Buy to Hold or Buy to Sell?

Servicer Business Models, Guarantees, and Mortgage Relief

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Abstract

A government-insured mortgage can be modified only after its servicer buys it out of its bond at face value. Within servicer and month, nonbank servicers, which fund ownership with short-term credit and resell, buy back loans whose bond clears a two-point resale premium at more than twice the rate of loans a quarter point lower whose bond does not; deposit-funded banks do not. This replicates out of sample in 2014–2018. Without the buyback, these loans would have stayed seriously delinquent, in a bond that bars modification, for seven to eleven of the next eighteen months.

Keywords: mortgage servicing, nonbank financial intermediaries, Ginnie Mae, early buyouts, loan modification, government guarantees.

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1 Introduction

Debt can be restructured only by its owner. In many credit markets the party best placed to offer a distressed borrower new terms, the servicer that collects the payments, does not own the claim; it holds an option to acquire it, much as investors in corporate distress buy claims in order to restructure them (Hotchkiss and Mooradian, 1997). Whether relief is offered then depends on the terms on which that intermediary will take the claim onto its own balance sheet. This paper studies those terms in the market for government-insured mortgages, where the option and its exercise are observed loan by loan, and shows that they depend on the intermediary's business model: whether it buys the claim to hold it or to resell it. An intermediary that funds ownership with deposits can hold the loan until it is resolved, as a patient investor in the sense of Hanson, Shleifer, Stein and Vishny (2015). An intermediary that funds ownership with short-term secured credit is in the position of an arbitrageur with a funding constraint (Shleifer and Vishny, 1997): it takes the position when the resale price covers the cost of carrying it. The supply of the ownership that loan modification requires then moves with bond prices and with the guarantor's rules on resale, even when borrowers and the rules governing relief are unchanged.

Most mortgages to first-time and lower-income buyers in the United States are insured by the Federal Housing Administration (FHA) or the Department of Veterans Affairs (VA) and pooled into bonds guaranteed by Ginnie Mae. The servicer collects the payments; the bond's investors own the loan. A modification that lowers the rate or extends the term requires the servicer to buy the loan out of the bond at face value, with its own money.[1] The servicer may do so once the loan is three months behind; it does not have to. Three-quarters of these loans are serviced by nonbanks, which finance buybacks on short-term secured lines and resell what they buy, into a new Ginnie Mae bond once the loan has cured or to a buyer of distressed loans; the rest are serviced by banks, which can hold them on deposits. A loan placed into a new bond is worth the price of that bond, which is above face value when the loan's rate is above the rate on newly issued bonds.

Measuring how the resale price enters the buyback decision is difficult because the price moves with the loan's rate relative to the market rate, and so does almost everything else a servicer cares about: FHA's relief rule, which routes a borrower between a modification and a partial claim by the same rate gap; the borrower's incentive to refinance after curing; the value of the servicing right; and the kind of borrower who took a given rate. I separate the price from all of these with a feature of how loans are assigned to bonds. Loan rates are set

[1] Ginnie Mae MBS Guide, Chapter 18: "the Issuer may not execute a loan modification agreement altering the terms of the loan until after the loan is bought out." Payment pauses (forbearance) and partial claims, which add the missed payments to an interest-free second lien, do not require the loan to be bought back.

in quarter points, bond coupons are spaced half a point apart, and a loan can be placed into a coupon between a quarter and three-quarters of a point below its rate. The highest coupon open to a loan, which is the one that pays most for it, therefore holds exactly two adjacent quarter-point loan rates, and the next quarter point starts a new coupon. Two of a servicer's cohorts a quarter point apart are either in the same coupon, at the same resale price, or on either side of a coupon boundary, at prices one to two points apart; and whether a boundary pair sits on opposite sides of the premium at which reselling pays changes from month to month with the level of bond prices. Comparing the two cohorts within the same servicer, program and month, and netting the same comparison for pairs inside one coupon, removes anything at the level of the servicer and any smooth function of the loan rate; placebo pairs, described below, test whether anything other than the price remains. Loans at a quarter or three-quarters, which could go into either of two coupons, sit in the higher one 83 to 85 percent of the time, and nine in ten of those bought back and later re-pooled at their original rate go back into it.

In the months in which a boundary pair straddles a price two points over face value, nonbanks buy back the upper cohort, relative to the lower, at 2.7 times the relative rate of other months, net of the same comparison at banks (0.99 log points, s.e. 0.31, over the 2019–2021 decline in rates; bootstrap $p < 0.001$).[2] Banks' own ratio does not move (0.01, s.e. 0.01). Whether a pair straddles the premium depends only on its two coupons and the month, so the crossing varies across 25 coupon-pair-months rather than across servicers; clustering at that level leaves the estimate precise, and when each coupon pair's straddle months are shifted at random in calendar time, none of 500 shifts produces an estimate as large. The estimate is 0.96 in the first seven months of 2019, 1.06 around the 2016 election and 0.72 over 2019–2022, each with a p-value of 0.05 or less under a bootstrap that treats each servicer as one observation. Frozen and carried to the months of 2014–2018 that the design had not used, it gives 1.36 (s.e. 0.30; randomization $p < 0.002$). Three features tie it to the resale price rather than to the rate gap. It depends on whether the price difference crosses the premium, not on its size. It is largest when the premium is placed at two points and falls away when the premium is moved a point either way. And pairs of cohorts inside a single coupon that sit at the same rate gaps in the same months, and so face the same relief rule and refinancing incentive but no price difference, show nothing (0.02, s.e. 0.09, and −0.06, s.e. 0.04). In levels, nonbanks buy back the upper cohort of a straddling pair at 3.6% a month against 1.6% for the lower, while in other months they buy back the two at about 5% alike; at banks, whose buyback rates are near a third a month, the gap between the two cohorts is

[2]Throughout, a difference of x log points means that one rate is e^x times the other: 0.7 log points is about double, 1.1 log points about triple.

about the same in both kinds of month, so their small response is not a ceiling effect.

The buybacks the price induces matter for the borrowers. Following every loan from the month it becomes seriously delinquent, the same comparison shows what the loans that the price brings onto nonbanks' balance sheets would otherwise have become (Section 8). Without the buyback, the loan would have spent 7.4 more of the next eighteen months seriously delinquent in its bond, where it cannot be modified, for entries in 2019–2021 (weak-instrument-robust 95% set 0.3 to 9.2), and 10.6 more months for entries in 2014–2018, before the pandemic (9.4 to 13.8). Eighteen months on, a quarter to four in ten of these loans would still have been seriously delinquent in the bond (0.25 in 2014–2018, 0.39 in 2019–2021, with sets that exclude zero); in 2019–2021 about one in fifteen would have been foreclosed, and in 2014–2018 four in ten would have been removed from the bond for other relief. In 2019–2021 at least one in eleven is back in a new bond as a performing loan within eighteen months, a lower bound because a bought-back loan can be traced only when it reappears in a bond. For these borrowers, access to an owner who can modify the loan moves with mortgage-bond prices: when the price of the bond a loan would be resold into falls below the reseller's threshold, the borrower waits in the bond.

Measured across all cohorts, nonbank buybacks relative to banks' are flat up to a price two points over face value and 1.2 to 1.8 log points higher in every one-point bin above it (Figure 3). Two points is about what it costs to buy a loan in order to resell it: the part of the price the lender will not advance, months of interest before resale, and the credit risk the servicer keeps; with the line terms nonbanks disclose, these come to roughly two points (Section 3, a check made after the estimates). The bid-date cash flows with which an institutional buyer of bought-back loans priced 19 offers in 2018–2020, discounted at 4% instead of the buyer's yield, imply that, for the median loan offered, a buyback at face value breaks even at an exit price of about 102 (99 at 3%, 106 at 5%, and below face value at 2%; Section 3). Had nonbanks bought back the cohorts below the step at the rate, relative to banks, at which they bought those above it, they would have bought back about 9,500 more seriously delinquent loans over 2019–2021 (3,800 under a stricter specification), against the 4,800 they did buy from those cohorts. The number is small because rates were falling and 96% of nonbank loan-months sat above the step. The rise in rates reversed that: from the second half of 2022 through 2023, 98% of nonbank seriously delinquent loan-months were in cohorts whose bond traded below the premium, and 74 to 91% in each half-year of 2024 and 2025, and nonbank buybacks largely stopped. The price helps explain when nonbanks buy back delinquent loans. It does not explain why, at every price, they buy back a far smaller share of them than banks do.

The comparison of adjacent rates also disposes directly of the most natural alternative,

FHA's relief rule: the months in which the rule's threshold falls between the two rates of a pair move nonbank buybacks of the upper cohort by 0.02 (s.e. 0.02), against 0.99 for the price. Two other designs give the same answer, one controlling for every eighth of a point of the rate gap by servicer type and program, the other holding the price fixed within a coupon while the rule's threshold varies (Section 6.6). The rest of the evidence fits the same account without identifying it separately. When Ginnie Mae reopened the resale of loans bought back during a payment pause, in February 2021, nonbank buybacks of those loans rose relative to other delinquent loans and to banks (0.58, s.e. 0.24), although part of the rise had begun in late 2020. Nonbanks buy back VA loans, whose guaranty leaves a buyer with uninsured credit risk that the whole-loan market prices well above its expected loss, at a quarter of their FHA rate within servicer, month and borrower cells; banks buy back both at about the same rate (log ratio 0.05, s.e. 0.04). And the one episode in which banks' buybacks fell with the price, the rise in rates of 2021–2022, is concentrated among banks whose deposit costs moved with the policy rate, as a patient holder's would once its funding stopped being cheap; this rests on about thirty banks, and mostly on the largest.

The account does not explain everything, and I report where it fails. In the spring of 2020, with almost every delinquent loan resellable at a premium, nonbank buybacks fell; a threshold that rises with the shadow cost of a reseller's capital can produce that, but I do not test it here. Because a buyback for resale pays only when market rates have fallen below the rates on the delinquent loans (Bandyopadhyay, Kim and Smith, 2026), the comparison is not applied to the years of rising rates after mid-2022, when most nonbank delinquent loans sat below the premium (Internet Appendix Section IA.24). The step was located from the data, after a threshold at face value, specified first, found nothing, and the boundary design was added afterwards; the threshold sweep and the placebo pairs test that location on a comparison that did not produce it (Appendix A). And a loan's fate after a buyback is observed only when it reappears in a new bond, so the share of induced buybacks that end in a modification is a lower bound; the eighteen-month horizon of the 2019–2021 entries also spans the 2020 payment pauses. Ahsin (2026), using Ginnie Mae's suspension of an early buyout option for FHA loans, finds that earlier eligibility to buy a loan back lowers foreclosure by about 40% and raises cures by about half, as servicers pursue loss mitigation once they own the loan; the lower foreclosure that the boundary design finds for price-induced buybacks points the same way.

The paper contributes in three ways. First, it shows at the level of the individual loan, and for the borrowers concerned, that an intermediary's business model shapes when it takes on the ownership that debt restructuring requires, and that the two models do so differently: the market-funded reseller like an arbitrageur that takes a position when the spread covers its

financing (Shleifer and Vishny, 1997; Brunnermeier and Pedersen, 2009), the deposit-funded holder like a patient investor whose relevant cost is its own funding (Hanson et al., 2015; Drechsler, Savov and Schnabl, 2017). Work on nonbank intermediaries has documented their growth, their funding and their fragility (Buchak, Matvos, Piskorski and Seru, 2018, 2024; Jiang, Matvos, Piskorski and Seru, 2020; Kim, Laufer, Pence, Stanton and Wallace, 2018); this paper measures what their funding model does to the borrowers they serve. Second, it adds the resale price to the determinants of debt relief. Studies of mortgage renegotiation find that securitization and servicer constraints limit relief (Piskorski, Seru and Vig, 2010; Agarwal et al., 2011, 2017; Aiello, 2022; Kim, Lee, Scharlemann and Vickery, 2024); here the constraint is the secondary-market price at which the servicer can recover its outlay, and it moves with every change in interest rates. Third, it identifies a channel from bond prices to distressed borrowers. Lower rates reach current borrowers through refinancing (Di Maggio et al., 2017; Beraja, Fuster, Hurst and Vavra, 2019); they reach delinquent borrowers of nonbank servicers through the resale price, which also rose with the Federal Reserve's purchases of mortgage bonds in 2020 (Fuster, Hizmo, Lambie-Hanson, Vickery and Willen, 2021), although nonbanks then bought less for reasons the price does not explain (Section 6.9). When rates rise, that channel closes. For policy, the result separates two margins that the debate on nonbank servicers tends to merge (Financial Stability Oversight Council, 2024): facilities that fund the advances nonbanks owe investors address their liquidity, while the supply of modification depends on the terms on which they can own and resell delinquent loans.

Bandyopadhyay, Kim and Smith (2026), of which I am a coauthor, show that servicers use what they learn in servicing to buy back the loans that gain most when they re-perform, and that nonbanks buy back less often; this paper measures the resale price directly, identifies its effect within servicer and month, and traces what it means for the borrowers. My working paper on the 2020 episode (Bandyopadhyay, 2026) is a separate paper. Section 2 describes the institutions and Section 3 gives a minimal model. Section 4 describes the data and Section 5 follows bought-back loans to their later bonds. Section 6 contains the tests, Section 7 the insurance programs and Section 8 the borrowers; Section 9 discusses policy.

2 Institutions

The bond, the servicer and the buyback. Ginnie Mae guarantees bonds backed by FHA, VA and USDA loans. The servicer, which Ginnie Mae calls the issuer, collects payments and passes them to the bond's investors. When a borrower stops paying, the servicer must keep paying the investors the scheduled principal and interest out of its own pocket ("advances"), including every payment missed under a payment pause. Once a loan has been three months

behind, the servicer may buy it back from the bond at face value plus accrued interest (MBS Guide, Chapter 18). The buyback ends the advances and makes the servicer the owner. While the loan is in the bond it cannot be modified; a payment pause or a partial claim "may be accomplished without buying out the delinquent loan." The loan's insurance and the agency's relief rules survive the buyback.

The cash involved. The monthly payment on a 30-year loan at 4.5% is about 0.51% of the balance. Buying the loan back at face value therefore costs roughly two hundred months of advances, paid at once. The outlay comes back only when the loan is resold, modified or liquidated. For a servicer with ample funding the trade pays whenever the resale premium and the avoided advances exceed the cost of carrying the loan. For a servicer whose binding concern is cash over the next several months, the buyback worsens the cash position for months before any return arrives.

Two business models. A bank funds a buyback with deposits. It can hold the loan indefinitely, earning the loan's interest on a government-guaranteed asset that it may carry at cost. Because deposit rates respond to market rates with a pass-through (a "deposit beta") of roughly a third for the average bank (Drechsler, Savov and Schnabl, 2017, 2021), the spread the bank earns on a held loan is insulated from the market rate: when market rates rise, the bank's funding cost rises by only a fraction of the increase, so the spread on a fixed-rate loan narrows by less than a market-funded holder's would. A nonbank funds the buyback with a credit line secured by the loan. The lender advances only part of the loan's value, and the line charges interest, and ties up the nonbank's own capital in the haircut, until the loan is resold. The nonbank brings the loan current, usually by modifying it, and then exits: it either places the seasoned loan into a new Ginnie Mae bond and sells the bond at the market price, or it sells the loan outright to a buyer of distressed government loans. Both kinds of servicer resell (Section 5.2); what differs is the horizon. A resold loan is worth the price of a bond at the loan's interest rate: above face value when that rate exceeds the rate on newly issued bonds, below it otherwise. The buyer of the bond bears no credit risk; the servicer keeps the advance obligation and any uninsured loss if the loan defaults again.

Two insurance programs. FHA insurance pays the lender's claim on a foreclosed loan in full, less some interest and a third of foreclosure costs. The VA guaranty is 25% of the balance for loans above $144,000, with higher shares on smaller loans (38 U.S.C. 3703). When the property is worth less than the uninsured part of the balance, the VA pays the guaranty and declines the property (38 CFR 36.4323); the holder keeps the property and the loss above the guaranty. Until July 2021 the VA had no partial claim, so the only cure for a VA loan that changed its payment was a modification, which required a buyback; a VA partial claim then existed until October 2022.

The FHA relief rule. Since 2013 the order in which an FHA servicer must consider relief has depended on the borrower's rate relative to the market. Under Mortgagee Letter 2013-32 (September 2013, effective December 2013), a servicer may use a stand-alone partial claim, without a modification, only if the borrower's rate is at or below the "Market Rate," the payment is at or below a target, and the borrower otherwise qualifies for FHA's modification program. A stand-alone modification is used when re-amortizing the loan over 30 years at the Market Rate achieves the target payment. The Market Rate is at most a quarter point above the most recent weekly Freddie Mac survey rate, rounded to the nearest eighth (Mortgagee Letter 2013-17). Mortgagee Letter 2016-14 (effective December 2016) made these routes mandatory rather than permitted. For borrowers in pandemic payment pauses, Mortgagee Letter 2020-06 (April 2020) created a COVID-19 partial claim with no rate condition, and Mortgagee Letter 2020-22 (July 2020) restated it and added options (HUD, 2013a, 2013b, 2016, 2020a, 2020b). Outside the pandemic options, a borrower whose rate was above the Market Rate, approximately the national average, was routed to an instrument that requires the servicer to own the loan, and a borrower at or below it to one that does not. The VA had no rate-based rule; from September 2020 it allowed servicers to defer paused payments to the end of the loan (VA Circular 26-20-33).

The survey rate. Freddie Mac's weekly survey rate, which FHA's rule references and which I use as the "average mortgage rate" throughout, is the rate on conventional 30-year loans, not on FHA or VA loans. Government-insured loans usually carry somewhat lower rates, and the bonds that hold them trade at their own prices. For this reason the rate gap is only a proxy for resale value in this market, and the paper's main measure is the price of the Ginnie Mae bond itself (Section 6.3). Section 6.3 shows that a government-insured loan whose rate equals the survey rate is resellable at about two to four points above face value, not at face value.

Buyback financing. The filings of public nonbanks show that buyback credit was not always priced as a floating margin over short-term rates. One servicer's dedicated buyback facility carried a fixed 3.375% in 2020, 2021 and 2022 while short rates moved from 0.1% to 4.4%. Another's was priced at each transaction off the loan's rate. Smaller servicers' lines carried floors. Only the largest servicer with a disclosed buyback line paid LIBOR plus 1.75%. Ginnie Mae's September 2020 market report described buyback lines at 2.50–3.50% with advance rates of 85–95% of value, and observed that "depository issuers have access to near-zero cost of funds." Nonbank liquidity requirements rise with the non-performing share of the book, so a wave of payment pauses raises the liquidity a nonbank must hold while it is drawing liquidity down to advance.

2020. The CARES Act of March 27, 2020 entitled any borrower attesting to pandemic

hardship to a payment pause. About three-quarters of Ginnie Mae loans reaching serious delinquency in 2020 were in a pause, at similar rates across servicer types (77% at banks, 73% at nonbanks). The Federal Reserve bought about $580 billion of agency mortgage bonds in March and April 2020 alone, and by the summer every coupon traded well above face value (Fuster et al., 2021). Ginnie Mae's Pass-Through Assistance Program (APM 20-03, April 2020) lent servicers the money to cover advances as a last resort; it did not fund buybacks. On June 29, 2020, Ginnie Mae's notice APM 20-07 barred loans bought back while in a payment pause from standard bonds, citing the need to "ensure that transactional activity related to these options does not impair market confidence in Ginnie Mae securities": with bond prices far above face value, buying a paused loan back at face value and reselling it at once had become a profitable trade at the investors' expense. The reopening in February 2021 came with a seasoning requirement. Table 1 collects the dated events used in the paper.

Table 1: Dated events used in the analysis

Date	Event
1 Dec 2013	FHA relief rule routes by loan rate relative to the Market Rate (ML 2013-32); mandatory from 1 Dec 2016 (ML 2016-14)
27 Mar 2020	CARES Act payment-pause entitlement
1 Apr 2020	FHA COVID-19 stand-alone partial claim, without the rate test (ML 2020-06)
29 Jun 2020	APM 20-07: resale of loans bought back in a payment pause restricted from 1 July
1 Feb 2021	Re-performing (RG) bond type opens
27 Jul 2021	VA COVID partial claim available; requests end 28 Oct 2022

Other dated rules referred to in the text and not used for identification: VA refinance seasoning (EGRRCPA §309, APM 18-04, APM 19-03, APM 19-05); the Pass-Through Assistance Program (APM 20-03); and the VA COVID-19 deferment (Circular 26-20-33).

3 A minimal model

The model has two kinds of servicer, a holder and a reseller, and asks when each buys back a delinquent loan. A loan of balance one carries interest rate c. The current market mortgage rate is r. The loan is seriously delinquent and may be bought back at face value. While it sits in the bond it costs the servicer a per period in advances. Let D be the annuity factor over the loan's expected remaining life after resolution and s the expected time to resolution.

Holder. A holder funds the purchase at deposit cost $\rho = \rho_0 + \beta r$, where $\beta \in [0, 1)$ is the pass-through of the market rate to its deposit cost (the deposit beta), and holds the loan to resolution, carrying it at amortized cost as a loan held for investment. Its gain is therefore

the spread between the loan's rate and its own funding cost rather than the loan's market value; this is the sense in which stable deposits make a bank a patient owner in Hanson et al. (2015), which need not realize the market value of what it holds. It bears a capital charge κ. The uninsured part of a loss, $(1-\gamma)\lambda$, where γ is the share the insurer covers and λ the expected loss on an uninsured loan, falls on the servicer whether it buys the loan back now or at foreclosure, when Ginnie Mae requires it to remove the loan from the bond at face value; it does not enter the comparison. The holder's gain from buying back, relative to continuing to advance, is

$$V_H = D\,(c-\rho) - \kappa + a\,s.$$

It buys when $V_H > 0$. The market rate enters only through ρ, so $\partial V_H/\partial r = -D\beta$: a holder with β near zero is unaffected by r, and a holder with a high β loses as rates rise. A holder that later resells the loan, once the premium has returned, is still a holder at the moment of decision. A holder that marked the loan to market would value it as a reseller does; Section 6.8 tests whether banks respond to the price only through their funding cost.

Reseller. A reseller finances the purchase on a line at rate ℓ that advances a share $1-h$ of the loan's value, puts up the remaining h from its own capital at cost $k > \ell$, and carries the loan for the s periods it takes to cure and season, recovering a share ψ of the loan's interest for those periods when the loan is resolved. It then exits in one of two ways. It may sell the whole loan at a price that reflects the buyer's exposure to the uninsured loss, $P_W = 1 + \delta(c-r) - \pi(1-\gamma)$, where $\delta > 0$ is the price sensitivity to the rate differential and π is the whole-loan market's price of the credit tail. Or it may place the loan into a new Ginnie Mae bond, sell the bond at $1+\delta(c-r)$, and keep the credit exposure, which costs a thinly capitalized servicer $\kappa_R(1-\gamma)\lambda$ with $\kappa_R > 1$. The bond buyer bears no credit risk (Section 2). Since the expected uninsured loss is the servicer's in any case, only the excess of the market's price of the tail, or of the cost of retaining it, over that loss enters the comparison. Along either route the reseller's gain is

$$V_R = \delta\,(c-r) - \min\{\pi-\lambda,\,(\kappa_R-1)\lambda\}\,(1-\gamma) - s\left[(1-h)\,\ell + h\,k - \psi c\right] + a\,s,$$

and the resale value enters through $\delta(c-r)$ in both. The whole-loan market prices the credit tail above its expected loss. In one institutional buyer's pricing of about 24,000 FHA and VA loans offered out of Ginnie Mae bonds in 2018–2020, loans ninety or more days delinquent were priced 4.9 cents per dollar lower if VA-guaranteed than if FHA-insured (s.e. 0.2), with the same delinquency, loan-to-value, state and offer. The discount sits where the guaranty runs out: among seriously delinquent loans, VA loans are priced within half a cent of FHA loans below 90% loan-to-value, 7 cents below at 90 to 100%, 13 cents below at 100 to 110%

and 25 cents below above 110% (Internet Appendix).

Funding hurdle. Either servicer may face a budget. With capacity K net of the advances it must make, it buys in order of value per dollar until capacity runs out, so it buys when $V/B \geq \mu_t$, where $\mu_t \geq 0$ is the shadow cost of a dollar of its capital and B the outlay at face value. A delinquency wave lowers K and raises μ_t, little for a servicer funding advances from deposits and much for one funding them on lines that will not take delinquent collateral (Kim et al., 2018).

Proposition 1 (Buyback rules)**.** *Write the resale price as $P = 1 + \delta(c - r)$ and the reseller's costs as $K_R = \min\{\pi - \lambda, (\kappa_R - 1)\lambda\}(1 - \gamma) + s[(1 - h)\ell + hk - \psi c] - as$. The reseller buys when the premium $P - 1$ exceeds K_R: its threshold is a premium over face value, not face value, and its buyback probability falls as the premium drops below K_R. The holder's decision does not depend on P; it depends on the market rate only through ρ.*

Proposition 2 (Insurance)**.** *A lower insured share γ raises the reseller's threshold, because the credit term $\min\{\pi - \lambda, (\kappa_R - 1)\lambda\}(1 - \gamma)$ rises as γ falls whenever the whole-loan market prices the credit tail above its expected loss and the reseller's cost of retaining the tail also exceeds that loss; it leaves the holder's decision unchanged.*

Proposition 3 (Funding hurdle)**.** *A rise in the shadow cost of capital μ_t lowers buybacks at every price and raises the reseller's threshold premium from K_R to $K_R + \mu_t B$.*

All three follow directly from the value expressions.

The size of K_R can be gauged from the terms nonbanks disclose (Section 2): buyback lines at 2.5 to 3.5%, advance rates of 85 to 95%, and a median of about ten months from buyback to resale (Section 5.2). With $\ell = 3\%$, $h = 10\%$, a cost of capital of 15%, half the interest recovered on a 4% loan, and s of ten months, the carry term is about 1.8 points; the credit term is small for FHA loans, and avoided advances offset a fraction of a point. A threshold of about two points is the order of magnitude the model implies. This is a check on the magnitude made after the estimates, not a prediction made before them. The institutional buyer's own cash flows give a second check, also made after the estimates (Internet Appendix Section IA.16). Its pricing model values a cured loan's re-pooling at a coupon price; that price enters only the re-pooling proceeds, so a loan's value is linear in it. In the 19 offers it priced from December 2018 to February 2020 (40,041 loans, 57% of them sixty or more days delinquent when offered), re-pooling carries 28% of the present value of the cash flows on which the buyer bid for the median loan, and a point of exit price is worth about 0.28 points of value per 100 of balance. Discounted at the 4.2% blended cost of this calibration ($0.9 \times 3\% + 0.1 \times 15\%$) instead of the buyer's 9% yield, those cash flows break even against

a purchase at face value, for the median loan, at an exit price of 102.6, and a two-point premium is the median break-even at a funding rate of 4.0%; the line terms above imply blended costs of about 3 to 5%, and break-evens of about 99 to 106. At 2%, closer to a bank's cost of funds, the break-even is 95.9, below face value.

