Mortgage Insurance Risk Based Capital

Document 1: Overview of proposed RBC approach

Updated May 9, 2016

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Overview of proposed RBC approach

1. Introduction and background

This document forms an integral part of the proposed risk-based capital ("RBC") framework for US-based mortgage insurers. The proposed framework is covered in two documents:

- Overview of proposed RBC approach (this document): This covers the proposed approach to establishing capital levels for US-based single family mortgage insurance businesses. At the core is a "grids-based" approach to estimating capital for loans based on defined risk characteristics.
- Loan Level cash-flow model methodology white paper: This covers the detailed cash-flow model developed and used to parameterize the aforementioned RBC grids.

The purpose of this document is to provide an introduction and overview of the proposed RBC capital approach for US mortgage insurers. In addition to this overview, a far more detailed manual is in development, which will provide detail on a number of elements not fully expanded in this document, as well as instructions concerning regulatory reporting.

1.1. Background

The NAIC Risk-Based Capital (RBC) system was established to provide a capital adequacy standard which is:

- Risk related
- Provides a safety net for insurers
- Provides uniformity across state regulators
- Provides regulatory authority for timely action

The RBC methodology establishes a minimum capital requirement appropriate for an insurance company to support operations based on its risk profile. Specific RBC formulas exist for each of the primary insurance types:

- Property & Casualty
- Life
- Health

The RBC Formula establishes a minimum capital level which is compared to the company's actual capital level. The RBC is calculated by applying a set of risk factors to various asset, premium, and reserve balances. Higher risk factors reflect greater underlying risks.

1.2. Additional information & remaining items pending finalization:

The RBC proposal outlined in this document is comprehensive, however a number of outstanding questions remain, many of which relate to the application of the proposed approach within the broader RBC framework. These include:

- Calendar of economic / company data for market assignments and UW risk score
- Treatment of ceded risk
- Application of pool & other loss limiting structures
- Ensuring that RBC is adjusted appropriately for any state or regional concentration
- Minimum capital floors
- Action level triggers

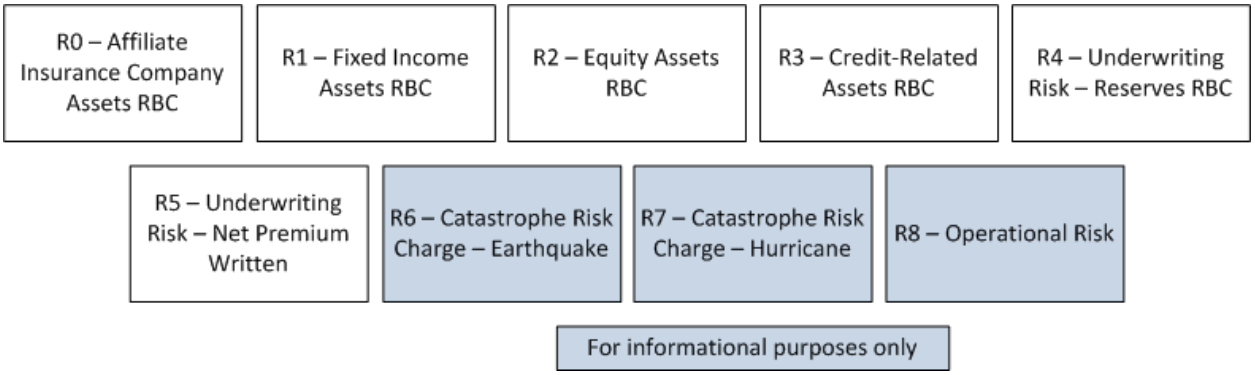
In addition, the approach covered in this document models all sources and uses of resources, and as such an adjustment is requirement to translate to statutory capital requirements:

- Subtract established loss reserves
- Subtract non-refundable UPR, net of future expenses

1.3. Recap on RBC for P&C insurance

The proposed MI RBC approach is an extension of the approach currently in place for property and casualty (P&C) insurance businesses. Below is an illustration of the current P&C RBC framework and formula.

Figure 1: Illustration of current P&C RBC framework and formula



Each of the components of RBC covered above, other than those determined for informational purposes only, are combined as per the equation below.

