Policy Briefs

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What Happens When You Assume

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Abstract

Mortgage assumption allows borrowers to transfer both their property and their mortgage to a homebuyer. Assumption of a loan has value when the note rate is below prevailing market rates. This paper uses survival analysis to estimate the likelihood of assumption and the effect of assumption on the likelihood of default. The author finds that every additional $1,000 in assumption value is associated with a nearly 2-percent increase in the likelihood of assumption. Assumption is more likely when the existing homeowner is seriously delinquent and when housing markets are weak. Assumption subsequently lowers by 20 to 40 percent the risk that a loan will default relative to loans that are not assumed. As mortgage rates rise from recent historic lows, mortgage assumption may become more common.

Introduction

When borrowers sell their homes, they usually use the proceeds to pay off the remaining balance of their mortgage. In fact, most loan contracts require such payment. But some mortgages, such as those insured by the federal government through the Federal Housing Administration (FHA), allow homebuyers to "assume" the debt of sellers. A homebuyer may be interested in the existing mortgage if the interest rate is lower than prevailing market rates or the terms of the contract are otherwise better.

The mortgage assumption value (MAV) is the difference between the unpaid balance and the present value of the remaining payments discounted at prevailing market interest rates. The assumption value increases with larger loan balances, more payments remaining, and higher spreads between the mortgage rate and prevailing market rates. However, declining interest rates over the past several decades have meant that the assumption option is rarely "in the money." The average rate on new 30-year fixed-rate mortgages fell below an unprecedented 2.7 percent in 2020, but nearly doubled to over 5 percent by early 2022. Rising mortgage rates may create value for borrowers with assumable loans.

This paper discusses the history and limited existing research on mortgage assumptions. Using a sample of more than 23,000 FHA-insured loans and a semi-parametric survival analysis model, the paper examines the financial and economic determinants of mortgage assumption and the average effect of mortgage assumption on loan performance. The author finds that the likelihood of assumption increases nearly 2 percent for every $1,000 increase in the assumption value. Assumption subsequently decreases the likelihood of default. These results are important for understanding the effect of interest rates on the housing market and evaluating FHA's financial risk.

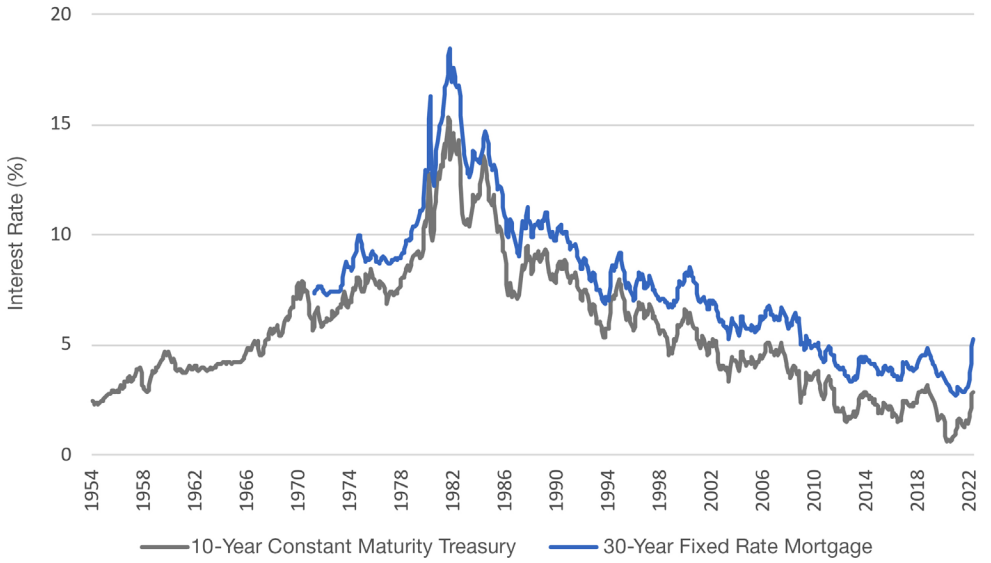
Assumptions and Due-on-Sale Clauses

Mortgage underwriting typically entails assessment by a lender of the borrower's collateral, creditworthiness, and capacity to repay. However, those assessments may be of limited use if the homeowner is able to convey the mortgage in a property transaction (Goddard, 1932). To protect their financial interests, lenders place contract provisions that prohibit assignment to a successor borrower without consent of the lender. Modern terminology labels these mortgage assignments as "assumptions" and restrictions on assignment as "due-on-sale" or similar clauses.

Due-on-sale clauses remained a relatively arcane part of mortgage lending until the 1960s, when interest rate risk, rather than credit risk, prompted lenders to enforce the provisions. Exhibit 1 shows the rate on 10-year constant maturity Treasury securities and the average interest rate on 30-year fixed-rate mortgages. Between 1960 and 1970, the 10-year Treasury yield approximately doubled, from 4 percent to 8 percent. Rates roughly doubled again over the following decade, peaking at 15.3 percent in mid-1981. Mortgage rates reached more than 18 percent at the same time. Consequently, homebuyers in the 1970s and 1980s faced dramatically higher interest rates on new loans than the rates sellers typically carried on their existing mortgages.

Exhibit 1

Historical Interest Rates



Sources: Board of Governors of the Federal Reserve System, Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis; Freddie Mac, 30-Year Fixed Rate Mortgage Average in the United States. Retrieved from FRED, Federal Reserve Bank of St. Louis

Simulations by Lacour-Little, Lin, and Yu (2020) demonstrated how assumability partially offsets the negative impact of rising interest rates on house prices. Sellers capitalize the value of below-market interest rates through higher sales prices. Sirmans, Smith, and Sirmans (1983) used a hedonic house price model and found that buyers assuming an existing mortgage paid roughly $3,000 more than comparable properties, meaning roughly one-third of the MAV is capitalized into the sales price. The MAV may not be fully capitalized for several reasons, including transaction costs, buyer's tax rate, expected length of tenure, and expected future interest rates (Agarwal and Philips, 1985; Allen and Springer, 1998; Ferreira and Sirmans, 1987; Lacour-Little, Lin, and Yu, 2020; Sirmans, Smith, and Sirmans, 1983). Sunderman, Cannady, and Colwell (1990) focused on the fact that the unpaid balance of a mortgage typically declines through amortization, whereas house prices typically (but not always) rise, meaning that the assumed loan often can finance only a portion of the sales price. The authors found that the capitalization rate declines as the loan-to-value (LTV) ratio increases.

