for both CECL and DFAST)

# Solution: CreditForecast.com

Exclusive forecasts of household finances based on data from Equifax

- » Joint product offering from Equifax and Moody's Analytics combining credit and economic data
- » Monthly updated historical/quarterly updated forecast consumer credit data
- » Detailed analysis/research covering each product line published quarterly

## Volume (# and \$)

- Total outstanding volume
- New Originations
- High credit/Utilization rate
- Scheduled monthly payments
- Trades with >\$0 balance (for revolving accounts)

## Active Statuses (# and \$)

Mutually exclusive non-terminal status buckets:

- Current
- 30-59 DPD
- 60-89 DPD
- 90-119 DPD
- 120+ DPD
- Foreclosure Started

## Final Dispositions (# and \$)

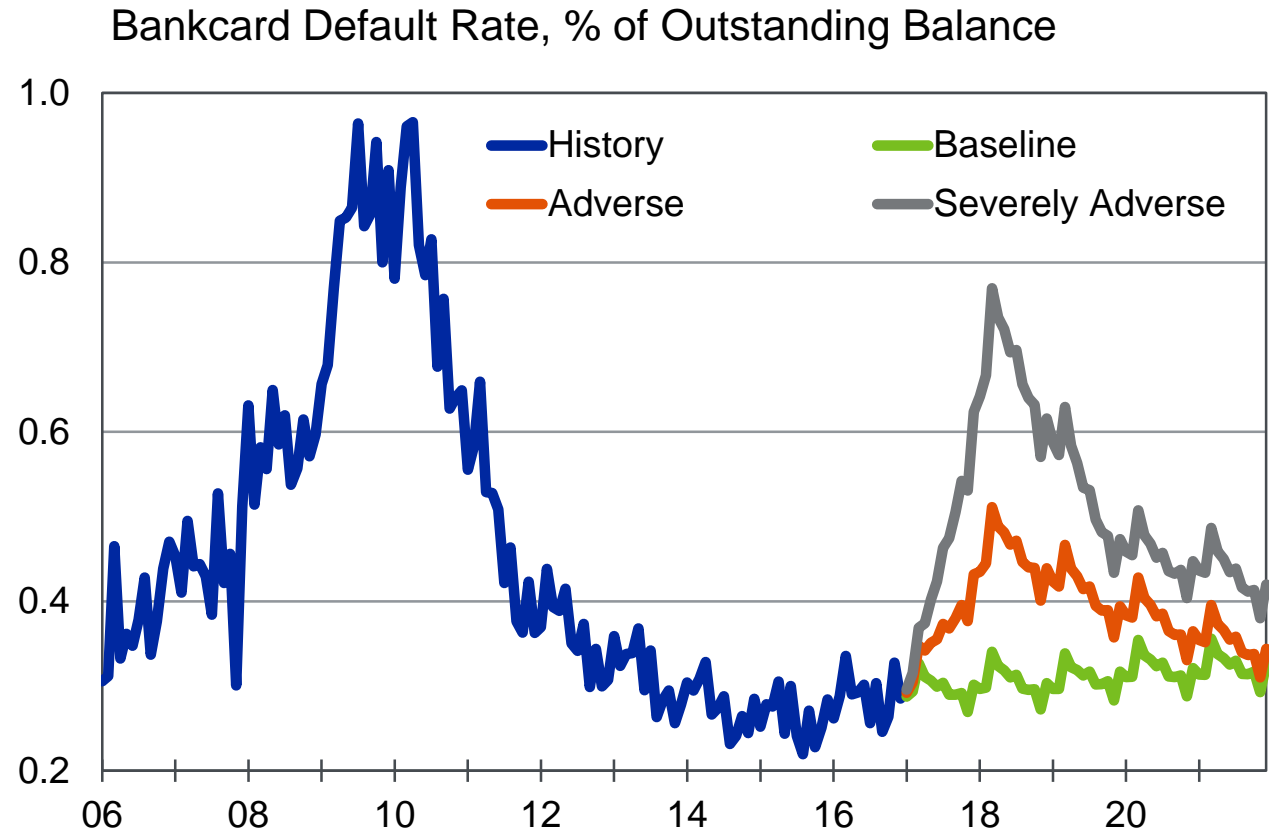
Mutually exclusive terminal statuses:

- Default
- Bankruptcy
- Closed positive (Prepayment)