Equation 1: Generalized P&C RBC calculation

$$P\&C\ Total\ RBC\ = R0 + \sqrt{R1^2 + R2^2 + R3^2 + R4^2 + R5^2}$$

The Risk-Based Capital Model Law grants state insurance regulators authority to take specific actions triggered based on the level of capital impairment, which is defined as the ratio of Total Adjusted Capital to the Authorized Control Level. Current RBC action levels applicable to all companies subject to the RBC requirements include:

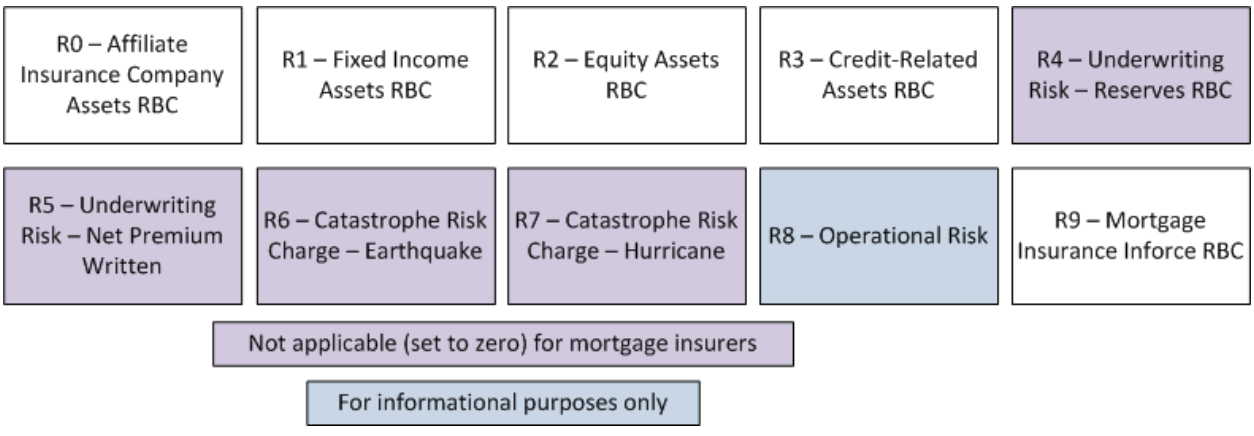
- No Action based on Adjusted Capital of 200% or more of the Authorized Control Level
- Company Action Level (150-200%) – requires a company plan containing proposals to correct financial problems and project financial condition
- Regulatory Action Level (100-150%) – requires company filing of an action plan as well as a state insurance department examination
- Authorized Control Level (70-100%) – allows regulator control of the insurer in addition to all other previously discussed remedies
- Mandatory Control Level (less 70%) – requires regulator control of the insurer

2. Proposed RBC approach for MI business

Mortgage guaranty insurance companies have historically been exempted from the RBC requirement due to their unique operating environment. The objective of the Mortgage Guaranty Insurance Model Act update is to modify existing RBC methodology to adapt it to the mortgage insurance industry.

Below is an illustration of the proposed MI RBC framework and formula:

Figure 2: Illustration of proposed MI RBC framework



As per the P&C approach, the proposed formula for aggregation of the components of capital would be as per the equation below. This assumes a correlation between the components of zero.

Equation 2: Proposed MI RBC calculation

$$\boldsymbol{P\&C\ Total\ RBC\ = R0 + \sqrt{R1^2 + R2^2 + R3^2 + R9^2}}$$

For components other than R9, the approach proposed is identical to that used within the P&C RBC calculation.

Action level triggers based on the RBC result have not yet been finalized for mortgage guaranty insurance.

3. The MI Risk model

At the center of the RBC for mortgage insurers is the Mortgage Insurance in Force Component (the "R9 Component"). For mortgage insurers the R9 Component replaces the standard P&C premium and reserve components. The foundation of the R9 Component is a risk-based, countercyclical credit risk model for mortgage insurance risk (the "MI Risk Model").

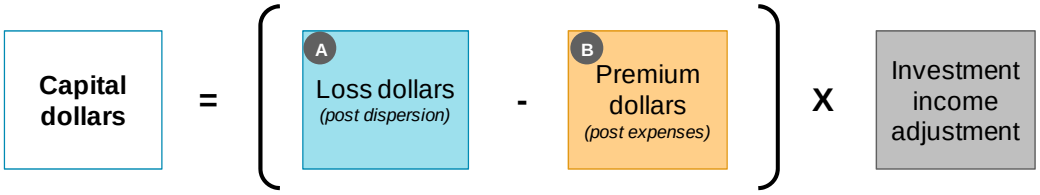
The RBC MI Risk Model calculates gross capital dollars required for insured mortgage guaranty loans over a ten year projection period through generation of expected stress premiums and stress losses, net of future operating expenses and investment income. This was derived from the loan-level cash-flow model; for further details see the separate model methodology white paper document.

