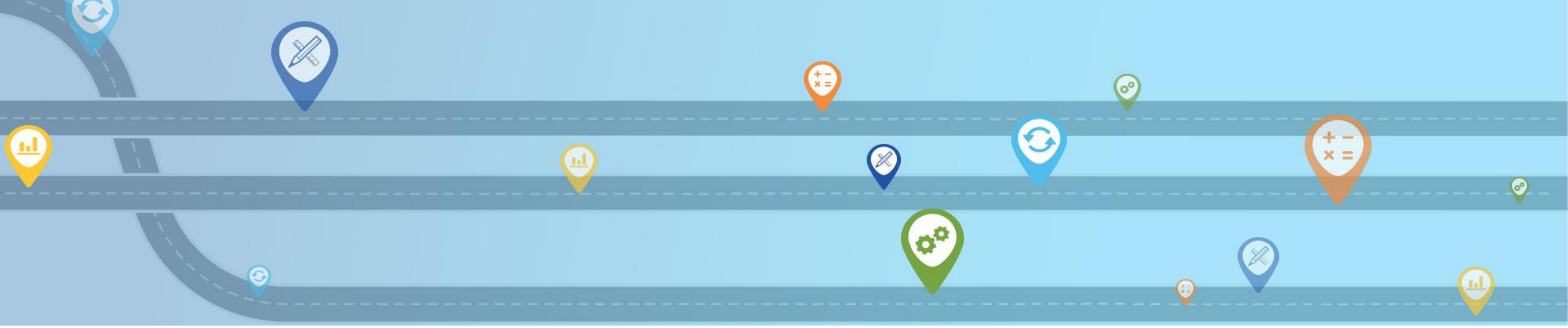
Moody's Analytics

CECL Webinar Series:
The Roadmap to Success

Glenn Levine, Associate Director
David Fieldhouse, Director

September 6, 2017



Moody's Analytics CECL Webinar Series:

The Roadmap to Success

TODAY

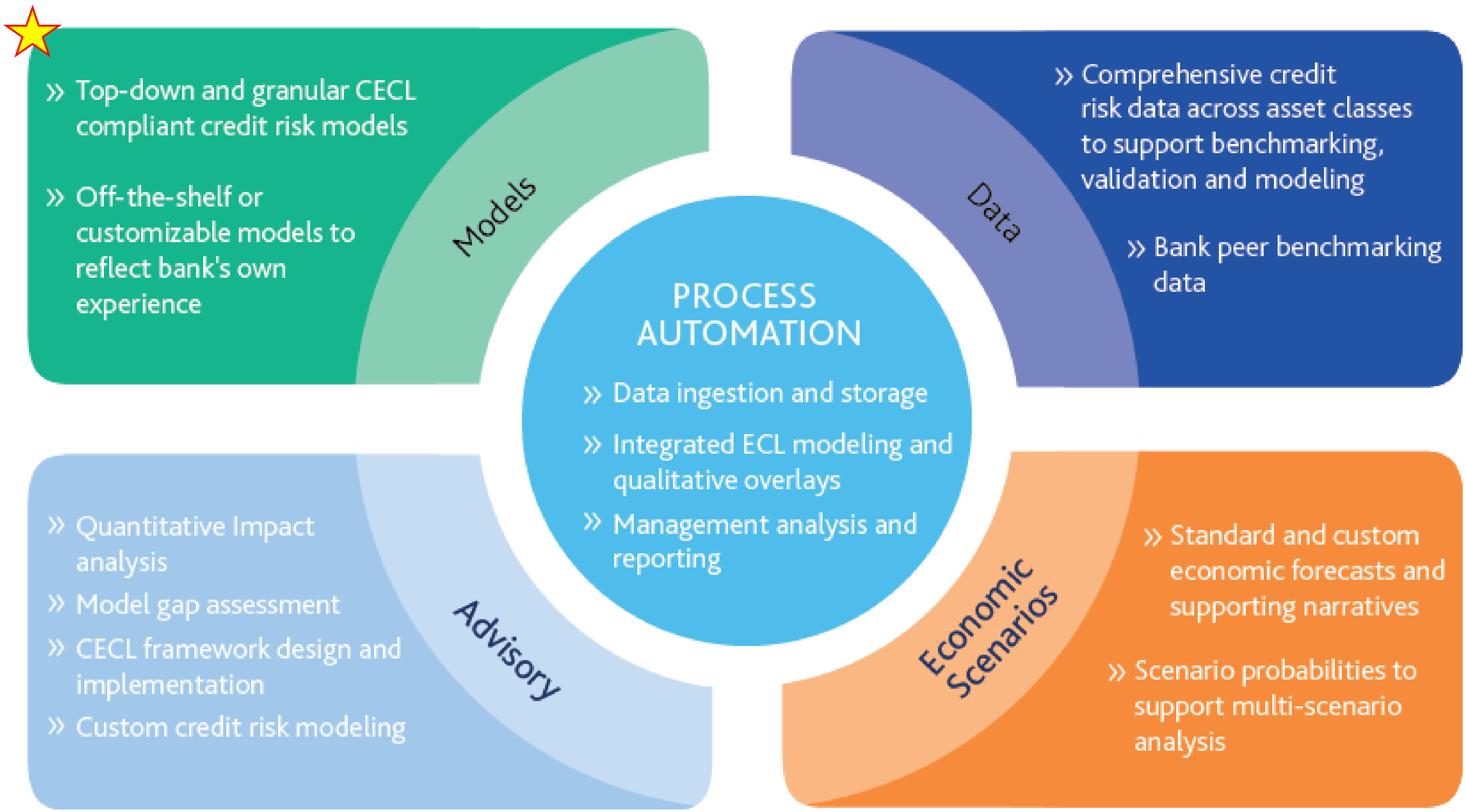
Lifetime Expected Credit Loss Modeling

UPCOMING EVENTS

Tue, Sep 19	**Economic Scenarios for CECL: What's Reasonable and Supportable?**
Thur, Oct 5	**Empowering Users, Satisfying Auditors**

Moody's Analytics CECL Solution Suite

Today's Focus is on Models



Today's Speakers

Glenn Levine

Associate Director, Credit Risk Analytics Group

Glenn is a quantitative researcher in the Credit Risk Analytics Group. He provides support for the CreditEdge product suite and is the lead researcher for Stressed EDF, a model which allows corporate credit risk to be conditioned on different macroeconomic scenarios. Prior to his current role, he was a Senior Economist in MA's Economics and Consumer Credit division, based in Sydney, Australia. He holds an MSc from the London School of Economics.

