Overview Of Government Sponsored Enterprise Credit Risk Transfer

CLRS 2018

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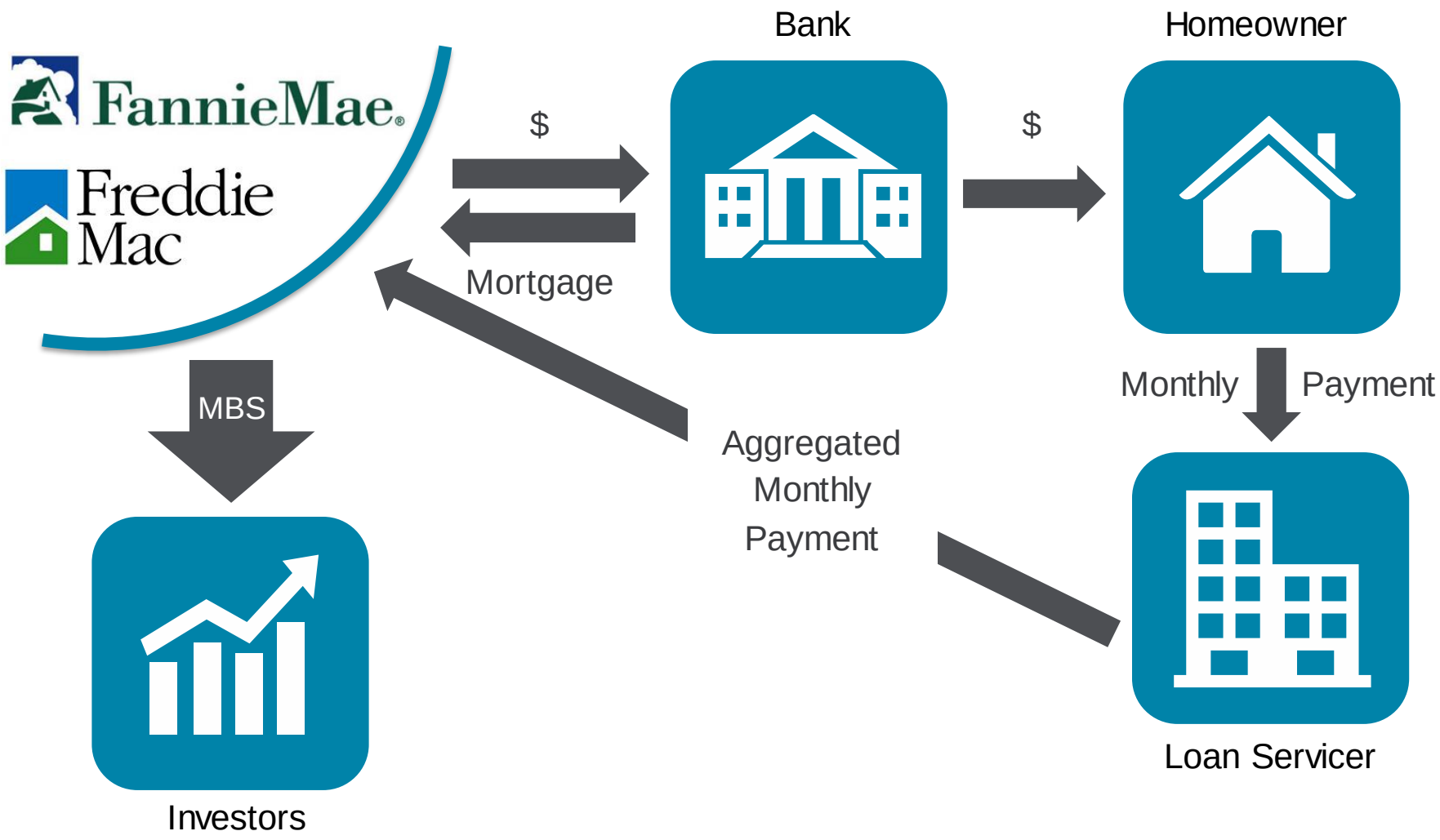
Overview of U.S. Mortgage Loan Origination Process



Overview of the Government Sponsored Enterprises (GSEs)