The model has four implications for the data. A reseller's buybacks step up at a premium of a few points and are flat below it; a holder's depend on the market rate only through its funding cost; a shortfall in insurance lowers resellers' buybacks and not holders'; and a rise in the shadow cost of a reseller's capital raises its threshold. Section 6 tests the first and Section 7 the third. With $\partial V_H/\partial r = -D\beta$, a rise in r of the size seen in 2022 (three points) lowers a holder's gain by $3D\beta$, which is material for a bank with β of 0.3 and negligible for one with β of 0.1; Section 6.8 tests the second. Proposition 3 is not tested here; Section 6.9 notes that 2020 is consistent with it.

4 Data

Loans. Ginnie Mae publishes a monthly record for every loan in its bonds. I use these records from December 2013 to December 2022, assembled for Bandyopadhyay, Kim and Smith (2026), supplemented by the full December 2022 file, the 2023 monthly files (for the ten-month outcomes in the Internet Appendix) and the 2024–2025 monthly files (with the 2023 files, only to measure how many delinquent loans sat below the premium once rates rose). The unit of analysis is an FHA or VA loan in a bond in a month at which the loan can be bought back the following month: the loan is reported three or more months behind with no removal recorded, or it is reported two months behind and its record the following month shows three or more months behind or a removal at that stage. The second case is the first month in which a buyback can be executed, and it belongs in the sample: 60% of all buybacks take place in that first eligible month, which holds 17% of the loan-months. An earlier draft excluded these buybacks; the sample was revised and every estimate re-run (Appendix A). The outcome is the same loan's record the following month: a buyback (removal reason 2), a removal for other relief (4), a foreclosure removal (3), a cure inside the bond (zero months behind), or continued delinquency. The 2019–2022 panel holds 15.3 million such loan-months on 2.36 million loans, with 1.11 million buybacks. The 2014–2018 panel, built the same way, holds 6.8 million. A loan is followed by its identifier within its bond. A loan whose servicing is transferred appears under the new servicer, so cohorts are defined by the servicer of record each month. The December 2022 stock in the file (261,364 seriously delinquent loans in bonds) matches the count from the raw monthly files exactly. The full December 2022 universe (10.8 million active loans) is read for the destination match of Section 5.2.

Servicers. Servicers are classified as banks or nonbanks from the public Ginnie Mae issuer directory and an earlier hand classification, which agree on every servicer both cover; servicers neither covers are classified by charter words in their names, with state housing agencies excluded. I call the first group banks; Ginnie Mae's directory and the Internet Appendix label them depository institutions. The 2019–2022 estimates use 123 servicers (87 nonbanks, 36 banks) that account for 90% of loan-months; the 2014–2018 estimates include the name-classified servicers (141 servicers, 58 of them banks, in the 2016–17 window).

Rates and balance sheets. The Freddie Mac 30-year survey rate averaged by month, which is the conventional-loan rate that FHA's rule references (Section 2); the effective federal funds rate from the New York Fed; deposit costs from FDIC call reports for the bank servicers I could match, with the counts entering each regression given in Section 6; and the balance of loans eligible for buyback that servicers must recognize under ASC 860-50, from SEC filings.

Borrowers. For borrower characteristics not in the public file I use one firm's book of government-insured loans acquired after buyback: its contact-log hardship indicators for January 2018 to September 2020, and consumer-data attributes from a commercial data vendor, matched by address. The data are proprietary and were obtained while I was the provider's employee; only aggregates appear here.

Prices. TRACE, the system through which bond dealers report trades, records trades in individual Ginnie Mae bonds. I use these for 2019–2022 and 2014–2018 (and for 2023–2025 only for the share of delinquent loans below the premium), linked to the bonds through the TRACE master file (every bond in the loan file matches a bond number; 99.8% of bonds map to one security identifier), which also supplies each trade's coupon, program and maturity for the price index of Section 6.3; bond characteristics come from the December 2022 universe.

An institutional buyer's records. The firm whose book supplies the borrower data above buys loans that servicers have bought back out of Ginnie Mae bonds. With its written permission I also use, in aggregate, the cash flows of the spreadsheet model in which it priced 19 offers of such loans from December 2018 to February 2020, and its monthly servicing records of the loans it bought (Sections 3 and 5.2 and the Internet Appendix).

Table 2 summarizes the period. Over the whole period banks buy back 30.7% of their seriously delinquent loans a month and nonbanks 4.5%. Nonbanks come closest to the bank rate in 2021, when nearly every delinquent loan carried a rate above the market and the re-performing bond type had opened; both collapse in 2022 as the share of loans above the market rate falls from 71% in the second half of 2021 to 1% in the second half of 2022.

Table 2: The market by half-year, 2019–2022

	Mortgage rate	Share of delinquent loans	Monthly buyback rate, %	
Half-year	(%)	above the market rate	Banks	Nonbanks
2019 H1	4.19	0.18	36.0	5.1
2019 H2	3.68	0.47	39.9	8.3
2020 H1	3.37	0.76	57.0	2.8
2020 H2	2.85	0.91	26.8	3.8
2021 H1	2.94	0.84	17.7	6.9
2021 H2	2.97	0.71	20.4	6.1
2022 H1	4.52	0.15	18.2	1.9
2022 H2	6.14	0.01	4.6	0.3

FHA and VA loan-months at risk of buyback the following month: the loan is three or more months behind, or two months behind and reported three or more months behind (or removed at that stage) the following month; the buyback is recorded the following month; 123 classified servicers. Rates are buybacks over loan-months at risk. Mortgage rate is the Freddie Mac 30-year survey rate averaged over the half-year. "Above the market rate" means the loan's rate is at least half a point above the survey rate, weighted by loan-months.

5 Business models: where bought-back loans go

5.1 Portfolio stocks

Table 3 counts, for each servicer type, the loans in its bonds in December 2022 that got there by being resold after a buyback (modified loans with a first payment date from 2019, or loans in re-performing bonds), against its buybacks over 2019–2022. Nonbanks have 0.83 such loans per buyback and banks 0.36; re-performing bonds hold about 0.17 loans per buyback at both types, and modified-and-resold loans 0.66 for nonbanks against 0.19 for banks. The ratio is a stock over a cumulative flow, not a loan-level probability; it attributes a loan to the servicer holding it in December 2022, misses resold loans that have since prepaid, and includes loans acquired by servicing transfer. The loan-level match below shows that a quarter of resold loans are held in December 2022 by a different servicer than the one that bought them back, mainly nonbanks, so the table overstates the difference between the types. Bank buybacks peaked in 2020 (364,000) and nonbank buybacks in 2021 (297,000), after the re-performing bond type opened. These counts come from the removal file; the loan-month panel of Section 4 holds 541,633 bank and 540,757 nonbank buybacks over 2019–2022 at the 123 classified servicers, against the 600,022 and 579,984 counted here; the difference consists of buybacks at servicers outside the 123 and buybacks of loans that have no at-risk loan-month in the panel.

Table 3: Resold loans per buyback, December 2022

	Loans in bonds	Buybacks 2019–22	Resold, still in a bond	Per buyback	Of which modified
Banks	2,591,244	600,022	214,900	0.36	0.19
Nonbanks	7,978,951	579,984	478,803	0.83	0.66

5.2 Loan-level destinations

The public file does not carry a loan identifier across bonds. Bandyopadhyay, Kim and Smith (2026) link bought-back loans to their resold records on program, state, first payment date and original balance, in order to value servicers' gains. The match here serves a different purpose, the comparison of destinations and timing across servicer types, and it also has to reach modified loans, whose first payment date and balance are reset. The file does carry fields that a buyback and a modification leave unchanged: the program, the state and the loan's origination date. The origination date is disclosed for loans in bonds issued from April 2015 and is present for 70% of 2018–2022 buybacks. I match every FHA and VA removal from January 2018 to a loan in the December 2022 universe that carries a modified or re-performing purpose code or sits in a bond issued at least a year after its first payment, on program, state and origination date, and disambiguate with what a modification cannot change and what a resale must satisfy: the candidate's bond was issued after the removal; an unmodified candidate has the removed loan's original balance (to the thousand dollars) and rate; a modified candidate's new balance lies between 0.95 and 1.30 times the balance at removal; and credit scores, where both are present, differ by at most forty points. A removal counts as matched when exactly one candidate passes and that candidate passes for no other removal. Two placebos bound the false-match rate. Foreclosure removals, which cannot be resold, match at 2.3–2.9%. Running the same filters against candidates whose bonds were issued *before* the removal, which cannot be the same loan, matches 3–4% of buybacks. I report rates net of this. The rates are lower bounds: a third of modified loans carry a reset origination date, ambiguous keys are discarded, loans resold and since prepaid are missed, and 2022 buybacks had little time to season.

Table 4 shows that both types resell and nonbanks resell sooner. Net of the placebo, 7–8% of 2019 buybacks and 14% of 2020 buybacks reappear in a bond by December 2022 at both kinds of servicer. For 2021 buybacks the nonbank rate is 12% and the bank rate 5%. The route differs by program and not by type: VA resales are mostly modified loans, since before the pandemic options a VA loan had no cure short of a modification. The share of resold loans held by a different servicer in December 2022 is an upper bound on cross-servicer resale,

since the file identifies the servicer of record in that month, not the servicer that resold the loan, and so counts later servicing transfers. In December 2022, 82% of resold bank loans and 80% of resold nonbank loans were current, and 5–6% were again three or more months behind.

Two conclusions follow. The title's distinction is not one of destinations: both kinds of servicer resell part of what they buy, at similar lower-bound rates, and some bank buybacks end up resold by nonbanks. It is one of horizon and exposure: a nonbank exits sooner and, as the rest of the paper shows, decides on the price it will get, while a bank can wait and, while rates fell, responded to the price an order of magnitude less. What the match cannot show is the fate of the 85–90% of bought-back loans that do not reappear by December 2022: loans held in portfolio, sold whole and not resold into a bond, resold and prepaid, or lost to the matching key. One buyer's records show what becomes of loans sold whole after a buyback. Of 7,861 such loans that the institutional buyer purchased from December 2019 to March 2020, 26.5% were re-pooled within twelve months of purchase, 2.1% ended in a claim, foreclosure sale or short sale and 68% were still held, over a window that spans the payment pause; among those re-pooled by May 2021 the median time to re-pooling was 9.2 months (Internet Appendix Section IA.16).

Figure 1 shows the two types' monthly buyback rates over 2014–2022 against the share of seriously delinquent loans whose rate is at or above the survey rate.

6 What makes a servicer buy: resale value

In this section and the next the two empirical types stand in for the model's: banks are the holders and nonbanks the resellers. The estimates are from Poisson regressions of buyback counts on the number of loans at risk, so a coefficient is a difference in log buyback rates; standard errors are clustered by servicer, and the main results are checked with a bootstrap that treats each servicer as one observation. Sections 6.1 to 6.3 build the price measure and establish the shape of the response; Section 6.4 gives the identifying comparison, between adjacent loan rates of the same servicer in the same month; Sections 6.5 and 6.6 test the resale rules and the relief rule; Section 6.8 looks inside the banks; Section 6.9 treats 2020.

6.1 Across a servicer's loans

Define a loan's rate gap as its rate minus the month's survey rate. Across a servicer's loans in a month, comparing within servicer-month and program-month, a bank buys back loans above and below the market rate at the same rate (log ratio 0.01, s.e. 0.035, for loans half a

Table 4: Where bought-back loans go: matches to the December 2022 universe

	Banks	Nonbanks
Buybacks 2018–2022 with an origination date	371,892	490,388
Resold by December 2022, net of placebo (%): 2019 buybacks	7.3	8.2
2020 buybacks	13.6	14.1
2021 buybacks	5.2	12.2
Buybacks Jan 2020–Jun 2021 resold within 12 months (%)	6.4	10.9
within 18 months (%)	12.1	15.8
Months from buyback to resale, median (interquartile range)	14 (10–20)	10 (8–15)
Share of resales within 12 months	0.41	0.64
Held by a different servicer in December 2022, share of matched	0.28	0.22
of which a nonbank	0.84	0.70
Route, FHA: modified / re-performing / seasoned unmodified	0.41 / 0.47 / 0.12	0.40 / 0.53 / 0.07
Route, VA: modified / re-performing / seasoned unmodified	0.62 / 0.18 / 0.20	0.72 / 0.21 / 0.08
Current in December 2022, share of matched	0.82	0.80
Placebo: foreclosure removals matched (%)	2.3	2.9
Placebo: time-reversed candidates matched, buybacks (%)	4.0	3.8

Servicer type is the buying servicer's. "Net of placebo" subtracts the time-reversed match rate of the same year. Loan-level matches are kept locally and are not part of the replication package.

point or more above). A nonbank buys back a loan above the market rate at about 2.2 times the rate of one below it (additional 0.80, s.e. 0.16). Because the comparison runs across loan rates, which are correlated with vintage, credit quality and the cost of advancing, it does not isolate resale value. Bandyopadhyay, Kim and Smith (2026) document the same gradient.

6.2 Within a cohort

The sharper test holds a cohort fixed: one servicer's loans in one program at one rate (to the quarter point). Comparing within cohort, as well as within servicer-month and program-month, the market rate alone moves the cohort's resale value. I use two measures of that value. The first is the rate gap below the survey rate, $\min(\text{loan rate} - \text{survey rate}, 0)$; it is the measure of earlier work and exists for every month, and it is a first pass. The second, in Section 6.3, is the TRACE price at which the cohort's loans could be resold; it is the test. A cohort is a category, not a fixed set of loans. Loans enter and leave its seriously delinquent population, so its delinquency depth, payment-pause status and vintage mix can

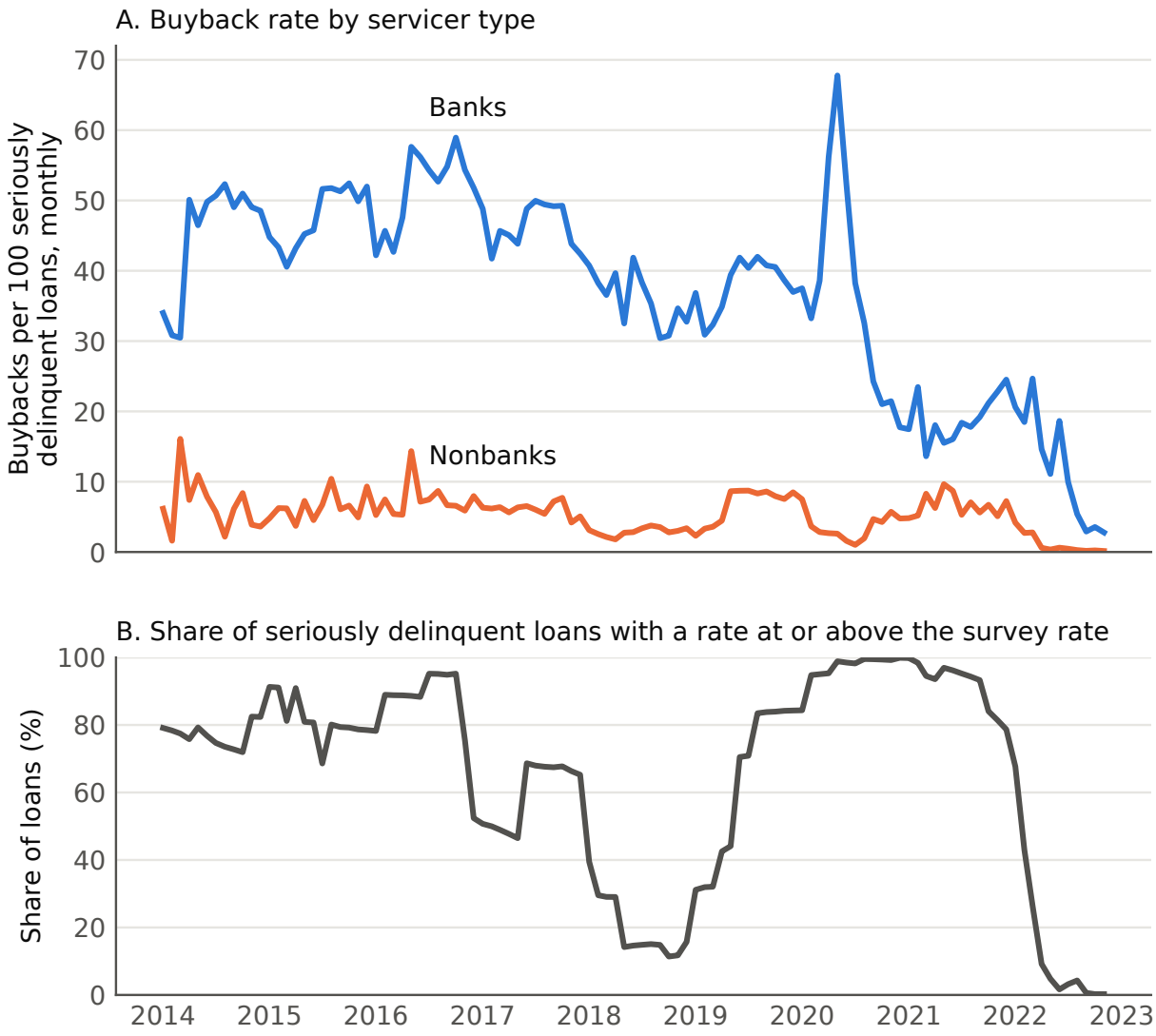


Figure 1: Monthly buyback rate of seriously delinquent FHA and VA loans by servicer type, and the share of those loans whose rate is at or above the 30-year mortgage rate, January 2014–November 2022.

change; the robustness table adds delinquency-by-pause-by-month controls, and the loan rate proxies vintage only approximately. A linear rate gap is absorbed by the cohort and month controls. The identifying variation therefore comes from the kink: the regressor is zero above the survey rate and falls below it. Figure 2 is the primary object, a response function estimated bin by bin for both types, and the linear slopes summarize it. A loan rate equal to the survey rate is not a price of face value; Section 6.3 shows it is a resale premium of two to four points. For a loan that is modified to the market rate before resale, the new bond's price depends on the market rate, not on the old rate, so the old coupon's price is the value of an unmodified exit. The premium that pays a reseller's costs is earned on loans resold

unmodified or sold whole, which is about half of the matched resales (Section 5.2).

Figure 2 shows that nonbank buybacks fall in the first half-point below the survey rate and bank buybacks only once the discount is deep. Relative to cohorts within half a point above the survey rate, nonbank buybacks fall by 0.58 (s.e. 0.16) in the first half-point below it, by 1.22 (0.29) in the second, by 1.39 (0.35) in the third and by 1.68 (0.52) beyond. Bank buybacks are flat in the first half-point (0.04, s.e. 0.04), fall by 0.20 (0.10) in the second and by 0.60 (0.12) in the third, and by 1.50 (0.26) beyond a point and a half. Above the survey rate nonbank buybacks rise little further and bank buybacks fall in the top bin. The pooled 2019–2022 linear slope (Table 12) is dominated by 2022, when rates rose two to three points above loan rates and both types stopped; banks respond strongly to the rate gap in that episode (Table 12). The rate gap is therefore a proxy to which both types respond once the discount is deep.

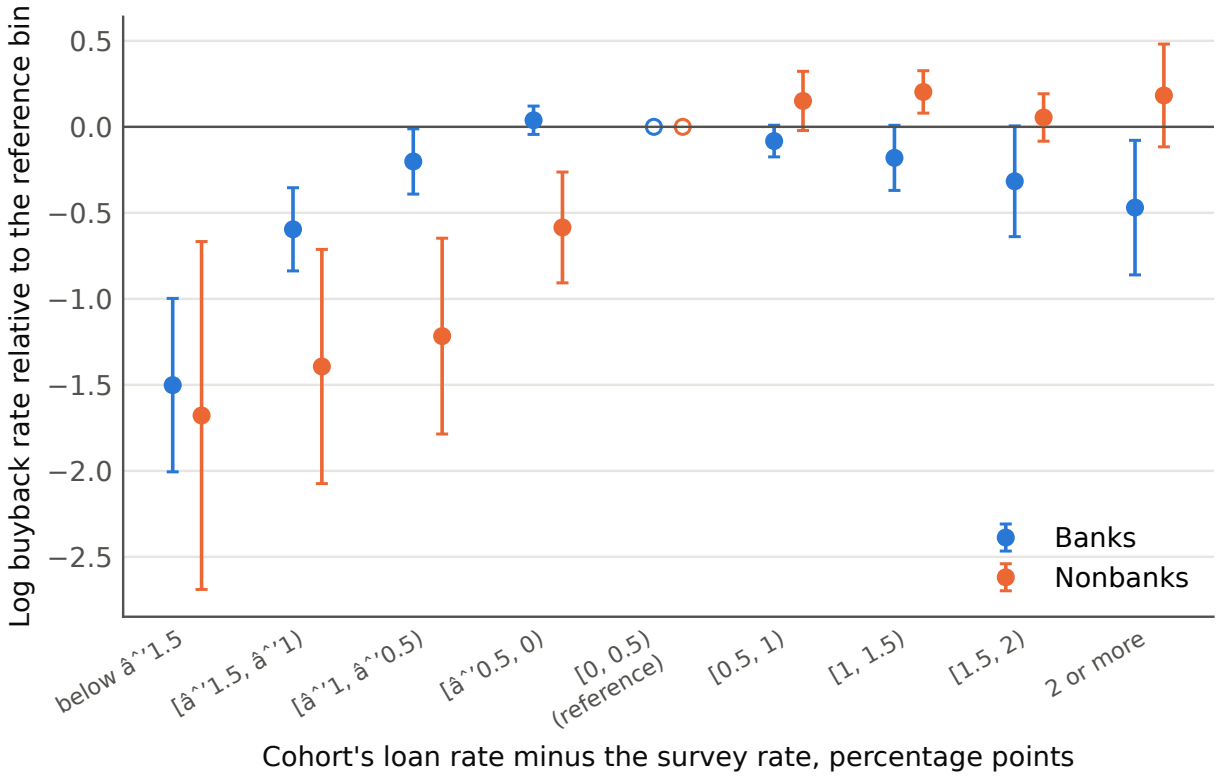


Figure 2: Log buyback rate by a cohort's rate-gap bin relative to the $[0, 0.5)$ bin, within servicer-by-program-by-rate cohorts, with servicer-by-month and program-by-month controls, 2019–2022. Bars are 95% intervals, clustered by servicer.

Table 5 reports two episodes chosen from the rate history. From January to July 2019 the survey rate fell from 4.46% to 3.77% while the federal funds rate stayed at 2.4%, so within a cohort only resale value moved. Nonbanks' buybacks respond to the cohort's rate gap

Table 5: Buyback response to a cohort's rate gap below the survey rate, within cohort (log ratio per point of rate)

Episode	Nonbanks	Banks	Difference
Jan–Jul 2019: mortgage rate 4.46 → 3.77, funds rate flat at 2.4	2.72 (0.57)	0.35 (0.16)	2.35 (0.59)
Oct 2016–Mar 2017: mortgage rate 3.47 → 4.20	0.44 (0.27)	0.19 (0.04)	0.22 (0.27)
Pooled 2014–2018			1.58 (0.38)
Jan–Sep 2016: 3.87 → 3.46, 9% of loan-months below the survey rate			0.38 (0.54)
Pooled 2019–2022	1.11 (0.34)	0.86 (0.17)	0.17 (0.38)

Servicer-by-month, program-by-month and servicer-by-program-by-rate controls; Poisson on cell counts; clustered by servicer. The nonbank and bank columns are separate regressions on each type's cells; the difference is the nonbank interaction in the pooled regression, whose base slope (0.37 and 0.20) is close to the banks-alone value quoted in the text. 84 servicers (31 banks) and 93,826 buybacks in the 2019 window; 141 (58) and 91,548 in 2016–17.

below the survey rate with a slope of 2.72; banks' respond with a slope of 0.35, an eighth as large; the difference is 2.35 (s.e. 0.59). From October 2016 to March 2017 the survey rate rose from 3.47% to 4.20%, pushing cohorts holding 35% of loan-months below it. Nonbanks cut buybacks of those cohorts more than banks did, but the difference is not distinguishable from zero in rate-gap terms. The window also straddles December 1, 2016, when FHA's rule became mandatory (Section 2), so rate-gap estimates for it cannot separate the price from the rule; the price-based tests of Section 6.6 are the ones to read for that episode. The January–September 2016 decline is uninformative because only a tenth of loans sat below the survey rate. The proxy has two limits: in the 2016 episode it does not separate the types where the price measure of Table 6 does, and in the pooled 2019–2022 sample its contrast is zero because banks respond to it strongly once rates rise far above loan rates. I therefore keep Table 5 as a first pass and use the price measure as the test.

6.3 Resale value measured

Measured as a price, the nonbank response is a step at a two-point premium and the bank response is nearly flat. The object in the reseller's payoff is the price at which the loan can be placed into a new bond, and TRACE reports the trades. Ginnie Mae bonds come in coupons spaced half a point apart (3.0%, 3.5%, 4.0%, and so on). From trades in individual Ginnie Mae II bonds in 2019–2022 (320,198 trades after excluding corrections, as-of and special trades and bonds with less than 25 years to maturity) I take the monthly median price by coupon, keeping coupon-months with at least twenty trades (448 coupon-months).

I build the same index for 2016–2017 from the archived TRACE files (120,412 trades, 201 coupon-months). A loan with rate c pays a servicing fee of 25 to 75 basis points and can be placed into the coupon $c - 0.25$ rounded down to the half point. I assign each cohort that coupon's price, which covers 92.5% of cells and 99.6% of loan-months, and I measure resale value in price points over face value. Across cells the price measure and the rate gap correlate 0.956.