David Fieldhouse

Director, Consumer Credit Analytics

Dr. David Fieldhouse is a Director in the Content Economics and Structured Analytics Group. His responsibilities include developing and validating models of consumer loan performance for financial institutions. He also provides regular analysis and commentary on consumer credit markets. David has a PhD from the University of Western Ontario.

Moderator

Anna Krayn

Senior Director and Team Lead, Capital Stress Testing Business Development

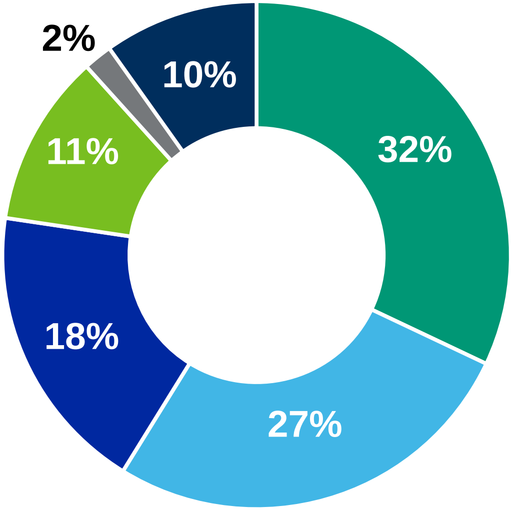
Anna is a senior director who manages the regulatory and accounting solutions team in the Americas. The team is responsible for solutions structuring, leveraging Moody's Analytics products and services focusing on impairment, stress testing, and capital planning solutions. Her primary focus is on financial institutions.

CECL Implementation Concerns

Model-related issues consistently rank high

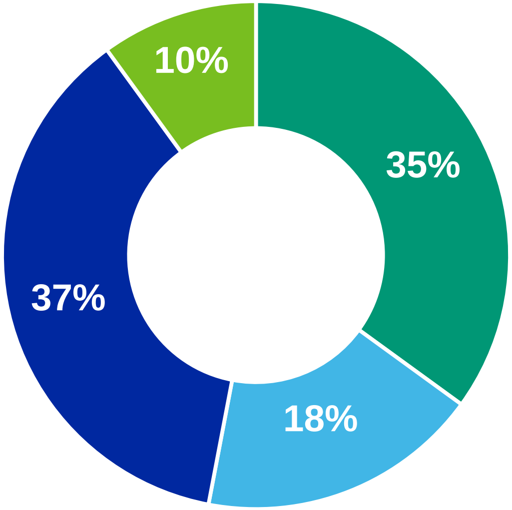
What is the most significant challenge you anticipate in CECL implementation?

February 2017



- Data availability
- ECL quantification
- Scenario design
- Qualitative overlay methodology
- Performance (i.e. speed of execution)
- Data and processes governance

August 2017



- Data availability
- Scenario selection, design, and support
- Expected credit loss methodology
- Process governance and controls

Agenda

1. Some background to CECL-compliant models
2. How can a rating be used for CECL?
3. Consumer Credit Challenges

1

Background on CECL-compliant models

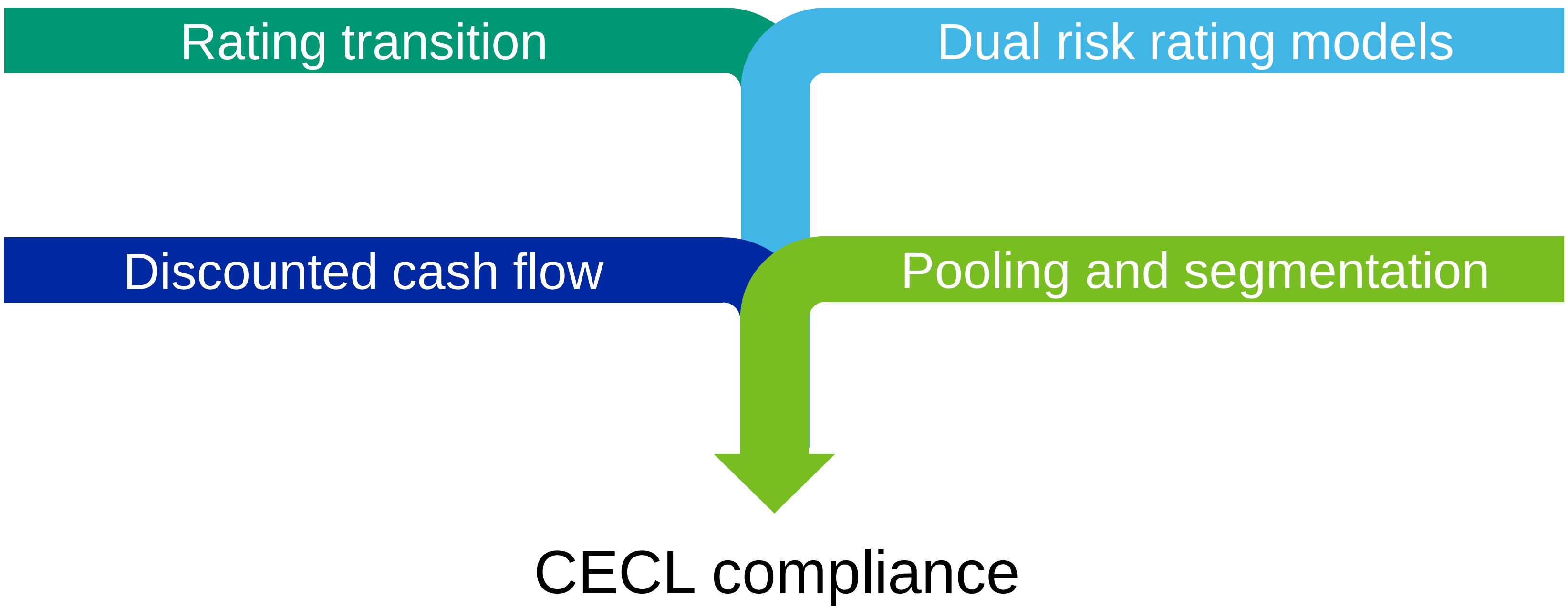
When is a Credit Model CECL-Compliant?