Due-on-sale clauses prohibit assumptions, forcing buyers to shoulder higher debt payment burdens or sellers to lower asking prices. Bonanno (1972) argued, "Depressed conditions and excessive economic contractions created by high interest rates are rendered all the more severe by the artificial reduction in the transfers of real property induced by the discouragement of deals by buyer [sic] and sellers because the due-on-sale clause hangs over their heads like the sword of Damocles." The due-on-sale provision effectively serves as a prepayment penalty equal to the value of the mortgage assumption option (Dunn and Spatt, 1985). Several state courts ruled that due-on-

sale clauses were unconscionable and a restraint on the alienation of property (Murdock, 1984). However, the Federal Home Loan Bank Board (FHLBB) preempted these state rules for federally chartered savings and loan associations in 1976, an action upheld by the U.S. Supreme Court.[1] Congress then extended the preemption to all mortgage lenders through the Garn-St. Germain Depository Institutions Act of 1982:[2]

> Notwithstanding any provision of the constitution or laws (including the judicial decisions) of any State to the contrary, a lender may … enter into or enforce a contract containing a due-on-sale clause with respect to a real property loan … [T]he exercise by the lender of its option pursuant to such a clause shall be exclusively governed by the terms of the loan contract, and all rights and remedies of the lender and the borrower shall be fixed and governed by the contract.[3]

After the Garn-St. Germain Act, due-on-sale clauses became standard for most conventional mortgages. By contrast, federal agencies that provide mortgage insurance continue to allow assumption by creditworthy borrowers. More important, however, declining mortgage interest rates since the mid-1980s largely removed the financial incentive for assumptions.

Little theoretical or empirical research on the determinants and effects of mortgage assumptions has been done due to their general scarcity in the mortgage market. Assumption is typically presumed not to be an option. For example, Kau and Kennan (1995) distinguished between endogenous, or "optimal," prepayment based on the incentive for a borrower to refinance if prevailing rates are less than the coupon rate and exogenous prepayment arising from personal circumstances, which "most commonly involves the sale of a house with a nonassumable mortgage for such reasons as job relocation or change in family size" (Kau and Kennan, 1995: 226). Assumability would enable property transactions without prepayment; therefore, prepayment would always be optimal, in theory, with perfectly rational borrowers. Meador (1984) used the different rules governing state- and federally chartered institutions in California before the Garn-St. Germain Act as a natural experiment. He found that repayment rates fell 0.52 percentage points for every percentage-point increase in mortgage rate spread for institutions preempted by FHLBB but 1.21 percentage points among institutions subject to the decision of the California Supreme Court. The lower repayment rates contributed to disproportionate financial losses among state-chartered institutions.

The effect of assumption on default is more ambiguous. Deng, Quigley, and Van Order (2000) noted, "A borrower forced to move (e.g., due to divorce or job loss) who cannot have the mortgage assumed has a very short remaining term and may thus default with little negative equity" (Deng,

[1] *Fidelity Federal Savings and Loan v. Reginald de la Cuesta*, 458 US 141 (1982).

[2] Public Law 97-320, October 15, 1982.

[3] Section 431(d) provides certain exceptions to this preemption, including subordinate liens and transfers relating to death or divorce. Further, Section 431(c) states that assumptions are not prohibited and lenders are in fact encouraged to offer interest rates below market.

> In the exercise of its option under a due-on-sale clause, a lender is encouraged to permit an assumption of a real property loan at the existing contract rate or at a rate that is at or below the average between the contract and market rates, and nothing in this section shall be interpreted to prohibit any such assumption. Nevertheless, few conventional lenders appear to be swayed by this "encouragement clause."

Quigley, and Van Order, 2000: 280). This argument suggests that the assumption option may lower the risk of default. On the other hand, the continuation of a loan that would have been paid in full prolongs exposure to an adverse income or house price shock. Assumptions may also be used to circumvent mortgage underwriting—the original concern of lenders to include due-on-sale provisions in loan contracts. Allen and Springer (1998) noted that the mortgage assumption value is not limited to the interest rate environment but also includes transaction cost differentials and qualification criteria and that these considerations may even outweigh interest costs.

A HUD task force in the 1980s investigating fraud and abuse in FHA's mortgage insurance program found losses associated with the free assumption of FHA-insured loans, including "straw buyers" qualifying for FHA insurance before flipping the property to less creditworthy borrowers. To curb those abuses, FHA implemented a policy of assessing the creditworthiness of homebuyers seeking to assume an FHA-insured loan (HUD, 1986, 1988). According to the Department of Housing and Urban Development Reform Act of 1989,[4] "The Secretary shall take appropriate actions to reduce losses under the single-family insurance programs," including "requiring that at least one person acquiring ownership of a one- to four-family residential property encumbered by a mortgage insured under this subchapter be determined to be creditworthy under standards prescribed by the Secretary, whether or not such person assumes personal liability under the mortgage." Further, the successor borrower must intend to occupy the property as a principal residence or approved second home and not an investment property (HUD, 1989). Those reforms drastically curtailed assumptions. However, FHA-insured assumptions must be manually underwritten, whereas most new endorsements are evaluated by the Technology Open to Approved Lenders (TOTAL) mortgage scorecard, an empirically derived algorithm that assesses credit risk.[5]

Assumptions in the 21st Century

Continuing a decades-long trend, mortgage interest rates generally fell over the past two decades, from a high of more than 7 percent to less than 3.5 percent in 2012. However, rates rebounded to nearly 5 percent by 2018 such that more than three out of four existing 30-year fixed-rate home mortgages insured by FHA had below-market rates (exhibit 2). Given the remaining mortgage payments, this interest rate difference translates into an average MAV of $11,200, or a median of $9,244 (exhibit 3).[6] The aggregate MAV was more than $81 billion, or roughly $1,050 for every owner-occupied housing unit in the United States, and 0.33 percent of the aggregate value of the housing stock.[7]

[4] Public Law 101-235, December 15, 1989.