# CreditForecast.com

## Probability of Default (PD) Model Methodology

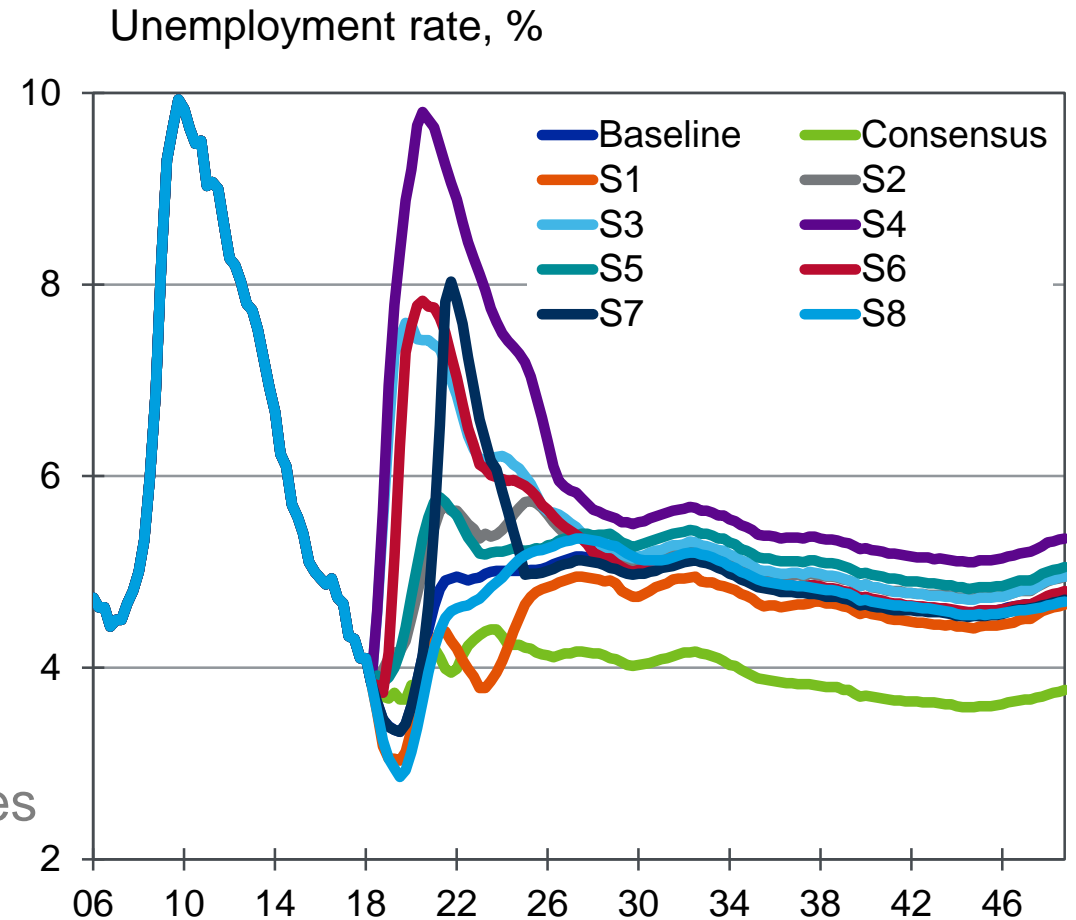
- » Cohort/Vintage Pooled time series
- » Fractional logit models of default rates
- » Primary Model Drivers
  - Life Cycle/Maturation Component
  - Vintage Quality Variables
  - Time-Varying Macro Conditions
  - Seasonality Dummies
  - Delinquency Roll Rates/Daisy Chain
  - Segment x Macro factor interactions



# CreditForecast.com Models Consider Future Conditions

Include both national and regional forecast economic factors:

- » Economic Performance  
GDP Growth, Disposable Income Growth
- » Labor Markets  
Unemployment, Job/Wage/Salary Growth
- » Demographics  
Population, Number of Households, Migrations etc.
- » Real Estate Markets  
Home Prices, Home Sales, Housing Starts, Permits
- » Financial Markets  
Federal Reserve Interest Rates, Equity Mark Indexes



# CECL Loss Forecasting Methods

Moody's Analytics supports all acceptable CECL methodologies

## Primary Methodologies

- » Loss rate method (Pool/cohort/vintage, loan level analysis)
- » Probability of default method (PD & LGD) (Pool/cohort/vintage, loan level analysis)
- » Discounted cash flow analysis (loan level analysis)
- » Roll rate method (Migration analysis/Transition Matrices) (loan level analysis)



# Solution: Expected Consumer Credit Losses (ECCL)

Industry forecasts of Expected Credit Loss under reasonable and supportable scenarios

## Input Requirements

- » Product Category
- » Exposure Footprint
  - Geography × Origination Date × Origination Risk Score Cohorts
- » Key Inputs
  - Expected Lifetime
  - Loss Given Default
  - Scenario/Probability Weighted Scenarios
  - Discount Rate

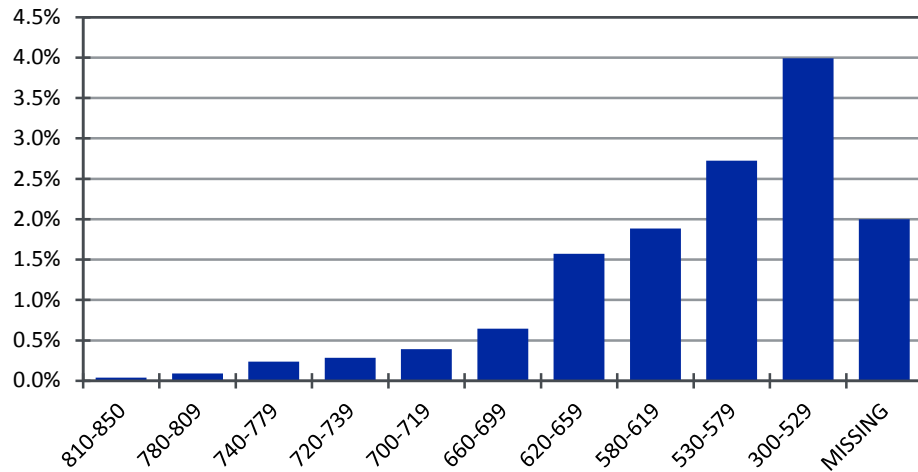
# Solution: Expected Consumer Credit Losses (ECCL)

Industry forecasts of Expected Credit Loss under reasonable and supportable scenarios

## Output

Summary of ECL projections at the most granular level as well as aggregated segments based on input assumptions and client footprint