Two facts about this price change how the rate-gap results should be read. Interpolating between the coupons that bracket a price of 100, the coupon that trades at face value sat 1.26 points below the survey rate in 2019–2022 (s.d. 0.13 across the 21 months with a bracketing pair). It sat 2.12 points below it in 2016–2017 (s.d. 0.20, 10 months, on a thin index whose bracketing coupons are not always ordered; the Internet Appendix gives the detail). A loan whose rate equals the survey rate is therefore placed into a coupon half a point to a point above the one trading at face value. At these bonds' price sensitivity that is a premium of roughly two to four points. Only 12% of 2019–2022 loan-months, and almost none in the October 2016–March 2017 window, sat at a price below face value. The break the bins locate at the survey rate is a break at that premium. Figure 3 replaces the kink with one-point price bins and plots the nonbank response net of the bank response, together with the bank response itself. The nonbank response is a step at two points that reaches a plateau by four points and is flat below. While rates fell, from January 2019 to December 2021, nonbank buybacks relative to banks' are the same in every bin up to a premium of two points (0.30, s.e. 0.38, below face value and 0.31, s.e. 0.25, at one to two points, both relative to zero to one point) and higher in every bin above it: 1.20 (s.e. 0.34) at two to three points, 1.54 (0.47) at three to four, 1.80 (0.55) at four to five, 1.81 (0.61) at five to six and 1.80 (0.56) at six and more. Bank buybacks move by 0.13 to 0.24 across the bins from one point upward (s.e. about 0.05), an order of magnitude less, and are lower only below face value (-0.37, s.e. 0.31). Over all months of 2019–2022 the step sits in the same place and is smaller, between 0.79 and 1.43 above two points, and banks' below-face-value bin is -0.76 (s.e. 0.23), the response to the deep discounts of 2022. That is the shape Proposition 1 gives a reseller whose costs must come out of the premium: a threshold at a premium and no response below it.

Table 6 reproduces both episodes with the regressor in price points and the kink at the premium a loan at the survey rate carries. In January–July 2019 nonbank buybacks fall by 0.63 log points per point that the cohort's price sits below a three-point premium (s.e. 0.13); bank buybacks fall by 0.08 (0.04), an eighth as much. In October 2016–March 2017 the figures are 0.53 (0.24) against 0.05 (0.01). The contrast holds at a two-point threshold in both windows, at four points in 2019 (in 2016–17 the four-point kink is imprecise), and over the whole 2019–2021 rate decline (nonbank differential 0.61 at three points, s.e. 0.22, over a

bank slope of 0.13, s.e. 0.06). With the kink at face value itself, where almost no loan-month sat in either window, the estimates are imprecise (differences of 0.35, s.e. 0.35, and −0.25, s.e. 0.47), which is why a kink at 100 was uninformative. Pooled over 2019–2022 both types' slopes are small and positive and the nonbank slope is no larger; at face value it is smaller (−0.25, s.e. 0.09), because 2022 took every coupon ten points and more below face value and banks, whose deposit costs were then rising, cut back more than nonbanks, who had already stopped (Section 6.8). The design of Section 6.4, which holds the rate gap to a quarter point, recovers the nonbank step in the pooled sample as well (0.72, s.e. 0.26).

A single step at a two-point premium summarizes the figure (Table 6, lower panel). Relative to banks, nonbanks buy back cohorts priced two or more points over face value at 3.0 times the rate of cohorts priced below that over the 2019–2021 decline (1.09 log points, s.e. 0.35; bootstrap $p = 0.013$), at 2.5 times in January–July 2019 (0.91, s.e. 0.30; $p = 0.003$) and at 2.5 times around the 2016 election (0.93, s.e. 0.47; $p = 0.08$). Unlike the kink, the step keeps its sign in the pooled 2019–2022 sample (0.66, s.e. 0.33; $p = 0.10$), though it is not significant there, because it does not require cohorts already below the threshold to be bought back still less as their price falls further. The step also passes the test of Section 6.6. With controls for every eighth-of-a-point rate gap by servicer type and program, it is 0.58 (s.e. 0.22) over 2019–2021 and 0.34 (s.e. 0.24) over 2019–2022, and for FHA loans 0.63 (s.e. 0.23; $p = 0.007$) and 0.42 (s.e. 0.26; $p = 0.14$) (Internet Appendix). In the 2021–2022 rise taken alone the bank step is 0.82 (s.e. 0.24) and the nonbank step is no larger (difference −0.06, s.e. 0.42): as prices fell through the threshold, banks' buybacks fell with them as much as nonbanks', a bank response that Section 6.8 traces to the banks whose deposit costs had risen. A step at one point gives similar estimates; at three and four points the estimates shrink (0.67 and 0.36 over 2019–2021), as they should if the step sits near two points (Internet Appendix).

The step implies a count. Had nonbanks bought back the cohorts below it at the rate, relative to banks, at which they bought back the cohorts above it, they would have bought back about 9,500 more seriously delinquent loans over 2019–2021 (3,800 with the rate-gap controls), against the 4,800 they did buy from those cohorts. In the 2021–2022 rise, rates took most coupons below the premium and the nonbank step is not identified (difference −0.06, s.e. 0.42), so applying the 2019–2021 estimate to the 1.8 million nonbank loan-months then below the step would be an extrapolation; it would roughly triple the figure. Each of these loans stayed in its bond, where it could cure or receive a partial claim but could not be modified.

Out of sample. Because the step was placed after the price bins were seen, it needs a check on data that did not place it. The coupon-boundary design of Section 6.4 uses the

same two-point premium; frozen and run on the months of 2014–2018 that it had not used, it gives the same answer (Table 9).

Table 6: Buyback response to resale value measured from bond prices, within cohort

Sample	Threshold	Nonbanks	Banks	Difference
Jan–Jul 2019	2 points	0.85 (0.23)	0.09 (0.06)	0.75 (0.24)
	3 points	0.63 (0.13)	0.08 (0.04)	0.54 (0.14)
	4 points	0.60 (0.12)	0.09 (0.04)	0.50 (0.12)
	face value	0.53 (0.29)	0.16 (0.19)	0.35 (0.35)
Oct 2016–Mar 2017	2 points	0.92 (0.44)	0.07 (0.02)	0.83 (0.43)
	3 points	0.53 (0.24)	0.05 (0.01)	0.48 (0.24)
	4 points	0.18 (0.19)	0.04 (0.01)	0.13 (0.19)
	face value	−0.26 (0.46)	−0.02 (0.06)	−0.25 (0.47)
Rates falling, 2019–2021	2 points		0.18 (0.09)	0.82 (0.34)
	3 points		0.13 (0.06)	0.61 (0.22)
Pooled 2019–2022	2 points	0.17 (0.06)	0.24 (0.05)	−0.08 (0.08)
	3 points	0.23 (0.07)	0.21 (0.04)	0.01 (0.08)
	face value	0.07 (0.05)	0.30 (0.07)	−0.25 (0.09)
Step: indicator for a price two or more points over face value				
Jan–Jul 2019	step at 2		0.05 (0.02)	0.91 (0.30)
Oct 2016–Mar 2017	step at 2		0.09 (0.02)	0.93 (0.47)
Rates falling, 2019–2021	step at 2		0.23 (0.11)	1.09 (0.35)
	+ rate-gap controls		−0.04 (0.08)	0.58 (0.22)
Rates rising, 2021–2022	step at 2		0.82 (0.24)	−0.06 (0.42)
Pooled 2019–2022	step at 2		0.38 (0.09)	0.66 (0.33)
	+ rate-gap controls		−0.03 (0.11)	0.34 (0.24)

Upper panel: coefficient on $\min(P - 100 - \text{threshold}, 0)$, where P is the TRACE price of the bond coupon the cohort's loans would be placed into; a positive value means buybacks fall as the price drops further below the threshold. Nonbank and bank columns are separate regressions, except in the rates-falling rows, where the bank column is the base slope of the pooled regression; the difference is the nonbank interaction in the pooled regression. Servicer-by-month, program-by-month and servicer-by-program-by-rate controls; Poisson on cell counts; clustered by servicer. Lower panel: an indicator for a price two or more points over face value and its nonbank interaction in one regression; the bank column is the base coefficient and the difference is the interaction. "+ rate-gap controls" adds controls for rate-gap bins of 0.125 points by servicer type and program, as in Table 11. Bootstrap p for the step difference: 0.003 (2019), 0.08 (2016–17), 0.013 (2019–21), 0.10 (2019–22). FHA and VA loans. Cells without a priced coupon-month are dropped, so the samples are smaller than in Table 5. 2019 window: 84 servicers, 92,376 buybacks; 2016–17 window: 126 servicers, 78,903 buybacks; 2019–2022: 109 servicers, 1,069,332 buybacks.

6.4 Adjacent loan rates in the same servicer and month

The sharpest test uses the way loans are assigned to bonds. Loan rates come in quarter points, and a loan can be placed into a coupon between a quarter and three-quarters of a point below its rate: 3.75% and 4.00% loans can go into the 3.5% bond but not the 4.0%

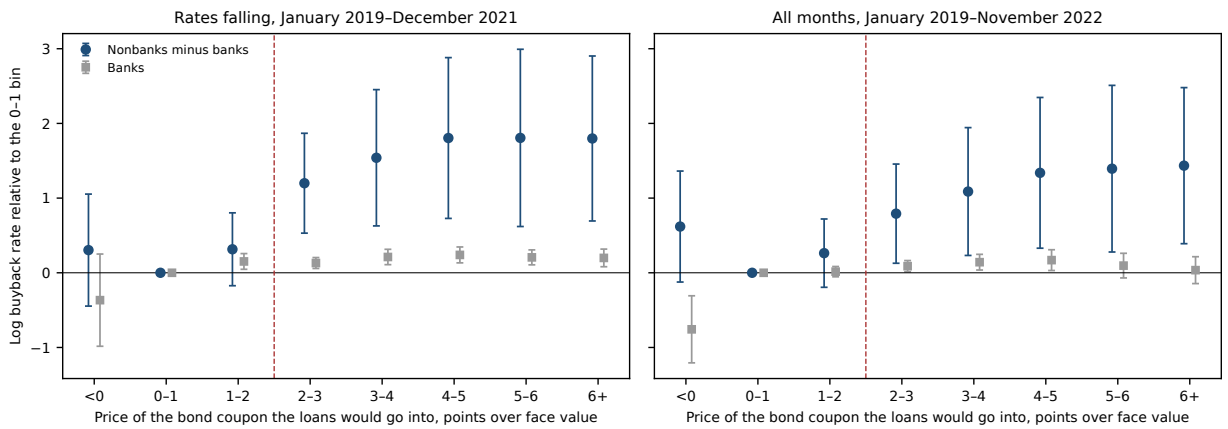


Figure 3: Log buyback rate by the TRACE price of the bond coupon a cohort's loans would be placed into, in one-point bins relative to the bin zero to one point over face value (par), within servicer-by-program-by-rate cohorts with servicer-by-month and program-by-month controls (one Poisson regression per panel, FHA and VA loans). Circles: nonbanks minus banks; squares: banks. Bars are 95% intervals, clustered by servicer. The dashed line marks a premium of two points.

bond, and a 4.25% loan can go into either. Because a loan can always be placed into a lower coupon, the highest coupon open to it is the one that pays most for it, and I measure each cohort's resale price there. The highest open coupon holds two adjacent quarter-point cohorts, and the next quarter point up begins a new coupon. Two cohorts a quarter point apart are alike in everything that moves with the loan rate, up to that quarter point: the relief rule treats them almost identically, their borrowers took their loans in the same months at nearly the same rates, and their incentive to refinance differs by a quarter point. But when the two sit on either side of a coupon boundary their resale prices differ by a half coupon, one to two points, and whether that difference puts them on opposite sides of the two-point premium changes from month to month with the level of bond prices. Over 2019–2021 the lower coupon was priced below the two-point premium and the upper coupon at or above it in 8% of boundary-pair months; in October 2016–March 2017, in 21%.

I compare, within pairs of adjacent cohorts of the same servicer, program and month, how much more the upper cohort is bought back in the months in which the pair straddles the premium than in the months in which it does not. Pair-by-month controls absorb everything the two cohorts share in a month, including the servicer's funding and policies and the level of bond prices; cohort controls absorb permanent differences between the two cohorts, including the larger share of round-rate loans in one of them; pairs of adjacent cohorts inside one coupon, whose prices never differ, are included and pin down the common effects; and an indicator for the months in which the relief rule's threshold falls between the two rates separates the rule. What remains is the movement of the deliverable coupon's price across

the step, within a pair, from one month to the next.

Table 7 reports the result. Over the 2019–2021 decline, in the months in which a boundary pair straddles the premium, nonbanks buy back the upper cohort relative to the lower at 2.7 times the rate they do in other months, relative to banks (0.99 log points, s.e. 0.31; bootstrap $p < 0.001$). The estimate is 0.96 (s.e. 0.34; $p = 0.004$) in January–July 2019, 1.06 (s.e. 0.42; $p = 0.05$) around the 2016 election and 0.72 (s.e. 0.26; $p = 0.005$) pooled over 2019–2022, and it is the same for FHA loans alone. Nonbanks on their own move by 1.01 (s.e. 0.31) over 2019–2021 and banks by 0.01 (s.e. 0.01); in 2019 banks move by -0.11 (s.e. 0.04). In the 2021–2022 rise the estimate is 0.14 (s.e. 0.18): only 9% of pair-months straddle the premium and nonbanks had largely stopped. Three further results follow. The size of the price difference matters little once its crossing of the premium is accounted for: per point of price difference, the nonbank-minus-bank estimate is -0.03 (s.e. 0.03) over 2019–2021 and -0.07 (s.e. 0.03) pooled (0.27, s.e. 0.14, in the 2019 window), so the response is a threshold, as Proposition 1 says, not a slope. The relief rule's threshold falling between the two rates moves nonbank buybacks of the upper cohort relative to banks' by 0.02 (s.e. 0.02) over 2019–2021 and 0.05 (s.e. 0.02) pooled, an order of magnitude less than the price. And when the premium is moved, the estimate falls away on both sides: defining the crossing at 101, 102, 103, 104 and 105 gives 0.63, 0.99, 0.43, 0.20 and -0.05 over 2019–2021 (Internet Appendix), which places the step within a point of the two-point premium read from Figure 3 and confirms that placement on a design that did not produce it.

Because the two cohorts are the same servicer's loans in the same month, this comparison cannot be produced by anything at the servicer level: a funding shock, a staffing change, a change in the servicer's rule for buybacks. Because the two cohorts' rates differ by a quarter point and the comparison is netted against pairs inside a coupon, a smooth function of the loan rate (the relief rule, the refinancing incentive, the value of the servicing right, or the characteristics of borrowers who took a given rate) does not produce it, a claim the placebo pairs below test directly. And because the price difference moves with the bond market, not with anything the servicer or the borrower does, the design identifies the effect of the resale price on the buyback decision.

Table 8 reports the checks a skeptic of this argument would ask for. The first is that the straddle indicator could be a narrow band of the rate gap, within which some function of the rate gap steep enough to matter (the value of recapturing a refinance, the value of the servicing right, the relief rule) favors the upper cohort. Pairs of cohorts inside a single coupon that sit in the same band in the same month face the same function of the rate gap but no price difference: for a within-coupon pair whose upper rate is the lower rate of a straddling boundary pair, the nonbank-minus-bank coefficient is 0.02 (s.e. 0.09) over

2019–2021, and for one whose lower rate is the upper rate of a straddling pair it is −0.06 (s.e. 0.04), while the boundary coefficient in the same regression is 0.99. The second concerns inference. Whether a pair straddles the premium depends only on its two coupons and the month, so the crossing varies across 25 coupon-pair-months, spread over five coupon pairs, rather than across servicers. Clustering by servicer and by month gives standard errors of 0.35 over 2019–2021 and 0.30 pooled; clustering by coupon pair and month gives 0.27, and by servicer and by coupon pair and month 0.35. A randomization test shifts each coupon pair's month-by-month straddle path by an independent random number of months, which keeps the length and persistence of every spell but moves it in calendar time, and re-estimates the coefficient: in 500 draws over 2019–2021 none is as large as the estimate, and the 95th percentile of their absolute values is 0.54. In the seven months of the 2019 window the shifts have little room and the test little power ($p = 0.12$). The third concerns rounding: 43% of loan-months carry rates off the quarter-point grid and are rounded for cohorts, which can place a loan in a coupon it cannot enter; on loans whose rate sits on the grid the estimate is 0.96 (s.e. 0.35) in January–July 2019, 1.14 (s.e. 0.32; bootstrap $p < 0.001$) over 2019–2021 and 0.85 (s.e. 0.28) over 2019–2022. A related question is whether loans actually sit in the highest coupon open to them. Joining 1.7 million loans removed from Ginnie Mae bonds in 2018–2022 to their bonds' coupons, loans at a quarter or three-quarters, which could go into either of two coupons, sit in the higher one 84 and 83 percent of the time; among bought-back loans later re-pooled at their original rate the shares are 91 and 88 percent (Internet Appendix Section IA.19). The upper cohort of a boundary pair is therefore priced at the coupon its loans would be resold into about nine times in ten, and the estimates understate by about an eighth the response of loans that would be resold there. The fourth concerns the payment-pause months: excluding March 2020 to June 2021 gives 0.93 (s.e. 0.28; bootstrap $p = 0.002$). By program the estimate is 1.07 for FHA loans and 0.40 for VA loans over 2019–2021, in line with Section 7.

Out of sample. The design was built on 2019–2022 and checked on October 2016–March 2017. On 18 October 2026 I wrote down a test on the months it had not used, before estimating anything on them: the same specification, the same two-point premium and the same controls, on the 2014–2018 delinquency panel with a coupon price index built from TRACE for 2014–2018 exactly as for 2016–2017 (it reproduces the 2016–2017 index to the cent). Table 9 reports the results. On the months of 2014–2018 outside the window already used, the nonbank-minus-bank estimate is 1.36 (s.e. 0.30 clustered by servicer, 0.20 by coupon pair and month, 0.31 two-way; bootstrap $p = 0.006$), and none of 500 random shifts of the straddle months comes close (the 95th percentile of their absolute values is 0.94). Nonbanks alone move by 1.20 (s.e. 0.29) and banks by −0.16 (s.e. 0.07); the relief rule's

threshold between the two rates adds nothing (0.00, s.e. 0.13). The test rests on 42 straddling coupon-pair-months, across six coupon pairs, and 279 servicers.

Timing is less sharp than the cross-section. The panel's unit is a loan at risk in a month, and the buyback is recorded in the following month's record. Entered alone, the straddle in the month in which the buyback is recorded gives 1.26 (s.e. 0.39) over 2019–2021. Entered together with the straddle in the two months before it and in the month after, the coefficients spread across the four months (0.35, 0.30, 0.66 and 0.37, in calendar order; Table 8, Panel C). Prices are persistent, and a reseller cares about the price at which it will resell, months after the buyback, so a response that is not confined to one month is what a forward-looking reseller would show; it does not separate that reseller from one that responds with a lag. A servicer's own buybacks cannot move the price of a coupon traded in a market of this size, so the loading on the following month is not a reverse effect.

Where the induced buybacks come from. Applied to the other outcomes in the following month's record, the same comparison shows that the price adds buybacks without drawing loans away from cures inside the bond in the following month (Internet Appendix). Over 2019–2021, when a pair straddles the premium, the nonbank upper cohort's cures inside the bond (0.16, s.e. 0.13) and removals for other relief (-0.01, s.e. 0.05) do not change, its foreclosure removals fall (-0.16, s.e. 0.06, on a base of 0.3% a month), and the share still delinquent falls slightly (-0.02, s.e. 0.02); around the 2016 election the nonbank share still delinquent falls by 0.03 (s.e. 0.01; the Internet Appendix reports the nonbank-minus-bank difference, -0.05). In levels, nonbanks buy back the upper cohort of a straddling pair at 3.6% a month against 1.6% for the lower, while in other months they buy back the two at about 5% alike. At banks, whose buyback rates are near a third a month, the gap between the two cohorts is about the same whether or not the pair straddles (5.3 and 6.1 percentage points, from unrounded rates), so their small response in logs is not a ceiling effect of high buyback rates.

6.5 Two events that moved the exit

Two dated Ginnie Mae rules changed what a reseller could do with a bought-back loan, left a holder untouched, and apply to an identifiable set of loans within the same months. The background is the Federal Reserve's bond buying of spring 2020, which pushed every Ginnie Mae coupon well above face value (Fuster et al., 2021) and made it profitable to buy a paused loan back at face value and resell it at once. APM 20-07 (June 29, 2020) barred loans bought back while in a payment pause from standard bonds issued from July 1, 2020. The re-performing bond type (February 1, 2021) reopened an exit for such loans, with a

Table 7: Adjacent loan rates in the same servicer and month: buybacks of the upper cohort when the pair straddles the two-point premium

	Nonbanks minus banks		Nonbanks	Banks	Per point of price	Rule threshold	Share of pair-months	
	FHA and VA	FHA	alone	alone	difference, NB − B	between the rates, NB − B	straddling	Servicers
Jan–Jul 2019	0.96 (0.34)	1.00 (0.36)	0.85 (0.34)	−0.11 (0.04)	0.27 (0.14)	0.15 (0.09)	0.19	84
bootstrap p	0.004							
Rates falling, 2019–2021	0.99 (0.31)	1.07 (0.34)	1.01 (0.31)	0.01 (0.01)	−0.03 (0.03)	0.02 (0.02)	0.08	107
bootstrap p	< 0.001							
Rates rising, 2021–2022	0.14 (0.18)	0.15 (0.22)	0.23 (0.16)	0.09 (0.08)	0.01 (0.07)	0.02 (0.10)	0.09	102
bootstrap p	0.49							
Pooled 2019–2022	0.72 (0.26)	0.81 (0.29)	0.75 (0.26)	0.03 (0.02)	−0.07 (0.03)	0.05 (0.02)	0.09	109
bootstrap p	0.005							
Oct 2016–Mar 2017	1.06 (0.42)	1.07 (0.44)	1.16 (0.43)	0.09 (0.03)	0.03 (0.07)	0.15 (0.11)	0.21	126
bootstrap p	0.05							

Poisson regressions of buybacks on cell counts with log loan-months as offset, on pairs of adjacent quarter-point cohorts of the same servicer, program and month: boundary pairs (the two cohorts go into different coupons) and within-coupon pairs (the same coupon). Controls: pair-by-month and cohort-within-pair. Regressor: upper cohort × pair straddles the premium (lower coupon priced below 102, upper at or above), and its nonbank interaction; plus upper cohort × rule threshold (survey rate +0.25) between the two rates, and its nonbank interaction. "Per point": upper cohort × price difference between the two coupons, in points, with the straddle indicator also included; the column reports the nonbank interaction. Standard errors clustered by servicer; bootstrap p from the null-imposed wild cluster score bootstrap (Kline and Santos, 2012; 9,999 draws). Share straddling: share of boundary-pair months in which the pair straddles the premium.

seasoning requirement. Loans in a payment pause are flagged in the public file from May 2020. The resale channel predicts that, relative to delinquent loans not in a pause, nonbank buybacks of paused loans fall when the exit closes and rise when it reopens, and that bank buybacks do neither. A relief rule cannot produce this contrast: the pandemic routing and the modification options of July 8, 2020 (Mortgagee Letter 2020-22) applied to paused borrowers at both kinds of servicer alike, and the comparison across the two types nets out what they share.

Table 10 reports the three-way comparison (paused × after the rule × nonbank) with servicer-by-month, program-by-month, cohort-by-pause and delinquency-by-pause-by-month controls, and the paused × after-the-rule difference within each type. Both events have the sign the resale channel predicts, and the reopening is the better estimated. After APM 20-07, nonbank buybacks of paused loans fell relative to banks' by 0.37 log points (s.e. 0.61; FHA 0.34, s.e. 0.64). Banks raised buybacks of paused loans as the pandemic modification options arrived (0.13, s.e. 0.13); nonbanks did not (−0.02, s.e. 0.57). For VA loans alone both types raised buybacks of paused loans after the bar (nonbanks 0.68, s.e. 0.25, on 3,526 events; banks 0.28, s.e. 0.12), which the resale channel does not predict; paused VA loans then needed a modification for any change in payment (Section 7), and the three-way difference is −0.21 (s.e. 0.34). After the re-performing bond type opened, nonbank buybacks of paused loans rose relative to banks' by 0.58 (s.e. 0.24; FHA 0.58, s.e. 0.24). Nonbanks rose by 0.63 (s.e. 0.26); banks moved by −0.08 (s.e. 0.09). With conventional clustered standard errors

Table 8: Adjacent loan rates: placebo pairs, inference, rounding and timing

	Jan–Jul 2019	Rates falling, 2019–2021	Pooled 2019–2022	Oct 2016–Mar 2017
A. Placebo pairs inside one coupon, same rate-gap band and month (nonbank minus bank)				
Boundary pair straddles the premium	0.96 (0.34)	0.99 (0.31)	0.72 (0.26)	1.06 (0.42)
Within-coupon pair, upper rate at the band's lower rate	0.06 (0.09)	0.02 (0.09)	0.04 (0.07)	−0.04 (0.16)
Within-coupon pair, lower rate at the band's upper rate	−0.05 (0.05)	−0.06 (0.04)	−0.03 (0.02)	−0.01 (0.08)
bootstrap p, the two placebo rows	0.54, 0.47	0.81, 0.16	0.65, 0.27	0.82, 0.87
B. Baseline estimate under alternatives (nonbank minus bank)				
Clustered by servicer and month	0.96 (0.45)	0.99 (0.35)	0.72 (0.30)	1.06 (0.55)
Clustered by coupon pair and month	0.96 (0.30)	0.99 (0.27)		
Clustered by servicer and by coupon pair and month	0.96 (0.39)	0.99 (0.35)		
randomization p, straddle months shifted by coupon pair	0.12	< 0.002		
Loans with rates on the quarter-point grid	0.96 (0.35)	1.14 (0.32)	0.85 (0.28)	
FHA loans	1.00 (0.36)	1.07 (0.34)	0.81 (0.29)	1.07 (0.44)
VA loans	0.61 (0.29)	0.40 (0.23)	0.28 (0.16)	1.12 (0.46)
Excluding March 2020–June 2021		0.93 (0.28)		
C. Timing: straddle in the month the buyback is recorded, the month after and the two months before (nonbank minus bank)				
Buyback month alone	1.23 (0.36)	1.26 (0.39)	0.72 (0.26)	0.38 (0.41)
Buyback month, with the month after	1.02 (0.40)	1.12 (0.38)	0.67 (0.26)	
month after	0.52 (0.25)	0.41 (0.14)	0.19 (0.10)	
Four months together: two months before	0.27 (0.22)	0.35 (0.15)	0.30 (0.12)	
month before	0.41 (0.31)	0.30 (0.26)	0.33 (0.15)	
buyback month	0.67 (0.32)	0.66 (0.33)	0.42 (0.21)	
month after	0.64 (0.26)	0.37 (0.14)	0.14 (0.10)	

Specification of Table 7: Poisson on adjacent-cohort pairs with pair-by-month and cohort-within-pair controls and the rule-threshold control; clustered by servicer unless stated. Panel A adds, for within-coupon pairs, the upper cohort interacted with an indicator that the adjacent boundary pair straddles the premium in that month, in the two possible positions. Panel B: "coupon pair and month" clusters on the lower coupon of the pair and the month, the level at which the straddle indicator varies; the randomization test shifts each coupon pair's sequence of straddle months circularly by an independent random number of months and re-estimates (500 draws over 2019–2021, 300 in 2019), p being the share of draws at least as large in absolute value; quarter-point-grid row: cells rebuilt from loans whose note rate is exactly on the quarter-point grid (57% of loan-months). Panel C: the straddle indicator dated by the month whose record shows the buyback (the at-risk month plus one), alone, with the following month, and with the two preceding months and the following month. In 2016–17 the window ends before the following-month index is available for every pair.

the reopening's three-way difference is significant at the 5% level in the pooled sample and for FHA loans. With about ninety servicer clusters, of which some fifty are nonbanks, a bootstrap over servicers is the more reliable guide, and it agrees: $p = 0.03$ for the pooled three-way difference, 0.03 for FHA and 0.01 for the nonbank response (Internet Appendix). The month-by-month path qualifies this. In an event study with January 2021 as the reference month, nonbank buybacks of paused loans were already near their January level in November 2020 (Internet Appendix), so part of what the reopening coefficient measures may have begun before the rule. I therefore treat the reopening as consistent with the resale channel, not as a separate test of it. The closure is not statistically significant, and the pause flag allows only one pre-event month for it besides the reference month.

