RESEARCH INSTITUTE FOR HOUSING AMERICA **SPECIAL REPORT**

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Executive Summary

The Financial Crisis witnessed massive upheaval in the U.S. housing market. Significant declines in house prices left a staggering percentage of homes in negative equity. Combined with high unemployment, defaults for some vintages of mortgages rose to double digit rates.The mortgage finance system was unprepared to deal with this level and intensity of borrower stress.

It is incumbent that we identify key lessons from the actions taken during the Financial Crisis to better prepare for future periods of housing market stress. The goal is to create a more robust system of mortgage that promotes sustainable homeownership. This requires examining mortgage design, underwriting, and intervention policies for addressing stressed mortgage borrowers. A basic principle is that prevention beats cure.

Efforts over time to make housing more affordable have often led to weaker underwriting and higher mortgage default risk. In addition, these efforts typically resulted in higher home prices benefiting existing homeowners rather than those trying to transition into homeownership. The FHA is an instructive case study in the downside of emphasizing affordability over sustainability. As the FHA shifted its focus over time its default rate rose from the low single digits to double digits.

There are three basic situations that lead to mortgage default. Strategic default occurs when borrowers have the ability to pay their mortgage but choose to default due to being in negative equity. Evidence indicates that this category accounts for less than 10 percent of defaults. Double-trigger default occurs when a borrower is unable to pay their mortgage due to a liquidity shock — income or payment — and cannot sell their home due to negative equity. A key issue in these cases is whether the liquidity shock is transitory or persistent. These cases make up the majority of defaults. Cash-flow defaults occur when the borrower is unable to pay their mortgage due to a liquidity shock and chooses not to sell their home even though they have positive equity. Many researchers discounted this as a likely category on the assumption that borrowers would be better off selling the house. However, foreclosure auction data indicates that many homes sold in foreclosure are in positive equity and that this category likely makes up around a third of defaults.

The aim when intervening with a stressed borrower is not to limit foreclosures (or to maximize the success of the intervention), but rather to minimize the loan's expected loss. To calculate the expected loss from foreclosure requires an estimate of the average loss associated with a foreclosure and the likelihood that a borrower in default will cure. For any intervention, estimates are needed for the average losses if the intervention is successful and if it fails, as well as the likelihood that the intervention will be successful (that is the borrower will not redefault). The design of the intervention will affect each of these three components. A key concept is the "breakeven" success probability that equates the expected losses from the intervention and foreclosure. Governments can induce lenders to incorporate externalities from foreclosures in their decisions by offering subsidies to interventions.

Two key strategies for addressing stressed borrowers are to mitigate any cash-flow constraints and to deleverage the borrower. Capitalization modifications that were popular at the outset of the Financial Crisis where the missed payments and penalties are rolled into the mortgage balance fail on both accounts. Given the prevalence of liquidity shocks as a default trigger and the challenges facing many households to self-insure with savings, liquidity insurance would help to limit mortgage default. As an example, liquidity insurance could provide three months of full mortgage payments in the case of a persistent shock — for example a death or divorce — for the family to sell the house. In the case of a transitory shock, liquidity insurance could provide six months of half mortgage payments. This would dovetail with the typical six months of unemployment insurance. The goal is to prevent the borrower from going delinquent. Payment forbearance is an alternative, but is not insurance and, in some implementations, requires the borrower to go delinquent.

If cash flow problems facing a stressed borrower are addressed, what if anything should be done in addition if the borrower is in negative equity? An emerging consensus from the Financial Crisis is that principal forgiveness is not economic. However, recent research indicates that this reflects poor targeting and the lack of up-side sharing of any house price appreciation. The poor targeting often reflects the lender's lack of information to inform that targeting. An alternative approach is for lenders to offer to swap equity for debt. Borrowers who think they can keep making their monthly payments until house prices recover will not likely accept. Unlike debt that is forgiven, equity provides up-side sharing for the lender of any future increases in house prices.

A goal across several Administrations has been to increase the U.S. homeownership rate. However, these efforts were based on the poor foundation of affordability instead of sustainability. Consequently, all of the gains were quickly lost during the Financial Crisis. Refocusing on sustainability will ensure that future gains in the homeownership rate are enduring and that households are more likely to attain their aspiration of one day owning their home debt free.

Introduction

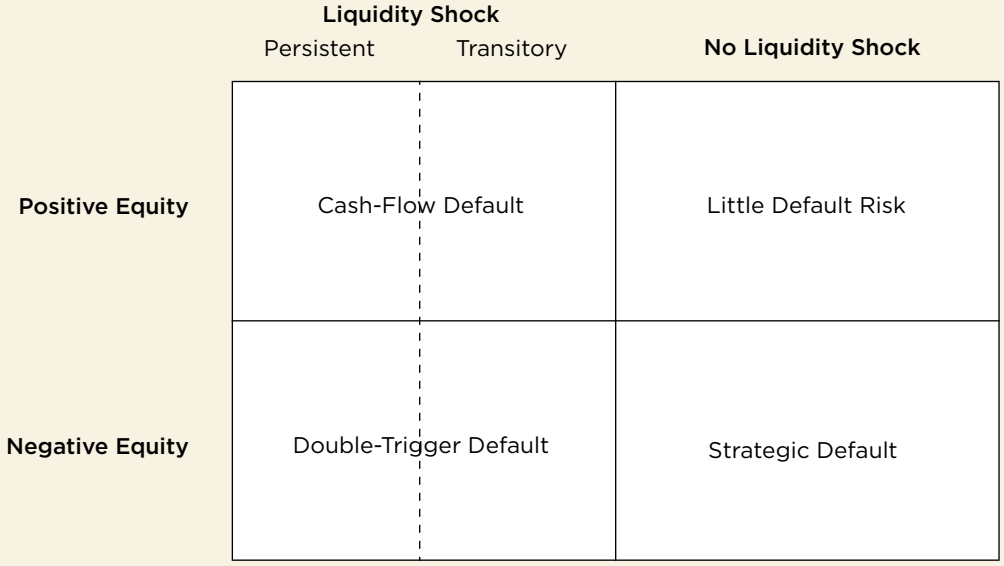
The Financial Crisis witnessed massive upheaval in the U.S. housing market. Significant declines in house prices left a staggering percentage of homes in "negative equity" or "underwater" with their current value below the mortgage balance. Combined with high unemployment rates, defaults for some vintages of mortgages rose to double digit rates. This level of stress in housing markets and mortgage finance had not been seen since the Great Depression.

Efforts to reduce defaults and subsequent foreclosures were initially reactive and slow to get underway. The mortgage finance system was unprepared to deal with this level and intensity of borrower stress. Over time policy actions became more broad based, energetic and forceful. Understandably, there was considerable "in the moment" learning about how to best intervene. Unfortunately, at the time this created uncertainty among market participants and a sense by investors of policy interventions "moving the goal posts" as the housing crisis unfolded.

As Nobel laureate Paul Romer stated back in 2004 "A crisis is a terrible thing to waste." It is incumbent that we identify key lessons from the actions taken during the Financial Crisis to better prepare for future periods of housing market stress. A goal is to create a system of mortgage finance that is more robust and promotes sustainable homeownership. A metric for sustainable homeownership is the fraction of time borrowers are homeowners between when they initially transition to homeownership to when they retire. This metric tracks the exposure time of households to house price appreciation and therefore the ability to accumulate home equity as a source of retirement wealth.

Improving the robustness of housing finance and sustainable homeownership requires examining mortgage design, underwriting, and intervention policies for addressing stressed mortgage borrowers. Improved transparency and predictability in mortgage finance with less need for ad hoc interventions during periods of market stress would promote better pricing and risk-sharing — key functions of financial markets that support robustness. In addition, proactive as opposed to reactive interventions would limit mortgage defaults and their associated costs to households thereby supporting sustainable homeownership.

Figure 1. Taxonomy of Mortgage Default



There are many reasons why a borrower defaults on a mortgage — that is, when a borrower becomes "seriously delinquent."[1] These often involve some combination of a liquidity shock — either income and/or payment — and being in negative equity on their mortgage. In these situations, it is important to assess whether the liquidity shock is likely to be transitory or persistent. These scenarios are illustrated in Figure 1. Key issues for robustness and sustainability when housing markets are stressed are the distribution of borrowers across the four quadrants, what percentage of borrowers in each quadrant will default and, absent any intervention, what fraction of defaulters in each quadrant will cure or go through foreclosure.

The NE quadrant of Figure 1 represents those borrowers where there is little default risk. They have at least some home equity to absorb any house price decline and the transactions costs of selling their home. In addition, they are not facing a liquidity problem. These households could sell their home and pay off their mortgage.

As we will discuss, the SE quadrant represents borrowers who are "strategic defaulters" in that they have an ability to pay their monthly mortgage but decide to default due to the value of the home falling below the outstanding mortgage balance.[2] While early default research focused primarily on this group, evidence suggests that this quadrant comprises a relatively small share of defaults. For this set of borrowers deterrence rather than mitigation is likely to be more effective at addressing any foreclosure risk. This could be accomplished with stronger recourse and shorter foreclosure times.

The SW quadrant represents borrowers who are "double-trigger" defaulters. These represent cases where the borrower is both unable to continue to make the mortgage payments due to a liquidity shock and unable to sell the home and pay off the mortgage due to negative equity and a lack of financial assets.[3] With the high unemployment rates during the Financial Crisis much of the focus for borrowers in this quadrant was on income-related liquidity shocks. However, across time payment shocks have also been an important contributor to this set of borrowers. A key question for borrowers in this quadrant is the degree to which mitigating default and foreclosure requires only dealing with the borrower's liquidity problem, or whether the negative equity must also be addressed. Important to this question is whether the liquidity shock facing the borrower is likely to be transitory or persistent, as well as the outlook for the economy and house prices.

The NW quadrant represents those borrowers who have positive equity but are facing a liquidity shock that results in falling behind on mortgage payments — "Cash-Flow Defaults." The fraction of borrowers in this quadrant who default depends in part on the capacity of the borrower facing a liquidity shock to continue to make mortgage payments from savings or other sources. A common view is that borrowers in the left side of this quadrant — those facing a persistent liquidity shock — can sell the house and pay off the mortgage thereby avoiding foreclosure (Foote et al., 2010). Perhaps surprising, there is evidence indicating that at times there are many completed foreclosures from this set of borrowers. For those borrowers in the right side of this quadrant (those facing a transitory liquidity shock), the risk of a default leading to foreclosure depends on how long it takes to recover from the liquidity shock and whether the borrower can reinstate the mortgage and resume payments or, instead, sell the home and pay off the mortgage.

Promoting sustainable homeownership involves addressing the specific needs of borrowers particularly those in the NW and SW quadrants to minimize defaults and any subsequent foreclosures. The relative sizes of these quadrants will vary over time depending on changes in mortgage design, underwriting standards as well as prevailing economic conditions. The significant house price declines associated with the Financial Crisis increased the relative size of the SW quadrant. In contrast, the COVID-19 health pandemic and the policy responses to limit the spread of the disease significantly increased the size of the NW quadrant.

Each crisis provides insights for effective policies to limit foreclosures for borrowers in these two quadrants. Making progress on sustainable homeownership and a more resilient system of mortgage finance requires evaluating mortgage design, underwriting standards and intervention policies to deal with these stressed borrowers. In this paper I will examine each of these elements.

Sustainable homeownership starts with mortgage design. Mortgage designs that build in potential upward payment shocks, allow negative amortization, or assume that the borrower can easily refinance after a few years can create default risk. Following the Financial Crisis in 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act included an "ability-to-repay" requirement. This was incorporated in the Qualified Mortgage (QM) rule which prohibited mortgages that were interest only, incorporated negative amortization or balloon payments. Lenders now have to make a good faith effort to determine that a borrower has the ability to repay the mortgage through verification of the borrowers' income, assets and debts. However, the scope for this rule was circumscribed since Freddie Mac and Fannie Mae (the GSEs) as well as the Federal Housing Administration (FHA),

1. Unfortunately, there is not a common definition of "default" in the literature. Researchers typically define a default as the borrower going 60- or 90-days past due. Default is a pre-condition for a borrower to go through a foreclosure process, though borrowers in default can cure the delinquency and avoid foreclosure

2. These households may or may not have the financial assets to be able to sell their home and pay off the full mortgage balance.

3. Brueckner et al. (2024) find that 6 percent of negative equity borrowers pay off their mortgage in full.

the Veterans Administration (VA) and state Housing Finance Agencies (HFAs) were exempted.[4]

Weak underwriting also creates default risk. The history of the FHA provides an interesting case study illustrating this point. Relaxing underwriting often happens incrementally and during times of low mortgage defaults. Advocates often argue that relaxing underwriting is necessary to promote homeownership through making mortgage credit more accessible and therefore owning a home more affordable. However, more often than not, these efforts end up making homes more expensive benefiting current owners rather than those households trying to transition from renting to owning. In addition, weak underwriting puts new homeowners at greater risk of defaulting on their mortgage which can have adverse long-term consequences.[5]

Effective intervention policies for stressed borrowers are also important. Given the prominence of liquidity shocks as a contributing factor to mortgage default, having borrowers self-insure, purchase liquidity insurance or be provided access to payment forbearance can reduce default risk. Liquidity insurance would be most effective if it were required for borrowers with inadequate liquid financial assets to cover three months of mortgage payments. This would treat liquidity risk similarly to credit risk where borrowers with small downpayments are required to purchase mortgage insurance. However, liquidity insurance is not designed to deal with the type of national liquidity shocks generated by the COVID-19 health pandemic and policy response.

A basic principle in finance is that when a borrower is stressed it is important to relax the cash flow constraint and deleverage the borrower. Unfortunately, many types of mortgage interventions such as capitalization modifications (where the lender rolls the missed mortgage payments and any penalties into the balance and returns the borrower to current status) violate this principle by increasing the borrower's monthly payment and indebtedness. To a lesser extent, payment forbearance and principal forbearance which involve adding a second-lien or final balloon payment onto the current mortgage also increases the borrower's overall indebtedness (see White, 2009a and 2009b). In contrast for borrowers in negative equity principal forgiveness or an equity for debt swap would reduce the borrower's monthly payment and degree of leverage.

Success at reducing defaults and limiting foreclosures depends on targeting the right intervention to the right borrowers. If a mortgage intervention would be accepted by all borrowers, then the lender/insurer must target the intervention by selecting which borrowers to offer it to. However, the lender/insurer must do this targeting using imperfect and incomplete information. This reduces the effectiveness of the targeting and raises the implementation costs. An alternative approach is to design interventions so that they will be accepted only (or primarily) by those borrowers that the lender/insurer would target if they had full information. In this case, the intervention can be offered to a broad set of stressed borrowers knowing that self-selection in take-up by borrowers will lead to well targeted acceptances. This reduces implementation costs and improves effectiveness and is one reason that equity for debt swaps would likely dominate principal forgiveness for negative equity borrowers.

Reducing defaults and foreclosures will promote sustainable homeownership and is the focus of this paper. However, it is important to note that foreclosure is not the only reason that homeownership is not sustainable. Lee and Tracy (2018) use the Federal Reserve Bank of New York (FRBNY) Consumer Credit Panel (CCP) data to follow FHA first-time buyers (FTBs). They document for the 2001 and 2002 cohorts of FHA FTBs that almost 25 percent were unable to sustain their homeownership. However, only half of these cases involved households that lost their home through foreclosure. The remaining half successfully paid off their mortgage but transitioned back to renting for at least 3 years. A comprehensive approach to homeownership sustainability also requires understanding and addressing the determinants for this transition back to renting.

