CECL Impact Analysis for Consumer Lending Portfolios

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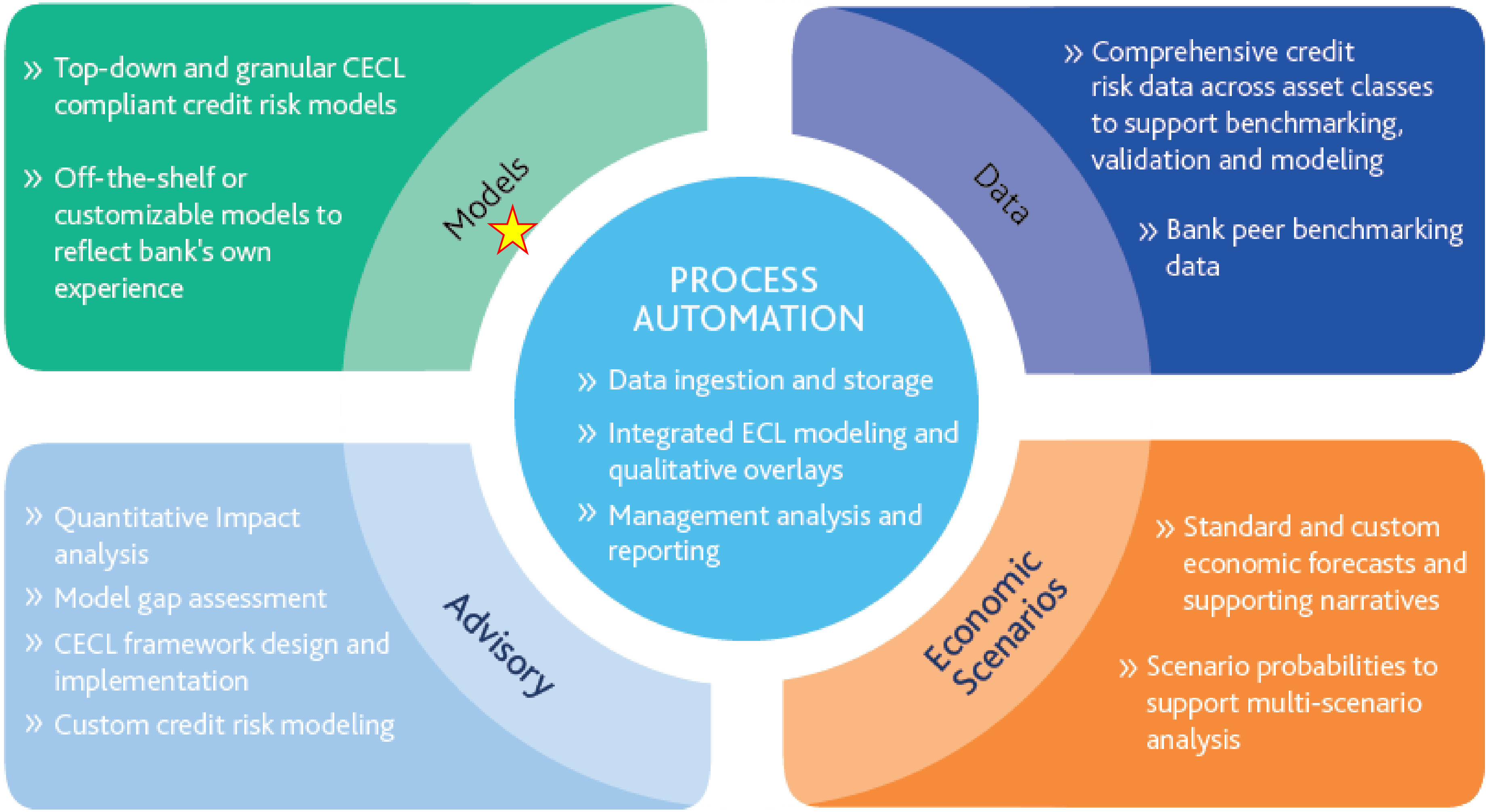
Timothy Daly, Senior Director, Moderator

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.

