How Mortgage Finance Reform Could Affect Housing

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Since house prices peaked in 2006-07, major changes in mortgage finance have occurred: the conservatorship of Fannie Mae and Freddie Mac, the expansion of FHA and new mortgage guidelines. Yet several issues remain unresolved, centering on the roles of Fannie Mae, Freddie Mac, and the FHA. We analyze how some reforms might affect house prices and rents in a framework rich enough to simulate the impact of several potential mortgage finance reforms. In our model, the reforms change mortgage interest rates and/or loan-to-value (LTV) ratios of first time home buyers, the key drivers of house prices in recent decades. Simulations suggest that ending the implicit interest rate subsidy from Fannie and Freddie would have small effects, while changes in capital requirements or maximum FHA loan size limits would have larger effects.

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I. Model

Our analysis builds on the house price-to-rent model in John V. Duca, John Muellbauer, and Anthony Murphy (2011), whose model of post 1980 U.S. house prices incorporates the price and non-price terms of mortgage credit. They proxy mortgage lending standards (the non-price terms of credit) with a moving average of the combined LTV ratio on private / non-government mortgages used by first time homebuyers, the key marginal group of buyer.[1] Their model attributes half of the 80 percent rise in real house prices between 2000 and 2007 to lower interest rates, and the other half to the (*ex-post*) unsustainable easing of credit constraints facing first-time buyers. Both channels are amplified by extrapolative capital gains, expectations (e.g., Karl E. Case and Robert J. Shiller, 1989).

To analyze possible housing finance reforms we extend the house price-to-rent approach in our 2011 paper by adding

[1] Combined (first and second lien) LTVs for first time buyers are derived from the American Housing Survey. The majority of government mortgages are FHA and VA loans. The first time buyer LTV ratio is less endogenous and displays a very different time path than the LTV ratios of repeat home-buyers, who often use capital gains for down-payments.

equations for non-government LTVs, overall LTVs and rents to the model. John V. Duca, John Muellbauer, and Anthony Murphy (2013) show that overall first time buyer LTV ratios are needed to account for FHA's expansion since 2008, partly offsetting the contraction of private credit. Table 1 sets out the estimated equations for the (1) median LTV on non-government loans to first-time buyers (LTV^{NG}), (2) median LTV for all first time buyers (*LTV*); (3) house price-to-rent ratio (*HPRent*), and (4) real apartment rents (*RRent*).

[Insert Table 1 Here]

Equation (1) shows the key determinants of the median LTV ratios of first time home buyers using non-government loans (LTV^{NG}). *Inter alia*, the ratio responds to financial innovations, the ebb and flow of capital requirements and feedback effects from falling house prices. The 2000 Commodity Futures Modernization Act (CFMA) boosted LTV^{NG}. Higher capital requirements (*CapReq*) lowered LTV^{NG}, consistent with easier capital requirements boosting private label mortgage backed securities (PMBS) and LTVs in the subprime boom. Falling nominal house prices ($Neg\Delta_4 \ln HP$) result in tighter credit standards and a lower LTV^{NG}.[2]

The non-government LTV ratio was relatively flat until 2000. It then rose and fell with the market shares of non-prime mortgages (subprime and Alt-A), which were mainly funded by PMBS. The expansion of these securities was made possible by the rise of structured finance (e.g. CDOs and CDSs), as well as lower effective capital requirements that altered the incentives to hold and make non-prime loans. While subprime mortgages existed before 2000, the rise of structured finance made subprime lending economically significant.

The CFMA, which made derivatives enforceable throughout the U.S. and payable before bankruptcy, permitted derivative enhancements for PMBS (Lynn A. Stout, 2011). We track this innovation with the variable *CFMA*, a four-quarter moving average of a 0/1 step variable, with the step in 2001q1.

Changing capital requirements drove non-prime mortgage lending and first time buyer LTVs. Shifts in leverage are tracked by the effective capital exposure of marginal originators (*CapReq*), reflecting bank capital

[2] The low interest rate environment in the early 2000's may also have induced lower LTVs.

requirements to fund subprime mortgages on mortgages held in portfolio.[3]

The LTV^{NG} equation also includes a short-run control for disintermediation from closing failed Savings and Loans in 1989 and the transition to Basel I capital standards (*S&LBaselI* = 1 in 1989q2-q4, 0 otherwise).

To account for FHA actions to counter the housing bust, equation (2) models the overall first time buyer LTV as a function of the systemic component of the non-government (LTV^{NG}), the relative size limits on FHA mortgages (*FHASize*) and lower nominal house prices ($Neg\Delta_8 \ln HP$).