- GSEs are chartered by the federal government to extend financing liquidity for the agriculture and real estate sectors
- The GSEs create mortgage liquidity by buying loans from originators, securitizing them, and selling bonds into the capital markets
- Currently, 60% to 70% of new single family loans originated are passing through either Fannie Mae, Freddie Mac or Ginnie Mae (through the FHA)
- Fannie Mae and Freddie Mac were put into conservatorship by the Federal government in 2008 and are now supervised by the Federal Housing Finance Agency (FHFA)
- Historically,
  - Primarily transferred only interest rate risk and prepayment risk to bond holders
  - The main source of default risk protection was from Private Mortgage Insurers covering only high-LTV loans (representing approximately 1/3 of total portfolio)
- FHFA has encouraged the GSEs to "de-risk" by finding private sources of default risk protection
  - Roughly 80% through new types of bond issuances
  - Remaining 20% through (re)insurance on portfolios of mortgages

GSE (Re)Insurance Transactions Through August 2018

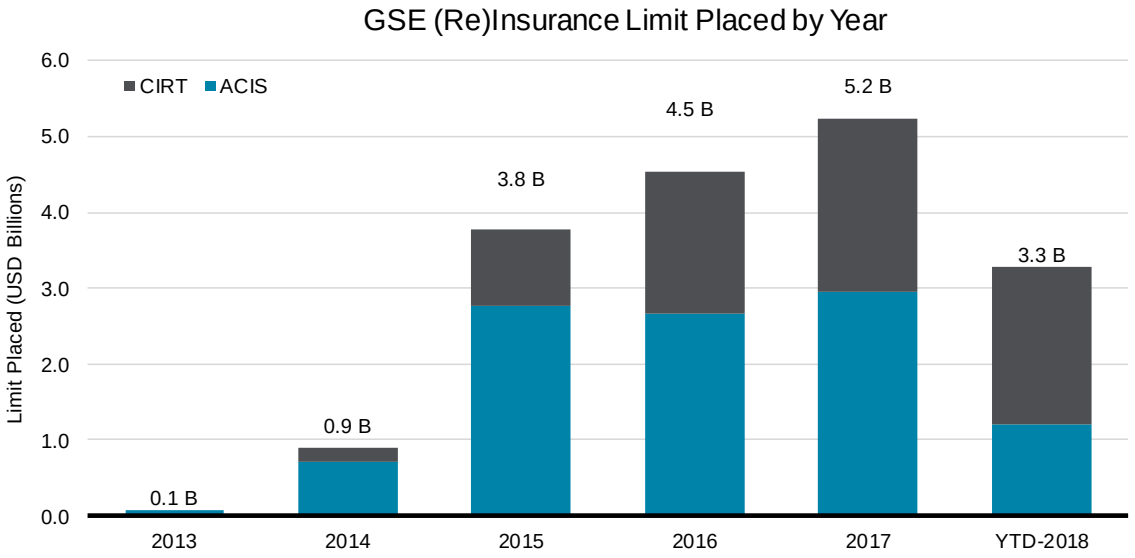
70+
transactions

$17.8bn
limit transferred

$1bn+
premium paid to date

$3.5bn+
lifetime premium

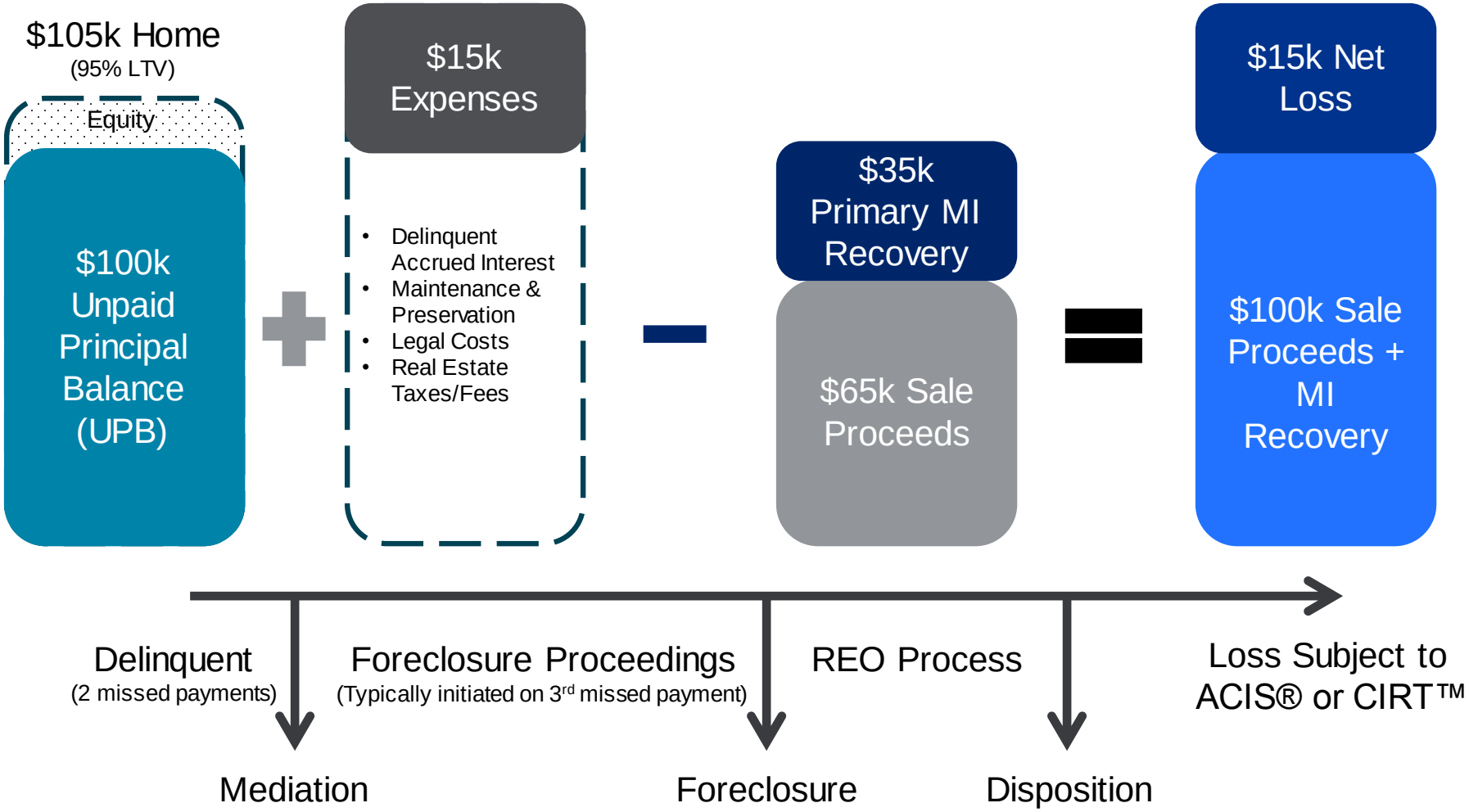
15%-25%
pre-tax return on collateral



- First GSE CRT Insurance occurred in 2013 with a $77M pilot transaction with Arch
- The GSE programs grew significantly from 2014 to 2017 and are now part of a mature market that has been recognized by industry and FHFA for its innovation and support of the US housing market
- 40+ active (re)insurance counterparties participating on GSE CRT deals
- Deals generating high teens returns on capital with sub 15% expected loss ratios
- 2016 & 2017 GSE limit exceeded $4B annual GSE CRT volume, YTD 2018 volume is 3.3B, looking forward volume is anticipated to be $4B to $5B per year
- Project $25B to $30B of steady state limit outstanding and roughly $1B of annualized run-rate ceded premium