Institutions will need to measure and record immediately all expected credit losses (ECL) over the life of their financial assets based on:

1) Past events, including historical experience
2) Current conditions
3) Reasonable and supportable forecasts

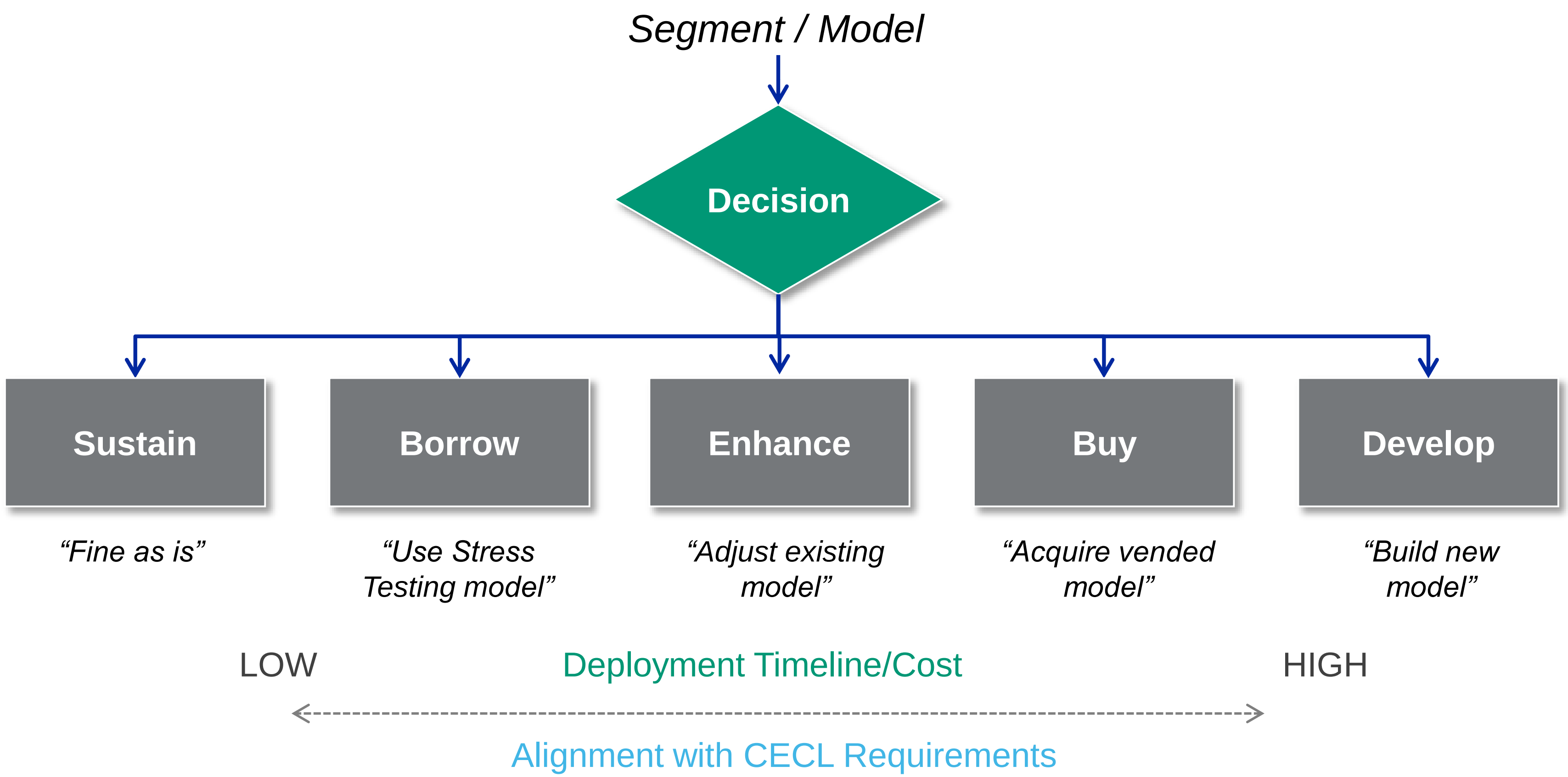
When is a Credit Model CECL-Compliant?

There are many modeling paths to CECL-compliance



Support Different Implementation Paths

Illustrative Loss Modeling Decision Tree



2

“But all I have is a rating”

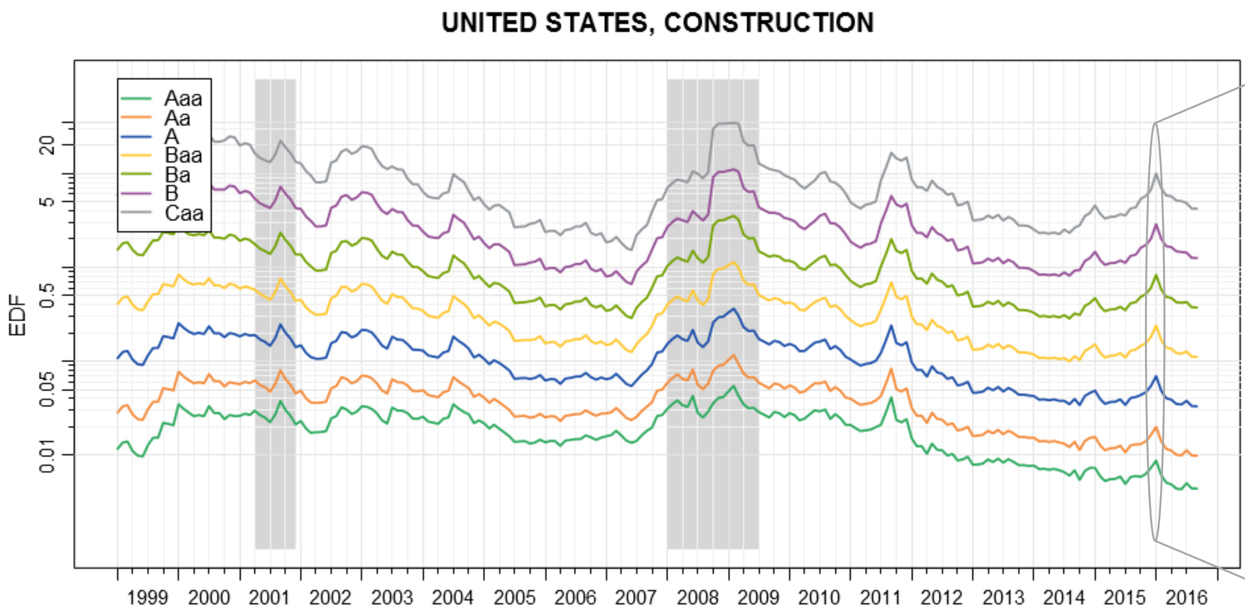
If All You Have is a Rating…

- Ratings are an ordinal ranking of credit risk; CECL requires a cardinal measure of expected losses
- Agency ratings are through-the-cycle measures of credit risk, rather than point-in-time. Internal ratings can be a mixture of both.

