

Mortgage Credit Risk Transfer (CRT) while emerging from a Pandemic

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2022 CAS Virtual Seminar on Reinsurance

June 13, 2022



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- Private Mortgage Insurance (PMI) – the basics
- Economics during and while emerging from a pandemic
- Reinsurance vs. Capital Markets
- Long Term view of mortgage credit risk

Basics of Private Mortgage Insurance (PMI)

- Front-end risk transfer
- Covers lender/investor for financial loss if borrower defaults
- Generally required if (loan > 80% x property value)
- What makes it different:
 - Long term contracts with pricing set up front
 - Reserves only cover delinquent loans – claims vs cures
 - But ultimate losses have substantial tail risk
 - Mismatch between revenue and expense
 - Therefore contingency reserves and capital requirements
 - Reserving: short-ish tail
 - Pricing/PDR/Capital Adequacy: long tail!
- Q/S and XOL but function similarly for PMIERs capital relief
- CRT shares these risk characteristics



Milliman M-PIRe

End-to-end CRT and mortgage reinsurance analytics software solution

Key Product Features

1. Contains all required data for complete and thorough CRT analysis **including reinsurance and private transactions**: Eliminates the requirement for time-consuming data collection, processing, and report generation
2. 100% Cloud-based product with all required integrated modules for CRT analysis: No need to purchase multiple licenses from multiple providers and try to stitch the pitches together
3. Real-time updates to platform for all users: All users received continuous updates to the platform; clients do not need to download or update software
4. Stochastic portfolio analysis can be performed within minutes for a new portfolio: M-PIRe was built by a development team with expertise in mortgage analysis and high-frequency trading.
5. Coverage for multiple exposure types: GSE CRT, MI Reinsurance, MI ILN, Multifamily, and non-US risk transfer deals

Milliman M-PIRe

M-PIRe - Mortgage Platform for Investments and Reinsurance

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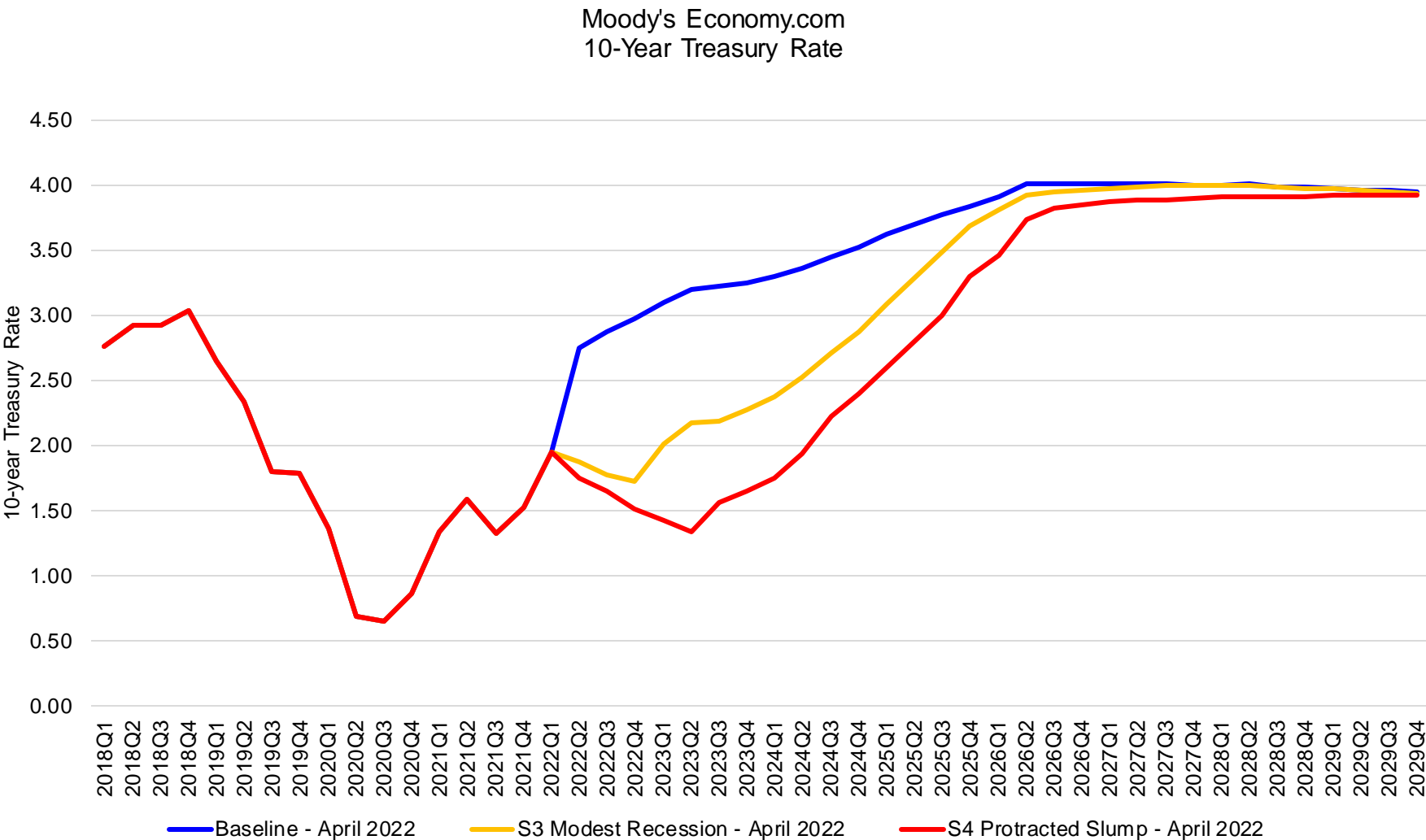
M-PIRe - Mortgage Platform for Investments and Reinsurance

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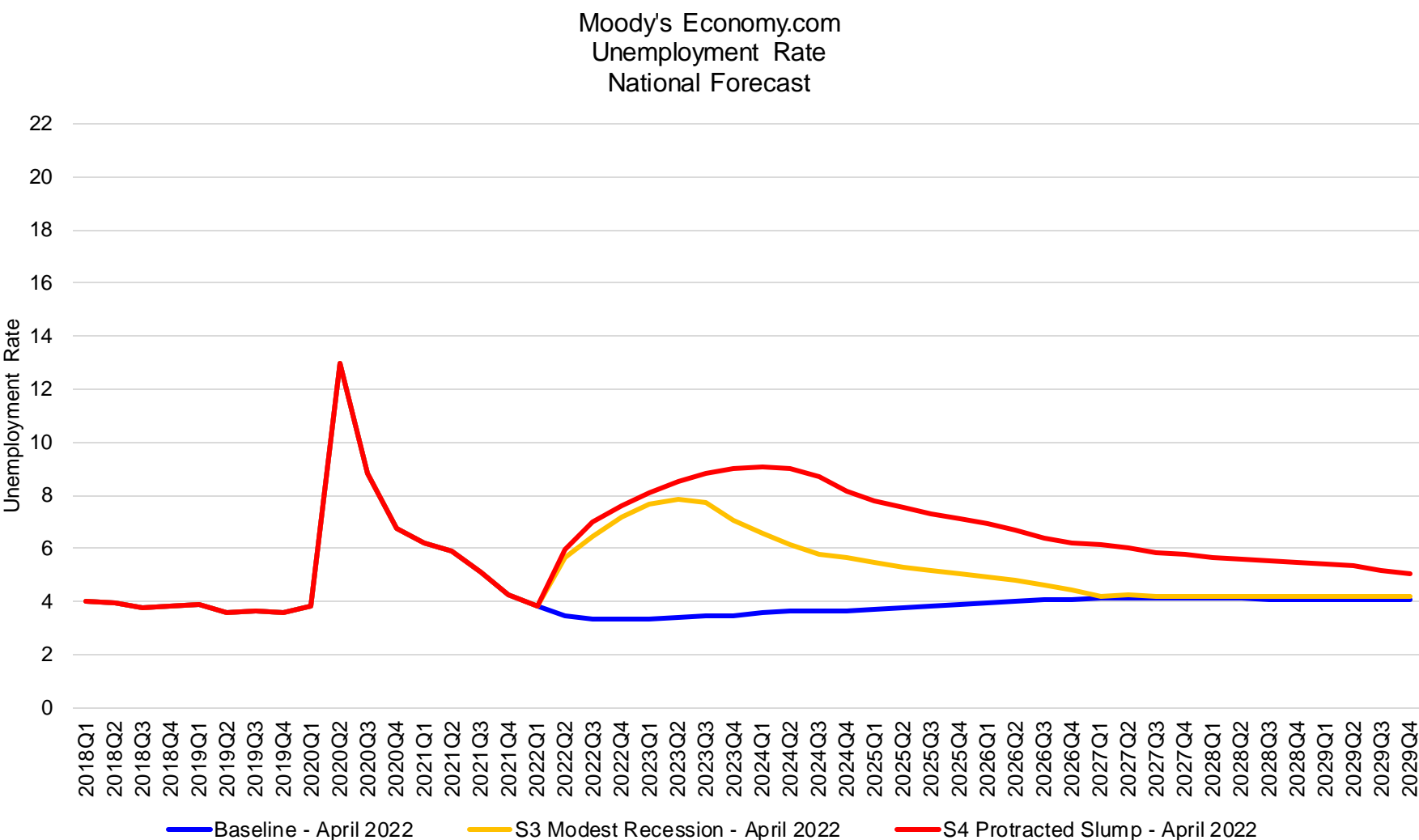
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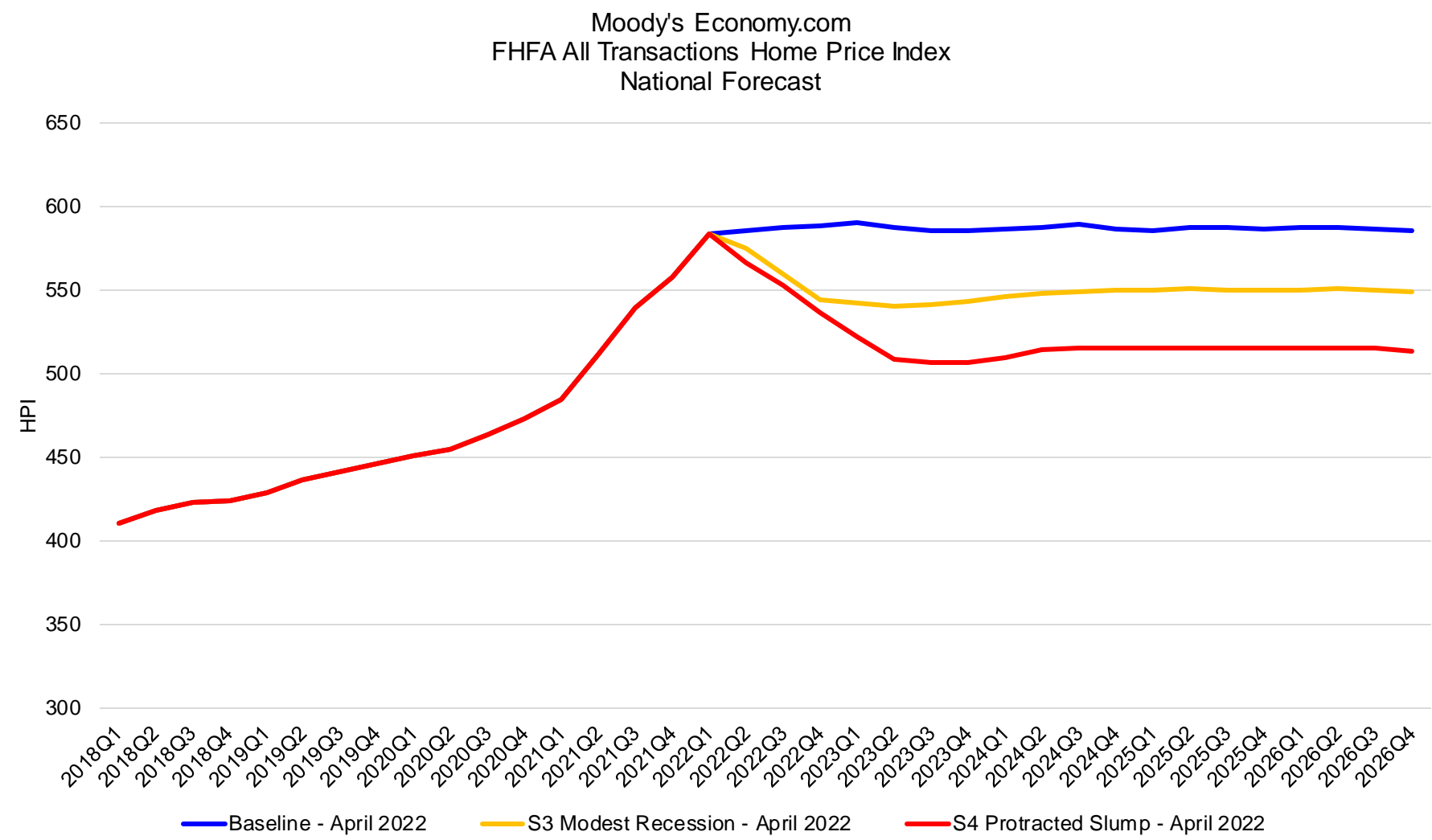
Economics during a pandemic: 10-Year Treasury