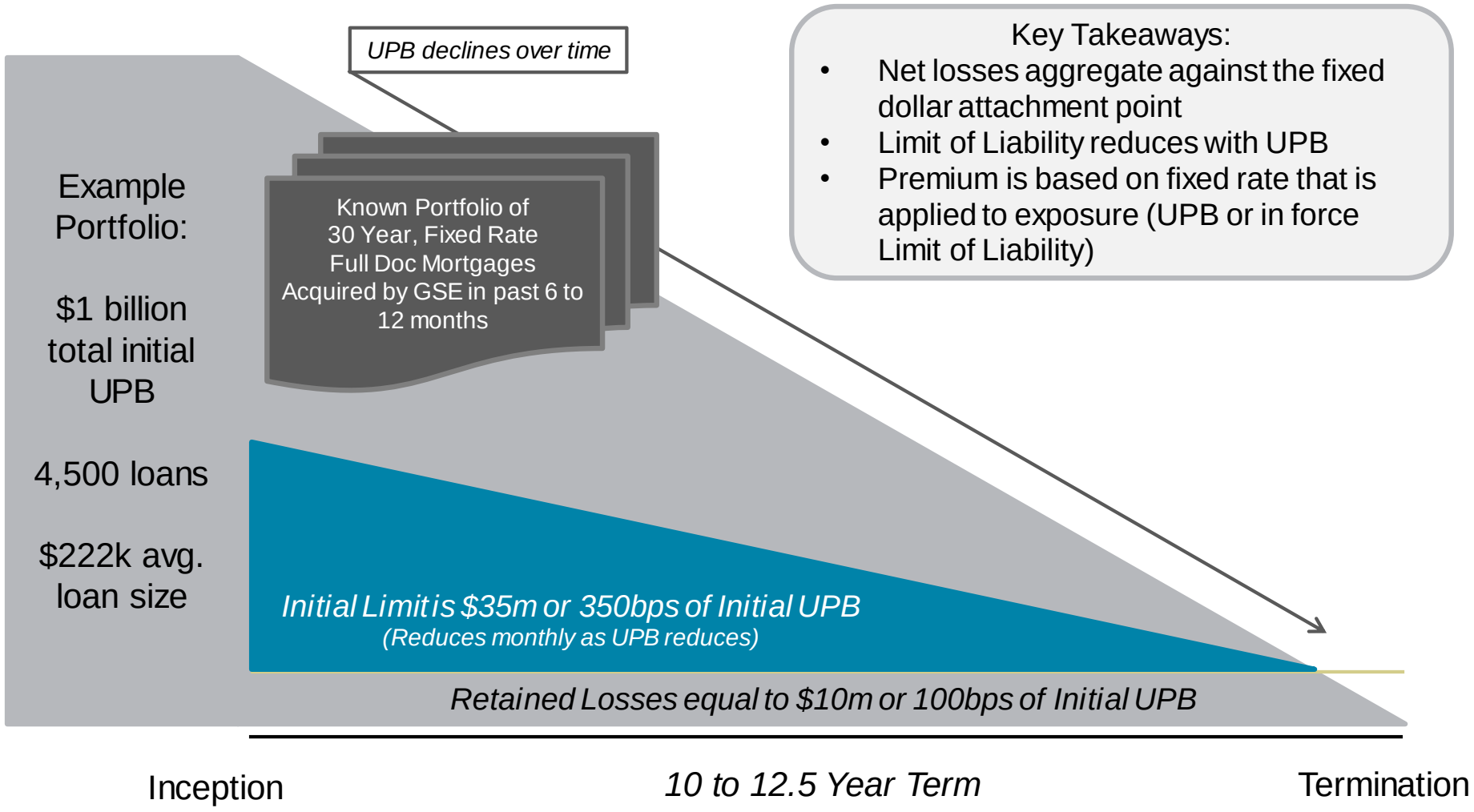
Premiums and returns on ongoing transactions estimated quarterly based on actual transaction emergence to date and Baseline macroeconomic scenarios for future periods. Returns on collateral will vary by counterparty

Loan Level Illustration of Covered Loss in GSE CRT Transactions



Cumulative Losses and Reducing Outstanding Limit of Liability

Illustrative Aggregate Excess of Loss Example



Key Takeaways:

- Net losses aggregate against the fixed dollar attachment point
- Limit of Liability reduces with UPB
- Premium is based on fixed rate that is applied to exposure (UPB or in force Limit of Liability)

Multiple Ways to Estimate Pool Level Mortgage Default Risk

Method	Pros	Cons
Historical Experience Rating	▪ Easy to understand ▪ Based on actual events	▪ Hard to fully adjust for changes in UW characteristics ▪ Simple actuarial methods don't handle calendar year effects well
Scenario Based Cash Flow Modeling	▪ Easy to understand ▪ Can design exact scenario that one cares about	▪ Usually no explicit tie between macroeconomics and modeled default / prepay
Scenario Based Loan Level Modeling	▪ Can design exact scenarios based on macroeconomics ▪ Can capture very granular nuances in loans comprising pool	▪ More challenging to understand drivers of results vs. cash flow or experience based modeling ▪ Uncertainty around out of sample performance
Stochastic Loan Level Modeling	▪ Of methods above, only one that can generate full probabilistic distribution of outcomes	▪ Hardest to understand ▪ Requires thoughtful modeling and calibration of home prices and interest rate distributions and correlations ▪ Uncertainty around out of sample performance

