MODEL UPDATE: NEW GINNIE MAE FIXED-RATE PREPAYMENT MODELS

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Contents

Overview and List of Key Changes

On April 11, 2018, FactSet's Ginnie Mae 30-yr and 15-yr fixed-rate prepayment models will undergo a major structural overhaul.[1] The new models continue to utilize the broad framework that is common across all of our fixed-rate models,[2] but incorporate significant structural changes that lead to a more intuitive and defensible model structure and better fits. The key changes are listed below. More details on our approach, rationale, and changes versus current production are described in the next section, followed by a comparison of model fits for the current production model versus the new model. The final section of this report presents the valuation impact of the new model, as well as the risk/reward profiles versus the Street.

1. Introduction of a **multi-population framework** which propagates the FHA and VA components separately through time
2. New refi seasoning ramps and other updates to provide for **better handling of VA loan churn** and the associated regulatory developments
3. Introduction of a **"MIP Media Effect"** to better capture the surge in speeds that tends to occur in response to large FHA MIP cuts
4. **Updated methodology for calculating the FHA-MIP incentive** to better align with our refi incentive methodology
5. **Improved handling of FHA-to-conventional refis**, which results in a more accurate total refi incentive

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[1] Many thanks to Ilya Ayzenberg, Eugene Chumak, Ansa Ephraim, Alec Mendes, Samhitha Kuduvalli Vasudeva Murthy, Adam Stoelting, Beckett Weber, and Kun Yao for their contributions to this model update.

[2] See "FactSet Agency Prepayment Model," David Mieczkowski, Dec. 2009.
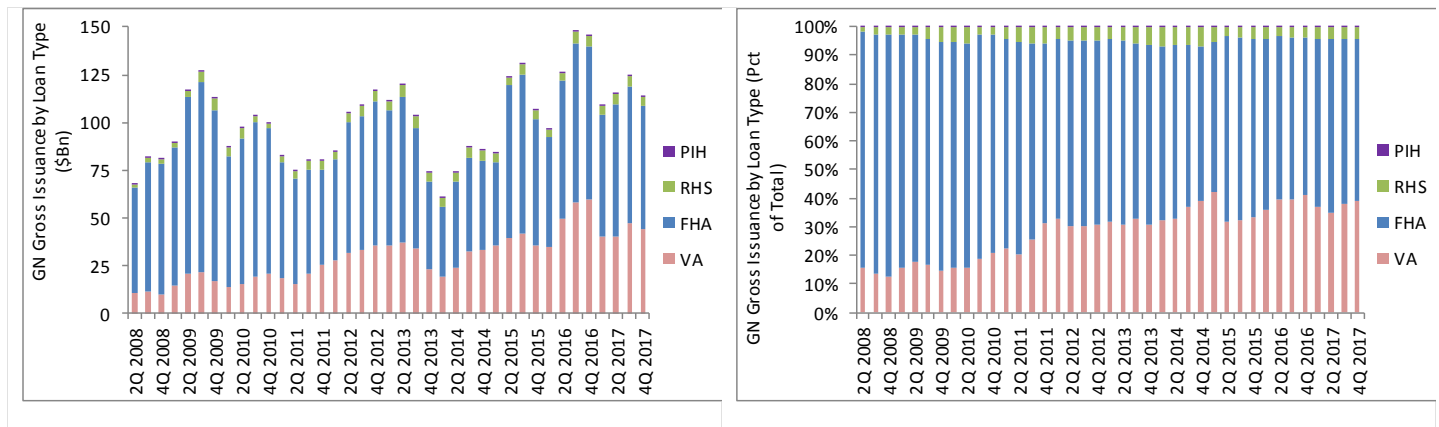
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6. **Slower curtailment speeds** vis-à-vis conventional pools to account for the typically weaker credit profile on GNMA collateral

7. **Updated model assignment on GNII 20-yr fixed-rate pools**[3] — these will default to the Ginnie Mae 30-yr fixed-rate model

Detailed Description and Rationale

Multi-Population Framework

The Ginnie Mae single-family MBS universe is comprised of four types of loans, each with its own unique prepayment characteristics. These four loan types are as follows: Federal Housing Administration (FHA), Veterans Administration (VA), Rural Development (RD), and Public and Indian Housing (PIH).[4] FHA and VA loans collectively constitute over 90% of gross issuance (see Figure 1). FHA remains the dominant loan type, but the VA share has been trending higher in recent years.

Figure 1. GNMA Gross Issuance by Loan Type — Dollar Amount (Left Panel) and Percent of Total (Right Panel): FHA Remains the Dominant Loan Type, but the VA Share Has Increased in Recent Years

Sources: 1010data and FactSet Research Systems Inc.

The loan types differ in terms of underwriting standards, borrower profile, property characteristics, down payment, loan size, LTV, geographical distribution, loan originator and servicer distributions, and numerous other criteria. Moreover, there is also significant variation in terms of the various refinancing options available to borrowers and the mortgage insurance premiums that apply to each of the loan programs.

The differences listed above lead to big differences in the level of baseline speeds and rate reactivity across loan types. Figure 2 shows speeds on FHA, VA, and conventional collateral on selected cohorts and illustrates the dramatically different prepayment behavior of FHA versus VA collateral in various market environments. Out-of-the-money FHA speeds tend to run faster than out-of-the-money VA speeds, as illustrated by the 2.5s of 2013 (Figure 2, top left panel) as well as the 3.0s of 2015 during most of 2017 (Figure 2, top right panel). The differential is driven in large part by higher default rates on FHA collateral.


[3] This change went into production on March 15, 2018.
[4] FHA and PIH loans are administered by HUD, VA loans are administered by the U.S. Department of Veterans Affairs, and RD loans are administered by the U.S. Department of Agriculture.

Conversely, VA refi speeds tend to run faster than refi speeds on FHA collateral — for example, VA speeds were significantly more reactive than FHA speeds in response to rallying rates in the first half of 2016 (Figure 2, top right and lower left panels). Several factors contribute to fast VA speeds and the generally higher reactivity into a rally:

- Larger loan sizes versus FHA loans and better credit scores versus FHA borrowers

- The relative ease of obtaining a VA streamline refi (the "Interest Rate Reduction Refi Loan") for VA borrowers

- VA loan churn in recent years

But MIP policy changes can create significant volatility in FHA speeds, causing them to surpass to VA speeds in certain periods. For example, the large FHA MIP cut in early 2015 (combined with the rate rally) led to a much larger surge in prepayments on FHA collateral than on VA collateral — see 4.0s of 2013 in the lower right panel of Figure 2.