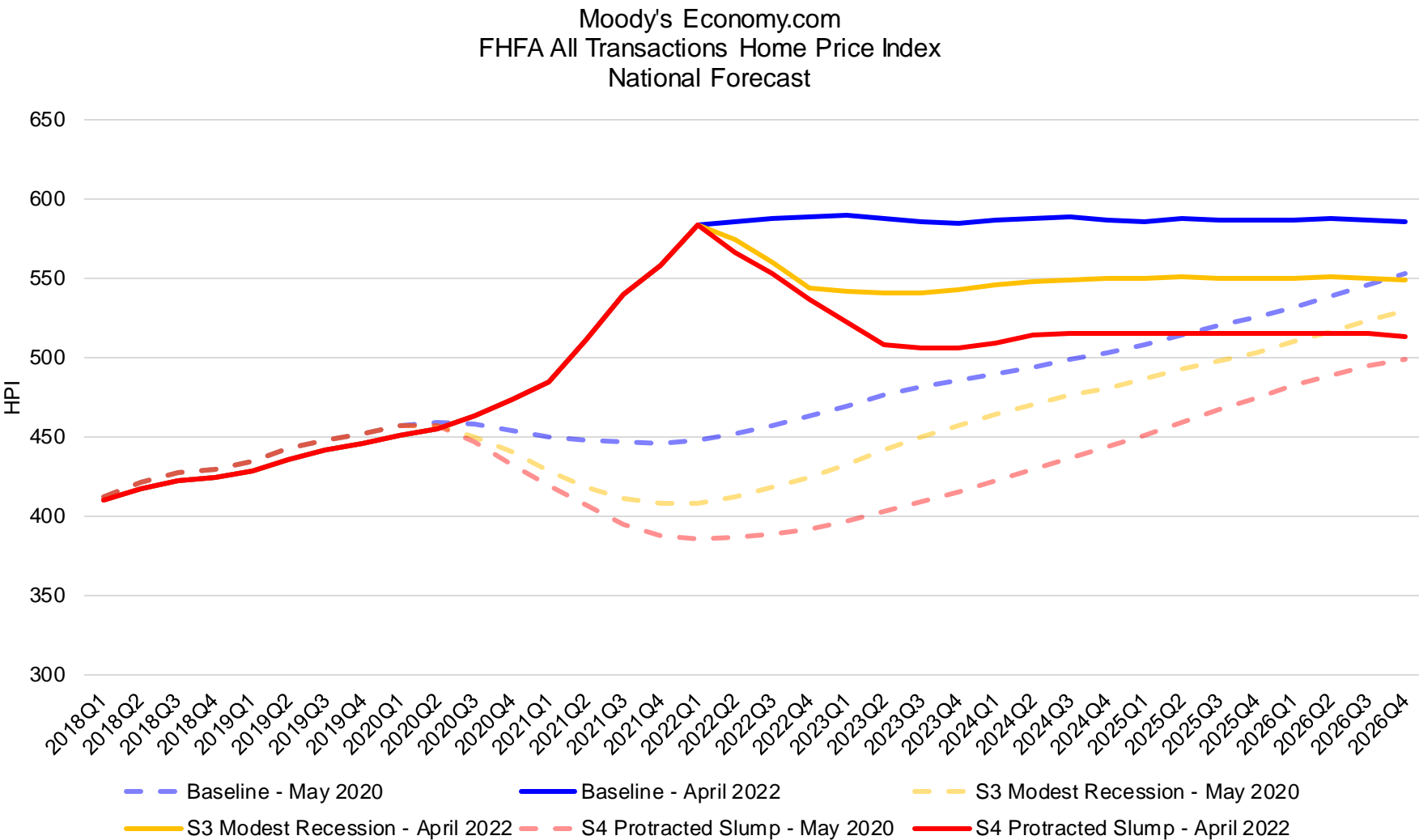
Economics during a pandemic: Unemployment Rate



Economics during a pandemic: Home Prices (FHFA)

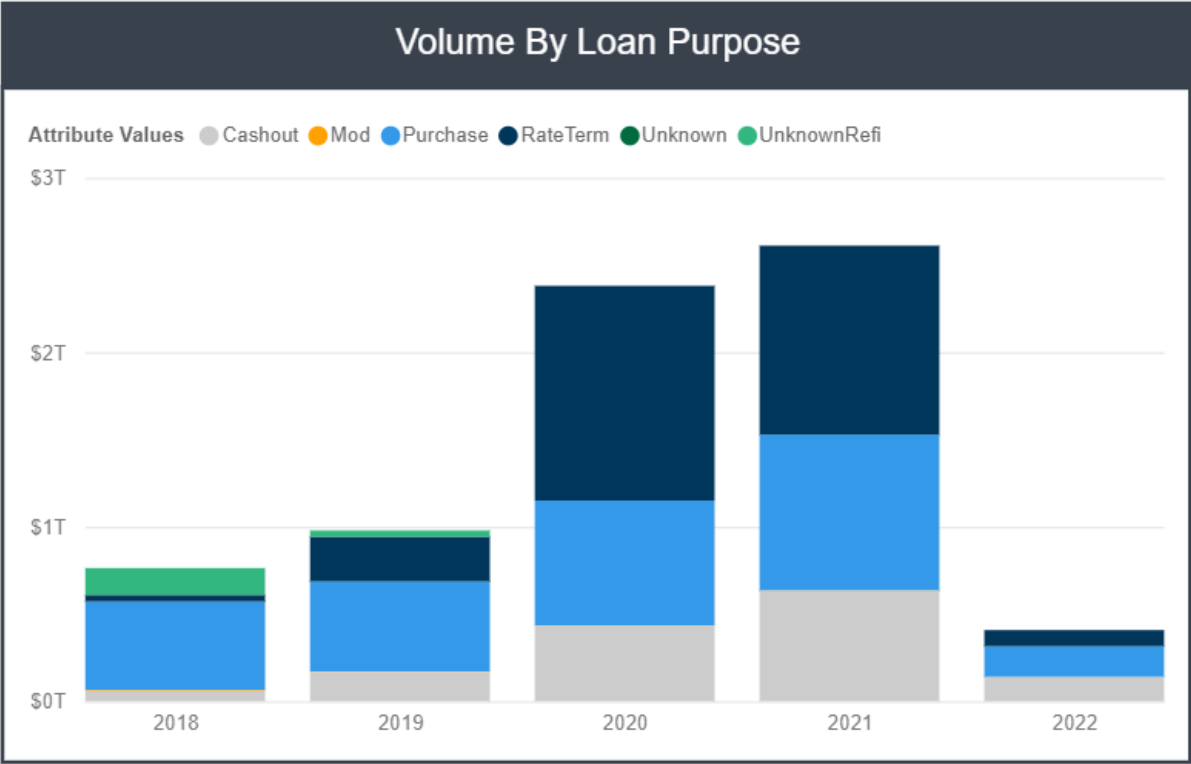
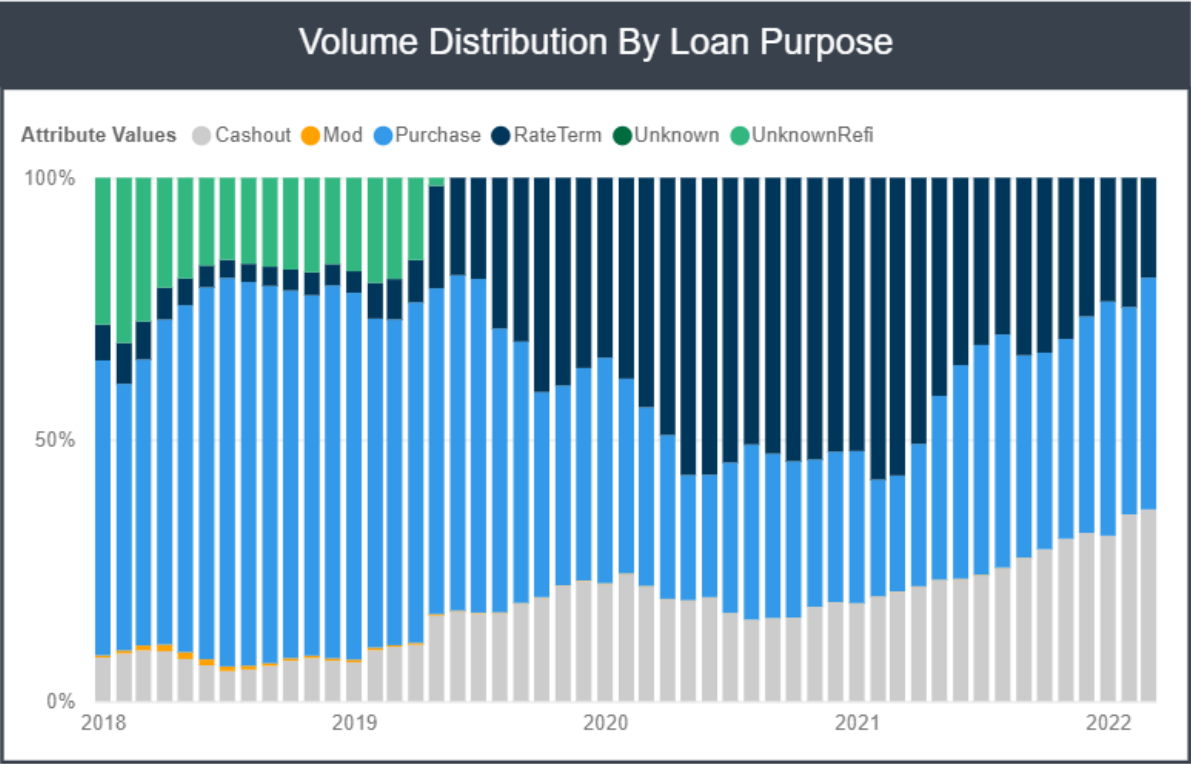


Economics during a pandemic: Home Prices (FHFA)

