



**THE SIZE OF THE AFFORDABLE MORTGAGE MARKET:
2025-2027 ENTERPRISE SINGLE-FAMILY HOUSING GOALS**

August 22, 2024

This Federal Housing Finance Agency (FHFA) technical report documents the statistical forecast models that the modeling team has developed as part of the process for establishing the affordable housing goal benchmark levels for Fannie Mae and Freddie Mac for 2025 through 2027. The report was prepared by Omena Ubogu and reviewed by Jay Schultz, Samson Ramasamy, Ken Lam, and Padmasini Raman.

Introduction

The Federal Housing Enterprises Financial Safety and Soundness Act of 1992 (the Safety and Soundness Act), as amended, mandates that the Federal Housing Finance Agency (FHFA) establish annual housing goals for Fannie Mae and Freddie Mac (the Enterprises).¹ Since 2010, FHFA has adopted a two-part approach to establishing and measuring the Enterprise housing goals. The “benchmark” level is set prospectively by rulemaking based on various factors set out in the statute, including FHFA’s forecast of the goals-qualifying market based on the econometric models described in this paper. The actual market level is determined retrospectively by FHFA based on the Home Mortgage Disclosure Act (HMDA) data for the year when it becomes available. Both the benchmark market and the retrospective market levels are determined at the national level and for a full calendar year. In any given year, an Enterprise is deemed to have met the goal if it meets or exceeds either the benchmark level or the retrospective market level. Typically, HMDA data for a given calendar year is released in the second quarter of the following year so that FHFA’s retrospective market level determination of the Enterprise’s housing goals performance is made the following year.²

The benchmark level is based on the market forecast model (and other factors) and is set in advance for the goal period to provide a planning target for Enterprise activities. The market forecast model referred to here is the national level statistical model that is estimated using monthly goal-qualifying share data from HMDA and the resulting monthly forecasts are then averaged into an annual forecast for each of the three years in the goal period.

The retrospective market level is based on FHFA’s determination of the goal qualifying market for each year based on HMDA data. This is not a statistical modeling exercise but rather an aggregation based on applying counting rules to HMDA data.

The Safety and Soundness Act sets out seven factors that FHFA is expected to consider when setting the benchmark level.³ FHFA’s approach has been to incorporate as many of these factors into the statistical forecast model as possible, generating model forecasts for each of the goal years along with confidence intervals. For instance, four of the seven factors (national housing needs; economic, housing, and demographic conditions; other mortgage data; and the size of the conventional purchase money or refinance mortgage segment) are explicitly modeled in the statistical forecast models. Three factors (performance and effort of the Enterprises to lead the industry in making mortgage credit available; the ability of the Enterprises to do so; and the need to maintain sound financial condition of the Enterprises) are not readily quantifiable and there are no public data on these factors. As a result, they are not explicitly modeled in the statistical forecast models. FHFA incorporates these factors into the benchmark setting process while picking the specific point estimate within the model-generated confidence intervals for a given goal year. That process is documented in the preamble to the proposed rulemaking and is beyond the scope of this report. This report focuses on documenting the statistical models and the associated confidence intervals of the estimates.

The single-family goals are limited to conventional conforming mortgages on owner-occupied housing with a total of one to four units. Therefore, jumbo mortgages (with loan amounts above the

¹ 12 U.S.C. 4561(a).

² Typically, FHFA will issue a preliminary determination of each Enterprise’s housing goals performance in a given calendar year, in the following October. The Enterprises will have 30 days to respond to the determination and FHFA typically issues a final determination in December.

³ 12 U.S.C. 4562(e)(2).

conforming loan limit), mortgage loans to investors, mortgages on second homes, and non-conventional loans (loans with some form of government insurance on them) are all excluded.

FHFA is required to establish three single-family home purchase goals and one refinance goal. FHFA has also established two additional single-family home purchase subgoals for low-income census tracts and minority census tracts. The single-family home purchase goals and subgoals and the single-family refinance goal are defined as follows:

- **Low-Income Home Purchase (LIP) Goal:** This goal measures the share of each Enterprise’s goal-qualifying purchase loans made to families with incomes no greater than 80 percent of Area Median Income (AMI).
- **Very Low-Income Home Purchase (VLIP) Goal:** This goal measures the share of each Enterprise’s goal-qualifying purchase loans made to families with incomes no greater than 50 percent of AMI.
- **Minority Census Tracts Purchase (MCT) Subgoal:** This goal measures the share of each Enterprise’s goal-qualifying purchase loans made to families with incomes no greater than 100 percent of AMI in minority census tracts.⁴
- **Low-Income Census Tracts Purchase (LCT) Subgoal:** This goal measures the share of each Enterprise’s goal-qualifying purchase loans made to two subgroups: (1) families (regardless of income) in low-income census tracts⁵ that are not minority census tracts, and (2) families with incomes greater than 100 percent of AMI in low-income census tracts that are also minority census tracts.
- **Low-Income Areas Home Purchase (LIA) Goal:** This goal measures the shares of each Enterprise’s goal-qualifying purchase loans that are included in the minority census tracts and low-income census tracts subgoals, plus purchase mortgages made to families with incomes no greater than 100 percent of AMI living in a federally-declared disaster area.
- **Low-Income Refinance (LIR) Goal:** This goal measures the share of each Enterprise’s goal-qualifying refinance loans made to families with incomes no greater than 80 percent of AMI.