The next section provides a case study of the FHA's single family mortgage guarantee program and how it shifted its focus over time from sustainable to affordable homeownership. This shift significantly increased FHA mortgage defaults with little lasting benefit on affordability. I then turn to a discussion of theories of mortgage default illustrated in Figure 1 and an assessment of these theories based on survey data, statistical analysis of defaults and foreclosure auction data. This provides a foundation for a discussion of the design and choice of mortgage interventions for stressed borrowers that highlights the key data elements necessary to make informed choices. The following section summarizes research results on the degree and determinants of redefault from mortgage intervention and how this affects the evaluation of different intervention approaches. I then take a "blank sheet" approach to mortgage design, underwriting and intervention that builds on the insights from the Financial Crisis. The aim is to outline an effective, proactive, and transparent approach that supports the goal of a robust system of mortgage finance and sustainable homeownership. The paper concludes with a discussion of why increasing the U.S. homeownership rate in a durable manner requires a refocus on sustainable homeownership.[6]

4. The GSEs were exempt from the QM 43 percent debt-to-income ratio cap under CFPB's QM patch if the underwriting standards met Desktop Underwriter or Loan Prospector.

5. Examples of research following households' post foreclosure experience include Brevoort and Cooper (2013), Molloy and Shan (2013) and Chan et al. (2014).

6. The FHA could also sharpen its focus on sustainable homeownership by restricting its guarantees exclusively to purchase mortgages for FTBs. This would be similar to the restriction that prohibits state HFAs from raising funds from tax exempt mortgage revenue bonds to refinance mortgages (U.S.C., Section 143a, 1986).

Prevention Versus Cure: The Importance of Mortgage Design and Underwriting

In this section, I use the FHA as a case study to understand how mortgage design and underwriting can help limit default and the need for intervention thereby supporting sustainability of homeownership.

In 1934 with the onset of the Great Depression, it was estimated that 45 percent of urban owner-occupied homes were in default (Wheelock, 2008). In response, the Home Owners' Loan Act of 1933 created the Home Owners Loan Corporation (HOLC) to purchase defaulted loans from banks. Over the initial three years, HOLC purchased more than a million mortgages from lenders replacing them with liquid government guaranteed HOLC bonds. Borrowers of these mortgages were refinanced into a 15-year amortizing mortgage with a 5 percent mortgage rate and up to an 80 percent loan-to-value (LTV) — where this mortgage design choice reflected a desire by policymakers to limit redefaults on the new HOLC mortgages.

The objective of HOLC was to help foster economic recovery by cleaning up bank balance sheets so that they could resume lending. The economy, though, was still struggling and banks were reluctant to make new mortgages without mortgage insurance. However, the private mortgage insurance market had dissolved due to earlier significant losses (see Alger Commission Report, 1935). While HOLC had involved the federal government directly in mortgage lending, there was a strong desire by the Roosevelt administration to return mortgage financing to the private sector.

The legislated solution was the passage of the National Housing Act of 1934 that created the FHA. Unlike earlier private mortgage insurance (PMI) which covered a percentage of the loss on a defaulted mortgage, FHA's mortgage insurance covered up to the full principal and interest. This broadened coverage addressed the concern by banks over the uncertain economic environment and the effects this might have on the performance of these new mortgages.[7]

To qualify for FHA insurance the mortgage had to be a 20-year amortizing fixed rate mortgage (FRM) with at least a 20-percent downpayment. This was similar to the structure of the HOLC mortgages but with a 5-year longer term. This longer term further reduced any rollover risk thereby providing time for the economy to recover. The mortgages had no prepayment penalty and were assumable. The maximum loan size was $16,000 which was over three times the median house price in 1930.[8]

Given its roots in the Great Depression, the initial goal of the FHA was to promote homeownership sustainability in order to support economic recovery. This was accomplished by providing credit guarantees for long-term mortgages designed to promote home equity accumulation. The FHA, in a 1936 publication, articulated this goal as follows (see Vandell, 1995):

> "The possession of a home, free and clear of all debt at the earliest possible date, should be the goal of every American family."

Over time, the FHA's focus shifted from sustainability to "affordability".[9] The nascent economic recovery stalled in 1937 (see Eggertson and Pugsley, 2006) and the Steagall National Housing Act of 1938 reduced the required downpayment on FHA mortgages from 20 to 10 percent and the loan term was extended to 25 years for new homes valued less than $6,000. Despite the resulting increased default risk from higher LTVs and slower debt amortization, the FHA mortgage insurance premium was also cut in half to 25 basis points.

7. It is possible that if the private mortgage industry was financially sound in 1934 that the FHA would not have been created. This suggests that an alternative legislative approach would have been to establish the FHA as a temporary bridge to allow time for the private mortgage industry to reconstitute itself and then sunset the FHA. Alternatively, the FHA could have been established as a co-insurer or reinsurer for private insurers. Instead, the permanent status of the FHA created a barrier to entry for private mortgage insurance companies which did not re-enter the market until 1957.

8. That is, at its outset FHA mortgage insurance was broad based rather than targeted at FTBs.

9. The FHA has used the term affordability in describing its mission. However, a better term is accessibility. Efforts by the FHA intended to improve affordability also improve access. However, some actions taken by the FHA have improved access to mortgage credit without affecting the cost of the credit to the borrower. Both types of actions can impact sustainability.

The term of FHA mortgages was further extended in 1948 to 30 years for new homes and in 1954 for existing homes. The minimum downpayment was progressively lowered in the 1950s to 3 percent in 1957 (currently the minimum is 3.5 percent for borrowers with credit scores of 580 or higher). The lower downpayments and longer terms reduced the pace of equity accumulation for FHA borrowers. For example, after five (ten) years the amortized LTV on a FHA mortgage (apart from house price appreciation) went from 76.5 (63) percent in 1950 to 91.5 (84.3) percent in 1961 (see McFarland, 1963).

There was recognition within the FHA that these shifts in mortgage design and underwriting standards would have a meaningful impact on the credit risk to the FHA's insurance fund. The tension between affordability and sustainability was articulated by FHA Commissioner Hardy in the 1963 FHA report.

> "There can be no question that the assumption by FHA of progressively increasing risks to accomplish the legislative objective of making home purchases more widely possible has had an influence on the recent FHA property acquisition experience."

It took time for these mortgage and underwriting changes to impact the default rates on FHA mortgages. During its first 20 years, the FHA insured 2.9 million mortgages of which only slightly more than 9,000 ended in foreclosure — a foreclosure rate of only 0.3 percent. Over the period from 1948 to 1962 the FHA default rate moved within the narrow range of 0.5 to 1.25 percent. However, by the early 1960s the higher risk was evident as loans insured in 1958 with LTVs of 96–97 accounted for 49 percent of foreclosures between July 1961 and March 1962, but only 16.8 percent of insured mortgages. In contrast, mortgages with LTVs of 80 or less accounted for only 1.2 percent of all foreclosures and 12.4 percent of insured mortgages, (see McFarland, 1963, Table 12).

The underwriting standards for FHA mortgages continued to erode over time. From 2011 to 2021, despite the very low minimum downpayment requirements, between 30 and 40 percent of FHA borrowers used downpayment assistance.[10] That is, the borrower received help with the downpayment from family, a government or non-government source. Kelly (2006) reports that for FHA borrowers who received downpayment assistance, the amount accounted for almost all of the required downpayment. Borrowers who receive downpayment assistance perform worse than other borrowers. The FHA reported in its 2009 Annual Report to Congress (Table 12) that from 2000 to 2008 the unconditional claim rate on FHA mortgages with downpayment assistance ranged from 2.3 to 3.2 times the claim rate on other mortgages. Kelly (2006) controls for many other determinants of default and finds that FHA downpayment assistance raises the conditional default rate from 16 to 19 percent.[11]

In addition, the FHA guaranteed mortgages with increasingly high borrower debt-to-income (DTI) ratios.[12] The higher a borrower's DTI, the less budget capacity the borrower has to absorb a liquidity shock and still be able to make the required mortgage payments. From 2000 to 2021 the fraction of new FHA guaranteed mortgages with "high" DTIs — in excess of 42 percent — more than doubled from 25 percent to 55 percent. High DTIs can be mitigated if a borrower has savings that can cover several months of the required mortgage payments, i.e., "months reserve". However, from 2009 to 2019 the fraction of FHA borrowers with less than two months reserve ranged between 40 and 50 percent (FHA Annual Reports, Table B-11).

The reported default rates for FHA mortgages are also biased downward (in a conceptual sense) due to the FHA's "streamline" refinance program. In an environment of falling mortgage rates this program allows FHA borrowers to lower their monthly payment by refinancing even if the mortgage is in negative equity. This refinance program makes sense given that the FHA owns the credit risk. However, Caplin et al. (2015) argue that the streamline refinance program necessitates calculating FHA default rates by following the borrower and not the mortgage. For the years 2007 and 2008 vintages of FHA purchase mortgages, they show that the mortgage-based default rate understates the borrower-based default rate by 24 to 29 percent.

As an example, consider a borrower who takes out an FHA purchase mortgage in 2007, streamline refinances in 2009 and again in 2011 (note that there is no limit to the number of times a borrower can streamline refinance). In 2013 the borrower defaults. In the FHA's mortgage-based accounting, this borrower paid off two mortgages and defaulted on one mortgage — that is, two "successes" and one "failure". In addition, the default would be assigned to the 2011 refinance mortgage not to the 2007 purchase mortgage that created the credit risk. If we follow the borrower through the streamline refinances — which simply transfer the original credit risk to subsequent mortgages — the borrower experience ended in a default which is assigned back to the 2007 mortgage — no successes and one failure.

Lee and Tracy (2018) use the FRBNY CCP data to measure FHA default risk using a borrower — rather than mortgage-based approach. The authors focus on FTBs which comprise

10. FHA Annual Reports to Congress, Table B-10. State Housing Finance Agencies FTB purchase mortgages have a higher rate of downpayment assistance (Moulton and Quercia, 2014).

11. Kelly reports that seller-funded downpayment assistance raised the conditional default rate from 44 to 49 percent.

12. The DTI is calculated as the annual mortgage payments plus property tax and homeowners' insurance divided by the borrower's annual income.

the majority of FHA purchase mortgages. The FRBNY CCP is a random 5 percent sample of household credit files that are tracked over time. This allows the authors to link FHA streamline refinances back to the original purchase mortgage. The borrower experience is labeled as a "default" if the loan history terminates in "120+ day past due" or "charged off". Correctly measured, the default rates for the 2001 and 2002 cohorts of FHA FTBs were 12 percent and rose to 30 percent for the 2006 cohort. This increase over time in default rates required the FHA to increase its efforts and focus on mortgage interventions (see Capone, 1996).

While the stresses from the Financial Crisis would have increased defaults even if the FHA had maintained key features of its original mortgage design and underwriting, the erosion in both aspects over time magnified the default risk. As former FHFA Director Mark Calabria said in his book Shelter From the Storm.

> "Hard experience had proven that sustainable homeownership depended on strong, sensible underwriting." (page 13)

This is the sense in which prevention beats cure.

The systematic pattern of changes over time in the FHA's mortgage design and underwriting resulted from a shift in its mission focus from sustainable to affordable homeownership. The irony is that for many housing markets with relatively inelastic housing supply demand subsidies provided by the FHA to make purchasing a home more affordable instead resulted higher house prices and little to no resulting gain in affordability for new homeowners. An alternative approach to support affordability is to enact policies that increase the supply of lower cost housing.[13]

13. See, for example, the American Enterprise Institute Housing Center's work on zoning reforms to support "Light Touch Density." See https://www.aei.org/light-touch-density/.

Theories of Mortgage Default

Designing effective and efficient interventions for stressed mortgage borrowers starts with an understanding of the drivers of mortgage default as illustrated in Figure 1.

For example, if negative equity is a key determinant of default, then reducing the likelihood that a borrower ends up in negative equity should help to limit defaults. This can be accomplished by requiring higher minimum down payments and/or promoting mortgage designs with faster amortization of the mortgage balance.[14] Also, policies such as the ability for lenders to pursue a deficiency judgment against defaulting borrowers and shorter foreclosure timelines would be relatively more effective at mitigating strategic default as opposed to default driven by an inability to pay (see Ambrose et al., 1997 and Cutts and Green, 2005).

For readers who are less interested in the details of mortgage default theories and empirical testing, let me provide a summary. You can then skip to the next section. Early theories focused on negative equity as the primary driver of mortgage default. Survey data, however, pointed to the importance of liquidity shocks as a contributing factor. These can be either an adverse income or payment shock and can be transitory or persistent. If a borrower is in negative equity and experiences a liquidity shock, the combination of an inability to pay the mortgage with the inability to sell the house and pay off the mortgage pushes the borrower into default. There do appear to be a small percentage of defaults where borrowers can afford to pay the mortgage but choose not to due to negative equity. In addition, auction data indicate that some homes in foreclosure sell for more than the obligations by the borrower to the lender — that is, the borrower has positive equity. This suggests that in some cases liquidity constraints alone can lead to mortgage default and foreclosure.

Early theories of mortgage default started with the view that the borrower has an option to "put back" the house to the lender if the value of the house fell below the balance of the mortgage (see Foster and Van Order, 1984; Kau et al., 1994; and Vandell, 1995). Given sometimes lengthy foreclosure timelines,[15] whether the option is in or out of the money depends on the borrower's expected equity position just prior to end of the foreclosure process.[16] This theory of mortgage default was called "strategic" or "ruthless" default (the SE quadrant of Figure 1).

Negative equity is the key to strategic default. That is, for strategic default it is sufficient that borrowers expect to be in negative equity at the time of the foreclosure completion and they do not need to have suffered any liquidity shock. In the case of strategic default, the borrower could continue to make the mortgage payments but, instead, chooses to default.

There are several challenges to estimating the fraction of defaults that appear to be strategic. The first is estimating whether the borrower is in negative equity — that is, has an estimated LTV greater than one. There are two challenges in estimating a borrower's current LTV. The first is that a borrower may have multiple mortgages taken out against a property. In these cases, it is important to have information on all liens in order to correctly calculate the numerator of the borrower's current "combined loan-to-value" (CLTV).[17] The denominator of the current LTV is typically estimated using the purchase price (or appraised value) updated using a house price index. The second challenge is the heterogeneity in house price changes within the area covered by the index.[18] We discuss these two issues in more detail below. A final challenge in estimating the share of strategic defaulters is that mortgage servicing data do not provide updates on borrowers' income making it difficult to determine if the borrower could continue to make the mortgage payments.

14. An example of the latter is the Wealth Building Home Loan proposal by Ed Pinto and Stephen Oliner at the American Enterprise Institute. See https://www.aei.org/wp-content/uploads/2022/12/The-Wealth-Building-Home-Loan.pdf

15. For example, Ambrose et al. (1997) report that after reaching 90-DD, FHA borrowers spend on average 13.8 months until a completed foreclosure.

16. This could help explain the finding in Bhutta et al. (2017) that "borrowers do not walk away until they are deeply underwater — more deeply than traditional models predict." The degree of current negative equity is a predictor of future negative equity at foreclosure.

17. As indicated, what is more important is the expected CLTV at the time of the completion of the foreclosure. This would depend on expected timelines for the foreclosure process as well as a forecast for future house price changes.

18. Aragon et al. (2010) estimate that the standard deviation in individual house price appreciation is typically greater than 20 percent. This dispersion grows with the time since the purchase and creates measurement error in updated house values. In addition, what borrowers think their house is worth may not align with the updated value implied by a house price index. This is especially true prior to the time when borrowers could look up their estimated house "values" on sites like Zillow. Goodman and Ittner (1992) find that self-reported house values tend to diverge over time since the purchase date from updated values based on price indices.