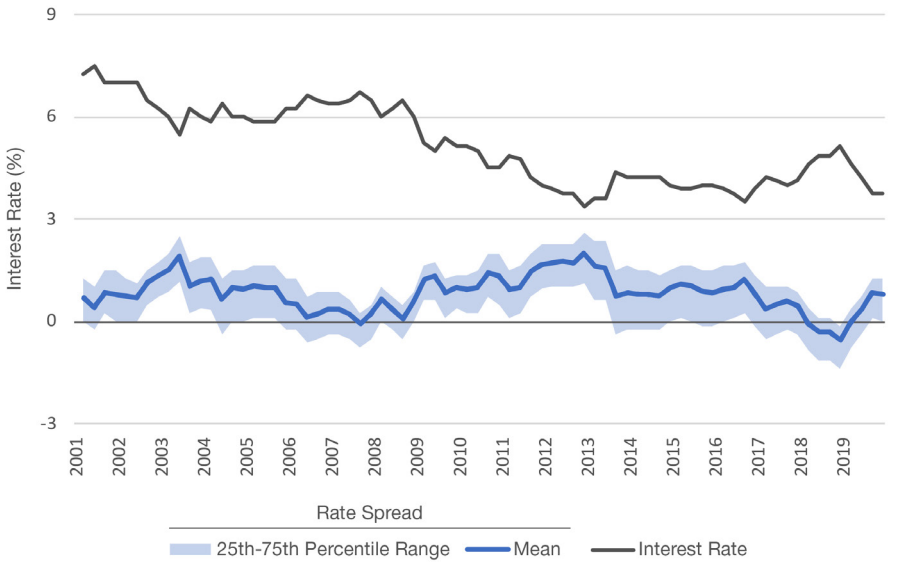
[5] For mortgage assumptions, see Sections II(A)(8)(n) and III(A)(3)(b) of the FHA Single Family Housing Policy Handbook. For underwriting using the TOTAL mortgage scorecard, see Section II(A)(4). https://www.hud.gov/sites/dfiles/OCHCO/documents/4000.1hsgh_Update7.5.pdf.

[6] Among loans with below-market rates, the average is $16,156 ($13,314 median).

[7] Based on 2018 American Community Survey one-year estimates of owner-occupied housing stock and aggregate value.

Exhibit 2

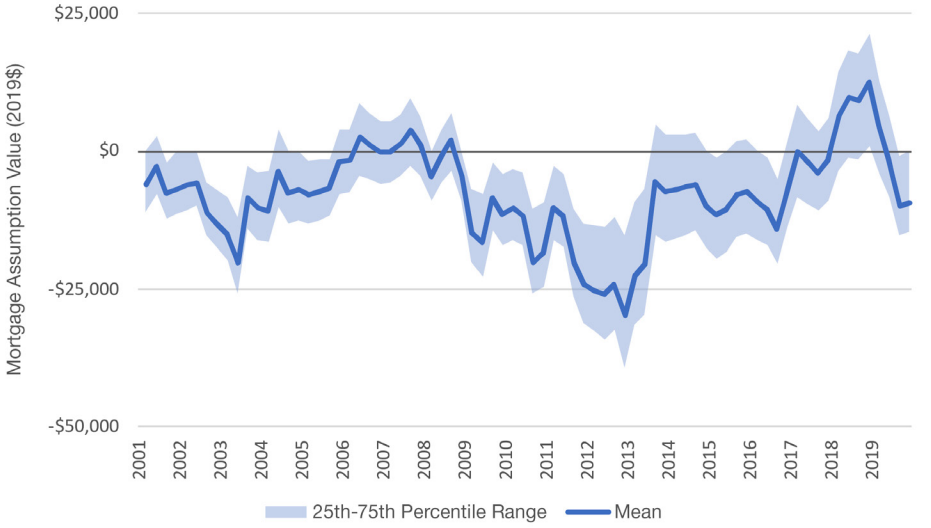
Interest Rates and Rate Spreads



Source: Author's tabulations of Federal Housing Administration administrative data

Exhibit 3

Mortgage Assumption Value

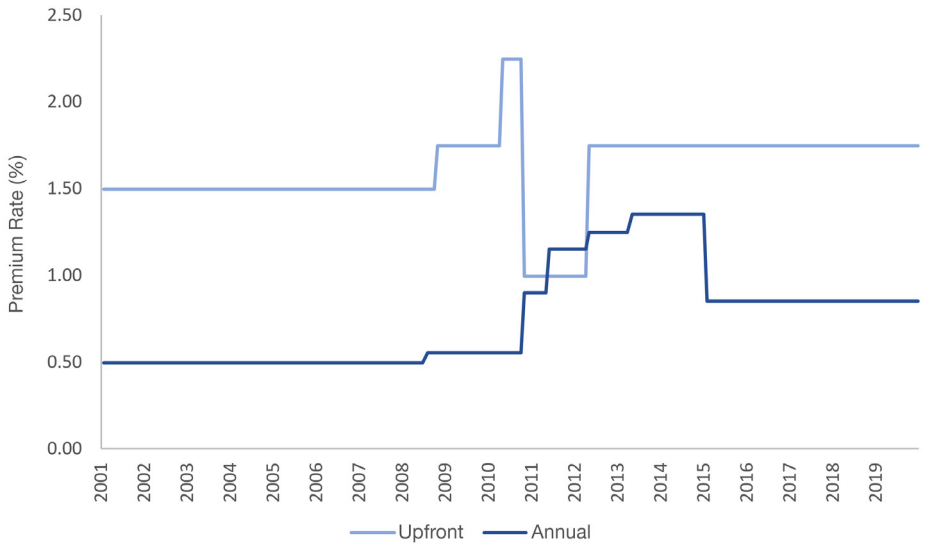


Source: Author's tabulations of Federal Housing Administration administrative data

Insurance premiums below current rates have values similar to below-market interest rates. In 1998, Congress passed the Homeowner Protection Act to automatically terminate private mortgage insurance once the balance of a mortgage reaches 78 percent of the original value of the collateral.[8] Because private mortgage insurance typically covers only the top 20 to 30 percent of the original mortgage, continued insurance after amortization had reduced the unpaid balance was considered excessive.[9] FHA implemented a comparable policy for loans closed on or after January 1, 2001 (HUD, 2000a, 2000b). The new policy canceled the collection of annual insurance premiums even though FHA insurance continues to cover the full loan amount for the life of the loan. However, faced with mounting credit losses during the Great Recession, FHA rescinded the premium cancellation policy and raised insurance premiums. For most 30-year fixed-rate loans, upfront mortgage insurance premiums increased from 1.5 percent to 2.25 percent and are currently 1.75 percent (exhibit 4). Annual premiums rose from 0.5 percent to 1.35 percent and are now 0.85 percent. Further, annual premiums are required for the life of the loan for most applications received on or after June 3, 2013 (HUD, 2013). Lower premiums and premium cancellation effectively lower monthly mortgage costs similar to below-market interest rates.

