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ABOUT

Research on the methodology to determine the Weighted Average Maturity of the contractual payments due under the tranche, and analyzing the impact on the risk weight calculation of a securitization transaction for the Ratings-Based Approach.

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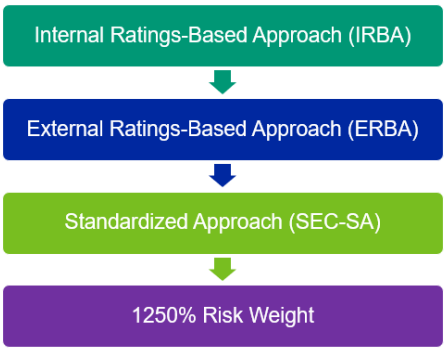
Calculation of Tranche Maturity for SEC-ERBA

Introduction

The Basel 3 framework was developed as a response to the 2008 credit crisis. Some of its main foci are the risk-weighted assets (RWA), internal ratings and the setting of regulatory capital floors. The calculation of RWA can be done through different approaches according to the hierarchy below:



In this paper, we specifically explore the External Ratings Based Approach (ERBA). The ERBA is applied if the Internal Ratings-Based Approach (IRBA) may not be applied and if permitted in the relevant jurisdiction. ERBA assigns risk weights to rated securitization exposures based on qualifying CRA ratings, tranche seniority, interpolation for tranche maturities between 1-5 years, and adjustment for thickness of non-senior tranches.

This paper focuses on the calculation of tranche maturity for securitization exposures, and specifically on how different assumptions can impact the Weighted average Maturity (WAM) calculation and resulting RWA. Comparative results are presented from a sample dataset of 1000 ISINS across EMEA asset classes, countries and seniorities.

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ERBA Overview

When applying the SEC-ERBA, the RWA is defined by the external rating of the tranche, its seniority, thickness and its maturity as defined in article 68 of the "*Basel III Document Revisions to the securitisation framework*"[1].

Risk Weight for Senior Tranches

For long-term exposures for non-STC senior tranches, the risk weight should be calculated through a linear interpolation of their tranche maturity according to the table in Figure 1 below.

Figure 1 ERBA risk weight for long-term exposures for senior non-STC tranches

RATING[2]	SENIOR TRANCHE	
	TRANCHE MATURITY (M_T)	
	1 YEAR	5 YEARS
Aaa	15%	20%
Aa1	15%	30%
Aa2	25%	40%
Aa3	30%	45%
A1	40%	50%
A2	50%	65%
A3	60%	70%
Baa1	75%	90%
Baa2	90%	105%
Baa3	120%	140%
Ba1	140%	160%
Ba2	160%	180%
Ba3	200%	225%
B1	250%	280%
B2	310%	340%
B3	380%	420%
Caa1 / Caa2 / Caa3	460%	505%
Below Caa3	1250%	1250%

[1] https://www.bis.org/bcbs/publ/d374.pdf

[2] The rating grades shown are Moody´s Ratings, however this is only illustrative.

Risk Weight for Non-Senior Tranches

For non-senior tranches, using the risk weight interpolated for the tranche maturity using the table in Figure 2 below, and using the tranche thickness, the risk weight should be calculated using the following formula:

$$Risk\ Weight = (risk\ weight\ from\ Figure\ 2\ \ adjusted\ to\ maturity)\ \times\ (1 - \min(T; 50\%))$$

Where *T* is the tranche thickness.

Figure 2 ERBA risk weight for long-term exposures for non-senior non-STC tranches

RATING[3]	NON-SENIOR TRANCHE	
	TRANCHE MATURITY (M_T)	
	1 YEAR	5 YEARS
Aaa	15%	70%
Aa1	15%	90%
Aa2	30%	120%
Aa3	40%	140%
A1	60%	160%
A2	80%	180%
A3	120%	210%
Baa1	170%	260%
Baa2	220%	310%
Baa3	330%	420%
Ba1	470%	580%
Ba2	620%	760%
Ba3	750%	860%
B1	900%	950%
B2	1050%	1050%
B3	1130%	1130%
Caa1 / Caa2 / Caa3	1250%	1250%
Below Caa3	1250%	1250%

For STC compliant securities, the resulting risk weight is subject to a floor risk weight of 10% for senior tranches, and 15% for non-senior tranches.