A rating is not CECL compliant…

But: We can help!

How Can I get a Point-in-Time PD From a Through-the-Cycle Rating?



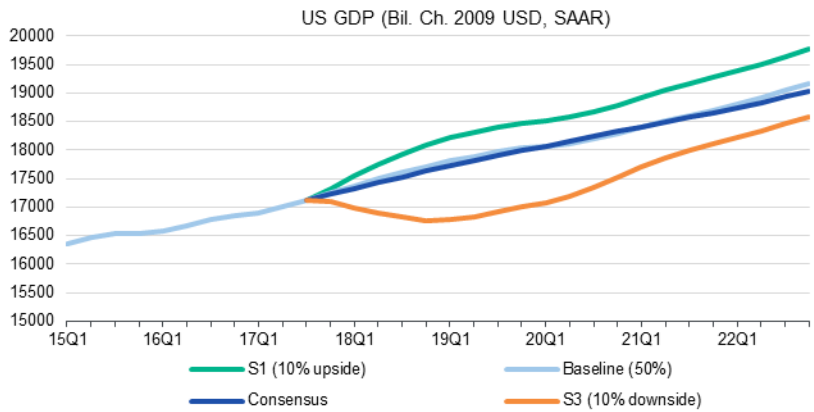
1-year PD

Rating\Maturity	1.00
Aaa	0.038%
Aa1	0.061%
Aa2	0.077%
Aa3	0.097%
A1	0.122%
A2	0.153%
A3	0.193%
Baa1	0.243%
Baa2	0.307%
Baa3	0.398%
Ba1	0.517%
Ba2	0.672%
Ba3	0.847%
B1	1.067%
B2	1.344%
B3	1.846%
Caa1	2.535%
Caa2	3.481%
Caa3	5.427%
Ca	13.192%
C	50.000%

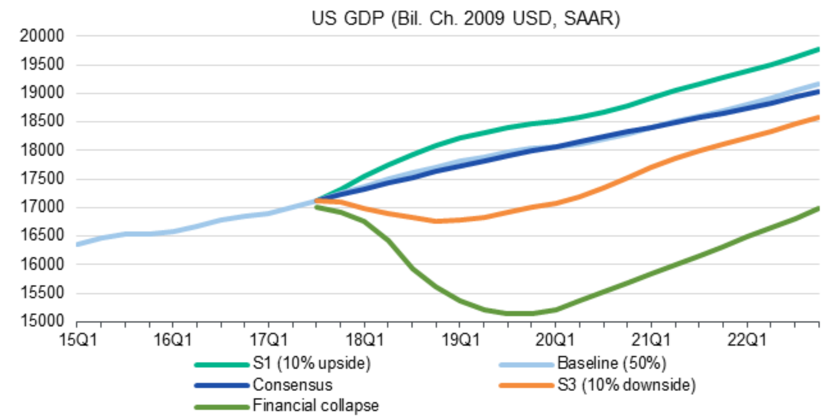
Source: Moody's CreditEdge

Incorporating an Economic Forecast

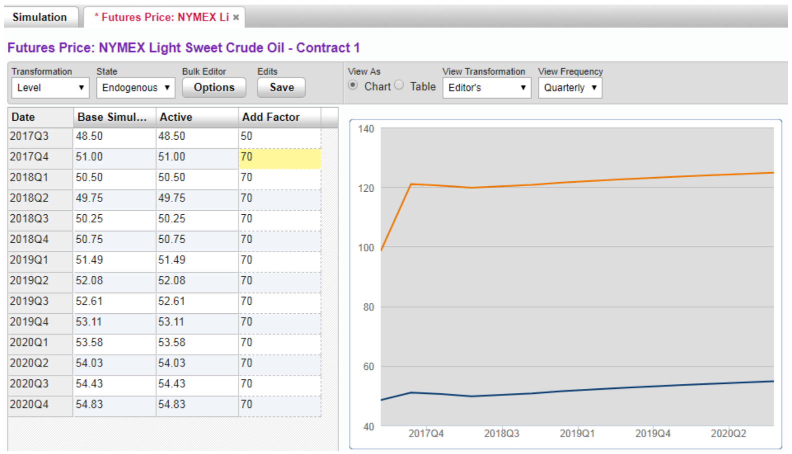
1 Off-the-shelf scenarios



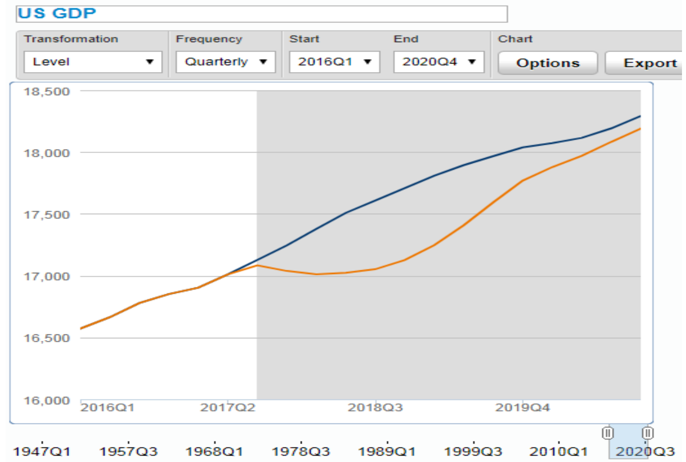
2 Fully customized scenarios



3 User-defined scenarios…



Date	Base Simul...	Active	Add Factor
2017Q3	48.50	48.50	50
2017Q4	51.00	51.00	70
2018Q1	50.50	50.50	70
2018Q2	49.75	49.75	70
2018Q3	50.25	50.25	70
2018Q4	50.75	50.75	70
2019Q1	51.49	51.49	70
2019Q2	52.08	52.08	70
2019Q3	52.61	52.61	70
2019Q4	53.11	53.11	70
2020Q1	53.58	53.58	70
2020Q2	54.03	54.03	70
2020Q3	54.43	54.43	70
2020Q4	54.83	54.83	70