Illustrative (and Simple) Single Deal CIRT Analysis

Goal: Utilize a simple spreadsheet based approach to understand key dynamics of Fannie Mae's CIRT insurance program and estimate common insurance metrics for a recent CIRT transaction

Common Insurance Metrics

Rate on Line

- Total nominal dollars of premium collected over treaty term divided by original limit

Loss on Line

- Total nominal dollars of losses paid over the treaty term divided by original limit

Margin on Line

- Total profit generated during treaty term divided by original limit

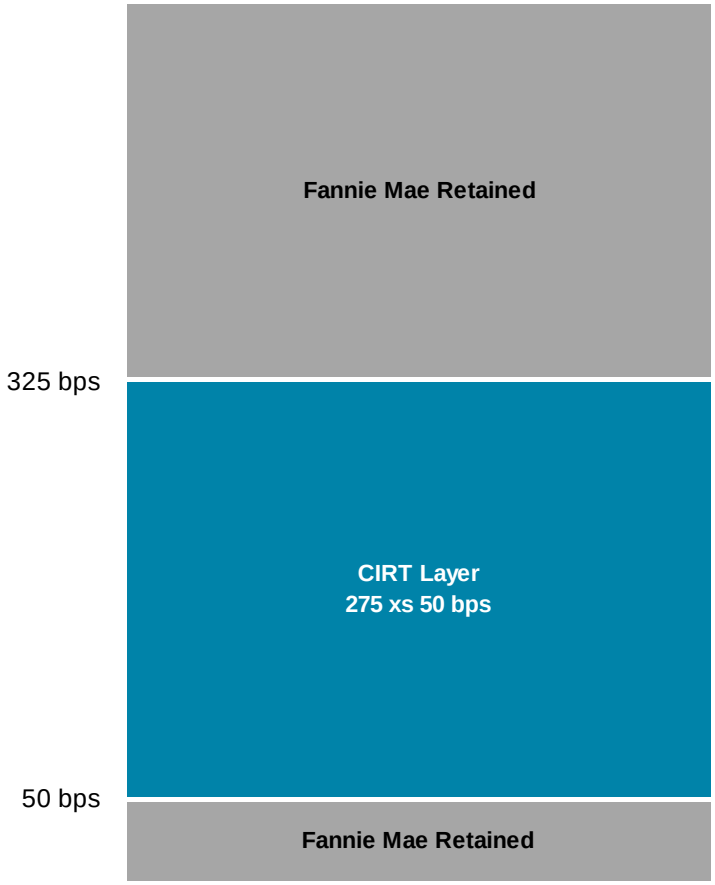
Pre-Tax Nominal Return on Capital

- Total profit generated during treaty term divided by cumulative capital committed during treaty term plus investment income on committed capital

CIRT™ Structure Overview

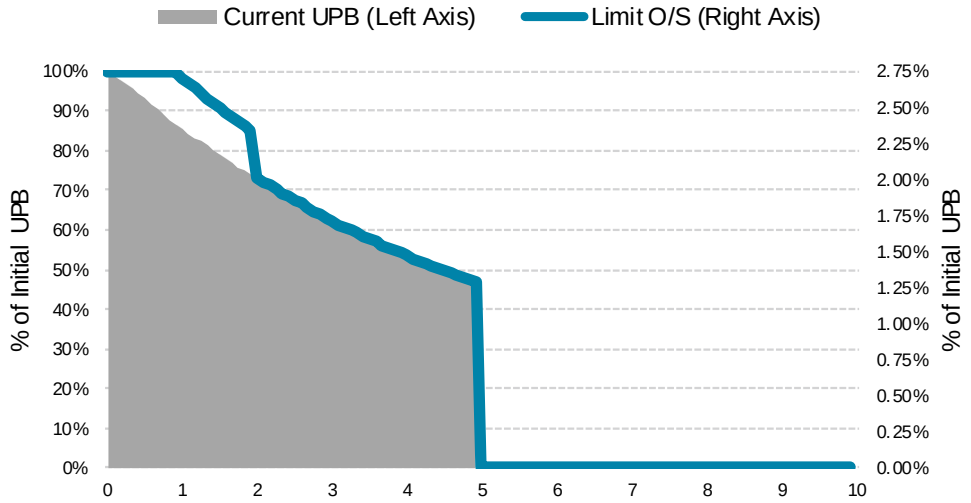
Based on CIRT 2018-1 Structure and Pricing