In both cases, the effective maturity has a floor of 1 year and a cap of 5 years; consequently, different maturities are restrained by these effective maturities limits. For instance, an effective maturity of 6 years must follow the 5 years rule.

$$Risk\ Weight\ for\ a\ Maturity\ equal\ to\ X\ =\ RW_{year\ 1} + (\ X - 1)\ \times \frac{RW_{\ year\ 5} - RW_{\ year\ 1}}{5 - 1}$$

Where X is equal to tranche maturity and RW stands for risk weight weight according to the tables above.

The definition of tranche maturity (Mt) has implications for Risk weight calculations and therefore it is crucial to evaluate the impact of its calculation.

[3] The rating grades shown are Moody's Ratings, however this is only illustrative.

Tranche Maturity Calculation

The tranche maturity is the effective maturity that is remaining and is expressed in years. In order to calculate it, the institution can choose between two possible ways as defined in article 22 of the "*Basel III Document Revisions to the securitisation framework*":

a. The weighted-average maturity of the contractual remaining cash flows of a tranche, is calculated using the following formula:

$$M_T = \frac{\sum_t t \times CF_t}{\sum_t CF_t}$$

Where CF_t denotes the cash flows (the sum of principal, interest and fees) contractually paid in the period t by the borrower.

This approach is also known as the Weighted Average Maturity, WAM, approach.

b. Based on tranche final legal maturity, using the formula:

$$M_T = 1 + (M_L - 1) \times 80\%$$

Where M_L stands for the tranche final legal maturity.

The latter is easier to implement, but produces maturity levels consistently higher than the WAM approach regardless of the assumptions applied.

The below table shows the joint distribution of tranche maturity results for German Auto-ABS calculated using:

a. WAM approach with Baseline macroeconomic scenario (see description of approach below).

b. Tranche Legal Maturity.

Figure 3 Joint distribution of tranche maturity for German Auto-ABS

		(b) Mt from Legal Maturity			
	Years	[2,3[	[3,4[	[4,5[	5
(a) Mt from Average Life (Baseline)	1	2.02%	0.00%	3.77%	14.66%
	]1,2[	0.05%	0.00%	3.76%	46.09%
	[2,3[	0.00%	0.00%	0.82%	7.84%
	[3,4[	0.00%	0.00%	0.23%	17.21%
	[4,5[	0.00%	0.00%	0.00%	0.75%
	5	0.00%	0.94%	0.00%	1.87%

As can be seen from the table above:

» There are almost no cases where the Legal Maturity approach leads to lower tranche maturity (lower diagonal).

» Almost half the tranches with a Legal Maturity implied WAM of 5 years have an Average Life implied maturity of 1-2 years.

Assumptions for Calculating the WAM

In the below analysis, we are investigating the various assumptions that can be applied to calculate the WAM, as well as their feasibility and impacts on RWAs results.