3.1. Capital Calculation for Performing Loans

Performing loans are defined as those not currently delinquent as of the date of calculation of RBC. For these loans, the capital is a function of factors known at origination for the loan, with a known seasoning factor applied through time.

At the core, the estimated capital requirements consist of the loss estimate, net of a premium estimate. This is then adjusted to reflect investment income. This approach is outlined in the figure below.

Figure 3: MI Risk Model capital estimation for performing risk



Loss dollars are based on the risk in force on a loan at the evaluation date and represent the projected claim rate multiplied by the loss severity.

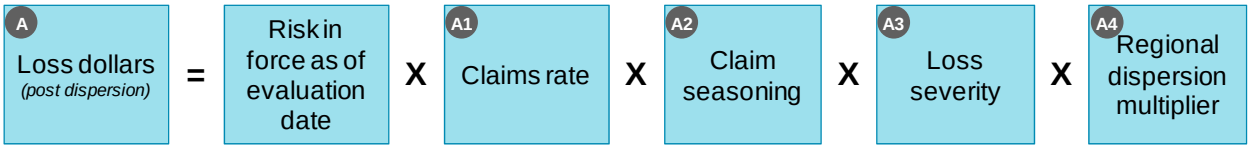
Premium dollars represent a projection of revenues generated by premiums expected to be received during the projection period based on insurance in force, contract premium rates and the projected number of times a loan will pay premiums. Premium dollars are net of expenses which are calculated as a function of premium dollars earned.

Losses and premium dollars amounts are estimated using a series of grids and multipliers dependent on both loan level and market level characteristics as of the loan origination date.

3.1.1. Performing Loans: Loss Dollars

Estimated loss dollars are a function of multiple look-up components, as per the figure below.

Figure 4: Loss dollars calculation for performing risk



Taking each of these in turn:

- Risk in force as of evaluation date: The UPB of the loan at the evaluation date multiplied by the mortgage insurance coverage percentage.
- Claims Rate [A1]: The claims rate is a function of the base claim incidence rate and loan level and market level claim risk factors.
  - Claim incidence rate [A1.1]: The claim incidence rate factors estimate the percentage of risk in force that results in a claim based on market assignment, original LTV and credit score.
  - Claim risk factors [A1.2]: The claim risk factors adjust the base claim incidence rate based on certain loan level factors:
    - Not full documentation (increases risk)
    - Single borrower (increases risk)
    - Not primary residence (increases risk)
    - Not fully amortizing (increases risk)
    - Shorter term loans (decreases risk) defined as under 20 years term
    - Credit union originations (decreases risk)

    In addition to the loan level claim risk factors there is one market level claim risk factor which is a measure of the level of underwriting quality in the market (the "UW Risk Proxy"). The UW Risk Proxy is determined each quarter based on all of the loans insured by the mortgage guaranty insurance industry in that quarter. The UW Risk Proxy is the average count of the following risk factors:

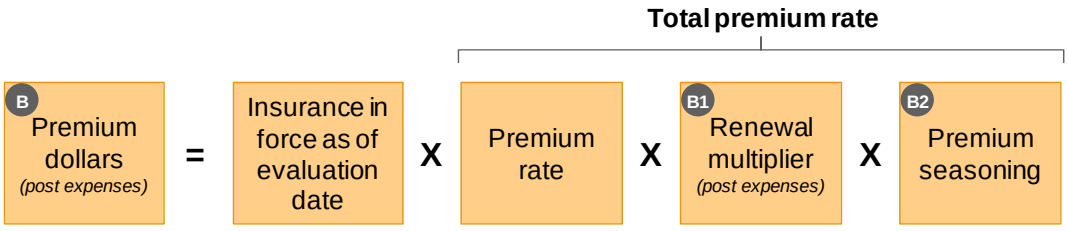
- LTV > 90% (+1)
- LTV > 95% (+1)
- Not full documentation (+1)
- Refinance (+1)
- Cash out refinance (+1)
- Interest-only (+1)
- Negative amortization (+1)
- Condominium (+1)
- Not primary residence (+1)
- Third party origination (+1)
- 15-year term (-1)

