

**Have the GSE Affordable Housing Goals Increased
the Supply of Mortgage Credit?**

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Abstract

In the 1980's, housing market analysts and policymakers were concerned that Freddie Mac and Fannie Mae were not adequately facilitating the financing of affordable housing for low- and moderate-income families. To address these concerns, the Department of Housing and Urban Development establish quantitative Affordable Housing Goals requiring the Government Sponsored Enterprises (GSEs) to increase their purchases of mortgages originated by low- and moderate-income households and for homes located in low-income neighborhoods. Our analysis indicates that the goals increased the supply of mortgage credit available to low- and moderate-income households, after controlling for other mortgage market factors. Our analysis suggests that the increase in the supply of low-income mortgage credit occurred primarily in 1998.

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Introduction

The 1992 Federal Housing Enterprises Financial Safety and Soundness Act (FHEFSSA) called for the Department of Housing and Urban Development (HUD) to establish quantitative goals regarding the purchase of mortgages for Fannie Mae and Freddie Mac, two Government Sponsored Enterprises (GSEs), because of concerns among housing market analysts and policymakers that the GSEs were not adequately facilitating the financing of affordable housing for low- and moderate-income families. The GSEs have generally been able to meet their mandated percentage of business targets since they were established in 1993.^{1,2}

Although it is clear that the GSEs are meeting their target goals, it is unclear as to whether the goals are having the desired affect – that of increasing the overall supply of mortgage credit to borrower groups targeted by the legislation.³ Given the importance of the GSEs to the primary mortgage market and the importance of the Affordable Housing Goals to the supply of credit to targeted households, this study empirically estimates the effect that the Affordable Housing Goals had on the primary mortgage market. To preview the results, we find that the Affordable Housing Goals had a limited effect after controlling for other supply and demand factors.

¹According to Manchester [1998], the percentage of mortgages purchased by Fannie Mae and Freddie Mac that were originated to low- and moderate-income families increased from 34.1 percent and 30 percent respectively in 1993 to 45.5 percent for Fannie Mae and 42.9 percent for Freddie Mac in 1997.

²Listokin and Wylly [1998], Williams [1999], and Temkin, et al. [1999]. Temkin, et al. and Williams also point out that Fannie Mae and Freddie Mac trail many lenders in terms of service and outreach to low- and moderate-income families.

³ The appendix provides a brief overview of the goals established by HUD.

Model Development

The central question is whether the GSE Affordable Housing Goals increased the supply of mortgage credit in so-called geo-targeted areas. We examine this issue by estimating via maximum likelihood the parameters of the following mortgage market model:

$$\begin{aligned}D_{it} &= \alpha_1 P_{it} + \beta_1 X_{i1t} + u_{i1t} \\S_{it} &= \alpha_2 P_{it} + \beta_2 X_{i2t} + \delta_2 I_i + u_{i2t} \\Q_{it} &= \text{Min}(D_{it}, S_{it}) \\ \Delta P_{it} &= \gamma(D_{it} - S_{it})\end{aligned}\tag{1.}$$

where X_{i1t} and X_{i2t} are exogenous variables determining mortgage demand and supply in area i , respectively, I_i is a dummy variable indicating whether area i is a geo-targeted area, and P_{it} is the price of mortgage funds in area i . Although we do not observe the actual amount of funds demanded or supplied, we do observe X_{i1t} , X_{i2t} , P_{it} , I_i and the quantity of loans originated, Q_{it} .

Fair and Jaffee (1972) used a similar mortgage market model in their study of the housing market and noted that if $D_{it} > S_{it}$, then the quantity of loans originated is determined by the supply function, and if $D_{it} < S_{it}$, then the quantity of loans originated is on the demand function. In this model, the price of mortgage funds is exogenous.

Following Fair and Jaffee (1972), we classify Q_{it} as either being on the demand or supply curve by observing the sign on the change in the price of mortgage funds from one period to the next. Thus, if $\Delta P_{it} > 0$, then excess demand for funds exists and we observe $Q_{it} = S_{it}$. However, if $\Delta P_{it} < 0$ then excess supply exists and we observe $Q_{it} = D_{it}$. The coefficient of proportionality, γ , indicates how quickly the market adjusts to equilibrium.