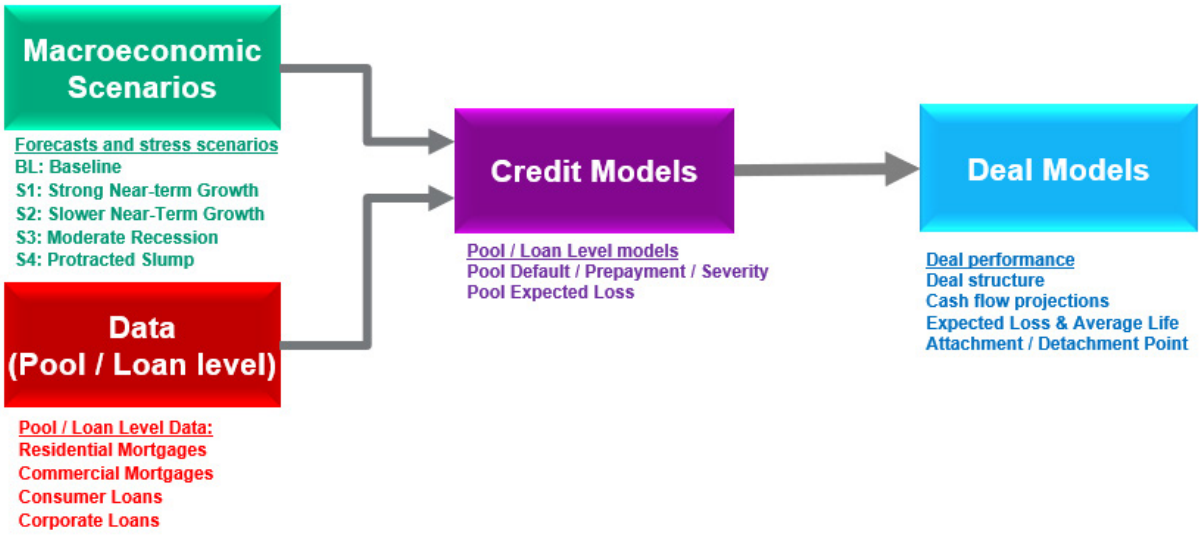
Applying Default and Prepayment assumptions

When forecasting cashflows of securitizations, the waterfall model requires default and prepayment vectors to generate collateral cashflows. The current "*Draft Guidelines* on *the determination of the WAM of a tranche*"[4] recommends applying zero future prepayments and zero future defaults to collateral cashflows.

Running Macroeconomic Assumptions

Future pool performance for securitization under a macroeconomic scenario is forecasted using a credit model. The forecasted prepayment and default vectors will be used to project collateral cash flows, which are then passed through the waterfall model of the securitization to derive tranche cashflows. Figure 4 below shows the methodology used to determine the WAM using macroeconomic forecasts.

Figure 4 Historical and Forecasted default (CDR) for Italy MBS Prime



Macroeconomic Forecasts

The economic forceasts are generated using a macroeconomic model which captures both interconnectedness among economic regions and country-specific idiosyncracies. Moody's Analytics Global Macroeconomic Model produces forecasts for more than 15,000 time series across 100+ countries that collectively constitute more than 95% of global GDP[5]. While the model structure is similar across countries, the framework allows for country-specific variations of key equations and for inclusion of tailpipe equations for variables important for some countries.

Moody's Analytics uses its global forecasting framework to quantify its economic outlook in the form of a Baseline forecast, generated on a monthly basis. The forecast is produced based on globally consistent assumptions that reflect the view regarding the economic outlook. The global assumptions are augmented by region and country-specific assumptions if required. The Baseline is used as an anchor for Moody's Analytics suite of scenarios that captures the key risks to the global outlook.

[4] https://eba.europa.eu/sites/default/documents/files/documents/10180/2883227/52eb10d7-085d-4401-8b74-cec60d710b7d/EBA-CP-2019-08%20CP%20on%20the%20draft%20GLs%20for%20the%20determination%20of%20WAM.pdf?retry=1

[5] For more details please refer to M. Hopkins, "Moody's Analytics Global Macroeconomic Model Methodology", March 2018. https://www.moodysanalytics.com/-/media/whitepaper/2018/global-macroeconomic-model-description-short-version.

Credit Models

A credit model is an analytic tool to assess credit risk and measure performance over different macroeconomic scenarios for portfolios of different asset classes. Moody's Analytics Credit models solution consists of loan-level and pool-level econometric models for performance variables like delinquencies, CPR, CDR, and severities[6].

Waterfall Models

Each security receives cashflows according to the priority of payments described in its deal waterfall. Moody's Analytics' solution includes extensive deal libraries with accurate and validated waterfalls and collateral data updated every payment period which facilitates cash flow analytics on structured transactions[7].