Figure 2. Speeds on FHA, VA, and Conventional Collateral: FHA and VA Collateral Differ in Terms of Both Baseline Speeds and Reactivity to Interest Rates
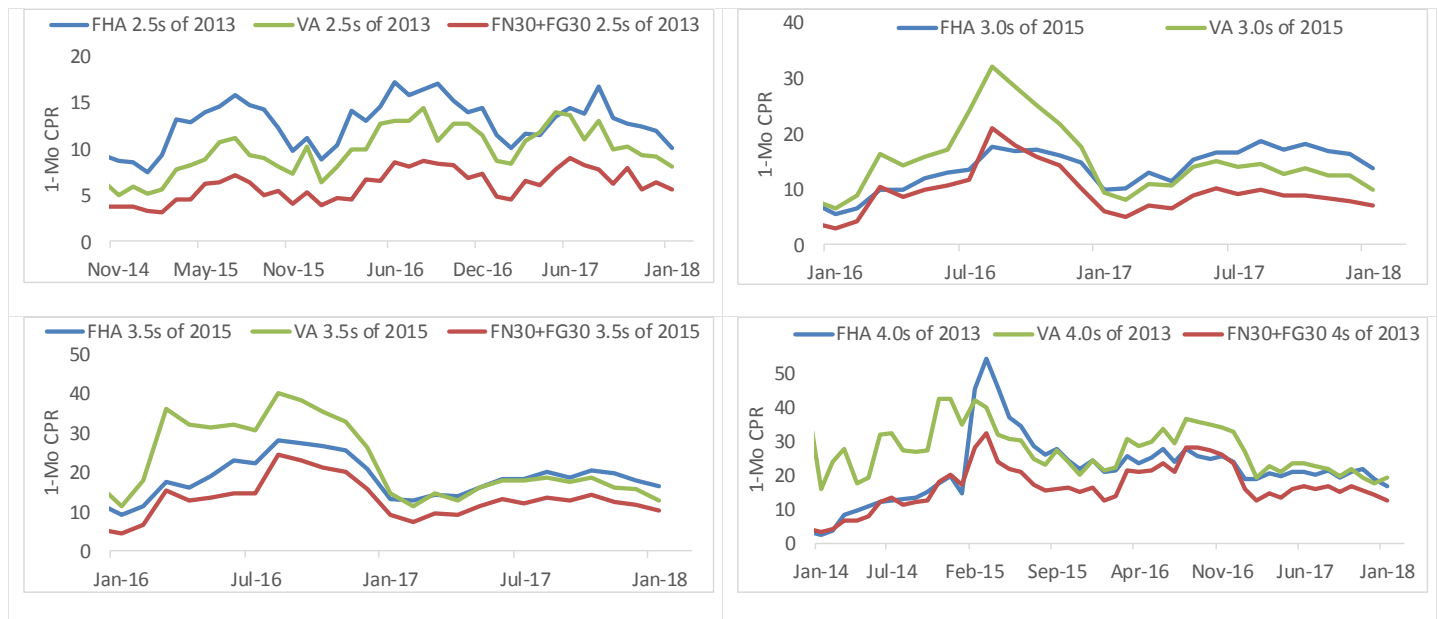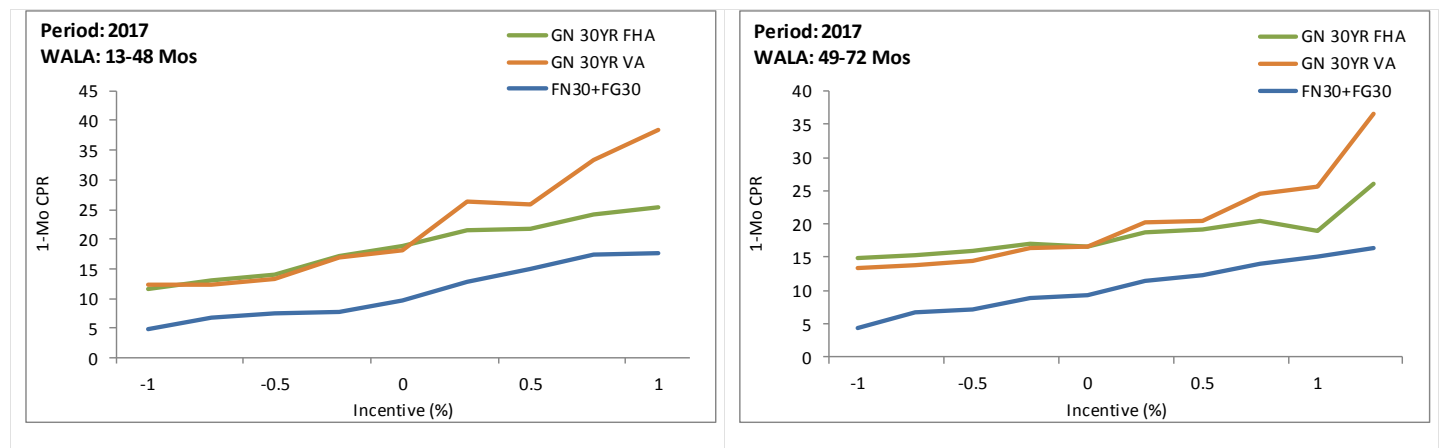

Sources: 1010data and FactSet Research Systems Inc.

A modeling approach that applies uniform treatment to Ginnie Mae pools may not effectively capture the differences in the level and reactivity of speeds on the different types of loans backing Ginnie Mae pools. To better account for the differences, the new Ginnie Mae fixed-rate models divide the collateral into two populations: (1) the FHA component and (2) the non-FHA component (which is mostly comprised of VA loans).[5] In addition to potentially leading to better fits versus realized speeds, a two-population approach also allows the models to better account for the differing prepayment *outlooks* on these populations, resulting from regulatory changes or a change in market conditions. The key differences in our treatment of FHA versus VA collateral are outlined below.

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[5] The models do not currently incorporate separate treatment for RD and PIH collateral, which collectively constitute less than 10% of recent issuance.

- **Baseline speeds:** The new models incorporate slower involuntary prepayment speeds and slower total out-of-the-money speeds on VA collateral than on FHA. VA borrowers tend to have higher credit scores than FHA borrowers, which likely leads to a greater ability to move and potentially faster turnover speeds. But default rates tend to be significantly lower on VA collateral than on FHA, leading to slower baseline speeds overall versus FHA collateral.

- **Rate reactivity:** Figure 3 shows realized S curves on FHA, VA, and conventional 30-yr fixed-rate collateral. The figures illustrate the greater reactivity on VA collateral than on FHA (and on conventional) collateral. The VA S curves within the new models are steeper than for FHA, and are shifted to the left. This results in faster speeds on in-the-money VA collateral for a given level of dollar refi incentive, as well as greater rate reactivity into a rally.

Figure 3. FHA, VA, and Conventional S Curves in 2017: VA Collateral Is Generally More Reactive than VA

Sources: 1010data and FactSet Research Systems Inc.

- **Treatment of mortgage insurance premiums:** VA borrowers do not pay a periodic mortgage insurance premium (MIP). Bifurcating the treatment of FHA and VA collateral allows the new models to apply an annual MIP to FHA collateral only, leading to a more accurate (i.e., higher) refi incentive on the VA component of the pool. Moreover, VA collateral is now isolated from changes in FHA MIP policy, which can create volatility in aggregate Ginnie speeds, but should have no impact on VA loans.

Modeling VA Loan Churn and the Associated Regulatory Response

- The new models better account for recent fast VA speeds on unseasoned collateral, which are largely attributable to loan churn. Note that loan churn is difficult to model, because it is not tied to the usual refi drivers that determine whether there is an economic benefit to the borrower.

- To account for the new GNMA pooling criteria that went into effect on February 1, 2017, the new models incorporate updated refi seasoning ramps that are calendar-date dependent. These ramps allow the models to capture the reshaping that was observed in 2017.

- The new models also account for the likelihood of slower speeds in the months to come, given the crackdown on loan churn by GNMA and the Veterans Administration, and their commitment to ensuring that veteran borrowers receive an economic benefit from refinancing.

By way of background, fast VA speeds have been making headlines the past couple of years and have garnered significant regulatory focus since late 2016. Since mid-2016, certain lenders have been aggressively marketing refis

to veteran borrowers without necessarily ensuring a net tangible benefit to the borrower. This has led to a decoupling of speeds on premium-priced pools from market conditions (posing a modeling challenge). The CFPB published a report on November 16, 2016, highlighting issues related to VA mortgage refis (specifically, complaints by VA borrowers about aggressive solicitation practices).[6] Senators Elizabeth Warren and Dean Heller have also weighed in on the issue. On October 13, 2017, Ginnie Mae and the VA announced the formation of a "Joint Ginnie Mae – VA Refinance Loan Task Force" to "examine aggressive and misleading refinancing propositions" and to "address loan churning and repeated refinancing."

On October 19, 2016, Ginnie Mae announced the updated pooling criteria mentioned above. Per the new criteria, a streamline refi loan can be pooled in GN single-issuer pools or in GNII Multiple Issuer Pools only if at the time of refinance, six consecutive monthly payments have been made on the loan.[7] Note that the new pooling criteria only affect VA collateral, as the rules governing an FHA refi already impose a six-month seasoning criterion.