CIRT 2018-1 Structure



Annual Rate on Subject UPB is 10.56 bps

Illustrative CIRT 2018-1 Baseline Scenario Limit over Time



CIRT 2018-1 Key Features

- Coverage attaches above Fannie Mae loss retention of 50 bps
- Limit placed of 275 bps of inception UPB
- Ten year transaction term
- Limit step down calculation monthly after year one[1]
- Optional cancellation any time after five years[2]
- Premium paid monthly on subject pool outstanding UPB balance
- Outstanding limit partially collateralized during treaty term

1 Monthly step down new feature in 2018. Prior transactions featured annual step down calculation
2 Additional Premium paid if cancellation option is exercised

Estimating Rate on Line for CIRT 2018-1

CIRT Premium is Largely a Function of Prepayment Speed and Treaty Term

CIRT Rate on Line by Prepayment Speed and Treaty Term

			5 Year Term		10 Year Term	
CPR	Rate	Limit	WAL[1]	ROL[2]	WAL	ROL[2]
5.0%	10.56 bps	275 bps	4.9	19%	7.1	27%
7.5%	10.56 bps	275 bps	4.6	18%	6.3	24%
10.0%	10.56 bps	275 bps	4.2	16%	5.7	22%
12.5%	10.56 bps	275 bps	4.0	15%	5.1	20%
15.0%	10.56 bps	275 bps	3.7	14%	4.6	18%

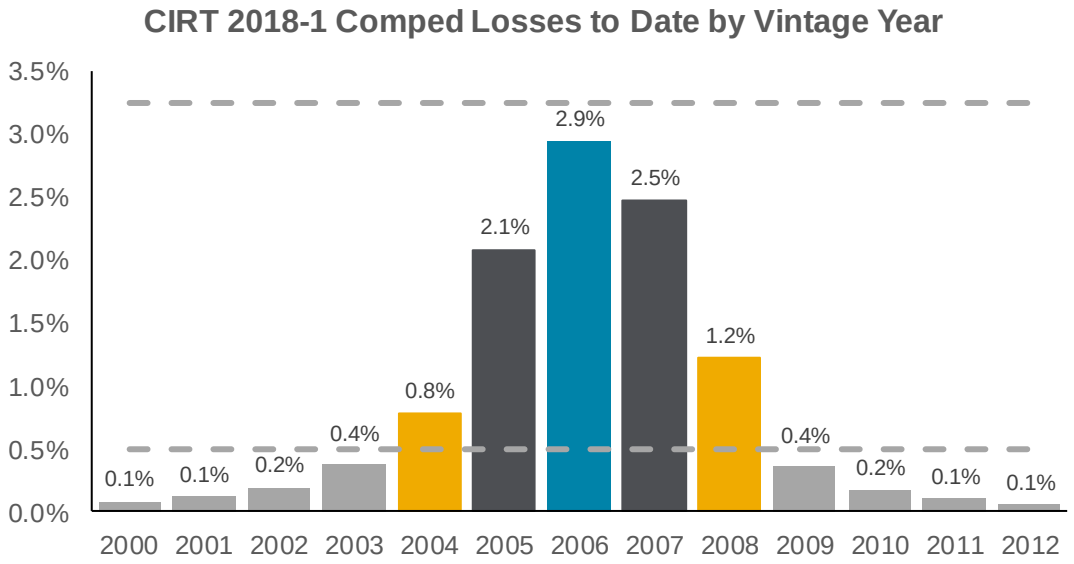
Source: Aon Benfield CIRT 2018-1 Cashflow Tool

Note 1: Five Year Term WAL includes Additional Premium for early termination

Note 2: ROL = (10.56 bps rate / 275 bps limit) * Premium WAL

- CIRT deals to date have experienced a wide range of prepayment speeds
- For 5 year term, assuming a benign macro scenario, CPRs of 7.5% to 12.5% produce ROLs from 15% to 18% including additional premium for early termination
- For 10 year term, assuming a stressed macro scenario and lower prepayment speeds, CPRs of 5.0% to 10.0% produce ROLs from 22% to 27%

Estimating Loss on Line for CIRT 2018-1



Source: Data Dynamics

Scenario	Approximate Probability*	Loss on Line
No CIRT Attach	90%	0
2nd Adjacent Crisis	7%	20%
1st Adjacent Crisis	2%	60%
Crisis Peak	1%	90%
Wtd Avg		**3.5%**