[6] https://www.moodysanalytics.com/solutions-overview/credit-risk/credit-risk-modeling

[7] https://www.moodysanalytics.com/solutions-overview/structured-finance/structured-finance-sell-side-solutions

Analysis

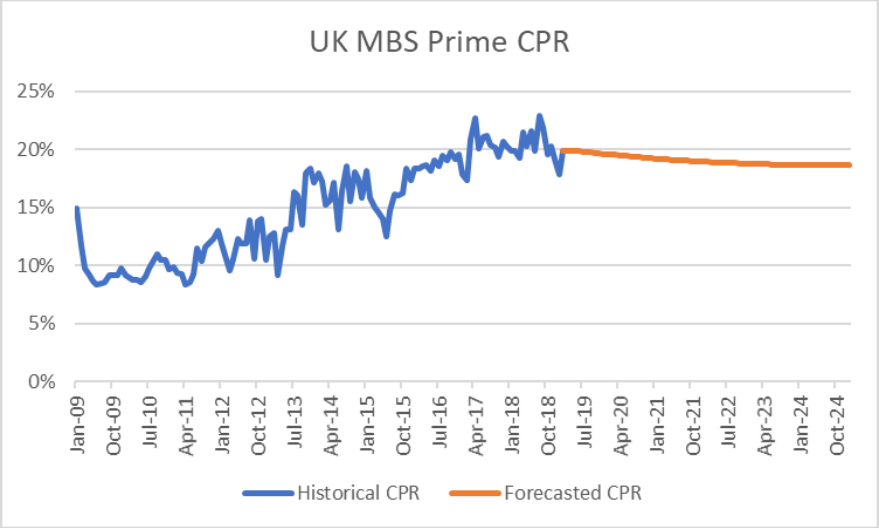
Historical pool performance

An assumption of zero prepayments will project pool performance quite differently to historically observed performance. The historical average of reported Constant Prepayment Rate (CPR) in the Moody's Analytics EMEA active universe of securitized collateral pools as of end of October 2019 is 13.8%.

Across the Moody's Analytics EMEA active universe of securities, there are multiple cases of significant differences in average reported CPR, for example Slate No 1 plc (UK RMBS) has a reported average CPR since issuance of around 15.6%, while VCL 26 (German Auto leases) has a reported average CPR since issuance of around 1.6%.

On the other hand, forecasted CPR for each asset class and region derived from a macrcoeconomic scenario is much more in line with historical reported CPR. For example, the chart below compares historical performance data and forecasted data for UK MBS Prime.

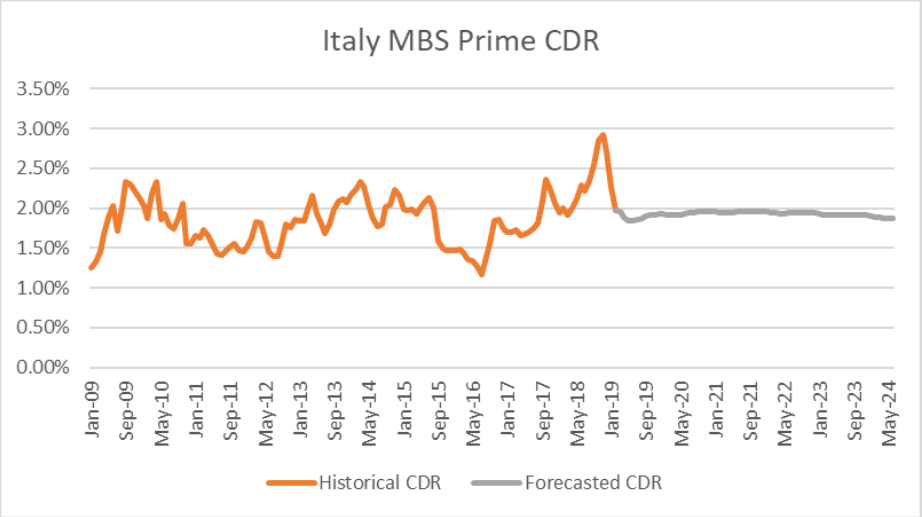
Figure 5 Historical and forecasted prepayment (CPR) for UK MBS Prime



The above chart shows the prepayment rate forecast for the average UK MBS Prime – 2015 vintage over the next five years, under a Baseline macroeconomic scenario. Here, the model does not take into account any specific pool fixed effects.