Exhibit 4

FHA Mortgage Insurance Premiums



Source: Author's tabulations of Federal Housing Administration administrative data

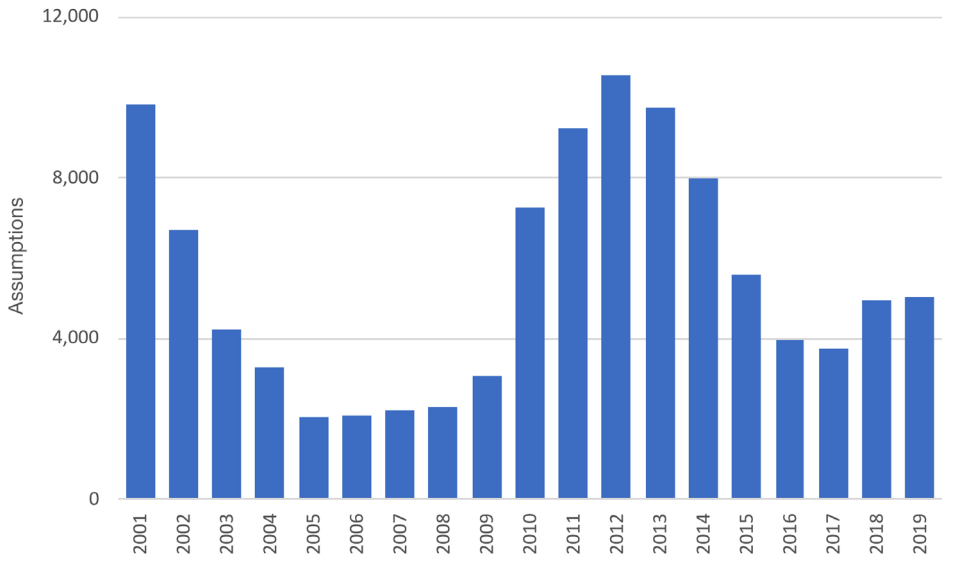
Nearly 104,000 FHA-insured loans were assumed between 2001 and 2019, from a low of barely 2,000 in 2005 to more than 10,500 in 2012 (exhibit 5). However, fewer active FHA-insured loans existed before the Great Recession. As a share of active loans, the assumption rate fell from 0.27 percent in early 2001 to just 0.05 percent in early 2006 (exhibit 6A). Although the absolute number of assumptions rose again in the early 2010s, the assumption rate was much lower than in 2001.

[8] Public Law 105-55, July 29, 1998.

[9] Senate Report 105-129 (1997).

Exhibit 5

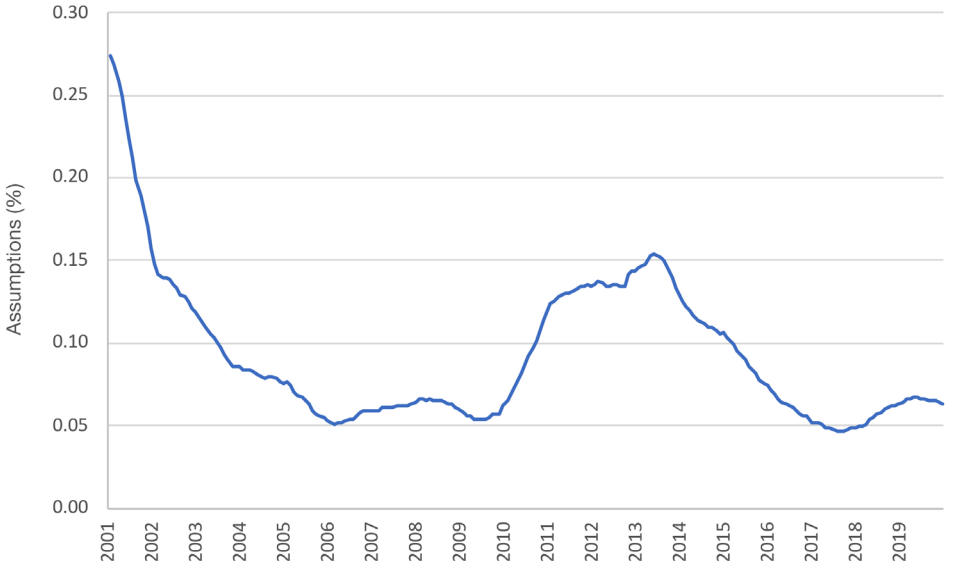
Assumptions



Source: Author's tabulations of Federal Housing Administration administrative data

Exhibit 6A

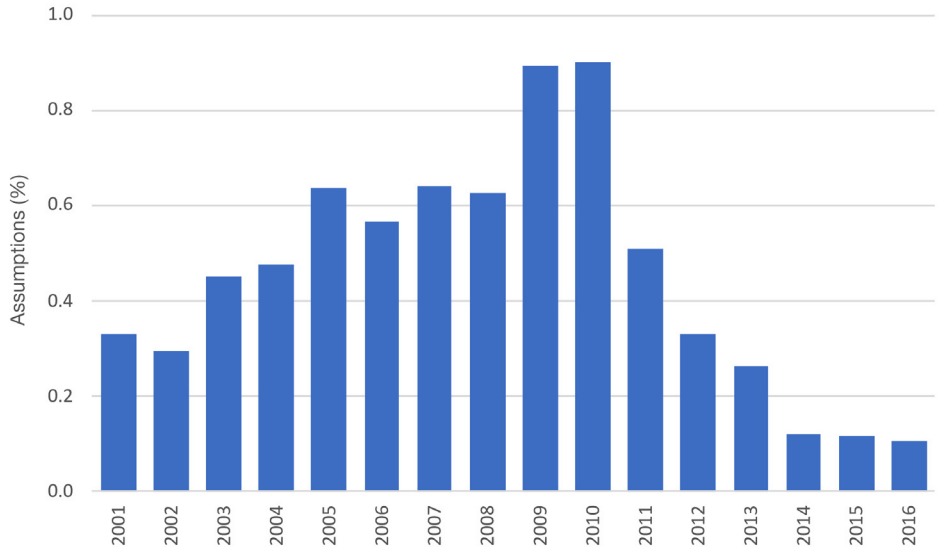
Assumption Rate—Rate Among All Active Loans



Source: Author's tabulations of Federal Housing Administration administrative data

Exhibit 6B

Assumption Rate—Rate by Cohort

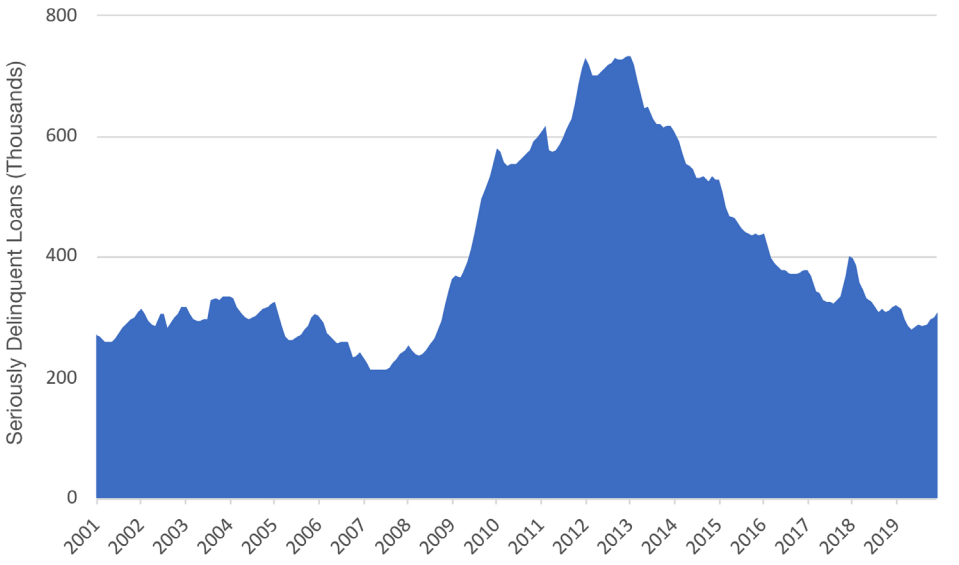


Source: Author's tabulations of Federal Housing Administration administrative data