However, VA speeds have remained elevated even after the new pooling criteria went into effect. Figure 4 shows speeds on monthly GNII 30-yr Mult CUSIPs and on Fannie 30-yr fixed-rate 3.5s and 4.0s as a function of loan age. The loan age on each CUSIP roughly matches the corresponding FN30 WALA shown along the top axis. The left panels show the data as of September 2016, before the new pooling criteria went into effect, while the right panels show speeds a year later, after the new pooling criteria went into effect. The figure shows that before the new pooling criteria went into effect, the GNII refi seasoning ramps are much steeper than on conventional collateral immediately after issuance. After the new pooling criteria went into effect, the GNII and conventional ramps are initially aligned, but GNII speeds overtake speeds on conventional collateral beginning in the seventh month.

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[6] See https://files.consumerfinance.gov/f/documents/112016_cfpb_OSA_VA_refinance_snapshot.pdf

[7] Any loan that does not satisfy the requisite payment history (on the prior loan) can only be delivered into a GNII Custom pool.

Figure 4. Comparison of Speeds on GNII 30 and FN30 Collateral: Changes to GNMA Pooling Criteria Have Delayed (but Not Deterred) Churning
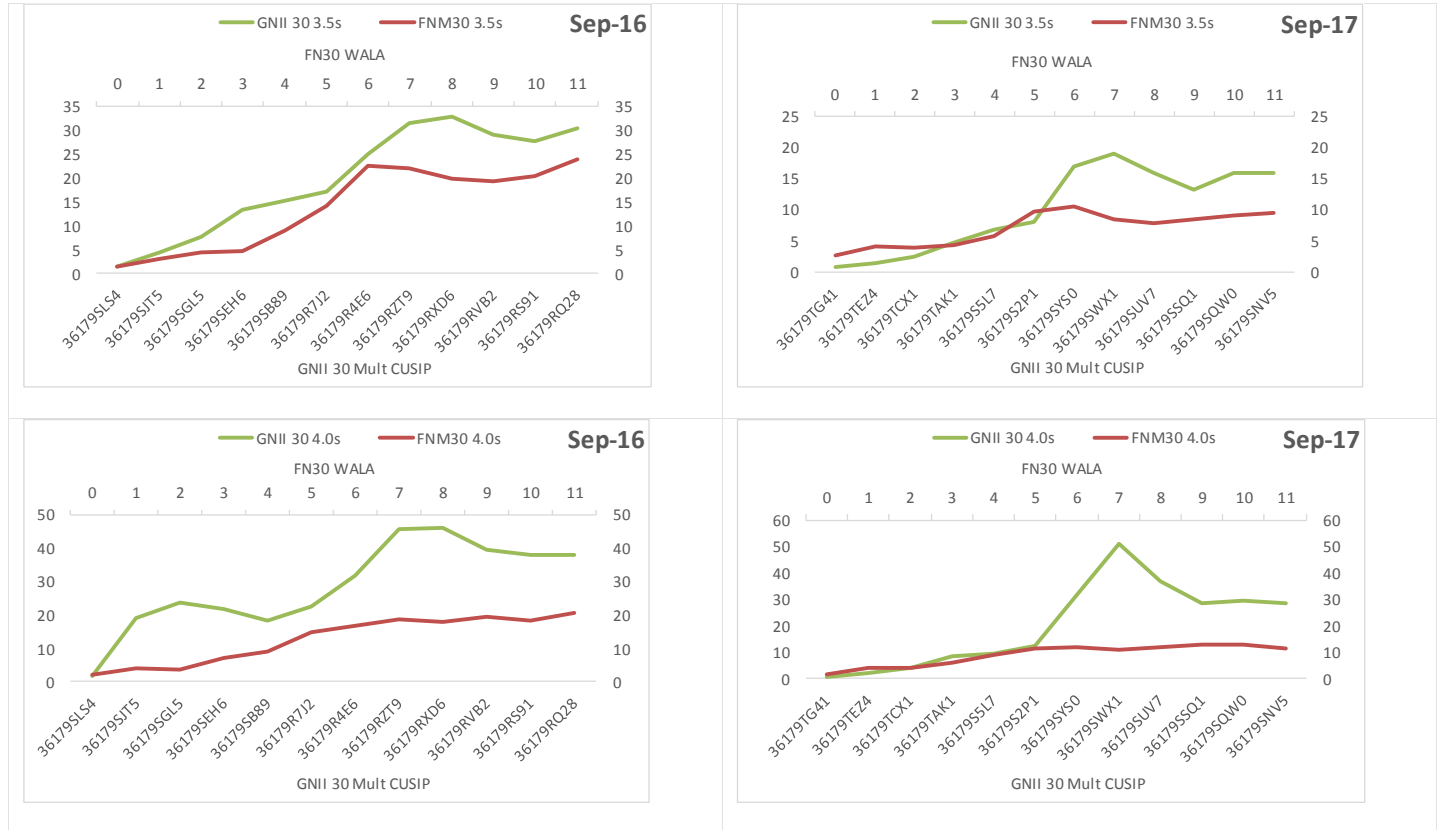
Note: FN30 speeds are plotted vs. WALA (top axis); GNII 30 speeds are plotted vs. the Multiple Issuer CUSIP (lower axis) whose loan age roughly matches the corresponding FN30 3.5 WALA along the top axis.
Sources: 1010data and FactSet Research Systems Inc.

The new pooling criteria simply pushed out the inflection point, as some servicers sought to refinance borrowers into a streamline refi immediately after the six-month window was completed. Moreover, some servicers simply opted to refinance borrowers into a non-streamline refi within a couple of months after origination.

But regulators remain focused on taking the steps necessary to curb VA loan churn. Two recent developments in 2018 should have a significant impact on speeds in the months ahead (despite the absence of a mandatory net tangible benefit test). On February 8, 2018, Ginnie Mae announced that it has put certain VA servicers on notice regarding their fast speeds.[8] These servicers must provide a plan to align speeds with the market or risk being banned from issuing GNII Mults. And on February 1, 2018, the Veterans Administration updated their IRRRL documentation requirements to

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[8] See Ginnie Mae's press release (https://www.ginniemae.gov/newsroom/Pages/PressReleaseDispPage.aspx?ParamID=129) and the associated Bloomberg news story (https://www.bloomberg.com/news/articles/2018-02-08/u-s-threatens-to-dump-lenders-from-veterans-mortgage-program).

provide greater transparency on fees.[9] The issue continues to evolve and more developments are likely in the coming months.

Introduction of "MIP Media Effect"

The updated 30-yr fixed-rate model increases the responsiveness of the FHA component of a pool to large MIP cuts by means of a newly introduced "FHA MIP Media Effect" feature. This leads to better model fits in early 2015 following the 50bp MIP cut that went into effect for all case numbers assigned on or after January 26, 2015 (see Figure 5).