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

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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.

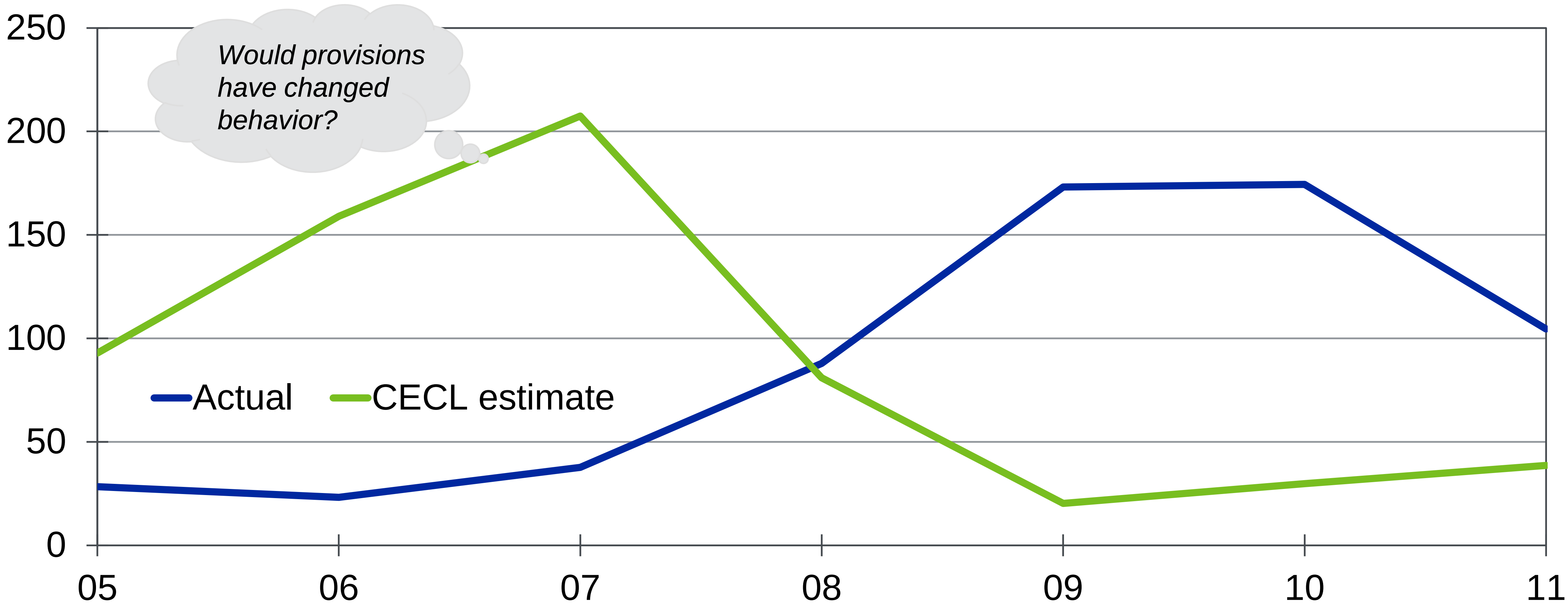
How Will CECL Impact a Bank's Loss Allowance?

» 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



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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 $)	Active Statuses (# and $)	Final Dispositions (# and $)
• Total outstanding volume • New Originations • High credit/Utilization rate • Scheduled monthly payments • Trades with >$0 balance (for revolving accounts)	Mutually exclusive non-terminal status buckets: • Current • 30-59 DPD • 60-89 DPD • 90-119 DPD • 120+ DPD • Foreclosure Started	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