FHFA sets the low-income areas home purchase goal each year based on the sum of the minority census tracts subgoal and low-income census tracts subgoal benchmark levels, plus an additional increment based on federally-declared disaster areas over the past three years. As a result, FHFA does not create a separate statistical forecast model for the low-income areas home purchase goal.

The current set of statistical forecast models all use outcome variables (i.e., market share estimates for the five housing goals and subgoals) that are derived from the HMDA data. We rely on nineteen years of HMDA data: data from 2004 until 2022. As we will discuss in the next section, although HMDA data prior to 2004 is available, those datasets do not contain key variables needed to define the market shares for the outcome variables. The current goal cycle continues the practice established in the 2022-2024 rulemaking cycle of using Moody’s Analytics as the primary data source for the independent or driver variables.⁶ This practice streamlined the data collection process and permitted FHFA to rely on Moody’s Analytics forecasts. There are some exceptions. For some of the variables, Moody’s

⁴ Census tracts that have a minority population of at least 30 percent and a median income of less than 100 percent of AMI.

⁵ Census tracts where the median income is no greater than 80 percent of AMI.

⁶ The variables on the right-hand-side of a forecast model are often referred to as the driver variables, while they are also called independent variables and covariates in statistics and economics.

forecasts were not available. For such cases, we use FHFA’s own forecasts. The goal of FHFA’s statistical forecast models is to provide our best estimate of various affordable market segments for the next housing goal period. This naturally relies on forecasts of the key driver variables for that period.

FHFA’s models include the best-fit model specifications and key driver variables for all goal-qualifying shares while following generally accepted professional practices and standards adopted by economists at other federal agencies. The models not only fit the historical data well but are also robust (as indicated by the out-of-sample tests). However, as is the case with any forecasting model, whether the models yield “accurate” forecasts is crucially dependent on the accuracy of the forecasts for the driver variables that are inputs to the models. Moreover, the length of the forecast period is important: the longer out the forecast period, the wider the confidence bands around the forecasts.

This report provides technical documentation of the market models used to generate the single-family housing goal forecasts for the 2025-2027 period. It assumes familiarity with econometric methods and forecasting practices that are commonly used by economists. The report is organized as follows: Section 1 describes the mortgage market and economic forecast data used to construct the econometric models. Section 2 identifies the model driver variables and uses them to provide an overview of the housing and macro-economic environments that shape the mortgage market. Section 3 and Section 4 present the models for each of the four housing goals. Finally, concluding remarks are provided in Section 5. Technical appendices on sensitivity analysis and data sources are attached at the end.

Section 1: Sources of Data

The historical monthly time-series data used in estimating the Enterprise housing goals forecast models are produced by a variety of sources. We use HMDA data to construct the outcome variables – that is, the estimates for the goal-qualifying market shares for the two home purchase goals, two home purchase subgoals, and one refinance goal. Our Home Mortgage Disclosure Act (HMDA) dataset is provided by the Consumer Financial Protection Bureau (CFPB).⁷ The dataset contains loan-level records of mortgage originations that occurred during a calendar year, including the month of mortgage origination. HMDA data is considered to be broadly representative of the mortgage market in the United States. For the purpose of estimating the single-family mortgage market for goal-qualifying loans, we limit the HMDA records to originations of conventional conforming first lien, prime home purchase (or refinance) mortgages.⁸ We further limit the data to originations since January 2004 because HMDA records from the pre-2004 time period do not include a number of variables that are critical in identifying the originations that are relevant to the housing goals. In particular, the pre-2004 HMDA data do not identify property type, lien status, Home Ownership Equity Protection Act (HOEPA) status, and the Average Prime Offer Rate (APOR) rate spread. The pre-2004 data were also less precise in identifying manufactured housing loans and high-priced

⁷ Prior to 2018, HMDA data was processed and released by the Federal Reserve Board on behalf of Federal Financial Institutions Examination Council (FFIEC), an interagency body empowered to administer HMDA. Beginning with the 2018 HMDA data, it has been processed and released by CFPB; in addition, new data elements on loan, borrower, and property characteristics were added as part of the reporting requirements.

⁸ For the purpose of this analysis, prime mortgage loans are defined as mortgage originations that are not high-priced. In HMDA data, we identify high-priced loans as those with a spread (difference) between the Annual Percentage Rate (APR) of the loan and the applicable Average Prime Offer Rate (APOR) of 1.5 percentage points or greater.

mortgages. Since 2004, HMDA data began including: (1) rate-spread information for high-priced loans, (2) an indicator for manufactured housing loans, and (3) an identifier for first-lien mortgages. The rate-spread and manufactured housing information help to better identify subprime and chattel loans. HMDA data through December 2022 are used in these models.