- Claim Seasoning [A2]: Claims seasoning factors provide for performing loan Claim Incidence Rate adjustment to reflect the diminished risk of loss over time as loans age, based on the length of time a loan has remained on the mortgage guaranty insurance company's books. Note: Non-performing loans are not subject to claims seasoning factors.
- Loss severity [A3]: Loss severity factors reflect the percentage of risk in force as of the evaluation date that results in a paid loss. For performing loans the loss severity factors are dependent on the market assignment of the loan and the mortgage insurance coverage level. For loans with 100% mortgage insurance coverage, the loss severity is also dependent on the original LTV.
- Regional dispersion multiplier [A4]: The regional dispersion multiplier adjusts the estimate of loss dollars to reflect the HPI differences between the Census Division level experience used and the more granular MSA level. This regional dispersion multiplier is **111.32%.**

3.1.2. Performing Loans: Premium Dollars

Estimated premium dollars are a function of multiple look-up components, as per the figure below.

Figure 5: Premium dollars calculation



Taking each of these in turn:

- Insurance in force as of evaluation date: The UPB of the loan at the evaluation date.

- Premium Rate: The premium rate is the stated renewal rate per the mortgage insurance contract. For single premium policies the premium rate is set equal to zero.
- Renewal Multiplier [B1]: The premium multiplier represents the average number of renewals (years) a performing loan will pay premiums based market assignment, original LTV and credit score. The premium multipliers are all reduced by 23% to account for future operating expenses (both Loss Adjustment Expense ("LAE") and Expenses Other than Loss Adjustment ("EOLA")).
- Premium Seasoning [B2]: The premium seasoning factors adjust the premium estimate based on the length of time the loan has remained on the mortgage guaranty insurance company's books.

3.1.3. Performing Loans: Investment Income Adjustment

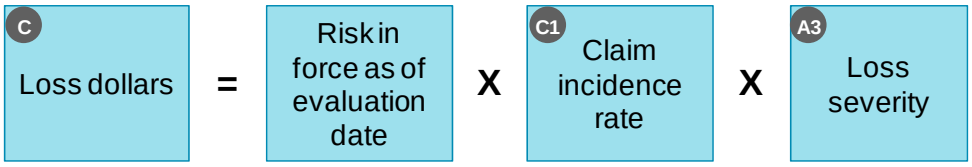
The investment income adjustment is intended to reflect risk-free investment income earnings over time on the required capital. For performing loans the investment income adjustment is **88.58%.**

3.2. Capital Calculation for Non-Performing Loans

Capital calculation for non-performing loans is simply an estimate of loss dollars, multiplied by an investment income adjustment. Loss dollars are based on the risk in force on a loan at the evaluation date and represent the projected claim rate multiplied by the loss severity.

There is no factor for future premium as future premium on non-performing loans is set equal to zero. Estimated loss dollars are a function of multiple look-up components, as per the figure below.

Figure 6: Loss dollars calculation for non-performing risk



- Risk in force as of evaluation date: The UPB of the loan at the evaluation date multiplied by the mortgage insurance coverage percentage.
- Claim Incidence Rate [C1]: The claim incidence rate for non-performing loans is a function of original market assignment, number of months delinquent, and pending claim status.
- Loss severity [A3]: The loss severity factors for non-performing loans are equal to the loss severity factors for performing loans.

3.2.1. Non-Performing Risk: Investment Income Adjustment

The investment income adjustment is intended to reflect risk-free investment income earnings over time on the required capital. For non-performing loans the investment income adjustment is **94.31%.**

4. Counter-cyclicality and market assignment

By design, the proposed RBC capital approach is counter-cyclical, in that the amount of capital held for a loan at origination is a function of where house prices are relative to a long-run trend. This is achieved through differentiating components of required resources by different "markets". These markets are defined each quarter for each US census division, and reflect four (4) different potential future home price decline paths:

- Down 10%
- Down 17.5%
- Down 25%
- Down 35%

The assignment of the market is based on the position of the home price index ("HPI") for the census division, relative to a long-run trend in the index. The detailed approach is outlined in section 4.1.1. below. The market assignment for a loan is established at origination, and does not change based on subsequent evolution in home prices. This is a simplification, but reflects the fact that as home prices for a region may increase, and hence shocks would be expected to get larger, the LTV on the underlying insured mortgage will decrease in a corresponding manner. These two effects largely offset, and hence a simplification in the approach is to set capital at origination for all performing loans.