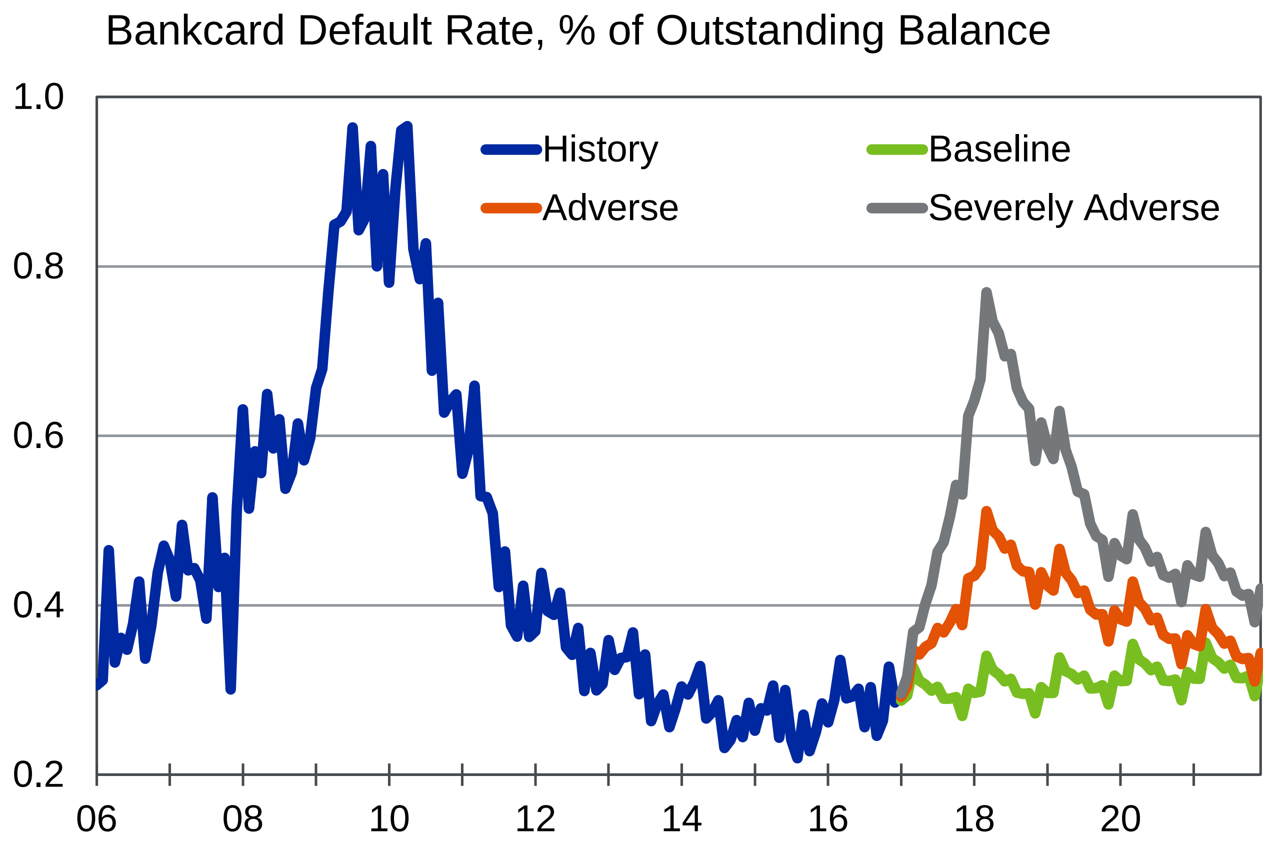
– Vintage Quality Variables

– Time-Varying Macro Conditions

– Seasonality Dummies

– Delinquency Roll Rates/Daisy Chain

– Segment × Macro factor interactions



CreditForecast.com Models Consider Future Conditions

Include both national and regional forecast economic factors:

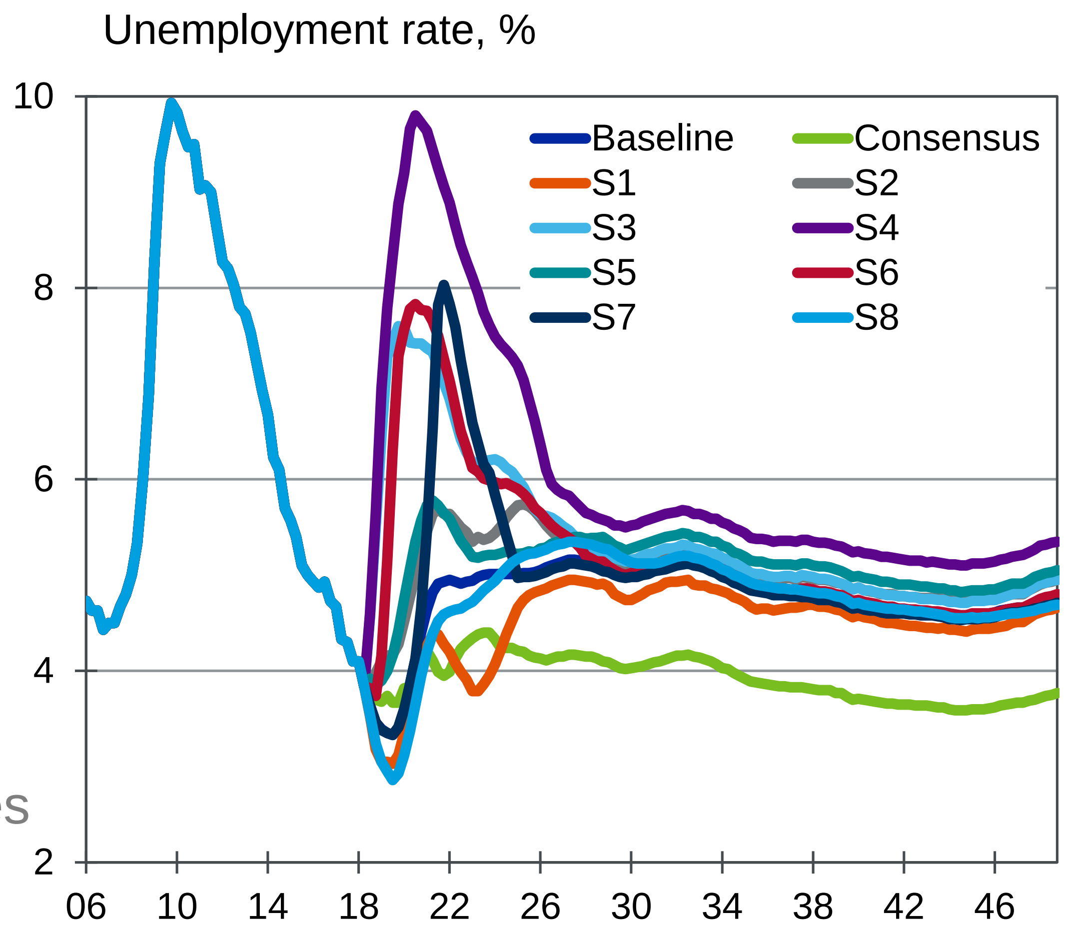
» Economic Performance
GDP Growth, Disposable Income Growth