Historical and forecast values of the model driver variables were downloaded from Moody's Analytics web site. Moody's Analytics obtains the historical values of the variables from various government agencies and industry trade groups and then generates forecasts for the variables using statistical models. Specifically, the unemployment rate, labor force participation rate, consumer price index, and new housing sales come from the Census Bureau and the Bureau of Labor Statistics. Constant maturity interest rates on Government notes and bonds are generated by the U.S. Department of the Treasury, while mortgage interest rates are obtained from Freddie Mac's Primary Mortgage Market Survey. The Housing Affordability Index (HAI) is provided by the National Association of Realtors (NAR) to Moody's. To measure house price changes, we use FHFA's House Price Index (HPI) (for all transactions and for home purchase loans, separately). The refinance rate and the government market share information are calculated from the HMDA data. The volume of refinance applications is captured by the refinance application index released by the Mortgage Bankers Association. The household debt service burden variable is collected by the Federal Reserve System. Per capita income information is released by the Bureau of Economic Analysis. Finally, a measure of the tightness of underwriting standards is constructed from data from the Senior Loan Officer Opinion Survey on Bank Lending Practices. The survey is conducted by the Federal Reserve System. For a complete list of data sources, see Appendix B.

The modeling team used Moody's forecasts published in February 2024 (specifically the Baseline Forecast scenario) for the macroeconomic drivers where available. The Baseline Forecast scenario is designed by Moody's such that the probability that the economy will perform better than this projection is equal to 50 percent, as is the probability that it will perform worse. Model results based on other alternative forecast scenarios are reported in the Appendix section of the report. In cases where Moody's forecasts were not available (in particular, for the government share of home purchases and refinances), the team generated and tested its own forecasts.

Section 2: Housing and Mortgage Market Driver Variables

This section describes the historical and forecasts of key driver variables and the macroeconomic environment that has shaped the mortgage market for the forecast period.

Macroeconomic Outlook Embedded in the Models

There are many factors that impact the affordable segments of the housing market. Interest rates are arguably one of the most important variables in determining the trajectory of the mortgage market. In an effort to continue its support of the U.S. economy and promote maximum employment and price stability, the Federal Reserve at its January 2024 meeting reiterated its commitment to seeking maximum employment and inflation at the rate of 2 percent in the long run by maintaining its target for the federal funds rate at between 5.25 percent to 5.5 percent until inflation targets are achieved.⁹ Moody's February 2024 forecast assumes that the Federal Reserve will begin cutting rates in May 2024

⁹ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20240131a.htm>

and then projects that mortgage interest rates – in particular the 30-year fixed rate, which is closely tied to the federal funds rate and the 10-year Treasury note yield – will remain elevated, and only decline 0.2 percent from 6.5 percent in 2025 to 5.9 percent in 2027.

Moody's forecast also projects that the unemployment rate will stay around 4 percent through 2027. Moody's also forecasts an increase in per capita disposable nominal income growth – from \$62,600 in 2021 to \$70,200 in 2024. Inflation is expected to be below 2.5 percent for the 2025-2027 period.

House prices rose by 51.0 percent in the fourth quarter of 2023 relative to the same time in 2019, according to FHFA's purchase-only House Price Index (HPI).¹⁰ The rise was 6.6 percent in the first quarter of 2024, relative to the same time the previous year.¹¹ FHFA noted that the market showed signs of softening as house price appreciation was lower in the fourth quarter of 2023 than in the previous quarter.¹² Moody's predicts that home price appreciation will slow down even more in 2024. Its February 2024 forecast of the same HPI index expects the annual rates of house prices to be -1.0, 0.3, and 1.8 percent in 2025, 2026, and 2027, respectively.

Everything else being equal, the continued elevation in mortgage interest rates and house prices will likely affect the ability of low- and very low-income households to purchase homes. Housing affordability, as measured by Moody's forecast of the National Association of Realtors' Housing Affordability Index (HAI), is projected to modestly rise from 114.2 in 2025 to 121.5 in 2027. (Lower values of the HAI imply that affordability has worsened). Affordable housing supply – the third main factor in housing affordability – has not kept pace with the growth of demographic demand even prior to the onset of the COVID-19 pandemic.¹³

High interest rates led to a steep drop in refinance activity in 2023. The refinance share of overall mortgage originations declined from a 62.4 percent in 2020 to 19.3 percent in 2023. Moody's forecasts this share to decline further to 15.9 percent in 2024 but rise to 19.7, 25.4 and 33.4 percent in 2025, 2026 and 2027 respectively.