Two early studies used mortgage servicing data and credit data to estimate the share of strategic default. Foote et al. (2010) use the insight that strategic defaulters would likely progress straight from current to serious delinquency. Liquidity shocks in contrast to strategic default would likely result in the borrower moving back and forth through stages of delinquency as the household tries to get current on the mortgage. For a default to be classified as strategic, Foote et al. (2010) require three things: (1) the borrower is current for 3 months and then goes from 30- to 90-days delinquent (DD) over three months; (2) the borrower has never been previously seriously delinquent; and (3) the borrower does not subsequently move back to 30- or 60-DD. In their data mortgage servicing data covering the period from 2003 to 2008, 30.8 percent of defaults meet these requirements.

Experian-Oliver Wyman (2009) used a similar approach based on borrower credit files. They infer a strategic default as occurring if a borrower went straight from being current to 180-days delinquent with no delinquencies on any other credit lines.[19] Their tabulations indicated that roughly 20 percent of mortgage defaults were strategic. Bradley et al. (2012, 2015) extend this analysis by incorporating updated borrower income. They use CoreLogic mortgage servicing data merged with Equifax credit data. In addition to capturing a borrower's credit information, the Equifax Workforce Solutions provides employment and income data for 54 million workers from more than 7,000 employers — typically larger employers. These employers provide Equifax with employee employment/income information so that Equifax can directly respond to inquiries to verify an individual's employment status and income.

A limitation with the Equifax Workforce Solutions income data is that for an individual whose income goes to zero, researchers can't distinguish between an individual becoming unemployed or instead switching jobs to an employer that does not use the Equifax service. However, the data is reliable for ruling out if an individual who is at a covered firm suffered an adverse income shock. In addition, the CoreLogic data captures all liens on the property allowing a calculation of the combined amortized mortgage balance. Updated house values are calculated using CoreLogic's repeat-sale house price indices.

A basic finding by Bradley et al. (2012, 2015) is that as one further refines the measure of strategic default its estimated share of overall defaults declines meaningfully. Using the Experian-Oliver Wyman definition of strategic default, the authors find a similar share of around 21 percent. Requiring, in addition, that the borrower also be estimated to be in negative equity reduces this share to 16.6 percent. Finally, further narrowing the focus to borrowers who did not experience an adverse income shock reduces the strategic default share to between 7.7 and 14.6 percent depending on the measure of income shock used.

A separate empirical challenge for the strategic default theory was the observation that following the Financial Crisis a vast majority of borrowers that were estimated to be in negative equity remained current on their mortgages. CoreLogic reported in September 2012 that for borrowers estimated to be in negative equity only 15 percent were delinquent.[20] This is at odds with the view that negative equity is a key driver for default.

The observation that most negative equity borrowers never default and that only a small share of defaults appear to be due just to negative equity created increased interest in a second theory of mortgage default. The "double trigger" theory views negative equity as a necessary but not a sufficient condition for default (see Gerardi et al., 2007; Foote et al., 2008 and 2010).[21] In addition to negative equity (the first trigger), a second trigger must also occur that prevents the borrower from being able to make the required mortgage payments. Research on mortgage default during the Financial Crisis typically assumed this second trigger was an income shock — say from unemployment.[22] The combination of an income shock with negative equity pushes the borrower into default. Absent any interventions, whether the borrower can cure the default depends on the persistence of the income shock and the borrower's months reserve.

19. See also Keys et al. (2012) and Mayer et al. (2014).

20. See http://www.dsnews.com/argicles/borrowers-in-negative-equity-slowly-declining-as-home-values-gain-report-2012-09-2.

21. Riddiough (1991) posits a "life-event" theory of mortgage default. An early discussion of the double trigger hypothesis is in Ambrose and Capone (1998) and Goldberg and Capone (1998).

22. This focus during the Financial Crisis on unemployment as a second trigger reflected the fact that over the period from 2007 to 2009 the unemployment rate increased from 5 to 10 percent resulting in more than 15 million unemployed individuals.

Testing the income shock version of the double trigger hypothesis faces a similar challenge in that mortgage servicing data does not include updated borrower income. As an alternative, researchers often included a local unemployment rate as a proxy for the likelihood that a borrower experienced an income shock. A challenge to this version of the double-trigger theory was that researchers reported that the unemployment rate had a much smaller estimated impact on mortgage default than other risk factors such as the borrower's credit score (see for example Elul et al., 2010). In 2008, the FHA's annual evaluation of its mortgage insurance fund dropped the unemployment rate from its default models on the grounds that it did not help in explaining defaults (IFE, 2008 pg. A-13). The intuitive appeal of the double trigger hypothesis was confronted by an apparent lack of empirical support.

Gyourko and Tracy (2014) reconcile this expected role of borrower unemployment in mortgage default and the poor performance of local unemployment rates in estimated default models. They argue that the local unemployment rate is a very poor proxy for the missing information on whether the borrower is unemployed. To demonstrate this point, they create simulated unemployment transitions that in aggregate match the dynamics of the reported Bureau of Labor Statistics' (BLS) unemployment rate. They then simulate mortgage payment histories where transitions by a borrower to unemployment were calculated to raise the default hazard by 645 basis points. Using the simulated data, they estimate a standard default model using the implied unemployment rate. However, the estimated coefficient on the unemployment rate was only 0.00042 — despite the large true effect. Scaling up the small estimates of the impacts of the unemployment rate on default by the large degree of attenuation bias confirms the likely important role of unemployment in mortgage default consistent with the double trigger hypothesis.

More direct confirmation of the role of unemployment as a second trigger for mortgage default required finding borrower-level data on mortgage performance and updated borrower income and/or employment status. Gerardi et al. (2018) use micro data from the Panel Study of Income Dynamics (PSID) over the period from 2009 to 2013 to evaluate the relative prevalence of strategic and double trigger default. The data provides information on mortgage delinquency, borrower income, unemployment spells and household consumption. They estimate that a 10 percent decline in residual income raises the probability of default by between 1.1 and 2.5 percentage points (a significant increase). An unemployment spell by the household head had the equivalent estimated impact on default risk as a 35 percent decline in home equity.

Ganong and Noel (2023) use linked checking account and mortgage servicing data for 2.9 million Chase customers starting in October 2012. This data provides an updated but noisy measure of household income.[23] Updated payment history and CLTVs are available for those customers whose mortgages are serviced by Chase. Ganong and Noel (2023) find that income begins to decline 6 months prior to the borrower reaching 90-DD for borrowers with both positive and negative equity. A similar pattern exists for bank account balances. This similarity supports the importance of adverse income shocks as a determinant of mortgage default but raises the question of whether negative equity is a necessary condition. We return to this question later in this section. They also report that only 3 percent of defaults in their data appear to be due solely to negative equity with an upper bound estimate of 11 percent — consistent with Bradley et al. (2012, 2015) that strategic default is the exception.

The double-trigger theory of default can be broadened to consider any liquidity shock as the second trigger — rather than just an income shock. Borrower survey data of the reasons for default across many time periods and types of mortgages support this generalization as illustrated in Figure 1.[24] The FHA in its 2011 Annual Report to Congress (Table 5) provides the primary reported reasons for default on FHA mortgages for the period from 2007 to 2011Q3. Data on 1.7 million FHA defaults indicate that the share due to "income or employment" is 50 percent, "excess obligations" is 21.4 percent and "other" is 28.7.[25]

Table 1 summarizes two additional surveys in the 1970s and in the 2000s where I have tried to make the reported reasons conforming across the surveys. This is helpful to see if the stated reasons for default have materially changed over time. The survey data in Table 1 indicate that income loss is the leading stated reason for mortgage default with more than 40 percent of borrowers selecting this reason in both surveys. Divorce, death and illness also account for a sizeable fraction of survey responses. Finally, adverse expense shocks account for between 15–24 percent of responses across the two surveys.

Low (2023) provides more recent survey data that support taking a broad view of liquidity shocks as the second trigger for mortgage default. Low uses data from the American Survey of Mortgage Borrowers (ASMB) collected between 2016 and 2018 which is merged to mortgage servicing data. The analysis is based on data for 1,400 delinquent borrowers (90-DD). For borrowers who indicated that they had "concerns or difficulties" in making their mortgage payment (92 percent of respondents) they were asked the source(s) of these difficulties. Respondents could select multiple reasons, so the percentages are not comparable to those in Table 1.

23. If a household has multiple Chase checking accounts, the accounts are aggregated. However, if a household has multiple checking accounts across different banks, then the household income may be partially censored.

24. Some caution is needed in interpreting self-reported reasons for default.

25. The most frequent reasons in the "other" category are death, illness or marital problems.

Table 1. Survey Reasons for Mortgage Default (Percent)

Reason	Gardner and Mills (1989)[a]		Cutts and Merrill (2008)[b]	
Loss of income	40.1		41.8	
Unemployment		21.3		17.4
Curtailment of income		18.8		22.0
Business failure				2.3
Extreme stress other than income loss	23.7		14.4	
Excess obligations				11.5
Extreme hardship				2.5
Payment adjustment				0.4
Death or illness	6.3		23.2	
Property problem/casualty loss	0.6		1.9	
Other	14.3		13.1	

Note: Category "Financial Problems" in Gardner and Mills is mapped to "Extreme Stress Other Than Income Loss" in Cutts and Merrill.
a. Sample of 713 90-DD borrowers with mortgages originated in the 1970s.
b. Freddie Mac mortgages originated between 2001–2006 that were evaluated using Workout Prospector system.

The importance of liquidity shocks as contributing to mortgage payment difficulty is underscored by the fact that 72 percent of respondents reported at least two liquidity shocks as contributing to their default. Unexpected expenses were indicated as a contributing factor in 63.8 percent of responses. The second most cited reason was job loss at 56.4 percent. The next two most cited reasons were payments on large debts (44.3 percent) and illness, disability or death (43.3 percent). The ASMB data provide strong support for considering liquidity shocks — income and/or expense — as a second trigger.

Low (2023) argues further that liquidity shocks alone should be treated as a third theory of default — "Cash-Flow" default shown in the NW quadrant of Figure 1 — and not just a contributor to the double-trigger hypothesis (SW quadrant). That is, negative equity should not be considered as a necessary condition for default. This reflects the finding that only 35 percent of delinquent borrowers are in "effective" negative equity with this fraction increasing to just 52 percent for completed foreclosures.[26] This closely matches the fraction of ASMB respondents who respond that negative equity was a factor in their foreclosure.

This finding accords with earlier research by Ambrose and Capone (1998) who examine the prevalence of estimated negative equity using data on FHA-insured mortgages with defaults reported in 1988 through 1994. Updated LTVs are estimated using OFHEO SMSA repeat-sale house price indices. In a sample of 43,751 defaults, 92.7 percent of borrowers at the time of the default had estimated positive equity.

The question posed by Ambrose and Capone (1998), and later by Foote et al. (2010) and Foote and Willen (2018) is why would a positive equity borrower go through foreclosure rather than sell the house prior to foreclosure. If a borrower is facing transitory liquidity shocks (either income and/or expense related), then given long foreclosure timelines it may be completely rational for the borrower to default on the mortgage and prioritize other payments until the liquidity shock dissipates. At that point, the borrower can work to become current again on the mortgage and avoid foreclosure. That is, selling the house may not make sense for all positive equity borrowers facing an adverse liquidity shock. Along these lines Ambrose and Capone (1998) state

> "The main body of defaults likely come from borrowers who use their non-payment status as a means of financing other expenditures (page 393)."

This is also consistent with observed high cure rates from 90-day delinquency that will be discussed later in the paper.

If liquidity constraints alone were the principal cause of mortgage default, then one would not expect to find LTVs as a useful predictor of default. However, a consistent finding across empirical studies of mortgage default is that updated LTVs are a strong predictor of default (see for example Caplin et al., 2015 for FHA mortgages; Haughwout et al., 2008 and Sherlund, 2010 for non-prime mortgages; and Deng et al., 1996 for GSE mortgages). Given the measurement error in estimating updated LTVs, this suggests that the true effect of updated LTV on mortgage default is likely even stronger. Similarly, liquidity constraints as a primary default trigger would suggest that a borrower's DTI would have a stronger influence on default than is found in empirical studies (see Foote et al., 2010).

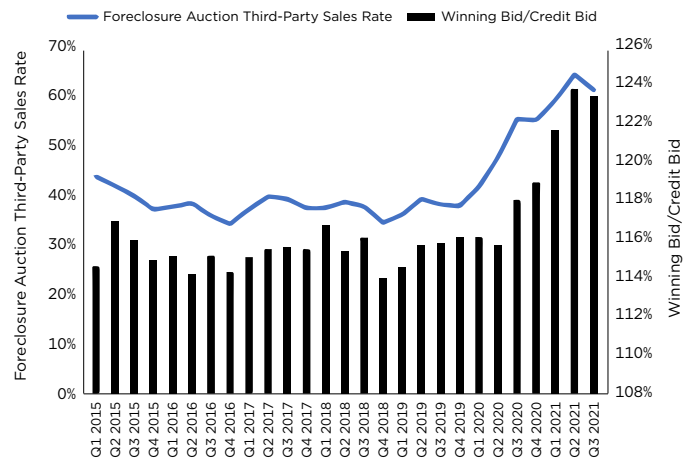
26. "Effective negative equity" means that the borrower cannot pay off the mortgage using the proceeds from selling the house net of selling costs.

As noted earlier, not all defaults end up as foreclosures. Stronger evidence of the role of negative equity in foreclosure would be provided by estimated models of the hazard of foreclosure rather than just default. However, fewer studies have examined the effect of LTV on the risk of foreclosure. Foote et al. (2008) find that the risk of foreclosure is 5 times higher for a borrower estimated to have an updated LTV of 120 relative to a value of 80. Again, measurement error in the updated LTV implies that this is likely an underestimate of the relative underlying foreclosure risk.

Additional insights on the degree to which negative equity is necessary for mortgage default can be obtained from foreclosure auctions. Lenders typically set a minimum price equal to the unpaid mortgage balance plus all fees incurred as a result of the foreclosure process. Consequently, the percentage of foreclosure auctions that do not result in a sale would be an indication of the fraction of negative equity properties at the time of foreclosure auction.[27] If there is no sale, the home transitions to "real estate owned" (REO) by the lender who then arranges to subsequently sell the property.

Foreclosure auction data indicates that positive equity properties do end up going through foreclosure. Cutts and Merrill (2008) using data on Freddie Mac loans originated between 2001 and 2006 that went through foreclosure by September 2007 report that 13.2 percent were sold at auction to a third party. More recent data on foreclosure sales and prices is available from Auction.com.[28] Their Q4 2021 Foreclosure Market Outlook provides data beginning in 2015 on foreclosure sales and prices. Figure 2 summarizes from their data the fraction of successful foreclosure auctions and, conditional on a sale, the ratio of the winning bid to the lender's "credit bid."[29] Between 2016 and 2019 (the post Financial Crisis and pre-COVID period), between 30 to 40 percent of foreclosure auctions resulted in a sale. Conditional on a sale, the winning bid generally exceeded the lender's credit bid by between 20 and 30 percent.[30] Foreclosure auction data reveal that a meaningful percentage of homes at the end of the foreclosure process have positive equity. This illustrates that negative equity is not necessary for foreclosure.