Similarly, forecasted CDR for a specific asset class and region derived from a macroeconomic scenario is much more in line with historical reported CDR. For example, the chart below compare historical performance data and forecasted data for Italy MBS Prime.

Figure 6 Historical and Forecasted default (CDR) for Italy MBS Prime



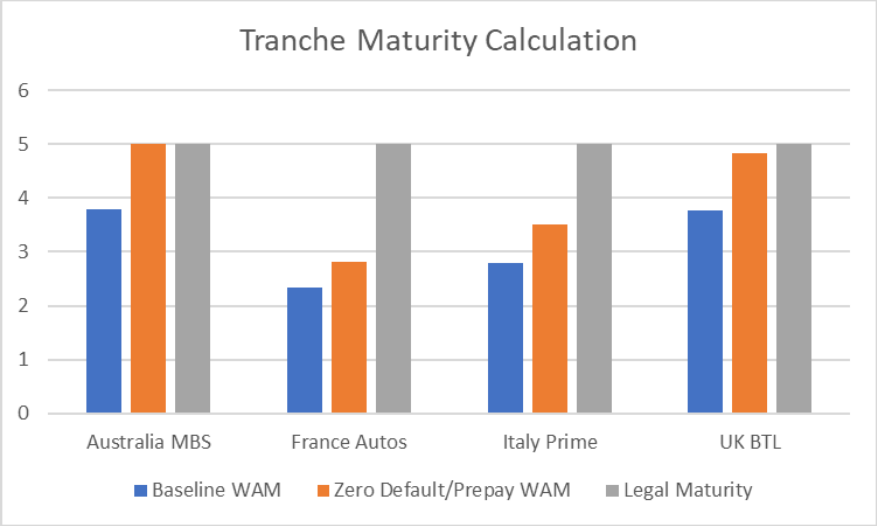
The above chart shows the default rate forecast for the average Italian MBS Prime – 2015 vintage over the next five years, under a Baseline macroeconomic scenario. Here, the model does not take into account any specific pool fixed effects.

Impact on Tranche Maturity Result

We have run analysis on the effect of different scenario assumptions on WAM and RWA calculations across a dataset of 1000 sampled securities from nine countries, and fifteen asset classes, the "Research Dataset". Securities were randomly sampled within their group of asset class and country. The number of deals selected for each group depended on the size of the group in the Moody's Analytics EMEA universe of structured finance securities.

For the Research Dataset, running zero default/prepayment assumption leads to a 3.2 years higher WAM compared to running a Baseline Macroeconomic scenario. This is illustrated by the chart below which compares the regional impact on Tranche Maturity when running a Baseline scenario, a zero default/prepayment assumption or when using the legal maturity approach.

Figure 7 Tranche Maturity Calculated using Baseline, zero default/prepayment and legal maturity



Impact on RWA Result

As a result the derived average RWA in the Research Dataset is 3.35 percentage points higher when running zero default/prepayment. Results vary widely by asset class, region and seniority.

Running zero default/prepayment assumptions and comparing with results when running a Baseline scenario, we notice the following:

- Asset Class: The MBS Prime asset class, which is the most heavily represented asset class in our Research datasetwith 366 tranches, exhibited an average RWA 3.9 percentage points higher when running zero default/prepayment compared to Baseline.
- Region: Deals with collateral based in the Italy exhibited the greatest regional sensitivity, with an average RWA 7.6 percentage point higher when running zero default/prepayment compared to Baseline.
- Seniority: junior tranches across all countries and asset classes are most significantly impacted with an average RWA of 3.25 percentage point higher when running zero default/prepayment compared to Baseline.