Figure 4 traces the two events month by month in one regression. Nonbank buybacks of paused loans, relative to banks' and to other delinquent loans, fall by 0.5 to 0.7 log points in the two months after the resale bar (July −0.70, s.e. 0.53; August −0.54, s.e. 0.61), are back

Table 9: Adjacent loan rates out of sample: the frozen design on months it had not used

	2014–2018, months not used before	All of 2014–2018
Nonbank minus bank	1.36	1.38
s.e., clustered by servicer	(0.30)	(0.30)
s.e., by coupon pair and month	(0.20)	(0.19)
s.e., two-way	(0.31)	(0.32)
bootstrap p (servicer clusters)	0.006	0.003
randomization p (straddle months shifted)	< 0.002	< 0.002
Nonbanks alone	1.20 (0.29)	1.24 (0.29)
Banks alone	−0.16 (0.07)	−0.14 (0.06)
Rule threshold between the rates, NB − B	0.00 (0.13)	0.07 (0.10)
Straddling coupon-pair-months	42	48
Share of upper boundary cells straddling	0.19	0.19
Servicers	279	279
Buybacks in the stacked pairs	926,532	1,079,553

Specification of Table 7, FHA and VA loans, written down before estimation. Each cohort enters both a within-coupon and a boundary pair, so buybacks in the stacked pairs count most buybacks twice. "Months not used before": January 2014–December 2018 except October 2016–March 2017. Price index for 2014–2018: monthly median TRACE price of Ginnie Mae II specified pools by coupon, built as for 2016–2017. Randomization: each coupon pair's straddle months shifted circularly by an independent random number of months, 500 draws; bootstrap: null-imposed wild cluster score bootstrap over servicers, 4,999 draws. Script `66_boundary_1418.py`.

at the reference by September, and move around it through January 2021. From February 2021, once the re-performing bond type is open, they sit 0.6 to 0.7 above it (s.e. about 0.5). Three placebo dates on which no resale rule changed check the pattern. A false event in May 2021, after both rules, moves nothing (−0.04, s.e. 0.12). False events in October and November 2020, inside the closed-exit period, give 0.08 (s.e. 0.31) and 0.22 (s.e. 0.21), not distinguishable from zero.

6.6 An alternative at the same threshold: FHA's relief rule

FHA's relief rule switches where the price does, and this subsection shows that the nonbank response follows the price and not the rule. Since December 2013 (Mortgagee Letter 2013-32), a borrower at or below the Market Rate, at most a quarter point over the survey rate, may receive a stand-alone partial claim, which leaves the loan in the bond; a borrower above it who can be made affordable at the Market Rate receives a modification, which requires a buyback (Section 2). A nonbank that bought back loans only when the prescribed instrument requires ownership, and a bank that bought regardless, would therefore show the contrast of

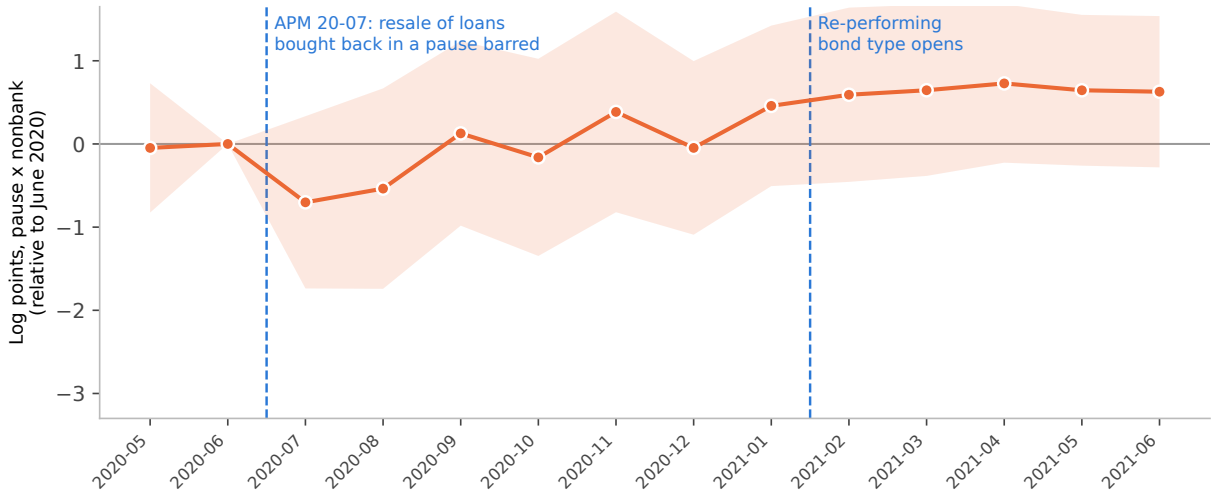


Figure 4: Nonbank buybacks of loans in a payment pause relative to other delinquent loans and to banks, by month, May 2020–June 2021 (reference June 2020). Coefficients on pause × nonbank × month from one Poisson regression with servicer-by-month, program-by-month, cohort-by-pause and delinquency-by-pause-by-month controls; the band is the 95% interval, clustered by servicer. Vertical lines mark APM 20-07 (resale of loans bought back in a pause barred from July 1, 2020) and the opening of the re-performing bond type (February 1, 2021).

Table 10: Two events that moved the reseller's exit: buybacks of loans in a payment pause relative to other delinquent loans

	Nonbanks (pause × post)	Banks (pause × post)	Three-way difference (pause × post × NB)
A. APM 20-07: resale of loans bought back in a pause barred from 1 July 2020 (window May 2020–Jan 2021; the pause flag is populated from May 2020)			
FHA and VA	−0.02 (0.57)	0.13 (0.13)	−0.37 (0.61)
FHA	−0.07 (0.58)	0.09 (0.13)	−0.34 (0.64)
VA	0.68 (0.25)	0.28 (0.12)	−0.21 (0.34)
B. Re-performing bond type opens 1 February 2021 (window Aug 2020–Jul 2021)			
FHA and VA	0.63 (0.26)	−0.08 (0.09)	0.58 (0.24)
FHA	0.63 (0.27)	−0.09 (0.07)	0.58 (0.24)
VA	0.52 (0.26)	−0.07 (0.17)	0.58 (0.39)

Poisson on cells of servicer × month × program × loan rate × months behind × pause status, with exposure. Type-specific columns: servicer-by-month, program-by-month, cohort-by-pause and delinquency-by-month controls. Three-way difference: servicer-by-month, program-by-month, cohort-by-pause and delinquency-by-pause-by-month controls. Clustered by servicer. NB = nonbank servicer. Buybacks: A 495,695 (FHA 434,882; VA 60,813); B 447,223 (FHA 401,373; VA 45,850).

Tables 5 and 6 with no reference to resale value. Program-by-month controls cannot absorb a rule that varies across loans by rate.

The Internet Appendix reports four tests that do not settle the question. In cohorts half a point or more above the survey rate, where the rule's rate condition fails for every loan, the premium moves nonbank buybacks slightly less than banks' (difference −0.08 per price point, s.e. 0.04, 2019–2022), and VA cohorts, which had no rate-based rule, show a nonbank price response less than half the FHA one (0.26, s.e. 0.12, against 0.59, s.e. 0.16, in the 2019 window); but a reseller's buybacks saturate above its threshold and Proposition 2 predicts a weaker VA response, so both channels predict both results. The nonbank response to the rate gap is stronger after the rule became mandatory (2.59, s.e. 0.42, in 2017–2018 against an imprecise −0.03, s.e. 0.43, in 2014–2016), as the rule predicts, though the earlier period has little variation below the threshold; and in October 2016–March 2017 nonbanks' response to the premium above the threshold, where the rule gives them no reason to respond, has the sign price predicts but no precision (0.13, s.e. 0.14).

The structure of the bond market gives a sharper test. The rule depends only on the rate gap, the loan's rate less the survey rate. The resale value depends on the TRACE price of the coupon the loan is placed into, and coupons come in half-point steps: loans at 3.75 and 4.00 percent both go into a 3.5 percent bond, while a loan at 3.50 percent goes into a 3.0 percent bond. Because the survey rate moves continuously, the same rate gap falls into different coupons in different months, and two loan rates in the same coupon share a price but can sit on opposite sides of the Market Rate. Table 11 uses both features. Panel A adds a separate control for each eighth-of-a-point rate-gap bin, by servicer type and program, to the specification of Table 6. These absorb the rule, wherever its threshold sits, together with any other function of the rate gap that differs between nonbanks and banks; the price coefficient is then identified only from the month-to-month reassignment of rate gaps to coupons. Panel B adds servicer-by-month-by-program-by-coupon controls, which absorb the resale price completely, and tests whether, within a coupon, nonbanks buy back the loan rate above the Market Rate more often than the one below it, controlling for its position in the coupon.

Table 11 separates the two. With every function of the rate gap absorbed by type, the nonbank response to the price threshold is 0.70 (s.e. 0.16; bootstrap $p = 0.013$) in the January–July 2019 window, 0.46 (s.e. 0.17; $p = 0.003$) over the 2019–2021 decline, 0.26 (s.e. 0.11; $p = 0.04$) in the pooled 2019–2022 sample and 2.42 (s.e. 0.85; $p = 0.03$) around the 2016 election, for FHA loans. Allowing the rate-gap controls to differ by year leaves 0.66 (s.e. 0.16; $p < 0.001$) over 2019–2021 and 0.35 (s.e. 0.08; $p = 0.002$) over 2019–2022 (Internet Appendix). With the price held fixed, the rule's threshold adds little at nonbanks: 0.11 (s.e.

0.05; bootstrap $p = 0.12$) in 2019, −0.04 (s.e. 0.03) over 2019–2021, −0.07 (s.e. 0.08) in 2021–2022 and −0.04 (s.e. 0.05) around the 2016 election. Placing the threshold at the survey rate itself, or an eighth or three-eighths above it, in the 2019, 2019–2021 and 2021–2022 windows gives nine further estimates, all within 0.15 of zero and none significant (bootstrap p from 0.17 to 0.84; Internet Appendix). During the 2021–2022 rise in rates the price coefficient is zero (0.07, s.e. 0.14): prices then fell well below the threshold for most cohorts, both types stopped buying, and little variation remained near the threshold. The coarser horse race in the Internet Appendix, which enters a price kink and a rate-gap step or kink side by side, gives the same sign in the episodes in which rates fell or rose after 2016, with less precision when the two kinks are entered together, but in the pooled 2019–2022 sample, and so in 2021–2022, it attributes the nonbank response to the rate-gap kink. That attribution reflects the collinearity of the two kinks in that period: once the rate gap is absorbed flexibly, the rule's threshold has no effect there either.

Table 11: Separating resale value from FHA's relief rule

	Jan–Jul 2019	Fall 2019–21	Rise 2021–22	2019–22	Oct 2016–Mar 2017
A. Price kink at +3 × nonbank, with rate-gap bin × type × program controls					
FHA	0.70 (0.16)	0.46 (0.17)	0.07 (0.14)	0.26 (0.11)	2.42 (0.85)
bootstrap p	0.013	0.003	0.59	0.04	0.03
FHA and VA	0.66 (0.14)	0.40 (0.17)	0.03 (0.13)	0.18 (0.10)	1.54 (0.92)
bootstrap p	0.01	0.006	0.82	0.11	0.18
B. Rule threshold (loan rate > survey rate +0.25) × nonbank, with servicer × month × program × coupon controls					
FHA	0.11 (0.05)	−0.04 (0.03)	−0.07 (0.08)	−0.04 (0.02)	−0.04 (0.05)
bootstrap p	0.12	0.16	0.46	0.18	0.41
FHA and VA	0.10 (0.04)	−0.05 (0.02)	−0.07 (0.07)	−0.04 (0.02)	−0.04 (0.05)
bootstrap p	0.10	0.10	0.40	0.13	0.40
Servicers (FHA)	82	103	97	105	119

Poisson regressions of buybacks on cell counts with log loan-months as offset; standard errors clustered by servicer. Panel A: servicer-by-month, program-by-month and cohort (servicer × program × loan rate) controls, plus controls for rate-gap bins of 0.125 points interacted with servicer type and program. Panel B: servicer × month × program × coupon controls and cohort controls; the regression also includes an indicator for the upper loan rate within the coupon and its nonbank interaction. Bootstrap p: null-imposed wild cluster score bootstrap over servicers, Rademacher weights, 9,999 draws.

I therefore read the threshold as resale value. The 2016 tightening of the rule, after which the nonbank response to the rate gap grew, remains consistent with both, since the rate gap moves the resale price as well. The borrower's affordability test, which also decides the route and is not in the public file, cannot generate a response that is absent within a coupon and present across coupons at the same rate gap.

6.7 Robustness and threats

Two checks apply to all of the main estimates. Inference: the cohort designs cluster by servicer, and the number of clusters is modest (67 to 102, with 29 to 67 in the single-type regressions). A bootstrap over servicers gives $p = 0.004$ for the nonbank-minus-bank price response in the January–July 2019 window, 0.05 around the 2016 election and 0.03 over the 2019–2021 rate decline; the bank responses, small but positive, have p of 0.04, 0.03 and 0.05. Specification choice: a specification curve over the threshold (two, three or four points, or linear), the window, the controls and the program gives 162 estimates (Internet Appendix). In the rate episodes 88 of the 90 threshold specifications give a positive nonbank-minus-bank difference, 64 of them significant at the 5% level, and every 2019 specification is significant; the linear premium is weaker (26 of 30 positive, 12 significant), and the pooled 2019–2022 sample gives zero throughout for the kink (12 of 24 positive, median 0.00), as Table 12 also shows, though not for the step of Figure 3. The reopening event gives a positive three-way difference in all 18 of its specifications, 13 of them significant at the 5% level.

Table 12 reports the 2019–2022 rate-gap regression under alternatives. The bank slope survives delinquency-by-pause-by-month controls, exclusion of the March–June 2020 freeze, and restriction to either program; the nonbank differential is absent for VA loans, for the reason Section 7 gives. The nonbank differential is positive and large while rates fell and negative while they rose, over a bank slope that is larger in the rise. That is the one-sided pattern: holders respond little to a modest discount and strongly to a deep one. Dropping any one of the twenty largest servicers keeps the differential between -0.14 and 0.38. Three threats remain. Servicing transfers move loans between servicers and so between cohorts; a transferred loan is counted under its new servicer, and a transfer that selects on the loan's position relative to the survey rate would bias the comparison. I have not measured the direction of transfers in this panel. A nonbank-specific change in the cost of advancing that correlates with the cohort's position relative to the survey rate would mimic the result; advancing cost scales with the loan's rate, which the cohort controls absorb, not with its difference from the market rate. And the one-sidedness is inferred from episodes and from the bins rather than tested as a single parametric function. The price bins of Figure 3 are the closest the data come: banks are nearly flat from one point over face value upward and lower below it, but loan-months below face value are concentrated in 2022 and too few elsewhere to trace a bank response to a deep discount within an episode.

What was specified in advance. Five of the tests reported were written down before they were estimated: the boundary design on the months of 2014–2018 it had not used (Table 9); its borrower outcomes on 2014–2018 entries (Table 17); the 2019 borrower holdout (Section 8.3); the deposit-beta test (Section 6.8); and the windows of the two resale-rule

Table 12: Within-cohort rate-gap slope, 2019–2022: robustness

	Banks	Nonbanks, additional
Baseline	0.89 (0.16)	0.17 (0.38)
+ months-behind × pause × month controls	0.76 (0.11)	0.14 (0.32)
Without March–June 2020	0.93 (0.18)	0.16 (0.39)
FHA loans only	0.89 (0.19)	0.53 (0.44)
VA loans only	0.68 (0.13)	−0.68 (0.41)
Rates falling, 2019–2021	0.48 (0.25)	2.24 (0.87)
Rates rising, 2021–2022	1.20 (0.19)	−0.54 (0.36)
Below-survey-rate indicator instead of depth	−0.10 (0.05)	−0.60 (0.22)

events (Section 6.5). The location of the price step was read from the price bins, and the coupon-boundary design was added after it; the threshold sweep and the placebo pairs of Table 8 test that location on a comparison that did not produce it. Appendix A summarizes the history and the Internet Appendix gives it in full.

Carry. A reseller pays interest on its line until it resells, so its threshold contains a carry term (Section 3). Adding to the rate-gap cohort regression the cohort's depth below a carry threshold, the federal funds rate plus 2.85 points, gives a nonbank carry coefficient of 0.62 (s.e. 0.22) over 2019–2022 and 0.52 (s.e. 0.21) over the 2019–2021 decline, and none for banks (−0.06, s.e. 0.04). The carry and rate-gap depths are correlated 0.80 across cells and the nonbank carry coefficient turns negative in the 2021–2022 rise (−1.68, s.e. 0.43), so the carry term is not separately identified; it is consistent with the carry component of the reseller's threshold (Internet Appendix).

Alternative explanations. Table 13 collects the explanations other than resale value that a reader may propose for the nonbank–bank contrast, the prediction on which each differs from the framework, and the evidence that bears on it. Each is addressed by a result reported in this paper; the last is not excluded.

Designs that found no effect. About thirty designs for a direct effect of the servicer's funding on buybacks, including the April 2020 cap on advances, lender exposures and contract-dated credit facilities, do not separate funding from the business model it finances; and bond trades show no evidence that investors price a bond's exposure to its servicers' buyback intensity (Internet Appendix).

6.8 What moves holders: the deposit beta

The model's second implication concerns banks alone: among them, the response to the resale price should rise with the deposit beta. For each bank matched to an FDIC certificate

I estimate the beta as the slope of the quarterly change in its deposit cost (interest expense on deposits over deposits, annualized) on the quarterly change in the effective federal funds rate over 2018Q4–2022Q4, a window that contains one easing and one tightening. Thirty-two banks have at least ten quarters; the median beta is 0.20 (interquartile range 0.16 to 0.26), below the all-deposit average of about a third in Drechsler, Savov and Schnabl (2017), as expected for a window in which most of the rise in rates came in its last three quarters. The prediction, the definition of the beta and the specification were written down before the estimates were run (Appendix A). Table 14 reports the two-point step of Table 6 on bank cells alone, interacted with an indicator for an above-median beta. While rates fell in 2019–2021 the two groups respond alike (0.22 and 0.22, s.e. 0.12). In the 2021–2022 rise, high-beta banks' buybacks fall by 0.94 log points at the threshold (s.e. 0.29) and low-beta banks' do not move (0.01, s.e. 0.07); the difference is 0.92 (s.e. 0.29) with a bootstrap p-value of 0.10 over 31 banks, and 0.93 (s.e. 0.28; $p = 0.09$) with an interaction of the step with log assets added. Pooled over 2019–2022 the difference is 0.23 (s.e. 0.14; $p = 0.22$), or 0.33 (s.e. 0.11; $p = 0.05$) with the size interaction, which itself takes a negative sign. The 2022 bank response of Section 6.3 is therefore the response of banks whose funding cost had risen with the policy rate, as $\partial V_H/\partial r = -D\beta$ says it should be, and it is absent when funding costs did not move. Two limits apply. Betas estimated over seventeen quarters are noisy, so the split-sample estimates are the ones to read, and with about thirty banks the bootstrap has little power. And the result rests on the largest banks; the high-beta group holds 89% of bank buybacks: dropping the largest leaves the 2021–2022 difference at 1.08 (s.e. 0.53), and dropping the three largest leaves 0.10 (s.e. 0.13) in the rise, on 39,000 buybacks, and −0.16 (s.e. 0.10) in the pooled sample: without the three largest banks there is no difference to find. It is a statement about where the bank response lives, not an independent test with many clusters.

6.9 The 2020 exception

In the spring of 2020 the survey rate fell and almost every delinquent loan became resellable at a premium, yet nonbank buybacks fell while bank buybacks rose. On the loan-month panel, with servicer and program-by-month controls, nonbank buybacks fell to a quarter of their earlier level relative to banks' (log ratio −1.40, s.e. 0.32). A fixed threshold cannot produce this. A threshold that rises with the shadow cost of a reseller's capital (Proposition 3) can: the payment-pause wave raised the advances nonbanks had to fund at the same time as lenders tightened terms on delinquent collateral, the strain Kim et al. (2018) anticipated. I do not test that explanation here. The main estimates include the payment-pause months; excluding

March 2020 to June 2021 leaves the boundary estimate at 0.93 (Table 8). Bandyopadhyay (2026) studies the episode.

7 Why VA loans

7.1 The borrowers: descriptive context

Table 15 compares VA and FHA borrowers inside one servicer's book of loans acquired after buyback; the servicer, the period and the investor are the same, and only the program differs. VA borrowers are more often current and show fewer hardship indicators on every measure. This is a selected population, loans that were bought back, sold and acquired, observed under a subsequent servicer, and lower hardship-flag incidence can reflect contact rates and recording as well as hardship. It is context, not the set of loans a bank or nonbank faced at the buyback decision, and it cannot exclude private information at the original servicer. The evidence that observable borrower quality does not account for the VA gap comes from the public data in the next subsection.

7.2 The buybacks

In the public data, within servicer and month and within cells defined by months behind, pause status, credit-score, loan-to-value and rate bins, and state, nonbanks buy back VA loans at a quarter of their FHA rate (log ratio -1.37, s.e. 0.18; 73 servicers, 4.2 million loan-months). With the same cells but without state, the specification on which the bank estimate converges, the figures are -1.28 (s.e. 0.18) for nonbanks and 0.05 (s.e. 0.04) for banks (36 servicers). The gap at nonbanks widened over time: within servicer-month the VA-to-FHA ratio was 0.40 from January 2019 to February 2020, 0.11 in the March–June 2020 freeze and 0.15 in the year after. At banks it was 1.00, 1.08 and 1.04. In a three-way comparison against banks, relative to January 2019–February 2020, the freeze coefficient is -1.74 (s.e. 0.43; bootstrap $p = 0.01$) and the post-freeze coefficient -1.33 (s.e. 0.37; $p < 0.001$).

The resale channel explains the pattern. Adding a VA interaction to the rate-gap cohort design, in the January–July 2019 window nonbanks' response to an FHA cohort moving across the survey rate is 2.56 (s.e. 0.66). Their response to a VA cohort is 2.56 less 1.58 (s.e. 0.49), about 1.0, less than half the FHA response. Over 2019–2022 the VA interaction is -1.36 (s.e. 0.44). Banks respond to the two programs alike (VA interaction 0.01, s.e. 0.14, over 2019–2022). A VA loan that cannot be resold near face value when its rate is at the market rate is worth less to a reseller at every rate. That is Proposition 2: the whole-loan market prices the VA credit tail above its expected loss, and the holder, which bears the loss in any

case, is unaffected. The relief-rule alternative of Section 6.6 predicts no VA response at all, since VA borrowers had no rate-based rule and, before 2020, no cure short of a modification; a VA response of about 1.0 is therefore evidence for price rather than the rule. Nor does the alternative predict the level gap: a servicer that buys when relief requires ownership should have bought back VA loans, which then required it at every rate, more often, not at a quarter of the FHA rate. The gap is consistent with the guaranty, with a limit. Within VA loans, the statutory guaranty share is higher on balances up to $144,000. The nonbank gap is smaller on those loans but not significantly so (0.20, s.e. 0.13), and it is no smaller on loans with a loan-to-value of 90% or less (−0.10, s.e. 0.15). The gap therefore tracks the program more than the degree of coverage within it.

Over 2014–2018 as a whole nonbanks responded to VA and FHA cohorts alike (VA interaction −0.15, s.e. 0.51; in the 2016–17 window −0.36, s.e. 0.60), although the half-year estimates below show the gap opening during 2018. The change lies in the resale market for VA loans, not in the guaranty. The VA's net-value cost factor, which sets when it declines a foreclosed property, was 15.95% from December 2015 through 2020. The VA issued no servicing, claim or modification rule between 2018 and mid-2020. The Blue Water Navy Act's removal of loan limits applies only to loans closed from January 2020. The one dated change that is specific to VA loans and to resellers is Ginnie Mae's seasoning rule for VA refinances (Table 1). It raised the cost and legal risk of returning a VA loan, most of which at a nonbank are streamline refinances, to a standard bond, and it touched no portfolio holder. The fit is imperfect: the rule begins in mid-2018, and APM 19-05 (August 2019) revised the seasoning requirements for VA refinances. A half-year event study of the VA interaction over 2018–2019 does not locate a break at any of these dates. Nonbanks' VA response is already weaker than their FHA response in the first half of 2018 (−0.62, s.e. 0.37), moves by −0.02 (s.e. 0.47) in the first half of 2019, and is imprecise in the second half of 2019 (a change of 0.71, s.e. 1.03), when only 26% of VA loans sat below the survey rate. The VA-specific insensitivity is clearest from 2019 onward and sharpest in 2020–2022. I treat the onset as undated and the level of the gap as the product of two structural features: a guaranty capped at a quarter of the balance and, until July 2021, no VA partial claim.