The polar case of γ equal to zero implies that supply and demand do not adjust while γ equal to infinity implies perfect adjustment in supply and demand.

Data and Empirical Specification

We would like to estimate (1) using census tract data because the geotargeted GSE Affordable Housing Goals are established using census tracts. In this case, Q would be the aggregate amount of mortgage credit originated in a census tract. If census tracts were homogenous, then they would have equivalent demand for mortgage credit.

However, census tracts are not homogenous. For example, a census tract dominated by older persons (or higher incomes households) will have a significantly different housing demand than a census tract with a younger (or lower income) population profile. The demand for mortgage credit is also a function of the characteristics of the housing stock in the census tract—there is not much demand for single-family mortgage credit in tracts containing mostly apartment properties. Similarly, the supply of mortgage funds is not necessarily equal across all areas. Although lenders are prohibited from discriminating against geographically defined areas based on demographic factors (redlining), it is within their discretion to use economic risk factors to determine the amount of capital to place at risk in a particular area.

Unfortunately, much of the data necessary to specify the mortgage market characteristics in (1) are not available at the census tract level. As a result, we aggregate to the MSA level for our empirical analysis. Moving to the MSA level necessitates altering the geo-targeted indicator variable to an MSA level variable such as the proportion of mortgages originated in geo-targeted areas.

We estimate Q_{it} , the volume of the primary mortgage market, as the total dollar volume of purchase and refinance loans reported each year in the Home Mortgage Disclosure Act (HMDA) database for the period 1995 to 1999. This provides an overall picture of the primary mortgage market for the largest 308 metropolitan statistical areas (MSAs). Mortgage volume increased rapidly between 1995 and 1998, and declined slightly in 1999 in response to the increase in interest rates.

Table 1 reports the descriptive statistics for the variables used in the model estimation. To test whether GSE market shares are correlated with targeted borrower groups as defined by the Affordable Housing Goals (AHG), we follow Ambrose and Pennington-Cross (2000) and include the percentage of the population that resides in underserved census tracts interacted with year dummy variables.⁴ If regulations requiring greater investment in geo-targeted areas are successful, then market shares of conventional lenders and the GSEs should reflect these efforts. By interacting this variable with a time trend, we test whether GSE purchase activity has shifted in response to the AHG regulations. However, the interpretation remains – a positive coefficient for δ implies that MSAs with higher concentrations of geo-targeted areas have higher levels of mortgage credit during periods of excess demand. Table 1 reports that substantial variation exists in the percentage of the population that resides in underserved census tracts – ranging from 0% to 79%.

⁴“Underserved” is the term introduced by HUD to describe census tracts with minority populations exceeding 30 percent of the total and with median family income at or below 120 percent of the area median, or census tracts with median family income at or below 90 percent of the area median (HUD, 1995). Ambrose and Pennington-Cross (2000a) found that, on average, 27 percent of loans from census tracts in an MSA are classified as underserved. However, substantial variation exists across MSAs ranging from 0 percent to 74 percent.

We assume that demand for mortgage credit at the MSA level is a function of economic and demographic characteristics. Specifically, mortgage demand depends on average borrower income, house price appreciation and volatility, and interest rates (median effective interest rates). In the system of equations (1), the quantity of mortgage credit demanded and supplied responds to the price of mortgage credit (P). We use the average effective interest rate for each MSA as reported in the Federal Housing Finance Board's Monthly Interest Rate Survey (MIRS) for the price of mortgage credit.

Empirical studies of credit risk have found a negative relationship between house price appreciation and default loss.⁵ Following Ambrose and Pennington-Cross (2000), we estimate the percentage change in local house prices over the last year (ΔHPI) using the OFHEO MSA Repeat Sales Index where increases in house prices indicate areas that are experiencing economic growth and lower risk. We also include the overall volatility in the local housing market as an additional measure of local economic stability ($VOLATIL$) and the yearly local unemployment rate for each MSA (U) as a measure of economic risk. Since ΔHPI controls for the house price appreciation for the MSA, we estimate the volatility in the house price series using the volatility parameters reported by OFHEO.⁶ This variable tests whether greater volatility in house prices produces more risk to mortgage lenders.