Figure 5. Projected and Realized Speeds on Selected GNII 30-Yr Fixed-Rate Cohorts: The New Model Does a Better Job of Capturing the Response to a Large MIP Cut
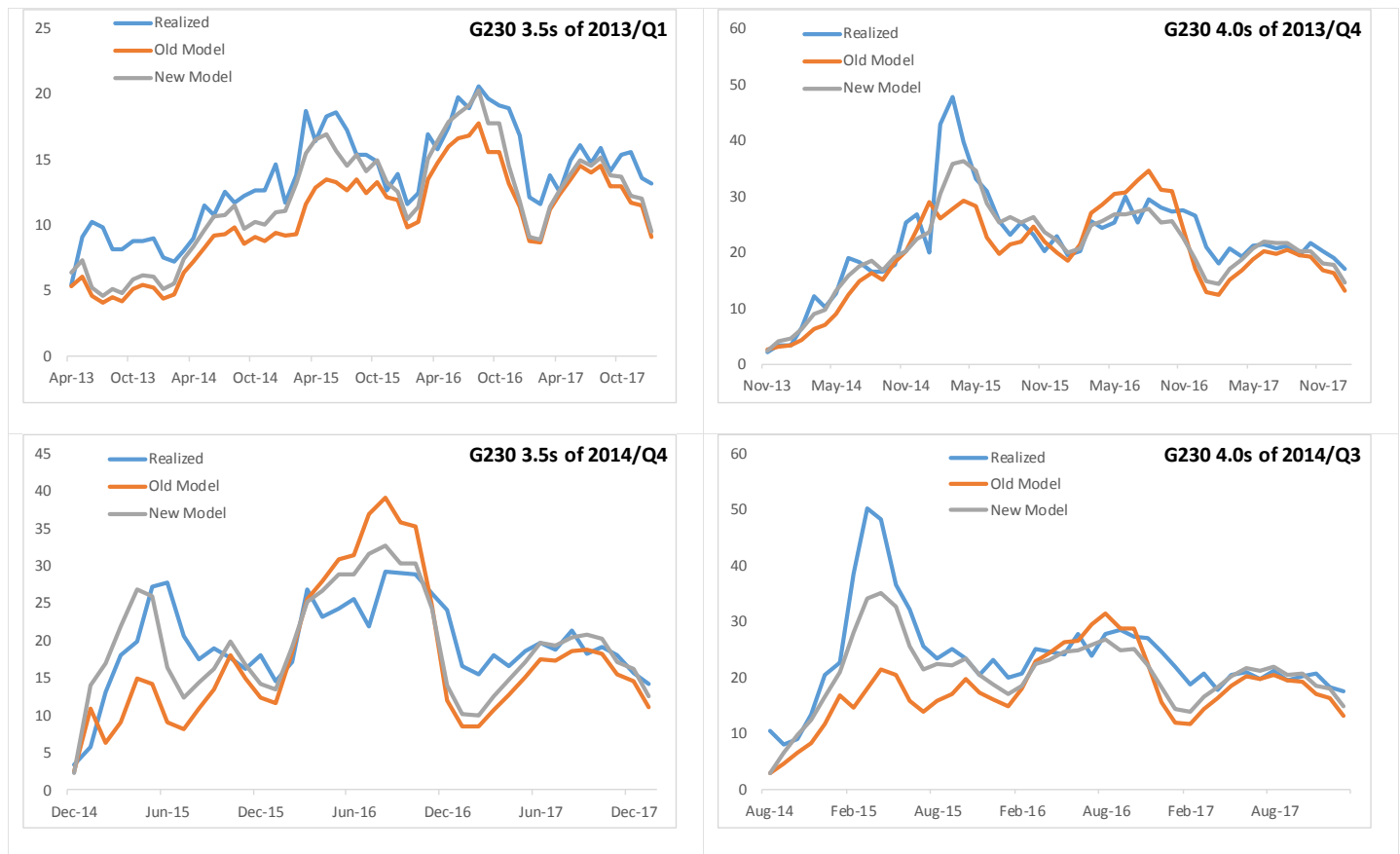
Sources: FactSet Research Systems Inc. and eMBS.

To be sure, another MIP cut seems unlikely in the near future, given the current health of FHA's Mutual Mortgage Insurance Fund (MMIF) as well as the political backdrop. The MMIF capital ratio remains below pre-crisis levels, making it likely that a MIP cut would be seen as imprudent by regulators. The 25bp MIP cut that was announced by former HUD Secretary Julian Castro on January 9, 2017 (scheduled to go into effect on January 27, 2017) was canceled by the

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[9] Specifically, the Veteran's Statement, which includes loan costs/recoupment period, must be provided no later than 3BD after the date of application. See VA Home Loan Circular 26-18-1:
https://www.benefits.va.gov/HOMELOANS/documents/circulars/26_18_1.pdf

Trump administration on Inauguration Day (January 19, 2017). Another MIP cut is unlikely until the political environment changes or a new administration takes over.

Updated FHA MIP Incentive Methodology

The new models revise the MIP incentive methodology to be consistent with our methodology for computing dollar refi incentive. The new calculation also includes an adjustment to account for the MIP rebate, leading to a more accurate measure of the "true" incentive to refinance. Our modeling framework computes the total incentive on Ginnie Mae pools as the sum of the "MIP incentive" and the "rate refi incentive."

Improved Handling of FHA-to-Conventional Refis

The new Ginnie Mae fixed-rate models now account for the private mortgage insurance (PMI) that FHA borrowers are typically required to pay when refinancing into a conventional loan. This change leads to a lower total refinancing incentive versus the current production version. Recall that borrowers who take out a conventional loan must pay a PMI premium if the LTV on the new loan is greater than 80%. The new models estimate the applicable PMI premium based on the estimated marked-to-market LTV (but, for simplicity, do not currently incorporate an adjustment based on the credit score).

The economics of an FHA-to-conventional refi versus an FHA-to-FHA refi depend on the marked-to-market LTV as well as the borrower's credit profile (see Figure 6). An FHA-to-conventional refi may be the economic option for higher-FICO borrowers, but an FHA loan is generally the cheaper (and perhaps only) option for borrowers with weaker credit. The economics of the refinancing decision also vary depending on the relative cost of the FHA MIP versus PMI — MIP cuts over the past few years increased the relative attractiveness of an FHA loan, as shown in the figure. But beyond the monthly cost of insurance, the lifetime cost also factors into the refinancing decision. The MIP on 30-yr FHA loans must generally be paid over the life of the loan, while PMI is automatically terminated when the LTV falls to 78%, per the original amortization schedule.

Figure 6. The Economics of an FHA-to-Conventional Refi vs. an FHA-to-FHA Refi by Credit Score and Prevailing MIP: FHA-to-Conventional Refi Becomes More Attractive as LTV Declines and FICO Rises
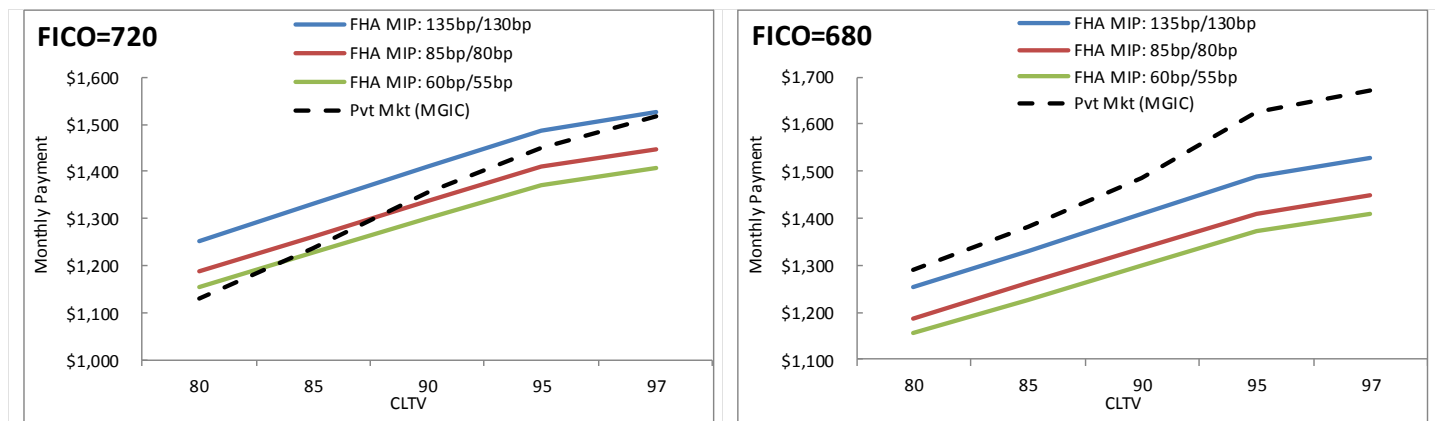
Notes: Figures are based on the PMMS as of March 9, 2018, current FNMA LLPAs, and the latest MGIC rate card (as of December 4, 2017).
Sources: FactSet Research Systems Inc., HUD, Freddie Mac, and MGIC.