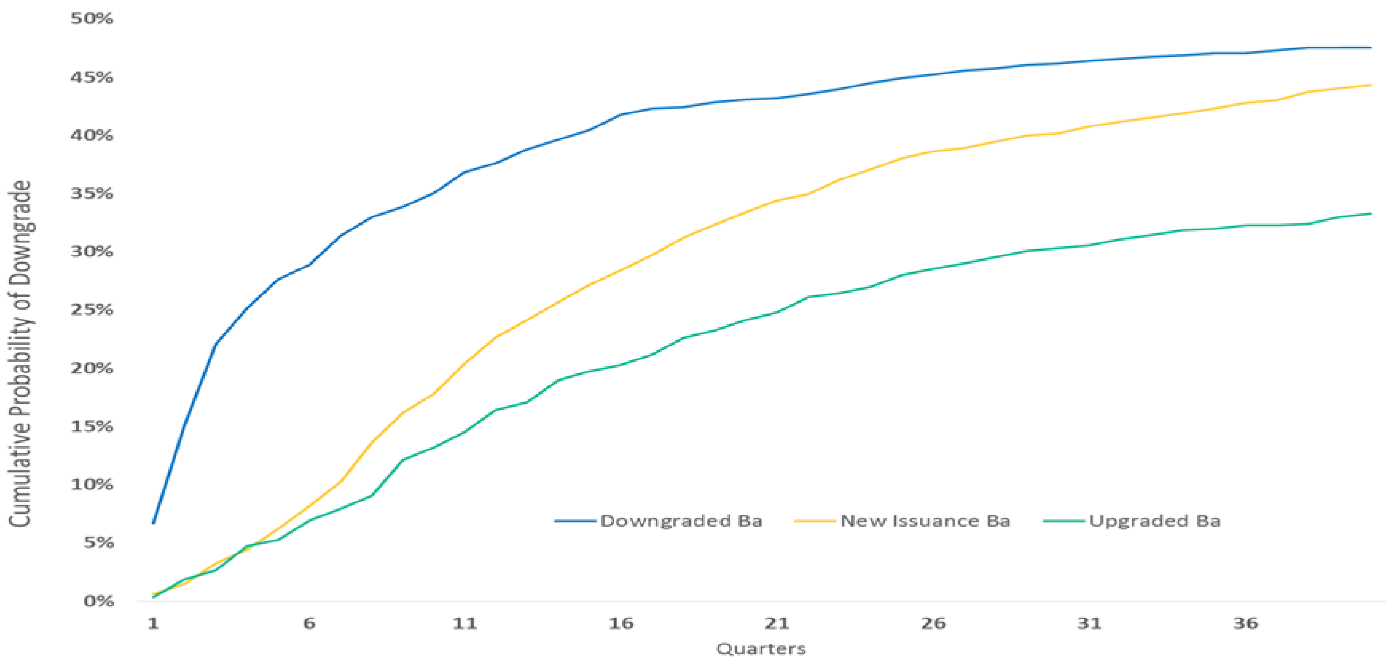


4 Embedded in Existing Models

Credit transitions

Forecast rating transition probabilities (including default) based on an economic forecast and a firm's ratings history

Cumulative Probability of Downgrade for US Ba Issuers, 1987-2016



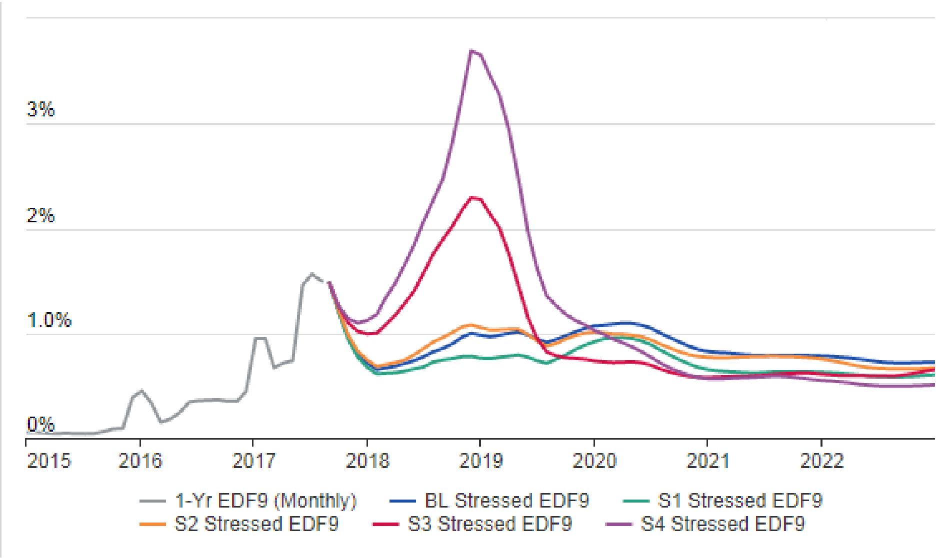
4 Embedded in Existing Models

Stressed PD forecast

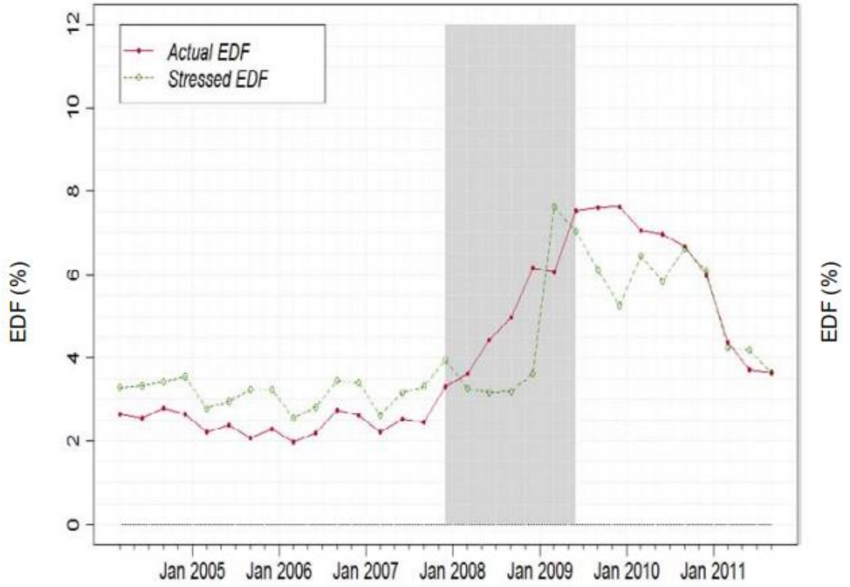
Forecasts the 1-year PD based on an economic forecast and firm-level data (financials, equity price, etc.)