4.1.1. Market Assignment

The market assignment is a function of the difference between the current HPI and a conservative view of the long-run HPI trend, suing the following steps:

1. Determine the long-run trend in HPI for the census division, based on a simple linear regression with PCI for the same census region
2. Apply a trough relative to the end-point of this trend-line of 12.9 percentage points of home price decline
3. Compare where the current index is relative to this trough value, as a percentage of the current HPI

This indicated "current-to-trough" value is then used to determine the market assignment.

- If the value is below 10%, the 10% down market is selected.
- If the value falls between 10% and 17.5%, the 17.5% down market is selected.

- If the value falls between 17.5% and 25%, the 25% down market is selected.
- If the value falls over 25%, the 35% down market is selected.

5. Factors for MI Risk Model

5.1. Claim incidence rate [A1.1]

Table 1: Claim incidence rate for 10% down market

A1.1 Claim incidence rate Market Assignment: 10% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	3.29%	1.80%	0.99%	0.60%	0.42%
60 < LTV <= 65%	4.15%	2.25%	1.25%	0.75%	0.55%
65 < LTV <= 70%	5.25%	2.95%	1.60%	0.99%	0.71%
70 < LTV <= 75%	6.56%	3.64%	2.00%	1.22%	0.90%
75 < LTV <= 80%	7.88%	4.57%	2.52%	1.53%	1.13%
80 < LTV <= 85%	8.87%	5.32%	3.18%	2.07%	1.62%
85 < LTV <= 90%	10.08%	6.33%	4.00%	2.68%	2.14%
90 < LTV <= 95%	11.64%	7.42%	4.66%	3.14%	2.47%
95 < LTV <= 100%	13.14%	8.46%	5.46%	3.72%	2.94%
100 < LTV <= 105%	14.69%	9.60%	6.12%	4.17%	3.29%
LTV > 105%	16.45%	10.76%	6.96%	4.71%	3.72%

Table 2: Claim incidence rate for 17.5% down market

A1.1 Claim incidence rate Market Assignment: 17.5% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	4.49%	2.48%	1.37%	0.83%	0.59%
60 < LTV <= 65%	5.65%	3.09%	1.73%	1.04%	0.76%
65 < LTV <= 70%	7.13%	4.04%	2.20%	1.36%	0.98%
70 < LTV <= 75%	8.85%	4.99%	2.78%	1.71%	1.26%
75 < LTV <= 80%	10.24%	6.22%	3.60%	2.29%	1.74%
80 < LTV <= 85%	11.25%	6.98%	4.31%	2.87%	2.27%
85 < LTV <= 90%	12.88%	8.22%	5.26%	3.56%	2.85%
90 < LTV <= 95%	14.87%	9.64%	6.12%	4.16%	3.28%
95 < LTV <= 100%	16.51%	10.77%	7.03%	4.81%	3.82%
100 < LTV <= 105%	18.31%	12.13%	7.81%	5.37%	4.25%
LTV > 105%	20.24%	13.43%	8.77%	5.97%	4.74%

Table 3: Claim incidence rate for 25% down market

A1.1 Claim incidence rate Market Assignment: 25% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	6.23%	3.47%	1.93%	1.17%	0.83%
60 < LTV <= 65%	7.81%	4.32%	2.43%	1.46%	1.08%
65 < LTV <= 70%	9.77%	5.66%	3.15%	1.98%	1.44%
70 < LTV <= 75%	11.81%	6.90%	3.97%	2.51%	1.88%
75 < LTV <= 80%	13.29%	8.32%	4.97%	3.24%	2.49%
80 < LTV <= 85%	14.54%	9.18%	5.75%	3.87%	3.08%
85 < LTV <= 90%	16.54%	10.71%	6.93%	4.72%	3.80%
90 < LTV <= 95%	18.82%	12.39%	7.96%	5.45%	4.31%
95 < LTV <= 100%	20.67%	13.69%	9.03%	6.23%	4.96%
100 < LTV <= 105%	22.43%	15.07%	9.81%	6.79%	5.39%
LTV > 105%	24.16%	16.24%	10.71%	7.34%	5.85%

