# *Accounting for Financial Guarantee Insurance Contracts*

## *Probabilistic Approach to Measuring Expected Claims Liability*

RangeMark

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## FAS No. 163 Compliance

Projecting losses under a single *most-likely* scenario is an insufficient measure of credit risk. The recent failure of the traditional letter grade rating system has proven it is not possible to fully understand credit risk and associated financial implications without simulating a complete distribution of possible outcomes. Statement of Financial Accounting Standards (FAS) No. 163 suggests a financial guarantor is expected to measure claim liability as the "…probability-weighted cash flows that reflect the likelihood of all possible outcomes" (paragraph 25). The guidance further requires the measurement to consider "…the amount, timing and probability of possible net cash flows, that is, cash outflows, net of potential recoveries, to be paid to the holder of the insured financial obligation, excluding reinsurance" (paragraph 26). The *Expected Claims Calculator* (ECC) performs the requisite quantitative analysis – credit modeling and probabilistic simulation. It enables financial guarantors to establish initial claims liability, relative to unaccrued premium, and adjust claims liability and associated unearned income and reserves as circumstances change.

## Fundamental Credit Modeling

The shape of loss distributions for a security and its associated financial guarantee are determined by both the collateral composition and payment priorities defined by a security's indenture. However, collateral performance is the key driver of risk since a structured security's performance is a levered outcome of the underlying assets. The objectives of a mortgage credit model are to predict borrowers' payment behavior under a range of individual and macroeconomic circumstances, lenders' response to borrowers' decisions (foreclosure), and the outcome of foreclosure (severity). The more granular the modeling system, the greater the potential for an accurate projection of collateral performance profile. *RangeMark generates unique default and loss curves for individual loans derived from the actual loan attributes (e.g. doc level, loan type, lien position, purpose) and borrower credit quality (e.g. LTV, FICO).* Delinquency, default and severity curves are combined with loan-level amortization schedules and prepayment projections to generate cash flow schedules. The schedule is applied to the subject bonds' waterfall rules. Projecting losses at the loan-level enables quantitative measurements of a pool's layered risk factors and tail risk.

Modeling Credit Performance – RangeMark employs a multinomial logit discrete choice framework to estimate the probability of monthly loan performance transitions across eight status states (current, 30 day delinquent, 60 day delinquent, 90+ day delinquent, foreclosure, REO, prepay and default). Because behavior causing delinquencies, defaults, severity, prepayments and loss are interrelated, the mathematical functions describing them need to be integrated. The Model employs interest rate and Home Price Appreciation HPA time paths generated by separate modules to perform deterministic scenario analysis or as random variables in stochastic simulations.

Dynamic Transition Matrix – Projecting mortgagor credit performance remains the key to the proper valuation of mortgage-backed securities. Over the last decade, methods of assessing mortgage credit risk have evolved from simple tranche default probabilities, to loss curves that estimate expected severity and timing of defaults, to transition matrices where performance is simulated at each time period for the life of the loan.

Transition matrices provide users with the deepest insight into the performance of mortgages. The goal of the approach is to project the payment status of each obligor at every time period in a transaction. Knowing the details of expected payment for each loan in a given period combined with the projected borrower credit state, one can develop a reasonable portrayal of an obligor's cash contribution to a pool over time. Aggregating mortgager projections provide asset cash flows for a specific MBS liabilities structure.

The organizing framework is a *matrix of possible transitions* for a mortgagor and the associated probabilities that can change dynamically. The figure below depicts a typical credit transition matrix for a mortgagor. The matrix defines probabilities of a loan moving from a given state to another state in a given period. The propensity of an obligor to pay is a function of their circumstances (ability and willingness to pay) and the value of the obligor's home relative to the size of their loan (LTV). With aging, interest rate changes and home price appreciation/depreciation, the probability of delinquency changes continuously. As such, the most effective transition matrix is dynamic rather than stationary.

***Basic Transition Matrix Example***

| | To State | | | | |
|---|---|---|---|---|---|
| From State | Current | 1-30 Days Delinquent | 31-60 Days Delinquent | 61-90 Days Delinquent | Default |
| Current | P(C,C) | P(C, 1-30) | P(C, 31-60) | P(C, 61-90) | P(C, Default) |
| 1-30 Days Delinquent | P(1-30, C) | P(1-30, 1-30) | P(1-30, 31-60) | P(1-30, 61-90) | P(1-30, Default) |
| 31-60 Days Delinquent | P(31-60, C) | P(31-60, 1-30) | P(31-60, 31-60) | P(31-60, 61-90) | P(31-60, Default) |
| 61-90 Days Delinquent | P(61-90, C) | P(61-90, 1-30) | P(61-90, 31-60) | P(61-90, 61-90) | P(61-90, Default) |
| Default | P(Default, C) | P(Default, 1-30) | P(Default, 31-60) | P(Default, 61-90) | P(Default, Default) |