The increase in assumptions when the financial value of assumption was extremely low is unexpected. However, the aftermath of the Great Recession also experienced tighter underwriting standards and a reduction in credit availability. Assumptions may have enabled marginal homebuyers to access mortgage credit through existing loans. "One motivation for an above-market assumption is the buyer's ability to avoid the loan qualification process involved with new loans. The qualification process can involve significant origination costs and subject the borrower to stringent qualification criteria that can preclude the borrower from obtaining a new loan" (Allen and Springer, 1998: 268). In addition, the housing bust created a large stock of delinquent borrowers looking to sell in any way possible (exhibit 7). Mortgage assumption may be an alternative to default and foreclosure if a willing buyer can be found.

Exhibit 7

Delinquent Loans



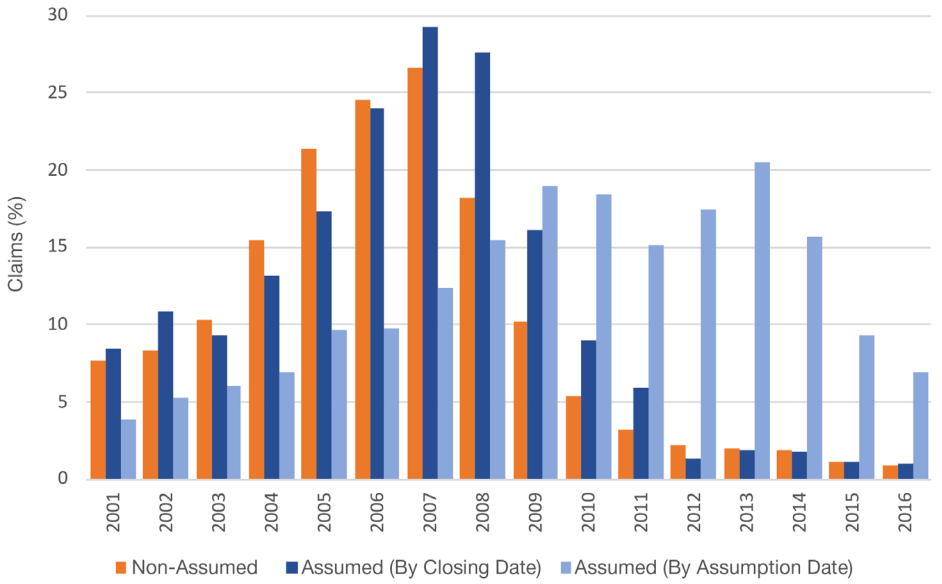
Source: Author's tabulations of Federal Housing Administration administrative data

Exhibit 6B shows the assumption rate by cohort between 2001 and 2016. Roughly one of every 214 FHA-insured loans originated between 2001 and 2019 has been assumed, but the rate tripled from 0.3 percent among loans originated in 2002 to nearly 0.9 percent for loans originated in 2009 and 2010. The rate declines for more recent vintages with less seasoning (i.e., less time exposed to be assumed).

A higher share of assumed loans has resulted in FHA mortgage insurance claims. Exhibit 8 shows the claim rate by cohort and assumption status. Roughly 8 percent of loans closed between 2001 and 2016 and never assumed have terminated with an insurance claim. By comparison, 13 percent of assumed loans have gone to claim.

Exhibit 8

Mortgage Insurance Claims by Assumption Status



Source: Author's tabulations of Federal Housing Administration administrative data

Data and Methodology

This paper uses administrative data from FHA's 203(b) mortgage insurance program to examine the causes and consequences of assumption. The data are restricted to 30-year fixed-rate mortgages for the purchase of existing single-family homes with loan-to-value (LTV) higher than 95 percent that were active between 2001 and 2019.[10] That sampling frame yielded a dataset of more than 23,400 loans, including all assumed loans, 1-in-50 never-assumed loans that defaulted with an insurance claim, and 1-in-1,000 other non-assumed loans. Weighting was used to account for oversampling of assumptions and claims. Exhibit 9 provides descriptive statistics. Due to generally falling interest rates and, thus, positive rate spreads, active loans in the sample had an average mortgage assumption value of *negative* $7,962 over the study period. By contrast, because the upfront mortgage insurance premium had already been paid (or financed) on existing loans but would be required on originations, the premium assumption value averaged $6,703. Overall, the total assumption value averaged negative $1,259; however, assumption values varied substantially both across borrowers and across time.

[10] Loans were also restricted to less than $625,500. FHA mortgage insurance premiums have minimal variation by credit risk but differ by *LTV* ratio, loan term, and loan amount. Those data restrictions create a standard FHA mortgage insurance premium within a given time period.

Exhibit 9

Descriptive Statistics

	Mean	Standard Deviation		
		Overall	Between	Within
Assumption Value	-$1,259	17,337	14,172	10,356
Mortgage Assumption Value	-$7,962	17,303	14,239	9,820
Premium Assumption Value	$6,703	8,034	6,092	4,831
Loan-to-Value Ratio	86%	17	12	11
Delinquency				
Currently Delinquent	0.15	0.36	0.23	0.28
Months Delinquent	1.49	5.77	3.03	4.43
Ever Delinquent	0.32	0.47	0.34	0.29
Delinquency Episodes	0.97	2.13	1.25	1.35
Economic Conditions				
Unemployment Rate	6.4%	2.7	2.4	1.6
Change in Employment	1.0%	2.5	1.9	2.0
Delinquency Rate	4.7%	3.5	3.3	2.1
Change in House Values	2.6%	6.9	6.3	5.2
Value Ratio	104.0%	113.5	63.4	94.9
Number of Home Sales	1,573	1,985	2,008	503

Notes: Sample includes 23,407 subjects with average 58.3 months for 1,365,044 observations. Unweighted statistics.
Source: Author's tabulations of FHA administrative data

Survival analysis helps address the issues of censoring and differences in exposure. This article uses semi-parametric survival analysis to model the assumption hazard

$$h(t) = h_0(t)e^{\beta X_t + \delta AV_t + \phi + \theta}$$

where h_0 is an unspecified baseline hazard. Loans that terminate without assumption are right-censored. In addition, the study period ends in 2019 to avoid complications related to the COVID-19 pandemic. The author used a Cox proportional hazard model rather than a subdistribution model because he is interested in the cause-specific effect of the assumption value on the likelihood of assumption (Allison, 2018; Austin, Lee, and Fine, 2016). However, he also estimated a Fine-Gray subhazard model that treats loan termination as a competing risk to find the effect of assumption value on the cumulative incidence of assumption.