The economic outlook from Moody's described above is largely consistent with the outlook provided by other forecasters. For instance, according to the latest estimate released by the Bureau of Economic Analysis (BEA), real Gross Domestic Product (GDP) grew by 2.5 percent in 2023.¹⁴ According to the most recent estimate published by the Congressional Budget Office (CBO) in February 2024, GDP is projected to grow by 1.5 percent in 2024, then remain in the 2.1-2.2 percent range through 2028.¹⁵ The unemployment rate remained at 3.7 percent in January 2024 for the third month in a row according to the Bureau of Labor Statistics (BLS).¹⁶ CBO projects this number to be 4.2 percent in 2024 and remain in the 4.3-4.4 percent range through 2028.¹⁷

¹⁰ https://www.fhfa.gov/sites/default/files/2024-02/HPI_2023Q4.pdf

¹¹ Ibid

¹² Ibid

¹³ <https://www.freddiemac.com/research/insight/20210507-housing-supply>

¹⁴ Bureau of Economic Analysis, "Gross Domestic Product, Fourth Quarter and Year 2023 (Second Estimate)," February 2024. <https://www.bea.gov/news/2024/gross-domestic-product-fourth-quarter-and-year-2023-second-estimate>

¹⁵ Congressional Budget Office (CBO), An Update to the Budget and Economic Outlook: 2024 to 2034. Published in February 2024. <https://www.cbo.gov/publication/59946>

¹⁶ U.S. Bureau of Labor Statistics "Employment Situation Summary," February 2024, Release Number: USDL-24-0148, available at: <https://www.bls.gov/news.release/empstat.nr0.htm>

¹⁷ Congressional Budget Office (CBO), An Update to the Budget and Economic Outlook: 2024 to 2034. Published in February 2024. <https://www.cbo.gov/publication/59946>

Exhibit 1 provides summary statistics on key macroeconomic indicators and the driver variables that are used in the forecast models. Variables that are forecasted by Moody's are presented in the first panel of the Exhibit, while those that are forecasted by FHFA are presented in the second panel of the Exhibit.

Exhibit 1: Historical and Projected Trends of Key Macroeconomic Driver Variables

	Historical Trends					Projected Trends			
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Real GDP Growth Rate.....	2.5	-2.2	5.8	1.9	2.5	2.3	1.6	2.0	2.2
Unemployment Rate.....	3.7	8.1	5.3	3.6	3.6	3.9	4.1	4.0	4.0
Labor Force Participation Rate.....	63.1	61.7	61.7	62.2	62.6	62.7	62.7	62.5	62.5
Inflation Rate (Change in CPI).....	1.8	1.2	4.7	8.0	4.1	2.7	2.4	2.3	2.2
Consumer Confidence Index.....	128.3	101.0	112.7	104.5	105.4	110.9	111.9	106.8	105.6
Yield Curve.....	0.1	0.5	1.3	0.1	-1.1	-0.4	0.2	0.6	0.8
30-Year Mortgage Fixed Rate.....	3.9	3.1	3.0	5.3	6.8	6.5	6.1	6.0	5.9
Per Capita Disposable Income (1000s \$).....	\$48.9	\$52.4	\$56.1	\$56.1	\$60.3	\$62.6	\$65.0	\$67.5	\$70.2
Household Debt Service Ratio.....	4.2	3.9	3.7	4.0	4.0	4.4	4.6	4.5	4.5
Existing Home Sales (1000s).....	4,746	5,060	5,420	4,525	3,672	3,825	4,347	4,627	4,835
Net Percent of Banks Tightening Standards.....	-0.6	18.1	-8.0	-2.3	8.5	2.8	-0.4	-1.8	-1.5
Refinance Mortgage Application Share.....	48.9	62.9	58.7	30.6	20.8	18.3	20.3	26.6	34.4
Housing Affordability Index.....	166.2	167.0	141.0	101.9	93.3	106.2	114.2	119.8	121.5
Percent Change in House Prices (PO) ¹	5.5	11.2	17.7	8.4	6.6	0.7	-1.0	0.3	1.8
Percent Change in House Prices (ALL) ²	5.0	6.5	18.1	11.7	4.2	0.2	-0.6	0.6	1.6
Refinance Mortgage Share.....	42.8	62.4	57.4	27.1	19.3	15.9	19.7	25.4	33.4
Percent Gov. Insured Home Purchase Loans.....	28.6	28.6	24.9	23.9	27.6	30.4	32.0	33.4	33.5
Percent Gov. Insured Refinance Loans.....	21.1	17.9	15.9	18.2	19.8	20.3	20.9	21.3	21.6

Note: Historical values and projected trends are provided by Moody's Analytics. Government shares of the home purchase and refinance market are forecasted by FHFA.