*Probabilities roughly estimated based on Vasicek distribution with 25% rho, 15bps baseline loss rate and 800bps max loss rate

- Fannie Mae Single Family Loan Performance Dataset allows for analysis of loss rates since 2000
  - Data Dynamics provides comped losses adjusted for FICO / LTV / Risk Layer distribution of CIRT 2018-1
- Adjusted historical losses provide insight into potential for loss in individual baseline and stressed scenarios
  - Application of probabilities allows for estimation of across the cycle average losses to CIRT

Estimating A.M. Best Capital Charges for CIRT 2018-1

Illustrative Day One Charge

Element	Value	Note
(1) SUL @ 99.6th Percentile	4.6%	UPB Wtd Avg SUL
(2) 12 Year Loss Pattern	81.8%	Loss Emergence Chart
(3) Cumulative Stressed Loss	3.7%	= (1) x (2)
(4) Gross B5 Charge	79%	Discounted at 4%
(5) Premium Credit	23%	Discounted at 4%
(6) Net B5 Charge	56%	(4) – (5)
(7) Net Diversified B5 Charge	18%	67.5% Diversification Credit

Source: Aon Benfield Analytics

- In February 2018 A.M. Best finalized their criteria for required capital supporting GSE CRT transactions
- Framework utilizes AD&Co modeling and simplifies CIRT structure as follows:
  - Loss estimated based on FICO / LTV grid and follows specified payment pattern
  - Premium estimated based on low single digit CPR prepay speeds
  - All cash flows discounted at 4% to date of evaluation
- Individual results will vary but Aon estimates 60% to 75% diversification benefit for GSE CRT when combined with other insurance lines of business

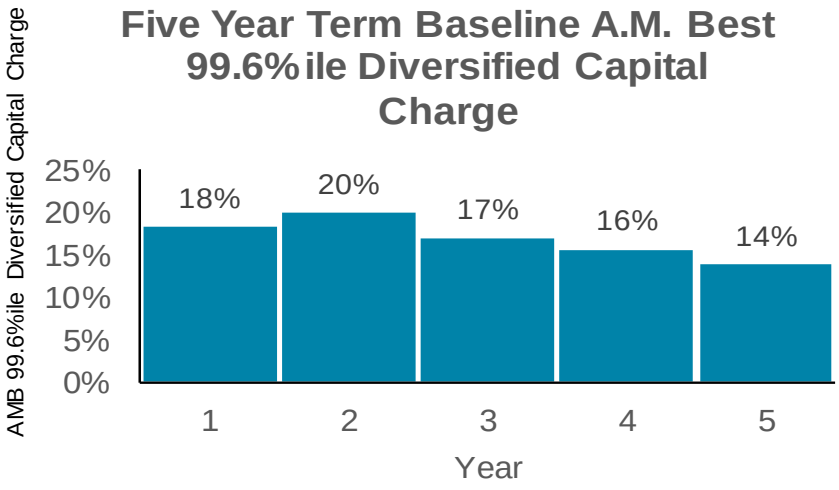
Estimating A.M. Best Capital Charges for CIRT 2018-1

Multi Year Charges – 5 Year Term Baseline Scenario

A.M. Best CIRT 2018-1 Baseline Capital Charges

Month	(1) 12 Yr SUL	(2) Realized Loss	(3) Cumulative Stress Loss	(4) Future Loss on Line	(5) Discounted Gross Capital Charge	(6) Discounted Premium Credit	(7) Discounted Net Capital Charge	(8) Diversified Capital Charge
0	3.7%	0.0%	3.7%	100%	79%	23%	56%	18%
12	3.5%	0.0%	3.5%	100%	81%	20%	61%	20%
24	3.2%	0.1%	3.2%	78%	67%	15%	52%	17%
36	2.7%	0.1%	2.8%	69%	60%	12%	48%	16%
48	2.2%	0.1%	2.3%	61%	53%	10%	42%	14%
						5 Year Average:	**52%**	**17%**

Assumptions: 10% CPR, 0.15% CDR, 25% Severity



- Charge increases over time initially as future premium is reduced but stressed loss is remains greater than 325 bps exhaustion point
- Charge decreases after stressed loss falls below exhaustion point
- Average charge before diversification is ~52% of original limit and ~17% after reasonable diversification credit