Figure 2: Foreclosure Sales Rates in Excess of Credit Bid by Lender



Source: Auction.com, Q4 2021 Foreclosure Market Outlook

The question raised by Ambrose and Capone (1998), Foote et al. (2010) and Foote and Willen (2018) can be reframed as why would borrowers with positive equity prefer having the lender attempt to sell the house at a foreclosure auction instead of selling the house prior to the auction using a broker. The surplus of the winning bids over the credit bids appears to be more than sufficient to cover the selling costs if the borrower used a broker to sell the house pre-auction. There are several constraints that would indicate that foreclosure auctions would not likely provide the highest price for a property. Bidders at an auction typically do not have access to the property for inspection and must pay cash. While shedding light on the question of whether negative equity is necessary for default, foreclosure auction data leave us in the dark regarding the motivations and situations of borrowers leading up to the auctions.[31]

Summarizing the evidence on the theories of default, the data indicate that negative equity and liquidity shocks are two forces pushing borrowers into default. Negative equity alone rarely appears to lead to foreclosure — with estimates of strategic default typically in the single digits. Survey and foreclosure auction data suggest that liquidity constraints alone may account for roughly a third of foreclosures. This leaves the majority of foreclosures resulting from a combination of negative equity and liquidity shocks — most likely shocks of a persistent nature. Importantly, the mix of types of default in Figure 1 will likely vary over time reflecting differences in economic conditions.

27. That is negative equity as perceived by potential buyers of the properties at the time of the foreclosure auction.

28. Auction.com is a transaction platform with 6.9 million registered buyers. To date, the platform has generated 510,000 sales at a total value of $62 Billion. There are roughly 15,000 sales per year across all states. See: https://www.auction.com/lp/about-us/

29. The credit bid is the value of the note including accrued interest, late fees, and costs associated with the foreclosure. The lender can bid up to the credit bid without having to come up with cash at the sale.

30. Any surplus from a winning bid at the auction over the lender's credit bid is transferred to the borrower.

31. It is possible that borrowers may underestimate the value of their property. Some of these cases could also involve borrowers who have vacated the property and are not in communication with the lender/insurer. Others could be cases of contentious divorce or estate settlements where the parties are uncooperative.

Mortgage Intervention Design and Selection

We turn now to a discussion of whether a lender/insurer should intervene in the case of a stressed borrower, and, if so, the appropriate design and selection of that intervention. I will assume that the objective of the lender/insurer is to minimize the expected loss on a mortgage to a stressed borrower. This calculation will not incorporate any potential negative externalities of a foreclosure on neighboring properties or any long-term costs to the borrower. Incentivizing lenders/insurers to internalize these externalities and mitigate long-term borrower costs can be addressed with government subsidies for intervention.

This section borrows from Ambrose and Capone (1996) who explored the concept of a "breakeven" success rate for a stressed mortgage intervention where foreclosure is treated as the default option. The premise is that an intervention would be pursued only if the expected loss associated with the intervention was less than the expected loss from a foreclosure.[32]

Define the following terms:

Let P_C = probability that a loan in default will "cure" prior to foreclosure completion

L_F = average loss in a completed foreclosure

$L_{I,S}$ = average loss for a successful intervention *I*

$L_{I,F}$ = average loss for an unsuccessful intervention *I* that results in a foreclosure ($L_{I,F} < L_F$)[33]

Each of these losses is calculated relative to the expected value if the borrower pays off the mortgage.

Researchers often measure the cure rate as the probability that a borrower in default transitions back to current over some time window following the default. However, as we will discuss later, borrowers can cycle between default and being current — that is, a cured mortgage can redefault. For our purpose the cure rate P_C is defined as the probability that a borrower in default pays off the mortgage balance in full. In the analysis that follows, I assume that there are no cures from an intervention.

INTERVENTION DESIGN

In deciding whether to intervene for a stressed borrower and, if so, what intervention to use it is important to optimize the design of each different intervention approach. Selecting the design of an intervention to maximize its success rate is not the objective. Rather, the aim of design choices is to minimize the expected loss associated with that intervention.

The expected loss from a foreclosure conditional on a default is given by the probability that the borrower does not cure multiplied by the average loss associated with a foreclosure.

$$E(L_F) = (1 - P_C)L_F \quad (1)$$

Similarly, the expected loss associated with an intervention *I* is the probability weighted average of the average losses given a successful intervention versus an unsuccessful intervention. This can be expressed as the average loss from a failed intervention plus the probability of a successful intervention times the average loss differential between a successful and unsuccessful intervention.

$$\begin{aligned} E(L_I) &= P_{I,S}L_{I,S} + (1 - P_{I,S})L_{I,F} \\ &= L_{I,F} + P_{I,S}(L_{I,S} - L_{I,F}) \end{aligned} \quad (2)$$

where $(L_{I,S} - L_{I,F}) > 0$. Holding constant the loss differential, the expected loss declines as the probability of success increases. Similarly, holding the probability of success

32. Note that this section is more technical in nature and readers who are less interested in the mechanics can skip to the next section.

33. Since losses are negative.

constant, the expected loss declines as the loss differential between success and failure widens.

Consider now the design choice for an intervention. Let α denote some design feature of the intervention — for example, the number of months of forbearance, the percent reduction in the monthly mortgage payment or the percent of principal that is forgiven. Assume the following:

$$\frac{\partial P_{I,S}}{\partial \alpha} > 0, \quad \frac{\partial L_{I,S}}{\partial \alpha} < 0, \quad \frac{\partial L_{I,F}}{\partial \alpha} \lesseqgtr 0$$

(where losses are negative values). That is, doing more of α increases the probability of success, but also increases the average losses associated with a successful intervention and may also increase the average loss associated with a failure of the intervention followed by foreclosure.

The optimal design for an intervention would select the value of α for each design feature so that any small change in this design feature from a specified value leaves the expected loss from the intervention unchanged. This involves balancing the expected benefit from adjusting this design feature with the associated expected cost.

$$\frac{\partial E(L_I)}{\partial \alpha} = \left[P_{I,S} \frac{\partial L_{I,S}}{\partial \alpha} + (1 - P_{I,S}) \frac{\partial L_{I,F}}{\partial \alpha} \right] + (L_{I,S} - L_{I,F}) \frac{\partial P_{I,S}}{\partial \alpha} = 0 \qquad (3)$$

The first term in square brackets on the right-hand side is expected costs from the design change while the second term is the expected benefit from the design change.

For simplicity, assume that the design change does not impact $L_{I,F}$. For example, the design change will not delay the expected time of a foreclosure or its associated average loss conditional on the failure of the intervention. With this assumption, for a design change to reduce the expected loss it must be the case that the resulting increase in the success rate satisfies the following condition.

$$\frac{1}{P_{I,S}} \frac{\partial P_{I,S}}{\partial \alpha} \geqslant \frac{-1}{(L_{I,S} - L_{I,F})} \frac{\partial L_{I,S}}{\partial \alpha} \qquad (4)$$

The proportional increase in the success rate due to the design change must be at least as large as the proportional increase in the expected loss from success where we scale the change in the average loss given a successful intervention by the average loss differential.

For example, assume that the expected loss under a current design from a successful intervention is $20,000 and from an unsuccessful intervention is $60,000 and the success rate is 50 percent. A design change under consideration is expected to increase the loss from a successful intervention by $10,000, what is the minimum increase in the probability of success that makes this design change profitable? Using the expression above, this works out to 12.5 percent. So, if the design change is expected to increase the success probability, but only by 8 percent, this change is not economic even though it further reduces the likelihood that the borrower ends up in foreclosure.

This illustrates the point that the objective of intervention design is not to maximize an intervention's success rate. Put differently, it is incorrect to measure the "success" of an intervention's design by measuring the "prevented" foreclosures — where more prevention is assumed to be better. Often, though, this is the metric for success that is the focus in policy discussions as well as used to track the performance of the intervention.

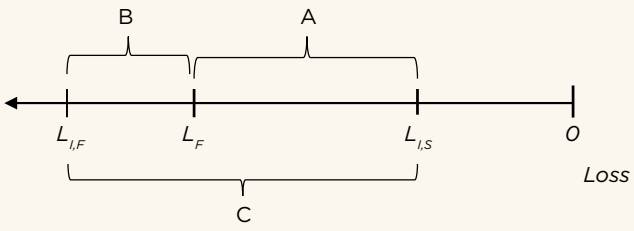
PURSUING ALTERNATIVES TO FORECLOSURE

Assume that the designs for each alternative to foreclosure have been optimized to minimize the expected loss from that intervention. In this case, a net present value (NPV) approach implies that an intervention would be pursued only if one of these interventions offers a lower expected loss than that associated with foreclosure. If not, then lender/insurer would pursue the foreclosure option.

MORTGAGE INTERVENTION SELECTION

Recall that the expected loss from foreclosure is given by $(1 - P_C)L_F$ while the expected loss from a mortgage intervention I is given by $L_{I,F} + P_{I,S}(L_{I,S} - L_{I,F})$. The three average losses that make up these two expected losses — successful intervention, unsuccessful intervention and foreclosure — in terms of magnitudes follow the following pattern where we assume that the loss from a failed intervention exceeds the loss from foreclosure.

Figure 3: Relative Loss Rates From Foreclosure and Interventions



A successful intervention reduces the loss relative to a foreclosure (segment A). However, a failed intervention increases the loss relative to foreclosure (segment B) since the mortgage still goes to foreclosure, but now possibly with an extended timeline and the additional costs incurred in implementing the failed intervention. The loss differential between success and failure for an intervention (segment C) is given by the sum of the other two segments.

The "breakeven" success probability for the non-foreclosure intervention, $P^*_{I,S}$, is the success rate that equates the two expected losses.

$$(1 - P_C)L_F = L_{I,F} + P^*_{I,S}(L_{I,S} - L_{I,F})$$

$$P^*_{I,S} = \frac{(L_{I,F} - L_F) + P_C L_F}{(L_{I,F} - L_{I,S})} \quad (5)$$

If the cure rate were zero, then the breakeven success rate is given by the ratio of B (the incremental loss due to a failed intervention as compared to foreclosure) to C (the incremental loss from a failed intervention as compared to a successful intervention) in Figure 3.

Factoring in a positive cure rate increases the breakeven success rate since cures reduce the expected loss from foreclosure for a given loss associated with foreclosure.

$$P^*_{I,S} = \frac{(L_{I,F} - L_F) + P_C L_F}{(L_{I,F} - L_{I,S})} > P^*_{I,S}\ (P_C{=}0) \quad (6)$$

The higher the cure rate the higher the associated breakeven success rate for an intervention. The breakeven success rate for an intervention is driven to one — that is the intervention will never be an optimal choice — when the cure rate reaches the threshold $(L_F - L_{I,S})/L_F$. If there is observable heterogeneity in cure rates across borrowers, then lenders/insurers can "target" mortgage interventions to those distressed borrowers with lower predicted cure rates.

Redefault and the Choice and Design of Mortgage Interventions

As discussed above, five factors are critical for a lender/insurer in evaluating the effectiveness of a mortgage intervention relative to foreclosure. The first two are the average loss from foreclosure and the cure rate from default. These two determine the expected loss from a foreclosure which determines the hurdle for a mortgage intervention to dominate the foreclosure option. The three other factors are the success rate associated with each type of mortgage intervention and the average loss given success and the average loss given failure associated with each intervention. The challenge in practice is that these five factors vary across borrowers and across time. That is, it is unlikely that one approach will always be optimal for dealing with all stressed borrowers across all time periods.

Loss rates vary significantly across insurers and over time. A detailed discussion of the components of the average loss in a completed foreclosure, L_F, and the impact of state foreclosure laws is provided by Clauretie and Herzog (1990).[34] Qi and Yang (2009) report loss severities of 30.5 percent from Freddie loans acquired between 1990 and 2003. An and Cordell (2021) report that Fannie and Freddie (GSEs) loss severities averaged between 15 to 20 percent between 2000 and 2003 and then rose to over 45 percent by 2011. Despite the post Financial Crisis recovery in housing markets, they report that as late as 2017 the GSEs loss severity rates remained above 35 percent.

Turning to the FHA, low downpayments for FHA guaranteed mortgages contribute to higher loss severities. The FHA in their Annual Reports to Congress report loss severity rates that ranged between 36.4 percent in 2021 to 64.5 percent in 2011. Similar to Fannie's experience, loss severity for the FHA increased as a result of the Financial Crisis. Between 2009 and 2012, the FHA's loss severity in each year exceeded 60 percent. This higher loss severity during the Financial Crisis existed across all categories of mortgages. Cordell et al. (2009, page 7) report that during the Financial Crisis loss severities increased significantly to around 50 percent for prime mortgages, 60 percent for near prime mortgages and 70 percent for subprime mortgages.

State foreclosure laws also influence loss severity by lengthening the average time to complete a foreclosure. The sensitivity of loss severities to foreclosure timelines depends on the outlook for house prices. Delays generate relatively higher severity rates when house prices are declining. Cutts and Merrill (2008) using Freddie data on loans originated between 2001 and 2006 estimate that the costs of foreclosure increase by 12 percent for every 50 days between the start and completion of a foreclosure. Cordell et al. (2015) estimate that following the Financial Crisis foreclosure costs increased by 15 percentage points in judicial review states in contrast to only 4 percentage points in non-judicial review states.[35] An and Cordell (2020) estimate that reducing foreclosure timelines by one year would reduce loss severity for the GSEs by 5 to 8 percentage points.

Calculating the expected loss to foreclosure also requires estimates of borrower cure rates from default. To reiterate a point made earlier, the cure rate that we need is not the

34. For simplicity of notation, I am assuming that at the time that an intervention is being considered the average loss associated with a foreclosure is known. In fact, this loss will be uncertain so the lender/insurer will have to use an estimate based on current information.

35. The impact of state foreclosure laws on expected foreclosure costs could be reflected in risk-based mortgage insurance rates. This would incentives states to weigh any benefits from a judicial foreclosure process against the higher mortgage insurance costs to its residents.

rate that is typically cited in research. In our analysis in the prior section, the cure rate is defined as the probability that a seriously delinquent borrower will successfully pay off the mortgage. This is not the same as the probability that a seriously delinquent borrower transitions back to being current on the mortgage which is what is often reported in research. Redefault is a problem not just for mortgage interventions, but also for self-cures if the lender/insurer is pursuing foreclosure.

For example, Adelino et al. (2013) report a 30 percent cure rate for a sample of mortgages where the authors define a "cure" as a mortgage being current, 30-DD or pre-paid within 12 months from an initial transition to 60-DD. What this statistic does not indicate is what fraction of borrowers who ever reach 60-DD (or 90-DD) end up successfully paying off their mortgage(s). This is the relevant statistic for calculating the expected loss from foreclosure. The question is how much lower due to redefault is the "final" cure rate from the "initial" cure rate? Data limitations prevented Adelino et al. (2013) and other researchers at the time from being able to calculate this statistic.

Ambrose and Capone (2000) find that subsequent default risk for borrowers who reinstate out of a first default is significantly greater than the risk of initial default. In an earlier paper, Ambrose and Capone (1998) provide a detailed analysis of redefault of initial cures. They use data on FHA mortgages originated after 1987 with performance data through the end of 1995. They define default as a borrower reaching 90-DD. They report an initial cure rate of 57.6 percent. However, 43.2 percent of these cures subsequently redefault at least once. They track these borrowers through up to five cycles of cures and redefaults. The final cure rate is 45.3 percent — 21.3 percent lower than the initial cure rate.

Measuring the cure rate for FHA mortgages is further complicated by their streamline refinance program. As discussed earlier, the FHA streamline refinance program allows its borrowers to refinance into another FHA mortgage without going through a full underwriting — even if the borrower is underwater. While a borrower has to be current on their FHA mortgage to do a streamline refinance, this does not preclude a delinquent borrower from transitioning from delinquent to current, later doing a streamline refinance and this being treated as a final cure even if the borrower subsequently goes through foreclosure on the streamline refinance.