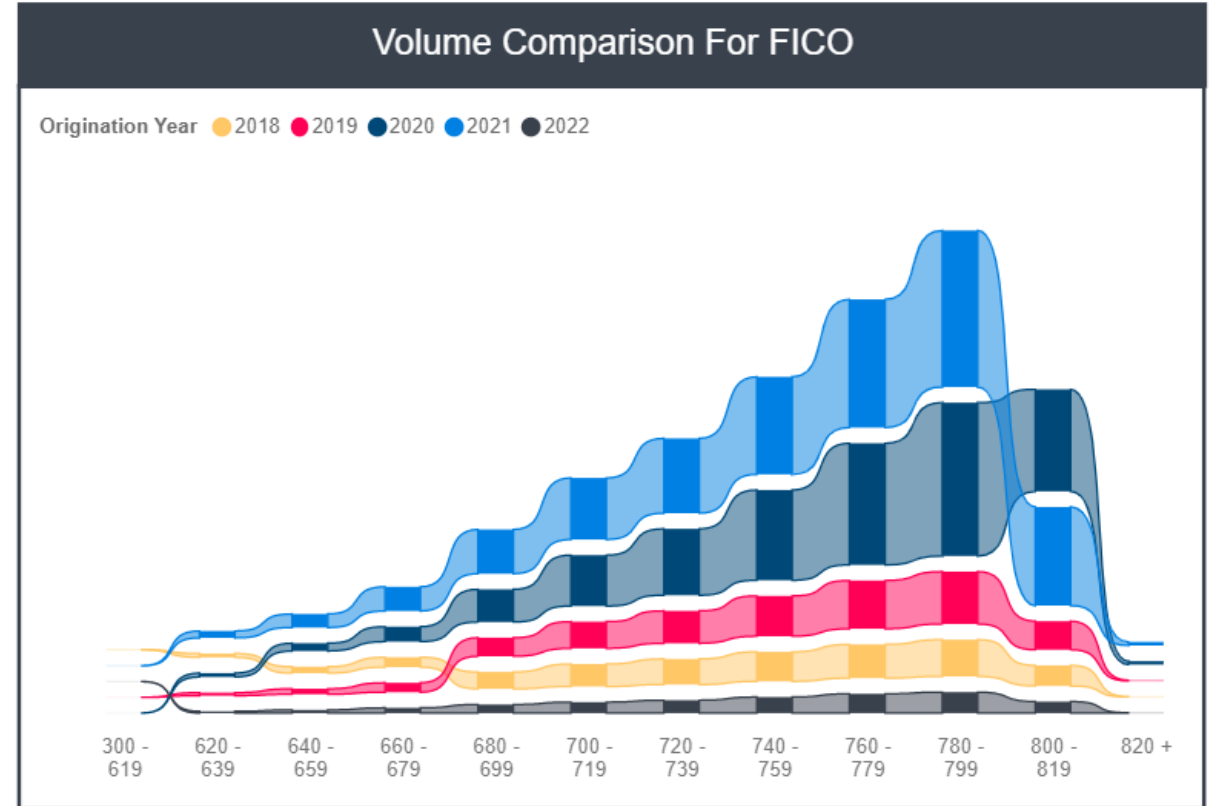
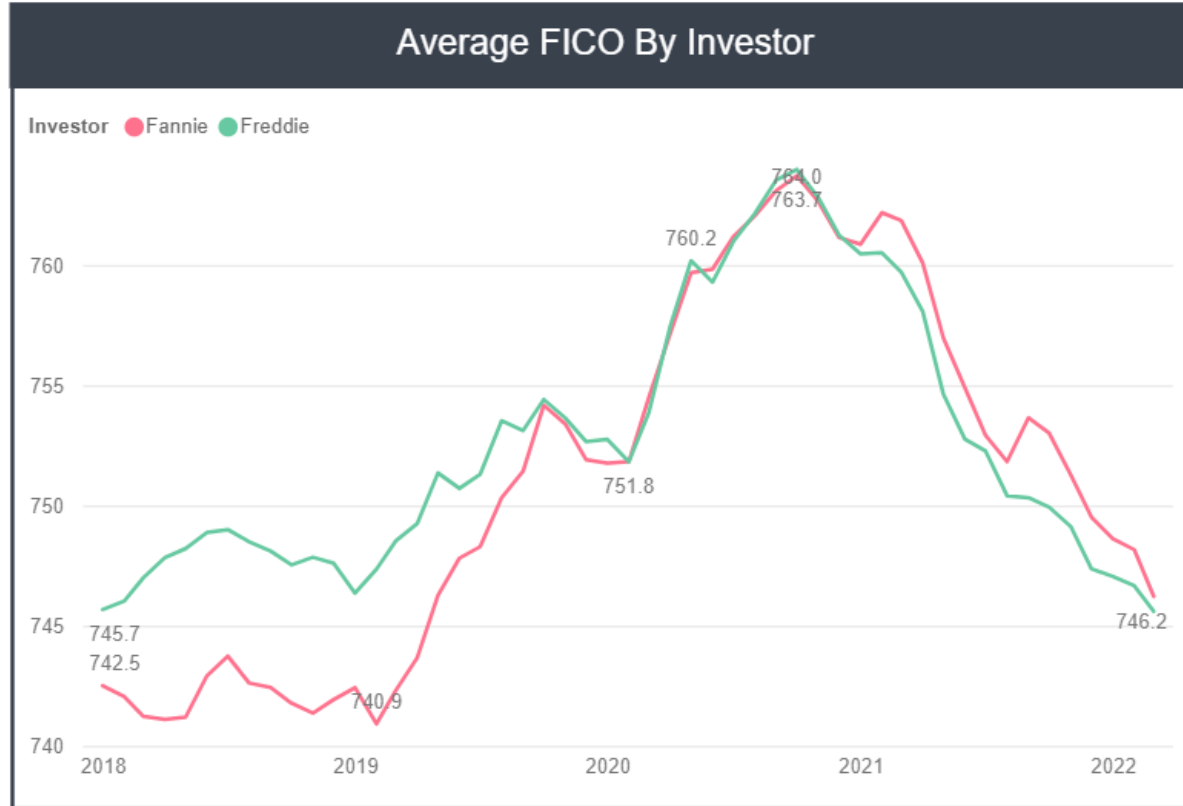


Moody's Economy.com – May 2020 and April 2022 Forecasts - FHFA All Transactions Home Price Index, (Index 1980Q1=100, NSA)

Purchase vs Refi Market



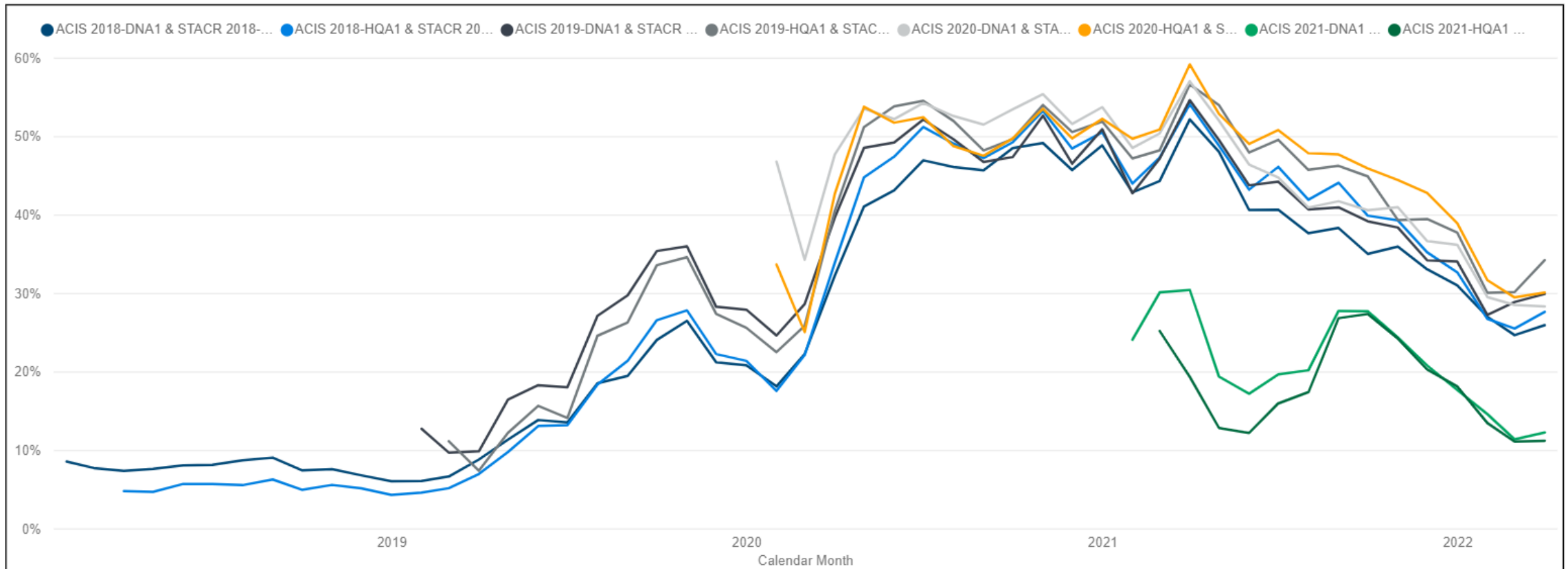
FICO Trends



Prepayment Speeds

Incremental Annualized Prepay Rates by Calendar Month

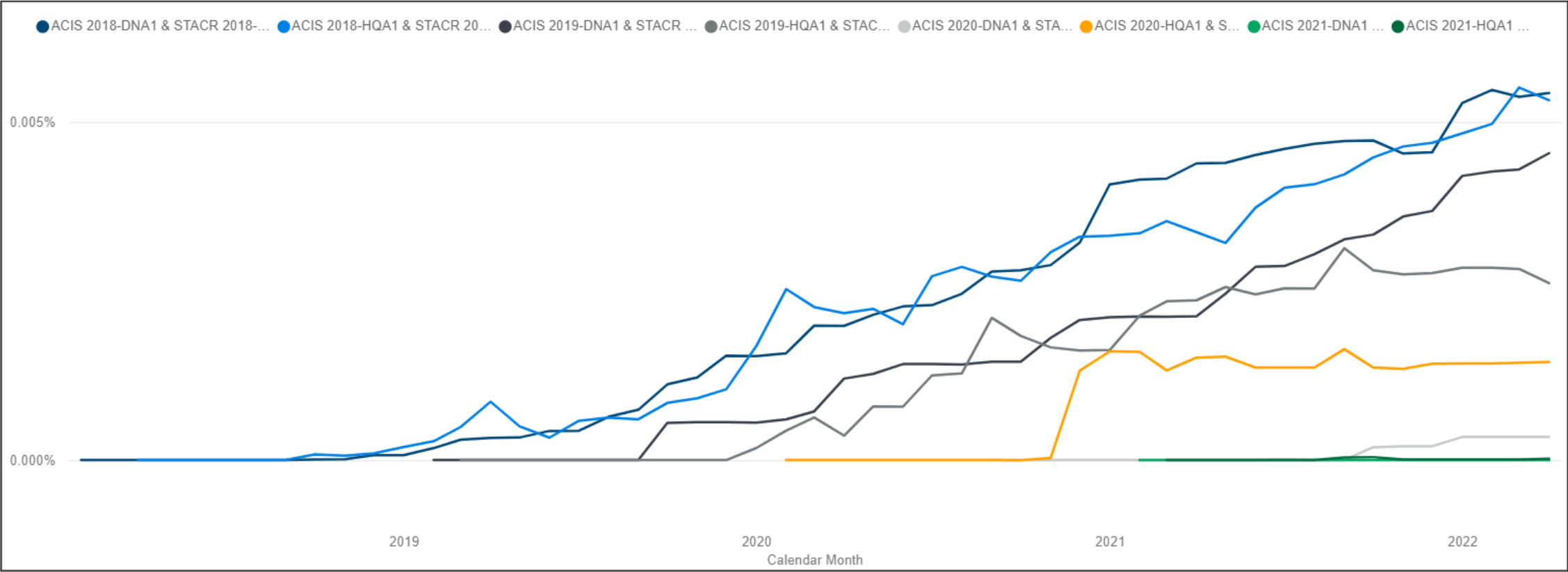
[Click here to access underlying data](#)



Net Loss Rates

Cumulative Collateral Loss Amounts by Calendar Month

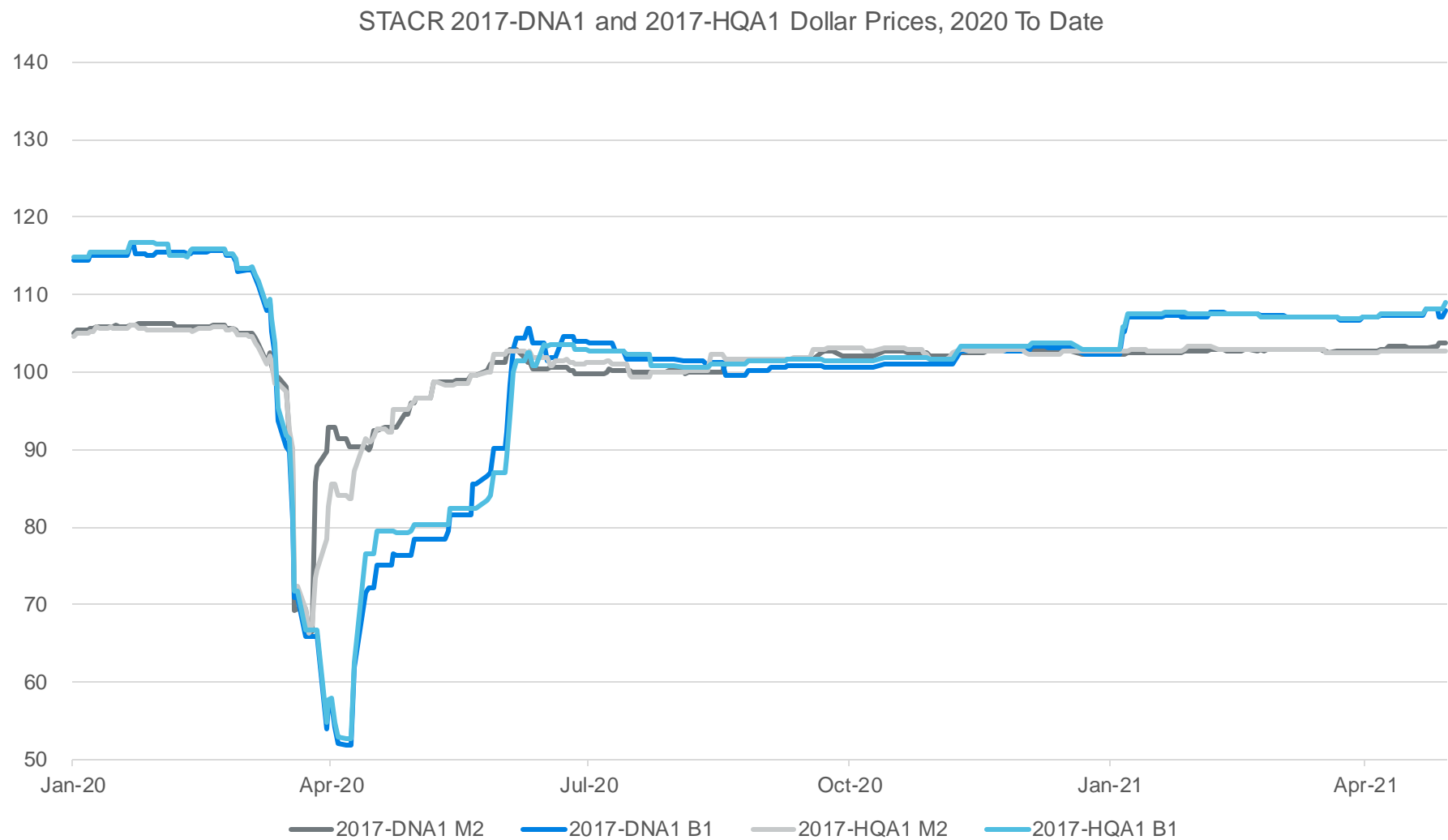
 [Click here to access underlying data](#)