8 What happens to the borrowers

8.1 At the coupon boundary

A buyback is a change of owner, not relief. What matters for borrowers is what would have become of the loans that the price brings onto a reseller's balance sheet, and the coupon-

boundary design answers that question. I follow every FHA and VA loan from the month in which it becomes seriously delinquent, that is, its first month at risk of a buyback in a spell of delinquency, from February 2019, and record where it stands six, twelve and eighteen months later: bought back; removed from its bond for other relief, paid off or foreclosed; or still in the bond, either seriously delinquent or caught up. Loans are grouped into cohorts by servicer, program, quarter-point rate and month of entry, and the comparison of Section 6.4 is run on the share of each cohort in each status, weighted by entries, with the straddle measured in the month of entry. Bought-back loans leave the public file; a bought-back loan that reappears in a new bond is found through the destination match of Section 5.2, which links about one buyback in seven to a later bond, so that outcome is a lower bound. Dividing the effect on each status by the effect on buybacks gives what the induced buybacks would otherwise have become: a two-stage least squares estimate with the straddle as the instrument, valid if the straddle changes a borrower's outcome only through the buyback. Within a pair and month the two cohorts face the same relief rules and, up to a quarter point, the same refinancing incentive, and the rule-threshold control is kept.

Table 16 reports the results for nonbanks over 2019–2021. In the months in which a boundary pair straddles the premium, the upper cohort of nonbank loans is bought back within eighteen months 9.9 percentage points more often (s.e. 3.9), on a base of 42%. Eighteen months after entry, its share still seriously delinquent in the bond is 3.8 points lower (s.e. 1.4), on a base of 10.7%; its share foreclosed is 0.7 points lower (s.e. 0.3; the base is low because foreclosures stopped in March 2020, and for the 2019 entries, among which most straddles fall, the eighteen-month rate was about 2%); its share paid off while in the bond is 1.6 points lower (s.e. 0.5); and its share found back in a new bond after a buyback is 0.9 points higher (s.e. 0.4). Over the eighteen months the loan spends 0.7 fewer months seriously delinquent in the bond (s.e. 0.4). The first stage is not strong, with a two-way cluster-robust F of 6.5, so I read the ratios through Anderson–Rubin sets, which remain valid with a weak instrument. Of every ten buybacks the price induces, about four would otherwise still have been seriously delinquent in the bond eighteen months on, where the loan cannot be modified (0.39; set 0.23 to 0.81); about two would have caught up in the bond (0.18) and two would have been removed for other relief (0.20), neither distinguishable from zero on its own; one and a half would have been paid off while in the bond (0.16; 0.07 to 0.54); and almost one would have been foreclosed (0.07; 0.01 to 0.22). Nearly one is known to be back in a new bond within eighteen months (0.09; 0.03 to 0.22), a lower bound, and a third of those with a modification. Without the buyback the loan would have spent 7.4 more of the eighteen months seriously delinquent in the bond (set 0.3 to 9.2). Clustering by coupon pair and month alone gives a first-stage F of 52 and narrower sets, and clustering by servicer alone an F of 5.4 and similar

ones (Internet Appendix). The nonbank-minus-bank estimates are the same for the statuses in the bond, payoffs and foreclosure. In the January–July 2019 entries alone the nonbank first stage is too weak for informative sets; net of banks they give 0.33 still seriously delinquent per induced buyback at eighteen months, with a set, clustered by servicer, that excludes zero (0.04 to 0.99), and 0.09 foreclosed (Internet Appendix). Because entries from 2019 onward reach eighteen months during the 2020–2021 payment pauses, Section 8.2 repeats the analysis on entries from 2014 to 2018, all observed before the pandemic.

The split differs by horizon. Six months after entry, the induced buybacks come from loans that would otherwise have been seriously delinquent (0.43) or caught up (0.34) in the bond; at twelve months the larger group is loans that would have caught up (0.44); at eighteen months it is again loans still seriously delinquent (0.39). The eighteen-month status is the one closest to a final outcome.

Two conclusions follow, and Section 8.2 supports both before the pandemic. The loans the price brings onto resellers' balance sheets are not mainly loans that would have recovered anyway: the largest group would otherwise have stayed delinquent in a bond that bars modification, for seven to eleven more months, some would have been foreclosed, and only about one in five would have caught up in the bond on their own. And the price matters for borrowers at the margin where it binds: when the bond a loan would be resold into trades below the reseller's threshold, the borrower waits in the bond. The induced buybacks that can be traced to a new bond reappear more often as re-performing loans than as modified ones, so what the buyback brings the borrower is often an end to the delinquency through the servicer's loss mitigation rather than a change in the loan's terms. This is consistent with Ahsin (2026), who finds that earlier eligibility to buy a loan back lowers foreclosure and raises cures, because servicers pursue loss mitigation once they own the loan.

8.2 Before the pandemic: entries in 2014–2018

The same analysis on the 2014–2020 delinquency panel follows every loan that becomes seriously delinquent from February 2014 to December 2018 (to August 2018 for the eighteen-month status), so that every status is observed by February 2020; the coupon prices are those of Table 9. No destination match exists for buybacks before 2018, so re-pooling is not measured. The design and its outcomes were written down before estimation. Table 17 reports the results for nonbanks. The straddle raises the share bought back within eighteen months by 10.3 percentage points (s.e. 3.8; two-way F of 7.2), on a base of 32%. Of every ten buybacks it induces, two and a half would otherwise still have been seriously delinquent in the bond eighteen months on (0.25; set 0.08 to 0.49), four would have been removed for

other relief (0.39; 0.28 to 0.63), two would have caught up in the bond (0.19), and about one each would have been paid off or foreclosed (0.08 and 0.08, sets including zero). Without the buyback, the loan would have spent 10.6 more of the eighteen months seriously delinquent in the bond (set 9.4 to 13.8), against an average of 7.0 months per entry. Six months after entry, the straddle lowers the share still seriously delinquent in the bond by 7.4 points (s.e. 2.3). Excluding the October 2016–March 2017 window, or netting the same comparison at banks, gives similar estimates (Internet Appendix Section IA.23). Before the pandemic, then, the price-induced buybacks shortened a delinquency that would otherwise have continued inside the bond, and part of them replaced removals for other relief; the foreclosure effect seen in 2019–2021 is not distinguishable from zero.

8.3 Stocks of delinquent loans before the pandemic

A coarser comparison of 2016–2018, which does not use the coupon boundary, follows five stocks of seriously delinquent loans in 2016–2018 for eighteen months, so that every window ends before the pandemic (417,480 loans at 264 servicers), with the cohort design: a cohort's exposure is its average depth below the survey rate over the window. Relative to a bank cohort at the same depth, a nonbank cohort one point further below the survey rate is bought back 12.6 percentage points less (s.e. 4.8) and is 11.4 points more likely to be still in the bond and seriously delinquent at month eighteen (s.e. 3.7); foreclosure, and total relief counting a buyback as relief, do not differ significantly. The exposure measure was changed after seeing results from the start-date depth, which shows no difference except in removals for other relief, and in a 2019 holdout specified in advance a nonbank cohort one point further below the survey rate is bought back 9.1 points less within six months (s.e. 4.6). Because this design compares loans at different rates, it cannot separate the price from the relief rule, under which a loan below the survey rate is routed to a partial claim delivered inside the bond, and two-thirds of its delinquency differential comes from banks. The boundary design does not have these limits. Internet Appendix Sections IA.25 and IA.3 report the table, the horizons under both exposure measures, and the holdout.

9 Policy

Three implications follow. First, the instruments that address nonbanks' advance obligation do not address the buyback: Ginnie Mae's Pass-Through Assistance Program lends against advances and leaves the buyback decision where it was. A facility that financed buybacks, or that accepted bought-back delinquent loans as collateral with a small haircut, would move the

reseller's threshold directly. Whether the guarantor should want that is a separate question, since more buybacks transfer value from investors in premium bonds to servicers, as the 2020 episode showed, and sharpen the concern that servicers select which loans to buy. Second, relief that does not require ownership is the instrument whose supply does not depend on the servicer's exit. The FHA partial claim is such an instrument and has existed throughout, and the FHA rule's rate threshold, which allocates borrowers between it and a modification, coincides at nonbanks with the allocation of buybacks. The VA partial claim existed for fifteen months; a descriptive comparison of VA and FHA outcomes before and after its expiry is in the Internet Appendix. Third, the mix of servicers by business model determines how the supply of ownership-based relief moves with interest rates. When rates rise above the rates on the delinquent loans, as in 2022, the three-quarters of borrowers serviced by resellers lose the buyback route and the holders' share of the market sets the floor: from the second half of 2022 through 2023, 98% of nonbank seriously delinquent loan-months sat in cohorts whose bond traded below the premium. A guarantor that wants restructuring to be available across the rate cycle has to provide it through a channel that does not run through resale.

10 Conclusion

Changing the terms of a government-insured mortgage requires its servicer to own the loan. Most of these loans are serviced by nonbanks, which finance ownership with short-term credit and recover it by reselling the loan into a new bond. This paper shows that such servicers take ownership of delinquent loans far more readily when the bond they would resell into trades at a premium large enough to cover the cost of holding the loan until then, and that banks, which can hold the loans on deposits, do not make that calculation. The evidence comes from comparing loans of the same servicer in the same month whose rates differ by a quarter point but whose bonds fall on either side of that premium, and it holds in the earlier years the comparison was not built on. The loans brought onto resellers' balance sheets when the price clears the premium are in large part loans that would otherwise have stayed delinquent in a bond that bars modification, so the price decides when these borrowers can be offered new terms.

The availability of modification for most government-insured borrowers therefore rises and falls with mortgage-bond prices and with the guarantor's rules on when bought-back loans may be resold, and it contracts when interest rates rise. Rules and facilities that address the servicer's advances leave this margin unchanged; rules on ownership and resale move it. Relief that does not require the servicer to own the loan, such as a partial claim, is the instrument whose supply does not depend on the resale market.

A Specification history

Five of the tests reported were written down before they were estimated: the boundary design on the months of 2014–2018 it had not used (Table 9); its borrower outcomes on 2014–2018 entries (Table 17); the 2019 borrower holdout; the deposit-beta test; and the windows, reference months and placebo dates of the two resale-rule events. The boundary design and the price step were also run, as written down, on 2023–2025; that window of rising rates is not used, for the reason given in the introduction, and the Internet Appendix's specification history records the estimates. The rest was chosen with the data in view. A half-point rate-gap threshold and a price kink at face value, specified first, found nothing; the break at the survey rate was read from the shape regression and the two-point step from the price bins. The coupon-boundary design was added after every other estimate and uses the two-point premium; its threshold sweep and placebo pairs are reported so that the placement can be judged on a design that did not produce it. The borrower outcomes of the boundary design, the inference at the level of the coupon pair and month, and the tabulation of delivered coupons were added next, after independent reviews of the draft; the statuses and horizons were fixed before estimation and all are reported. The calibration with the institutional buyer's pricing cash flows and the description of its servicing records (Internet Appendix Section IA.16) were added after that, with the data in view; neither was written down in advance. The exposure measure for borrower outcomes was changed from the start-date to the window-average depth after the first version found nothing, and both are reported. The sample was revised once, to include buybacks in the first month of eligibility, which an audit found had been excluded; every estimate reported uses the revised sample. The bank crosswalk for the deposit-beta test was corrected after an audit, which raised the sample from 26 to 32 banks and moved the estimates; the corrected estimates are reported and the earlier ones are in the Internet Appendix. Internet Appendix Section IA.29 gives the full history with dates and the replication status of every estimate.

Table 13: Alternative explanations for the contrast and the evidence against each

Alternative	Where it differs from the framework	Evidence
FHA's relief rule routes borrowers by the rate gap	The response should follow the rate gap, not the bond price, and be absent for VA loans, which had no rule	Price response survives controls for every eighth of a point of rate gap by type (0.46–0.70 in the rate episodes); within a coupon the rule's threshold adds nothing (0.11 and below); between two adjacent loan rates the rule's threshold adds 0.02 where the price crossing adds 0.99; VA cohorts respond (Sections 6.6, 6.4, 7)
Nonbanks and banks serve different borrowers	Composition should drive the result across cohorts, not within them	All estimates compare the same servicer's cohorts in the same month; the boundary design compares cohorts a quarter point apart (Section 6.4); the VA gap holds within borrower cells (Section 7); the price-bin shape is within cohort
Nonbanks are short of cash in bad times	The response should appear with delinquency waves and funding shocks, not with prices in calm periods	The main episodes (2016–17, 2019) are outside any crisis; thirty funding designs find nothing outside 2020; 2020 is treated separately (Section 6.9)
Nonbanks' loans have worse cure prospects when rates fall	A fall in cure prospects shifts buybacks most where loans are most valuable	In the boundary design the upper cohort's cures inside the bond do not change when the pair straddles the premium (nonbanks 0.16, s.e. 0.13, 2019–2021), and within cohort cures do not respond to the rate gap (Internet Appendix)
Private information: servicers buy the loans they know will re-perform	Information valuable to a holder should move buybacks whether or not the loan can be resold; information valuable only on resale is part of resale value	Within servicer and month, buybacks of adjacent cohorts change only when the bond price crosses the premium (Table 7); the reopening of resale for paused loans, part of whose effect began before the rule, points the same way (Section 6.5)
Capital or accounting rules on banks	Regulation differs across banks, not across their cohorts, and does not move month to month with prices	Absorbed by servicer-by-month controls; the bank response that exists appears only when rates rose and is concentrated in high-beta banks; the two beta groups have similar median assets, and the interaction of the price step with bank size takes the opposite sign (Section 6.8)
Refinance incentive or servicing-right value tied to the rate gap	Would move buybacks with the rate gap, as the relief rule would	Absorbed by the rate-gap controls of Table 11; in the boundary design a quarter point of rate separates the cohorts while the price crossing separates the response (Sections 6.6, 6.4)
Servicing transfers reshuffle loans across servicers	Transfers that select on the rate gap would bias the within-cohort comparison	Not excluded; the direction of transfers is not measured in this panel and is listed as a remaining threat

Table 14: Banks' response to the resale price by deposit beta

Step: price two or more points over face value	Rates falling 2019–2021	Rates rising 2021–2022	Pooled 2019–2022
Low-beta banks alone	0.22 (0.12)	0.01 (0.07)	0.15 (0.10)
High-beta banks alone	0.22 (0.12)	0.94 (0.29)	0.39 (0.11)
Step × high beta	−0.02 (0.16)	0.92 (0.29)	0.23 (0.14)
bootstrap p	0.93	0.10	0.22
with step × log assets		0.93 (0.28)	0.33 (0.11)
bootstrap p		0.09	0.05
dropping the largest bank		1.08 (0.53)	0.35 (0.20)
dropping the three largest		0.10 (0.13)	−0.16 (0.10)
Banks (low / high beta)	16 / 16	16 / 15	16 / 16
Buybacks (low / high beta)	51,742 / 441,052	12,303 / 96,200	55,582 / 464,010

Bank cells only; Poisson on cell counts with log loan-months offset; servicer-by-month, program-by-month and cohort controls; clustered by servicer; null-imposed wild cluster score bootstrap for the interaction. Deposit beta: slope of the quarterly change in a bank's deposit cost on the quarterly change in the effective federal funds rate, 2018Q4–2022Q4, from FDIC call reports; high beta is above the median of 0.20. The two groups have median betas of 0.16 and 0.26; the beta is uncorrelated with log assets across banks (correlation −0.04) and the groups' median assets are similar ($40 billion and $44 billion), but high-beta banks account for 89% of bank buybacks, hence the size interaction and the leave-out rows.

Table 15: VA and FHA borrowers in one servicer's book

	FHA	VA
Loan-months current	34.1%	46.8%
Loan-months in foreclosure	17.4%	12.1%
Loan-months in bankruptcy	15.7%	10.2%
Income-curtailment indicator, per loan-month	6.5%	3.9%
Unemployment indicator	6.0%	3.8%
Illness of borrower (inbound call)	0.61%	0.18%
Inbound borrower contact	25.3%	19.6%
Credit score at origination	600	618
Consumer-data income index (100 = average)	95	114
Veteran in household	0.9%	6.7%
Loans	9,722	3,439

Contact indicators from the servicer's log, January 2018–September 2020 (98,276 FHA and 29,219 VA loan-months); income index and veteran status from consumer data matched by address. Aggregates only.

Table 16: What the price-induced buybacks would otherwise have been: status of the loan 6, 12 and 18 months after it becomes seriously delinquent

	Effect of the straddle (reduced form)			Per induced buyback, 18 months		Base,
	6 months	12 months	18 months	Estimate	AR 95% set	18 months[a]
Bought back (first stage)	9.6 (3.8)	8.3 (3.7)	9.9 (3.9)		$F = 6.5$	41.7
Still in the bond, seriously delinquent	−4.15 (1.74)	−0.82 (1.60)	−3.84 (1.38)	−0.39	[−0.81, −0.23]	10.7
Still in the bond, caught up	−3.25 (1.61)	−3.69 (1.08)	−1.79 (1.15)	−0.18	[−0.22, 0.21]	20.4
Removed for other relief	−1.15 (0.57)	−2.06 (0.96)	−2.03 (1.47)	−0.20	[−0.38, 0.28]	19.5
Paid off	−0.96 (0.43)	−1.25 (0.46)	−1.60 (0.51)	−0.16	[−0.54, −0.07]	7.3
Foreclosed	−0.09 (0.06)	−0.54 (0.16)	−0.68 (0.30)	−0.07	[−0.22, −0.01]	0.4
Bought back and found in a new bond (lower bound)	0.21 (0.11)	0.53 (0.31)	0.92 (0.38)	0.09	[0.03, 0.22]	3.2
of which modified	−0.04 (0.03)	0.11 (0.13)	0.29 (0.18)	0.03	[−0.02, 0.06]	1.4
Months seriously delinquent in the bond	−0.35 (0.16)	−0.51 (0.27)	−0.74 (0.37)	−7.4	[−9.2, −0.3]	7.6

Nonbank loans. Entries into serious delinquency (a loan's first month at risk of a buyback in a spell) from February 2019 to December 2021, to November 2021 for the twelve-month status and to May 2021 for the eighteen-month status, so that every status is observed by November 2022; cells are servicer × program × quarter-point rate × entry month, stacked into adjacent-cohort pairs as in Table 7, with pair-by-entry-month and cohort-within-pair controls and the rule-threshold control; weighted by entries; standard errors two-way clustered by servicer and by coupon pair and month, the level at which the straddle varies. Reduced form: coefficient on upper cohort × pair straddles the premium in the entry month, in percentage points of the share in each status at the horizon (in months for the last row: months, of the first eighteen, in which the loan is in its bond and seriously delinquent). Per induced buyback: two-stage least squares of the share in each status on the share bought back, instrumented by the straddle, so a value of −0.39 means that 39% of the induced buybacks would otherwise have been in that status (months: months that would otherwise have been spent seriously delinquent in the bond); the five statuses in the bond or removed and the buyback sum to one, so the first five estimates sum to −1. First-stage F: two-way cluster-robust, at eighteen months. AR 95% set: Anderson–Rubin confidence set, valid however weak the first stage. "Removed for other relief": removal reason 4. "Found in a new bond": bought back and matched to a loan in a bond issued by the horizon (Section 5.2); the match links about one buyback in seven to a later bond. About 1.6 million entries at 123 servicers; the nonbank estimates use the 87 nonbanks. [a]Percent; months in the last row. Internet Appendix Section IA.20 reports the nonbank-minus-bank estimates, the January–July 2019 entries, the sets at every horizon and the sets under other clusterings.

Table 17: Before the pandemic: what the price-induced buybacks would otherwise have been, entries in 2014–2018

	Effect of the straddle (reduced form)			Per induced buyback, 18 months		Base,
	6 months	12 months	18 months	Estimate	AR 95% set	18 months[a]
Bought back (first stage)	10.8 (3.9)	9.8 (3.6)	10.3 (3.8)		$F = 7.2$	31.9
Still in the bond, seriously delinquent	−7.36 (2.34)	−3.82 (1.33)	−2.58 (1.11)	−0.25	[−0.49, −0.08]	15.5
Still in the bond, caught up	−2.12 (0.93)	−2.50 (1.01)	−2.00 (1.15)	−0.19	[−0.31, 0.07]	20.9
Removed for other relief	−0.93 (0.53)	−2.71 (1.14)	−4.06 (1.43)	−0.39	[−0.63, −0.28]	18.7
Paid off	−0.35 (0.25)	−0.51 (0.37)	−0.85 (0.49)	−0.08	[−0.14, 0.03]	8.5
Foreclosed	−0.03 (0.08)	−0.20 (0.27)	−0.77 (0.47)	−0.08	[−0.19, 0.03]	4.3
Other removals	−0.01 (0.02)	−0.02 (0.02)	−0.02 (0.03)	0.00	[−0.01, 0.00]	0.2
Months seriously delinquent in the bond	−0.38 (0.15)	−0.74 (0.26)	−1.09 (0.38)	−10.6	[−13.8, −9.4]	7.0

Nonbank loans entering serious delinquency from February 2014 to December 2018 (to August 2018 for the eighteen-month status), from the 2014–2020 delinquency panel; at-risk and entry definitions, cells, stacking, controls and estimators as in Table 16; coupon prices as in Table 9. Standard errors two-way clustered by servicer and by coupon pair and month. "Other removals": removal reasons other than 1–4. About 1.9 million entries at 241 servicers. [a]Percent; months in the last row. Script `67_boundary_borrowers_1418.py`.

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Internet Appendix

to "Buy to Hold or Buy to Sell? Servicer Business Models, Guarantees, and Mortgage Relief"

Arka Bandyopadhyay

This appendix reports the robustness of the main estimates, the designs that found nothing, and construction details. Section, table and figure numbers cited without the prefix IA refer to the main text. All estimates from public data were produced with the code in the replication package. All are estimated on the risk set revised on 12 October 2026, in which a loan is at risk from the month before it is first reported three months delinquent; Section IA.29 gives the specification history and the replication status of each estimate. The appendix keeps the vocabulary of the estimation code: "depository" for the banks of the main text, "issuer" for servicer, "buyout" for buyback, "re-pooling" for resale into a new security, "forbearance" for payment pause, and "par" for face value.

IA.1 The cohort design: other outcomes and robustness

Table IA.1 reports the within-cohort rate-differential regression of Section 6.2 for the other removal outcomes. Loss-mitigation removals and cures inside the pool do not respond to a cohort's depth below the survey rate for either type; foreclosure removals move with a cohort's depth below the survey rate for depositories (0.21, s.e. 0.09). Leaving out any one of the twenty largest issuers keeps the nonbank differential for buyouts between −0.14 and 0.38.

Table IA.1: Within-cohort rate-differential slope by outcome, 2019–2022 (log ratio per point)

Outcome at $t+1$	Depositories	Nonbanks, additional
Buyout	0.89 (0.16)	0.17 (0.38)
Loss-mitigation removal	−0.15 (0.11)	0.18 (0.13)
Buyout or loss-mitigation removal	0.78 (0.14)	−0.63 (0.24)
Cure inside the pool	−0.15 (0.10)	0.11 (0.12)
Foreclosure removal	0.21 (0.09)	−0.10 (0.11)
Still seriously delinquent	−0.06 (0.10)	0.09 (0.11)

Issuer-by-month, program-by-month and issuer-by-program-by-note-rate effects; Poisson; clustered by issuer. A positive coefficient means the outcome falls as the cohort goes further below the survey rate.

IA.2 The VA gap: by period and within the VA program

All estimates in this section are on the revised risk set (scripts `15b_va_rerun.py` and `15c_va_rerun_fast.py`). Within issuer-month and borrower cells (months delinquent, forbearance, credit score, loan-to-value and note-rate bins, state, month), nonbanks buy out VA loans at 0.25 of their FHA rate over 2019–2022 (log ratio −1.37, s.e. 0.18; 73 issuers, 4.2 million loan-months). With borrower cells that omit state, on which the depository estimate converges, the gap is −1.28 (0.18) at nonbanks and 0.05 (0.04) at depositories (36 issuers, 1.2 million loan-months). At depositories the VA-to-FHA ratio is 1.00, 1.08 and 1.04 in the three periods below. By period, nonbanks' VA-to-FHA ratio was 0.40 (s.e. of the log 0.33) from January 2019 to February 2020, 0.11 (0.55) in March–June 2020 and 0.15 (0.29) from July 2020 to June 2021. Against depositories, the VA × nonbank coefficient is −1.74 (0.43; wild cluster bootstrap $p = 0.011$) in March–June 2020 and −1.33 (0.37; $p < 0.001$) from July 2020 to June 2021, relative to January 2019–February 2020, on issuer × month × program × note-rate cells with issuer-by-month, program-by-month and cohort effects (103 issuers). Within VA loans at nonbanks, the gap is 0.20 (0.13) smaller on balances up to $144,000, where the statutory guaranty share is higher, and −0.10 (0.15) on loans with an original loan-to-value of 90 or less; neither is significant. The quarterly event study, the leave-one-out and pairs-bootstrap checks, the USDA comparison and the dropped-depository variants reported in earlier drafts were estimated on the original risk set and are not reported.

IA.3 Borrower outcomes by horizon and exposure measure

Table IA.2 reports the cohort design of Section IA.25 at six, twelve and eighteen months, under the window-average exposure measure used there and the start-date measure specified first.

Table IA.2: Nonbank-minus-depository differential, percentage points per point further below the survey rate

	Start-date depth			Window-average depth		
Outcome	6 mo	12 mo	18 mo	6 mo	12 mo	18 mo
Bought out	5.2 (4.6)	4.1 (4.4)	4.4 (3.8)	0.8 (3.9)	−2.5 (4.8)	−12.6 (4.8)
Loss-mitigation removal	−6.5 (3.0)	−7.3 (3.4)	−7.1 (3.4)	−3.6 (3.0)	−3.1 (3.4)	0.8 (4.3)
Foreclosure removal	−0.5 (0.6)	−0.7 (0.8)	−0.8 (0.8)	−1.2 (0.8)	−1.9 (1.1)	−3.3 (2.1)
Still seriously delinquent	−0.8 (2.6)	4.0 (2.9)	3.4 (3.0)	3.0 (2.8)	7.0 (3.5)	11.4 (3.7)
Any relief	0.9 (3.2)	−1.6 (3.1)	−1.3 (2.8)	−1.5 (3.5)	−2.5 (3.9)	−5.3 (3.9)

Five stocks of seriously delinquent loans, January 2016–March 2018; cohort, issuer-by-stock and program-by-stock effects; loan-weighted; clustered by issuer. Signs follow Table IA.19 (change per point further below the survey rate). Holdout on the 2019 stocks at six months: bought out −9.1 (4.6), still delinquent 8.5 (7.2), foreclosure 0.3 (2.0), any relief −11.6 (6.7).