The *FHASize* term captures substitution between non-government and FHA mortgages, which often have LTVs close to the usual maximum of 97 percent. The FHA share of first time buyer mortgages partly reflects the extent to which FHA loan size limits are below those on conforming mortgages. Policies to shrink FHA reduced this ratio (*FHASize*) from 100 to 50 percent between 1981 and 1994, but later rose to 75 percent with policies to raise homeownership. To counter tighter credit standards on private mortgages, FHA loan size maxima were raised in 2006q1 to at least equal those on conforming mortgages in high cost areas. This spurred a jump in FHA's market share that partly offset the plunge in LTVs on non-FHA mortgages, resulting in a less notable reversal in overall LTVs.

The negative sign on the nominal house price fall term reflects how the FHA share rises with downside risk (John V. Duca and Stuart S. Rosenthal, 1991), cushioning the tightening of credit standards on non-FHA mortgages induced by price declines.

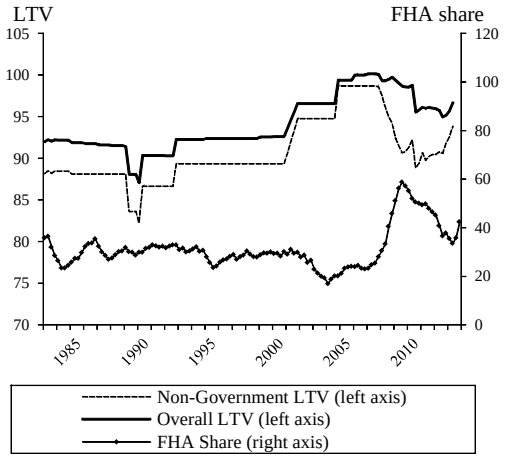

FIGURE 1. THE FHA SHARE OF FIRST TIME HOMEBUYER LENDING, AND UNDERLYING MOVEMENTS IN MEDIAN LTVS FOR FIRST TIME HOMEBUYERS

Notes: The late 1980s dip in the LTV ratios reflects the S&L crisis and new Basel I capital rules. The rises in 1992 and 2004 are due to lower effective capital requirements. The rise in 2001 reflects the rise in structured mortgage finance after the CFMA was passed. *Sources*: American Housing Survey and authors' calculations, including equations (1) and (2) in Table 1.

[3] The capital requirements are 5 percent until 1984, 5½ percent until 1989q4, and 8 percent until 1992q4. In 1993, the Community Reinvestment Act (CRA) imposed homeownership goals on Freddie Mac and Fannie Mae, inducing them to buy subprime mortgages (Stuart A. Gabriel and Stuart S. Rosenthal, 2010, and U.S. Department of Housing and Urban Development, 2001) funded by issuing debt having a 50% regulatory capital weight. This effectively lowered the capital requirement on bank holdings of non-prime mortgages to 4 percent. In mid-2004, the risk weight on investment-grade PMBS fell to 20 percent, cutting the effective capital requirement to 1.6 percent, coinciding with soaring issuance (Adrian Blundell-Wignall and Paul E. Atkinson, 2008).3 The Dodd Frank Act's "skin-in-the-game" rules made issuers of non-qualifying MBS take a first-loss position of 5 percent, so *CapReq* equals 5 percent since 2010q4.3

Figure (1) shows a smoothed estimate of the FHA share of first time buyer loans, and estimates of the underlying movements in the median non-government and overall LTVs for first time buyers based on equations (1) and (2). Similar estimates were obtained from more general, "local level" state space models.

The long run house price-to-rent ratio in equation (3) is increasing in the systematic component of the overall LTV, and decreasing in the real user cost of housing (*UC*).[4] The long run cointegrating vector is similar to the ones reported in our 2011 paper. The estimated speed of adjustment to the long run is 8 percent per quarter. *TaxCredit* captures the temporary boost to house prices from the first time home buyer tax credit in 2009.

In equation (4), long-run real rents (*RRent*) are positively related to real house prices (*RHP*), real disposable personal incomes (*RY*) and real user costs (*UC8*, an 8 quarter moving average of *UC*). Other short run drivers are the change in relative energy prices (*RPCEnergy*, the ratio of energy to total PCE prices, as rents often include utilities), and inflation surprises (tracked by the change in the inflation rate, $\Delta_2 \ln PC$, capturing nominal inertia).

[4] The user cost of housing *UC* equals the sum of the after tax mortgage, property tax, depreciation and insurance rates minus the lagged annual rate of appreciation over the prior four years, adjusted for the annualized cost of selling a home. Many studies argue that lagged rates of appreciation are good proxies for expected house price appreciation, suggesting a role for extrapolation in the formation of household expectations.