Can be aggregated by region/industry/starting risk rating

Macy's Inc, 1-year EDF (%)

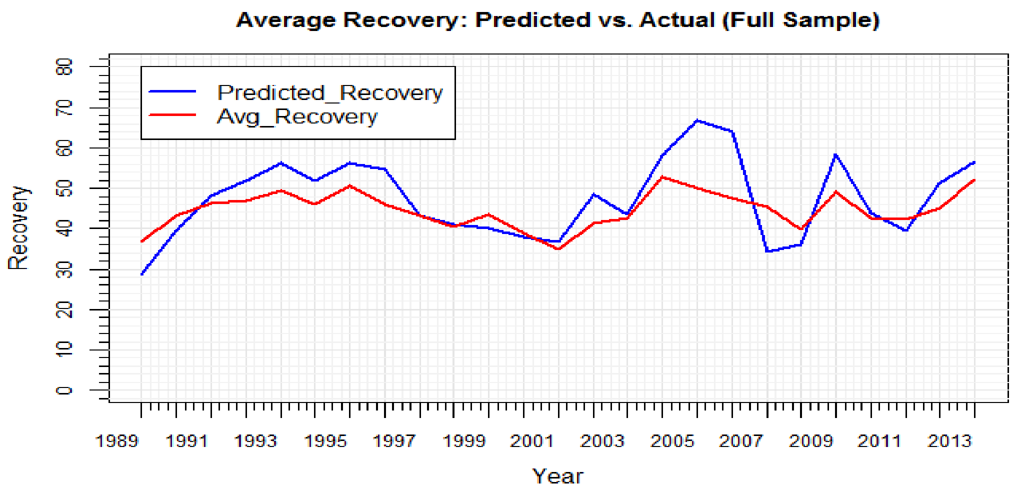


Private construction firms, 1-year EDF (%)



What About Loss Given Default?

» LGD is less important than PD when calculating expected losses
» For many institutions, a simple solution will be enough:
  – Historical LGD rates
  – Segmentation/pooling is encouraged



4 Embedded in Existing Models

Full coverage modeling solution + interface

Inputs

- Contractual Terms
- Forecast Scenarios
- Internal Credit Ratings or PDs
- Asset Classification

Moody's Analytics Impairment Calculation Automation

GCorr™ Macro Correlation based model

- Allowance Calculator
- Cash Flow Engine

Scenario based analysis

Moody's Analytics maintains

- Model Updates
- Scenario Management
- Business Support

Outputs

- Lifetime Expected Credit Loss
- Carrying Value & Amortized Cost
- Fair Value and Impairment
- Sensitivity Analysis
- Portfolio Reporting

3

Consumer Credit Challenges

CECL Methodology for Consumer Credit

- As in wholesale, guidance gives banks wide discretion
- Choice of CECL methodology depends on a variety of factors
- Industry-derived forecasts provide a low cost solution for smaller institutions
- Unlike some other asset classes, consumer credit typically…
  - ...has lots of data
  - …has lots of models (origination scorecards, pricing models, stress testing, etc.)

Main Methods for Consumer Credit

Portfolio-level

» Modeling losses at the asset class level is straightforward and less expensive

» Can capture broad sensitivities of performance to economic events

» Assumes consistency of portfolio profile. Ignores seasoning (or aging) of loans.

Account-level

» Loan-level models have the advantage of delivering loan-level forecasts and being able to control for heterogeneity within a portfolio.

» Most complex and flexible

Vintage-cohort

» Cohorting loans by common characteristics such as vintage, credit score, etc. can provide a happy medium between portfolio and loan level.

» Identify key areas of risk within a portfolio while maintaining model stability.

» Link macroeconomic scenarios to credit risk parameters.

Roll-Rate/Transition

» Transparent and easy to use

» Complexity varies across implementations

Potential Challenges

1. No Data, No Models
2. Limited Data or No Economic Drivers
3. Established Models
   a) Volatility of Net Present Value of Losses
   b) Lifetime Length Determination
4. Implementing a Discounted Cash Flow Approach