Caplin et al. (2015) use data provided by CoreLogic that ties these streamline refinances back to the original FHA purchase mortgage. This allows them to define a cure as the FHA credit risk is paid off. They estimate that the upper bound of the cure rates from 90-DD was 20.7 percent — less than half of the rate reported by Ambrose and Capone (1998). However, there is considerable uncertainty at the end of their sample as to the final cure rate as 78 percent of loans that reached 90-DD were still active and 9 percent had their servicing transferred so their payment history could no longer be followed.

A challenge for making decisions regarding mortgage modifications versus foreclosure is that up-to-date estimates of cure rates will not be available. The most complete data on cure rates will be for mortgages that were stressed well prior to the current situation facing lenders/insurers. One option is to go back to the historical data from the Financial Crisis and do a complete tabulation of cure rates from serious delinquency (broken down by characteristics of the mortgage, borrower, and local housing market) to use as a high stress benchmark. Tabulating these cure rates with updated data will avoid the censoring of the earlier estimates created by the large percentage of on-going mortgages at the time of the earlier research.

I will approximate the success rate for an intervention as one minus the redefault rates for modified mortgages.[36] This is another key factor in terms of selecting among modification approaches/designs as well as comparing a modification to the foreclosure option. Estimates of redefault rates suffer from the same data problem as cure rates in that they are downward biased since they are typically calculated using a limited time window following the modification. Similarly, success rates (or redefault rates) and loss severities for various types of mortgage interventions pursued following the Financial Crisis can now be more accurately calculated with the benefit of the additional post-crisis servicing data.

Early analysis from the Financial Crisis focused on redefaults on modifications (mods) prior to the HAMP program. For example, Adelino et al. (2013) use a 6-month window following a mod. They report that 20–40 percent of payment reduction mods redefault in their data, and that 40–50 percent of all mods redefault. This high overall redefault rate reflects that a sizeable percentage of mods — especially early in their sample — were "capitalization" mods that added the missed payments and penalties onto the borrower's mortgage balance leading to increased monthly payments and leverage.

Turning to redefault of HAMP mods, the OCC-OTS Mortgage Metrics Reports for the 4th Quarters of 2010 and 2011 report 90-DD redefaults within 12 months of a modification ranging from 25.2 to 29.8 percent for mods in the second half of 2009 and ranging from 33.7 to 38.0 percent for mods made in the second half of 2010. While redefaults are likely front loaded in the time since the modification, all of these redefault estimates would likely increase to some degree if each modified mortgage could be followed to its eventual conclusion.

36. The success rate on an intervention will equal to one minus the redefault rate only if mortgages that go through an intervention and redefault never subsequently cure. I have not seen an estimate of the cure rate from redefaults of loan modifications.

Longer post modification windows provide a more accurate estimate of the redefault rate. Haughwout et al. (2016) report a 56 percent redefault rate over the subsequent 12 months for mods in a sample of securitized nonprime loans originated between 2004 and 2007. Maturana (2017) uses a 2-year window and reports a 51 percent redefault rate for mods in a sample of non-agency mortgages originated between 2000 and 2007 (with performance information through September 2012).

The measured redefault rate increases with the length of the post-mod window but after a point at a decreasing rate. Moulton et al. (2022) examine mortgages that received temporary payment assistance (up to 24 months) from the Treasury's Hardest Hit Fund. Their estimates indicate a 48-month redefault rate of 38 percent. This compares to a 32 percent redefault rate after 12 months and 37 percent after 24 months. As another example, Huff (2023) examines 99,551 GSE 30-year FRMs that received loss mitigation between 2008 and 2012. These loans are followed up to the end of 2019 providing a better long-term estimate of redefault. Huff defines redefault as subsequent to the intervention, the mortgage experiences six or more months of default or completing a foreclosure. For those mortgages that received 20-30 percent principal and interest (P&I) reductions, the overall redefault rate was 43.2 percent. After 6-months the redefault rate was 9.0 percent (only 20.8 percent of the overall) and after 12-months the redefault rate had risen to 18.3 percent (42.4 percent of the overall).

It is important to keep in mind that these reported redefault rates are averages and do not control for differences in the types of modifications offered to borrowers as the Financial Crisis unfolded. As defaults and foreclosures increased, lenders/insurers shifted away from capitalization mods to designs that provided more payment relief to borrowers.

This shift was magnified by the introduction in early 2009 of the Home Affordable Modification Program (HAMP) that provided subsidies for mods with more significant payment reductions. A HAMP mod targeted a reduction in a borrower's DTI ratio to 31 percent. This was achieved by following the HAMP "waterfall" of first reducing the interest rate on the mortgage to as low as 2 percent, next extending the term to 40 years, and finally providing principal forbearance.[37] The lower interest rate would remain in place for five years, and then move up by one percentage point a year to the current 30-year mortgage rate (based on the Freddie Mac Primary Mortgage Market Survey). Agarwal et al. (2017) report that a permanent HAMP mod generated on average a 25 percent reduction in the borrower's monthly payment.

As noted earlier, more generous modifications (from the borrower's standpoint) will likely reduce redefault rates, but at the cost of increasing the average loss associated with a successful modification. For a failed mod, if more payment relief extends the expected time until a redefault, then added payment relief may also increase the loss associated with a failed mod by extending the time until a completed foreclosure.

Recalling the earlier discussion of calibrating the design of each type of modification (the choice of α) to minimize the expected loss, several papers examine how the generosity

37. For details see Holden et al. (2012).

of a modification as measured by the percent reduction in the monthly payment affects the redefault rate. In addition, holding constant the percent reduction in the monthly payment, researchers have examined whether the way in which the payment reduction is achieved matters — that is, through interest rate reductions, term extensions and/or principal forbearance or forgiveness.

For an FRM the monthly mortgage payment is calculated as follows:

$$Balance = \frac{P\ \&\ I}{r_M / 12}\left[1 - \frac{1}{\left(1 + r_M / 12\right)^{12 \times T}}\right]$$

Rearranging,

$$P\ \&\ I = \frac{Balance \times r_M / 12}{\left[1 - \frac{1}{\left(1 + r_M / 12\right)^{12 \times T}}\right]} = f\,(Balance, r_M, T) \qquad (7)$$

where *Balance* = mortgage origination balance, r_M = mortgage rate and T = term of the mortgage in years. An implication is that if we are controlling for the P&I in a redefault regression, we can only control for two of the three determinants of the P&I.

Haughwout et al. (2016) analyze securitized subprime mortgage mods between December 2005 and April 2009 — preceding the introduction of HAMP. As noted earlier, many of the mods early in their sample are capitalization mods. The authors focus their redefault analysis on the subset of mods that reduce the borrower's monthly payment. A redefault is defined as a mod transitioning back to 90-DD over the subsequent 12 months. For the mods receiving a lower interest rate, the average rate reduction was 300 basis points. For these borrowers, their balances increased by an average of 7 percent. Principal forgiveness was rarely offered to borrowers in their sample as only 3 percent of the mods received a balance reduction.

Haughwout et al. (2016) report that a 10 percent reduction in the borrower's monthly payment is associated with a 4.5 percentage point reduction in the 12-month redefault rate. Similarly, Agarwal et al. (2011) report that a 1 percentage point decline in the mortgage interest rate is associated with a 4 percentage point decline in default probability. Huff (2023) reports that the redefault rate on GSE loan mods increases from 43.2 percent for those that receive a 20-30 percent payment reduction to 60 percent for loans that received no payment reduction.[38]

Since Haughwout et al. (2016) observe few mods in their data that involve principal forgiveness, they infer the effect of a balance write-down by estimating the effect of the current LTV and mortgage balance at modification on the redefault rate. Relative to a mod with an LTV below 90, having a current LTV above 100 increases the 12-month redefault rate from 4.6 percent (LTV of 100–104) to 33.3 percent (LTV > 120). In addition, every additional $10,000 in the mortgage balance at modification is associated with an increase in the 12-month redefault rate of 0.4 percent.

From these estimates the authors infer that controlling for the reduction in the borrower's monthly payment the borrower's redefault rate will decline by more if the payment reduction occurs through a principal write down versus an interest rate reduction (see also Quercia and Ding, 2009 and Schmeiser and Gross, 2016). Principal write-down reduces redefault through three channels — a lower monthly payment, a lower LTV and a lower mortgage balance. It is important to keep in mind that Haughwout et al. (2016) were not able to directly examine a large sample of mods involving principal forgiveness.

The HAMP program provided an opportunity to directly study principal forgiveness. Scharlemann and Shore (2016) examine loans that received principal forgiveness under the HAMP Principal Reduction Alternative (PRA) program. They exploit some quasi-experimental variation in the degree of principal forgiveness induced by the program design. The average HAMP PRA mod provided a 28 percent reduction in the mortgage balance. The authors estimate that this only reduced the quarterly redefault rate (90-DD) from 3.8 percent to 3.1 percent. They conclude that principal forgiveness does not dominate interest rate reductions as a means to lower the monthly mortgage payment for stressed borrowers.

Kalikman and Scally (2023) argue that the HAMP PRA program was poorly targeted and that this explains the weak results estimated for its principal forgiveness. The authors argue that principal forgiveness can be a preferred modification approach for a subset of borrowers. They suggest that this type of modification works best for underwater borrowers with poor credit scores. High credit score borrowers are more likely to cure their serious delinquency and avoid future liquidity shocks thereby buying time for house prices to recover. Borrower expectations about the likely path of house prices are important to the borrower's behavior (Cordell et al. 2009).

Using simulations Kalikman and Scally estimate for low credit score negative equity borrowers that principal forgiveness which reduces their updated LTV to 95 would have prevented 84 percent of their defaults thereby saving lenders/insurers an average of $14,000 per intervention. Unlike traditional principal forgiveness, Kalikman and Scally incorporate sharing of house price appreciation into their

38. In contrast, a borrower's debt-to-income is a very weak predictor of initial mortgage default (Foote et al., 2010).

modification design. It is not clear how much of the added benefit from their principal forgiveness is related to this design feature versus the improved targeting.

The decision to reduce the borrower's monthly payment through an interest rate reduction versus a balance reduction also depends critically on the expected loss given redefault for each option. These expected losses depend on the prospect for recovery in house prices. If the primary concern with an interest rate reduction is that the borrower will redefault while still in negative equity, then, in this event, the lender/insurer will not recover the full balance of the mortgage anyway. This negates one advantage of lowering the borrower's monthly payment through an interest rate reduction rather than a principal writedown.

Furthermore, if the borrower faces an additional liquidity shock, a principal reduction mod in contrast to an interest rate reduction may allow the borrower to sell the house rather than go through a foreclosure. Having the borrower sell the house is generally preferable to having the lender/insurer sell the house in REO. These considerations imply that an environment of depressed house prices and expectations for a protracted recovery will likely increase the relative attractiveness of principal forgiveness relative to interest rate reductions as a way to lower borrower monthly payments in an effort to reduce foreclosures.

A key takeaway is that near-term expectations for the economy and house prices are important for evaluating the relative merits of providing payment relief through lower interest rates or lower mortgage balances. The near-term economic outlook matters as it affects the likelihood that a borrower resolves their current liquidity shock and/or faces a new liquidity shock that could lead to redefault. The relative loss from a successful principal forgiveness mod as compared to a successful interest rate reduction mod rises with the probability that house prices will recover during the time that the borrower will likely remain current on the modified mortgage. If for both types of mods the borrower can sell the house and pay off the mortgage, then the loss from the interest rate reduction is just the present value of the difference in monthly payments between the modification date and the sale date. For principal forgiveness, the loss also includes the present value of the forgiven mortgage balance. This component of the loss can be mitigated if, as in Kalikman and Scally (2023), there is sharing of any house price appreciation.

ILLUSTRATIVE EXAMPLE

The concepts on intervention choice and design can be illustrated with a simple numerical example. Consider a borrower who purchases a home for $300,000 with a 10 percent down payment. Assume that the borrower finances the balance of $270,000 with a 30-year FRM with a mortgage rate of 5 percent. Over the next three years the borrower makes timely payments, but house prices decline by 30 percent. At the end of the third year the borrower experiences a liquidity shock and misses the next three payments. At this point, the amortized balance on the mortgage including the three missed payments is $261,776 (assume no late fees are applied) pushing the borrower to an updated LTV of 125.

If the lender/insurer does not intervene, assume that the cure rate is 24 percent — the Adelino et al. (2013) initial cure rate of 30 percent adjusted to a final cure rate using the Ambrose and Capone (1998) 21.3 percent reduction from initial to final cure rate. Assume, as well, a 50-percent severity rate applied to the unpaid principal balance (UPB) for a completed foreclosure. This implies a foreclosure loss of $130,888 and an expected loss of $99,475.

The first intervention that the lender/insurer considers is an interest rate reduction/term extension. The intervention lowers the monthly payment from $1,449 to $1,139 — the average reduction of 21.4 percent reported by Haughwout et al. (2016). This involves reducing the mortgage rate from 5 percent to 3.25 percent and extending the term back to 30 years.

Assume that the borrower stays current on the modification for three years and then must move. Consequently, a successful modification will require that the borrower can sell the house and pay off the mortgage using the proceeds less transactions costs. The amortized balance at the time of the move is $244,819. If sales commissions are 5 percent, then this requires the house price to appreciate from $210,000 to $257,705 or nearly 23 percent. If this occurs, then the loss from the successful rate/term mod is $10,152. However, if house prices do not recover and the borrower redefaults the lender/insurer restarts the foreclosure process. To be conservative, assume that the borrower maintains the house during the three years following the rate/term mod and that the loss severity from the failed mod followed by foreclosure is the same as from a foreclosure just with the proceeds from the sale delayed three years. In this case, the loss from a failed rate/term mod is $148,710.

Since the rate/term mod reduced the borrower's P&I by the average amount reported by Haughwout et al. (2016), we will use their average redefault rate of 56 percent. This is conservative since they measured the redefault only over the 12-months following the modification. This redefault rate gives an expected loss from the rate/term mod of $87,745. This represents an expected savings of $11,730 relative to the foreclosure option.

Before considering other intervention options, the lender/insurer could consider a design change for the rate/term mod that increases the relative reduction of the P&I to the borrower. The key question is whether the benefit from a more aggressive interest rate reduction is worth the cost. Haughwout et al. (2016) report that an additional 10 percent reduction in the monthly payment is associated with a 4.5 percentage point lower redefault rate. This would imply reducing the interest rate to 2.36 percent yielding a new lower monthly payment of $1,014. Assuming everything else in the example remains the same, this change increases the loss from a successful mod by $5,654 to $15,806. At the same time, using the Haughwout et al. (2016) results this lowers the redefault rate by 4.5 percentage points to 51.5 percent. The expected loss for this design of the rate/term mod is $84,251 — a further savings of $3,494.

The lender/insurer also considers two alternative interventions to the initial rate/term mod. The first alternative is principal forgiveness of $60,208 or 23 percent. This would bring the borrower's updated LTV down to 96 and would provide essentially the same monthly payment as the rate/term mod. This mod would allow the borrower, if necessary, to sell the house and pay off the balance essentially providing a similar option to a short sale without the complication of having to obtain lender/insurer approval of the sale price.

Success for this intervention requires that the house price in three years is at least $200,141. This implies that even if house prices drift down another 4.7 percent over the three years following the mod, with the principal writedown and additional amortization the borrower can still sell the house and pay off the mortgage. The loss if this principal writedown is successful is $60,208. Using the same assumptions as earlier, the loss if this principal writedown is unsuccessful is the same $148,710.

The key is what redefault rate to use to calculate the expected loss. One approach is to start with the 56 percent average redefault rate from Haughwout et al. (2016) that is associated with the average monthly payment reduction of 21.3 percent. The authors report that controlling for this magnitude of the payment reduction, reducing the borrower's updated LTV from 120+ to 90–94 would reduce the redefault rate by 28 percentage points and reducing the mortgage balance by $60,209 would further reduce the redefault rate by 2.5 percentage points. This would result in a redefault rate of 25.5 percent. This yields an expected loss of $82,776 — lower than the expected loss of $87,745 from the rate/term mod.