II. Simulation Findings

The system of four equations is used to simulate the effect on the house price-to-rent ratio of changing some aspects of mortgage finance over the period 2015q3 to 2019q4 (Figure 2). The simulations use the nominal mortgage interest rate, real income, inflation and relative energy price paths in the Federal Reserve Board's November 2015 FRBUS model release. Note that we assume that mortgage interest rates do not adjust to any falls in the house prices.

The baseline simulation keeps regulatory variables frozen at their 2013q2 values. The lagged effects of earlier house price declines fade, elevating the non-government LTV, although the 2014q1 impact of the new qualified mortgage rules is assumed to lower the overall LTV by one percentage point. Nevertheless, at about 95½ percent, the overall LTV is high by historical standards, which coupled with below average user costs (partly driven by extrapolative expectations), generates further rises in the house price-to-rent ratio. As mortgage rates rise, and fundamentals

(e.g., the equilibrium correction term in the house price-to-rent equation) kick in, the HP/Rent ratio peaks and starts to retreat.

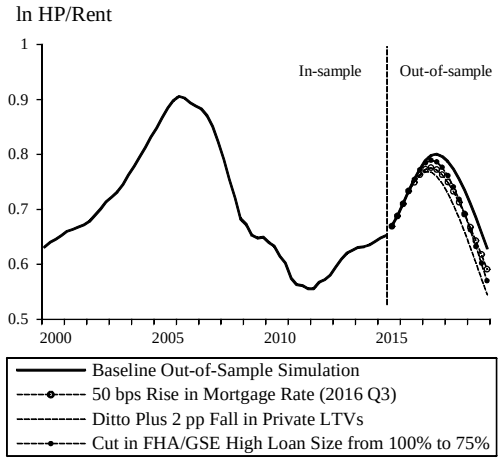

FIGURE 2. THE LOG HOUSE PRICE-TO-RENT RATIO, INCLUDING THE OUT-OF-SAMPLE SIMULATIONS OF SEVERAL MORTGAGE REFORMS

The second simulation assumes that a possible privatization of Fannie Mae and Freddie Mac has little effect on overall LTVs, but raises the mortgage interest rate by 50 basis points (bps). The 50 bps number, while close to many estimates of how much the implicit GSE subsidy lowers conforming mortgage interest rates, may be an upper bound.[5] The simulated effect of the higher mortgage rate tempers the near-term rise of the HP/Rent ratio, reflecting a modest interest rate channel effect.

The third simulation assumes that a privatization of these GSEs raises mortgage interest rates by 50 bps and lowers the non-government LTV ratio by about 2 percentage points, the gap between its 2013 and its 1992 (pre-CRA) levels. This lowers the overall LTV facing first-time buyers, and reflecting the greater importance of non-price credit constraints, results in a notably milder peak in the HP/Rent ratio than in the previous scenario.

The fourth simulation scales back the role of the FHA by shrinking the maximum size on FHA mortgages (relative to. conforming mortgages) back to its 2005 level from 2016q3 onwards. By lowering overall LTVs facing first-time buyers, this reduces the simulated path of the HP/Rent ratio, which is currently above historical averages – largely reflecting low real interest rates and low real user costs. Scaling back the FHA maximum loan size in the near-term may help limit further increases in house price valuations.

III. Comments

The recent boom, bust, and partial recovery in house prices reveals the key roles played by interest rates, lending standards and extrapolative house price expectations. The house-price-to-rent ratio seems likely to rise in the medium run,

[5] It should be noted that earlier estimates of the subsidy likely overstate its current level because the GSE's have raised their fees for insuring mortgages and have adopted risk-based loan pricing.

reflecting low interest rates and the waning of the negative feedback effects from earlier price declines on LTVs. This rise could be reduced by scaling back FHA lending. The expanded role of the FHA helped stabilize housing markets during the bust, but may no longer be needed to stabilize house prices.

Less clear are the possible effects of privatizing Fannie Mae and Freddie Mac. Ending their mortgage rate subsidy would reduce house valuations a little, whereas the potential, albeit uncertain, effect on LTVs facing first-time buyers could have more notable effects. The price-to-rent ratios then fall below their current levels, a relic—to some extent—of using a mortgage forecast that unrealistically reflects the lack of a policy reaction to falling valuations.

These simulations should be viewed cautiously, since the baseline simulation may overstate the outlook for house prices. They assume a limited effect of new qualified mortgage rules and other reforms after mid-2013, when our LTV data end. In addition, the simulations assume that the formation of house price expectations was unaffected by the housing bust and risk premia are constant. Less extrapolative post-crisis expectations would temper the simulated rises in the house price-to-rent ratio. Nevertheless, the qualitative simulation results appear plausible and from a macro-prudential perspective suggest that trimming back some government programs would help stabilize house price valuations.