We also include demographic variables, such as the average age of the population in each MSA ($AVGAGE$), the population growth rate for each MSA, the average

⁵ See Capozza, Kazarian, & Thomson (1997), Deng & Calhoun (1997), and Ambrose & Capone (1998).

⁶ The variance in house price growth rates from the OFHEO Repeat Sales Index is estimated as

$$\hat{\sigma}_t^2 = \hat{A}t + \hat{B}t^2$$

where A and B are the ordinary least squares regression estimates of the second stage weighted repeat sales procedure, and t is the number of quarters from the beginning of the series.

household income in each MSA (*INCOME*), and the MSA's racial profile to control for differences in demand. In order to capture variation in demand resulting from differences in area demographics, we include measures of the ethnic make up of the MSA. If minorities have preferences for certain types of lenders or mortgage products then locations with higher concentrations of minority groups may have different primary mortgage market demand functions. Thus, we include the percent of the population that is non-white (*MINOR*) to indicate the net effect of these forces.

We assume the supply of mortgage credit is also a function of local economic risk factors (unemployment and house price variation and growth) and interest rates (median effective interest rate). To control for the size of the market, we include the overall MSA population (*POP*). We do not include demographic characteristics in the supply equation since we assume that financial institutions do not engage in redlining geographic areas based on tract demographics. By including the percent of underserved census tracts in an MSA in the supply equation we are able to directly test for whether mortgage lenders and the GSEs in particular have responded to the GSE Affordable Housing Goal target of increasing mortgage credit to underserved areas during periods of excess demand.

Finally, we note that loan quantity is measured as the total MSA loan volume of mortgages originated (both purchase and refinance) as reported in HMDA. However, the theoretical model developed by Van Order [1996] suggests that a substitution effect may occur as the GSEs purchase seasoned loans from portfolio lenders thereby increasing the availability of credit in the primary mortgage market. As a result, GSE operations in the secondary market that are not reflected in the market share analysis of the previous sections could have a substantial impact on the availability of credit to underserved

mortgage markets. To test for this effect, we include the volume of seasoned loans purchased by the GSEs in each MSA as reported in the GSE PUDB. A positive coefficient for the seasoned loan variable would support the hypothesis that GSE purchase activity in the seasoned loan market does have a substitution effect in the primary mortgage market.

Results

In Tables 2 and 3, we report the parameter coefficients for the non-linear full information maximum likelihood estimation of the mortgage supply and demand model. In Table 2, we report the base model that includes only the underserved market percentage while Table 3 reports the results for the model containing the interaction of the underserved market share with the yearly dummy variables. Thus, Table 2 shows the overall impact of the GSE Affordable Housing Goals on the mortgage market while Table 3 attempts to determine the yearly impact of the Affordable Housing Goals.

Intuitively, the model coefficients appear plausible. For example, the price coefficients (effective interest rate) are significantly negative in the demand equation and significantly positive in the supply equation, indicating that supply and demand react as expected to changes in mortgage interest rates. As a further check on the consistency of our model to explain the dynamics of mortgage market, we find the coefficient of proportionality, γ , is negative and significantly different from zero. This confirms the hypothesis that demand is greater than supply when interest rates are rising and that supply is greater than demand when interest rates are falling.

Examining the coefficients on the demand side, we find that population growth leads to an increase in the demand for mortgage funds while increases in house price appreciation correspond to lower mortgage demand (possibility in response to a reduction in housing affordability). We also see that as average age and minority population increases, demand declines. Finally, we find increases in average income increase the demand for mortgage credit.

On the supply side, we find that mortgage supply increases as the size of potential market increases (population). Counter to the demand side, mortgage supply increases as house prices increase, possibly as a signal of economic growth. That is, lenders increase the availability of mortgage credit in areas with increasing housing values. Consistent with the hypothesis that lenders alter the supply of credit in response to changes in local economic conditions, we also see that supply declines as unemployment rates rise.

The coefficient for seasoned loans (*LOG SEASONED LOANS*) is positive and significant suggesting that an increase in GSE purchases of seasoned loans in an MSA results in an increase in the total mortgage origination volume in the MSA. Thus, the empirical findings support the hypothesis that GSE purchases of seasoned loans increase the overall supply of mortgage credit.