The coefficient of interest δ captures the increase in assumption hazard associated with the estimated assumption value. The assumption value is separated into two measures: the mortgage assumption value (MAV) and the premium assumption value (PAV). Both measures are adjusted for inflation using the chained consumer price index from the Bureau of Labor Statistics.

The author estimated MAV as the difference between the face value of the remaining mortgage amount and its market value after discounting the payment stream by current market interest rates.

$$MAV_t = UPB_t - NPV_{rt}(PI)$$

where

UPB_t is the unpaid principal balance in month t, including upfront mortgage insurance premium if financed, which is equal to the net present value of *PI* discounted at the original mortgage interest rate (i)

PI is the fully amortizing payment of principal and interest based on the original principal balance (*OPB*) and mortgage rate

$$PI = OPB \times \left(\frac{i}{1-(1+i)^{-360}}\right)$$

and NPV_{rt} is the net present value discounted by the current market mortgage interest rate (r)

$$NPV_{rt}(PI) = \sum_{t=1}^{T} \frac{PI}{(1+r)^t}$$

The stream of mortgage payments becomes more heavily discounted as prevailing mortgage rates rise, lowering the net present value and increasing the assumption value.

PAV is the difference between the net present value of the premium schedule on new originations and the net present value of the existing premium schedule, both discounted using current mortgage rates.

$$PAV_t = NPV_{r\hat{t}}(MIP_t) - NPV_{r\hat{t}}(MIP)$$

where MIP_t is the mortgage insurance payment at the current premium rate, including new upfront mortgage insurance premiums; *MIP* is the mortgage insurance payment on the existing loan (in which the upfront premium is already paid or financed into the loan amount[11]); and $\hat{t}$ is the length of time over which premiums are collected. FHA loans with case numbers before June 2013 could have their insurance premiums canceled once the unpaid principal balance fell to less than 78 percent of the property value at origination. For computing the NPV of MIP_t before June 2013, the author used 78 percent of the property value at time t.

Fixed effects capture time-invariant impacts of state ϕ and performance year θ. Covariates X account for changing economic conditions and borrower status.

LTV Ratio	The contemporaneous *LTV* ratio is defined as the amortized unpaid loan balance divided by the house value, estimated as the original house value adjusted by CoreLogic®'s county-level house price index.
Delinquent	Whether the borrower is delinquent in a given month.
Months Delinquent	The number of months within an episode of mortgage delinquency.
Ever Delinquent	Whether the borrower has ever been delinquent.
Delinquency Episodes	The number of mortgage delinquency episodes in the loan history.

[11] A financed upfront mortgage insurance premium could arguably be backed out of the unpaid balance of the mortgage and factored into the *PAV* instead of the *MAV*.

Monthly county-level economic conditions include—

Unemployment Rate	The unemployment rate reported by the Bureau of Labor Statistics.
Change in Employment	The 12-month change in the number of employed persons reported by the Bureau of Labor Statistics.
Mortgage Delinquency Rate	The serious mortgage delinquency rate, defined as the share of loans 90 days delinquent or in foreclosure reported by CoreLogic®.
Change in House Values	The 12-month change in the CoreLogic® house price index.
House Price Ratio	The estimated house value, computed by adjusting the value at origination by the CoreLogic® house price index, divided by the median sales price.
Homes Sales	The 12-month moving total number of property sales reported by CoreLogic®.

The author anticipated that the likelihood of assumption would increase with the contemporaneous LTV ratio (i.e., the share of the sales price that can be financed by the existing loan) and decrease with the strength of the local economy, when new mortgage credit might be more readily available.

In addition to the likelihood of assumption, the author further analyzed the *effect of assumption* on the likelihood of claim-default. Claim-default is defined as a mortgage insurance claim dated to the beginning of the delinquency episode that led to the claim (i.e., 1 month after the last payment made among loans that terminated with a mortgage insurance claim). This definition is preferred to the more often-used first 90-day delinquency because delinquent loans can be assumed; therefore, delinquency is not a competing risk to assumption. Only a terminated loan cannot be assumed. However, the date at which a claim is recorded depends on foreclosure, conveyance, and claims processes beyond the control of the borrower. Therefore, claim terminations in this paper are dated to the beginning of the default. Assumption becomes a time-varying binary indicator (*ASSUME*) in the loan history. If assumptions are used to bypass underwriting standards, as found by Allen and Springer (1998), then assumption may be associated with a greater credit risk. Assumption value and delinquency covariates are excluded, but the specification is otherwise similar. The focus is on the cause-specific effect of assumption, but both Cox and Fine-Gray models are estimated.

Findings

First are the findings related to the likelihood of assumption, then the results of the estimated effect of assumption on loan performance.

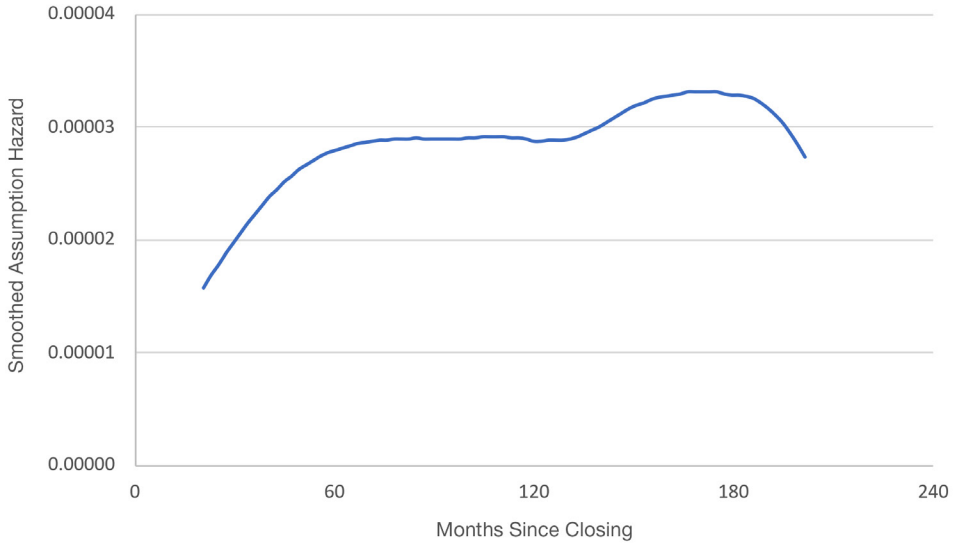
Assumption

Exhibit 10A shows the smoothed assumption hazard function estimated from the sample. The likelihood of assumption is relatively constant throughout the life of the loan. Exhibit 11 presents the results of assumption hazard models. The first three columns show the result of the

cause-specific Cox hazard model, and columns four through six show the result of the Fine-Gray subdistribution model.