ECL Rate: Orig. Risk Score Cohorts



Geography	Risk Score	Vintage	Assumed Lifetime	Assumed End Date	LGD	Exposure	ECL	ECL Rate
CA	300-529	2017q3	48	2021m7	0.20	1,559,849	65,737	4.214
CA	300-529	2017q4	48	2021m10	0.20	2,409,886	101,692	4.220
CA	530-579	2017q3	48	2021m7	0.20	6,915,574	209,011	3.022
CA	530-579	2017q4	48	2021m10	0.20	8,245,182	261,304	3.169
CA	580-619	2017q3	48	2021m7	0.20	15,128,379	306,710	2.027
CA	580-619	2017q4	48	2021m10	0.20	20,417,682	452,670	2.217
CA	620-659	2017q3	48	2021m7	0.20	35,368,369	484,239	1.369
CA	620-659	2017q4	48	2021m10	0.20	42,802,164	1,000,696	2.338
CA	660-699	2017q3	48	2021m7	0.20	53,904,068	400,000	0.742
CA	660-699	2017q4	48	2021m10	0.20	66,136,162	446,549	0.675
CA	700-719	2017q3	48	2021m7	0.20	29,104,995	114,848	0.395
CA	700-719	2017q4	48	2021m10	0.20	36,248,520	154,393	0.426
CA	720-739	2017q3	48	2021m7	0.20	36,503,509	141,363	0.387

# 3

An Industry Impact Analysis  
for First Mortgages and Autos

# What We Hear From Stakeholders

Key concerns from the market

## What will be the impact of CECL?

- » Quantification of forward looking economic risks may be difficult for both institutions and regulators
- » What if CECL goes into effect during a recession?
- » What if CECL had been in effect during the last recession?

**Our results show that reserves might have to increase significantly!**



# Estimating the Impact of CECL: Mortgages

## Our Research

- » We use Moody's Analytics Expected Consumer Credit Loss service to estimate Expected Credit Loss rates under forward-looking economic scenarios
  - Based on consumer credit report data from CreditForecast.com
  - Covers performance data from across lenders
  - \$8.4 trillion in First Mortgage loans as of August 2017
- » We use Moody's Analytics consensus, stress and probability-weighted scenarios
- » We assume a 40% loss given default rate
  - Based on RMBS securities data, Fannie Mae/Freddie Mac data and bank call reports
- » We assume the life of First Mortgages do not exceed 15 years
  - 99% of loans are terminated within 180 months
- » We assume 4.3% per annum discount rate
  - Based on 30-year mortgage rate, from MBA, Weekly Mortgage Applications Survey: 50%/75%

# Reserve Estimates for First Mortgages

## Results

- » Based on incurred loss method, we calculate ALL reserves to be about \$41 billion
  - Reported Fannie/Freddie portion of this is \$28.8 billion on \$4.8 trillion loans
- » Based on CECL methodology, we calculate required reserves to be about \$80 billion with an ECL rate of 0.97% under a consensus scenario
  - This makes **up to** a 100% increase in reserves due to CECL (just for First Mortgages)
  - Impact of switching scenarios:
    - Reserves under stress scenario estimated at \$155 billion with 1.87% ECL rate
    - Reserves under probability weighted scenario estimated at \$92 billion with 1.11% ECL rate
- » Segment analysis shows highest ECL rates in...
  - Less than <660 score bands. Largest ECL \$ in 620-699 band
  - MD, VA, IL, NJ, FL with biggest ECL \$ in CA, FL, TX

# Impact of Inputs on Results

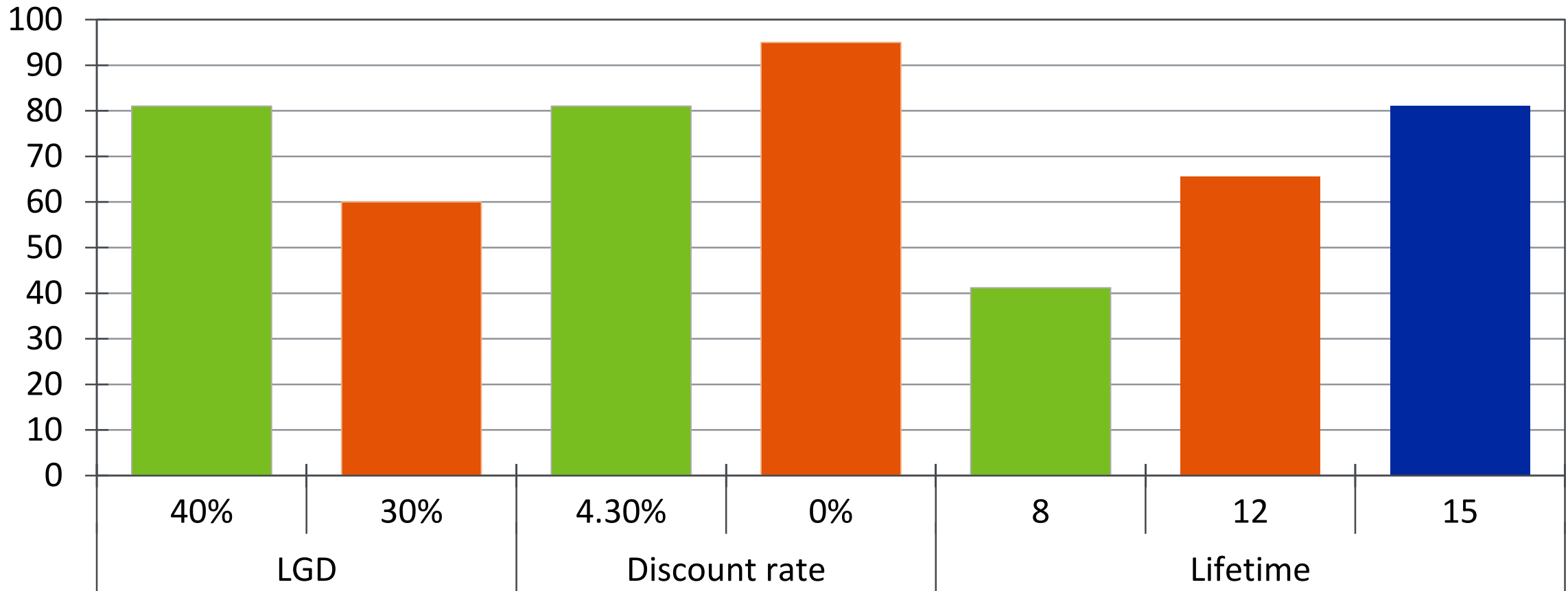
## Results should be taken with caution at institution level