¹ Purchase transactions only (Q4/Q4 % Change)

² All transactions (Q4/Q4 % Change)

Expectations Regarding Key Driver Variables

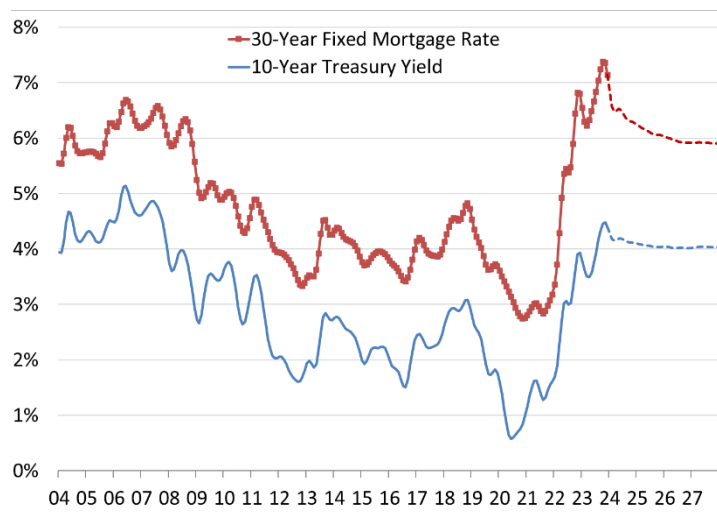
Interest Rates

Interest rates are affected by many demand and supply factors. Trends in interest rates on longer-term financial instruments such as mortgages typically follow the fluctuations of the 10-Year Treasury note yield. There is a 20 to 80 basis point spread between the 1-year and 10-year Treasury yields forecast for the 2025-2027 period, reflecting the expected differences in liquidity and credit risk during that period. This is following an expected two years of negative spreads, with the lowest point of -139 basis points in June 2023. Interest rates are heavily influenced by the monetary policies of the Federal Reserve Board's Federal Open Market Committee (FOMC). Since mid-2008, the FOMC has maintained an accommodative monetary policy in support of its dual mandate of fostering maximum employment and price stability. While near-term risks to the economic outlook appear roughly

balanced, the FOMC monitors the inflation rates closely. Exhibit 2 shows the historical and forecast values of the 30-year fixed mortgage interest rate (FRM) and the 10-year Treasury yield.

The 30-year fixed-rate mortgage interest rate fell to a low of 3.3 percent in November 2012 and rose to a high of 4.5 percent in September 2013, before eventually falling to its another low of 3.4 percent in August 2016. Over the following two years, the rate gradually rose to another high of 4.8 percent in November 2018. The rate has dropped sharply since then and it reached a historic low of 2.7 percent in November 2020. The rate rose to 3.2 percent in December 2021 then rapidly rose to a peak of 7.4 percent in October 2023. For the forecast period, that rate is expected to decline slightly from 6.1 percent in 2025 to 5.9 percent in 2027.

Exhibit 2: Historical and Projected Trends of Mortgage Rates and 10-Year Treasury



Unemployment, Labor Force Participation, and Inflation

In addition to being a general indicator of the economy's health, changes in employment also directly affect the housing market because buying a house is, for many households, the single largest investment and a long-term commitment that requires stable employment. The unemployment rate had fallen steadily from 9.1 percent in August 2011 to around 3.5 percent in last quarter of 2019. The rate then rose sharply in the first quarter of 2020 and peaked at 14.8 percent in April 2020 due to the pandemic and related economic shutdowns. Due to the aggressive fiscal and monetary policies, the unemployment rate fell to 3.9 percent in January 2022 and is forecast to remain below 4 percent through July 2024.

The labor force participation rate was rising gradually in the past few years prior to the pandemic and reached 63.1 percent in 2019. As expected, the rate dropped noticeably in 2020 to 61.7 percent then stayed at that level in 2021, before rising to 62.6 in 2023. It is expected to be in the 62.5-62.7 percent range from 2024 to 2027.

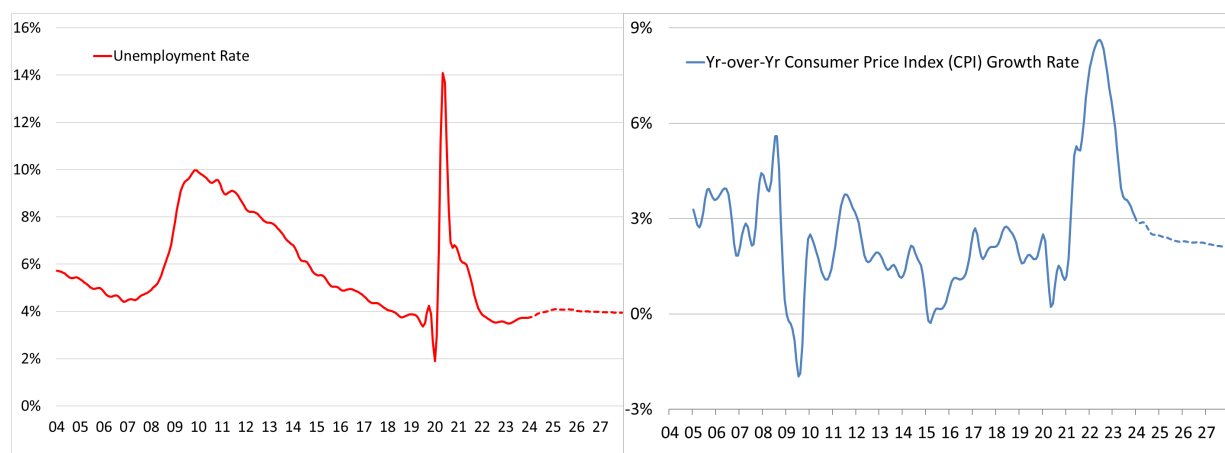
One of the stated objectives of the FOMC's interest rate policy is fostering maximum employment. Given the foreseeable monetary policy and the continued growth in the economy, the unemployment rate is expected to average about 4 percent for the 2025 to 2027 period according to Moody's forecasts. Its impact on the affordable home purchase market will depend on the composition of the