Capital Markets reaction to pandemic

- Milliman performed an overview and comparison of GSE CRT price developments during times of financial market stresses, original article and update links below
 - ✓ <https://www.milliman.com/en/insight/In-it-for-the-long-haul-A-case-for-the-expanded-use-of-the-GSEs-reinsurance-CRT-executions>
 - ✓ <https://www.milliman.com/en/insight/the-gse-crt-market-reopens-post-covid19-disruption-a-new-normal-or-more-troubles-on-the-horizon>
- Between 2017 and 2020, GSE CRT issuances reflect approximately a 75/25 split between capital markets executions and reinsurance executions
- Capital markets tend to be more volatile and represent a less stable source of risk capital during market stress
- Reinsurance markets heavily invest in understanding the risks of exposures during the underwriting process with less opportunity to trade out of the risk (illiquid risk position). Therefore, they tend to have a longer-term perspective of the exposure and price risks through market cycles

Capital Markets reaction to pandemic – seasoned CRT deal



Vista Data Services as of April 2021

Capital Markets Pricing Volatile in Early 2022



Capital Markets Pricing Volatile in Early 2022 (ILN similar story)

Fannie Mae Delays Mortgage-Backed Bond Sale After Volatile Day

- GSE holds off planned credit-risk transfer securities sale
- Plans to monitor market in coming days to determine next steps

By Adam Tempkin and Carmen Arroyo

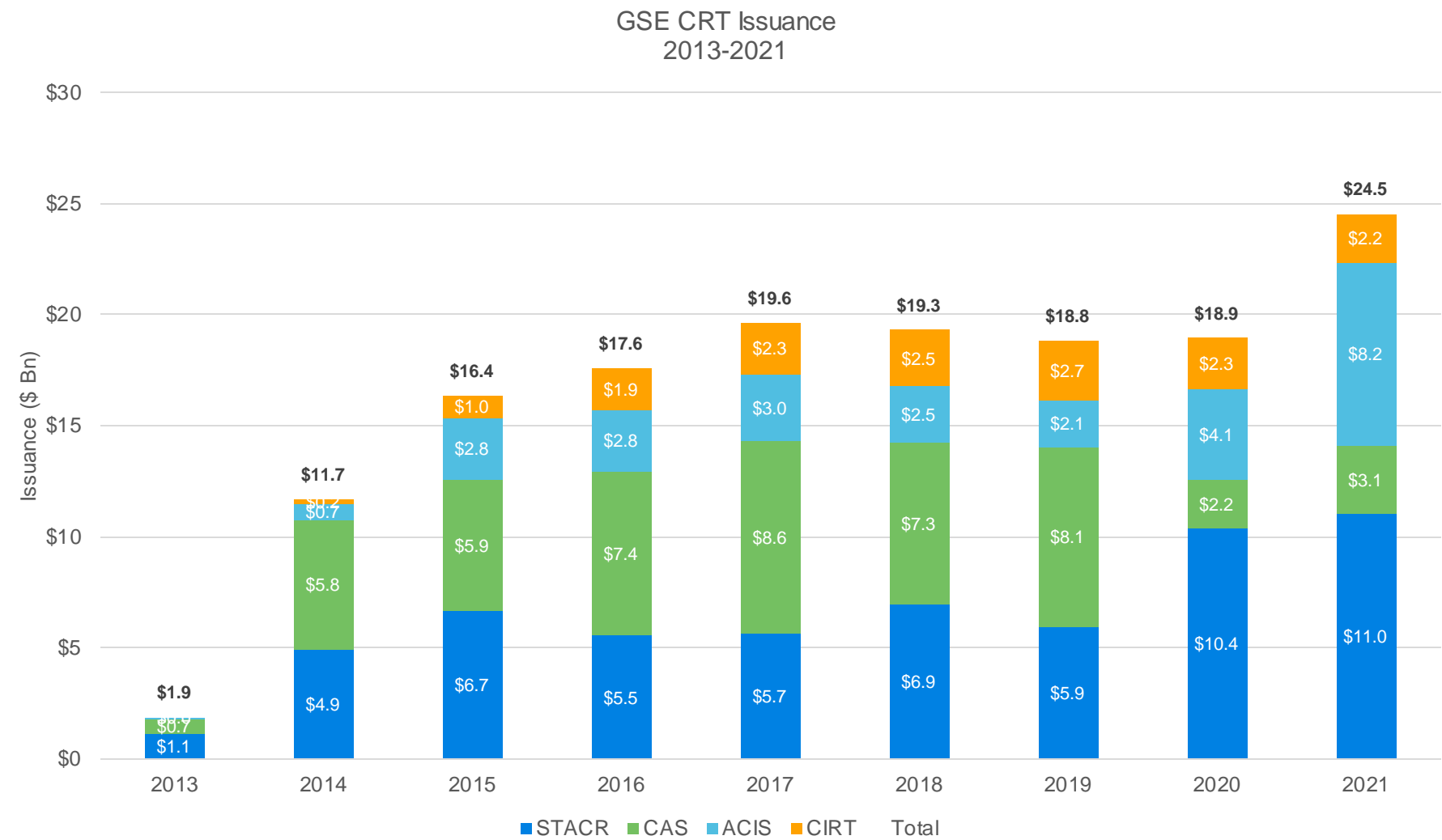
(Bloomberg) -- Fannie Mae delayed a scheduled residential mortgage bond on Thursday due to market volatility spurred by Russia's invasion of Ukraine, according to people with knowledge of the matter.

The government sponsored enterprise had kicked off marketing on the deal but postponed a key step in selling the debt, setting initial price guidance, said the people, who asked not to be identified as the transaction is private. The transaction is part of the GSE's Connecticut Avenue Securities programmatic series of RMBS.

Fannie Mae has opted to delay CAS 2022-R03 at this time. Market conditions and limited CRT trading volumes/price transparency over the past week are the primary reasons for the decision. We expect to utilize our next issuance window in March for this transaction, pricing the week of March 21.

Fannie Mae will notify Data Dynamics users when the updated loan tape is available.

Relative Share of Reinsurance Transactions Rise in 2021



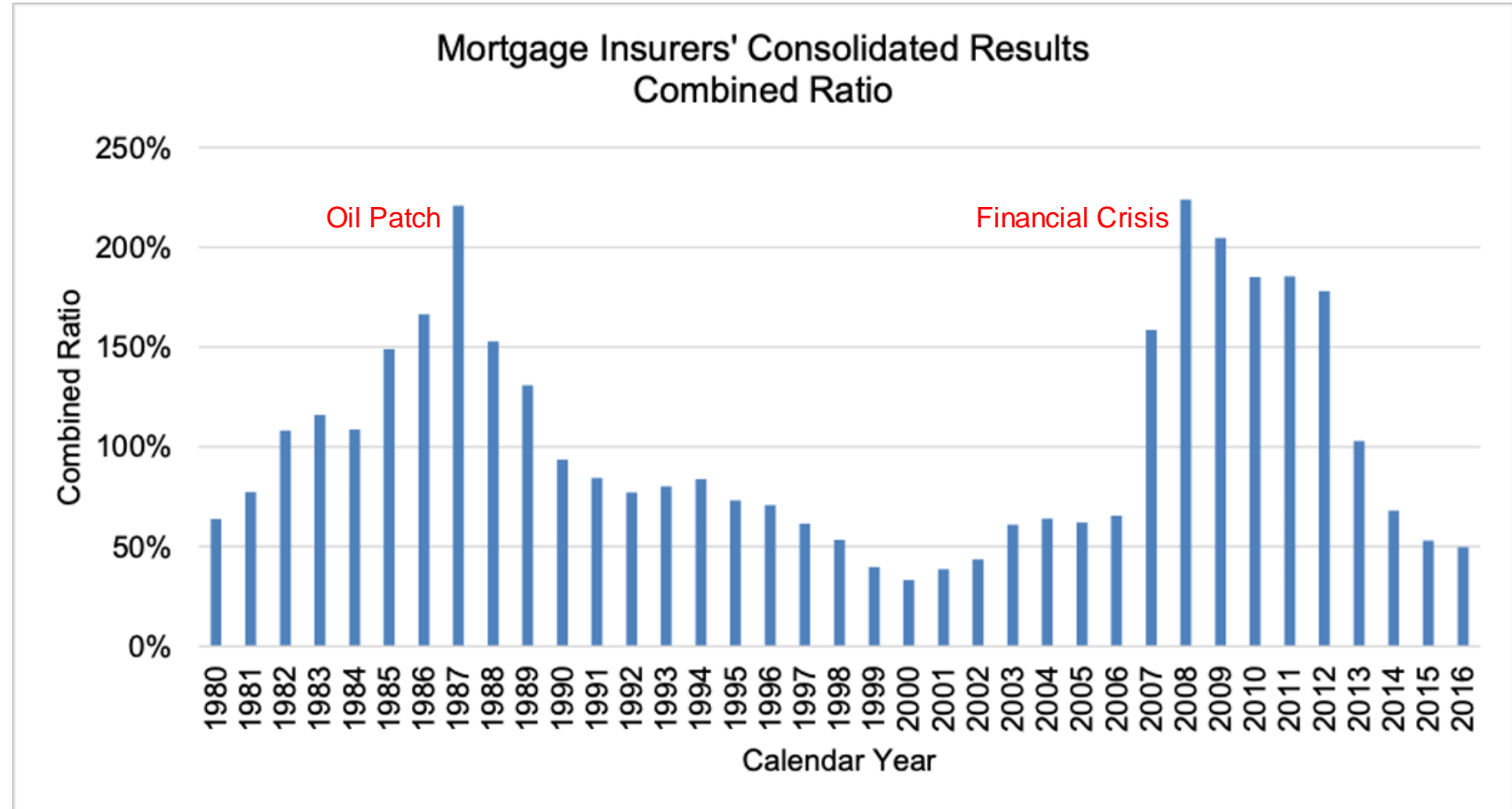
In Summary

- The GSEs historically relied more heavily on the capital markets relative to the reinsurance markets
- The Capital markets dislocations during the pandemic and Russia-Ukraine crisis suggests that reinsurance may be a more reliable and viable option in market stresses/dislocations
- Reinsurance executions are easier for GSEs to rapidly execute since due diligence and rating agency reviews slow capital markets execution. So paying a bit more for reinsurance in the current environment for stability and quick execution allows for complimentary executions with the capital markets
- Importance of long view of risk and robust surveillance and portfolio modeling