The two charts below compare the regional impact on RWA for senior and non-senior tranches when calculating maturity running a Baseline scenario, a zero default/prepayment assumption or when using the legal maturity approach.

Figure 8 RWA comparison for senior tranches using Baseline, zero default/prepayment and legal maturity

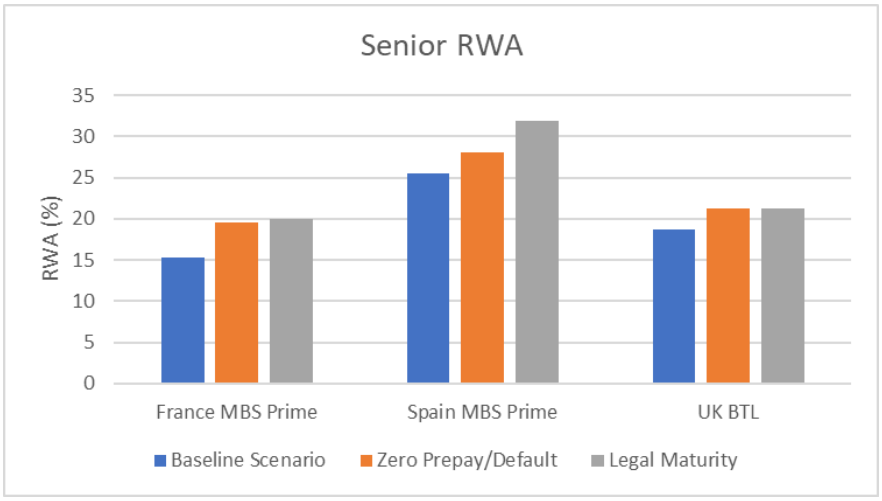
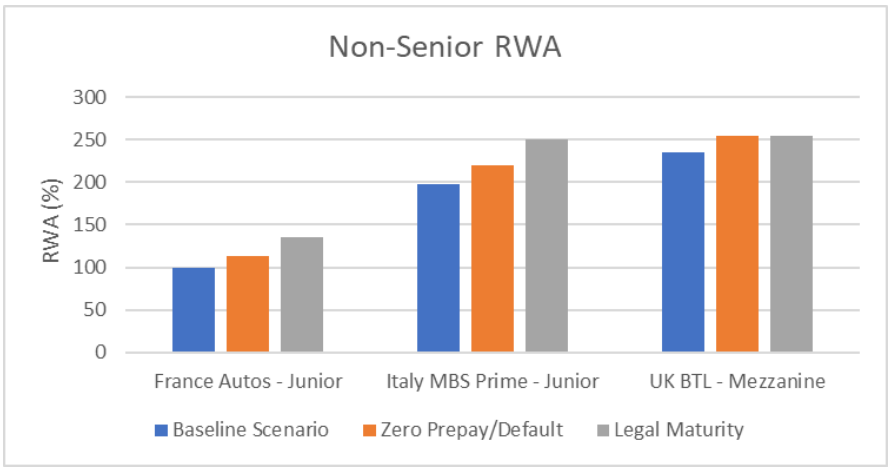


Figure 9 RWA comparison for non-senior tranches using Baseline, zero default/prepayment and legal maturity



The average RWA of a zero default/prepayment based approach is higher across various regions and assets.

To confirm that results are not driven by the choice of macroeconomic scenario, we ran the same analysis on other Moody's Analytics scenarios. On the Research Dataset, the use of a Moderate Recession scenario resulted in RWA levels 0.63 percentage points higher than a Baseline scenario, while a Protracted Slump resulted in 0.9 percentage points higher. We concluded that the choice of scenario has relatively low impact on the results.

Summary

Banks implementing ERBA can choose to use the calculated WAM method to compute tranche maturity (WAM) using cash flow projections, in order to obtain some RWA relief in exchange for investing in the more analytical approach. We have assessed the impact on RWA of a zero default and prepayment assumption on a sample of 1000 ISINs, and it produced results that were consistently less conservative than using the Legal Maturity and consistently more conservative than a macroeconomic approach.