Table 4: Claim incidence rate for 35% down market

A1.1 Claim incidence rate Market Assignment: 35% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	9.90%	5.62%	3.17%	1.94%	1.39%
60 < LTV <= 65%	12.01%	6.96%	4.08%	2.55%	1.91%
65 < LTV <= 70%	14.64%	8.84%	5.11%	3.30%	2.43%
70 < LTV <= 75%	16.74%	10.38%	6.33%	4.19%	3.23%
75 < LTV <= 80%	18.85%	12.25%	7.55%	5.04%	3.93%
80 < LTV <= 85%	20.50%	13.31%	8.51%	5.81%	4.66%
85 < LTV <= 90%	22.75%	15.08%	9.92%	6.83%	5.52%
90 < LTV <= 95%	25.39%	17.12%	11.18%	7.75%	6.16%
95 < LTV <= 100%	26.89%	18.21%	12.20%	8.50%	6.80%
100 < LTV <= 105%	28.29%	19.40%	12.81%	8.95%	7.14%
LTV > 105%	29.84%	20.44%	13.68%	9.46%	7.56%

5.2. Claim risk factors [A1.2]

Table 5: Claim risk factors (for all markets)

Claim Risk Factor	Factor	Log-Odd Factor
Not full documentation	157.07%	0.50
Single borrower	143.54%	0.40
Not primary residence	133.01%	0.31
Not fully amortizing	130.31%	0.29
Shorter term	33.67%	-1.14
Credit union originations	47.70%	-0.78
UW Risk Proxy <=1.2	100.00%	0.00
1.2 < UW Risk Proxy <=1.3	137.88%	0.31
1.3 < UW Risk Proxy <=1.4	175.75%	0.63
1.4 < UW Risk Proxy <=1.6	196.63%	0.76
UW Risk Proxy > 1.6	221.66%	1.03

5.3. Claim seasoning [A2]

Table 6: Claim seasoning factors (for all markets)

Months on book (MoB)	Factor
MoB < 12	100.00%
12 <= MoB < 24	92.15%
24 <= MoB < 36	84.57%
36 <= MoB < 48	78.60%
48 <= MoB < 60	78.02%
60 <= MoB < 72	79.28%
72 <= MoB < 84	80.00%
84 <= MoB < 96	62.69%
96 <= MoB < 108	47.59%
108 <= MoB < 120	33.44%
MoB >= 120	18.60%

5.4. Loss severity [A3]

Table 7: Loss severity for coverage under 100%

A3 Loss Severity MI coverage is less than 100%				
	Market Assignment			
Remaining LTV	10% Down	17.5% Down	25% Down	35% Down
RLTV > 40%	107.00%	107.00%	107.00%	107.00%
40% >= RLTV > 30%	92.69%	99.27%	105.55%	107.00%
30% >= RLTV > 20%	77.78%	83.34%	89.11%	96.77%
20% >= RLTV > 10%	68.86%	73.56%	78.39%	84.60%
RLTV <= 10%	58.97%	62.98%	67.07%	72.31%

RLTV = the remaining LTV after adjusting the original LTV for the MI coverage percentage. For example, a loan with an original LTV of 95% with 35% MI coverage has an RLTV of 61.75% [Formula = Original LTV - (Original LTV * MI Coverage)]

Table 8: Loss severity for 100% coverage

A3 Loss Severity 100% MI coverage				
	Market Assignment			
Original LTV	10% Down	17.5% Down	25% Down	35% Down
LTV > 100	56.61%	60.62%	64.70%	70.27%
90 < LTV <= 100	51.05%	55.34%	59.80%	65.92%
80 < LTV <= 90	44.56%	49.16%	53.99%	60.69%
70 < LTV <= 80	35.99%	41.08%	46.39%	53.82%
60 < LTV <= 70	25.08%	30.90%	37.03%	45.48%
LTV <= 60	14.27%	20.59%	27.39%	37.04%