Mortgage Insurance Cycles

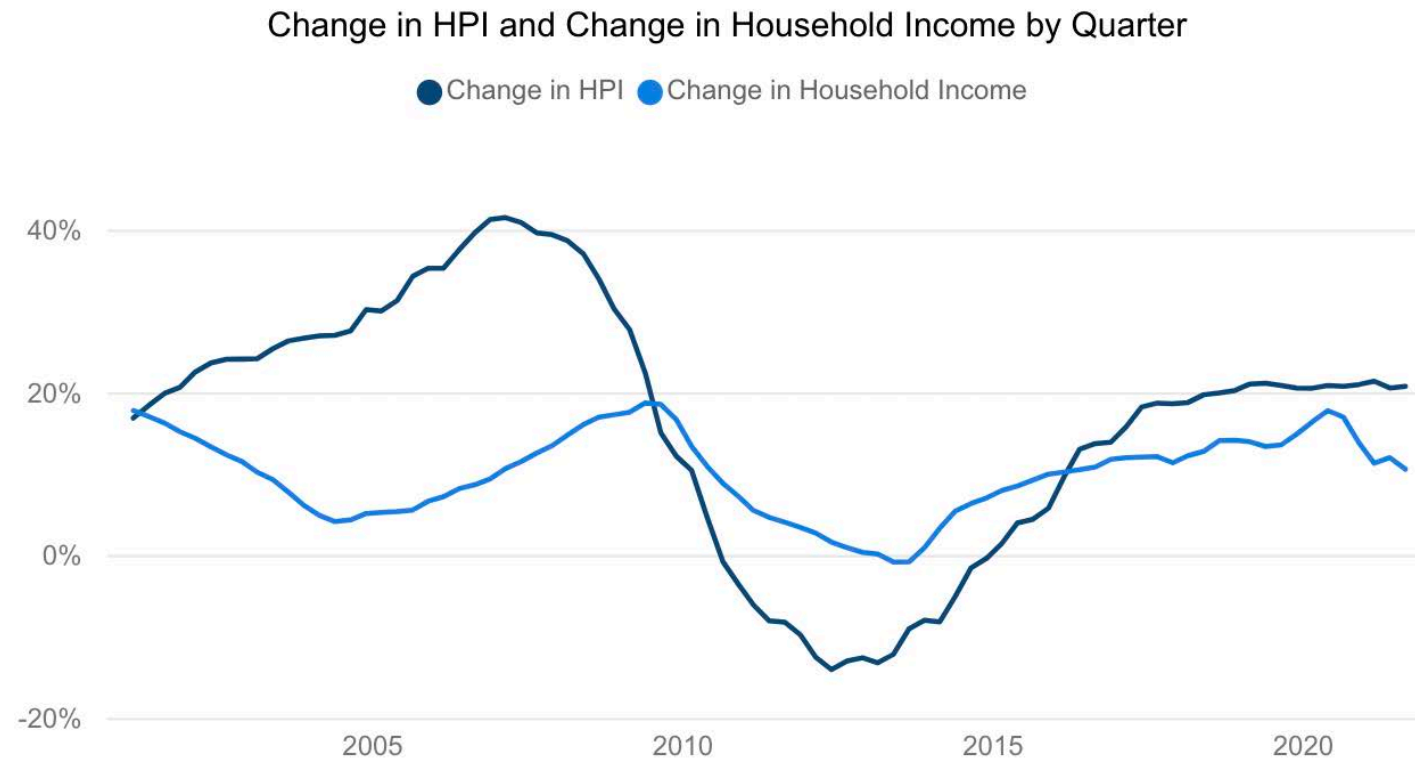
Housing Economics – Managing the Supply and Demand Curve

- Historical performance fundamentally impacted more by economics than credit
- However, credit shifts fundamentally linked by product changes as a result of economics:
 - No or negative amortization features
 - Limited terms
 - Downpayment / CLTV
 - Property Types
- Avoidance of “financing one’s way into a home”



Economics

House Prices vs. Personal Income



Change in HPI and Household Income is calculated by taking the prior years value over the value from 5 years prior. For example, The change in HPI for 1/1/2019 is calculated by taking the HPI as of 1/1/2018 over the HPI as of 1/1/2014

Limitations

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Accompanying Oral Discussion

- This document is not complete without the accompanying oral discussion and explanation of the underlying projection methodologies, results and variability.

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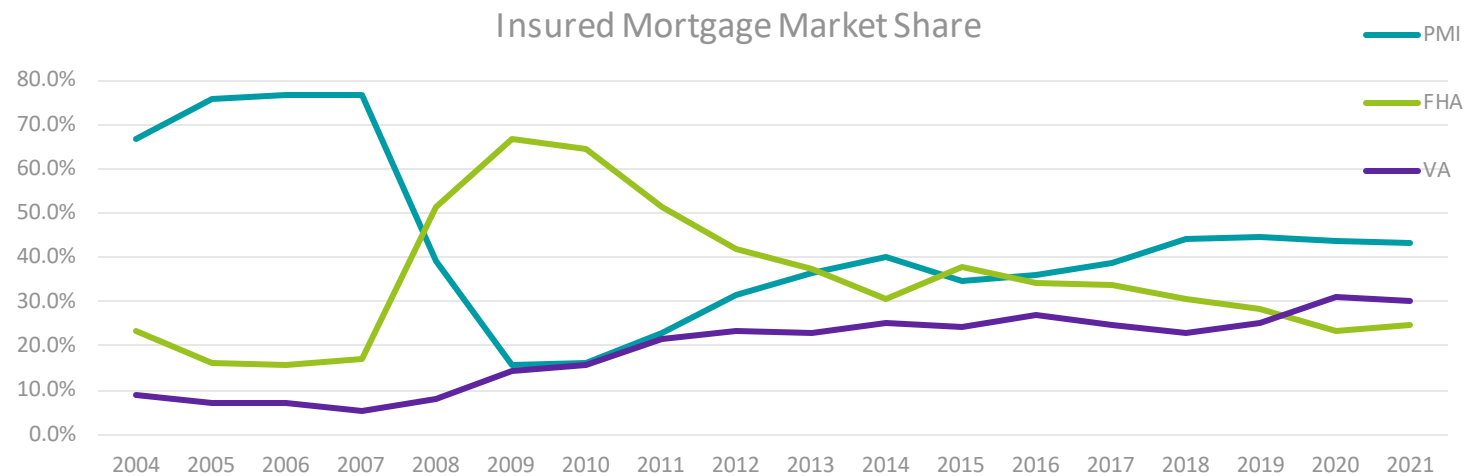
Thank you



Mortgage Credit Risk Transfer – The Primary MI Market

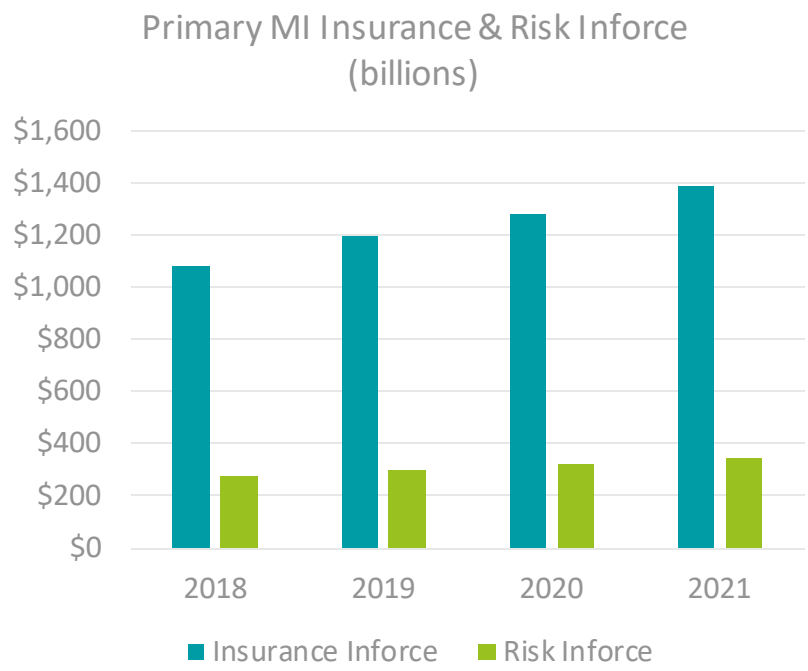
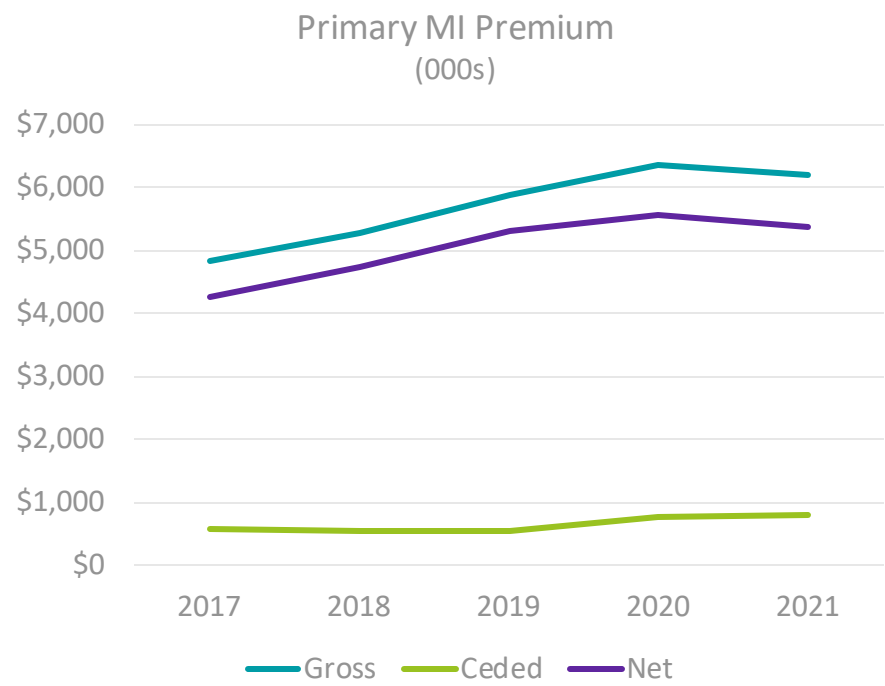
*John Gaines, EVP – Chief Actuary
Arch US MI*

- There are three main providers of Mortgage Insurance
 - Federal Housing Administration (FHA) Insurance
 - Government backed
 - Insures 100% of the loan amount
 - Veteran Affairs (VA)
 - Government backed
 - Guarantees a percentage of loan amount (25%)
 - Private Mortgage Insurance (PMI)
 - Primary credit enhancement for conventional mortgages with >80% Loan-to-value (LTV) sold to the Government Sponsored Entities (GSEs), also known as Fannie Mae and Freddie Mac
 - Can also be obtained if lender keeps the loan or sells to a private investor (usually for “jumbo” loans that are above the GSE’s maximum loan limit)
 - Typically insures a percentage of the loan amount



Primary Mortgage Insurance Industry

- Currently there are 6 PMI providers
 - Five are primarily monolines (MGIC, Enact, Essent, Radian & National MI)
 - One is a member of a multi-line group (Arch)



Source: Companies Financial Disclosures

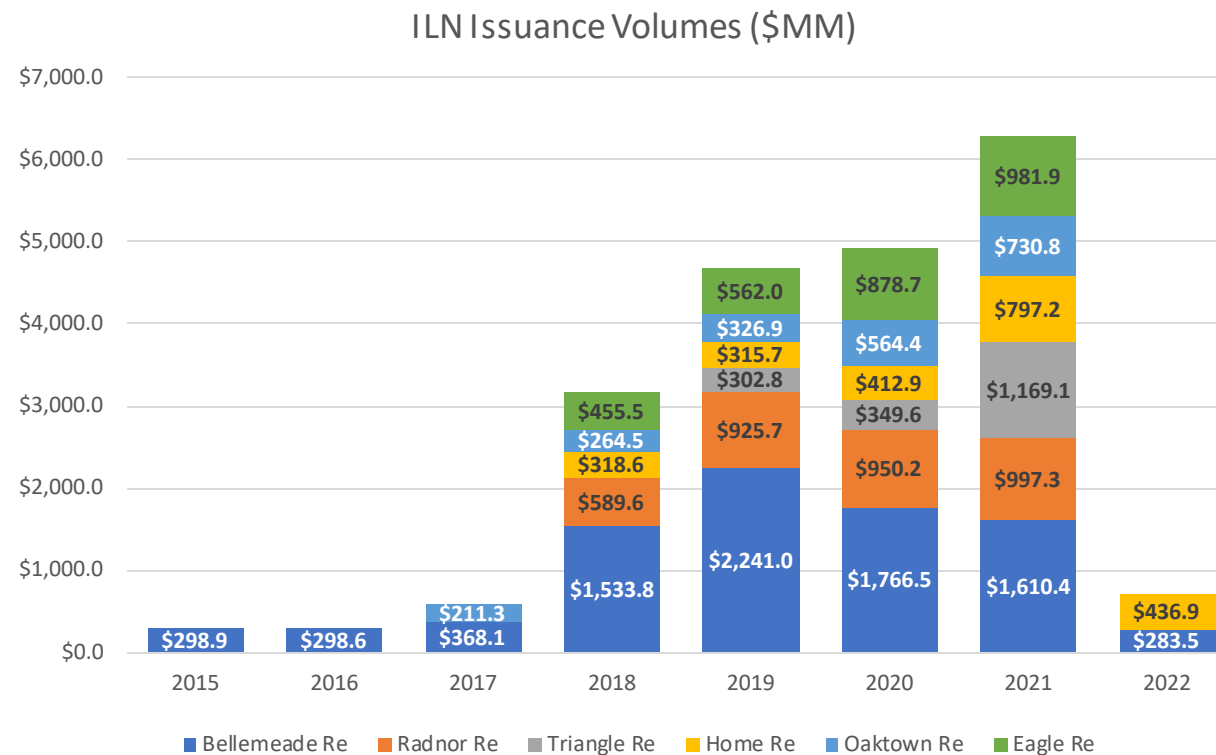
- Prior to the Great Financial Crisis (GFC), the industry utilized very little traditional reinsurance. Some companies did obtain reinsurance through captive reinsurers established by their customers.
- Catalyst for Change:
 - Going into the GFC there were 7 major writers of PMI – coming out of the GFC there were 4. Each of the surviving entities experienced some level of pressure on capital.
 - In response, the GSEs (Fannie Mae and Freddie Mac who are the primary beneficiaries of coverage) issued new capital rules (PMIERS). PMIERS established risk-based asset requirements for existing loans as well as new production (e.g. FICO, Loan to Value). In addition, the rules provide capital relief for qualifying reinsurance.
- As of 1Q 2022, use of third party reinsurance by mortgage insurers ranged from 67%-97% of Insurance In Force.