IA.4 Carry and line pricing

A reseller pays interest on its line until it resells, so its threshold contains a carry term (Section 3 of the main text). Treating the cost of a buyout line as the federal funds rate plus 2.85 points (within Ginnie Mae's September 2020 range of 2.50 to 3.50 points) and adding the cohort's depth below that carry threshold to the rate-gap cohort regression gives, for 2019–2022: depth below the survey rate 0.94 (0.16) for depositories and −0.31 (0.26) additional for nonbanks; depth below carry −0.06 (0.04) for depositories and 0.62 (0.22) additional for nonbanks. With the spread at 2.35 or 3.35 points the nonbank carry term is 0.84 (0.28) and 0.50 (0.17). Over the 2019–2021 decline it is 0.52 (0.21), alongside a nonbank rate-gap term of 1.23 (0.61); for FHA and VA loans separately, 0.61 (0.23) and 0.46 (0.15); leaving out any of the twenty largest issuers keeps it between 0.38 and 0.70. In the 2021–2022 rise it is −1.68 (0.43). The two depth measures are correlated 0.80 across cells, so the carry term is not separately identified from the rate gap; it is consistent with the carry component of the reseller's threshold. The filings describe the line terms: of the issuers disclosing buyout-specific financing, one paid a fixed 3.375% in 2020–2022, one paid a rate set per transaction off the collateral coupon, one paid LIBOR plus 1.75%, and smaller issuers' warehouse lines carried index floors of 0.25–1.75 points. Reported year-end weighted-average warehouse rates were 3.3–4.0% (2019), 1.9–3.3% (2020), 1.8–2.6% (2021) and 5.7–6.0% (2022). Script `04_carry.py`, re-run on the revised risk set on 18 October 2026.

IA.5 Contract-dated financing events

Five buyout-financing events at five nonbanks can be dated to a month from filings: two new warehouse agreements whose buyout category is FHA-only (August 2020), one new buyout facility of unstated scope (September 2020), and two upsizes of all-type facilities (March 2020, March 2021). For each, the issuer's monthly FHA buyout rate six months before and after, relative to the fifteen untreated nonbanks closest in pre-period mean and variance of the buyout rate and size of the delinquent stock: synthetic-control effects +15.8, +12.4, −1.3, 0.0 and +2.2 percentage points a month, the first two ranking first and second of 16 against placebo runs; pooled +5.8 (permutation $p = 0.03$ one-sided); stacked difference-in-differences on the same groups +6.1 (randomization $p = 0.005$), pre-event coefficients averaging −0.6. For VA loans both are negative (−1.1, −2.4). The two August 2020 agreements are general warehouse facilities in which the buyout category is form language the lender had used since 2013; both issuers held other financing that admitted VA buyouts; one opened five credit lines between June and October 2020. The result is reported as an association whose timing the issuers chose.

IA.6 Pool prices

Table IA.3: Pool price on servicers' buyout intensity (points per standard deviation)

Specification	Level	× premium	Trades / pools
No pool controls	0.18 (0.06)	0.04 (0.04)	171,108 / 3,105
Pool controls	0.04 (0.05)	0.06 (0.04)	171,108 / 3,105
Pool controls × premium	0.07 (0.05)	0.04 (0.03)	171,108 / 3,105
Premium pools only, controls	0.08 (0.04)		133,635 / 2,532
Discount pools only, controls	0.08 (0.13)		37,425 / 1,465
2019–2021, controls × premium	0.05 (0.04)	0.02 (0.04)	150,647 / 2,381
Customer trades, controls × premium	0.05 (0.06)	0.04 (0.04)	114,362 / 2,904

TRACE specified-pool trades in Ginnie Mae pools, 2019–2022, after removing canceled, as-of and special-price trades and prices outside 80–120; coupon-by-program-by-month and maturity-year-by-month effects; pool controls are log mean original balance, share of loans with first payment from 2019, share seriously delinquent, delinquent loans' mean credit score and loan-to-value, and log pool size; clustered by pool. Buyout intensity is the loan-month-weighted average of the servicing issuers' buyout rates across all their pools, standardized, computed on the revised risk set.

IA.7 What the paper does not find: funding and pool prices

Funding outside 2020. I tested the servicer's funding as a determinant of buyouts in about thirty designs: issuers' origination intensity; the April 2020 advance cap and June 2020 liquidity rule; cross-loan cash demand; lender exposures to Credit Suisse; contract-dated credit facilities (five events, with synthetic controls on matched issuers); Ginnie Mae's delinquency threshold; the cost of buyout lines; and the VA partial-claim window. None identifies an effect of funding distinct from the business model it finances. Two findings are useful in themselves. Before 2020, 40% of nonbanks had a seriously delinquent share of 3.5% or more and 12% exceeded Ginnie Mae's 5% limit, against 6% and none of the depositories. Buyouts did not rise as issuers approached the limit. And new credit agreements at two issuers in August 2020 were followed by a jump in their FHA buyouts (from 1.6% and 0.0% a month to 17.3% and 12.4%) but not in their VA buyouts, although both had financing for VA buyouts. The issuers were adding credit lines generally, so the timing is theirs. The designs and their estimates follow.

Prices. A buyout is a par prepayment, a loss to the holder of a premium pool. It is natural to ask whether investors price a pool's exposure to it. Bandyopadhyay, Kim and Smith (2026) ask this with yields at issuance for pools issued in 2014–2016; the test here uses secondary-market trades in 2019–2022. Within coupon, program and month, and controlling for the pool's mean original balance, seasoning, delinquent share, credit score and loan-to-value, a one-standard-deviation higher buyout intensity of a pool's servicers is associated with a price 0.04 points higher (s.e. 0.05) and with no interaction with the pool's premium (0.06, s.e. 0.04), on 171,108 trades in 3,105 pools. Two limitations keep this from resolving the question. The pool characteristics are measured in December 2022 and applied to earlier trades, which introduces later information and survivorship. The buyout-intensity measure is an issuer average rather than the pool's own expected prepayment. I read the result as no evidence that investors charge for buyout intensity, not as evidence that they do not. And, as that paper notes, if investors cannot tell pools apart by their servicers' propensity to buy out, the premium for buyout risk is market-wide and a cross-pool comparison cannot find it, so the test speaks only to pool-specific pricing. On the related concern that discretionary buyouts select against investors, the loans nonbanks bought out in 2020 look worse on observables than the loans they left behind, and the left-behind loans cured more often than observably identical loans elsewhere. The selection documented in ordinary times by Bandyopadhyay, Kim and Smith (2026) therefore did not sharpen when financing arrived.

The funding designs. The following designs were estimated and did not identify an effect of

the servicer's funding on buyouts: the bank–nonbank difference in the 2020 freeze with pool-by-month effects (reported in Section 6.9 of the main text, descriptive); origination intensity in 2019 interacted with the freeze (17 issuers); the April 2020 GSE advance cap by GSE share (75 nonbanks; −14.1, s.e. 16.2); the June 2020 GSE liquidity-rule change (70 nonbanks; 0.07, s.e. 0.59); predetermined cross-loan cash demand as an instrument (first-stage t^2 of 0.29); mandatory advances interacted with state unemployment (t^2 of 0.03–3.2); a single issuer's tax refund; the public-parent cash panel (three parents, 21 firm-quarters); lender exposure to Credit Suisse after March 2021 (four issuers, first-stage F of 0.42); contract-renewal timing (four issuers, zero residual degrees of freedom); settlement-prefunding contracts (two issuers); the 2023 Comerica exit (one issuer with zero buyouts); Ginnie Mae's delinquency threshold (buyouts do not rise near the 5% limit: +0.27, s.e. 1.27 at 4–5%; the issuers near the line are the ones that do not buy); the June 2020 re-pooling restriction, in an issuer-level design on loans already delinquent in February 2020 (−2.8, s.e. 2.8; the loan-level forbearance design of the main text's resale-rule events finds an effect at the reopening and not at the closure); and the VA partial-claim window as a funding shock to in-pool cures (gradual, with the FHA control moving). The 2020 freeze itself is described in Section 6.9 of the main text and studied in a separate paper.

IA.8 The VA partial claim's expiry: a descriptive comparison

VA borrowers had a partial claim, a cure that required no ownership, only between 27 July 2021 and 28 October 2022, the pandemic deferment of September 2020 aside. FHA borrowers had one throughout. Table IA.4 compares all pooled FHA and VA loans seriously delinquent in December 2021 with those seriously delinquent in December 2022, each followed ten months at its December servicer. FHA widened its own in-pool relief in early 2023, which inflates the FHA cure rate in the later cohort. The comparison is descriptive, and the triple difference below is null, so it is reported here rather than in the main text. Issuers that buy loans out readily did not protect VA borrowers after the expiry: a triple difference on pre-period buyout activity is 0.8 (s.e. 1.5) for foreclosure.

Table IA.4: Ten-month outcomes of loans seriously delinquent in December 2021 and December 2022 (%)

	FHA		VA	
	Dec 2021	Dec 2022	Dec 2021	Dec 2022
Foreclosure removal	1.6	1.9	2.9	5.7
Still seriously delinquent at month 10	20	24	28	37
Ever current while pooled	33	65	21	31
Removed by buyout or loss mitigation	42.2	11.8	39.7	19.6
Loans	151,670	180,635	70,701	55,967

IA.9 Borrower composition and demographic incidence

The consumer data in the servicer's book classify households by ethnic group and income. VA borrowers there are more often of Western European ancestry (68% against 55% for FHA) and less often African American (14 against 19) or Hispanic (10 against 15). National HMDA figures agree. Among 2023 home-purchase originations, FHA borrowers were 49% White, 17% Black and 29% Latino; VA borrowers were 66%, 14% and 16% (Urban Institute, 2025). Because the gap documented in this paper falls on VA loans, its incidence across groups runs through the share of each group's government-insured borrowing that is VA. In 2020 home-purchase originations that share was 34% for non-Hispanic White borrowers (10 of 29 points of FHA, VA and USDA lending), 26% for Black borrowers (16 of 61) and 16% for Hispanic White borrowers (8 of 49) (Consumer Financial Protection Bureau, 2021, Figure 5). The allocation documented here therefore falls proportionally most on White government-insured borrowers and least on Hispanic ones. Within program, the servicer's own modification and foreclosure outcomes differ little by group once credit score, income, age and loan-to-value are controlled (below). This is an incidence statement about the program mix, not a mechanism. Nothing in the buyout decision studied here responds to the borrower's group, and the paper does not claim that it does.

In one servicer's book, by the consumer-data vendor's ethnic-group coding of the first adult, Western European, African American and Hispanic households are 55%, 19% and 15% of FHA borrowers and 68%, 14% and 10% of VA borrowers. Logit marginal effects on ever-modified and ever-in-foreclosure within program, controlling for credit score, income index, age and loan-to-value, relative to Western European households: FHA, African American +4.1 (1.3) and −0.1 (1.1); Hispanic +0.4 (1.4) and −0.5 (1.2); VA, African American +4.5

(2.9) and −3.2 (2.1); Hispanic −4.2 (3.0) and +1.6 (2.1).

IA.10 Data construction

Loan-months are drawn from the Ginnie Mae loan-level delinquency file (December 2013 to December 2022); a loan is identified by its disclosure identifier; the record at $t+1$ is matched by identifier and calendar month, and 0.001% of origin loan-months lack a following record. A loan-month is at risk when the loan is reported three or more months delinquent with no removal, or when it is reported two months delinquent and its record at $t+1$ shows three or more months delinquent or a removal at that stage; the second group holds 17% of at-risk loan-months and 60% of buyouts. The 2019–2022 panel holds 15,268,917 loan-months and 1,107,942 buyouts on 2,355,857 loans at 339 issuers, of which 13,823,819 loan-months are at the 123 typed issuers. Note rates are rounded to the quarter point for cohorts (57% of loan-months sit exactly on the grid). The December 2022 stock in the file (261,364 seriously delinquent pooled loans) matches the count from the raw monthly files exactly. Issuer types come from the November 2020 issuer directory with an earlier hand classification, extended by charter words in names; the two sources agree on every issuer both cover. Pool characteristics are computed from the December 2022 universe (10.8 million active loans; issuance balances are reported in cents). TRACE trades are linked to pools through the master file's pool number (every pool in the delinquency file matches; 99.8% of pools map to one CUSIP).

IA.11 Resale value from pool prices, and the destination match: details

Price index. Ginnie Mae II specified-pool trades from TRACE, 2019–2022 (and 2016–2017 from the archived files), keeping trade reports (status P), excluding as-of and special trades and pools with less than 25 years to maturity, prices between 80 and 125, half-point coupons; monthly median by coupon; coupon-months with at least 20 trades. 448 coupon-months from 320,198 trades (2019–22); 201 from 120,412 (2016–17). A cohort with note rate c is assigned the coupon $c-0.25$ rounded down to the half point. Interpolating linearly between the coupons bracketing a price of 100, the par coupon sat 1.26 points below the survey rate in 2019–22 (s.d. 0.13; 21 months with a bracketing pair) and 2.12 below in 2016–17 (s.d. 0.20; 10 months). The 2016–17 index is thin: in six of those ten months the coupon priced at or below 100 sits above the coupon priced over 100, and the four months with ordered brackets give 2.24; the 2019–22 brackets are ordered in all 21 months. The assigned coupon has a

priced coupon-month for 92.5% of cells and 99.6% of loan-months. Across cells the price measure and the rate differential correlate 0.956; 12% of 2019–22 loan-months, and none to two decimal places in the October 2016–March 2017 window, had a price below 100.

Kink at par. With the regressor $\min(P - 100, 0)$, pooled 2019–22: depositories 0.30 (s.e. 0.07), nonbanks 0.07 (0.05), difference −0.25 (0.09); January–July 2019: nonbanks 0.53 (0.29), depositories 0.16 (0.19); October 2016–March 2017: −0.26 (0.46) and −0.02 (0.06). Entering both the rate-differential kink at the survey rate and the price kink at par, 2019–22: rate differential 0.45 (0.19), its nonbank interaction 1.48 (0.62); price 0.20 (0.06), its nonbank interaction −0.57 (0.14); the two regressors correlate 0.956 and the horse race is reported for completeness, not interpreted. With the premium entered linearly, 2019–22: 0.13 (0.03) and nonbank interaction −0.14 (0.06); January–July 2019: 0.12 (0.04) and 0.55 (0.14); October 2016–March 2017: 0.04 (0.01) and 0.03 (0.06). The 2016–17 price-bin shape is not reported because one bin is degenerate (a coefficient of −9.6 on a handful of cells).

Destination match: diagnostics. Field completeness in the December 2022 candidates (1,101,990 loans with a modified or re-performing purpose code or pooled a year or more after first payment): origination date 0.878, credit score 0.709, LTV 0.937; among 2018–22 FHA/VA buyouts: origination date 0.695 (0.54 in 2018, 0.71 in 2019, 0.61 in 2020, 0.84 in 2021, 0.79 in 2022), score 0.799, LTV 0.952. Among modified candidates, the median gap from origination date to (modified) first payment is 37 months and 67% exceed twelve months, so about a third carry a reset origination date. Coverage of buyouts by key, any candidate / unique candidate: program+state+origination date+score+LTV 0.088 / 0.087; without LTV 0.284 / 0.261; without score 0.368 / 0.182; program+state+origination date 0.917 / 0.092; with origination month in place of date 0.158 / 0.136. For pairs on program, state, origination date and note rate with the candidate's pool issued after the removal, the ratio of the candidate's original balance to the removed loan's is exactly 1.00 at the median and within 1% for 29% of pairs with re-performing candidates (43% and 50% for candidates with purchase and refinance codes; the remaining pairs are different loans sharing the key), so the balance field of a re-pooled unmodified loan is its original balance. The final pass formed 14,815,108 pairs on program, state and origination date, accepted 159,154 matches and 52,595 time-reversed placebo matches; 86% of buyouts have at least one later-pooled candidate on the key, so the lower bound reflects disambiguation, not absence of candidates.

IA.12 Price or policy: the tests behind Section 6.6 of the main text

FHA's loss-mitigation rule (Mortgagee Letter 2013-32, mandatory from 2016-14, suspended for pandemic-forbearance borrowers from 2020-06) routes a borrower with a rate above the Market Rate to a modification and one at or below it to a stand-alone partial claim, so it switches where the resale premium does. Table IA.5 reports the tests. Upper panels: restricting to cohorts half a point or more above (below) the survey rate and entering the premium linearly; the by-program price kink at a three-point premium. Bottom panel: the rate-differential kink before and after the December 2016 tightening. The above-threshold restriction and the VA comparison are consistent with both channels (a re-pooler's exercise saturates above its threshold; Proposition 2 predicts a weaker VA response). The 2016 tightening comparison favors routing but is underpowered before 2017 (18% of loan-months below the threshold) and cannot show trends; the October 2016–March 2017 premium response within the above-threshold sample favors price but is imprecise. A test using borrowers routed without the rate test (COVID-19 forbearance, April 2020–June 2021) is uninformative because only 1% of FHA loan-months then sat below the survey rate (`results_forbearance_exempt.csv`). The 2019–2022 estimates pool the pre-pandemic and pandemic routing regimes.

IA.13 Event paths for the two exit events

Coefficients on forbearance × month × nonbank, relative to the month before the event, with the triple-difference effects of the main text's exit-events table (issuer-by-month, program-by-month, cohort-by-forbearance, delinquency-by-forbearance-by-month), clustered by issuer. Event A, APM 20-07 (reference June 2020): May 2020 0.01 (0.39); July −0.81 (0.55); August −0.64 (0.74); September −0.10 (0.73); October −0.44 (0.78); November −0.03 (0.82); December −0.44 (0.72); January 2021 0.15 (0.69). Event B, re-performing pool type (reference January 2021): August 2020 −0.73 (0.36); September −0.31 (0.18); October −0.64 (0.16); November −0.04 (0.21); December −0.51 (0.20); February 2021 0.20 (0.14); March 0.28 (0.31); April 0.38 (0.27); May 0.34 (0.39); June 0.25 (0.22); July −0.05 (0.21). The forbearance flag is populated from May 2020, so event A has one pre-event month; the pre-period of event B carries the tail of event A; July 2021 coincides with the COVID-19 recovery options (Mortgagee Letter 2021-18) and the VA partial claim. Code: `27_exit_events.py`; results: `results_exit_events.csv`.

Joint path (one regression, May 2020–June 2021, reference June 2020; Figure 4 of the main text): May 2020 −0.05 (0.40); July −0.70 (0.53); August −0.54 (0.61); September 0.13

Table IA.5: Price or policy: rate-side restricted-sample test, and the price kink by program

Sample		Nonbanks	Depositories	Difference
Note rate at least half a point above the survey rate (rate condition for a stand-alone partial claim fails); premium entered linearly, per price point				
2019–2022	all	−0.10 (0.03)	−0.02 (0.02)	−0.08 (0.04)
	FHA		−0.02 (0.02)	−0.08 (0.04)
	VA		−0.02 (0.03)	−0.03 (0.04)
Jan–Jul 2019	all	0.06 (0.05)	0.03 (0.01)	0.04 (0.05)
Rates falling, 2019–2021	all	−0.10 (0.03)	−0.02 (0.02)	−0.08 (0.04)
Oct 2016–Mar 2017	all	0.08 (0.13)	−0.05 (0.04)	0.13 (0.14)
	FHA		−0.04 (0.04)	0.08 (0.14)
	VA		−0.18 (0.08)	0.79 (0.14)
Note rate at least half a point below the survey rate (rate condition met); premium entered linearly				
2019–2022	all		0.12 (0.06)	−0.21 (0.14)
Jan–Jul 2019	all		0.34 (0.13)	−0.93 (0.29)
All cohorts, kink at a three-point premium, by program				
2019–2022	FHA		0.22 (0.05)	0.10 (0.10)
	VA		0.17 (0.04)	−0.20 (0.09)
Jan–Jul 2019	FHA		0.09 (0.04)	0.59 (0.16)
	VA		0.04 (0.03)	0.26 (0.12)
Rates falling, 2019–2021	FHA		0.13 (0.07)	0.68 (0.25)
	VA		0.11 (0.03)	0.13 (0.14)
Rate-differential kink (per point of rate) before and after the December 2016 tightening of the routing rule				
Jan 2014–Nov 2016	all	−0.03 (0.43)	−0.05 (0.05)	0.02 (0.42)
	FHA	−0.02 (0.44)	0.00 (0.05)	−0.02 (0.45)
	VA	−0.01 (0.34)	−0.23 (0.03)	0.21 (0.34)
Jan 2017–Dec 2018	all	2.59 (0.42)	0.27 (0.07)	2.34 (0.42)
	FHA	2.72 (0.41)	0.46 (0.12)	2.25 (0.43)
	VA	1.74 (0.52)	−0.88 (0.50)	2.61 (0.71)
2014–2018, post × kink	FHA		0.70 (0.25)	2.21 (0.80)
	VA		1.18 (0.30)	−0.06 (0.72)

Same effects and clustering as Table 6 of the main text. "Nonbanks" is a separate regression on nonbank cells; "Depositories" is the base slope of the pooled regression and "Difference" its nonbank interaction. Buyouts: above-threshold sample 825,779 (2019–22), 33,078 (2019 window), 34,048 (2016–17 window); below-threshold sample 29,225 (2019–22) and 11,150 (2019 window); before and after the tightening 578,523 and 312,462. In the last two rows "Depositories" is the post-period change in the base slope and "Difference" the post-period change in the nonbank interaction.

(0.57); October −0.16 (0.60); November 0.38 (0.62); December −0.05 (0.53); January 2021 0.46 (0.49); February 0.59 (0.53); March 0.65 (0.53); April 0.73 (0.49); May 0.65 (0.46); June 0.63 (0.46). 92,075 cells, 659,617 buyouts, 88 issuers.

Placebo dates (triple difference forbearance × post × nonbank at a date on which no pooling rule changed): window July 2020–January 2021 with post from October 2020, 0.08 (0.31), FHA 0.13 (0.36); post from November 2020, 0.22 (0.21), FHA 0.24 (0.25); window February–June 2021 with post from May 2021, −0.04 (0.12), FHA −0.04 (0.12).

Dose-response, which does not work. Each issuer's re-pooling propensity is the share of its 2018–2019 buyouts matched to a re-pooled loan in the destination match (issuers with at least 200 such buyouts: 40, of which 28 enter the regressions); the mean is 0.097 for nonbanks and 0.101 for depositories with a standard deviation of 0.033, so the measure does not separate the types. Forbearance × post × propensity (per standard deviation): APM 20-07 window 0.00 (0.26), FHA 0.04 (0.28), within nonbanks 0.57 (0.42); re-performing pool window −0.41 (0.29), FHA −0.49 (0.31), within nonbanks −0.77 (0.42). With the nonbank indicator alongside: APM 20-07 propensity −0.04 (0.20) and nonbank −0.27 (0.64); re-performing pool propensity −0.41 (0.29) and nonbank 0.60 (0.28). The nonbank indicator carries the response; the propensity measure, a noisy lower bound, does not. Code: `28_exit_placebo.py`; results: `results_exit_placebo.csv`, `results_exit_path.csv`.

IA.14 The price step: bins, location and magnitude

Figure 3 of the main text plots the nonbank-minus-depository coefficients in the first and third columns of Table IA.6. The FHA-only estimates are larger and show the same step. The last column gives the share of 2019–2022 loan-months in each bin: most loan-months sit far above par, so over 2019–2021 the bins below two points are thin and the step is identified mainly from cohorts that crossed it.

Table IA.6: Nonbank minus depository log buyout rate by one-point price bin, within cohort

	Rates falling, 2019–2021		2019–2022		Loan-months
Price, points over par	FHA and VA	FHA	FHA and VA	FHA	(%)
below par	0.30 (0.38)	0.33 (0.41)	0.62 (0.38)	0.56 (0.36)	12.3
0–1 (reference)	—	—	—	—	1.5
1–2	0.31 (0.25)	0.54 (0.23)	0.26 (0.23)	0.40 (0.29)	2.6
2–3	1.20 (0.34)	1.44 (0.38)	0.79 (0.34)	0.98 (0.40)	3.5
3–4	1.54 (0.47)	1.78 (0.53)	1.09 (0.44)	1.29 (0.53)	5.9
4–5	1.80 (0.55)	2.07 (0.62)	1.34 (0.52)	1.56 (0.61)	4.8
5–6	1.81 (0.61)	2.07 (0.69)	1.39 (0.57)	1.61 (0.67)	10.9
6 and above	1.80 (0.56)	2.07 (0.64)	1.43 (0.53)	1.65 (0.63)	58.6

One Poisson regression per column with bin indicators and their nonbank interactions; issuer-by-month, program-by-month and cohort effects; clustered by issuer. Coefficients are the nonbank interactions; the depository base coefficients for the first column are −0.37 (0.31) below par and 0.15, 0.13, 0.21, 0.24, 0.21 and 0.20 (s.e. 0.04–0.06) from one point upward, and for the third column −0.76 (0.23) below par and 0.02 to 0.17 above. Rates falling: 107 issuers (FHA 103), 1,017,941 buyouts; 2019–2022: 109 issuers (FHA 105), 1,069,332 buyouts. The loan-month shares are those of the 2019–2022 regression sample. Scripts `r8_pricebins.py`, `r10_fig_pricebins.py`.

Table IA.7 moves the step. Estimates are largest with the step at one or two points and shrink at three and four, which places it near two points. After the 2016 election, when few loan-months sat below two points, the step at one point is largest (1.18, s.e. 0.43) and the step at three points is 0.58 (s.e. 0.30). With the step at four points in that window the estimate is negative and the depository base coefficient positive, on very few loan-months.

Table IA.7: Location of the step: nonbank × indicator for a price at or above the threshold

Step at	Oct 2016–Mar 2017	Rates falling, 2019–2021	2019–2022
par	−0.89 (1.51)	0.59 (0.44)	−0.08 (0.39)
1 point	1.18 (0.43)	0.89 (0.40)	0.29 (0.36)
2 points	0.93 (0.47)	1.09 (0.35)	0.66 (0.33)
3 points	0.58 (0.30)	0.67 (0.25)	0.57 (0.23)
4 points	−0.08 (0.04)	0.36 (0.20)	0.38 (0.19)

FHA and VA loans; issuer-by-month, program-by-month and cohort effects; clustered by issuer. Script `r11_step_thr.py`; step estimates with bootstrap in `r9_step.py` (`results_step.csv`).