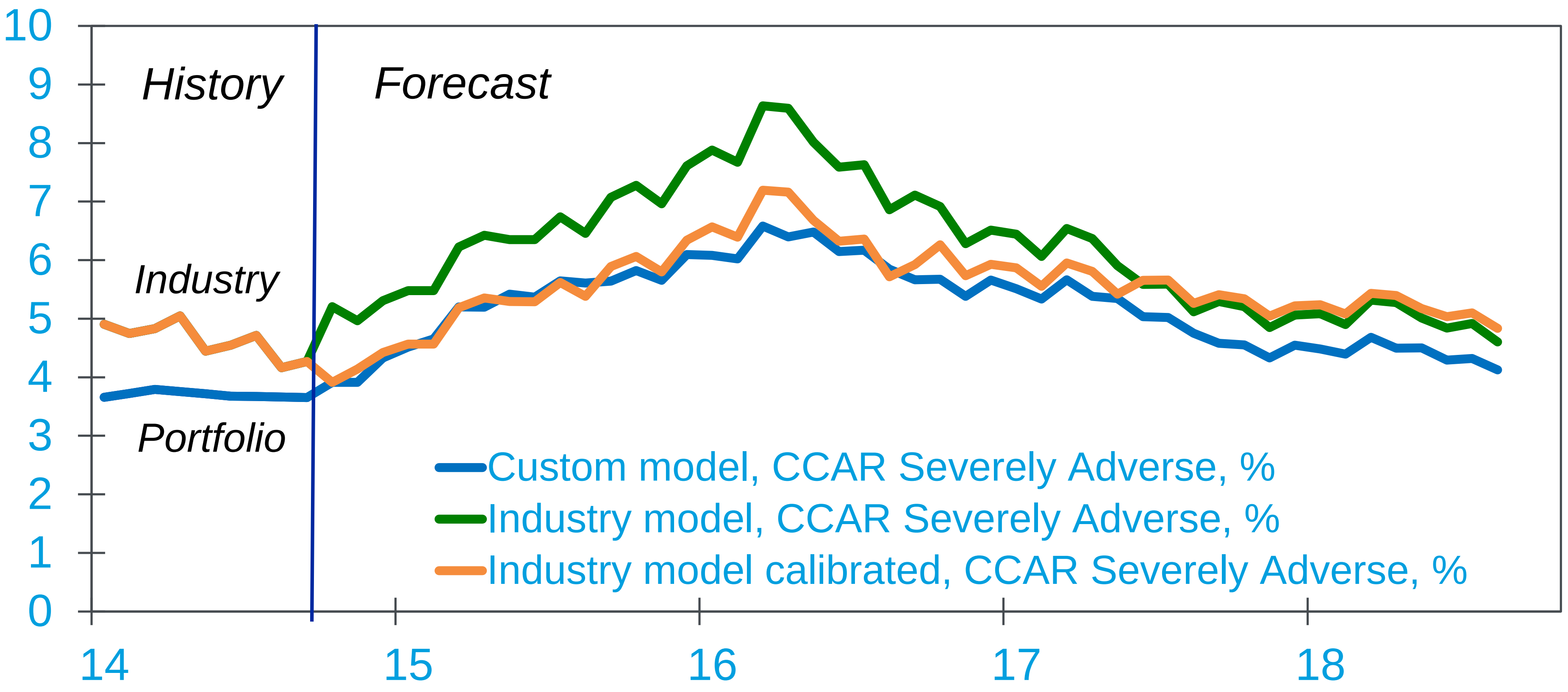
Case 1: No Data, No Models

Product	State	Credit Score	Origination Quarter	Outstanding Balance	PD Rate	LGD Rate	ECL Rate	ECL
Bankcard	CA	700-719	2009Q2	$100	4%	99%	4.0%	$ 4
Bankcard	CA	660-699	2011Q2	$300	6%	95%	5.7%	$ 17
Bankcard	CA	660-699	2013Q2	$500	7%	90%	6.3%	$ 32
Bankcard	CA	700-719	2015Q2	$200	4%	85%	3.4%	$ 7
Bankcard	CA	700-719	2017Q2	$700	5%	95%	4.8%	$ 33
Bankcard	CA	700-719	2019Q2	$1,000	6%	95%	5.7%	$ 57
Sum				**$2,800**				**$ 150**

Forward Looking Look-Up Table:
PD/LGD rates should be analytically driven estimates incorporating current and future economic conditions

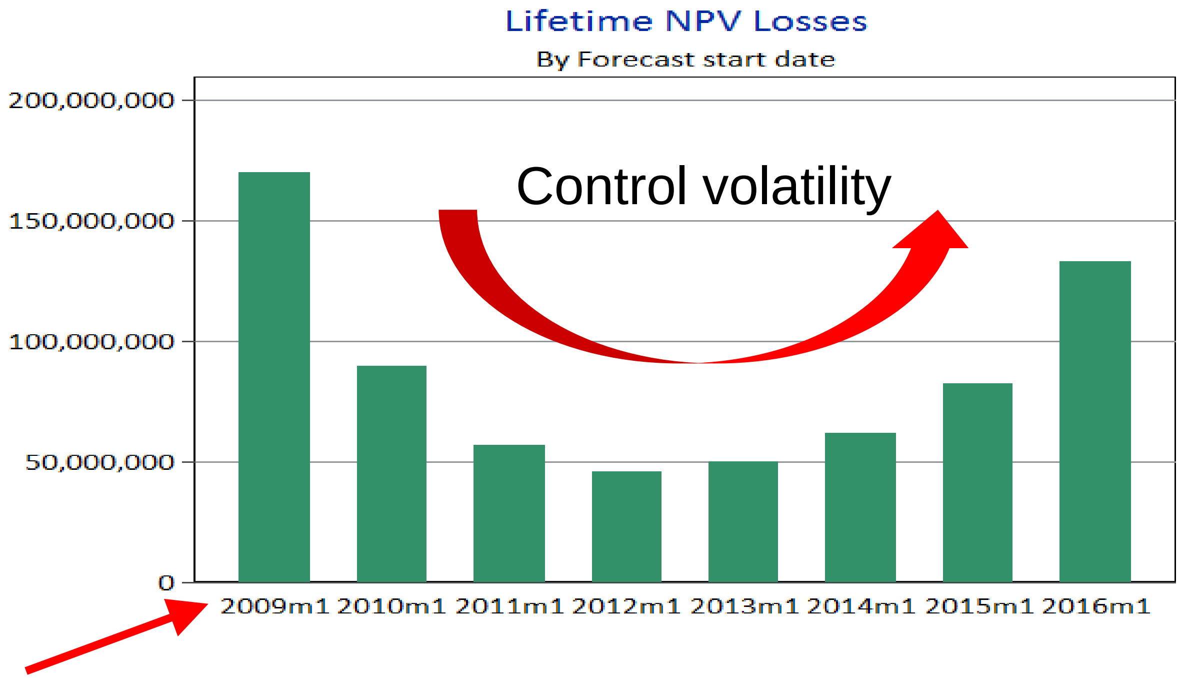
Case 2: Limited Data or No Economic Drivers