Exhibit 10A

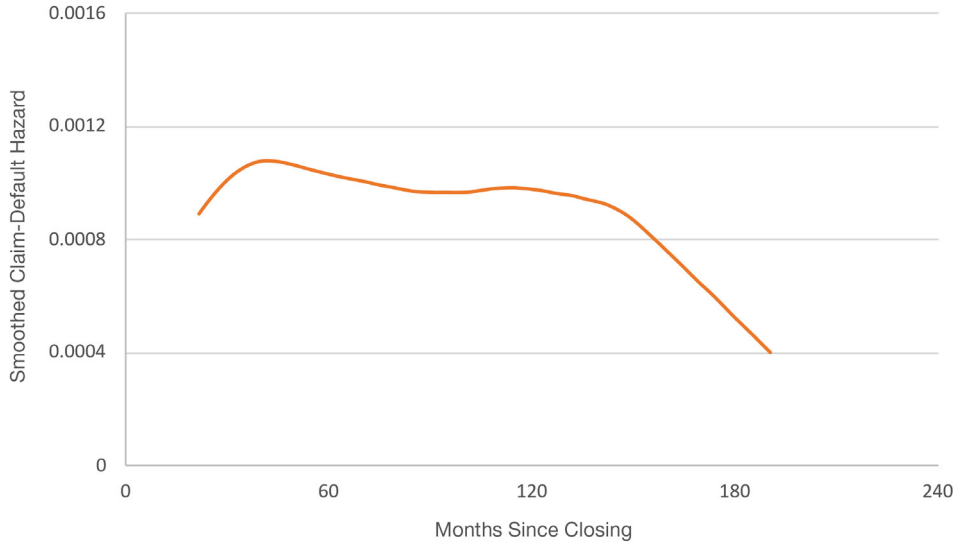
Baseline Hazards—Assumption



Source: Author's analysis of Federal Housing Administration administrative data

Exhibit 10B

Baseline Hazards—Claim-Default



Source: Author's analysis of Federal Housing Administration administrative data

Exhibit 11

Assumption Hazard

	Cox			Fine-Gray		
	(1)	(2)	(3)	(4)	(5)	(6)
Assumption Value ($000s)			1.017*** (0.002)			1.018*** (0.002)
Mortgage Assumption Value	1.019*** (0.003)	1.018*** (0.003)		1.017*** (0.002)	1.016*** (0.002)	
Premium Assumption Value		1.015*** (0.003)			1.021*** (0.004)	
Loan-to-Value Ratio	0.999 (0.005)	0.997 (0.005)	0.996 (0.004)	0.951*** (0.005)	0.948*** (0.004)	0.949*** (0.004)
Delinquency						
Currently Delinquent	0.991 (0.118)	0.995 (0.119)	0.997 (0.119)	0.738** (0.077)	0.753** (0.079)	0.748** (0.079)
Months Delinquent	1.041*** (0.003)	1.040*** (0.003)	1.039*** (0.003)	1.056*** (0.004)	1.054*** (0.004)	1.055*** (0.003)
Ever Delinquent	0.785*** (0.056)	0.784*** (0.056)	0.783*** (0.056)	0.816** (0.055)	0.817** (0.056)	0.818** (0.056)
Delinquency Episodes	0.990 (0.012)	0.990 (0.012)	0.991 (0.012)	1.075*** (0.012)	1.073*** (0.012)	1.073*** (0.012)
Economic Conditions						
Unemployment Rate	0.948* (0.022)	0.954* (0.022)	0.955* (0.022)	0.920* (0.034)	0.931* (0.032)	0.930* (0.033)
Change in Employment	1.023 (0.013)	1.022 (0.014)	1.021 (0.014)	1.014 (0.015)	1.013 (0.015)	1.014 (0.015)
Delinquency Rate	0.990 (0.010)	0.989 (0.010)	0.988 (0.010)	1.022 (0.015)	1.018 (0.013)	1.019 (0.013)
Change in House Values	0.972*** (0.005)	0.968*** (0.005)	0.967*** (0.005)	0.949*** (0.005)	0.945*** (0.005)	0.946*** (0.005)
Value Ratio	1.000*** (0.000)	1.000** (0.000)	1.000** (0.000)	1.000* (0.000)	1.000 (0.000)	1.000 (0.000)
Home Sales (Log)	0.934* (0.027)	0.929* (0.028)	0.928* (0.028)	0.875*** (0.027)	0.869*** (0.027)	0.870*** (0.027)
AIC	137,390	137,346	137,348	612	613	611

AIC = Akaike Information Criterion.

Notes: Cox model treats all other terminations as censored observations. Fine-Gray model treats other terminations as a competing hazard. Assumption Value includes both mortgage assumption value and premium assumption value.

*Statistically significant at the *** 0.001, ** 0.010, and * 0.050 levels. Errors clustered by state.*

23,407 subjects (1,203,119 observations). Standard errors in parentheses.

Source: Author's analysis of Federal Housing Administration administrative data

As expected, mortgage assumption is less common in strong housing markets. House price appreciation and homes sales are associated with statistically significant declines in the likelihood of assumption. In addition, the year fixed effects (not shown) are smallest before 2005, during the

housing boom, and greatest in 2012 at the nadir of the housing market. On the other hand, higher unemployment is also associated with a lower likelihood of assumption.

Borrowers that have never been delinquent are more likely to have their loan assumed. However, the likelihood of assumption increases if the borrower is currently delinquent and increases with the number of months delinquent. Contrary to expectation, higher contemporaneous LTV ratios are associated with a lower likelihood of assumption in the Fine-Gray model, but are not statistically significant in the Cox model.