Strong home price appreciation over the past several years has helped to push down marked-to-market LTVs to the range where an FHA-to-conventional refi results in a cost savings in many cases, despite lower FHA MIPs. FHA
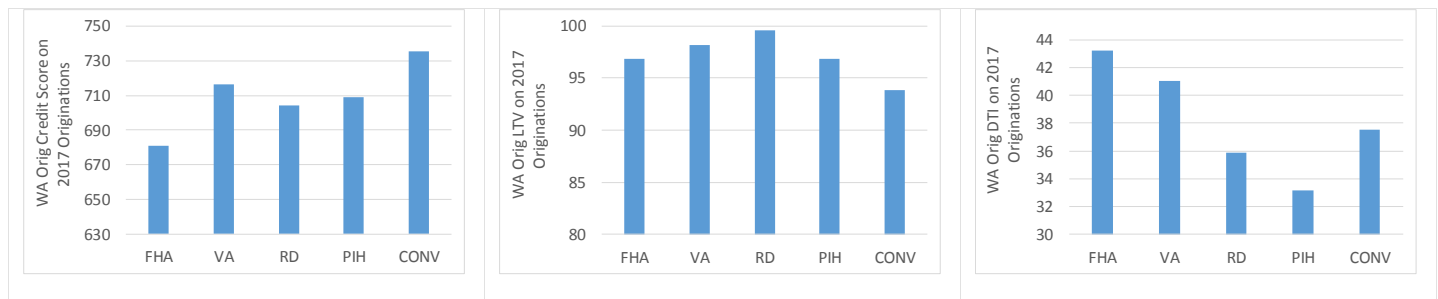
## Model Fits — Production Model versus New Model

Figure 8–10 show model projected 1-mo CPRs versus realized 1-mo CPRs by product (GNII 30-yr, GN 30-yr, and GNII 15-yr fixed-rate) over the trailing four years. The left panel in each figure was created using the production model, while the right panel was created using the new model. The figures show that the R^2 for each of the new models is comparable to the production model, but the slope coefficient β on GN and GNII 30-yr fixed-rate cohorts improved significantly (moving closer to unity in both cases). In the case of the GNII 15-yr fixed-rate cohorts, the R^2 improved a bit, while β is comparable to the production model.

Figure 8. Projected versus Actual 1-Mo CPR over Trailing 48 Months — GNII 30-Yr Fixed-Rate Cohorts
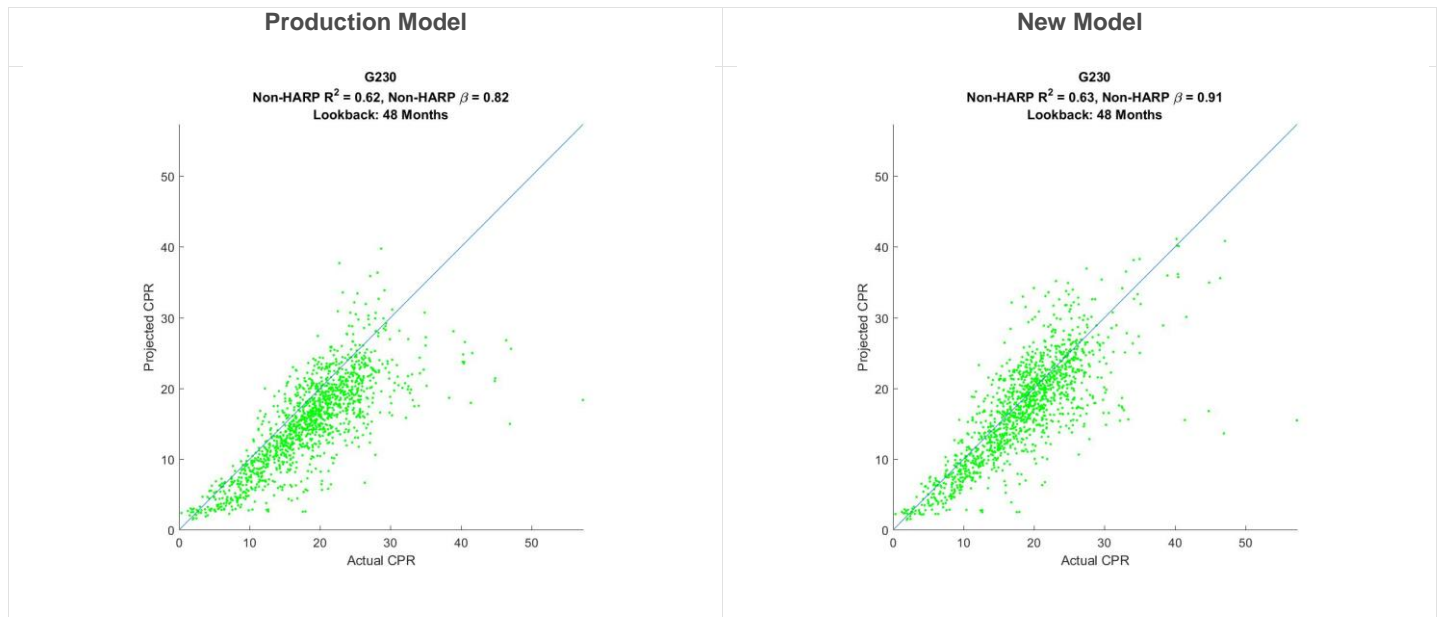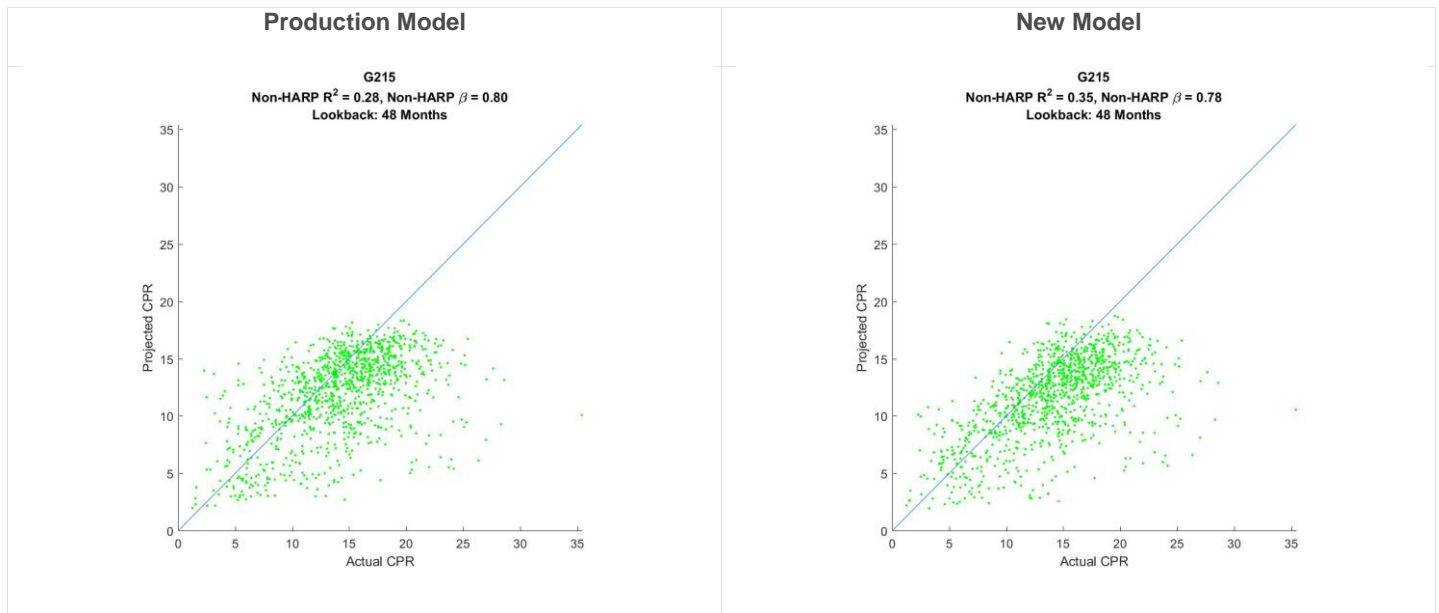

As of February 2018; Origination years: 2002 and later; Coupons: 2.5s-6.5s
Sources: FactSet Research Systems Inc. and eMBS.