Each financial institution will have its own expected lifetime and loss given default rate as well as loan quality

- » Results can also change based on
  - Where in the business cycle the line of business is
  - Discount rates: If no discount, impact would be larger, \$95 billion
  - Current incurred loss method: (look-back period): If incurred loss higher, impact would be smaller
  - Current conditions at time of CECL
  - Loss given default under different scenarios



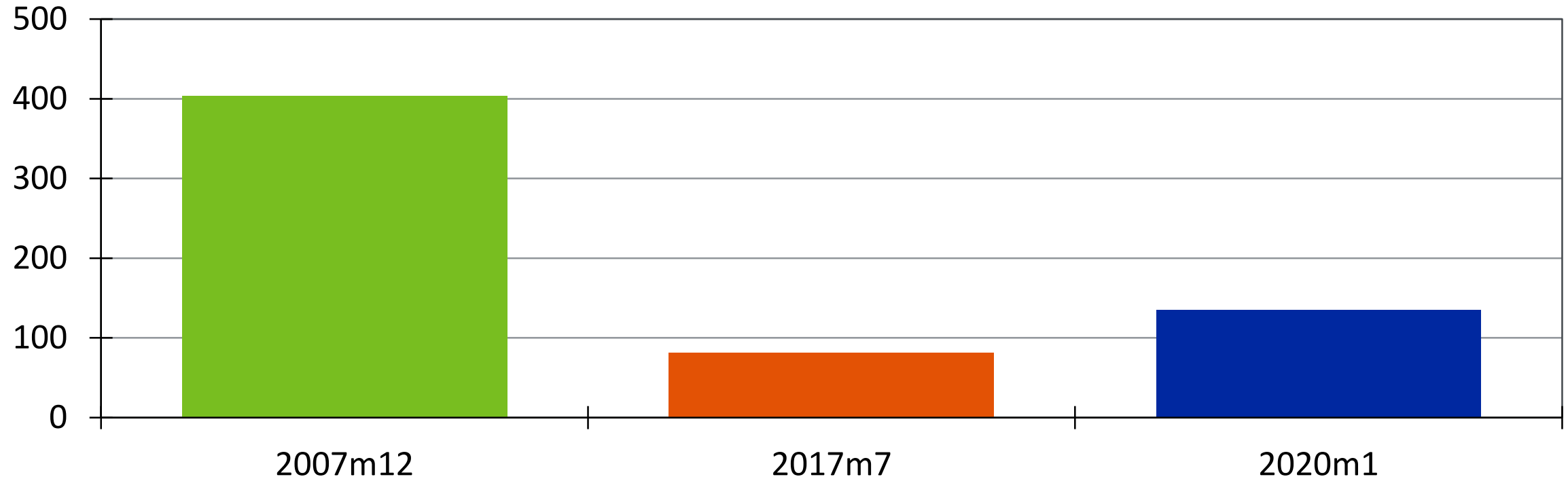
# Sensitivity of Results to Assumptions



# CECL Numbers in the Past and Future

What if we calculated the numbers during last recession or as of date CECL will go into effect?

CECL as of Different Dates



# Estimating the Impact of CECL: Autos

## Our Research

- » We use Moody's Analytics Expected Consumer Credit Loss product to estimate Expected Credit Loss rates under forward-looking economic scenarios
  - Based on consumer credit report data from CreditForecast.com
  - Covers performance data from across lenders
  - \$495 billion in Auto finance loans as of Jan 2018
  - \$601 billion in Auto bank loans as of Jan 2018
- » We use Moody's Analytics consensus, stress and probability-weighted scenarios
- » We assume a 46% loss given default rate based on Auto Portfolio Analyzer data
- » We assume the life of Autos does not exceed 5 years
- » We assume 4.81% per annum discount rate for auto bank loans and 4.64% for auto finance loans
  - FRB Bank New Car Loans Rate and FRB Finance Co. New Car Loans Rate

# Reserve Estimates for Autos

## Results

Based on CECL methodology, we calculate required reserves to be about \$7.5 billion with an ECL rate of 1.25% under a consensus scenario for Auto Bank Loans

- » Impact of switching scenarios:
  - Reserves under stress scenario estimated at \$13 billion with 2.17% ECL rate
  - Reserves under probability weighted scenario estimated at \$8.4 billion with 1.40% ECL rate