Reinsurance Structures

- Quota Share
 - At least three PMIs utilize quota share reinsurance on their forward production
 - The agreements contain traditional ceding and profit commission features
 - In addition, loss ratio caps and product concentration limits are common
- Excess of Loss
 - At least two PMIs utilize excess of loss reinsurance on their forward production
 - In addition, excess of loss agreements have been utilized in lieu of Mortgage Insurance Linked Notes (MILNs) when some type of dislocation event has occurred in the capital markets
- MILNs
 - The entire industry has utilized MILNs over the past couple of years and would be considered programmatic issuers
 - MILNs provide fully collateralized risk protection

MILNs at a Glance

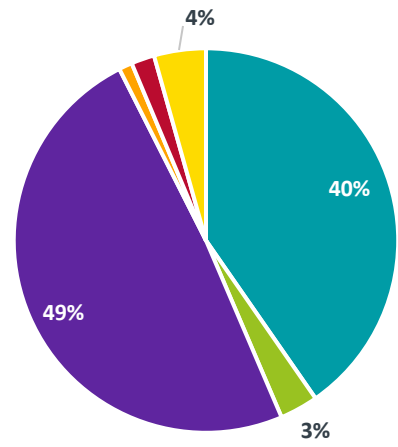
		ILN Original \$ Issuance (millions)								Total	# of Deals to Date
		2015	2016	2017	2018	2019	2020	2021	2022		
Arch	Bellemeade Re	\$298.9	\$298.6	\$368.1	\$1,533.8	\$2,241.0	\$1,766.5	\$1,610.4	\$283.5	\$8,400.9	18
Essent	Radnor Re				\$589.6	\$925.7	\$950.2	\$997.3		\$3,462.7	7
Enact	Triangle Re					\$302.8	\$349.6	\$1,169.1		\$1,821.5	5
MGIC	Home Re				\$318.6	\$315.7	\$412.9	\$797.2	\$436.9	\$2,281.3	6
National MI	Oaktown Re			\$211.3	\$264.5	\$326.9	\$564.4	\$730.8		\$2,098.0	7
Radian	Eagle Re				\$455.5	\$562.0	\$878.7	\$981.9		\$2,878.1	6
Total		\$298.9	\$298.6	\$579.4	\$3,162.1	\$4,674.1	\$4,922.3	\$6,286.8	\$720.4	\$20,942.6	49



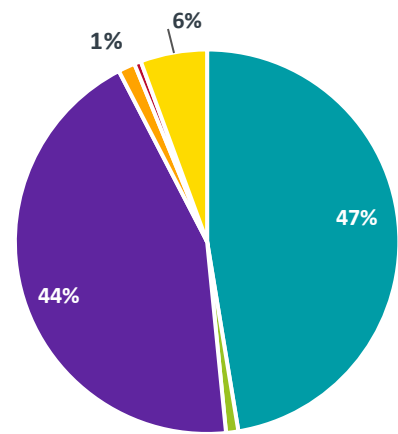
- Mortgage insurance linked notes issuance remained robust through most of 2021 before slowing near year end as interest rates rose and risk views became less certain.
- The \$6.3 billion of new issuance in 2021 was a new industry record.
- In the first months of 2022, issuance has slowed as mortgage insurers have alternatively secured traditional reinsurance arrangements. One provider has elected to secure an excess of loss reinsurance arrangement on their 2H 2021 production rather than market a new MILN.
- Some MIs have executed an excess of loss agreement concurrent with the issuance of their MILNs.

Ceded Premium by Geography

2020 Ceded Premium Location



2021 Ceded Premium Location



- Bermuda and the US are the primary domiciles of reinsurers participating in the primary MI market

Source: Companies Financial Disclosures

There are a number of reinsurers currently participating in the market

2021 Ceded Premium by Mortgage Insurer									
Reinsurer	ACGL	MGIC	RDN	NMI	Enact	ESNT	Total	Market Share	Country
1 Arch Mortgage Insurance Co.	237,927	0	0	0	0	0	237,927	27%	USA
2 Essent Reinsurance Ltd.	0	0	0	0	0	216,822	216,822	25%	Bermuda
3 Renaissance Re Europe	15,233	12,642	12,249	9,131	0	0	49,255	6%	Switzerland
4 Partner Reinsurance Co. Ltd.	16,652	12,413	3,500	0	0	0	32,565	4%	Bermuda
5 Renaissance Reinsurance Ltd.	480	8,656	-21,188	22,174	3,610	17,107	30,839	4%	Bermuda
6 Everest Reinsurance Co.	23	19,924	4,460	4,130	0	0	28,537	3%	USA
7 AXIS Reinsurance Co.	7,809	7,418	0	5,043	833	1,625	22,728	3%	USA
8 Arch Reinsurance Ltd.	20,119	0	2,379	0	0	0	22,498	3%	Bermuda
9 Ascot Bermuda Ltd.	0	4,979	3,500	9,279	117	3,515	21,390	2%	Bermuda
10 Everest Re (Bermuda) Ltd.	874	0	0	117	4,673	15,296	20,960	2%	Bermuda
11 Third Point Reinsurance Co.	0	4,338	0	16,381	0	0	20,719	2%	Bermuda
12 Validus Reinsurance Ltd.	672	0	0	12,014	1,562	4,062	18,310	2%	Bermuda
13 CUMIS Mortgage Reinsurance Co	4,949	10,085	0	0	0	0	15,034	2%	USA
14 National Union Fire Ins Co.	14,008	0	0	0	0	103	14,111	2%	USA
15 American Home Assurance Co	13,995	0	0	0	0	0	13,995	2%	USA
16 Greenlight Reinsurance Ltd.	0	1,381	0	8,997	1,460	716	12,554	1%	Cayman Islands
17 Lexington Insurance Co.	11,996	0	0	0	0	0	11,996	1%	USA
18 Markel Global Reinsurance Co.	2,287	7,152	-4,039	2,027	1,451	3,074	11,952	1%	USA
19 Transatlantic Reinsurance Co.	1,454	5,571	0	2,027	858	177	10,087	1%	USA
20 Steamship Mutual Trust	0	0	0	9,247	0	0	9,247	1%	Bermuda
21 Aspen Insurance UK Ltd.	1,441	2,628	-312	4,555	344	0	8,656	1%	United Kingdom
22 Nomura America USA Re Ltd.	0	0	0	0	7,360	0	7,360	1%	Bermuda
23 Partner Reinsurance Europe SE	0	4,983	0	0	0	0	4,983	1%	Ireland
24 Liberty Mutual Insurance Co.	0	4,784	0	0	0	0	4,784	1%	USA
25 Harco National Insurance Co.	0	439	-2,761	5,784	40	350	3,852	0%	USA

Note: Includes inter-company reinsurance agreements

Mortgage Credit Risk Transfer – The Reinsurance Market

Jonathan Berenbom, FCAS, MAAA
Managing Director, Guy Carpenter

CARe Seminar
June 13, 2022

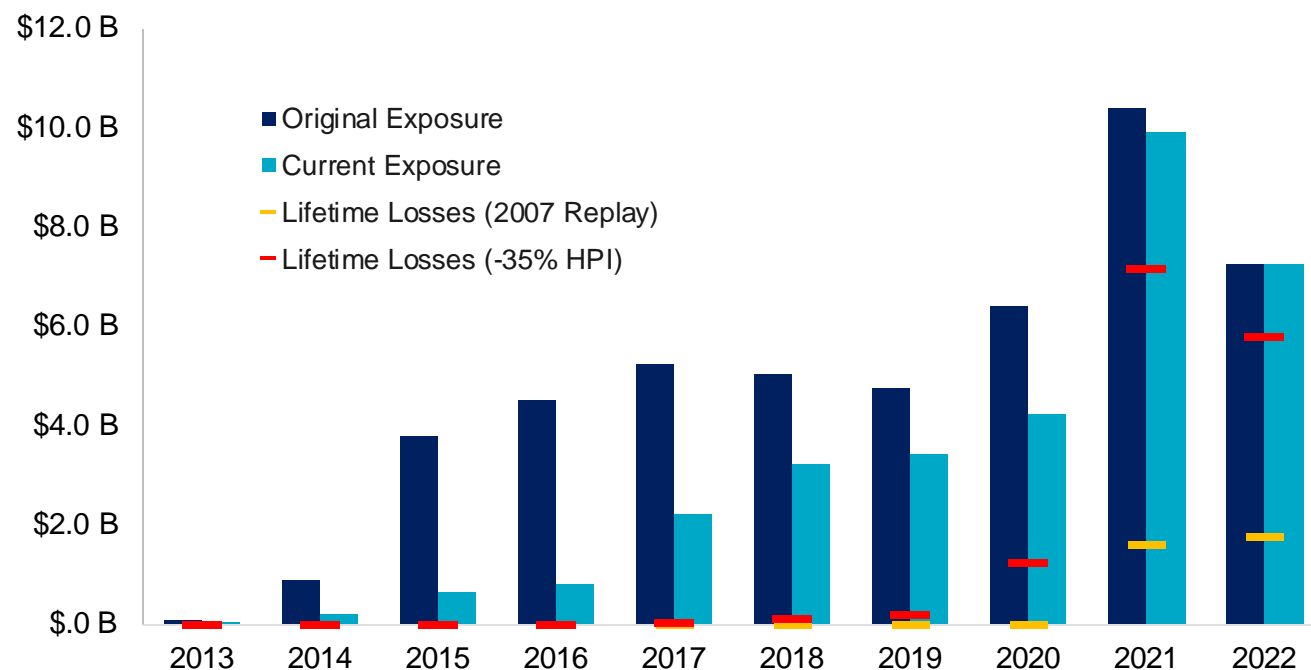
A business of Marsh McLennan



Discussion Topics

- Impact of Home Price Growth on Reinsurer Portfolios
- Primary Mortgage Insurer Demand for Reinsurance
- Additional Impact of FHFA Regulatory Changes

Reinsurer Capacity Freeing Up as Older Vintages Season



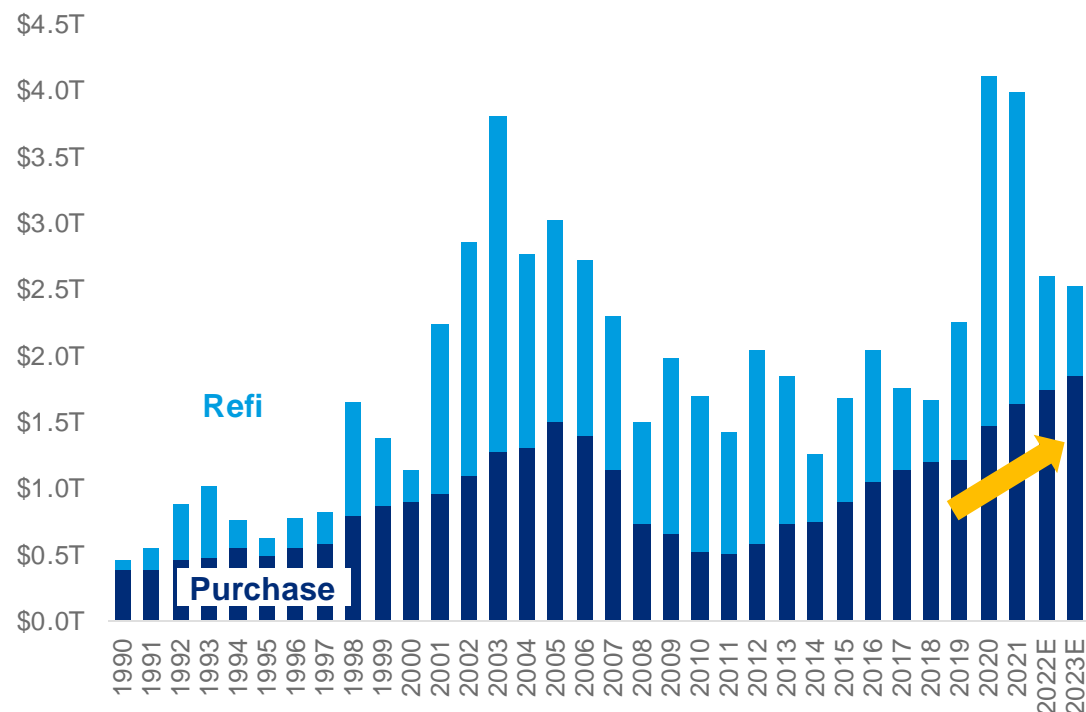
Notes: Modeled scenarios are based on M-PIRe modeling as of May 2022, assuming an economic call