Figure 9. Projected versus Actual 1-Mo CPR over Trailing 48 Months — GN 30-Yr Fixed-Rate Cohorts
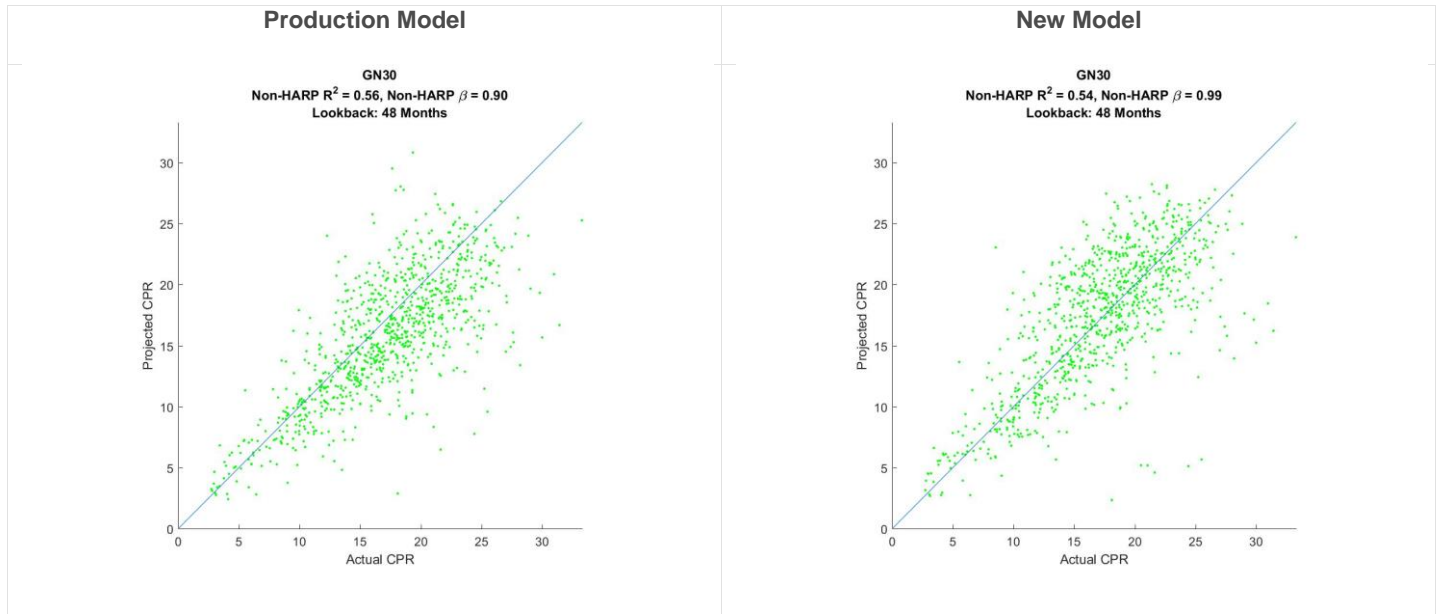
As of February 2018; Origination years: 2003 and later; Coupons: 2.5s-6.0s
Sources: FactSet Research Systems Inc. and eMBS.

Figure 10. Projected versus Actual 1-Mo CPR over Trailing 48 Months — GNII 15-Yr Fixed-Rate Cohorts


Notes: As of date: February 2018; Origination years: 2003 and later; Coupons: 2.0s-5.0s
Sources: FactSet Research Systems Inc. and eMBS.

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Impact on Valuations

Production Model versus New Model across the Coupon Stack

Figures 11–13 show projected 1-yr CPR, average life, effective duration, and effective convexity on GNII 30-yr, GN 30-yr, and GNII 15-yr fixed-rate collateral across the coupon stack. The figures show that the new model is slower on GN 30-yr and GNII 30-yr out-of-money coupons (2.5s–3.5s), roughly flat on 4.0s, but faster on premium coupons. Average lives and durations extend on the lower coupons, but shorten a bit on the higher coupons. The new model is a bit more reactive than current production — 3.0s, 3.5s, 4.0s, and 4.5s all become more negatively convex. The impact of the new model on GNII 15-yr collateral is similar to the impact on 30-yr collateral — projected speeds on discount coupons slow, leading to longer average lives and durations.
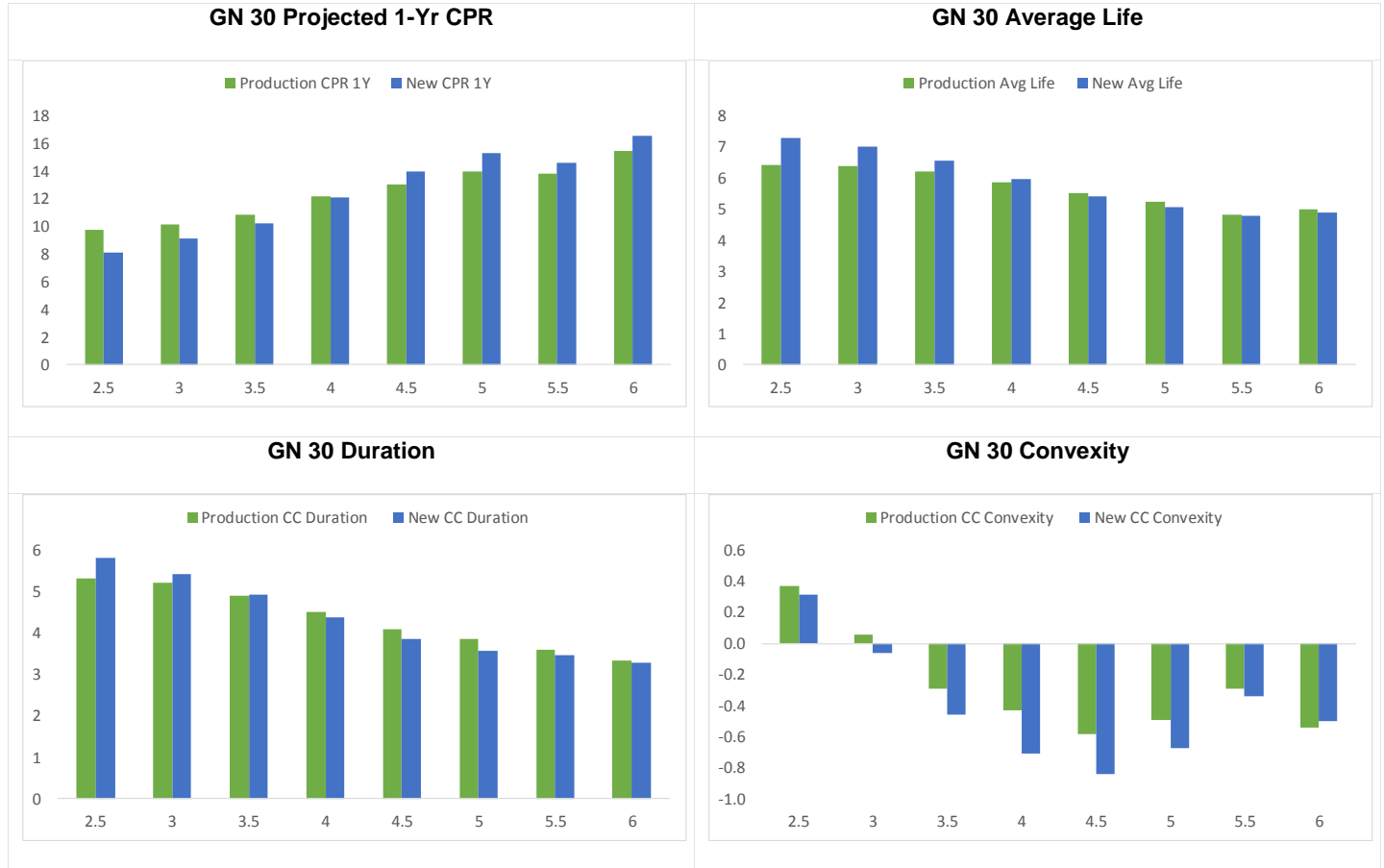
Figure 11. GNII 30-Yr Fixed-Rate Speeds/Valuations across the Coupon Stack — Production Model versus New Model, as of February 28, 2018
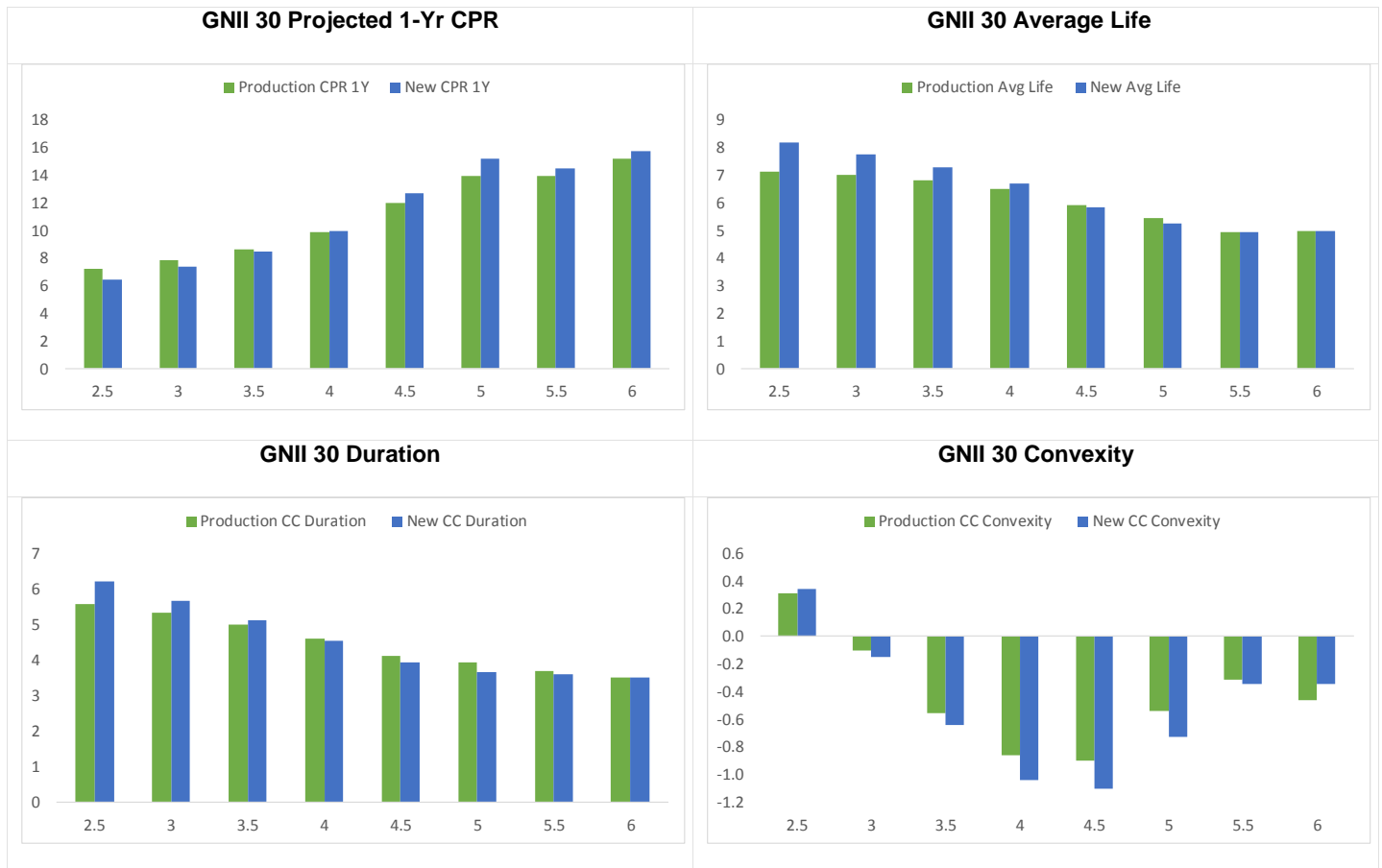
Note: To construct these charts, we selectively used prices from one or more of the following sources: Barclays, Citigroup, IDC, and Bank of America Merrill Lynch.
Sources: FactSet Research Systems Inc.