Based on CECL methodology, we calculate required reserves to be about \$17.5 billion with an ECL rate of 3.53% under a consensus scenario for Auto Finance Loans

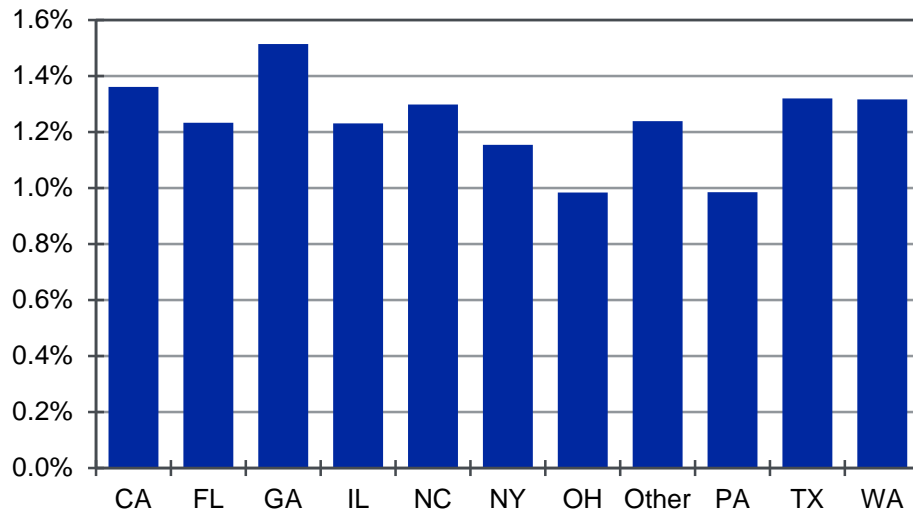
- » Impact of switching scenarios:
  - Reserves under stress scenario estimated at \$23.7 billion with 4.8% ECL rate
  - Reserves under probability weighted scenario estimated at \$18.5 billion with 3.73% ECL rate

# Reserve Estimates for Autos

## Auto Bank ECL Rates Results

Segment analysis shows, for Auto Bank Loans, highest ECL rates in...

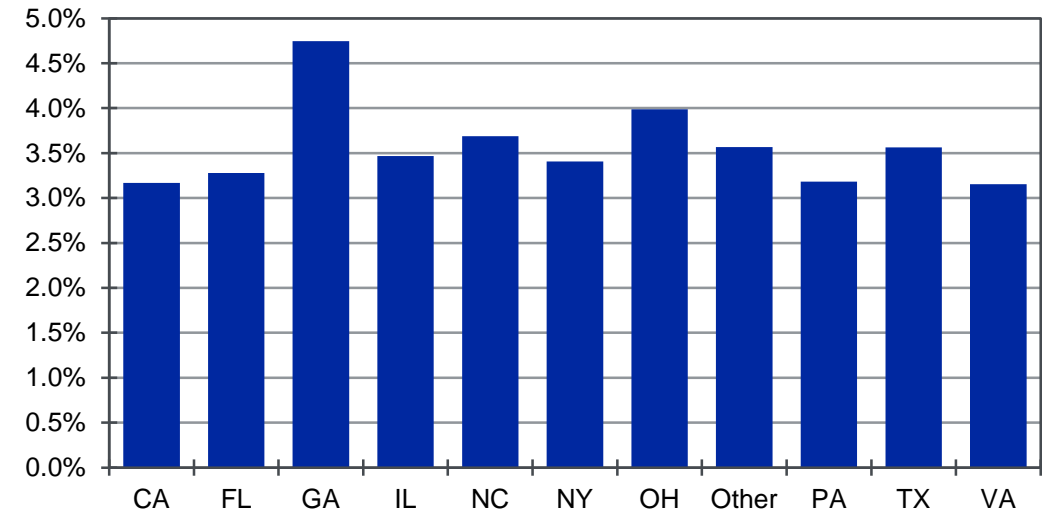
- » 300-529 score bands. Largest ECL \$ in 740-779, 660-699 band
- » GA with biggest ECL \$ in TX and CA



## Auto Finance ECL Rates Results

Segment analysis shows, for Auto Finance Loans, highest ECL rates in...

- » 300-529 score bands. Largest ECL \$ in 620-699 band
- » GA with biggest ECL \$ in TX and CA



# Summary: ECCL Provides Easy Look Up Tables for CECL

ECCL Data Dimensions – Client’s Footprint

Moody’s  
Analytics input

Client  
input

Derived

Geography	Origination Vintage	Risk Score	Loan Term	ECL Rate	LGD Rate	Exposure	ECL
CA	2016Q3	Orig. Score: 740-779	360+	0.050	0.048	\$ 60,532,444	\$ 30,420
CA	2016Q4	Orig. Score: 740-779	360+	0.055	0.048	\$ 56,251,104	\$ 30,934
CA	2017Q1	Orig. Score: 740-779	360+	0.061	0.048	\$ 35,829,712	\$ 21,910
CA	2017Q2	Orig. Score: 740-779	360+	0.056	0.048	\$ 49,811,888	\$ 27,997
CA	2017Q3	Orig. Score: 740-779	360+	0.063	0.048	\$ 41,669,548	\$ 26,381
CA	2009Q4	Orig. Score: 780-809	<180	0.008	0.048	\$ 4,727	\$ 0
CA	2010Q4	Orig. Score: 780-809	<180	0.005	0.048	\$ 6,377	\$ 0
CA	2016Q1	Orig. Score: 780-809	<180	0.009	0.048	\$ 334,918	\$ 30
CA	2016Q3	Orig. Score: 780-809	<180	0.012	0.048	\$ 293,081	\$ 35
CA	2016Q4	Orig. Score: 780-809	<180	0.013	0.048	\$ 98	\$ 0
CA	2007Q4	Orig. Score: 780-809	180-359	0.069	0.048	\$ 214,632	\$ 148
CA	2008Q2	Orig. Score: 780-809	180-359	0.039	0.048	\$ 864,379	\$ 337
CA	2008Q3	Orig. Score: 780-809	180-359	0.033	0.048	\$ 15,083	\$ 5