unemployment rate and could be expected to be greater if the unemployment rate of lower-wage earners substantially drives change in the overall unemployment rate.

The second stated objective of the FOMC in determining its interest rate policy is maintaining price stability. The inflation rate declined from 8.0 percent in 2022 to 4.1 percent in 2023 and Moody's forecasts that inflation will average 2.2 to 2.4 from 2025 to 2027.

Exhibit 3 plots the history and forecasts of the unemployment rate and the annual growth rate of the consumer price index (CPI).

Exhibit 3: Historical and Projected Trends of Unemployment Rate and Annual Growth Rate of Consumer Price Index (CPI)



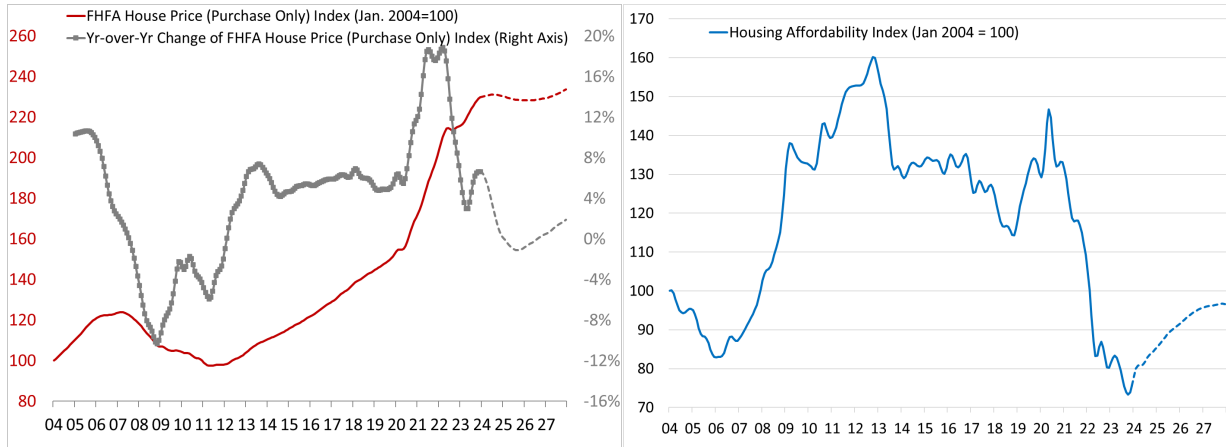
House Prices and Affordability

Trends in house prices influence the housing and mortgage markets. In periods of house price appreciation, home sales and mortgage originations may increase as the expected return on investment rises. In periods of price depreciation and/or price uncertainty, home sales and mortgage originations tend to decrease as risk-averse homebuyers are reluctant to enter the market. To measure house price appreciation, we use FHFA's purchase-only House Price Index (HPI). In the left-hand-side panel of Exhibit 4, we plot the level of the HPI (red line, represented by the left axis) and the year-over-year growth rate of the HPI (grey line, represented by the right axis) over the 2004-2027 period. As the graph shows, house prices fell dramatically during the 2007 financial crisis but have recovered and increased since 2012 with price increases in excess of 5.0 percent per year. The growth rate began to accelerate in the beginning of 2020 and reached 10+ percent on a year-over-year basis during the fall quarter of 2020 and staying at two-digit percent growth through September 2022. Although price increases decelerated, growth rate remained strong in 2023. According to Moody's, house prices are expected to decline by 1 percent in 2025. Then house price appreciation is expected to be 0.3 percent and 1.8 percent for 2026 and 2027.

The expected slight declines in interest rates and house prices in 2024 and 2025 are expected to modestly improve housing affordability from the 2023 low. To measure housing affordability, we use the housing affordability index (HAI) published by the National Association of Realtors and provided by Moody's. This index takes general house prices, mortgage interest rates, and borrower incomes into consideration. Higher HAI values means that housing is more affordable. The right panel of

Exhibit 4 presents the history and trends of the index. It shows that housing affordability has been increasing since early 2019, largely due to falling interest rates. Despite the economic downturns caused by the pandemic, housing affordability remained high during 2020 due to the historic low interest rates. However, affordability declined sharply in 2021-2023 due to high home price appreciation, rising and elevated interest rates and supply shortage.