Figure 12. GN 30-Yr Fixed-Rate Speeds/Valuations across the Coupon Stack — Production Model versus New Model, as of February 28, 2018

Note: To construct these charts, we selectively used prices from one or more of the following sources: Barclays, Citigroup, IDC, and Bank of America Merrill Lynch.
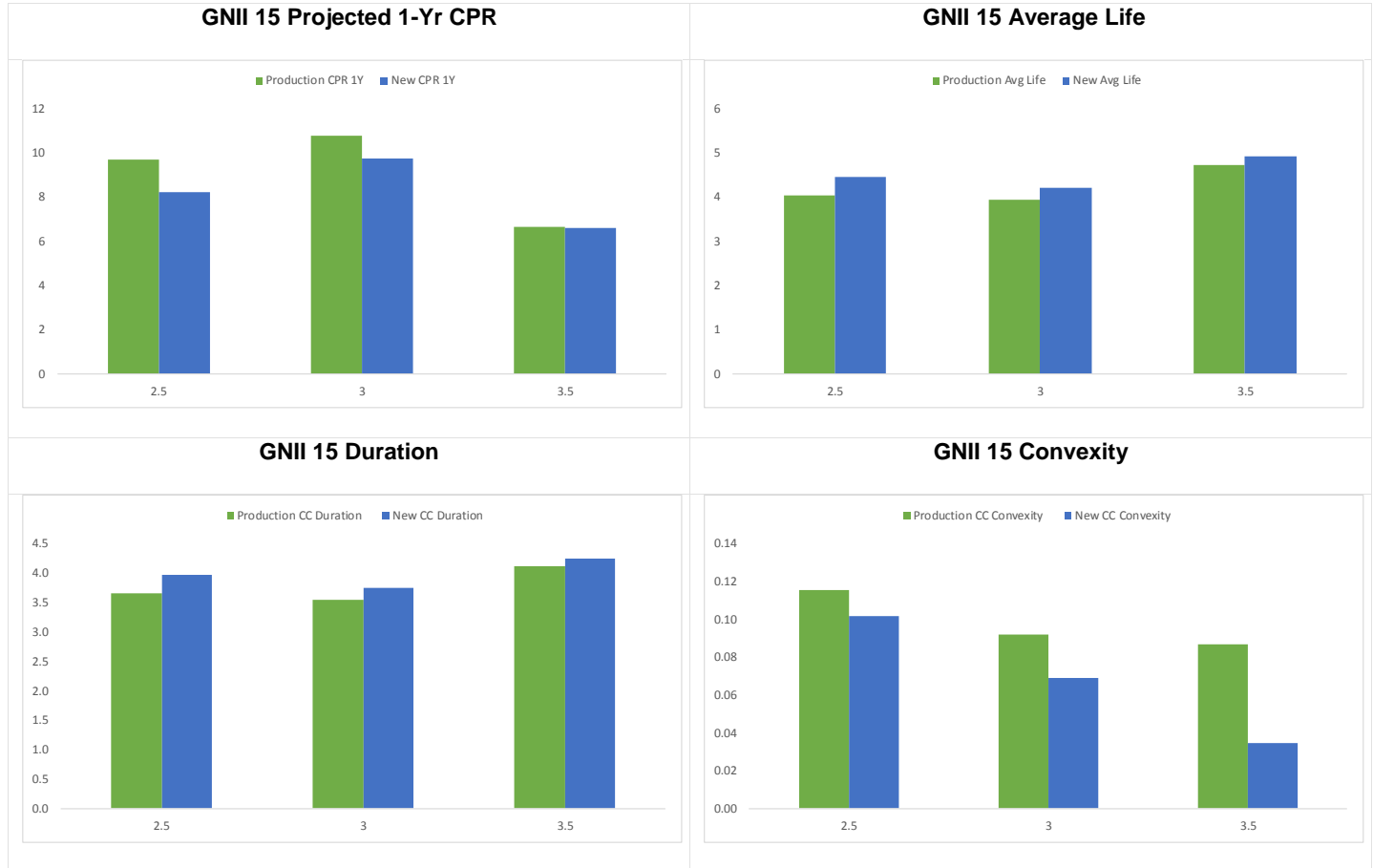Sources: FactSet Research Systems Inc.