The second alternative intervention under consideration is principal forbearance. In this case, the 23 percent reduction in the balance is rolled into a no interest second-lien payable on the sale of the house. Again, the borrower would be given a new 30-year FRM with a 5 percent mortgage rate the same as in the principal forgiveness intervention, but now also the no interest second-lien mortgage. This would reduce the borrower's monthly payment by the same amount as the rate/term and principal forgiveness interventions.

Intuition might suggest that principal forbearance would be somewhere between an interest rate reduction and principal forgiveness. However, principal forbearance is essentially equivalent to an interest rate reduction. The one difference is that the fraction of the monthly payment that goes to principal amortization is slightly higher under the interest rate reduction — cumulating over the three years in our example to an additional $4,814.

A successful principal forbearance mod requires a similar increase in house prices as was the case for the interest rate mod. The loss from a successful principal forbearance is $8,370 and if unsuccessful is $148,710. Since the borrower's updated LTV and combined mortgage balance are the same as in the interest rate mod, the same redefault rate of 56 percent would apply. This gives an expected loss of $86,961 which is slightly below the expected loss of $87,745 for the interest rate mod.

This example leads to the same conclusion as the more detailed NPV calculations carried out by Haughwout et al. (2016) that in an economic environment similar to 2009 principal forgiveness for stressed underwater borrowers may provide the best intervention alternative.

CALIBRATING THE HAMP SUBSIDIES

The final topic of this section is to take a closer look at the HAMP subsidies compared to estimates of the negative externalities from foreclosures. Again, the argument for subsidizing lenders/insurers (and borrowers) to conduct a HAMP mod (and to stay current) is to have lenders/insurers internalize any negative externalities from foreclosure into their NPV calculations.

A detailed analysis of foreclosure externalities is provided by Gerardi et al. (2015). An advantage of their empirical analysis is that they look at repeat-sales which allow them to difference out persistent observed/unobserved house and neighborhood attributes that affect house prices. They also examine the effect of serious delinquencies as well as foreclosures on neighboring house prices. Their estimation sample consists of 950,234 repeat-sale pairs across 15 MSAs. They find that serious delinquencies and properties in REO reduce the transaction prices of homes within 1/10th of a mile by around 1 percent. In addition, homes sold out of REO within the past year reduce transaction prices by 0.6 percent.[39]

We can use their results to estimate the average negative externality from a serious delinquency, a property in REO and a property recently sold out of REO. From their Table 4, a non-distressed property transaction is expected to be within 1/10th of a mile of 0.387 serious delinquencies, 0.618 properties in REO and 0.707 properties recently sold out of REO. From Table 3, the median sales price for non-distressed properties is $270,000. Using their estimates of the negative impacts on sales prices from Table 5, this implies an expected negative externality of $4,068 if we include the serious delinquency effect and $2,814 if we exclude the serious delinquency effect. HAMP mods were typically provided to borrowers who were already seriously delinquent so the lower of the two externality estimates may be more appropriate.[40]

The most recent performance report for HAMP indicates that the average redefault rate for the 2010 and 2011 HAMP mods (871,795 in total) was 47.9 percent. This would indicate that, on average, it would take two HAMP mods to prevent one foreclosure. The subsidies initially provided by HAMP included half of the cost of reducing the borrower's DTI from 38 to 31 (for up to five years) to the lender, $1,000 to the servicer when the mod completes its trial period and an additional $1,000 for the next three anniversaries as long as the borrower remains current. Finally, borrowers can receive up to five payments of $1,000 each year for continuing to make timely payments.

39. See also Immergluck and Smith (2006), Rogers and Winter (2009), Campbell et al. (2011) and Harding et al. (2009) who find negative externalities from close by foreclosures of around 1 percent.

40. A second source of negative externalities of foreclosures is the cost imposed on local governments. Apgar et al. (2005) examine data from Chicago and estimate a wide range of municipal costs depending on the specific circumstances for the foreclosure. However, they do not calculate an expected cost.

The subsidy provided to avoid a foreclosure is roughly the expected subsidy paid for a failed HAMP mod plus the expected subsidy for a successful HAMP mod. If we assume that the failure occurs within the first year of the mod, then ignoring the subsidy for reducing the DTI the government pays $1,000 for the completed trial mod. For a successful mod, the borrower will have a below market interest rate, so it is reasonable to assume that the borrower will not sell the house during the five years following the mod (even if house prices have recovered so that the borrower is not in negative equity). In this case, again ignoring the subsidy for reducing the DTI the government pays $9,000 in payments to the lender and borrower.

The undiscounted expected cost to the government of the subsidies to the lender, servicer and borrower for preventing a foreclosure exceeds $10,000. This is 3.5 times the estimated externality from preventing a property entering and then being sold out of REO, and 2.5 times the estimated externality if we assume that HAMP also prevented the externality arising from a serious delinquency.

To illustrate how the DTI incentives to the lender further increase the expected total subsidy we need to use a specific example. Consider a borrower who purchases a house for $180,900 with a 10 percent downpayment. The borrower finances the purchase with a 30-year FRM with a 6.25 percent rate. The borrower's annual income is $45,000 and property taxes and homeowner's insurance are 2 percent of the house price. The borrower's initial DTI is 34.8. The borrower makes three years of timely payments and then suffers a 25 percent income reduction raising the DTI to 46.4. At this point, the borrower goes 90-DD and receives a HAMP modification. The subsidy to the lender to bring the DTI from 38 to 31 is $1,181 per year. Adding in these DTI-related subsidies to our failed and successful mods and discounting at a 5 percent rate yields a present value of $6,551. The present value of the payments to the borrowers and servicers is $9,875, yielding an overall expected present value of HAMP subsidies of $16,426.[41]

From this example, the HAMP incentives appear to be well in excess of estimates of the negative externalities associated with foreclosures. The higher subsidies may have been selected to promote participation in HAMP (and to raise its "success" rate) rather than to simply internalize any negative externalities from foreclosures. This is consistent with the emphasis in the HAMP reports on the total number of HAMP mods and their redefault rates.

41. The borrower subsidies were later modified to include a $5,000 payment to the borrower at the end of the 6th year of a successful modification which would increase the expected present value of subsidies by $3,475.

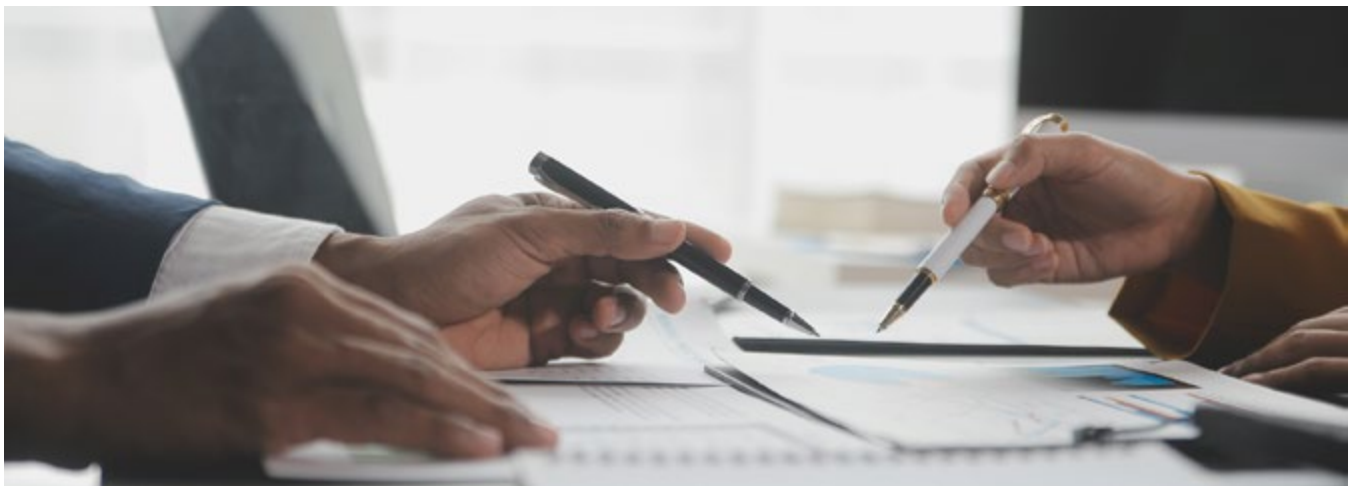
Policy Insights for Sustainable Homeownership

There are several key principles that inform how to support sustainable homeownership. First, it is important to keep stressed borrowers, to the extent possible, from going seriously delinquent. Communication between the lender/insurer and the borrower is critical for a successful intervention. Cutts and Merrill (2008) report that between September 2005 and August 2007 Freddie servicers had a "no-contact" rate of 53.3 percent of total loans that went to REO. They report that the redefault rate for borrowers jumps from 44 percent for those that were 30-DD at the start of a repayment plan to 70 percent for those 90-DD. Early intervention improves the success rate.

Early intervention will also help to preserve the borrower's credit rating and limit the likelihood of a financial problem growing more serious. In addition, it is helpful for borrowers to continue to pay what they can afford during a stress period, as opposed to not making any payments. This reinforces the borrower's on-going debt obligation, limits increases in the borrower's indebtedness and reduces the expected losses from an intervention thereby increasing the likelihood that an intervention will dominate foreclosure.

As discussed earlier, negative equity and liquidity shocks are the two most important drivers of mortgage default. Reducing default rates, then, necessitates some combination of reducing the likelihood of these two default drivers occurring for a borrower and providing insurance as a contingency for when they do occur. Reducing borrower leverage through higher downpayments and/or mortgages that amortize more quickly would reduce the risk of negative equity. Screening borrowers for their liquidity risk — for example using longer employment/income histories — can reduce the likelihood that the borrower will experience a liquidity shock.

At the same time, maintaining access to mortgage credit may require managing a degree of borrower credit and liquidity risk. This is facilitated by providing insurance for these risks. It is common for borrowers with low downpayments to be required to carry mortgage insurance. This insurance covers the lender for some specified percentage of any credit loss on the mortgage and can be cancelled by the borrower when the updated LTV falls below a threshold. Note, however, that this mortgage insurance does not reduce the risk of negative equity or lower its contribution to mortgage default. Instead, it simply compensates the lender for this credit risk when it materializes.



Modifying an existing mortgage involves time and cost, so it is important to design ways to support a borrower during a temporary difficulty thereby avoiding the need for a modification. In addition, as Agarwal et al. (2017) point out, mods are difficult to scale up even with significant financial incentives provided to servicers. They estimate that the HAMP program would have generated 70 percent more permanent modifications if all servicers participated at the same rate as the more active servicers.

MITIGATING LIQUIDITY SHOCKS

Given the prevalence of liquidity shocks as a default trigger, default risk could be reduced by requiring borrowers to self-insure against liquidity shocks, providing payment forbearance or requiring borrowers to purchase liquidity insurance.[42] These different approaches share similarities, but also have important differences. Each approach would reduce the risk of a default by allowing borrowers to better deal with transitory expense and/or income shocks. The differences across the three approaches are detailed below.

Similarly, it is also important to identify early on whether the liquidity problem facing a borrower is likely to be transitory or persistent. If persistent, borrowers can be encouraged to sell the home. Providing extended "lifelines" to borrowers in these cases may simply allow the borrower's financial problems to magnify. This leads to greater- and longer-lasting damage to the borrower's credit and reduces the borrower's future ability to own a home and accumulate home equity.

SELF-INSURANCE

Borrowers can self-insure against liquidity shocks by accumulating a sufficient number of mortgage payment in a liquid financial account — "months reserve".[43] Research from the JPMorgan Research Institute documents that three months of reserve significantly reduces default risk.[44] However, many borrowers, especially FTBs, find it difficult to accumulate and then maintain sufficient reserves. For example, over the period from 2009 to 2019 between 40 and 48 percent of FHA borrowers had less than two months of reserves at closing.[45] High DTIs make it even more difficult for borrowers to accumulate months reserve once they move into the house.

The ability for borrowers to self-insure could be assisted by pre-purchase financial advice on budgeting and setting financial goals.[46] Housing counseling is generally available for borrowers who are seriously delinquent. In the spirit of prevention over cure, it could be helpful for borrowers to receive financial/housing counseling prior to the purchase of a home. This is especially true for FTBs who are unfamiliar with the home buying and financing process (see Reid, 2006). These new homebuyers may not fully appreciate the on-going costs of homeownership beyond the monthly mortgage payment — property taxes, homeowner's insurance and maintenance (Moulton et al., 2015).[47]

Determining a monthly budget that accommodates all of these expenses and provides some cash flow cushion for the borrower is important financial preparation for a prospective FTB.[48] While counseling is required for some FTBs,[49] broadening the requirement to all FTBs might be helpful and facilitate better self-insurance against liquidity shocks.[50] There is scope for improvement as Argento et al. (2019) tabulate from the National Survey of Mortgage Originations that between 2013 and 2016 only 17 percent of FTBs reported receiving "homebuyer education and counseling." Improved access to pre-purchase counseling for FTBs could support homeownership sustainability by improving self-insurance against liquidity shocks (Brown, 2016; Hembre et al., 2021).

PAYMENT FORBEARANCE

Payment forbearance gained widespread use during the Covid-19 health crisis. Based on this experience, in March 2023 the Federal Housing Finance Agency (FHFA) announced its Enhanced Payment Deferral policies.[51] Borrowers with GSE mortgages can defer up to six months of payments as a non-interest-bearing loan to be repaid when the mortgage is paid off. In addition, no penalties, late-fees or other charges are allowed. The borrower must have been between two and six months behind on their mortgage and

42. See Quercia et al. (2016) for evidence on how household precautionary savings as well as unemployment insurance can mitigate default risk.

43. As discussed in the conclusion, FTBs can reduce their income risk by delaying the transition from renting to owning. Transitory income shocks are declining with the years that an individual has been in the labor market.

44. See Farrell et al. (2019) and https://www.jpmorganchase.com/institute/news-events/institute-prevent-mortgage-default .

45. FHA Annual Reports, Table B-11.

46. Moulton et al. (2015) analyze an Ohio Housing Finance Agency program that also provided for quarterly check-ins with a financial coach over the initial year post-purchase.

47. Poterba and Sinai (2008) estimate that annual depreciation and maintenance expenses alone can amount to 2.5 percent of the house value. Property taxes and homeowner's insurance can add another 1 or more percent to the annual cost.

48. There is also an array of mortgage products which new buyers may not understand, limiting their ability to make an informed choice. Finally, new buyers may overpay due to investing too little time in shopping for the best mortgage rate.

49. For example, from June through December 2011, all FTBs who purchased a home using the Ohio Housing Finance Agency FTB program were required to complete an online financial assessment.

50. Moulton et al. (2015) find from a randomized FTB counseling program that the treatment group was significantly more likely to self-report saving post-purchase — 70.8 percent as compared to 53.6 percent for controls.

51. FHFA Announces Enhanced Payment Deferral Policies for Borrowers Facing Financial Hardship | Federal Housing Finance Agency

subsequently resumed making timely mortgage payments.[52] These policies are aimed at transitory liquidity shocks as the payment deferral is conditional on the borrower having resumed payments.

The FHFA Enhanced Payment Deferral resembles in many respects a recommendation for payment forbearance in Alexandrov et al. (2022). A few important differences are that their proposal does not require the borrower to be delinquent. The list of payment shocks covered by their program includes death of a co-borrower and the start of divorce proceedings — neither of which are transitory liquidity shocks — so, it is unlikely that the borrower(s) in these cases can resume making monthly payments as required under the FHFA payment forbearance.[53] Finally, Alexandrov et al. (2022) provide up to four months of payment forbearance as opposed to the longer six months in the FHFA policy.

