Moody's
ANALYTICS

Basel III

Standard Approach and Rating Based Approach

June 2018

Introduction

Mike Mueller, Senior Director, Content Solutions – Structured

- 13 years of experience at Moody's Investors Service (MIS) leading the development of structured finance credit rating models
- Deep experience in multiple asset classes including European residential mortgages, global leveraged loans, corporate issuers
- Creator of Moody's CDOROM™ in addition to rating models used internally by MIS for CLOs, RMBS, SME
- Honours degree in Electrical & Electronic Engineering

Domitille de Coincy, Associate Director, EMEA Regulatory & Risk

- Responsible for EMEA Regulatory and Risk solutions for Structured Finance, including development and support of regulatory solutions for PRA annual stress testing, IFRS 9 and Basel reporting.
- Developed IFRS 9 (SPPI and impairment) methodology and automated solution for Structured Finance securities
- Expertise in loan level credit models and ABS cashflow models for many asset classes including US RMBS and SLABS and EMEA-APAC CLOs, RMBS and ABS
- MA in Mathematics of Finance from Columbia University

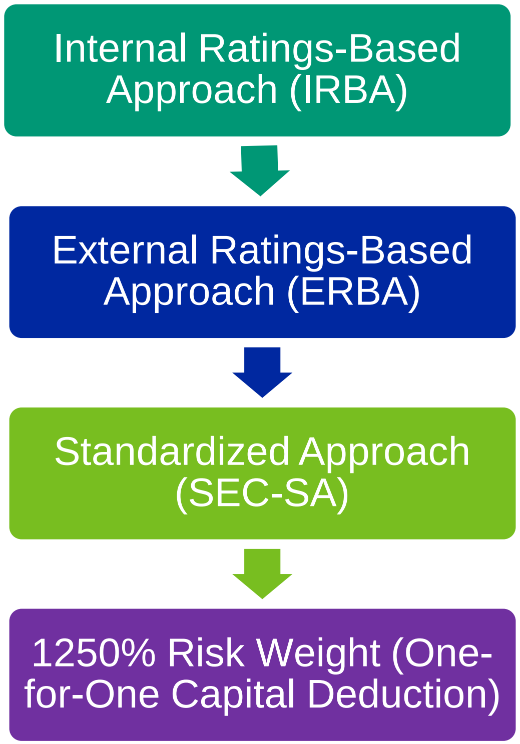
Agenda

1. Basel III Methodology for Structured Finance
2. Internal Rating-Based Approach (IRBA)
3. External Rating-Based Approach (ERBA)
4. Standardized Approach
5. Internal Assessment Approach (IAA) for ABCP conduits
6. Q&A

1

Basel III Methodology for Structured Finance

Basel III Hierarchy



» **Internal Ratings-Based Approach (IRBA):** applied if sufficient information is available to determine capital charges for the pool of underlying exposures

» **External Ratings-Based Approach (ERBA):** applied if IRBA may not be applied, and if permitted in the relevant jurisdiction

» **Standardized Approach for Securitization (SEC-SA):** applied if both IRBA and ERBA may not be applied

» **1250% Risk Weight (One-for-One Capital Deduction):** applied if no other calculation type may be applied

STC

What does STC mean?

Simplicity	Simplicity refers to the homogeneity of underlying assets with simple characteristics, and a transaction structure that is not overly complex.
Transparency	Criteria for transparency provide investors with sufficient information on the underlying assets, the structure of the transaction and the parties involved in the transaction, thereby promoting a more comprehensive and thorough understanding of the risks involved. The manner in which the information is available should not hinder transparency, but instead support investors in their assessment.
Comparability	Criteria promoting comparability could assist investors in their understanding of such investments and enable more straightforward comparison across securitisation products within an asset class. Importantly, they should appropriately take into account differences across jurisdictions.

- The most recent July 2016 update of the Basel Committee securitization standard specifies alternative capital treatment for securitizations that meet the STC criteria.
- Under all three approaches in the hierarchy, the risk weight for STC-complaint securitizations is subject to a floor of 10% for senior tranches and 15% for non-senior tranches.