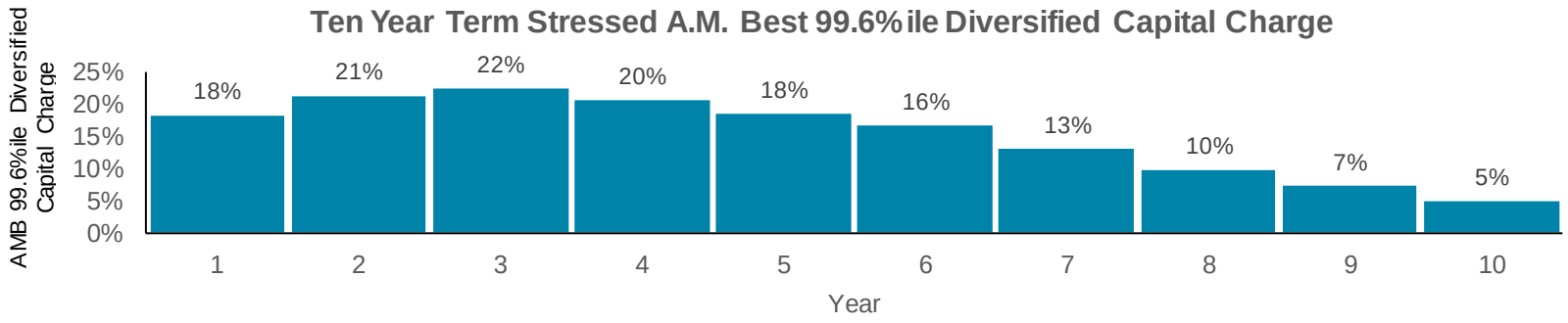
Estimating A.M. Best Capital Charges for CIRT 2018-1

Multi Year Charges – 10 Year Term Stressed Scenario

A.M. Best CIRT 2018-1 Stress Capital Charges

Month	(1) 12 Yr SUL	(2) Realized Loss	(3) Cumulative Stress Loss	(4) Future Loss on Line	(5) Discounted Gross Capital Charge	(6) Discounted Premium Credit	(7) Discounted Net Capital Charge	(8) Diversified Capital Charge
0	3.7%	0.0%	3.7%	100%	79%	23%	56%	18%
12	3.5%	0.3%	3.9%	100%	84%	19%	65%	21%
24	3.3%	0.6%	3.9%	93%	82%	14%	68%	22%
36	2.8%	0.9%	3.7%	84%	75%	12%	63%	20%
48	2.3%	1.1%	3.5%	75%	67%	11%	56%	18%
60	1.8%	1.4%	3.2%	66%	59%	8%	51%	16%
72	1.4%	1.6%	2.9%	51%	46%	6%	40%	13%
84	1.0%	1.7%	2.8%	38%	34%	4%	30%	10%
96	0.7%	1.9%	2.6%	27%	25%	3%	22%	7%
108	0.5%	2.0%	2.5%	17%	17%	1%	15%	5%
						10 Year Average:	**47%**	**15%**

Assumptions: 8% CPR, 0.70% CDR, 50% Severity



Simplified Estimate of CIRT 2018-1 Economics

Estimated Common Insurance Metrics for CIRT 2018-1 by Scenario

	Baseline Scenario	Stress Scenario[1]	Across the Cycle Avg
Rate on Line	15% to 18%	22% to 27%	16% to 19%
Loss on Line	0%	50% to 70%	3% to 4%
Margin on Line[2]	14% to 16%	-30% to -45%	11% to 13%
Required Capital[3]	65% to 105%	120% to 180%	70% to 110%
Return on Capital[4]	18% to 23%	-20% to -25%	14% to 18%

1 Roughly 200 to 250 bps of loss stressed scenario

2 Margin = Premium minus loss minus expense, which is assumed to be 10% of premium

3 Cumulative lifetime capital required for A.M. Best 99.6 percentile after diversication credit

4 Pre-tax nominal return on Capital plus investment income on committed capital

- Figures above scale with dollars of limit committed
  - For example, $100M of limit for CIRT 2018-1 might generate $15M to $18M of premium in the baseline scenario
- The simple analytic approach outlined today should help those new to CRT but considering CIRT get a quick understanding of the key components of potential economics – premium, losses, capital and potential returns

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