# 4

## Bank and Credit Union Specific Loss Estimates

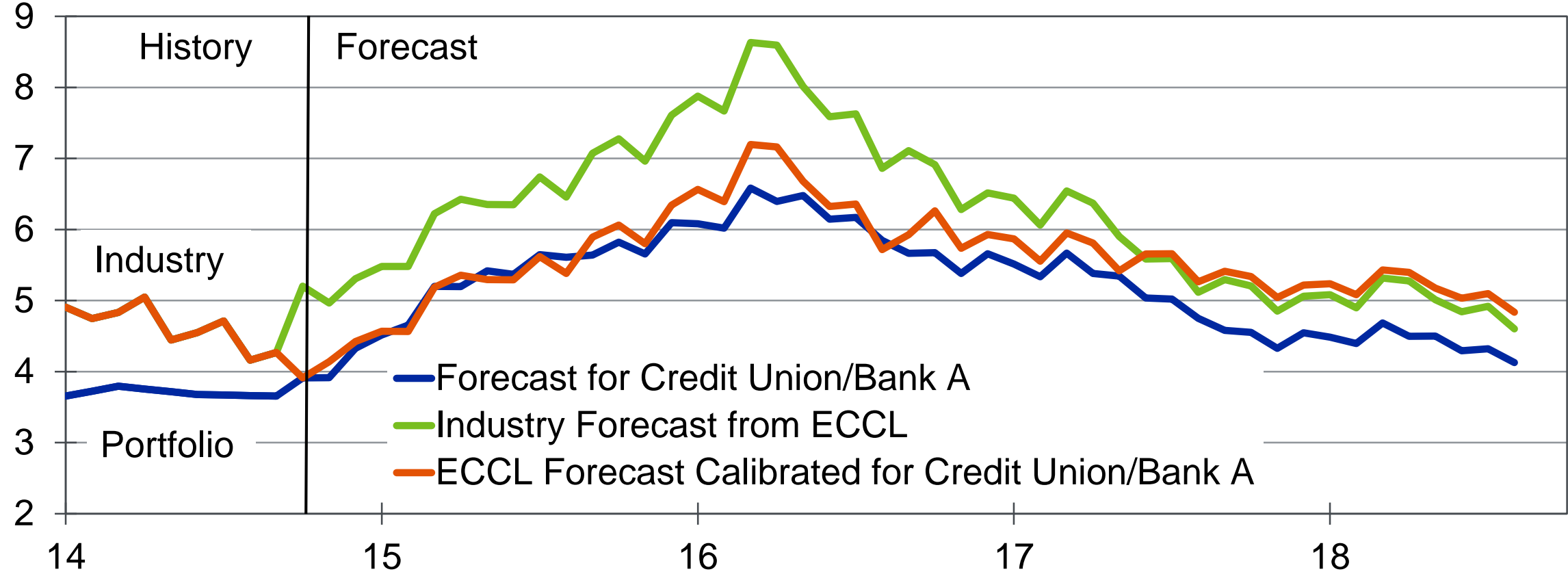


# Calculating Bank and Credit Union Specific Losses

- » **Small institutions: Loss rate approach: Use forecasts at portfolio level**
  - Use Moody's Analytics Call Report or Credit Union Forecasts
  - Simple, forward-looking, allows for comparison with peers
  - Needs assumptions such as homogeneous portfolio and remaining lifetime
- » **Medium size institutions: PD & LGD approach with anchoring**
  - Calibrate more granular ECCL data to institution specific data from Call Report or Credit Union Forecasts
  - Useful when there's no data archived by institution
  - ECCL provides vintage component; Call Report or Credit Union Forecasts allow calibration to specific bank/credit union
- » **Medium to large size institutions: PD & LGD approach with model access**
  - Use Moody's Credit Cycle (Standard) to run client's data
  - Allows custom calibration if institution has data with more dimensions, e.g. score bands, etc.
  - Access to models through online platform with audit trail, etc.