Integrated Solution for Basel III

Macro Economic and IR Models

- MA Alternative and Custom Scenarios
- Fed/PRA Scenarios

Data

- Historical Performance and Reference Data
- Pool Level and Loan Level

Credit Models

- Asset Class Specific Credit Model
- CMM, MPA, PA, Credit Edge / RiskCalc, AFT, AdCo

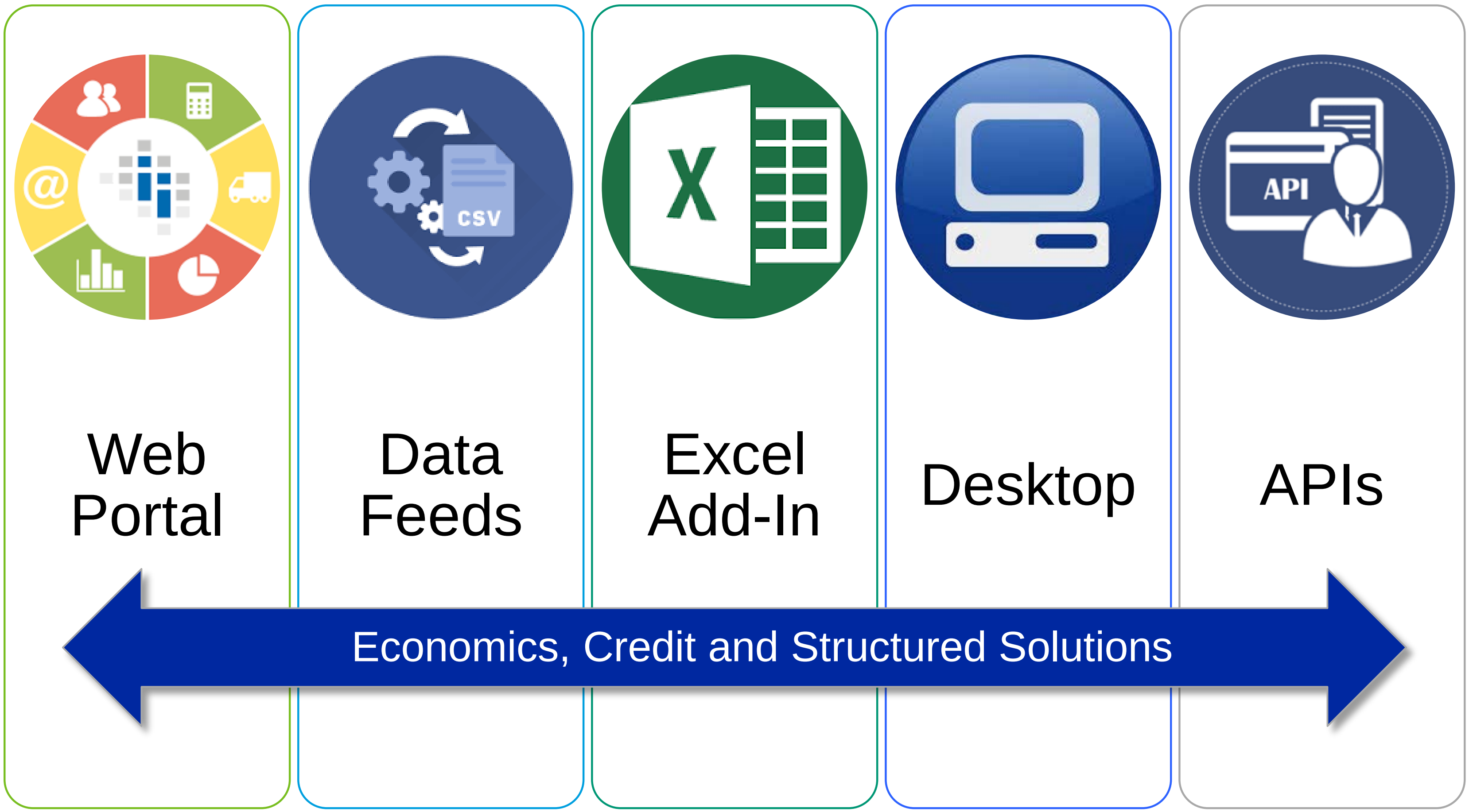
Cash Flow Models

- Deal Specific Waterfall Models
- Bond and Collateral Performance Data

Advanced Analytics

- Bond and Collateral Cash Flows
- Advance Risk and Regulatory Metrics

Basel III Delivery Options



2

Internal Rating-Based Approach

Required Data for Basel III IRB

- In the IRBA the capital requirement depends on the credit enhancement level and tranche thickness, along with the calculation of KIRB. In addition, the capital charge would be based on certain inputs that determine the “p” parameter.