LIQUIDITY INSURANCE

A complement to self-insurance and a substitute for payment forbearance is for the borrower to take out liquidity insurance. Outside of unemployment insurance (UI), the market does not widely provide liquidity insurance to individuals. Unemployment insurance helps to limit mortgage default from temporary liquidity shocks (Hsu et al., 2018). The aim of liquidity insurance would be to complement UI for unemployment related liquidity shocks and, more generally, to allow borrowers to manage through a liquidity shock without missing any mortgage payments. Using ex-ante risk-priced liquidity insurance could also improve efficiency and transparency.

This insurance could be offered by lenders or other financial institutions. One possible implementation would be for liquidity insurance to provide three months of full mortgage payments or six months of half payments.[54] Payments would be made directly to the mortgage servicer. Similar to traditional mortgage insurance that is required for low downpayments, this liquidity insurance could be required unless the borrower can document at least three months reserve in a liquid financial account (and provide this documentation on an on-going basis).[55] The market would charge a risk-based premium for this coverage. Liquidity insurance would assist the household in dealing with a liquidity shock without significantly reducing their consumption.[56]

In the event that a borrower experiences a liquidity shock, the borrower would submit documentation of the shock to the insurance provider. In the case where the shock is due to a death, serious health problem or separation/divorce, the insurance would provide three months of full mortgage payments to the servicer providing time to facilitate the sale

52. In addition, the borrower cannot have been on a prior payment deferral in the past 12 months.

53. To limit moral hazard borrowers must provide documentation of their financial hardship.

54. If borrowers have their property taxes and/or homeowners insurance paid monthly into an escrow account, these payments would also be covered by the liquidity insurance, as well, but would increase the monthly premium.

55. On bank portfolio loans the bank could require that the borrower maintain any months reserve in an account at that bank. This arrangement would simplify the monitoring process.

56. This insurance would also support aggregate consumption in the economy in the case of a macro liquidity shock.

of the home. In the case of a potentially transitory income or expense shock, the insurance would provide half of the mortgage payment (or mortgage and escrow payments) to the servicer for up to six months. For an unemployed borrower receiving unemployment insurance (UI), this coverage dovetails the typical six months of UI benefits that typically cover around half of the worker's prior earnings.[57] For these transitory liquidity shocks the borrower is expected to continue to make the reduced payments on their mortgage.

COMPARING PAYMENT FORBEARANCE AND LIQUIDITY INSURANCE

Both payment forbearance and liquidity insurance help mitigate foreclosures arising from transitory liquidity shocks and thereby support sustainable homeownership. There are differences, though, between the two approaches which are important to consider. I will focus on the differences between the FHFA policy for payment forbearance and the version of liquidity insurance described above.

The FHFA's payment deferral is more similar to self-insurance where the borrower is taking out a loan rather than using savings to manage (ex post as compared to ex ante) the liquidity shock. Since the loan is interest free, the cost to the borrower (in present value terms) depends on the eventual time until the mortgage is pre-paid.[58] The additional loan modestly increases the leverage of the borrower. Consider our earlier example of a borrower taking out a $270,000 30-year FRM at 5 percent to purchase a $300,000 house. If after two years the borrower received 6 months of payment forbearance, this would increase the mortgage balance by $8,694 — or 3.3 percent of the updated balance. If the price of the house were unchanged, the borrower's updated LTV would increase from 87.3 to 90.2. In contrast, liquidity insurance does not increase the leverage of the borrower.

Payment deferral is restricted to cases of temporary liquidity shocks, whereas liquidity insurance covers all documented liquidity shocks. For persistent liquidity shocks, liquidity insurance can help facilitate the sale of the house which may reduce the likelihood that the mortgage goes into foreclosure. This reduces the expected loss to the lender/insurer.

Liquidity insurance is intended to prevent missed mortgage payments while payment forbearance is conditional on missed payments. Consequently, liquidity insurance preserves the borrower's credit rating while payment deferral allows the adverse impact the credit rating.[59] In addition, for the case of income shocks covered by UI, liquidity insurance is designed to have the borrower continue to make partial payments while payment forbearance is not conditional on a borrower continuing to pay what they can afford during the liquidity shock. Furthermore, servicers do not need to cover payments to investors under liquidity insurance. In contrast, under payment deferral, servicers need to advance these payments and are only repaid when the payment deferral is settled. Finally, for a GSE mortgage the loan will stay in the pool under liquidity insurance but under payment deferral will have to be purchased out of the pool if the delinquency goes to 120 days or more.

EXTENDING PAYMENT FORBEARANCE OR LIQUIDITY INSURANCE PAST SIX MONTHS

An important question is what to do if a borrower is still unemployed after 6-months (that is, the borrower is now classified as "long-term unemployed"). Should assistance to the borrower be extended? The first point to note is that most unemployment spells end prior to six months. Farber and Valletta (2015) report that for 2000–2005 only 7.7 percent of unemployment spells lasted six months or longer, and for the period 2007–2012m10 covering the Financial Crisis the share rose to 11.3 percent. Farber and Valletta state:

> "The exit rates from unemployment are sufficiently high that only a small fraction of individuals remain unemployed after the first six months."

Chodorow-Reich and Coglianese (2019) use labor force transition rates to simulate completed unemployment durations. They report that in their simulations that two-thirds of the unemployed have completed durations less than 26 weeks.

For borrowers who transition into long-term unemployment, the likelihood that their re-employment earnings will allow them to continue to pay the mortgage is declining. Addison and Portugal (1989) find that a 10 percent increase in the duration of an unemployment spell is associated with a 1 percent decrease in the re-employment wage. An even more pessimistic assessment of re-employment earnings is provided by Cooper (2013) using Panel Study of Income Dynamics (PSID) data. He finds that for an unemployment spell lasting greater than 26 weeks average re-employment earnings decline by 67 percent. Another consideration is that the best option for long-term unemployed in terms of

57. All but nine states provide 26 or more weeks of regular UI coverage (see Chodorow-Reich and Coglianese, 2019). This duration also matches the maximum of six months of payment forbearance under the FHFA enhanced deferred payment policy.

58. Similarly, the cost of providing payment forbearance depends on the average holding period until the mortgage is pre-paid. Using a 5 percent discount rate, the cost to the GSEs increases from 14 percent of the monthly payment if the loan is prepaid in 3 years to 29 percent of the monthly payment if the loan is prepaid in 7 years. Unlike liquidity insurance where the provider does not face any credit risk from the policy holder, payment forbearance does involve credit risk if the borrower subsequently defaults and the sale of the home does not cover the combined mortgage and deferred payment.

59. Once the payment deferral is settled, the borrower's credit file will indicate that the mortgage is current. However, the delinquency will still show up on the credit file likely resulting in a decline in the borrower's credit score by around 100 points. The serious delinquency remains on the credit file for seven years.

re-employment earnings may involve moving to another labor market. A mortgage modification with a below market mortgage rate or principal forbearance that results in a similar low monthly payment both create a financial friction to moving (see Quigley, 1987).

For an unemployed borrower entering their fourth month of job search, an important consideration is the possibility that they will not find a sufficiently high wage job over the remaining three months of their liquidity coverage. If they have additional savings, they could decide whether to use these savings to "buy" more time for their job search. Similarly, if an unemployed borrower finds a job but with a much lower wage, then the borrower needs to reassess their ability to keep paying the mortgage versus selling the house.

During significant economic downturns, the Extended Benefits program that is jointly run by states and the federal government lengthens the maximum number of weeks of UI coverage if a state's unemployment rate exceeds the statutory threshold. In addition, Congress can pass emergency benefits that further extend the maximum number of weeks of coverage. In these cases, when a borrower's UI is extended it raises the question of whether it would be helpful to continue to have additional available funds to allow the borrower to stay current on the mortgage?

Funding for liquidity insurance beyond six months would likely have to shift from the private to the public sector. As explained above, the likelihood after six months that an unemployed borrower is re-employed at a wage that will sustain the borrower's ability to make the mortgage payments is diminishing. This implies that the extension of liquidity assistance past six months is less likely to provide a positive rate of return to the borrower relative to the required premium charged by a lender/financial firm. That is, if purchasing the extended liquidity insurance at the time of the mortgage origination were optional, the take-up rate may be limited.

However, this calculation ignores any negative externalities of foreclosures on surrounding property values and local economic vitality. The public sector can internalize these externalities by providing taxpayer support for the extended liquidity insurance. Public sponsored extended liquidity insurance programs for unemployed borrowers could be provided at the federal or the state level. At the federal level an example is the FHA's Payment Supplement Partial Claim program. This provides up to a 25 percent reduction in a borrower's monthly payment for four years and a 12.5 percent reduction for a fifth year.[60] This generates a no interest loan to the borrower that is paid back at the sale of the property. This program allows the borrower payment relief even when mortgage rates have risen thereby making the streamline refinance program unattractive. States could adopt programs such as Pennsylvania's Homeowners' Emergency Mortgage Assistance Program (HEMAP) or MassHousing MI Plus that provided borrowers with extended liquidity assistance.[61]

An alternative to extended liquidity protection is for the lender/insurer to consider at this point a modification that lowers the borrower's monthly payment for an extended period or for the life of the mortgage. If borrowers view this as a likely possibility, this perception risks creating an implicit tax on their job search. That is, if the borrower accepts a low paying job, then the mod will take place lowering the borrower's required monthly payments. However, if the borrower accepts a more challenging job that would support making the full mortgage payments, then the mod will not take place (Mulligan, 2008).

USING MORTGAGE DESIGN TO HELP TRANSITION BETWEEN LIQUIDITY INSURANCE AND SELF-INSURANCE

If it were more likely that borrowers could accumulate months reserve while they are paying their monthly mortgage payment, this would facilitate the transition between purchasing liquidity insurance and self-insuring. Rethinking the traditional 30-year FRM as our standard mortgage offers interesting possibilities.

An advantage of the traditional 30-year FRM is that it has a constant nominal monthly payment until its maturity. This facilitates household budgeting by eliminating interest rate risk. The 30-year FRM also has no prepayment penalty so that borrowers have an option to refinance. If the current mortgage rates fall sufficiently below the contract rate on the mortgage and the borrower expects to stay in the house long enough to recoup the cost of refinancing, then the prepay option is "in-the-money." However, while all borrowers

60. A requirement is that the cumulative payment reductions do not exceed 30 percent of the borrower's unpaid balance plus arrears at the time of the default. See Goodman and Tozer (2023) for a discussion.

61. See Orr et al. (2011) for details on the HEMAP program. For MassHousing MI Plus see: MI Plus Mortgage Payment Protection Eligibility (masshousing.com).

pay up-front for this option to prepay, many do not exercise the option even when it appears to be in the money. This generates financial transfers between borrowers based on their financial literacy (see Berger et al., 2023). Another disadvantage of the traditional 30-year FRM is that early in the life of the mortgage amortization takes place only slowly. This means that it is difficult for the borrower to initially build up housing equity unless house prices are increasing.

Several alternatives exist for the traditional 30-year FRM that keep the level payment feature but provide financial benefits to the borrower when interest rates fall. A feature of these designs is that they reduce the cost of the mortgage by eliminating the prepayment premium. One example is the Fixed COFI mortgage proposed by Passmore and Hafften (2018) where COFI stands for the nationwide bank "cost of funding index." The mortgage rate is fixed at origination at the prevailing 30-year FRM mortgage rate at the time of origination. The bank receives the current COFI rate plus a stipulated margin. If interest rates decline over time, any positive "wedge" between the fixed mortgage rate and the COFI rate plus margin generates an income stream back to the borrower.[62]

A design choice is how to direct this stream of income when it occurs. One option is to have it paid out to the borrower. The advantage of this option is that borrowers would receive monthly payment relief when mortgage rates decline without the cost of a refinance. This can also help to offset any liquidity shocks that the borrower may be experiencing, helping to reduce default risk (see Zhu et al., 2015; Tracy and Wright, 2016; and Fuster and Willen, 2017). A second option is to direct these funds to pay down the mortgage balance, thereby building up the borrower's equity at a faster rate which also mitigates future default risk.

A third option is to establish a "home equity" account for the borrower.[63] Any funds generated by the COFI mortgage would be deposited into this account. Initially, this account would build up a liquidity buffer for the borrower that could be assessed if the borrower faced a liquidity shock. After the account accumulates a balance equal to three months reserve, half of any future funds would go to pay down the mortgage balance and the other half to further increasing the liquidity buffer. At this point, the borrower would have the option of cancelling the liquidity insurance. Once the account reaches a balance of six months reserve, all future funds would be used to pay down the mortgage balance. At the payoff of the mortgage, all funds in the home equity account would be applied against the current mortgage balance.

62. However, if the COFI rate plus margin rises above the mortgage rate, this does not generate a cash flow from the borrower to the lender. The margin is calculated to cover this contingency.

63. This is similar to Passmore and Hafften's "homeownership" Fixed-COFI mortgage.

NEGATIVE EQUITY: TO TREAT OR NOT TO TREAT?

If liquidity insurance is provided to deal with liquidity shocks, what if anything should be done to address negative equity? Recall that mortgage insurance protects the lender but not the borrower. As discussed earlier, negative equity rarely appears to be the only reason for mortgage default. For these few cases of strategic default, policies allowing lenders/insurers recourse to the borrower's financial assets and shorter foreclosure timelines provide a disincentive for strategic default. This leaves whether and how to address negative equity when it occurs in tandem with a liquidity shock.

One approach would be to link together the treatment of negative equity with the payout on a liquidity insurance policy. When a borrower documents a liquidity shock to the insurance provider, this request could be forwarded as well to the lender/insurer (if different from the liquidity insurance provider). If house prices have been rising over the period of the mortgage, the lender/insurer does not need to intervene. The liquidity insurance should assist the borrower through a transitory liquidity shock or provide time to sell the house in the case of a persistent shock. However, if house prices have declined over the period since the mortgage origination, the lender/insurer would investigate the need to intervene.

In this event, the first step for the lender/insurer is to estimate the current market value of the property. This could be accomplished using an appraisal and/or AVM. Assume for the moment that the borrower does not have any second liens on the property. If the estimate of the current market value indicates an LTV less than 95, then the lender/insurer takes no immediate action. However, if the updated value indicates a current LTV in excess of 95, then, without other financial resources, it would be difficult for the borrower to sell the property, cover the selling costs and pay off the amortized mortgage balance.

To alleviate this problem, the lender/insurer could offer to do an equity for debt swap with the borrower that would bring the current LTV to 95. This equity for debt swap would be recorded as a new lien on the property. The lender/insurer would also have a right of first refusal on any sale of the house, but this right must be exercised within two business days. Like principal writedown, an equity for debt swap would also lower the borrower's monthly payments providing additional cash flow relief.[64]

Why might this equity for debt swap be the preferred course of action given the infrequent use of principal writedowns following the housing bust? For underwater borrowers who do not have a reasonable prospect of being able to resume full mortgage payments, lenders/insurers prefer a short-sale to a foreclosure. Houses tend to sell for higher prices if occupied and sold earlier by the borrower, rather than sold later as vacant properties by the lender.[65] However, a problem with short sales is that potential buyers can pull their bids if they are not quickly approved by the lender. The equity for debt swap enables the equivalent of short sales without the uncertainty over lengthy lender approvals. The right of first refusal provides protection to the lender/insurer if they believe that the proposed sale price is too low. In addition, with a short sale the borrower faces no upside from obtaining a higher price for the house. In contrast, with the equity for debt swap the borrower will receive a pro-rata share of any higher sale price which incentives them to attempt to get the highest price.