# Loss Forecasting Based on Industry and Institutional Trends

Conditional loss rate, % of balance, annualized



Source: Moody's Analytics

# Moody's Analytics Consumer Credit Solutions

Mortgage/Auto Portfolio Analyzer or Moody's CreditCycle Custom	Moody's Credit Cycle	Expected Credit Loss Service (ECCL)	CreditForecast.com
<ul style="list-style-type: none"> <li>» Custom modeling solution</li> <li>» Client data</li> <li>» Portfolio, vintage/cohort, loan level models</li> <li>» Flexible segmentation and driver options</li> </ul>	<ul style="list-style-type: none"> <li>» Off-the-shelf modeling solution</li> <li>» Based on CF.com models (and data)</li> <li>» Predetermined segments/cohorts</li> <li>» Calibration option</li> <li>» Term structure</li> </ul>	<ul style="list-style-type: none"> <li>» Data augmentation (PD &amp; LGD)</li> <li>» Based on CF.com data and models</li> <li>» Predetermined segments/cohorts</li> <li>» Client footprint adjusted results</li> </ul>	<ul style="list-style-type: none"> <li>» Data augmentation</li> <li>» Based on Equifax data</li> <li>» (more than just PD)</li> <li>» Cohort level data: Vintage, geo, score band, term</li> <li>» Quarterly updated forecasts with up to 9 scenarios</li> </ul>
<ul style="list-style-type: none"> <li>» Integration to other MA solutions</li> <li>» Online or desktop platforms</li> <li>» Best when client data covers at least one business cycle and is good quality</li> </ul>	<ul style="list-style-type: none"> <li>» Integration to other MA solutions</li> <li>» Online platform</li> <li>» Best when client data is short or multiple M&amp;As or as benchmark</li> </ul>	<ul style="list-style-type: none"> <li>» Integration to other MA solutions</li> <li>» Online interface</li> <li>» Best when client has no data/model or small portfolio or as benchmark</li> </ul>	<ul style="list-style-type: none"> <li>» Different views/cuts of credit bureau + econ data</li> <li>» Multiple delivery options including DB</li> <li>» Integration to other MA solutions</li> </ul>

# Q&A

Additional questions?

Send an email to [help@economy.com](mailto:help@economy.com) or contact:

Timothy Daly  
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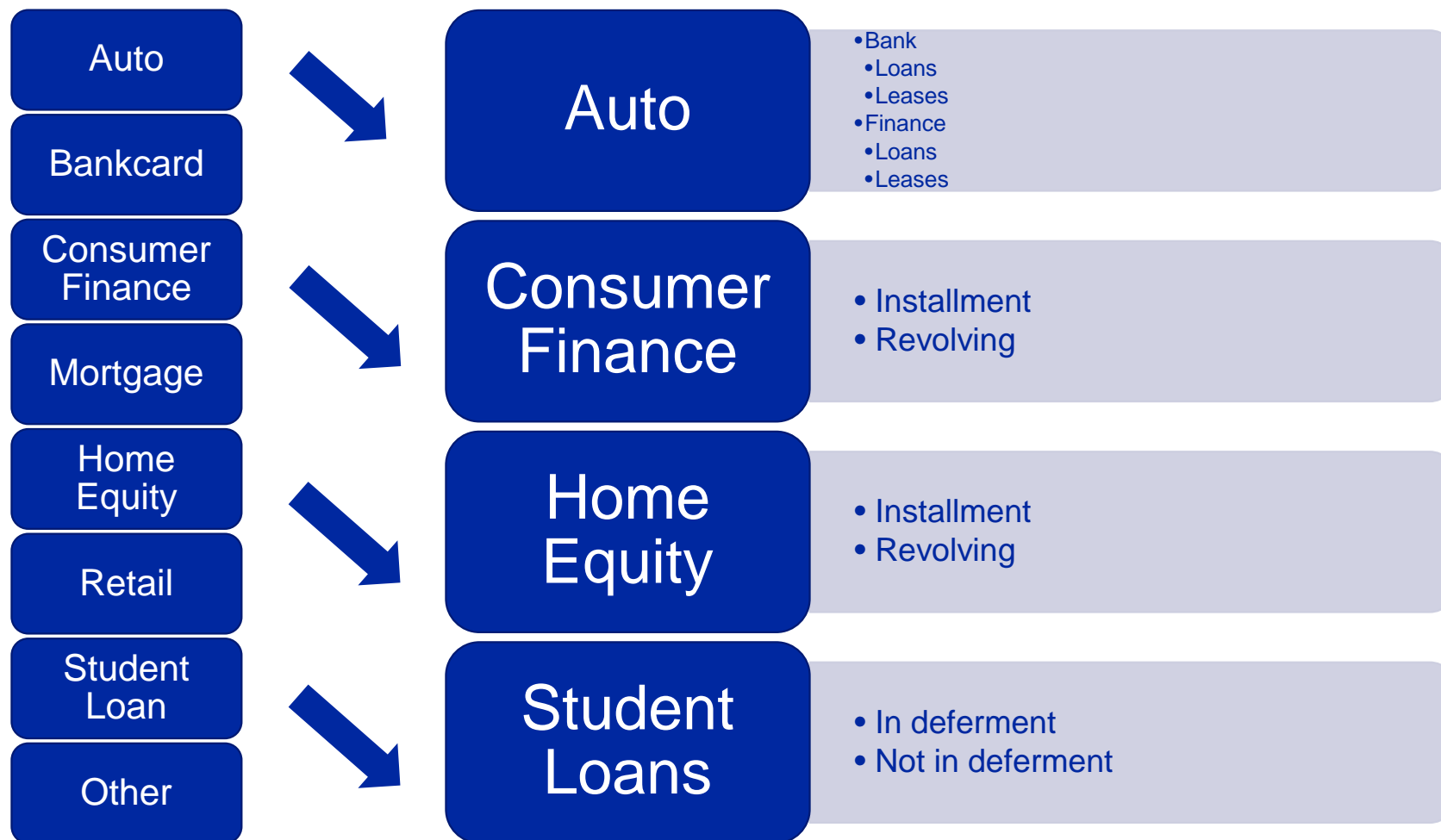
## Upcoming Events

- » July 17, 2018 Webinar: CECL Custom Modelling Applications
- » Aug 15, 2018 Webinar: U.S. Consumer Credit Outlook
- » Oct 16, 2018 Webinar: CECL Off the Shelf Modelling Applications