PARAMETER	EXPLANATION
AP	Attachment Point
DP	Detachment Point
Kirb	Weighted average capital charge of underlying pool
p	supervisory calibration parameter
Mt	Effective Maturity

IRBA – Mechanics

- The supervisory parameter will depend on the pool LGD and the tranche Maturity:

Non-STC securitizations: $p = \max\left[0.3; \left(A + B * \left(\frac{1}{N}\right) + C * K_{IRB} + D * LGD + E * M_T\right)\right]$

STC-compliant securitizations: $p = \max\left[0.3; \left(A + B * \left(\frac{1}{N}\right) + C * K_{IRB} + D * LGD + E * M_T\right) * 0.5\right]$

- Kssfa will be calculated based on the Kirb and the p:

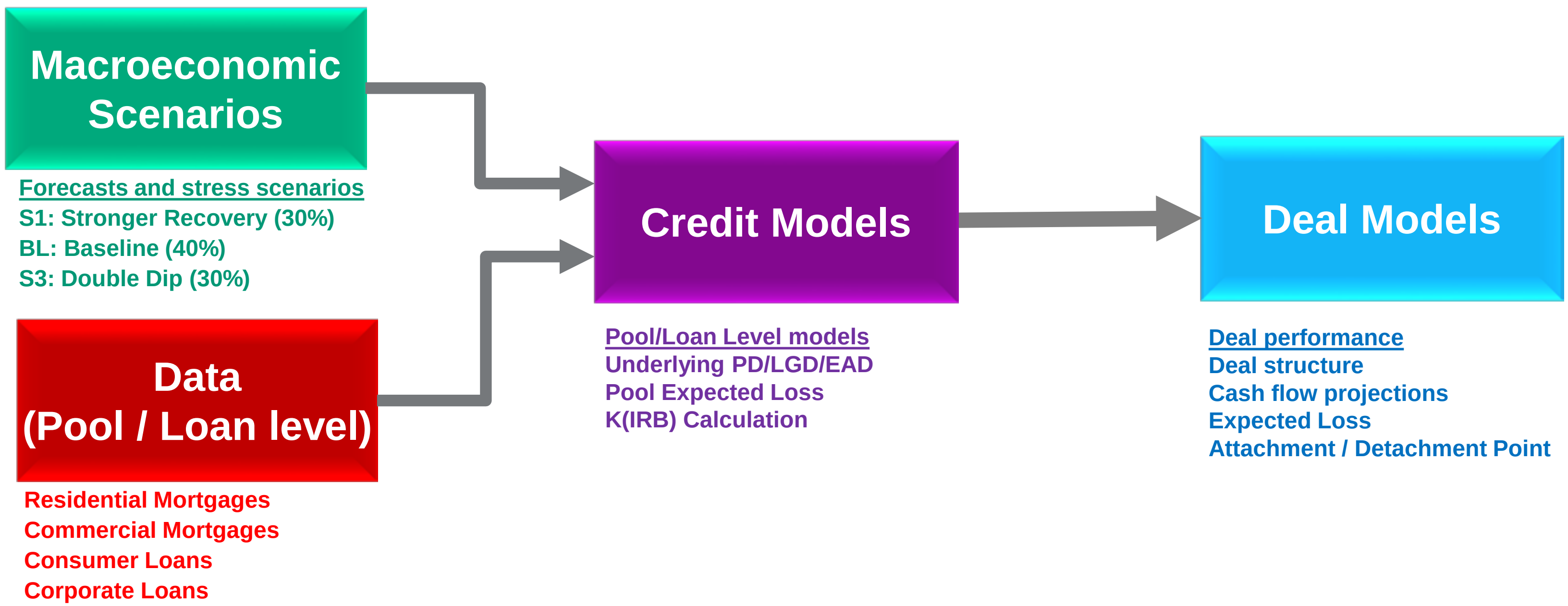
$\mathrm{K}_{\mathrm{SSFA}(\mathrm{K}_{\mathrm{IRB}})} = (e^{a \cdot u} - e^{a \cdot l})/(a(u - l)$ where