» 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

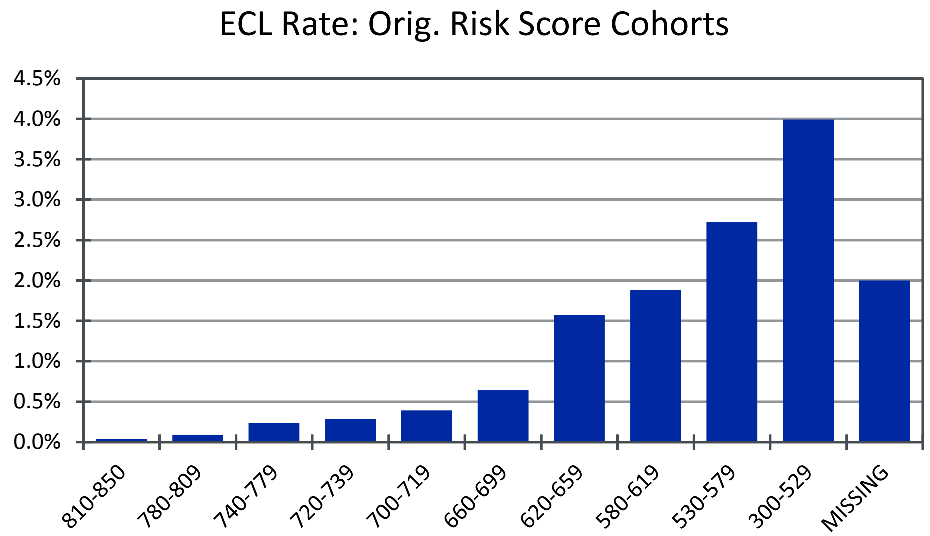
- Product Category
- Exposure Footprint
  - Geography × Origination Date × Origination Risk Score Cohorts
- Key Inputs
  - Expected Lifetime
  - Loss Given Default
  - Scenario/Probability Weighted Scenarios
  - Discount Rate

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



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

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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