Vintage	Original Limit	Remaining Limit	2007 Replay	-35% HPI
2013	\$.1 B	\$.0 B	\$.0 B	\$.0 B
2014	\$.9 B	\$.2 B	\$.0 B	\$.0 B
2015	\$3.8 B	\$.7 B	\$.0 B	\$.0 B
2016	\$4.5 B	\$.8 B	\$.0 B	\$.0 B
2017	\$5.3 B	\$2.2 B	\$.0 B	\$.0 B
2018	\$5.1 B	\$3.2 B	\$.0 B	\$.1 B
2019	\$4.8 B	\$3.4 B	\$.0 B	\$.2 B
2020	\$6.4 B	\$4.2 B	\$.0 B	\$1.2 B
2021	\$10.4 B	\$9.9 B	\$1.6 B	\$7.2 B
2022	\$7.3 B	\$7.3 B	\$1.8 B	\$5.8 B
Total	\$48.5 B	\$32.0 B	\$3.4 B	\$14.6 B

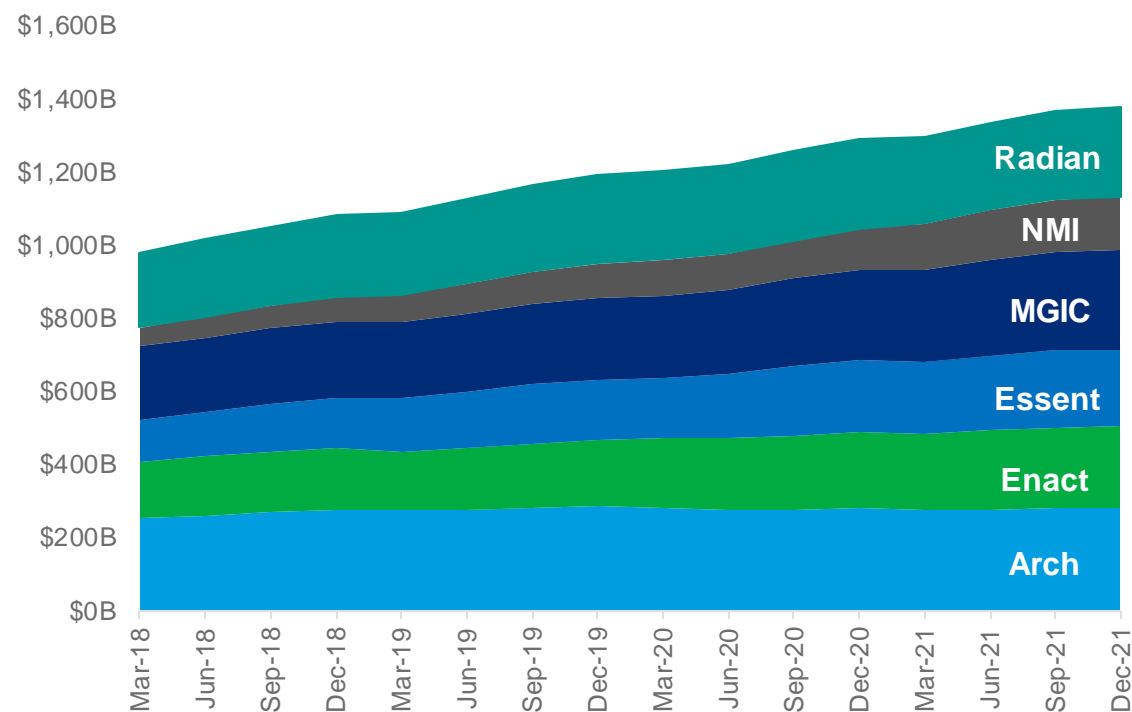
- Reinsurers' GSE CRT portfolios have materially de-risked, as 34% of limit has runoff since program inception
- All vintages 2019 and prior have virtually no expected losses in both severe stress scenarios

Positive Backdrop for MIs to Continue Growth

Record Purchase Mortgage Originations to Support MI Growth

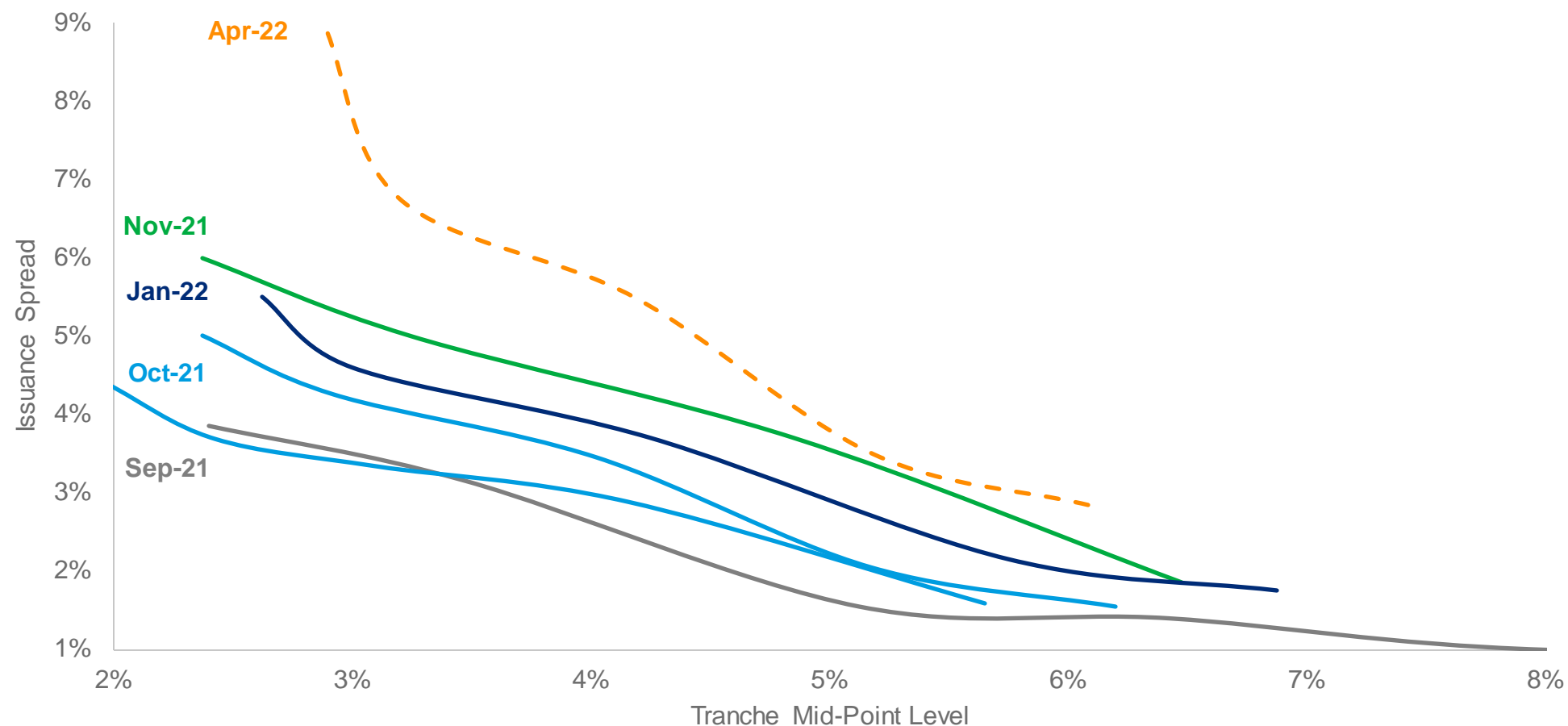


MI Insurance In Force Continues to Increase



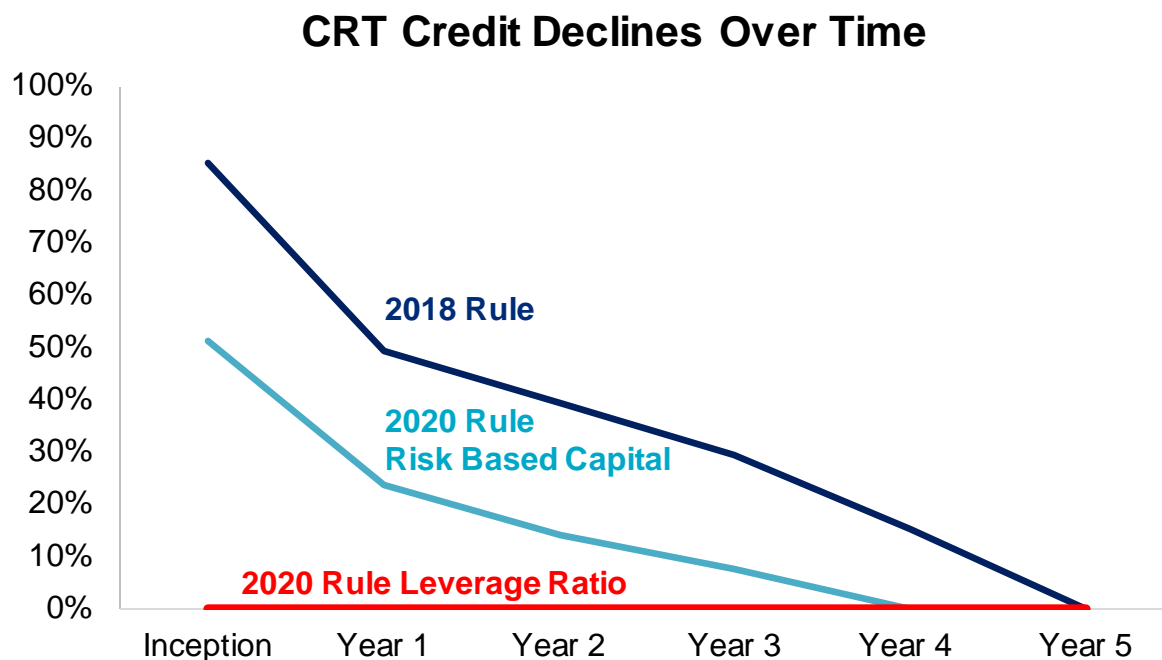
- Historically high mortgage originations have supported MI growth, with IIF up nearly 30% from 3 years ago
- MBA forecasts purchase mortgage originations to continue to increase through 2023, with materially lower refinance volume
- High purchase originations + low refinancing = MI growth