REFERENCES

Blundell-Wignall, Adrian and Paul E. Atkinson, 2008. "The Sub-prime Crisis: Causal Distortions and Regulatory Reform." In *Lessons from the Financial Turmoil of 2007 and 2008,* edited by Paul Bloxham and Christopher Kent, 55-102. Sydney: Reserve Bank of Australia.

Case, Karl E. and Robert J. Shiller, 1989. "The Efficiency of the Market for Single-Family Homes." *American Economic Review*, 79(1): 125-37.

Duca, John V. and Stuart S. Rosenthal, 1991. "An Empirical Test of Credit Rationing in the Mortgage Market." *Journal of Urban Economics*, 29(2):218-34.

Duca, John V., John Muellbauer, and Anthony Murphy, 2011. "House Prices and Credit Constraints: Making Sense of the US Experience." *Economic Journal* 121(552):533–51.

Duca, John V., John Muellbauer, and Anthony Murphy, 2013. "Shifting Credit Standards and the Boom and Bust in U.S. House Prices: Time Series Evidence from

the Past Three Decades." Federal Reserve Bank of Dallas, unpublished.

Gabriel, Stuart A. and Stuart S. Rosenthal, 2010. "Do the GSE's Expand the Supply of Mortgage Credit? New Evidence of Crowd Out in the Secondary Mortgage Market." *Journal of Public Economics* 94(2010):975-86.

Stout, Lynn A., 2008. "Derivatives and the Legal Origin of the 2008 Credit Crisis." *Harvard Business Law Review*, 1: 1-38.

U.S. Department of Housing and Urban Development, 2001. "HUD's Affordable Goals for Fannie Mae and Freddie Mac." Office of Policy Development and Research, Issue Brief No. V.

TABLE 1— FOUR EQUATION MODEL OF HOUSE PRICES, RENTS AND LTVS

(1) $$\ln LTV_t^{NG} = 4.554^{***} - 0.044^{***} \ln CapReq_t + 0.059^{***} CFMA_t - 0.052^{***} S\ \&\ LBaselI_t + 0.478^{***} Neg\Delta_4 \ln HP_{t-1} + 0.624^{***} Neg\Delta_4 \ln HP_{t-5} + \hat{u}_{1t}$$

$$R^2 = 0.68, SE = 0.028$$

(2) $$\ln LTV_t = 1.349^{***} + 0.709^{***} \ln LTV_t^{NG} + 0.010^{**} \ln FHASize_t - 0.296^{***} Neg\Delta_8 \ln HP_{t-1}^{**} + \hat{u}_{2t}$$

$$R^2 = 0.79, SE = 0.018$$

(3) $$\Delta \ln HPRent_t = -0.477 + 0.369^{***} \Delta \ln HPRent_{t-1} + 0.192^{**} \Delta \ln HPRent_{t-2} + 0.106^{*}{}_t \Delta \ln HPRent_{t-3} - 0.475^{**} \Delta^2 \ln Rent_t - 0.040^{***} \Delta \ln UC_t + 0.014^{***} TaxCredit_t - 0.082^{***} (\ln HPRent_{t-1} - 1.408^{***} \ln LTV_{t-2} + 0.154^{***} \ln UC_{t-1}) + \ldots + \hat{u}_{3t}$$

$$R^2 = 0.87, SE = 0.0042$$

(4) $$\Delta \ln RRent_t = 0.031^{*} + 0.690^{***} \Delta \ln RRent_{t-1} - 0.019^{***} \Delta \ln RPEnergy_t - 0.733^{***} \Delta^2 \ln PC_t - 0.056^{***} (\ln RRent_{t-1} - 0.307^{***} \ln RHP_{t-1} - 0.265^{***} \ln RY_{t-3} - 0.054^{***} \ln UC8_{t-2}) + \ldots + \hat{u}_{4t}$$

$$R^2 = 0.88, SE = 0.017$$

Notes: Refer to the text and Online Appendix for further details. The first three equations are jointly estimated by non-linear least squares over the sample period 1983q1 to 2013q2, substituting the conditional means of the non-government LTV equation (1) into the overall LTV equation (2), and the conditional mean of (2) into the house price-to-rent equation (3). The rent equation (4) is estimated by OLS over the period 1979q1 to 2013q4. In order to conserve space, a small number of impulse dummies and other terms in equations (3) and (4) are omitted.

Source: Authors' calculations.

***, ** and * denote significance at the 1, 5 and 10 percent levels respectively.