Exhibit 4: Historical and Projected Trends of House Prices and Affordability

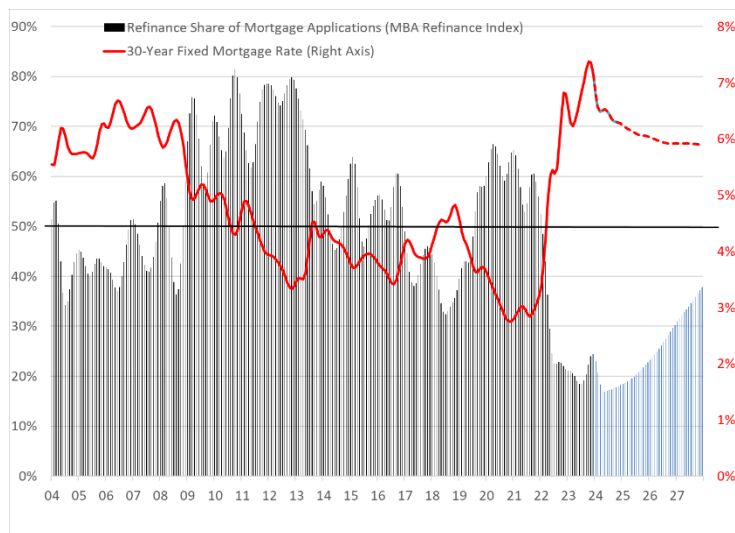


Refinance Share of Mortgage Applications

The size of the refinance mortgage market has an impact on the affordable share of refinance mortgages. Historically, refinance mortgage volume increases when the refinancing of mortgages is motivated by low interest rates (“rate-and-term” refinances). Higher-income borrowers tend to make up a greater share of this increased volume. As a result, in periods of low interest rates, the share of lower-income borrowers among all refiners tends to decrease. Likewise, refinancing that occurred when interest rates were high tends to have a higher proportion of lower-income homeowners who refinance to consolidate their debts or draw equity out of their homes for other uses.

Exhibit 5 plots the historical and projected values of the 30-year fixed mortgage rate and refinance share of mortgage applications (measured by MBA’s refinance index). As expected, it shows a roughly negative correlation between the refinance share and mortgage rate. The refinance share had consistently exceeded 50 percent of the mortgage applications for the period between 2009 and 2016 because of the low interest rate. 2020 and 2021 represented two solid “refinance boom” years due to the historic low mortgage rates. Refinance shares shrank in 2022 and 2023 due to the high interest rates, declining to as low as 18.5 percent in July 2023. Moody's forecasts that the refinance share will rise but stay well below 50 percent through 2027.

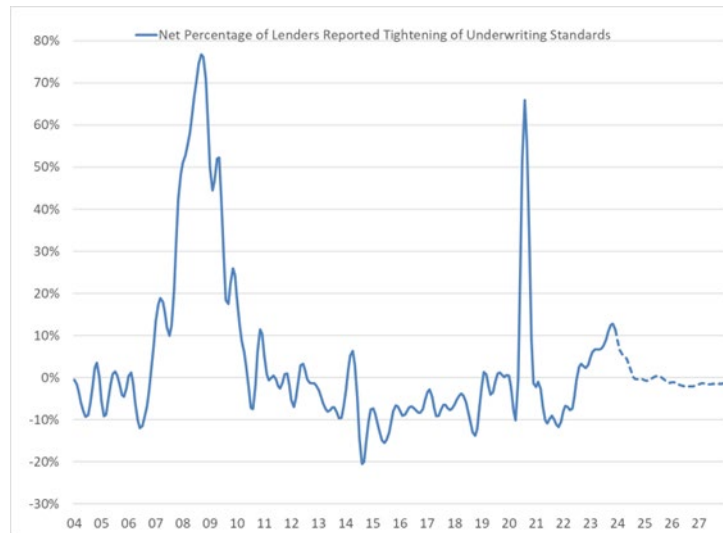
Exhibit 5: Historical and Projected Trends of Refinance Share and 30-Year Fixed Mortgage Rate



Underwriting Standards

Mortgage underwriting standards clearly have an impact on mortgage originations. One measure of the tightness of underwriting standards is the net percentage of lenders who reported a tightening of underwriting standards in the Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices. If the net percentage is greater than zero, it means that there is a higher percentage of lenders reporting a tightening of underwriting standards than lenders reporting a loosening of underwriting standards. Conversely, a negative net percentage implies that more lenders are reporting a loosening of underwriting standards. The variable is a qualitative assessment by nature but very useful in capturing underwriter attitudes as well as the use of credit score overlays and other mechanisms in which underwriting standards might tighten. Exhibit 6 plots the series over time. During the housing boom years, underwriting standards loosened. The graph shows that, following the housing bust in 2007, lenders tightened underwriting standards considerably for a number of years. The underwriting standards in 2020 were almost as tight as those during the 2007-2009 period. Following the COVID-19 pandemic, underwriting standards loosened but began to tighten as interest rates rose in 2022 and 2023. Moody's forecasts that underwriting standards will loosen in 2024 and remain so through 2027.