Finally, the top rows in exhibit 11 show the effect associated with the estimated assumption value. The first column includes just the MAV associated with the interest rate spread and remaining balance of the mortgage. Every $1,000 increase in MAV is associated with a 1.9 percent increase in the assumption hazard. The second column of exhibit 11 includes both the MAV and the value associated with the insurance premium schedule of the existing loan relative to the prevailing premium schedule. Every $1,000 increase in the PAV is associated with a 1.5 percent increase in the assumption hazard. Including PAV also slightly reduces the effect associated with MAV to 1.8 percent. However, the difference between the PAV and MAV coefficients is not statistically significant (χ^2=1.51). The third column sums mortgage and premium assumption values and finds every $1,000 increase in total assumption value is associated with a 1.7 percent increase in the assumption hazard. The Fine-Gray model produces comparable estimates of the impact of assumption value on the likelihood of assumption, although the effect associated with PAV is noticeably greater.

Claim-Default

Exhibit 10B shows the smoothed claim-default hazard function estimated from the sample. The likelihood of claim-default peaks within the first 5 years and then slowly declines. The first panel of exhibit 12 presents the results of claim-default hazard models. The first column shows the Cox model and the second column shows the Fine-Gray model.

Exhibit 12

Effect of Assumption

	A. Claim		B. FHA Refinance		C. Other Non-Claim	
	(1) Cox	(2) Fine-Gray	(3) Cox	(4) Fine-Gray	(5) Cox	(6) Fine-Gray
Assumed	0.591*** (0.068)	0.788* (0.093)	0.850* (0.066)	1.086 (0.087)	1.085* (0.036)	1.198*** (0.039)
Loan-to-Value Ratio	1.024*** (0.004)	1.014** (0.005)	1.027*** (0.004)	1.008* (0.004)	0.987*** (0.003)	0.951*** (0.002)
Economic Conditions						
Unemployment Rate	0.978 (0.014)	0.983 (0.016)	0.944*** (0.014)	0.921*** (0.021)	0.930* (0.027)	0.913** (0.026)
Change in Employment	0.976*** (0.006)	0.998 (0.008)	0.995 (0.009)	1.010 (0.010)	1.010 (0.016)	1.006 (0.017)
Delinquency Rate	1.056*** (0.011)	1.111*** (0.026)	0.963** (0.013)	0.987 (0.023)	0.900* (0.038)	0.925* (0.036)
Change in House Values	0.986*** (0.003)	0.989* (0.005)	1.012* (0.006)	1.005 (0.006)	1.029*** (0.003)	1.010*** (0.003)
Value Ratio	1.000 (0.001)	0.998 (0.001)	1.000*** (0.000)	1.000** (0.000)	1.000*** (0.000)	1.000** (0.000)
Home Sales (Log)	0.923*** (0.018)	0.863*** (0.022)	1.094** (0.034)	1.055 (0.037)	1.072*** (0.020)	1.035* (0.016)
AIC	6,402,260	86,114	22,080,705	86,114	45,390,610	173,408

AIC = Akaike Information Criterion.

Notes: Cox model treats all other terminations as censored observations. Fine-Gray model treats other terminations as competing hazard.

*Statistically significant at the *** 0.001 ** 0.010 * 0.050 level. Errors clustered by state.*

23,407 subjects (1,365,044 observations). Standard errors in parentheses.

Source: Author's analysis of Federal Housing Administration administrative data

As expected, the likelihood of claim-default declines with strong economic conditions. The likelihood is directly correlated with the mortgage delinquency rate but inversely correlated with home sales, house price appreciation, and job growth. Consistent with economic theory, the likelihood of claim default also increases with the contemporaneous LTV ratio.

Assumption is associated with a substantial and statistically significant decline in the likelihood of claim-default. The claim-default hazard declines more than 40 percent in the Cox proportional hazard model, which is most appropriate for causal inference. The estimate is smaller (a 21-percent decline) in the Fine-Gray model, which reflects the cumulative incidence.

The smaller effect of assumption found in the Fine-Gray model may be due to assumption being associated with an increase in non-claim terminations. Assumed loans may be less likely to go to claim simply because they are more likely to refinance or prepay. Although it is not the focus of this paper, the author estimated the effect of assumption on the likelihood of refinancing through FHA (panel B of exhibit 12) or otherwise terminating without claim (panel C), which includes selling the home, refinancing out of FHA, or prepaying some other way. Assumption is associated with a

reduction in the likelihood of refinancing with FHA in the Cox model but is not significant in the Fine-Gray model. On the other hand, assumption is associated with an increase in the likelihood of other non-claim termination in both models.

Conclusion

Mortgage assumptions have been an obscure part of the mortgage market, mostly limited to government-insured loans. Even the actuarial review of FHA's Mutual Mortgage Insurance Fund, which requires many economic assumptions, does not mention mortgage assumptions (Pinnacle, 2021). However, the number of mortgage assumptions may increase in the near future for three reasons. First, the market has more mortgages eligible to be assumed. At the end of 2020, the number totaled nearly 8 million active FHA-insured loans, accounting for roughly 10 percent of all owner-occupied households and 16 percent of homes with a mortgage, more than twice the comparable figures in 2005. Second, mortgage rates have already jumped from historic lows. The average interest rate on new 30-year fixed-rate mortgages reached over 5 percent by May 2022 and may continue to increase. By contrast, the median contract rate on active FHA-insured loans was only 3.875 percent. When these borrowers decide to sell their properties, they may also be able to sell their below-market rate mortgages. Finally, Congress has debated legislation that would reinstitute the premium cancellation.[12] Premium cancellation influences the premium assumption value, which has as much if not more effect than the mortgage assumption value. Real estate and mortgage industry professionals may want to become more familiar with the mechanics and benefits of mortgage assumption as options for interested borrowers.

The findings of this paper show that both the mortgage assumption value, based on the remaining mortgage payments and spread between mortgage and market interest rates, and the premium assumption value, based on the difference between mortgage and current insurance premium schedules, influence the likelihood of assumption. Every additional $1,000 in assumption value increases the assumption hazard by nearly 2 percent. Higher likelihood of assumption is also correlated with weaker housing markets and borrowers in delinquency. Mortgage assumption is subsequently associated with a significant reduction in the likelihood of default. The combination of delinquency increasing the likelihood of assumption and assumption reducing the likelihood of claim suggests that assumability may help reduce risk to FHA. Nevertheless, FHA should develop methods to efficiently process assumption applications in a timely manner while ensuring adequate evaluation of the credit risk of assumptors given that they are not processed through regular automated underwriting. Furthermore, the probability and impact of assumptions should be appropriately accounted for in actuarial reviews. Assumable loans cannot be presumed to prepay and otherwise behave as other loans that exercise due-on-sale clauses.

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[12] Making FHA More Affordable Act of 2017, HR 4159, 115th Congress (2017).

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