Figure 13. GNII 15-Yr Fixed-Rate Speeds/Valuations across the Coupon Stack — Production Model versus New Model, as of February 28, 2018


Note: To construct these charts, we selectively used prices from one or more of the following sources: Barclays, Citigroup, IDC, and Bank of America Merrill Lynch.
Sources: FactSet Research Systems Inc.

Risk/Reward Profiles — Production Model versus New Model

Figures 14–16 show risk/reward profiles, as measured by option-adjusted spread plotted versus effective duration and versus effective convexity, for the new Ginnie Mae fixed-rate models as well as for current production. The charts show that OASs generally narrowed as projected speeds on discounts slowed, while speeds on premium paper increased. For reference, the charts also include a comparison to the Street.

Note that MBS analytics are extremely model-dependent, so valuations and risk measures produced by different providers tend to differ significantly. And beyond the models themselves, differing pricing sources and other assumptions can lead to significant differences across analytics produced by various shops. There is no "right" value for any analytic — even static metrics like yield and WAL are strongly dependent on the primary mortgage rate path. All of the metrics are a function of numerous assumptions and therefore have a large element of subjectivity embedded within them. But the charts below still provide a general sense of expected return on the various Ginnie Mae fixed-rate products, given a level of rate risk.

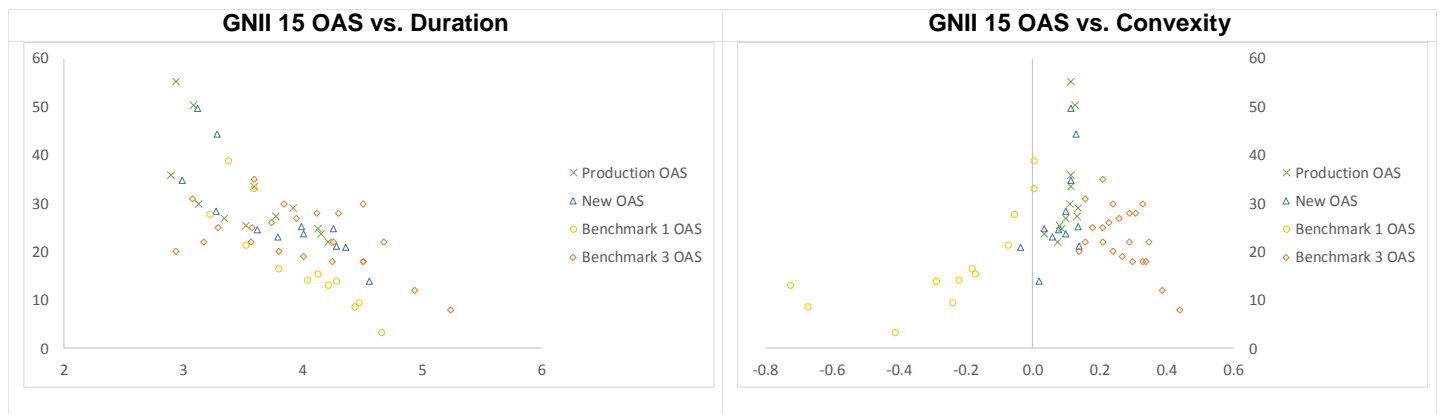**Figure 14. Risk/Reward Profile on the GNII 30-Yr Fixed-Rate Index Constituents, as of February 28, 2018**
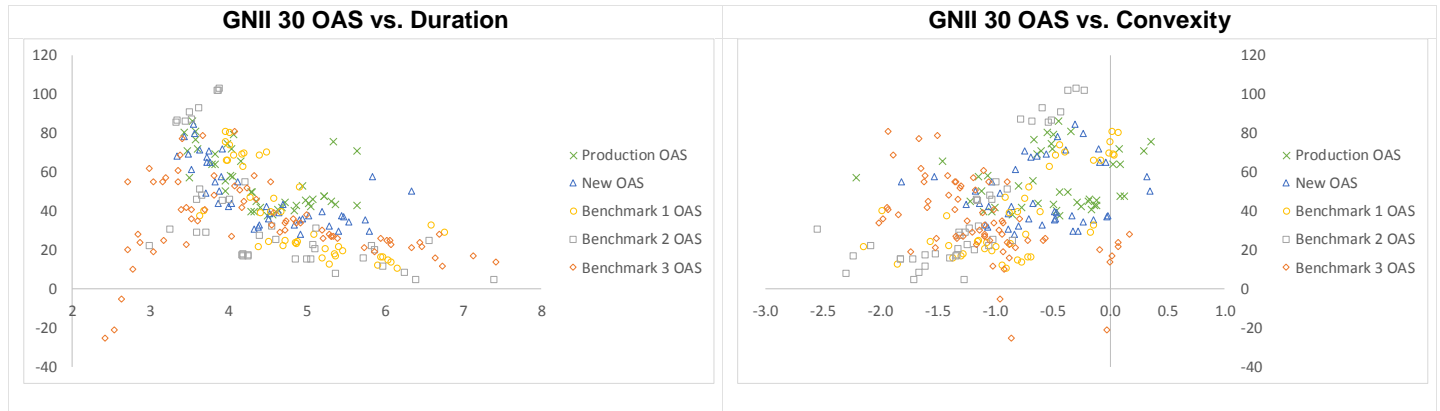
Sources: FactSet Research Systems Inc., Barclays, Citi, and Bank of America Merrill Lynch.

Figure 15. Risk/Reward Profile on the GN 30-Yr Fixed-Rate Index Constituents, as of February 28, 2018
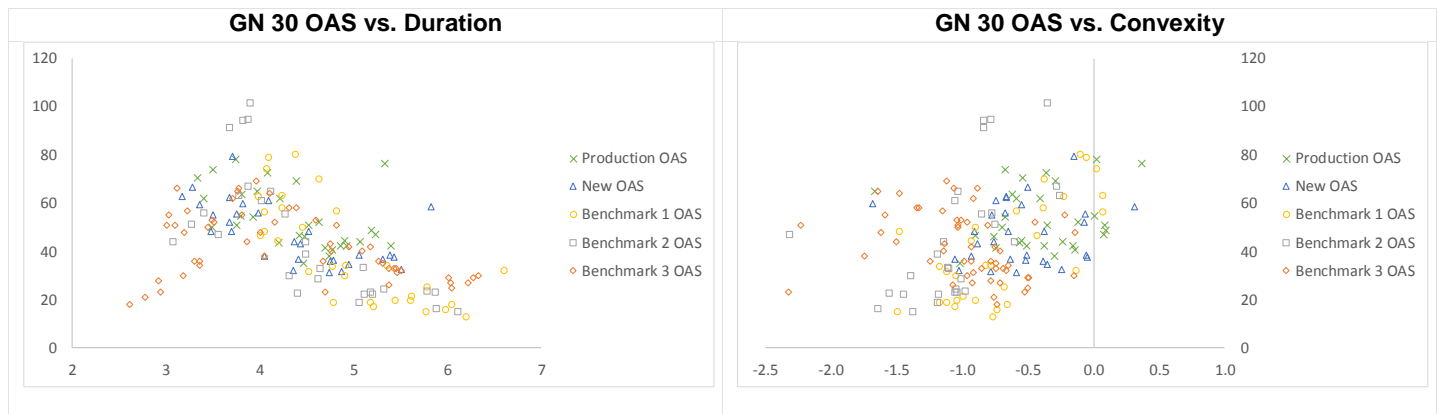
Sources: FactSet Research Systems Inc., Barclays, Citi, and Bank of America Merrill Lynch.

Figure 16. Risk/Reward Profile on the GNII 15-Yr Fixed-Rate Index Constituents, as of February 28, 2018

Sources: FactSet Research Systems Inc., Barclays, Citi, and Bank of America Merrill Lynch.