Finally, for the variables of interest in examining the impact of the GSE Affordable Housing Goals (*UNDSERVED* and *UND96-UND99*), we find mixed results. The positive and significant coefficient for *UNDSERVED* (Table 2) indicates that lenders increased the supply of mortgage credit in areas with higher proportions of underserved borrowers. This empirically supports the hypothesis that the various programs designed

to promote greater credit availability (e.g. CRA and GSE Affordable Housing Goals) have had a positive impact on the supply of mortgage credit.

In examining the yearly interaction effects (Table 3), it appears that the positive effect found in Table 2 results from 1998. For 1996, 1997 and 1999 we do not find a significant coefficient on the underserved interaction variable. Looking at the volume of mortgages originated between 1995 and 1999, it is clear that 1998 was unusual. For example, between 1997 and 1998 the volume of purchase mortgages increased 27% (from \$592 million to \$754 million) while the volume of mortgage refinances increased 211% (from \$241 million to \$754 million). In 1999, mortgage refinance volume fell 42% while purchase mortgage volume increased another 12%. These statistics suggest that further research is necessary in order to identify the link between the underserved market and mortgage activity.

Conclusions

Our mortgage market model analyzed whether GSE purchase activity leads to a substitution effect that results in greater capital flowing to targeted areas. The empirical mortgage flow results support a limited relationship between mortgage volume and the proportion of underserved census tracts in an MSA after controlling for other supply and demand factors. Our analysis suggests that this effect results primarily from the mortgage activity in 1998. We find a significantly positive relationship between the level of mortgage activity and the purchase of seasoned loans by the GSEs.

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Appendix: The GSE Affordable Housing Goals

The Federal Housing Enterprises Financial Safety and Soundness Act of 1992 (FHEFSSA) imposed two constraints on the GSEs. First, FHEFSSA required that HUD establish housing goals that strengthen the GSEs' commitment to promote homeownership for low-income borrowers, very low-income borrowers, and borrowers living in, or owning property in, historically underserved areas. Second, FHEFSSA established a minimum constraint on the GSEs' equity capital to be regulated by OFHEO.

Transition period goals were set in 1993 whereby the GSEs had to meet separate targets for purchases of mortgages originated to: (1) low- and moderate-income families (the "low-mod" goal); (2) purchasers of properties located in historically underserved areas (the "geographically targeted" goal); and (3) low-income families living in low-income areas and very low-income families (the "special affordable" goal). The low- and moderate-income goal for owner-occupied households defines a low- or moderate-income household as a household whose income is less than or equal to the area median household income. The "geographically targeted" goal for underserved areas is defined separately for metropolitan and non-metropolitan census tracts. For metropolitan areas, the final HUD rules define "underserved areas" as census tracts with either 1) at least 30 percent minority population and with a median family income at or below 120 percent of the area median family income; or 2) a median family income at or below 90 percent of the area median family income. For census tracts located in non-metropolitan areas, "underserved areas" are defined as census tracts with either 1) at least 30 percent minority population and median family income at or below 120 percent of the area median family income; or 2) median family income at or below 95 percent of the

maximum of the state non-metropolitan median income, or the national non-metropolitan median income. The “special affordable goal” defines a very low-income household as a household whose income is less than or equal to 60 percent of the area median income. The GSE housing goals are described in HUD [1995].

The transition period goals were updated in 1995 when HUD promulgated three “final rule” GSE Affordable Housing Goals that became effective in 1996 and included targets through 1999. The final rule targets for low-mod purchases were higher than those established for the transition period. The 1996 low-mod target was 40 percent for both Fannie Mae and Freddie Mac, up from the transition low-mod target of 30 percent. The low-mod 1997-1999 target of 42 percent is also higher than the transition period target. The geographically targeted and special affordable goals were also updated in the 1995 final rule. However, definitional changes to these two goals make numerical transition targets not comparable to those established under the final rule. The final rule called for a geographically targeted goal of 21 percent in 1996, and a 24 percent target for 1997, 1998 and 1999. The special affordable target was set at 12 percent in 1996, and 14 percent in 1997, 1998 and 1999.