$a = -(1/(p * \mathrm{K}_{\mathrm{IRB}})), u = D - \mathrm{K}_{\mathrm{IRB}}, l = \max(A - \mathrm{K}_{\mathrm{IRB}}; 0)$, and e = 2.71828 (base of natural logarithms)

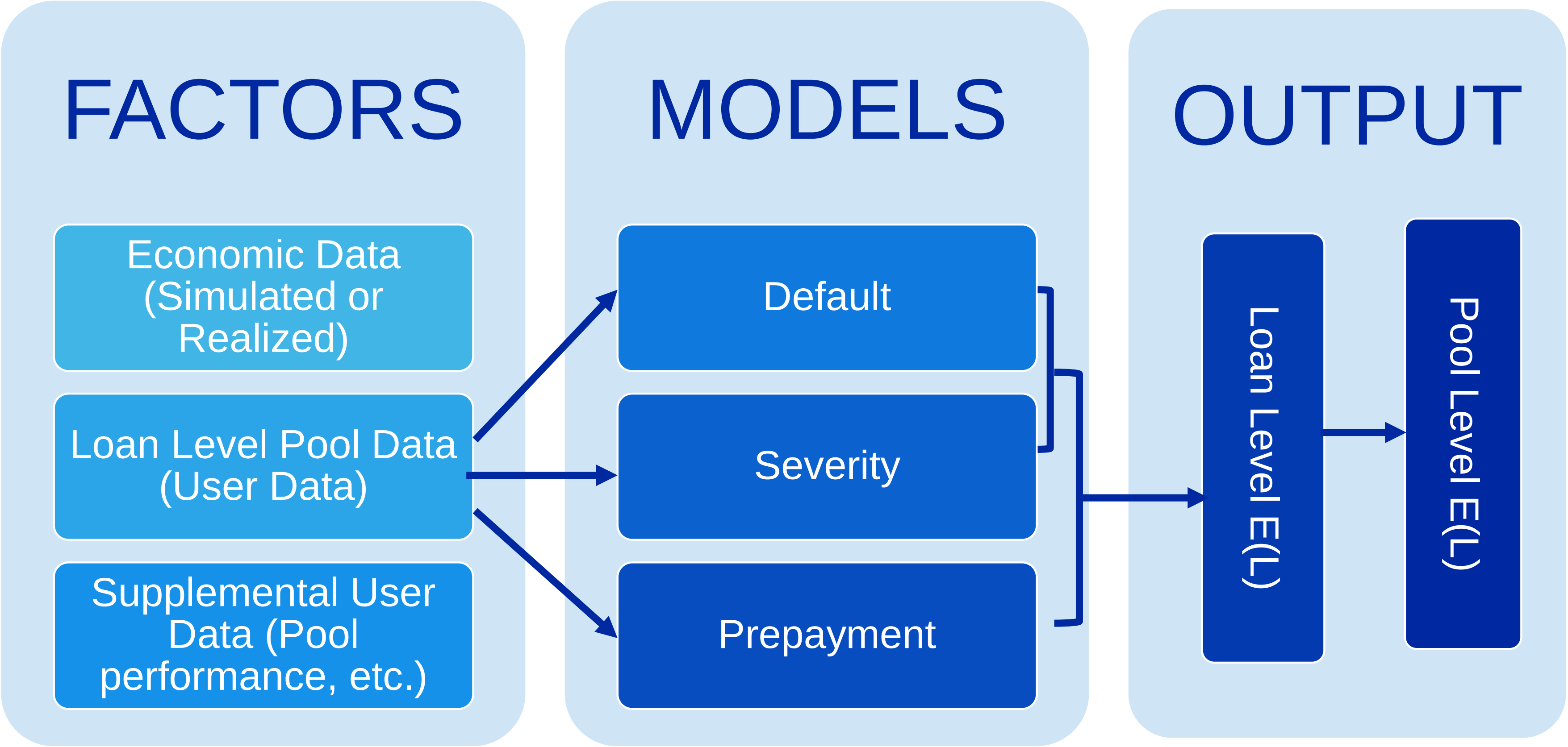
- Finally, the risk weight will depend on Kirb, Kssfa and the tranche AP and DP:

$$\text{Risk weight} = \begin{cases} 1{,}250\% \; [\mathit{when}\ D \le K_{IRB}] \\ \left[\left(\frac{\mathrm{K}_{\mathrm{IRB}} - A}{D - A}\right) * 12.5\right] + \left[\left(\frac{D - \mathrm{K}_{\mathrm{IRB}}}{D - A}\right) * 12.5 * \mathrm{K}_{\mathrm{SSFA}(\mathrm{K}_{\mathrm{IRB}})}\right] [\mathit{when}\ A < K_{IRB}\ \mathit{and}\ D > K_{IRB}] \\ \mathrm{K}_{\mathrm{SSFA}(\mathrm{K}_{\mathrm{IRB}})} * 12.5 [\mathit{when}\ A \ge K_{IRB}] \end{cases}$$

IRBA – Methodology



Credit Model: Mortgage Portfolio Analyzer



Training Data Example: UK RMBS

- Loan Level RMBS Data: EDW data and proprietary, collected by Moody's Analytics
- Loan level characteristics and monthly performance data: More than *2.2 million loans* and *75 million observations*

Loan & Borrower Characteristics:

- Mortgage type, payment type, loan-to-value, interest rate, loan term, origination balance, purchase price, occupancy/property/purpose type, geographic region, etc.
- Employment status, primary/secondary income, credit quality, borrower age, debt-to-income ratio, etc.
- Monthly remaining balance, arrears status, prepayment, current interest rate, default date, default type and sale price.

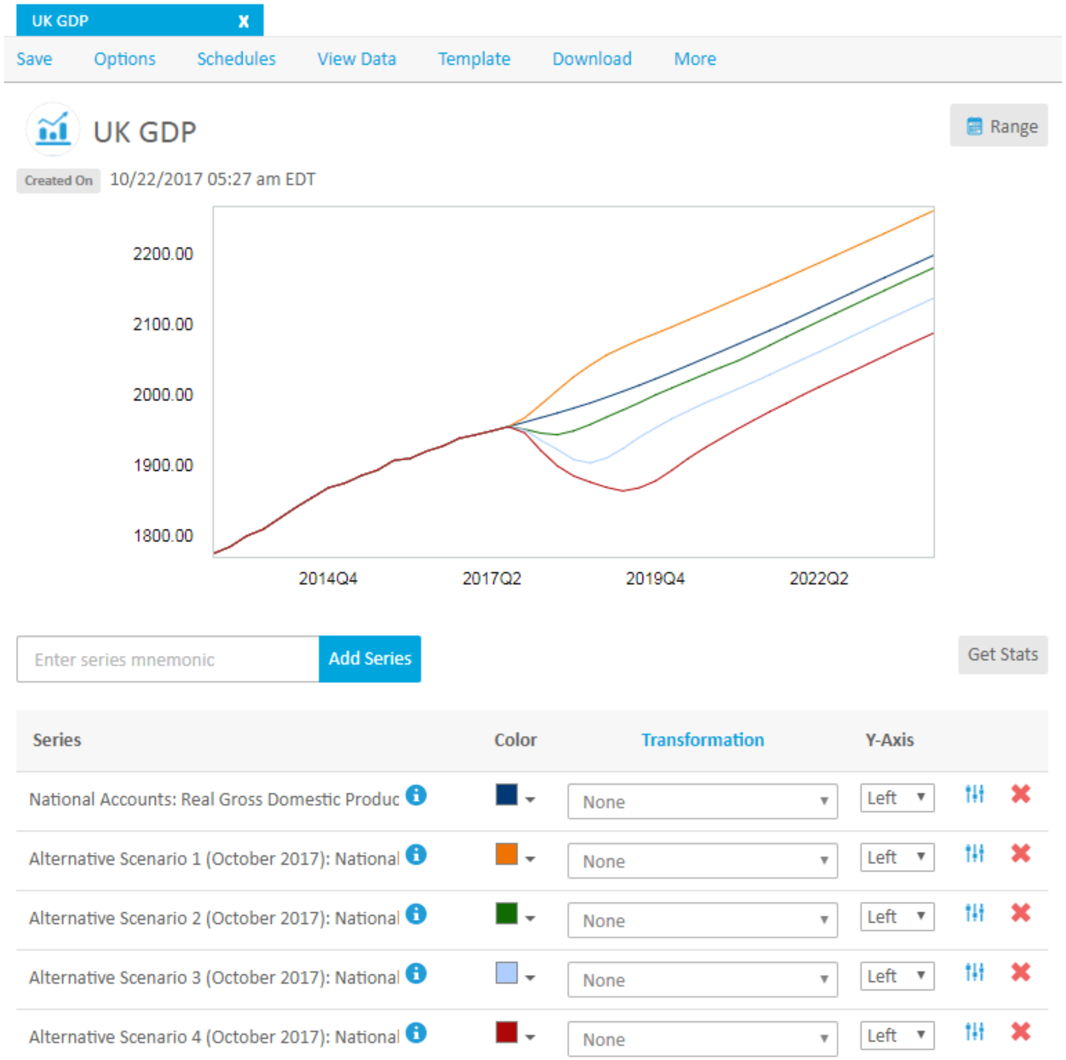
Macroeconomic Data:

- Collected by Moody's Analytics
- Home prices and unemployment rate

  for UK and 12 regions
- Interest rates for UK

Macroeconomic scenarios

- » Macroeconomic Model (1800+ variables)
- » Historical data for over 160 countries
- » Forecasts for over 70 countries
- » Baseline & over a dozen alternative scenarios



3

External Rating-Based Approach

Required Data for Basel III ERBA

- ERBA assigns risk weights to rated securitization exposures based in part on qualifying CRA ratings
- ERBA risk weights are determined using a formula based on qualifying CRA ratings, tranche seniority, interpolation for tranche maturities between 1-5 years, and adjustment for thickness of non-senior tranches

*Risk weight = [risk weight from table after adjusting for maturity] * [1 – min(T; 50%)],*

PARAMETER	EXPLANATION
AP	Attachment Point
DP	Detachment Point
T	Thickness = DP - AP
Rating	External rating grade or inferred rating
Seniority	Seniority of the tranche
MT	Tranche Maturity (floored and capped)

ERBA – Risk-Weights

Rating	Senior tranche		Non-senior (thin) tranche	
	Tranche maturity (M_T)		*Tranche maturity (M_T)*	
	1 year	*5 years*	*1 year*	*5 years*
AAA	15%	20%	15%	70%
AA+	15%	30%	15%	90%
AA	25%	40%	30%	120%
AA–	30%	45%	40%	140%
A+	40%	50%	60%	160%
A	50%	65%	80%	180%
A–	60%	70%	120%	210%
BBB+	75%	90%	170%	260%
BBB	90%	105%	220%	310%
BBB–	120%	140%	330%	420%
BB+	140%	160%	470%	580%
BB	160%	180%	620%	760%
BB–	200%	225%	750%	860%
B+	250%	280%	900%	950%
B	310%	340%	1050%	1050%
B–	380%	420%	1130%	1130%
CCC+/CCC/CCC–	460%	505%	1,250%	1,250%
Below CCC–	1,250%	1,250%	1,250%	1,250%

ERBA – Results

- Users can adjust risk weight boundaries at each rating level and perform notch-based what-if scenarios, measuring the risk weight impact of potential rating upgrades/downgrades at security level

EXTERNAL RATING BASED APPROACH RESULTS

Deal & Tranche	CUSIP / ISIN	Current Exposure	Final Rating	Stated Maturity	Maturity(Mt)	Senior/Non Senior	Thickness	Risk Weight %	Regulatory Capital %
BUSINESS MORTGAGE FINANCE 6 PLC - M2	XS0271324997	36,500,000	B3	2039-02-15	5.00	Non Senior	0.64	565.00%	45.20%
AYT GENOVA HIPOTECARIO VIII FTH - B	ES0312344023	12,745,992	Baa3	2039-06-15	5.00	Non Senior	0.02	410.88%	32.87%
BBVA 6 FTPYME FTA - B	ES0370460026	4,944,364	CCC	2046-03-22	5.00	Senior	0.11	505.00%	40.40%
BRUNEL RMBS NO. 1 PLC - B4A	XS0289324138	43,127,157	Aaa	2039-01-13	5.00	Non Senior	0.05	66.46%	5.32%

Portfolio Information | Intermediate Metrics | Results

4

Standardized Approach

Required Data for Basel III SEC-SA

- SEC-SA is similar to the US Simplified Supervisory Formula Approach (SSFA), determining the risk weight of a securitization exposure using a formula based on:

PARAMETER	EXPLANATION
AP	Attachment Point
DP	Detachment Point
W	Delinquency ratio of the underlying pool
Ksa	Weighted average capital charge of underlying pool
Ka	Ksa adjusted by W
p	supervisory calibration parameter for re-securitization

SEC-SA – Mechanics

- Ksa and W are used to calculate Ka, the augmented value of Ksa, which reflects the observed credit quality of the underlying pool of exposures. Ka is defined below.

$$K_A = (1 - W) \cdot K_{SA} + W \cdot 0.5$$

- The values of parameters A and D, relative to Ka, determine the specific risk-weighting factor assigned to a position as described below.
- When the detachment point D, for a securitization is less than or equal to Ka, the position must be assigned a specific risk- weighting factor of 1250 percent.
- When A is less than Ka and D is greater than Ka, the specific risk-weighting factor is a weighted average of 1.00 and Kssfa, but with parameter A revised to be set equal to Ka.

$$\text{Risk weight} = \begin{cases} 1{,}250\% \text{ [when } D \leq K_A \textit{ or delinquency status unknown} > 5\% \textit{ of all underlying]} \\ \left[\left(\frac{K_A - A}{D - A}\right) * 12.5\right] + \left[\left(\frac{D - K_A}{D - A}\right) * 12.5 * K_{SSFA(K_A)}\right] \quad \text{[when } A < K_A \text{ and } D > K_A\text{]} \\ K_{SSFA(K_A)} * 12.5 \text{ [when } A \geq K_A\text{]} \end{cases}$$

SEC-SA – Results

RISK WEIGHT CALCULATOR

Show 10 Items **SECSA Summary** | Kg Components | W Components | AP/DP Components Data

Search:

Deal and/or Tranche	Current Exposure	Capital Charge	Risk Weight	Kg	W	Ka	Attachment Point (AP)	Detachment Point (DP)	Resec %
Dryden 35 Euro CLO 2014 BV - E	27,100,000	23.18%	289.80%	8.00%	0.00%	8.00%	11.09%	17.42%	0.00%
FORNAX ECLIPSE 2006-2 BV - G	6,687,925	80.04%	1,000.49%	8.00%	0.00%	8.00%	0.00%	13.83%	0.00%
F-E MORTGAGES S.R.L. - C	11,000,000	2.46%	30.77%	8.00%	2.68%	9.13%	22.28%	31.18%	0.00%

Portfolio Information   Results   Intermediate Metrics

- Users can review data components for each metric used in the final result calculation
- Users can adjust the risk weight impact of multiple factors, including performance metrics and Kg categories across sub-asset classes

5

IAA

Internal Assessment Approach

- For ABCP conduits the CRR bank regulation allows banks to apply a tailored method to determine the capital charge, the so called Internal Assessment Approach (“IAA”), provided the regulator has granted permission.
- The IAA consists in developing rating models to derive the rating for each client financing, using a Credit Rating Agency (CRA) methodology for the relevant asset class.

Qualitative review

- Methodology Review
- Data Review, Inputs and Sources
- Feasibility Testing

Quantitative Review

- Recommendations on other Best Practice Model Comparisons
- Review of waterfall models, inputs (default/prepayment) and outputs (cash flows and losses)
- Review of potential external or additional internal data

Conclusion

- Observations, Findings and Recommendations
- Roadmap and timeline for implementation
- Production of full model documentation
- Production of model opinion including evaluation and validation services

Off-the shelf CRA implementations

Product	Methodology
RiskCalc	Credit Model: CLO, SME
Moody's CDOROM	Credit Model: CLO, SME, Trade Receivable Deal Model: Synthetic or simple synthetic-like structures
CDOEdge	Deal Model: CLO, SME
SFW	Deal Model: ABS, RMBS, CMBS

7

Q&A

MOODY'S
ANALYTICS

Domitille de Coincy
Associate Director
Moody's Analytics
One Canada Square
London, United Kingdom
+44 207 772 5291 tel
+44 781 183 7979 mob
Domitille.deCoincy@moodys.com

Mike Mueller
Senior Director
Moody's Analytics
One Canada Square
London, United Kingdom
+44 207 772 5553 tel

Mike.Mueller@moodys.com