Conditional loss rate, % of balance, annualized



Case 3: New Analysis in Established Models

Net Present Value of Losses By Forecast Start Date



Compare to incurred loss methods

Lifetime Length Determination Depends on Asset

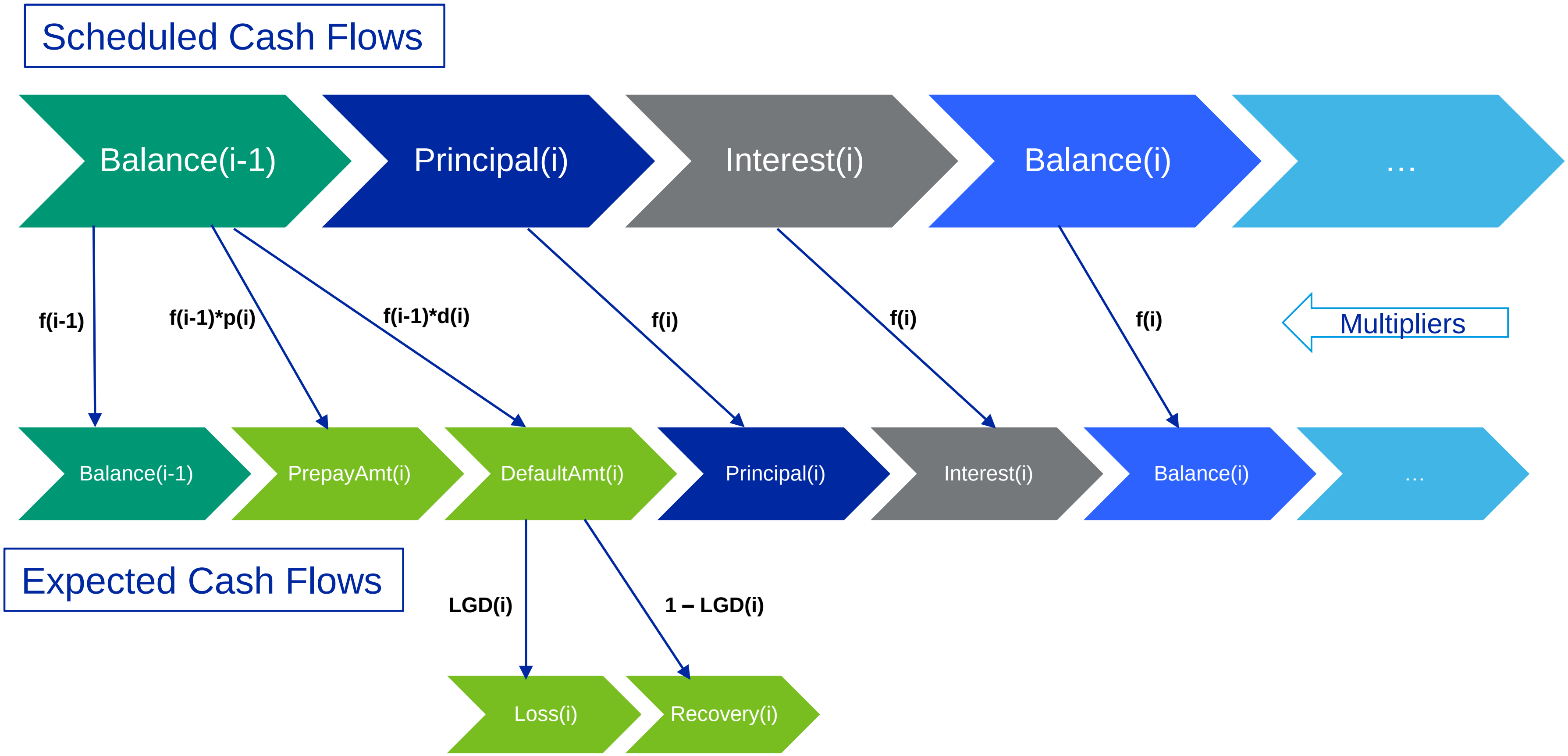
Credit Type	Examples of Products	Approach for Lifetime Length Determination
Non-revolving credit	Mortgages Loans Auto-Loans	Use contractual end date or behavioral life to identify lifetime length
Revolving credit	Credit Cards Current Accounts	Use date of periodic reviews OR Model behavioral life of portfolio

Case 4: Discounted Cash Flow Approach

- **Advantages**
  - Replicates the expected collectability of contractual cash flows including the expected timing of losses and prepayments.
  - The allowance is calculated as the difference between the recorded investment as of the balance sheet date, and the present value of expected cash flows discounted by the asset's effective interest rate.

- **Disadvantages**
  - Requires more data to run the models and generally has higher system requirements than non-DCF methods.
  - Requires one to also model prepayment.

Generating Cash Flows



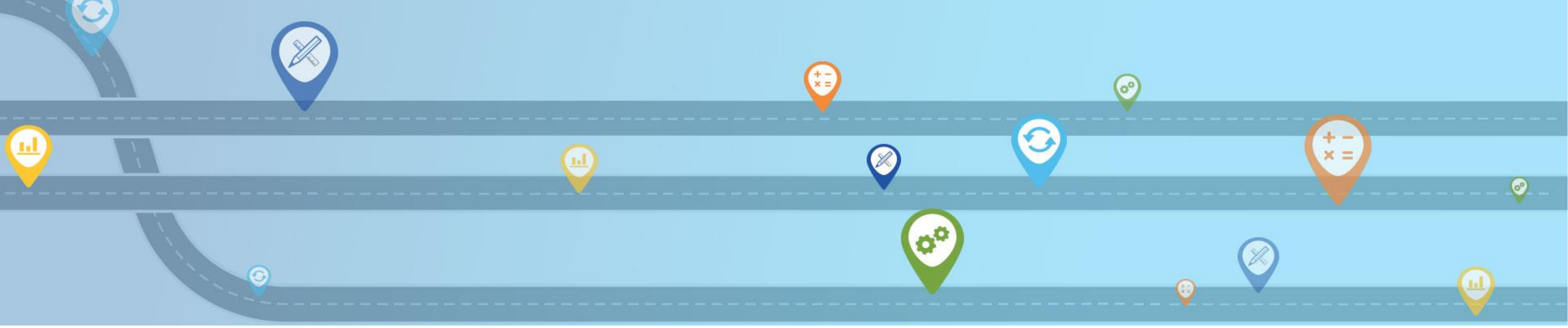
d(i) = Default probability, p(i) = Prepayment probability, LGD(i) = Loss Given Default

f(i) = Survival probability after period i

$f(i) = f(i-1) * (1 - p(i) - d(i))$

Key Takeaways

- CECL is a broad directive
  - There are many paths to CECL compliance.
  - Some models can be used as-is. Others can be modified to be made CECL-compliant.
- The choice of modeling solution will depend on:
  - Portfolio materiality and institution size
  - Type of exposures
  - Existing models
  - Data availability
  - Cash flows/prepayment risk
  - Other considerations (e.g. budget, existing models)



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Theme: The Rise of Risktech

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