5.5. Renewal multiplier [B1]

Table 9: Renewal multiplier for 10% down market

B1 Renewal multiplier Market Assignment: 10% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	2.36	2.33	2.27	2.19	2.15
60 < LTV <= 65%	2.46	2.46	2.40	2.33	2.27
65 < LTV <= 70%	2.59	2.59	2.56	2.49	2.44
70 < LTV <= 75%	2.70	2.74	2.71	2.66	2.61
75 < LTV <= 80%	2.81	2.89	2.88	2.83	2.79
80 < LTV <= 85%	2.93	3.01	3.02	2.99	2.97
85 < LTV <= 90%	3.26	3.37	3.39	3.37	3.34
90 < LTV <= 95%	3.49	3.63	3.69	3.69	3.65
95 < LTV <= 100%	3.81	3.99	4.11	4.13	4.10
100 < LTV <= 105%	3.92	4.16	4.32	4.36	4.36
LTV > 105%	4.00	4.30	4.47	4.53	4.57

Table 10: Renewal multiplier for 17.5% down market

B1 Renewal multiplier Market Assignment: 17.5% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	2.57	2.57	2.51	2.44	2.40
60 < LTV <= 65%	2.68	2.70	2.66	2.61	2.55
65 < LTV <= 70%	2.80	2.85	2.84	2.78	2.74
70 < LTV <= 75%	2.94	3.04	3.04	3.00	2.96
75 < LTV <= 80%	3.23	3.37	3.40	3.38	3.35
80 < LTV <= 85%	3.15	3.29	3.34	3.33	3.33
85 < LTV <= 90%	3.50	3.68	3.75	3.78	3.76
90 < LTV <= 95%	3.75	3.98	4.11	4.16	4.14
95 < LTV <= 100%	3.97	4.25	4.44	4.52	4.50
100 < LTV <= 105%	4.01	4.35	4.59	4.69	4.72
LTV > 105%	4.06	4.45	4.70	4.82	4.88

Table 11: Renewal multiplier for 25% down market

B1 Renewal multiplier Market Assignment: 25% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	2.79	2.82	2.79	2.73	2.69
60 < LTV <= 65%	2.89	2.97	2.96	2.91	2.86
65 < LTV <= 70%	3.10	3.22	3.26	3.22	3.18
70 < LTV <= 75%	3.27	3.45	3.51	3.50	3.47
75 < LTV <= 80%	3.48	3.71	3.80	3.82	3.80
80 < LTV <= 85%	3.33	3.55	3.66	3.69	3.71
85 < LTV <= 90%	3.68	3.96	4.11	4.19	4.19
90 < LTV <= 95%	3.85	4.18	4.39	4.49	4.51
95 < LTV <= 100%	4.02	4.39	4.67	4.81	4.83
100 < LTV <= 105%	4.04	4.48	4.81	4.97	5.03
LTV > 105%	4.07	4.55	4.89	5.06	5.16

Table 12: Renewal multiplier for 35% down market

B1 Renewal multiplier Market Assignment: 35% Down					
	Original Credit Score				
Original LTV	<= 619	620-679	680-739	740-779	780-850
LTV <= 60%	3.09	3.22	3.24	3.20	3.18
60 < LTV <= 65%	3.31	3.50	3.57	3.57	3.52
65 < LTV <= 70%	3.43	3.68	3.82	3.84	3.82
70 < LTV <= 75%	3.63	3.94	4.11	4.16	4.17
75 < LTV <= 80%	3.73	4.10	4.32	4.41	4.44
80 < LTV <= 85%	3.44	3.78	4.00	4.09	4.16
85 < LTV <= 90%	3.71	4.12	4.38	4.56	4.60
90 < LTV <= 95%	3.90	4.38	4.72	4.92	4.99
95 < LTV <= 100%	3.98	4.48	4.88	5.12	5.19
100 < LTV <= 105%	3.97	4.53	4.98	5.23	5.34
LTV > 105%	3.98	4.57	5.03	5.29	5.43

5.6. Premium seasoning [B2]

Table 13: Premium seasoning

Months on book (MoB)	Factor
MoB < 12	100.00%
12 <= MoB < 84	95.00%
MoB >= 84	92.00%

5.7. Claim incidence rate [C1]

Table 14: Claim incidence rate for non-performing loans

	Missed payments						Pending
Market Assignment	1	2	3	4	5	6+	Claims
10% Down	40.52%	45.01%	51.96%	57.08%	60.99%	75.30%	100.00%
17.5% Down	43.98%	48.72%	55.69%	60.71%	64.47%	76.32%	100.00%
25% Down	47.54%	52.47%	59.34%	64.21%	67.77%	77.24%	100.00%
35% Down	52.45%	57.49%	64.08%	68.61%	71.83%	78.33%	100.00%