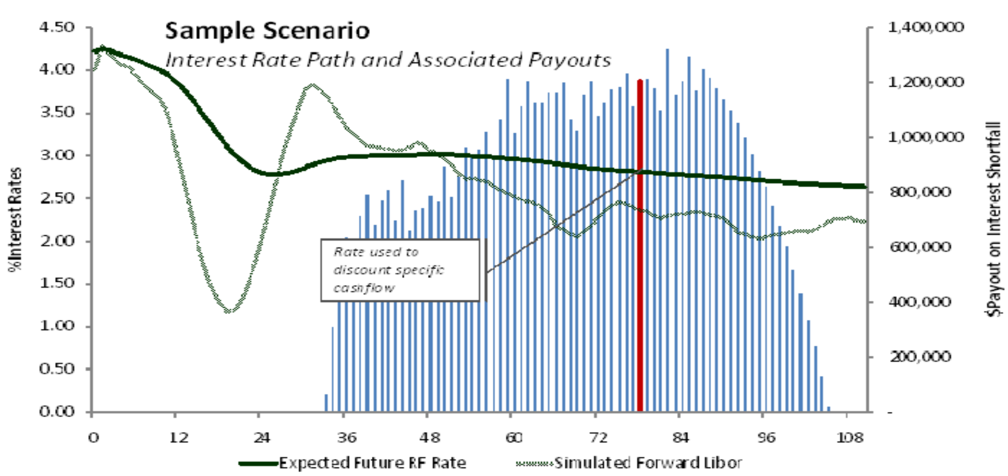
## PROBABILISTIC CREDIT PERFORMANCE

Stochastic analysis provides insight into relationships between loss drivers, related loss projections and probability of outcome. Using state-level HPA forecasts and interest rate evolutions, the Model generates periodic conditional probabilities of a loan moving from one state to another. The output of this simulation is a range of outcomes and a distribution of pool performance with results showing differences in the amount and timing of losses. The set of outcomes is applied as the input for the structure-specific cash-flow model to project a distribution of security-specific performance outcomes.

MEASURING EXPECTED CLAIMS LIABILITY

Appropriate Discount Rate – Use of a risk-free rate is the appropriate discount factor in this analysis. Paragraph 24 of FAS 163 specifies the use of "a current risk-free rate" and "that current risk-free rate shall be based on the remaining period of the insurance contract…" A risky discount factor would cause the present value of losses to be reduced relative to a present value using the risk-free rate. While the term risk-free rate is common, there is some disagreement about its specific definition in practice. Academic literature is now leaning towards a rate based on LIBOR (and interest rate swaps) rather than US Treasury Bills due to the favorable tax status of their interest and the regulatory-sponsored demand for T-Bills.[1] The ECC user has the option to select LIBOR flat or some other margin.

To discount simulated interest rate contingent outcomes, it is appropriate to create discount factors which are consistent with the interest rate simulation history used to generate the loss scenario (Smithson, "Valuing CDOs of ABSs", Risk Magazine, 3/08, page 86). The graph below labeled "Sample Scenario" portrays one of several hundred simulated outcomes. The blue bars represent one path of simulated time specific interest shortfalls (claims obligations). The light green line represents the path of the short forward rate which is the short end of the forward curve, evolved for each simulation period. To discount back the shortfall bar marked in red, one could discount by each of the respective short forward rates along the time path. Alternatively, one could calculate a zero coupon discount rate path consistent with the evolved history of short forward rates and discount by the single zero coupon discount factor associated with the same point in simulation time as the shortfall to be discounted. Either method will generate a discount which is consistent with the simulation scenario used to generate the projection of loss.




The graph represents the outcomes from one time path of insured liability shortfalls (created by the associated time path of loan level outcomes). This simulation process is repeated hundreds of times. The expected loss is the simple average of the set of simulated liability shortfalls, since each path is an un-weighted draw.

[1] Hull, Predescu and White, *Journal of Banking and Finance, 2004*, estimated the benchmark risk-free rate used by market participants is the swap rate minus 10 bps.

## EXPECTED CLAIMS CALCULATOR

FAS 163 establishes required procedures for reserve adjustment calculation, performed in four steps:

1) Generate a distribution of possible outcomes for the collateral pool, MBS, unearned premium, and interest and principal shortfall;
2) Calculate the present value (PV) of the net claims (premium minus payouts) for each scenario;
3) Calculate the mean PV of net claims across the distribution (Expected Claims);
4) Compare Expected Claims with extant Reserves and adjust appropriately.

The ECC stores the outstanding principal balance path for each loss time path. The premium path is the premium rate multiplied by the outstanding insured principal balance at each point in simulation time. Each discounted loss simulation is, therefore, associated with a discounted path of future premium collections. The average across these paths represents the expected unaccreted discounted premium. The ECC compares the expected loss and expected premium and determines the reserve, if any, required for the transaction.