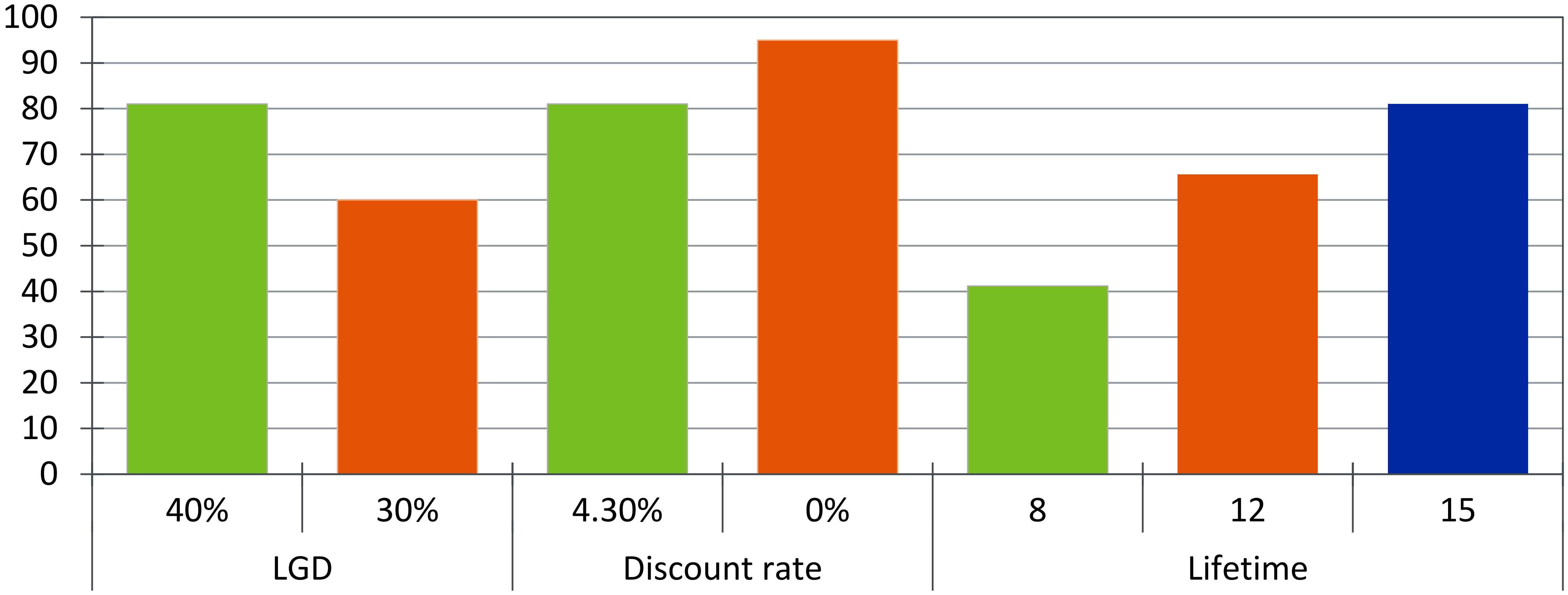
Impact of Inputs on Results

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

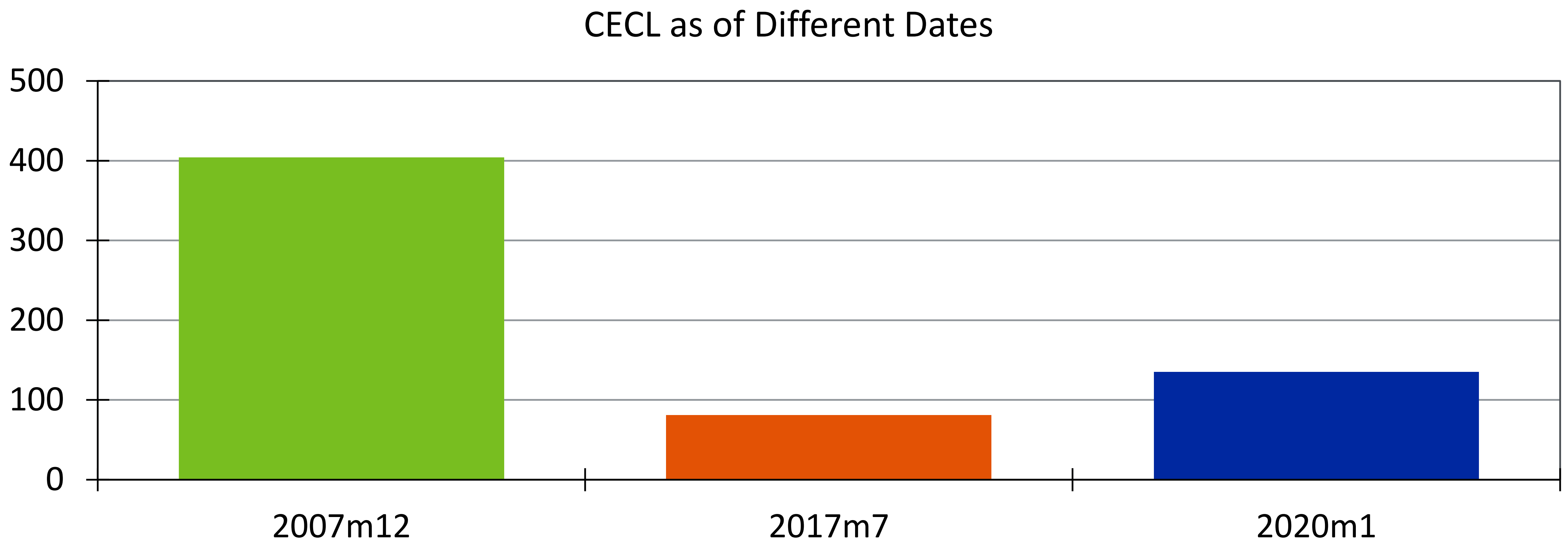
- Results can also change based on
  - Where in the business cycle the line of business is
  - Discount rates: If no discount, impact would be larger, $95 billion
  - Current incurred loss method: (look-back period): If incurred loss higher, impact would be smaller
  - Current conditions at time of CECL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