Magnitude. While rates fell, January 2019 to December 2021, nonbanks' cohorts below the two-point step account for 359,317 at-risk loan-months and 4,828 buyouts (1.34% a month),

against 9.52 million loan-months and 507,602 buyouts (5.33%) above it; for depositories the rates are 28.2% below and 33.9% above. In the Poisson model with issuer-by-month effects, fitted and actual buyouts coincide within the nonbank cells below the step, so the counterfactual of the main text is $4{,}828 \times (e^{\hat{\beta}} - 1)$: 9,532 with $\hat{\beta} = 1.090$ and 3,786 with the rate-gap effects ($\hat{\beta} = 0.579$). Over 2019–2022 the cohorts below the step hold 2.14 million nonbank loan-months and 13,166 buyouts, 83% and 63% of them in 2022; applying the pooled 2019–2022 step ($\hat{\beta} = 0.658$) would give 12,257, but in the 2021–2022 rise alone the nonbank–bank difference in the step is −0.06 (s.e. 0.42), so the main text does not report that figure.

IA.15 VA and FHA prices in an institutional buyer's records

The pricing records of an institutional buyer of loans bought out of Ginnie Mae pools, used with the buyer's written permission and reported only in aggregate, cover a series of offers with cutoff dates in 2018–2020: 19,282 FHA and 4,554 VA loans priced per dollar of unpaid balance. Regressing the price per dollar on a VA indicator with offer, delinquency-bucket, current loan-to-value-bucket and state effects gives a VA discount of 3.4 cents (s.e. 0.1, heteroskedasticity-robust) for all offered loans and 4.9 cents (s.e. 0.2) for loans ninety or more days delinquent. Table IA.8 shows where the discount sits.

Table IA.8: Price per dollar of balance, loans 90 or more days delinquent, by current loan-to-value

Current LTV (%)	FHA	VA	VA − FHA (cents)	Loans (VA)
up to 80	0.955	0.959	0.3	4,455 (750)
80–90	0.942	0.946	0.5	2,488 (462)
90–100	0.927	0.853	−7.4	1,609 (431)
100–110	0.924	0.796	−12.8	660 (174)
above 110	0.935	0.689	−24.6	684 (208)

Script `37_va_price_gap.py`, output `results_va_price_gap.csv`. Prices outside 0.2–1.3 per dollar are excluded.

Table IA.9: An institutional buyer's pricing cash flows at a servicer's funding rate and exit price, and its loans after purchase

Panel A. Bid-date cash flows: 19 offers, December 2018 to February 2020, 40,041 loans							
Discount rate	2%	3%	4%	4.2%	5%	6%	9%[a]
Value at exit price 100, balance-weighted mean	101.1	99.8	98.5	98.3	97.3	96.1	92.6
Value at the TRACE exit price, mean	102.6	101.3	100.0	99.8	98.8	97.6	94.0
share worth par or more	0.85	0.74	0.56	0.53	0.41	0.28	0.04
Break-even exit price, median	95.9	98.7	101.9	102.6	105.8	109.9	123.1
interquartile range	91–99	96–103	99–109	99–111	101–117	103–126	110–151
FHA loans only	95.8	99.0	102.5	103.3	106.7	111.1	124.9
Value per point of exit price, median	0.29	0.28	0.28	0.28	0.28	0.27	0.26
Panel B. After purchase: 7,861 loans bought December 2019 to March 2020, records to May 2021 (%)							
Months after purchase	6	12	15				
Re-pooled	8.7	26.5	30.0				
current or 30 days late at purchase	6.6	28.7	34.1				
other loans active at purchase	4.0	19.0	22.1				
Paid off	0.9	3.3	4.3				
Claim, foreclosure sale or short sale	1.3	2.1	2.6				
Still held	89.0	68.1	63.2				
Modified after purchase (% of re-pooled)	5.3	15.3	22.0				
Loans	7,861	7,861	5,667				

[a]The buyer's yield. Aggregates of the buyer's records, used with its written permission. Panel A: every offer of bought-back FHA, VA and USDA loans whose pricing workbook survives in the buyer's files, in the last saved version of each; the stored bid-date cash flows reproduce 99.96% of the 40,690 bids to within a cent. Values are per 100 of balance, net of the escrow advance, and change only the discount rate and the exit price of the buyer's model; the break-even is the exit price at which value equals par. Loans with balances under $5,000, bids outside 30–150 or note rates below the buyer's price table are dropped. TRACE exit price: the Ginnie Mae II index price, in the bid month, of the loan's highest open coupon (note rate less 0.25, rounded down to the half point; 39,010 loans with a price). Median break-evens of the 19 offers at 4.2%: 99.4 to 129.0. Panel B: loans first observed within two months of purchase; 396 loans already re-pooled (279), paid off or inactive when first observed are in the totals only. Median time to re-pooling among the 2,721 loans re-pooled by May 2021: 9.2 months.

IA.16 An institutional buyer's pricing cash flows and servicing records

The institutional buyer of Section IA.15, the firm whose book supplies the borrower data of the main text (Section 4), priced each offer of bought-back loans in a spreadsheet model and, after purchase, kept monthly servicing records of the loans it bought. Both are used with its written permission and reported only in aggregate (Table IA.9).

The pricing model. For each loan the model projects monthly cash flows along the paths of cure, re-pooling of a cured loan, payoff, short sale, foreclosure and insurance claim for 48 months, adds a final month that sums the rest, and discounts them at the buyer's target yield (9% for these offers); the bid is the discounted value less the escrow advance. A cured loan is re-pooled after a servicing-transfer delay, at speeds set by a vector in the model, and the proceeds are its balance times a price read from a table of Ginnie Mae II coupon prices. That exit price appears only in the re-pooling proceeds, so a loan's value is linear in it. Recomputing one workbook's formulas in Excel, with its macros disabled and without its database connection, at two flat price tables confirms the linearity to within a cent for the

six loans checked.

The offers. The buyer's files hold a pricing workbook for 19 offers of bought-back FHA, VA and USDA loans with bid dates from December 2018 to February 2020; where an offer was priced more than once, I use the last saved version. Each workbook stores, for every loan, the 49 monthly cash flows from which the bid was computed and, separately, their re-pooling part, and the stored cash flows reproduce 99.96% of the 40,690 bids to within a cent. After dropping loans whose note rate lies below the price table, balances under $5,000 and bids outside 30 to 150, 40,041 loans remain; 57% were sixty or more days delinquent when offered and 61% are FHA loans. Section IA.15 uses the prices the buyer recorded in an earlier extract of its pricing records; this section uses the model cash flows of every offer whose workbook survives, which is why the loan counts differ.

The buyer's cash flows at a servicer's funding rate and exit price. Because value is linear in the exit price, the re-pooling cash flows divided by the table price the loan was assigned are the cash flows per point of exit price, and the remaining cash flows do not depend on it. Panel A changes two inputs and keeps every other assumption of the buyer's: the exit price, set to the TRACE price of the loan's highest open coupon in the bid month or to a common value, and the discount rate, set to a holder's funding rate instead of the buyer's yield. For the median loan, re-pooling carries 28% of the present value of the stored cash flows, and a point of exit price is worth 0.26 to 0.29 points of loan value per 100 of balance across discount rates of 2 to 9% (0.28 at 4.2%). A purchase at par breaks even, for the median loan, at an exit price of 95.9 when the cash flows are discounted at 2%, 98.7 at 3%, 101.9 at 4%, 102.6 at the 4.2% blended cost of the calibration in Section 3, 105.8 at 5%, 109.9 at 6% and 114.3 at 7%; a two-point premium is the median break-even at a funding rate of 4.0%. The interquartile range at 4.2% is 99.4 to 111.0, and FHA loans alone break even slightly higher (103.3 at 4.2%). Across offers the median break-even at 4.2% runs from 99.4 to 129.0; it is highest in the offers in which the model expects least of the value to come from re-pooling (rank correlation -0.90 across the 19 offers), because there a point of exit price adds least. The break-evens are in the units of the exit price, a market price of the coupon. At the TRACE prices of the bid month, 85% of the loans were worth par or more to a holder funding at 2%, 53% at 4.2% and 28% at 6%.

After purchase. The buyer's monthly servicing records run from January 2020 to May 2021. Of the 7,861 loans it bought from December 2019 to March 2020 and first observed within two months of purchase (51% current or thirty days late at purchase), 8.7% were re-pooled within six months and 26.5% within twelve; within twelve months, 2.1% ended in a claim, foreclosure sale or short sale, 3.3% paid off and 68% were still held (Panel B). Of the 5,667 bought by February 2020, which can be followed for fifteen months (46% current

or thirty days late at purchase), 30.0% were re-pooled within fifteen. Loans current or thirty days late at purchase were re-pooled more often within twelve months (28.7%) than other loans active at purchase (19.0%). Among the 2,721 loans re-pooled by May 2021 the median time from purchase was 9.2 months (interquartile range 6.3 to 11.2); because most loans had not been re-pooled by then, this is a lower bound on the median among all loans eventually re-pooled. Of the loans re-pooled within twelve months, 15% had been modified after purchase. The window includes the payment pause of 2020–2021, which delayed cures, and the loans are one buyer's purchases of loans that servicers had bought back, so the shares describe this buyer rather than servicers' own resales.

IA.17 Routing versus resale value: the horse race

Table IA.10 enters the FHA routing threshold and the resale-value threshold in the same regression. The routing step is $\mathbf{1}\{\text{note rate} > \text{survey rate} + 0.25\}$, the upper bound of HUD's Market Rate; the routing kink is $\min(\text{note rate} - \text{survey rate} - 0.25, 0)$; the resale kink is $\min(P - 103, 0)$ with P the TRACE price of the cohort's deliverable Ginnie Mae II coupon. Both are interacted with the nonbank indicator. The two thresholds disagree for 13% of FHA loan-months in January–July 2019, 6% over the 2019–2021 decline, 41% in October 2016–March 2017 and 5% over 2019–2022, because the spread between the survey rate and the par coupon moves. Restricting the sample to the cells where they disagree leaves no within-cohort variation in either regressor, so the horse race in the full sample is the test. Table IA.11 reports the sharper separation of the main text with the routing threshold placed at the survey rate itself and at an eighth and three-eighths above it, the price kink with rate-gap effects allowed to differ by year, and the two-point step with rate-gap effects on FHA loans alone. VA loans, which had no rate-based routing rule, show a nonbank price response of 0.26 (s.e. 0.12) in 2019, 0.13 (s.e. 0.14) over 2019–2021 and 0.25 (s.e. 0.22) around the 2016 election, smaller than the FHA responses in the same windows. The pooled 2019–2022 reversal comes from the 2021–2022 rise in rates: excluding March 2020–June 2021, the routing kink × nonbank is 2.26 (0.67) (bootstrap $p = 0.003$) and the price kink −0.45 (0.12); over 2021–2022 alone, 1.03 (0.57) ($p = 0.15$) and −0.29 (0.13); with the routing step in place of the kink over 2021–2022, 0.21 (0.22) ($p = 0.39$) and −0.07 (0.07). Within March 2020–June 2021 neither is estimated precisely. FHA loans in forbearance, which were evaluated without the rate test from April 2020 to June 2021, provide no test, because none of their loan-months sat below the three-point premium (script `r5_round2.py`, output `results_round2.csv`).

Table IA.10: Routing and resale value side by side, FHA loans (coarser horse race)

	Jan–Jul 2019	Rate fall 2019–21	Oct 2016–Mar 2017	2019–22
Price kink at +3 and routing step (note rate > survey rate +0.25), nonbank interactions				
Price kink × nonbank	0.62 (0.17)	0.60 (0.21)	0.58 (0.26)	0.07 (0.09)
bootstrap p	0.003	0.03	0.03	0.46
Routing step × nonbank	0.13 (0.10)	0.21 (0.13)	0.14 (0.08)	0.40 (0.15)
bootstrap p	0.21	0.13	0.27	0.03
Price kink at +3 and routing kink (rate gap below survey rate +0.25), nonbank interactions				
Price kink × nonbank	0.56 (0.33)	0.29 (0.17)	0.59 (0.26)	−0.34 (0.11)
bootstrap p	0.20	0.12	0.03	0.01
Routing kink × nonbank	0.14 (0.96)	1.11 (0.75)	−0.18 (0.07)	1.78 (0.67)
bootstrap p	0.89	0.22	0.06	0.007
FHA loan-months classified differently	0.13	0.06	0.41	0.05
Issuers	82	103	119	105

Poisson regressions of buyouts on cell counts with log loan-months as offset; issuer-by-month, program-by-month and cohort (issuer × program × note rate) effects; standard errors clustered by issuer. Bootstrap p: null-imposed wild cluster score bootstrap over issuers, Rademacher weights, 9,999 draws. Script `r1_route_vs_resale.py`, output `results_route_vs_resale.csv`.

Table IA.11: Separation of price from the routing rule: further placements and controls

	Jan–Jul 2019	Rate fall 2019–21	Rate rise 2021–22
A. Routing threshold × nonbank within issuer × month × program × coupon, FHA, by placement of the threshold			
Survey rate +0.25 (main text)	0.11 (0.05)	−0.04 (0.03)	−0.07 (0.08)
Survey rate	−0.06 (0.06)	−0.05 (0.03)	0.08 (0.11)
bootstrap p	0.54	0.18	0.49
Survey rate +0.125	0.01 (0.03)	−0.01 (0.04)	0.15 (0.12)
bootstrap p	0.66	0.70	0.28
Survey rate +0.375	0.07 (0.05)	−0.02 (0.03)	−0.02 (0.06)
bootstrap p	0.17	0.56	0.84
		Rate fall 2019–21	2019–22
B. Price kink at +3 × nonbank with rate-gap bin × type × year effects, FHA			
Coefficient		0.66 (0.16)	0.35 (0.08)
bootstrap p		< 0.001	0.002
C. Step at +2 × nonbank with rate-gap bin × type × program effects, FHA only			
Coefficient		0.63 (0.23)	0.42 (0.26)
bootstrap p		0.007	0.14

Poisson on cell counts with log loan-months offset; clustered by issuer; null-imposed wild cluster score bootstrap (9,999 draws). Panel A: the routing step is $\mathbf{1}\{\text{note rate} > \text{threshold}\}$, with the cohort's position within the coupon controlled as in the main text; 81, 103 and 97 issuers. Panels B and C: 103 and 105 issuers. Scripts `r7_separate_rob.py`, `r9_step.py`; outputs `results_separate_rob.csv`, `results_step.csv`.

The main text replaces this comparison with a design that absorbs the rate gap flexibly (the main text's table separating resale value from the relief rule).

IA.18 Coupon-boundary design: threshold sweep

The design of the main text's Section 6.4 compares adjacent quarter-point cohorts of the same issuer, program and month, and identifies the price effect from the months in which a boundary pair's two coupons sit on opposite sides of the two-point premium. Table IA.12 moves the premium: the crossing indicator is redefined at 100, 101, 103, 104 and 105 points. The nonbank-minus-depository estimate peaks at 102, where the main text places the step from the price bins, and falls away on both sides; at 99 only 1.8% of pair-months cross and the estimate (−1.10, s.e. 0.21) rests on a handful of coupon-months and is not reported in the table. Shifting the price index to the adjacent coupon pair ($k - 0.5$, k or $k + 0.5$, $k + 1$) re-expresses the same sweep at a price level about one and a half points higher or lower and adds nothing. Scripts `56_boundary.py`, `57_boundary_sweep.py`; outputs `results_boundary.csv`, `results_boundary_sweep.csv`.

Table IA.12: Boundary design: crossing defined at other price thresholds

	Rates falling, 2019–2021			Pooled 2019–2022		
Threshold	NB − dep.	Depositories	Share crossing	NB − dep.	Depositories	Share crossing
100	−0.21 (0.22)	0.33 (0.14)	0.03	−0.18 (0.20)	0.34 (0.11)	0.04
101	0.63 (0.32)	0.22 (0.07)	0.06	0.38 (0.26)	0.22 (0.07)	0.08
102 (main text)	0.99 (0.31)	0.01 (0.01)	0.08	0.72 (0.26)	0.03 (0.02)	0.09
103	0.43 (0.20)	0.04 (0.03)	0.10	0.38 (0.17)	0.04 (0.02)	0.11
104	0.20 (0.13)	−0.03 (0.01)	0.12	0.20 (0.12)	−0.04 (0.01)	0.12
105	−0.05 (0.11)	−0.04 (0.04)	0.13	0.01 (0.09)	−0.08 (0.03)	0.12

Specification of the main text's boundary table with the straddle indicator defined at the threshold shown (lower coupon below, upper coupon at or above), FHA and VA loans; pair-by-month and cohort-within-pair effects; rule-threshold control included; clustered by issuer. 107 and 109 issuers.

IA.19 Coupon-boundary design: where loans are placed

The boundary design prices each cohort at the highest coupon open to it, $k = \lfloor 2(c - 0.25) \rfloor / 2$ for a loan at rate c. A Ginnie Mae II bond takes loans whose rate exceeds the coupon by a quarter to three-quarters of a point, so loans at whole and half rates have one coupon open to them and loans at a quarter or three-quarters have two; Ginnie Mae I bonds take only loans half a point above the coupon. Table IA.13 joins the loans removed from Ginnie Mae bonds in 2018–2022 (1.7 million, of which 1.05 million carry a rate on the quarter-point grid) to the coupon of the bond each sat in, taken from the TRACE master file, and, for loans bought back and later re-pooled at an unchanged rate (destination match, re-performing and seasoned unmodified routes), to the coupon of the bond they re-entered. Script `63_delivered_coupons.py`.

Table IA.13: Share of loans in the highest coupon open to them, by the fraction of the note rate (percent, and loans)

	Rate $x.00$		Rate $x.25$		Rate $x.50$		Rate $x.75$	
	% highest	Loans	% highest	Loans	% highest	Loans	% highest	Loans
All removals, 2018–2022	99.9	216,547	84.4	287,394	100.0	248,739	82.8	301,987
Buybacks, 2018–2022	99.9	166,313	84.9	213,438	99.9	188,857	83.1	222,668
Buybacks, bonds first paying 2015 or later	99.9	90,117	80.7	127,455	100.0	99,992	79.4	147,889
Bought back, re-pooled at the same rate: the new bond	100.0	7,298	90.7	9,850	100.0	9,498	87.8	10,942

Loans whose rate is on the quarter-point grid. "Highest": the bond's coupon equals k; nearly all the rest are one coupon lower. Loans at a quarter or three-quarters in Ginnie Mae I bonds (about 1%) cannot be in either coupon and are counted as not in the highest.

IA.20 Coupon-boundary design: what the induced buybacks would otherwise have been

Table IA.14 extends Table 16 of the main text. For each window, horizon and outcome it reports the two-stage least squares estimate per induced buyback (left three columns) and the reduced form, the effect of the straddle on the share in each status in percentage points with its standard error (right three columns). Because the first stage is weak, Table IA.15 gives the Anderson–Rubin 95% set for every ratio; a set that excludes zero corresponds to a reduced form significant at the 5% level. The months measure is in Table IA.15 and the main text's Table 16. The January–July 2019 entries are followed to January 2021 at most. Scripts `62_boundary_borrowers.py`, `62b_boundary_months.py` and `62c_boundary_ar.py`; the entries are built from the loan-month panel, and a loan's month of entry is its first month at risk in a spell, two or three months behind, from February 2019.

Table IA.14: Borrower status after entry into serious delinquency, coupon-boundary design

	Per induced buyback			Reduced form, percentage points		
	6 months	12 months	18 months	6 months	12 months	18 months
Rates falling, 2019–2021, nonbanks						
Bought back (p.p.)	9.6 (4.1)	8.3 (4.0)	9.9 (4.3)			
Still in the bond, seriously delinquent	−0.43	−0.10	−0.39	−4.15 (1.93)	−0.82 (1.63)	−3.84 (1.40)
Still in the bond, caught up	−0.34	−0.44	−0.18	−3.25 (1.81)	−3.69 (1.36)	−1.79 (1.36)
Removed for other relief	−0.12	−0.25	−0.20	−1.15 (0.37)	−2.06 (0.79)	−2.03 (1.40)
Paid off	−0.10	−0.15	−0.16	−0.96 (0.46)	−1.25 (0.43)	−1.60 (0.43)
Foreclosed	−0.01	−0.06	−0.07	−0.09 (0.08)	−0.54 (0.20)	−0.68 (0.31)
Bought back and found in a new bond (lower bound)	0.02	0.06	0.09	0.21 (0.12)	0.53 (0.33)	0.92 (0.42)
of which modified	0.00	0.01	0.03	−0.04 (0.04)	0.11 (0.13)	0.29 (0.21)
Rates falling, 2019–2021, nonbank minus bank						
Bought back (p.p.)	8.8 (4.1)	7.3 (4.0)	9.1 (4.3)			
Still in the bond, seriously delinquent	−0.42	−0.08	−0.40	−3.66 (1.96)	−0.62 (1.65)	−3.64 (1.42)
Still in the bond, caught up	−0.32	−0.42	−0.16	−2.85 (1.89)	−3.08 (1.41)	−1.46 (1.44)
Removed for other relief	−0.12	−0.22	−0.16	−1.05 (0.66)	−1.63 (1.01)	−1.50 (1.55)
Paid off	−0.13	−0.20	−0.20	−1.15 (0.54)	−1.43 (0.54)	−1.83 (0.54)
Foreclosed	−0.01	−0.07	−0.08	−0.07 (0.09)	−0.52 (0.20)	−0.70 (0.31)
Bought back and found in a new bond (lower bound)	0.00	0.03	0.01	0.00 (0.15)	0.23 (0.39)	0.10 (0.59)
of which modified	−0.01	0.02	0.06	−0.07 (0.08)	0.17 (0.22)	0.56 (0.30)
January–July 2019 entries, nonbanks						
Bought back (p.p.)	6.7 (3.6)	5.8 (3.4)	5.7 (3.3)			
Still in the bond, seriously delinquent	−0.47	−0.07	−0.40	−3.17 (1.80)	−0.43 (1.57)	−2.30 (1.15)
Still in the bond, caught up	−0.33	−0.37	−0.14	−2.21 (1.63)	−2.15 (1.48)	−0.80 (1.32)
Removed for other relief	−0.14	−0.32	−0.26	−0.94 (0.45)	−1.89 (0.92)	−1.48 (1.16)
Paid off	−0.05	−0.14	−0.09	−0.35 (0.50)	−0.81 (0.53)	−0.50 (0.49)
Foreclosed	−0.01	−0.09	−0.11	−0.04 (0.15)	−0.55 (0.24)	−0.62 (0.38)
Bought back and found in a new bond (lower bound)	0.02	0.04	0.10	0.14 (0.19)	0.24 (0.35)	0.59 (0.36)
of which modified	−0.01	0.01	0.04	−0.09 (0.04)	0.09 (0.14)	0.25 (0.16)
January–July 2019 entries, nonbank minus bank						
Bought back (p.p.)	8.1 (3.7)	8.0 (3.5)	7.9 (3.3)			
Still in the bond, seriously delinquent	−0.38	−0.05	−0.33	−3.10 (1.88)	−0.39 (1.62)	−2.60 (1.24)
Still in the bond, caught up	−0.22	−0.31	−0.12	−1.81 (1.81)	−2.46 (1.71)	−0.96 (1.59)
Removed for other relief	−0.22	−0.33	−0.27	−1.76 (0.74)	−2.60 (1.16)	−2.13 (1.37)
Paid off	−0.17	−0.24	−0.19	−1.34 (0.60)	−1.89 (0.73)	−1.54 (0.71)
Foreclosed	−0.01	−0.08	−0.09	−0.06 (0.17)	−0.61 (0.27)	−0.68 (0.40)
Bought back and found in a new bond (lower bound)	−0.01	0.04	0.12	−0.09 (0.26)	0.32 (0.43)	0.97 (0.51)
of which modified	−0.02	0.04	0.11	−0.15 (0.11)	0.31 (0.26)	0.88 (0.30)

Specification of Table 16. "Nonbank minus bank": instrument and regressor interacted with the nonbank indicator, the bank terms included. Standard errors clustered by servicer.

Table IA.15: Anderson–Rubin 95% sets for the effects per induced buyback

	6 months	12 months	18 months
Rates falling, 2019–2021, nonbanks; first-stage F = 5.6, 4.3, 5.4			
Still in the bond, seriously delinquent	[−0.73, −0.14]	[−0.26, 4.58]	[−0.90, −0.28]
Still in the bond, caught up	[−0.46, 0.16]	[−2.34, −0.35]	[−0.26, 0.52]
Removed for other relief	[−0.52, −0.05]	[−1.30, −0.18]	[−0.33, 0.36]
Paid off	[−0.22, −0.02]	[−1.27, −0.08]	[−0.69, −0.09]
Foreclosed	[−0.03, 0.02]	[−0.77, −0.02]	[−0.31, −0.01]
Bought back and found in a new bond (lower bound)	[0.00, 0.05]	[−0.13, 0.13]	[0.02, 0.26]
of which modified	[−0.03, 0.00]	[−0.20, 0.03]	[−0.05, 0.06]
Months seriously delinquent in the bond	[−4.3, −0.7]	[−7.9, 8.0]	[−9.3, 3.7]
Rates falling, 2019–2021, nonbank minus bank; first-stage F = 4.6, 3.3, 4.5			
Still in the bond, seriously delinquent	[−0.83, 0.13]	$(-\infty, -4.00] \cup [-0.28, \infty)$	[−1.59, −0.27]
Still in the bond, caught up	[−0.50, 0.86]	$(-\infty, -0.26] \cup [0.79, \infty)$	[−0.29, 1.56]
Removed for other relief	[−1.06, 0.04]	unbounded	[−0.36, 1.50]
Paid off	[−0.63, −0.02]	$(-\infty, -0.08] \cup [1.27, \infty)$	[−1.79, −0.10]
Foreclosed	[−0.04, 0.05]	$(-\infty, -0.02] \cup [0.56, \infty)$	[−0.65, −0.01]
Bought back and found in a new bond (lower bound)	[−0.24, 0.03]	$(-\infty, 0.12] \cup [0.47, \infty)$	[−0.78, 0.13]
of which modified	[−0.11, 0.01]	unbounded	[−0.01, 0.38]
Months seriously delinquent in the bond	[−5.1, −0.8]	unbounded	[−10.2, 10.2]
January–July 2019 entries, nonbanks; first-stage F = 3.4, 3.0, 3.0			
Still in the bond, seriously delinquent	unbounded	$(-\infty, -2.03] \cup [-0.45, \infty)$	$(-\infty, -0.04] \cup [0.79, \infty)$
Still in the bond, caught up	$(-\infty, -1.49] \cup [-0.59, \infty)$	unbounded	$(-\infty, -1.91] \cup [-0.37, \infty)$
Removed for other relief	$(-\infty, -0.03] \cup [0.53, \infty)$	$(-\infty, -0.05] \cup [0.70, \infty)$	unbounded
Paid off	unbounded	unbounded	unbounded
Foreclosed	unbounded	$(-\infty, -0.02] \cup [0.50, \infty)$	$(-\infty, 0.04] \cup [0.49, \infty)$
Bought back and found in a new bond (lower bound)	unbounded	unbounded	unbounded
of which modified	$(-\infty, 0.00] \cup [0.23, \infty)$	unbounded	unbounded
Months seriously delinquent in the bond	unbounded	unbounded	unbounded
January–July 2019 entries, nonbank minus bank; first-stage F = 4.8, 5.3, 5.7			
Still in the bond, seriously delinquent	[−0.77, 0.40]	[−0.33, 1.72]	[−0.99, −0.04]
Still in the bond, caught up	[−0.45, 1.62]	[−0.59, 0.50]	[−0.38, 1.15]
Removed for other relief	[−1.34, −0.06]	[−1.39, −0.07]	[−0.63, 0.22]
Paid off	[−1.45, −0.02]	[−1.31, −0.07]	[−0.89, −0.02]
Foreclosed	[−0.06, 0.13]	[−0.45, −0.01]	[−0.43, 0.02]
Bought back and found in a new bond (lower bound)	[−0.40, 0.05]	[−0.19, 0.19]	[−0.01, 0.49]
of which modified	[−0.20, 0.01]	[−0.04, 0.22]	[0.04, 0.51]
Months seriously delinquent in the bond	[−9.5, −2.7]	[−9.7, 0.3]	[−11.1, 4.1]

The set of values b_0 for which the cluster-robust t statistic on the straddle, in a regression of the outcome share minus b_0 times the bought-back share on the straddle and the controls, is at most 1.96 in absolute value. With a weak first stage the set can be unbounded or the union of two rays. First-stage F: cluster-robust F on the straddle in the bought-back regression.