MI Insurance Linked Notes Rates Increasing



Rising ILN Spreads Increase Attractiveness of Traditional Reinsurance

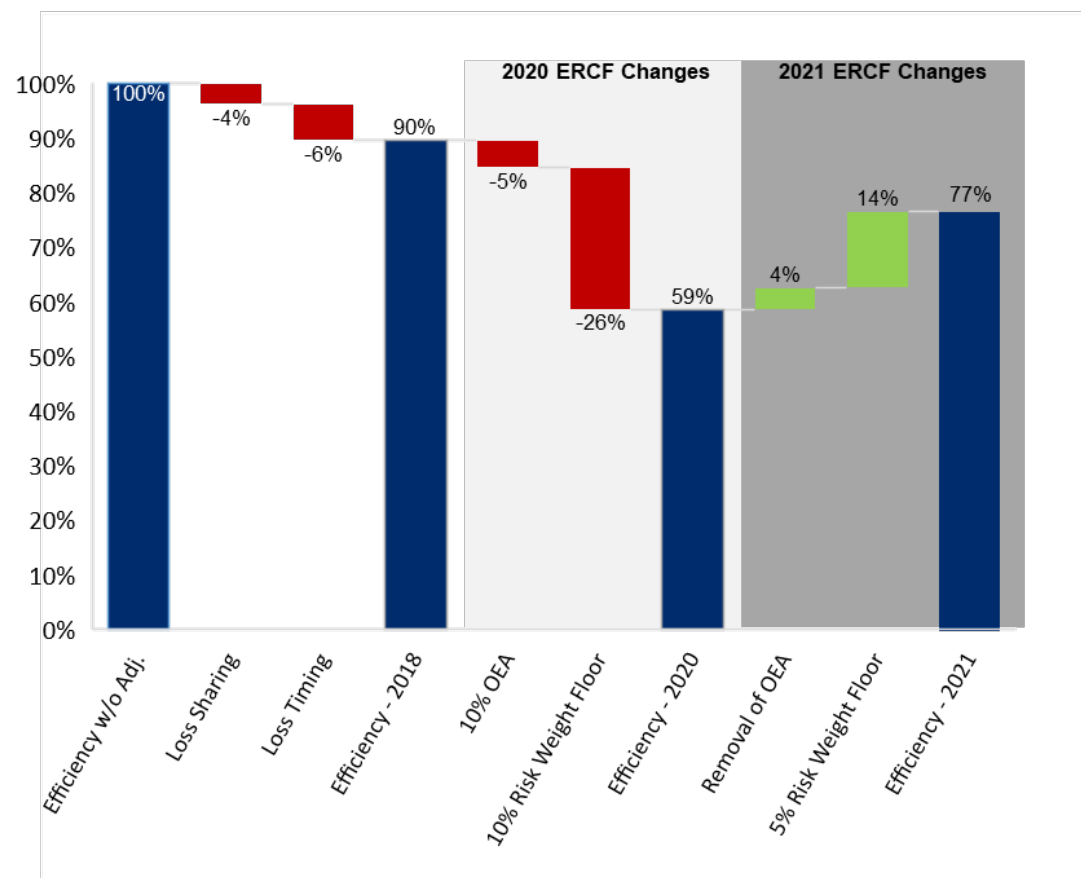
2020 FHFA Capital Rule Disincentivized CRT



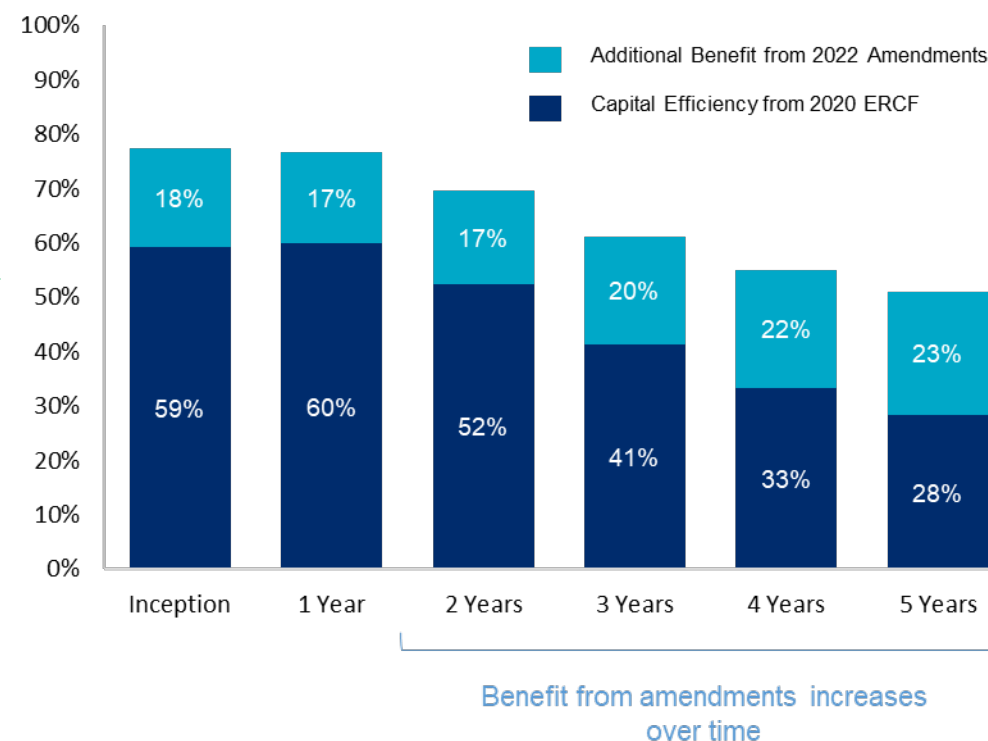
- The Federal Housing Finance Agency (FHFA) finalized a new Enterprise Regulatory Capital Framework (ERCF) in November 2020, causing significant reductions in CRT risk-based capital benefit
- CRT capital credit declined rapidly under the ERCF, increasing cost of capital to uneconomic levels
- After a June 2021 change in leadership at the FHFA, amendments to the ERCF increased the capital credit, but not to pre-2020 amounts
- ERCF amendments were sufficient for Fannie Mae to resume issuing CRT in late 2021.

2022 ERCF Amendments Improved CRT Efficiency

CRT Efficiency Adjustments Under ERCF



CRT Capital Efficiency Erodes Quickly Under ERCF

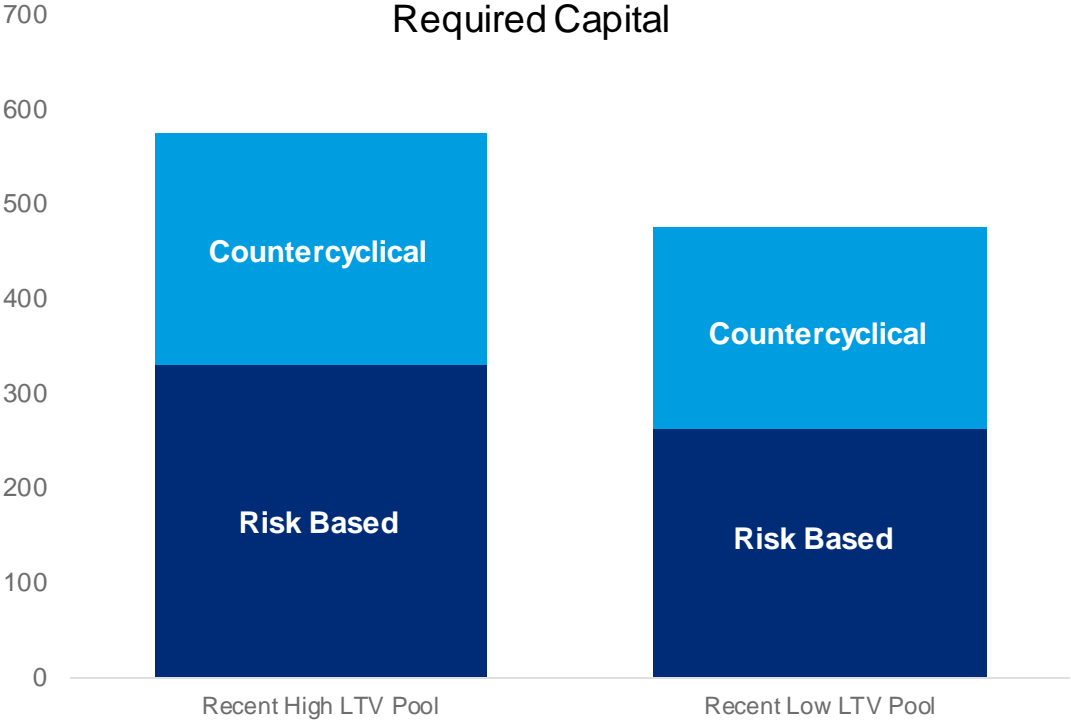


Source: GC Analytics modeled results

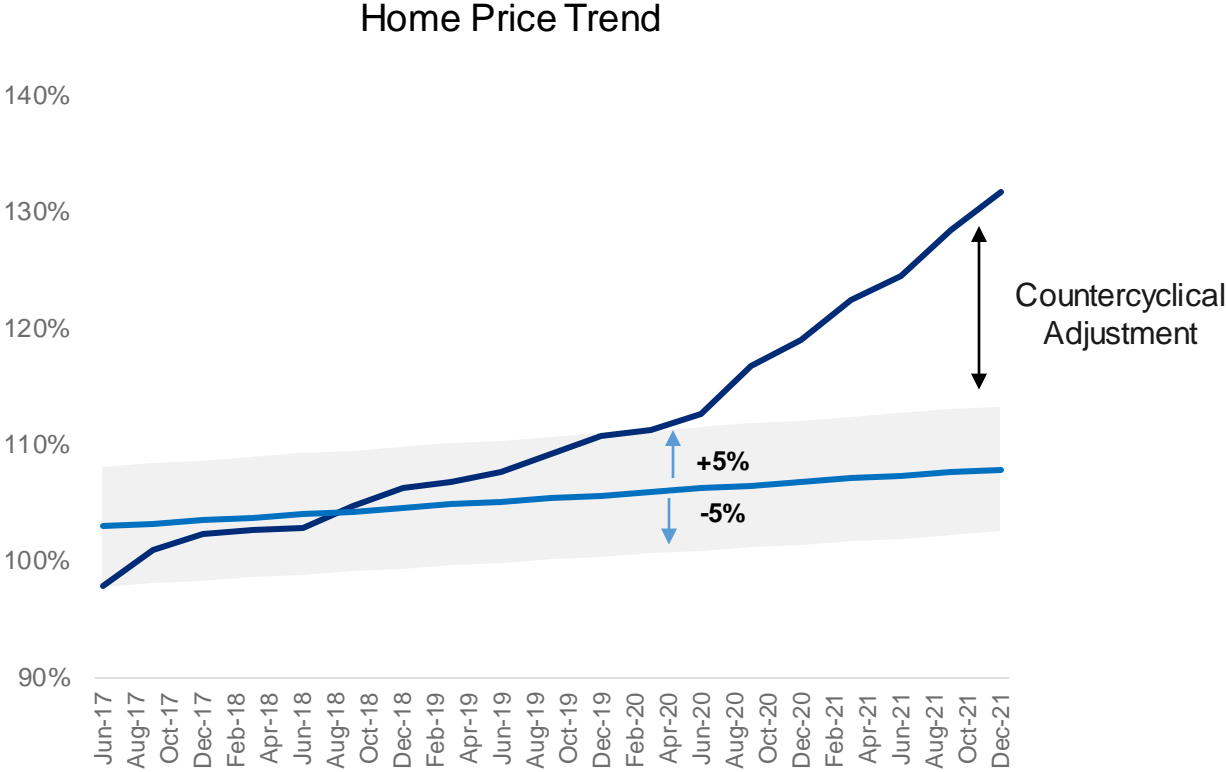
Assumptions: CIRT 2020-1 pool and structure, 300bps RBC at inception, 3% Annual HPI, 10% Annual CPR, 1% of Loans DQ at all times, 35bps expected loss, 1bp of annual paid losses

Countercyclical Adjustment Adding Required Capital

CCA Increases Required Capital by 75%



Current HPA Well Outside Corridor



Countercyclical Adjustment Adding Required Capital

Current CCA adds approximately 16% to LTV

Credit Score	Adjusted MTMLTV													
	<= 30	>30, <=40	>40, <=50	>50, <=60	>60, <=70	>70, <=75	>75, <=80	>80, <=85	>85, <=90	>90, <=95	>95, <=100	>100, <=110	>110, <=120	> 120
<620	2%	10%	18%	34%	49%	72%	105%	129%	159%	188%	218%	247%	275%	317%
620 - 639	2%	8%	14%	27%	39%	58%	84%	102%	127%	151%	178%	208%	237%	282%
640 - 659	2%	7%	12%	23%	34%	51%	73%	89%	111%	133%	159%	186%	214%	258%
660 - 679	2%	6%	10%	20%	29%	44%	63%	78%	98%	119%	141%	168%	194%	236%
680 - 699	2%	6%	9%	18%	26%	38%	55%	67%	88%	109%	125%	150%	176%	215%
700 - 719	2%	5%	8%	15%	22%	33%	47%	57%	75%	94%	110%	134%	158%	194%
720 - 739	2%	4%	6%	13%	19%	28%	41%	50%	66%	84%	96%	118%	140%	172%
740 - 759	2%	4%	5%	11%	16%	23%	33%	40%	54%	69%	80%	99%	119%	147%
760 - 779	2%	3%	4%	9%	13%	19%	27%	32%	43%	56%	65%	82%	99%	122%
>= 780	2%	3%	3%	7%	10%	14%	21%	25%	33%	43%	50%	63%	77%	96%

Before CCA

Today

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Resources Available to Explore Participating in Future Credit Risk Transfer Transactions



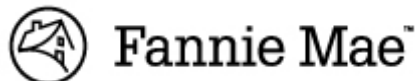
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Thank you

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