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

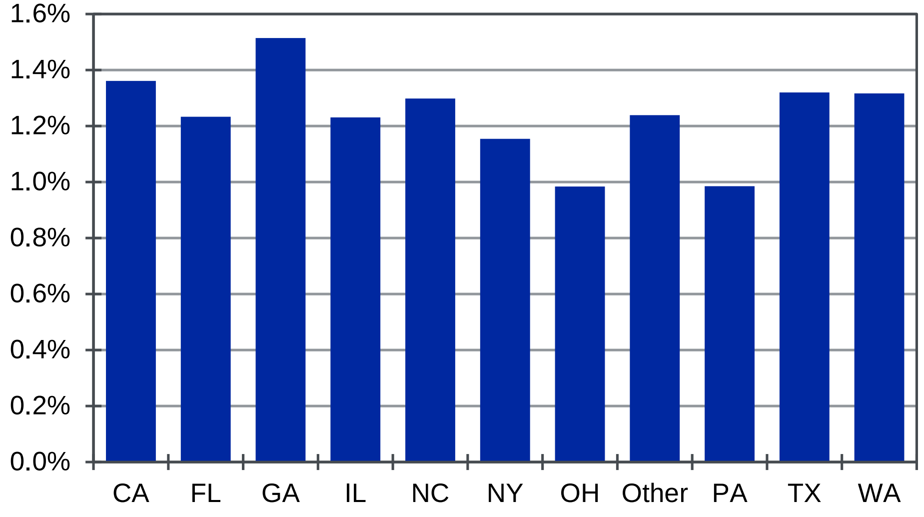
» Impact of switching scenarios:
  - Reserves under stress scenario estimated at $23.7 billion with 4.8% ECL rate
  - Reserves under probability weighted scenario estimated at $18.5 billion with 3.73% ECL rate

Reserve Estimates for Autos

Auto Bank ECL Rates Results

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

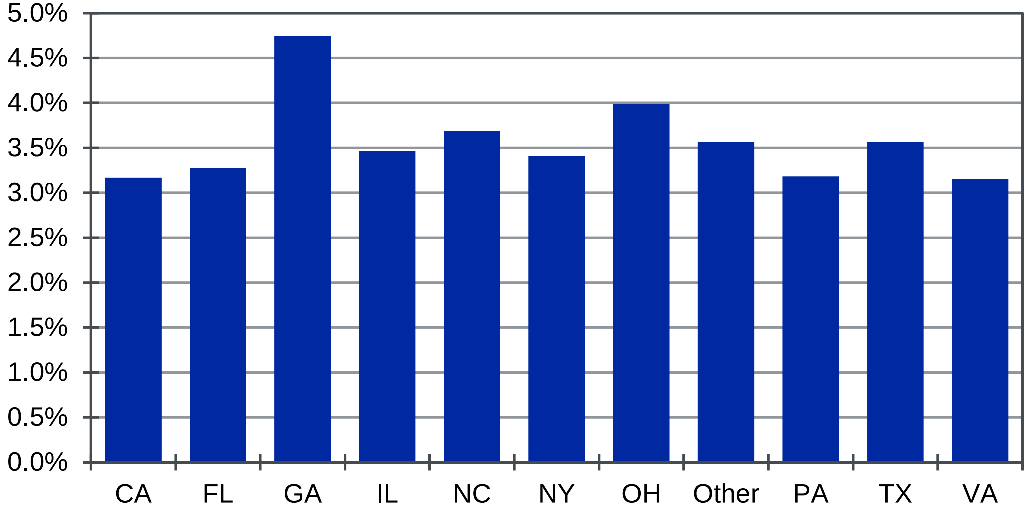
- 300-529 score bands. Largest ECL $ in 740-779, 660-699 band
- GA with biggest ECL $ in TX and CA