IA.21 Coupon-boundary design: other outcomes and base rates

Table IA.16 applies the specification of the main text's boundary table to every outcome recorded in the following month. Each coefficient is the change in the log rate of that outcome

for the upper cohort in months in which the pair straddles the two-point premium. Over 2019–2021, nonbanks' cures inside the pool, removals for other loss mitigation and payoffs do not change, foreclosure removals fall, and the share still seriously delinquent falls slightly; around the 2016 election the fall in the share still delinquent is significant. Depositories show no change in buyouts and imprecise changes elsewhere. In levels, over 2019–2021 nonbanks bought out the upper cohort of a straddling pair at 3.56% a month against 1.56% for the lower cohort, and in other months at 5.05% and 5.39%; depositories at 34.1% and 28.7% in straddling months and 37.7% and 31.6% in others. Script `60w_boundary_outcome_worker.py` (one window and outcome per process; the single-process `60_boundary_outcomes.py` crashed in the cure regression for January–July 2019, which is not reported); outputs `results_boundary_outcomes2.csv` and, for the levels, `results_boundary_baserates.csv`.

Table IA.16: Boundary design: all outcomes in the following month

	Rates falling, 2019–2021			Pooled 2019–2022		Oct 2016–Mar 2017
Outcome (base rate, nonbanks)	Nonbanks	Depositories	Difference	Nonbanks	Difference	Difference
Buyout (5.2%)	1.01 (0.31)	0.01 (0.01)	0.99 (0.31)	0.75 (0.26)	0.72 (0.26)	1.06 (0.42)
Still seriously delinquent (86.8%)	−0.02 (0.02)	0.02 (0.02)	−0.04 (0.02)	−0.02 (0.01)	0.00 (0.02)	−0.05 (0.02)
Cure inside the pool (3.4%)	0.16 (0.13)	0.94 (0.52)	−0.78 (0.53)	0.05 (0.03)	0.17 (0.12)	0.22 (0.19)
Removal for other loss mitigation (2.8%)	−0.01 (0.05)	−0.04 (0.06)	0.03 (0.08)	0.03 (0.03)	0.03 (0.05)	0.34 (0.16)
Foreclosure removal (0.3%)	−0.16 (0.06)	−0.01 (0.40)	−0.15 (0.39)	−0.13 (0.05)	−0.10 (0.27)	0.09 (0.41)
Payoff (1.0%)	−0.09 (0.06)	−0.02 (0.06)	−0.07 (0.08)	−0.02 (0.04)	−0.11 (0.08)	

Poisson on adjacent-cohort pairs, pair-by-month and cohort-within-pair effects, rule-threshold control; coefficient on upper cohort × pair straddles the premium (nonbank and depository columns from separate regressions; difference from the pooled regression's nonbank interaction); clustered by issuer. Base rates are monthly rates for nonbank cells in boundary pairs, 2019–2021.

IA.22 Coupon-boundary design: borrower outcomes under other clusterings

The straddle varies across coupon pairs and months, and outcomes are correlated within servicers. The main text's Table 16 clusters two ways; Table IA.17 gives the eighteen-month Anderson–Rubin sets for 2019–2021 entries clustered by servicer, by coupon pair and month, and two ways. Script `62d_boundary_ar_cm.py`. Tables IA.14 and IA.15 above cluster by servicer.

Table IA.17: Anderson–Rubin 95% sets at eighteen months, 2019–2021 entries, by clustering

	Servicer	Coupon pair and month	Two-way
Nonbanks; first-stage F = 5.4, 51.7, 6.5			
Still in the bond, seriously delinquent	[−0.90, −0.28]	[−0.57, −0.23]	[−0.81, −0.23]
Still in the bond, caught up	[−0.26, 0.52]	[−0.25, −0.09]	[−0.22, 0.21]
Removed for other relief	[−0.33, 0.36]	[−0.38, −0.01]	[−0.38, 0.28]
Paid off	[−0.69, −0.09]	[−0.27, −0.06]	[−0.54, −0.07]
Foreclosed	[−0.31, −0.01]	[−0.11, −0.03]	[−0.22, −0.01]
Bought back and found in a new bond (lower bound)	[0.02, 0.26]	[0.06, 0.14]	[0.03, 0.22]
of which modified	[−0.05, 0.06]	[0.01, 0.06]	[−0.02, 0.06]
Months seriously delinquent in the bond	[−9.3, 3.7]	[−9.3, −5.6]	[−9.2, −0.3]
Nonbank minus bank; first-stage F = 4.5, 44.9, 5.5			
Still in the bond, seriously delinquent	[−1.59, −0.27]	[−0.66, −0.19]	[−1.13, −0.18]
Still in the bond, caught up	[−0.29, 1.56]	[−0.28, −0.02]	[−0.26, 0.55]
Removed for other relief	[−0.36, 1.50]	[−0.40, 0.12]	[−0.42, 0.85]
Paid off	[−1.79, −0.10]	[−0.37, −0.05]	[−1.00, −0.07]
Foreclosed	[−0.65, −0.01]	[−0.12, −0.04]	[−0.32, −0.02]
Bought back and found in a new bond (lower bound)	[−0.78, 0.13]	[−0.07, 0.11]	[−0.32, 0.13]
of which modified	[−0.01, 0.38]	[0.00, 0.14]	[0.00, 0.24]
Months seriously delinquent in the bond	[−10.2, 10.2]	[−9.8, −5.9]	[−9.6, 0.5]

Specification of the main text's Table 16. First-stage F under the three clusterings.

IA.23 Coupon-boundary design: borrower outcomes before the pandemic, alternatives

Table IA.18 reports the eighteen-month estimates per induced buyback for 2014–2018 entries, with Anderson–Rubin 95% sets, for all months and excluding October 2016–March 2017, for nonbanks and net of banks. Two-way clustering by servicer and by coupon pair and month. Script `67_boundary_borrowers_1418.py`.

Table IA.18: Before the pandemic: eighteen-month estimates per induced buyback under alternatives

	Seriously delinquent in the bond	Caught up in the bond	Other relief removal	Paid off	Foreclosed	Months seriously delinquent in the bond
All months, nonbanks (main text) ($F = 7.2$)	−0.25 [−0.49, −0.08]	−0.19 [−0.31, 0.07]	−0.39 [−0.63, −0.28]	−0.08 [−0.14, 0.03]	−0.08 [−0.19, 0.03]	−10.6 [−13.8, −9.4]
Excluding October 2016–March 2017, nonbanks ($F = 8.0$)	−0.22 [−0.39, 0.00]	−0.19 [−0.34, 0.05]	−0.42 [−0.66, −0.32]	−0.09 [−0.17, −0.03]	−0.07 [−0.17, 0.03]	−10.4 [−13.0, −9.0]
All months, nonbank minus bank ($F = 8.0$)	−0.23 [−0.43, −0.08]	−0.21 [−0.31, 0.00]	−0.40 [−0.64, −0.30]	−0.09 [−0.15, 0.02]	−0.06 [−0.14, 0.04]	−11.2 [−15.0, −10.0]
Excluding October 2016–March 2017, nonbank minus bank ($F = 9.1$)	−0.21 [−0.35, −0.01]	−0.21 [−0.32, −0.01]	−0.41 [−0.63, −0.33]	−0.11 [−0.20, −0.04]	−0.06 [−0.13, 0.03]	−11.1 [−14.4, −9.7]

IA.24 Share of delinquent loans below the premium, 2019–2025

The share of seriously delinquent loan-months, weighted by loan-months, in cohorts whose highest open coupon traded below 102: for nonbanks, 0.45 in the first half of 2019, at most 0.03 in each half-year from the second half of 2019 through 2021, 0.70 in the first half of 2022, 0.98 in the second half of 2022 and in both halves of 2023, 0.91 and 0.84 in 2024 and 0.84 and 0.74 in 2025; for banks, 0.62 in the first half of 2022 and 0.86 to 0.99 from the second half of 2022 through 2025. Script `65_share_below.py`.

IA.25 Borrower outcomes in the cohort design, 2016–2018 stocks

The main text's Section 8.3 summarizes this design. Five groups of seriously delinquent FHA and VA loans (January and September 2016, March and September 2017, March 2018), each followed eighteen months so that every window ends before the pandemic, give 417,480 loans at 264 servicers. The design is the cohort design: servicer-by-program-by-rate controls with servicer-by-date and program-by-date controls, so that a cohort's exposure is the survey rate's movement during its window, measured as the cohort's average depth below the survey rate over the follow-up months. Measured at the start date alone, as first specified, no outcome other than removals for other relief differs by servicer type at any horizon. The survey rate moved by up to a point during these windows, so the start-date measure mis-states what a cohort faced. I report the change and both versions.

Table IA.19: Outcomes within 18 months, percentage points per point further below the survey rate

	Nonbank minus bank	Nonbanks alone	Banks alone
Bought back	−12.6 (4.8)	−8.1 (2.7)	5.5 (3.7)
Still seriously delinquent at month 18	11.4 (3.7)	3.7 (1.8)	−8.4 (3.2)
Foreclosure removal	−3.3 (2.1)	−3.4 (1.5)	−0.1 (1.5)
Any relief (buyback, other relief or cure)	−5.3 (3.9)	0.3 (2.4)	6.2 (3.0)
Nonbank base rates (%)	16.9 / 21.5 / 14.9 / 60.4		

Loan-weighted linear probability; a coefficient is the change in the outcome share, in percentage points, per point that the cohort's rate sits further below the mortgage rate, averaged over the window. Clustered by servicer. Leaving out any of the fifteen largest servicers keeps the first column's buyback coefficient between −14.1 and −10.7 and the delinquency coefficient between 8.5 and 12.6; weighting servicers equally gives −10.1 (5.5) and 6.7 (6.5).

Table IA.19 shows that, relative to a bank cohort at the same depth, a nonbank cohort one point further below the survey rate is bought back 12.6 points less and is 11.4 points more likely to be still in the bond and seriously delinquent at month eighteen. The delinquency differential grows with the horizon, from 3.0 (s.e. 2.8) at six months to 7.0 (3.5) at twelve. Total relief, counting a buyback as relief, is unchanged.

Two features limit interpretation. A loan that is bought back leaves the bond and the public file, so a servicer that removes fewer loans mechanically leaves more loans in the bond to be counted as delinquent, and the "still delinquent" differential is in part the buyback differential seen from the other side. Section 5.2 observes what became of bought-back loans only for the minority that reappear in a bond, four in five of which are current in December 2022, and not for the rest. The defensible statement is that the loans nonbanks stop buying remain in the bond and delinquent longer, are not foreclosed on faster, and are not cured inside the bond more often. Under the FHA rule, in force throughout these windows, a loan below the survey rate is routed to a partial claim rather than a modification; that relief is delivered inside the bond and is counted here only when the loan cures, so some of what appears as loans left behind may be loans in a partial-claim process. Whether borrowers were worse off than they would have been after a buyback requires following loans after a buyback; the main text's boundary design (Section 8.1) does so for the loans whose buyback the price induces, through the destination match. Two further qualifications apply: two-thirds of the

delinquency differential comes from banks resolving more of their loans below the survey rate, which the model does not predict and which runs opposite to the small positive bank slopes of Tables 5 and 6, and the differential rests on the large servicers.

Because the exposure measure was changed after seeing results, I ran the final specification once more on a holdout that had not been used: the two 2019 groups (January and July), followed six months to January 2020, with window-average depth fixed in advance (238,677 loans, 241 servicers). A nonbank cohort one point further below the survey rate is bought back 9.1 points less than a bank cohort (s.e. 4.6). In the estimation sample the same six-month comparison shows no difference (0.8 points more, s.e. 3.9) and the eighteen-month comparison 12.6 points less (s.e. 4.8), so the holdout is larger than the estimation sample at the matching horizon rather than a replication of the eighteen-month figure. The delinquency response has the predicted sign and a similar size, 8.5 points (s.e. 7.2), but at a six-month horizon it is not statistically distinguishable from zero. Total relief is 11.6 points lower (s.e. 6.7). Foreclosure does not differ.

IA.26 Deposit beta: estimates before and after the crosswalk correction

The deposit-beta test was first run on 16 October 2026 with an issuer-to-certificate crosswalk built by matching names. An audit on 17 October found five issuers matched to the wrong FDIC certificate (Citizens Bank, N.A. to First-Citizens Bank & Trust; First Federal Bank, Umpqua Bank, TIAA FSB and Fidelity Bank, N.A. to institutions with similar names) and two banks unmatched (BancorpSouth, now Cadence Bank, and M&T Bank); Wintrust Mortgage was assigned to its chartered bank, Barrington Bank & Trust. The corrected sample has 32 banks. The step $\times$ high-beta coefficient was 0.07 (0.14), 0.84 (0.28) and 0.28 (0.11) on the earlier crosswalk for the fall, the rise and the pooled sample, against -0.02 (0.16), 0.92 (0.29) and 0.23 (0.14) on the corrected one; with the size interaction, 0.90 (0.26) and 0.46 (0.15) against 0.93 (0.28) and 0.33 (0.11). The main text reports the corrected estimates. Scripts `58_fix_xwalk.py`, `54_bank_beta.py`, `55_bank_beta_rob.py`; the earlier inputs and outputs are kept as `bank_xwalk_v4.csv`, `bank_fin_v4.csv` and `results_bank_beta*_v4.csv`.

IA.27 Wild cluster bootstrap

The main estimates cluster by issuer. Table IA.20 reports, for each headline coefficient, the conventional clustered p-value and the p-value from a null-imposed wild cluster score bootstrap

for Poisson regression with high-dimensional fixed effects (Kline and Santos, 2012): the model is re-estimated under the null, the issuer-level scores of the tested regressor (partialled out of the fixed effects and other regressors with the Poisson weights) are perturbed with Rademacher weights, and the score statistic is compared with its bootstrap distribution over 9,999 draws. Clusters are the issuers that remain after cells with no buyouts in a fixed-effect group are dropped.

Table IA.20: Wild cluster bootstrap p-values for the headline estimates

	Coef. (s.e.)	Clustered p	Bootstrap p	Clusters
Price kink at +3, cohort design				
Jan–Jul 2019, nonbank minus depository	0.54 (0.14)	0.000	0.004	67
nonbanks	0.63 (0.13)	0.000	0.007	38
depositories	0.08 (0.04)	0.044	0.044	29
Oct 2016–Mar 2017, nonbank minus depository	0.48 (0.24)	0.042	0.050	94
nonbanks	0.53 (0.24)	0.024	0.033	51
depositories	0.05 (0.01)	0.000	0.032	43
Rate fall 2019–21, nonbank minus depository	0.61 (0.22)	0.006	0.026	102
nonbanks	0.74 (0.21)	0.000	0.001	67
depositories	0.12 (0.06)	0.047	0.049	35
Re-performing pool type opens (Feb 2021)				
Triple difference, FHA+VA	0.58 (0.24)	0.015	0.031	89
Triple difference, FHA	0.58 (0.24)	0.017	0.032	84
Nonbanks, FHA+VA	0.63 (0.26)	0.016	0.014	55
Depositories, FHA+VA	−0.08 (0.09)	0.37	0.62	34
Re-pooling barred (APM 20-07, Jul 2020)				
Triple difference, FHA+VA	−0.37 (0.61)	0.55	0.65	81
Triple difference, FHA	−0.34 (0.64)	0.59	0.71	75

Script `r2_wild.py`, output `results_wild.csv`. Specifications as in the main text's price and resale-rule tables.

IA.28 Specification curve

Figure IA.1 plots every estimate of the nonbank-minus-depository response to resale value over four thresholds (kink at a premium of two, three or four points, or the premium entered linearly), six windows (January–July 2019, 2019, the 2019–2021 rate decline, 2019–2022, October 2016–March 2017, July 2016–June 2017), three sets of fixed effects (issuer-by-month,

program-by-month and cohort; issuer-by-month and cohort; issuer-by-month, program-by-month and cohort-by-year) and two samples (FHA and VA, FHA only), and of the re-pooling triple difference over three windows, three program samples and two sets of fixed effects. Within one-year windows cohort-by-year effects coincide with cohort effects, so some of the 144 resale estimates are duplicates; the counts keep them. Of the 120 resale estimates outside the pooled 2019–2022 sample, 114 are positive and 76 are significant at the 5% level; 88 of the 90 threshold specifications are positive and 64 are significant, and 26 of the 30 linear-premium specifications are positive and 12 significant. All 24 January–July 2019 and all 24 calendar-2019 estimates are significant at the 5% level. The linear premium gives 0.02 to 0.03 in the October 2016–March 2017 window, where 37% of loan-months sat below a four-point premium. In the pooled 2019–2022 sample the 24 estimates lie between −0.14 and 0.14 with a median of 0.00; 12 are positive and 5 significant. The re-pooling triple difference is positive in all 18 specifications (0.11 to 1.10, median 0.62) and significant at the 5% level in 13; it is strongest when the post-period runs to December 2021 and weakest in the narrow November 2020–May 2021 window. Script `r3_speccurve.py`, output `results_speccurve.csv`.

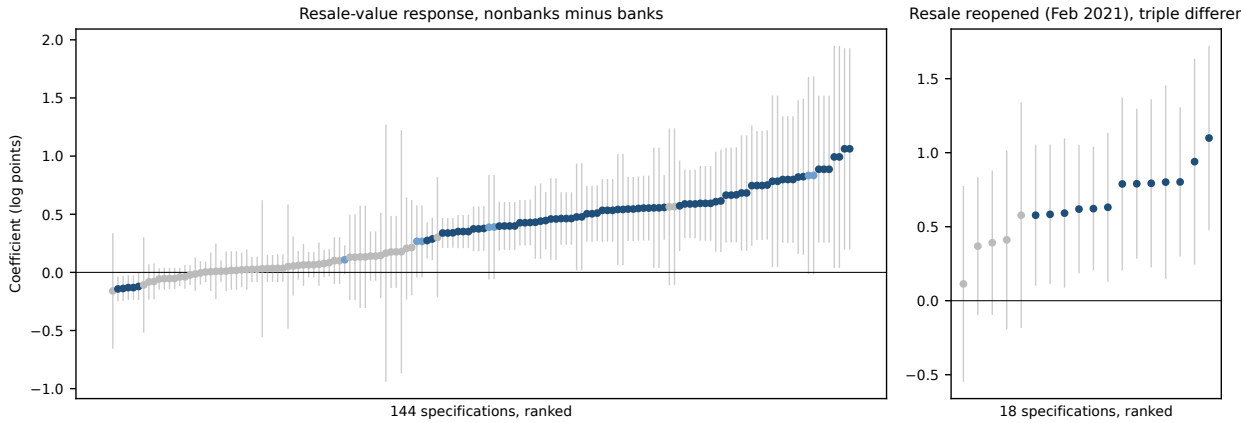


Figure IA.1: Specification curves. Left: nonbank-minus-depository response to resale value, 144 specifications. Right: re-pooling triple difference, 18 specifications. Dark: $p < 0.05$; light: $p < 0.10$; grey: otherwise. Bars are 95% intervals from issuer-clustered standard errors.

IA.29 Specification history and replication status

Sample. The loan-month sample was revised on 12 October 2026 after an audit found that buyouts executed in the first eligible month, the month in which a loan is first reported three months delinquent, had been excluded; 60% of buyouts occur in that month, and the earlier draft's depository buyout rates were about half their true level. Every estimate in the paper

and this appendix is on the revised sample. Estimates that could not be re-run on it were dropped: the quarterly VA event study and its inference checks, the USDA comparison, the July 2019–February 2020 carry window, and the matched-bank deposit-cost regressions of earlier drafts.

Choices made before and after seeing results. Specified in advance: the 2023–2025 out-of-sample test of the price step (written down before any estimate on 2023–2025 data was run, although the 2023 monthly files had already been read for the ten-month outcomes of 2019–2022 loans; nothing changed afterwards); the 2019 borrower holdout, including its exposure measure; the deposit-beta test of 16 October 2026 (prediction, beta definition, window, median split and three estimation windows); and the event windows, reference months and three placebo dates of the two resale-rule events. Chosen with the data in view: the half-point rate-gap threshold specified first showed nothing within cohort, and the break at the survey rate came from the shape regression; the price kink was first placed at 100, which showed nothing, and the thresholds of two, three and four points were chosen after the face-value-coupon interpolation and the price bins were seen, all three being reported; the one-point price bins were drawn after the kink estimates, and the two-point step was placed from them, with steps at face value and at one, three and four points reported; the coupon-separation table was designed after the horse race gave mixed results for 2021–2022; the coupon-boundary design was added on 17 October 2026, after every other estimate, using the two-point premium, and its threshold sweep (17 October) and its placebo pairs, timing, on-grid and outcome checks (18 October) were added afterwards; the exposure measure for borrower outcomes was changed from start-date to window-average depth after the start-date version showed no effect, and both are reported; the bond-price regressor was changed from the depository share to the servicers' buyout intensity after the first measure proved invalid; the 2019 and 2016–17 windows were chosen from the rate history before estimation, but the 2019 window was examined after the pooled 2019–2021 estimate pointed the same way; the destination-match key was changed after the first key matched 9% of buyouts, on the diagnostic that credit score and loan-to-value in a resold loan's record are not origination values; the issuer re-pooling propensity in the dose-response was added after the three-way differences were seen; the size interaction and leave-out rows of the deposit-beta table were added after the high-beta group was found to hold most bank buyouts; the bank crosswalk was corrected on 17 October (Section IA.26); and on 18 October 2026, after independent reviews of the draft, the following analyses were added, each written down before it was estimated: the boundary design on the months of 2014–2018 it had not used (main text, Table 9) and on 2023–2025, with a 2014–2018 coupon price index built as for 2016–2017; the borrower outcomes on 2014–2018 entries (main text, Table 17); two-way clustering of

the borrower estimates; and three further analyses: the borrower outcomes of the boundary design (Section IA.20), with the statuses and horizons fixed before estimation and all of them reported; inference at the level of the coupon pair and month, including the randomization test; and the tabulation of delivered coupons (Section IA.19). The cohort-design borrower table moved to Section IA.25 at the same time. Later, on 18 October 2026, the calibration with the institutional buyer's pricing cash flows and the description of its servicing records (Section IA.16) were added with the data in view. A first draft used the one offer whose workbook had been copied out of the buyer's files; the final version uses all 19 offers whose workbooks survive, in the last saved version of each. The after-purchase cohort is every loan bought from December 2019 to March 2020 and observed within two months of purchase, and the grid of funding rates was widened after the first results to include 2, 3, 5 and 7% and the 4.2% of the calibration. After an independent check of the draft, the cohort's start was corrected from September to December 2019 (no loan bought earlier is observed within two months) and loans already re-pooled when first observed were taken out of the purchase-status rows. Comparisons of the buyer's bids across coupons, a full recomputation of one workbook's bids from its saved inputs (which differ from the bid-date inputs; distinct from the linearity check in Section IA.16), and a counterfactual that treats the same loans as current were also run or begun; they are not used in the calibration and are not reported. Last, on the evening of 18 October 2026, after their results were known, the two 2023–2025 tests were taken out of the paper. In those years rates were rising, 74 to 98% of nonbank delinquent loan-months sat below the premium in each half-year (Section IA.24), and buybacks for resale do not pay when rates rise (Bandyopadhyay, Kim and Smith, 2026), so the window does not test the design. For the record, the frozen price step gave a nonbank-minus-depository difference of 0.68 (s.e. 0.26) with a nonbank step of 0.14 (s.e. 0.19), and the boundary design gave 0.31 (s.e. 0.17); the scripts (`50`–`53` and `68`) remain in the replication package.

Replication status. All estimates from public data were produced by code in the replication package (`rerun_v2/code`, scripts `00`–`68`) run on the author's computer from the public Ginnie Mae disclosure files, TRACE, FDIC call reports and Freddie Mac's survey rate. The code was written and run with an AI assistant under the author's direction. Every such estimate was produced on the revised sample by these scripts, run in several batches between 12 and 18 October 2026 rather than in a single pass; the author has not yet independently re-executed them. The script `run_all_paper.ps1` re-executes every script behind a reported estimate in order and writes a log for each. Records of the institutional buyer, the firm at which I was formerly employed, enter only as aggregates: its servicing records, under a non-disclosure agreement, in the main text's Section 7.1 and in Section IA.9; and its pricing records, pricing cash flows and servicing records after purchase, with its written

permission, in Sections IA.15 and IA.16 and the main-text passages that cite them. Because both permissions cover aggregates only, neither the records nor the code that reads them is part of the package: scripts 14, 16, 17, 19 and 19b of `rerun_v2/code`, the scripts that compute the buyer-record aggregates, and the script that recomputes one of the buyer's workbooks in Excel.

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