Recall that Kalikman and Scally (2023) argue that well targeted principal writedown provides a positive return to lenders/insurers. It is in the interest of all borrowers to accept a principal writedown without any upside sharing. To be effective, then, this requires that principal writedowns are only offered to those borrowers who are at most risk of foreclosure (or equivalently have sufficiently low expected cure rates). The difficulty is that lenders/insurers must make this targeting determination using only the limited information that is available to them.

However, equity for debt can be offered to all underwater borrowers since it will only be attractive to borrowers who are most at risk of foreclosure. Once the liquidity insurance has been paid out, borrowers who believe that they can sustain making their mortgage payments until house price increases sufficiently to cover their selling costs and mortgage balance would be unlikely to accept the equity for debt swap. These borrowers would prefer to keep all of the house price upside. Borrowers will make this determination using private information such as their expectations for job security, re-employment if unemployed and for house prices. In those cases where house prices do increase over time, the equity for debt swap if accepted by the borrower provides upside to the lender/insurer where a principal writedown does not.[66] In addition, restoring the borrower to positive equity provides financial incentives for the household to maintain the property (see Haughwout et al., 2013 and Melzer, 2017). Finally, restoring borrowers to positive equity removes a financial friction to selling and moving (see Ferreira et al., 2010, 2012).

If the borrower has a second lien on the property, then this creates a complication for the equity for debt swap. This was also a friction to modifications where the first-lien holder would only modify the mortgage if the second-lien holder agreed to re-subordinate their lien. Otherwise, the second-lien holder would jump ahead of the modified loan in the lien priority. Early in the Financial Crisis communication between the lien holders was a challenge, but over time communication improved.

Similarly, with an existing second lien on the property the first-lien holder would be unwilling to do an equity for debt sway that brought the borrowers updated CLTV down to 95. When the house is sold, the second lien would have to be fully paid off prior to the first-lien holder getting any return on its equity. A solution to this problem, similar to requesting the second-lien holder to resubordinate in the case of a mod, is to have the second-lien holder participate in the equity for debt swap. If the CLTV can be reduced to 95 by only having the second-lien holder swap equity for debt, then the first-lien holder would not be involved. If to get to a CLTV of 95 required both lien holders to contribute, then the second lien would be replaced entirely with equity and the balance would be accomplished by an equity for debt swap by the first-lien holder. As a result, there would a be 3-way pro-rata sharing of any net gain on the sale of the house in the future. A second-lien holder would benefit from participating in the equity for debt swap for the same reason in a mod they would be willing to re-subordinate their lien.

An alternative approach would be to have lenders adopt the "adjustable balance mortgage" (ABM) proposed by Ambrose and Buttimer (2012). With this mortgage, at prespecified intervals the balance on the mortgage is set to the minimum of the estimated current market value of the house and the original scheduled balance. If house prices have declined, the balance will be adjusted lower and the monthly payment recalculated. If house prices subsequently increase, the balance can be adjusted up but will never

64. Note that the liquidity insurance benefit would not be affected by an interest rate reduction, a principal writedown or an equity for debt swap. Since the premiums are based on the original monthly payment, the coverage would remain unchanged if the monthly payment is reduced through an intervention. This parallels how traditional mortgage insurance coverage is structured.

65. For example, the FHA reports in its 2013 Annual Report to Congress in Exhibit I-19 that its loss share as a percent of the unpaid balance for properties in REO was 69.7 percent in 2012 and 60.5 percent in 2013. In contrast, the loss rates for properties with a pre-foreclosure sale were 47.5 percent in 2012 and 44.2 percent in 2013.

66. The pro-rata sharing of any upside would be based on the borrower's initial equity position at the origination of the mortgage.

exceed the original scheduled balance for that point in the mortgage. Consequently, similar to the COFI FRM the borrower's monthly payments will never exceed the original amount. If house prices tend to decline in periods where the mortgage rate is also declining, then the ABM and the COFI FRM will both provide payment relief to the borrowers in periods of market stress. Also, similar to the equity for debt swap, the ABM achieves the objective of keeping the borrower from negative equity but retains upside for the lender/insurer.

AFFORDABILITY AND SUSTAINABILITY FOR FIRST-TIME BUYERS WITHOUT HIGH LEVERAGE

First-time homebuyers typically find accumulating a downpayment to be the largest financial hurdle for transitioning from renting to owning. This has led the FHA to offer very low downpayment mortgages — 3.5 percent. This modest downpayment leaves these FTBs extremely leveraged and exposed to house price declines. To compensate lenders for this higher credit risk, the FHA provides mortgage insurance that covers up to the full loss to lenders. While this insurance protects the lenders it does not reduce the FTB's default risk. A question is whether there is an alternative approach that would still limit the need for FTBs to accumulate a sizeable downpayment but would lower the leverage of the borrower and the associated default risk thereby supporting sustainability.

One alternative is to replace the low FHA downpayments with the FHA providing an approximate 2:1 equity match to a borrower's downpayment into a home equity savings account set up for the borrower. The idea is that the 3.5 percent downpayment with the FHA's equity matching is increased to 10 percent. With the assistance of a housing counselor, a target account balance would be determined for the borrower (with the FHA matching) to be able to make a 10 percent downpayment on a home they can afford. An agreed timeframe for accumulating this balance in the home equity saving account would determine the required monthly payment into the savings account by the borrower.

A key design element of home equity savings account is that the FHA match would be conditional on a borrower making each monthly contribution to the savings account in a timely manner. If the borrower misses a monthly savings payment, the borrower retains the balance in the account but there is no FHA matching. That is, matching only occurs for those borrowers who demonstrate over time that they can reliably make the required monthly contributions. This design feature helps to screen out borrowers who would be at higher risk of mortgage default. Borrowers who successfully reach their savings target would now make a 10 percent instead of a 3.5 percent downpayment. This makes the FTB mortgage less risky by providing more equity cushion against house price declines and lowering the required monthly mortgage payment.[67]

Under this program, any gains or losses would be shared on a 35:65 basis between the borrower and the FHA. To further promote home equity accumulation by FTBs, the FHA could stipulate that it would cap its upside gain at its cost of funding plus a risk premium to cover expected losses

67. This is similar to a proposal by Gyourko (2013) of a 2:1 cash match. In Gyourko's proposal the cost of the subsidy is offset by closing down the FHA and outsourcing the management of the home equity savings accounts.

from its equity participation. Any additional appreciation beyond this cap would go entirely to the FTB to help finance the downpayment on a trade-up purchase. Given that the 90 LTV mortgage will be less risky, the FHA could forgo the up-front mortgage insurance premium and charge a lower on-going premium which would further lower the borrower's monthly payments.[68]

A simple example will illustrate the contrast between the current FHA low downpayment purchase mortgage and the proposed FHA equity sharing purchase mortgage. Assume that a FTB has an annual income of $57,143 and wants to purchase a house for $200,000. Start with the traditional FHA low downpayment mortgage. Assume that the current mortgage rate is 7.31 percent. The FHA charges the borrower an up-front mortgage insurance premium (MIP) of 1.75 percent that is rolled into the mortgage balance. In addition, there is an annual MIP of 0.55 percent that is rolled into the mortgage rate. The borrower would make a downpayment of $7,000 and have a monthly payment of $1,438. The origination LTV is 98.2. Assume that property taxes and homeowners insurance amount to 1.25 percent of the house price. The borrower's front-end DTI is 34.6. Further assume that over the next 3 years average annual house price appreciation is 3 percent and the FTB decides to sell the house and move. The selling costs are 5 percent of the updated house value. Over the 3 years the borrower would have paid a total of $45,703 in interest. The borrower's gain net of selling costs and the borrower's downpayment is $10,313. The FHA would gain $6,618 from the combined MIPs.

Now consider using the FHA equity sharing purchase mortgage to finance the home purchase. The FTB's downpayment would still be $7,000, but now the FHA would contribute $13,000 in equity. Assume that the FHA would not charge an up-front MIP and the annual MIP is reduced by 50 percent to reflect that the FHA mortgage insurance kicks in only for losses greater than 10 percent of the purchase price. The origination mortgage balance would be $180,000 versus $196,378. The borrower's monthly payment would be $1,269 — $169 less (11.7 percent) than the traditional FHA mortgage. The origination LTV would be 90 and the borrower's front-end DTI is now 31 — both indicating that this is a less risky mortgage. At the end of the 3 years, the mortgage balance would be $174,710 and the borrower would have paid total interest of $40,397 — a savings of $5,306. The lower total interest reflects the combination of the lower origination balance and lower mortgage rate (reflecting half of the annual MIP for the traditional FHA low downpayment mortgage). The borrower's net gain adjusted for the difference in aggregate interest paid is $9,824.[69] The FHA's net gain including the annual MIP and an opportunity cost of 5 percent per year on its equity is $7,925.

Comparing the two methods of financing, in this successful scenario of rising house prices the FHA receives roughly $1,307 more with the equity sharing mortgage. In addition, the FHA is now backing a less risky mortgage given the lower LTV and front-end DTI. The downpayment constraint for the borrower is the same in both methods, but the cash flow constraint is relaxed with the equity sharing. Taking into account the lower interest rate payments, the two approaches are roughly equal for the borrower with the overall gain slightly lower under the equity sharing by roughly $489. Continuing to assume selling costs of 5 percent, with the equity sharing mortgage the house price can fall by up to 8 percent and the borrower would still be able to sell the house and pay off the amortized mortgage balance. This example illustrates how the equity sharing mortgage could support the FHA's mission of sustainable homeownership without compromising its focus on affordability. The FHA could pilot this type of program to gain more experience on how it performs relative to their traditional low-downpayment mortgage.[70]

This illustrates a general principle that bringing in more equity financing would lead to more sustainable homeownership. The difficulty has been how to accomplish this without exacerbating the challenge — especially for FTBs — of accumulating the higher downpayment. More generally, housing finance could expand to allow borrowers access to both equity and debt financing. Equity partners would share in losses as well as gains when the house is sold. An extensive discussion of this idea is provided in Caplin et al. (1997).

68. In this case, the mortgage insurance covers losses only greater than 10 percent. As discussed by Frame et al. (2017), by allowing the borrower to finance this up-front premium only borrowers who successfully pay off their FHA mortgage end up paying for this insurance. Covering the expected default costs through the upside appreciation sharing is an alternative way of collecting from the successful FHA borrowers, but has the advantage of lowering the original mortgage balance relative to financing the up-front premium.

69. This ignores any cap on the FHA's upside sharing of gains.

70. The GAO (2005, page 6) report recommends that the FHA use pilots to study potential new products or changes to existing products.

Final Thoughts

In the heat of the moment during an economic, health or housing crisis preventing foreclosures seems aligned with preserving homeownership. Promoting homeownership has been a goal across several Administrations. A natural question is why would we allow foreclosures to take place if policy could prevent them thereby preserving homeownership? For sustainable homeownership, what is important is maintaining homeownership for the future not necessarily maintaining homeownership for the present.

Policies that would effectively close down the foreclosure option would likely increase the expected losses associated with residential mortgages. Lenders/insurers will act to reduce the impact of these higher costs by rationing access to mortgage credit. They could do this by either or both increasing mortgage insurance rates and restricting access to mortgage credit — that is, either raising the cost and/or reducing access to mortgage credit. This would have the strongest impact on households trying to make the transition to homeownership resulting in downward pressure on homeownership rates.

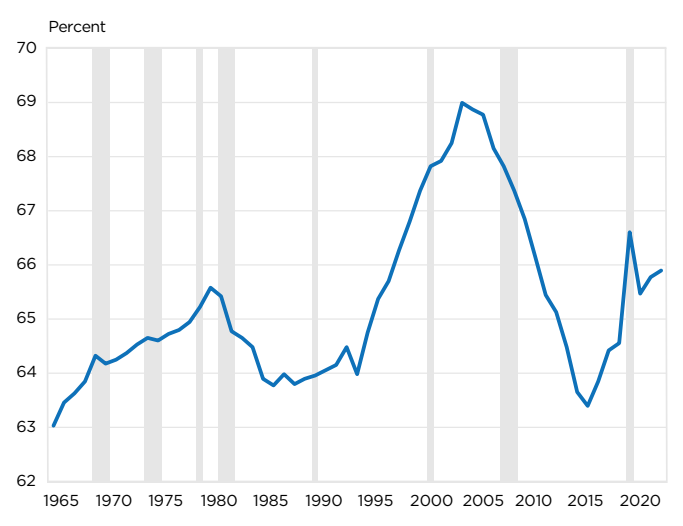
Any argument for the benefits of homeownership over renting is more forceful if that homeownership is sustained. Promoting sustainable homeownership is also the best long-term strategy for generating higher homeownership rates. A focus on affordability over sustainability appeared to be successful as we saw the homeownership rate in the U.S. increase over a 20-year period from the mid-1980s to the mid-2000s. The homeownership rate rose from 63.9 percent in 1985 to 69 percent in 2004. However, as shown in Figure 5, this rise in homeownership was not built on a sound foundation and the gains were subsequently completely lost in the turbulent wake of the Financial Crisis.

Sustainability should be the focus from the initial home purchase through each subsequent trade-up purchase. A successful first-time ownership experience also depends on the timing of when a household makes the transition from renting to owning. As discussed by Cameron and Tracy (1997, 1998) income volatility is high early in careers and declines steadily as individuals acquire more work experience. This income volatility also depends on an individual's education and industry/occupation.

Income variability is a risk for households taking on a mortgage. As we have seen, liquidity shocks are a common stress factor leading to default. This risk can be mitigated by delaying the transition to homeownership to allow the household's income variability to be reduced and additional months reserve to be accumulated. Financial counseling can help a household understand the full costs of homeownership and therefore how expensive a house they can afford. Relaxing underwriting standards to extend access to homeownership, however, is not the answer. The FHA experience is a sober case study of this failed approach.

Promoting a mortgage design that creates a faster amortization of the mortgage balance would allow households to initially accumulate home equity without relying only on house price appreciation. Reducing the leverage of FTBs through equity matching could improve sustainability of their initial homeownership experience promoting accumulation of home equity over the lifetime. Prevention beats cure over the long run.

Figure 4: U.S. Homeownership Rate



Note: Shaded areas indicate U.S. recessions.
Source: U.S. Census Bureau via fred.stlouisfed.org

Mortgage intervention can be more effective if tailored to treat the specific issues facing each stressed borrower. In most cases, a contributing factor is a liquidity shock. The most important first step is to determine whether this shock is likely transitory or persistent. Liquidity insurance can provide time (but limited) for borrowers to recover from a transitory shock. Similarly, liquidity insurance can provide time for borrowers facing a persistent shock to sell the home. Payment forbearance is an alternative approach to dealing with liquidity shocks.

In those cases where negative equity is also a contributing factor, the lender/insurer can provide an equity for debt swap that eliminates the negative equity. This allows the borrower to sell the property if moving is the best option, reduces the monthly payment relaxing any cash-flow constraints, provides incentives for the borrower to continue to maintain the property, and effectively screens out those borrowers who expect to be able to stay current on their mortgage until house price recovery occurs. This screening is likely to be more effective than the targeting required for lenders/insurers to identify these same borrowers in the case of offering a principal writedown.

Uncertainty for financial markets is like dry underbrush for forest fires. Clearing out uncertainty to the degree possible will help to mitigate the propagation of financial stress. For mortgage markets, uncertainty can be reduced by articulating a clear strategy for mortgage interventions that relies importantly on proactive ex ante insurance over reactive ex post policy actions. This will promote transparency and more accurate pricing of mortgage risks. If successful, we can put more households on the path of sustainable homeownership with the prospect of one day owning their home debt free.

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