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

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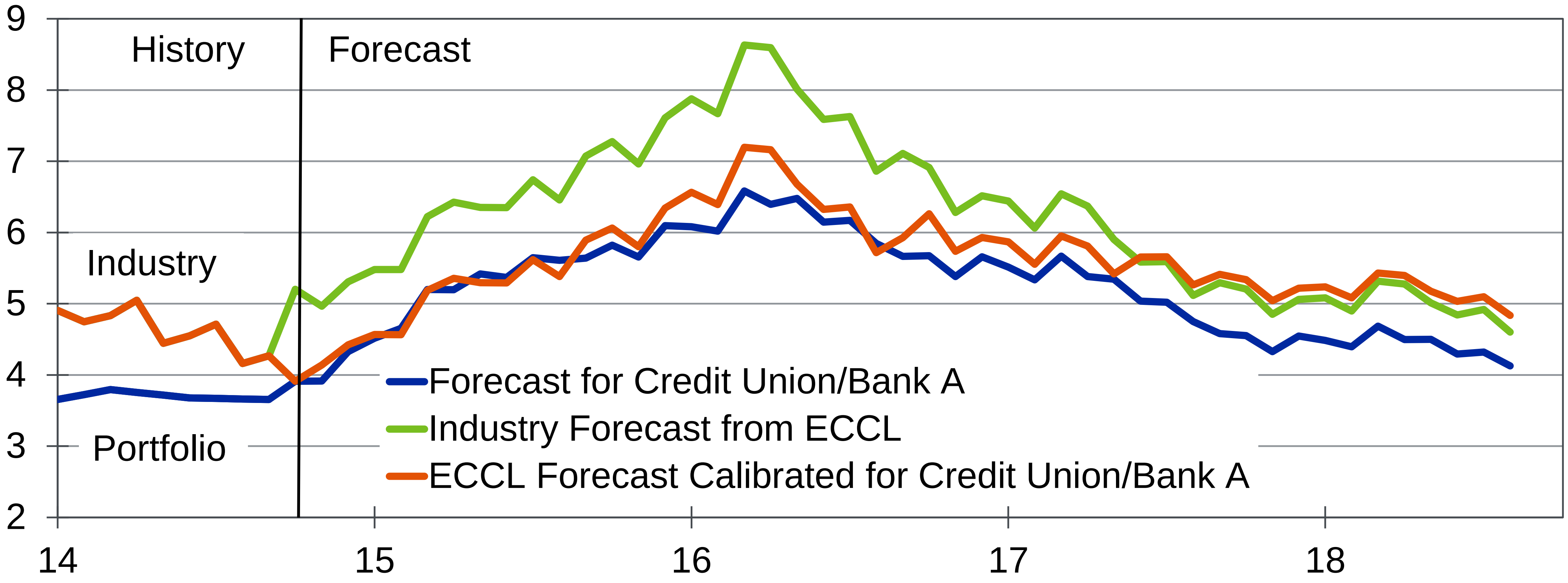
Bank and Credit Union Specific Loss Estimates

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
» Custom modeling solution » Client data » Portfolio, vintage/cohort, loan level models » Flexible segmentation and driver options	» Off-the-shelf modeling solution » Based on CF.com models (and data) » Predetermined segments/cohorts » Calibration option » Term structure	» Data augmentation (PD & LGD) » Based on CF.com data and models » Predetermined segments/cohorts » Client footprint adjusted results	» Data augmentation » Based on Equifax data » (more than just PD) » Cohort level data: Vintage, geo, score band, term » Quarterly updated forecasts with up to 9 scenarios
» Integration to other MA solutions » Online or desktop platforms » Best when client data covers at least one business cycle and is good quality	» Integration to other MA solutions » Online platform » Best when client data is short or multiple M&As or as benchmark	» Integration to other MA solutions » Online interface » Best when client has no data/model or small portfolio or as benchmark	» Different views/cuts of credit bureau + econ data » Multiple delivery options including DB » Integration to other MA solutions

Q&A

Additional questions?

Send an email to help@economy.com or contact:

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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

- Auto
- Bankcard
- Consumer Finance
- Mortgage
- Home Equity
- Retail
- Student Loan
- Other

Auto

- Bank
  - Loans
  - Leases
- Finance
  - Loans
  - Leases

Consumer Finance

- Installment
- Revolving

Home Equity

- Installment
- Revolving

Student Loans

- In deferment
- Not in deferment

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

Missing	300-529	530-579
580-619	620-659	660-699
700-719	720-739	740-779
780-809	810-850	

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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