5

Appendix

# CreditForecast.com covers all consumer credit products



# CreditForecast.com Vintage Segmentation

Loans grouped into origination date cohorts to track performance over maturation cycle

Pre-1990 and 1990-1995 aggregate vintages

Annual vintages:

Loans grouped together by year of origination (1996 to 2004)

Quarterly vintages:

Loans grouped together by quarter of origination (2005Q1 and onward)

# CreditForecast.com Credit Score Segmentation

11 Score Bands based on Vantage Score 3.0





# CreditForecast.com Term Segmentation

## Installment Product Category Loan Term Cohort Segmentation

Product Category	Description	Product Category	Description
Auto Lease	<= 24 months	First Mortgage	< 180 months
	25-39 months		180-359 months
	40+ months		360+ months
Auto Loan	<= 24 months	Home Equity Loan	< 120 months
	25-39 months		120-179 months
	40-63 months		180-359 months
	64-75 months		360+ months
	76+ months	Consumer Finance Installment	<= 6 months
Student Loan	< 120 months		7-12 months
	120+ months		13-24 months
Revolving	All Loans		25-59 months
Total	All Loans		60+ months

# Moody's Analytics Scenarios

Reasonable and supportable forecasts from Moody's Analytics

## Key Features

- » **Baseline forecast + eight alternative scenarios with probability weights**
- » Available for the **U.S., all state and metro areas**, as well as 60+ countries
- » Coverage of more than **1,800** economic, financial and demographic variables
- » Forecasts updated **monthly**, history updated in **real-time, 30-year horizon**
- » **Fully documented** model methodology; scenario assumptions published monthly
- » **Back-testing**, tracking and **model validation** reports available

# Consensus Scenario

This scenario is designed to incorporate the central tendency of a range of baseline forecasts produced by various institutions and professional economists.

- » The probability that the economy will perform better than this consensus is equal to the probability that it will perform worse.
- » The consensus scenario is based on a review of publicly available baseline forecasts of the U.S. economy. These sources include:
  - Congressional Budget Office
  - Social Security Administration
  - Federal Open Market Committee members' range of forecasts
  - Federal Reserve Comprehensive Capital Analysis and Review baseline
  - European Commission U.S. baseline
  - U.K. Prudential Regulation Authority U.S. baseline
  - Philadelphia Federal Reserve Survey of Professional Forecasters

Note: Assumptions for all other MA scenarios available

# First Mortgage Impact: Summary Statistics by Risk Score

Risk Score	Exposure		ECL		ECL Rate
810-850	\$	838,611,063,783	\$	1,679,197,307	0.20%
780-809	\$	1,731,285,255,853	\$	5,572,239,103	0.32%
740-779	\$	1,904,720,846,983	\$	11,038,449,432	0.58%
720-739	\$	815,252,158,634	\$	7,194,454,262	0.88%
700-719	\$	649,229,712,173	\$	7,601,373,278	1.17%
660-699	\$	1,061,738,948,496	\$	17,504,984,133	1.65%
620-659	\$	778,621,127,534	\$	17,202,323,897	2.21%
580-619	\$	309,396,123,906	\$	8,235,102,422	2.66%
530-579	\$	124,681,844,010	\$	3,400,088,592	2.73%
300-529	\$	38,491,894,788	\$	902,233,366	2.34%
MISSING	\$	35,228,338,579	\$	298,128,046	0.85%

# First Mortgage Impact: Summary Statistics by Vintage

Top 10 vintages by exposure

Origination Vintage	Exposure		ECL		ECL Rate
12Q4	\$	324,540,142,974	\$	1,962,080,227	0.60%
13Q2	\$	328,568,939,445	\$	2,402,369,634	0.73%
15Q2	\$	359,752,370,580	\$	3,697,928,816	1.03%
15Q3	\$	321,518,675,387	\$	3,335,374,789	1.04%
15Q4	\$	302,368,121,212	\$	3,109,867,603	1.03%
16Q1	\$	310,164,810,995	\$	3,281,665,192	1.06%
16Q2	\$	467,573,089,548	\$	5,035,380,587	1.08%
16Q3	\$	547,047,789,796	\$	5,612,744,307	1.03%
16Q4	\$	525,152,472,687	\$	5,835,255,855	1.11%
17Q1	\$	313,209,622,735	\$	3,265,057,526	1.04%
Other	\$	4,487,361,279,380	\$	43,090,849,301	0.96%

# First Mortgage Impact: Summary Statistics by State

Top 10 states by exposure

Geography	Exposure		ECL	ECL Rate	
CA	\$	1,610,824,367,705	\$	9,897,291,603	0.61%
FL	\$	456,041,235,199	\$	5,220,582,420	1.14%
IL	\$	305,393,717,283	\$	3,541,358,878	1.16%
MD	\$	244,486,158,680	\$	2,996,477,933	1.23%
NJ	\$	286,840,235,122	\$	3,310,108,190	1.15%
NY	\$	479,508,391,125	\$	3,809,458,775	0.79%
Other	\$	3,564,506,533,250	\$	38,340,525,264	1.08%
PA	\$	248,773,752,190	\$	2,413,006,393	0.97%
TX	\$	499,698,720,384	\$	5,255,511,431	1.05%
VA	\$	317,260,660,740	\$	3,682,799,091	1.16%
WA	\$	273,923,543,061	\$	2,161,453,859	0.79%



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