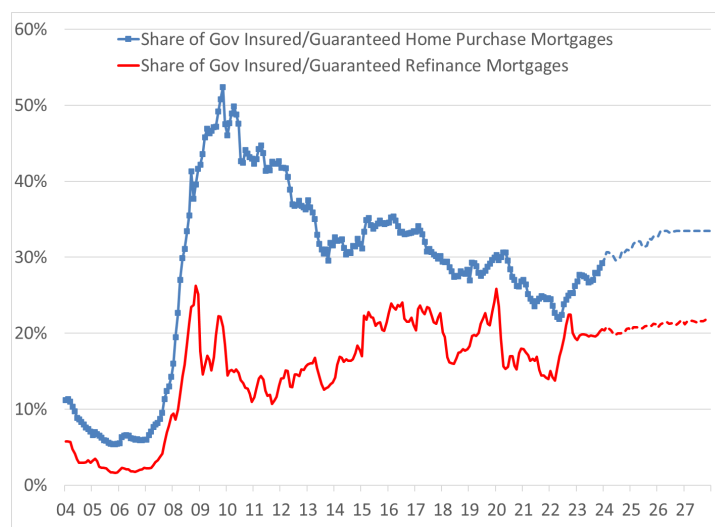
Exhibit 6: Historical and Projected Trends of Mortgage Underwriting Standards



Share of Government-Insured and Guaranteed Mortgages

Moody's does not publish forecasts for the government share of home purchase and refinance originations. The modeling team has developed basic forecast models to project these series for the 2025-2027 period. Government shares are modeled to be driven by trends in the unemployment rate, interest rates, the spread between FHA and conventional mortgage rates, existing home sales, relative underwriting tightness, and house prices. Exhibit 7 plots the historical and projected paths of the two series. Both series, especially the refinance share, declined noticeably during the pandemic in 2020 but they have since rebounded. It is expected that the government share of home purchases and refinances will reach 33.5 percent and 22.1 percent by 2027.

Exhibit 7: Historical and Projected Trends of Government Shares of Mortgages



Section 3: Econometric Models of the Single-Family Housing Goals

The purpose of the statistical models is to forecast the market share of the goal-qualifying mortgage originations in the mortgage market for the 2023-2027 period. The focus is on generating reliable model forecasts, rather than testing economic hypotheses or trying to explain the relationship between the variables. Moreover, the forecast equation itself is a reduced-form model for the affordable market. Separate models are developed and estimated for each of the five single-family housing goals. We use a type of time-series regression models called Autoregressive Integrated Moving Average (ARIMA) models. Widely used in the field of economic forecasting, ARIMA models are known for their flexibility and ability to generate good fit to various historical series. FHFA has employed these ARIMA models in past rulemaking cycles to generate market forecasts. We have updated the model specification of the ARIMA models in this goal cycle from the models used in the 2022 rulemaking cycle as needed.

The outcome variable for each of the models is expressed in percentage share format. It is constructed as a monthly time-series using the 2004-2022 HMDA data, as described earlier. All outcome variables and driver variables were first-differenced to ensure that the data series have the statistical property that they are stationary. The augmented Dickey-Fuller tests (ADF) have been conducted on each of the first-differenced series to confirm that they are stationary.

Fitting an ARIMA model on first-differenced variables means that the reported regression coefficients can no longer be interpreted in the way the “beta” coefficients are interpreted in linear regression. Not only are the estimated equations non-linear (indicating the slope of the line is dependent on the specific point the reader is interested in), the coefficients themselves represent the change in the first difference of the dependent variable. Fortunately, since the goal of our models is to forecast rather than explain the reduced form equation of the various housing goal “markets,” we are able to rely on the “hold-out” samples and out-of-sample forecasts to test the robustness of the model specifications as is common among forecasters.

In order to model the non-contemporaneous nature of the relationship between macroeconomic variables, both lagged and un-lagged versions of each driver variable were tested and the appropriate form of the variable chosen.¹⁸ Moreover, to avoid multi-collinearity (or correlation among driver variables), the modeling team has examined the correlation between potential driver variables and ensured that the final model specifications did not include driver variables that are highly correlated. Monthly indicator variables are included in the models to control for the seasonal/cyclic patterns of the mortgage activities. Finally, to allow for non-linearity between the outcome variable and driver variables, we tested and included some of the variables in natural logarithm scale. For example, the consumer confidence index variable is entered in logarithm scale in the model for the low-income home purchase market share because it provides a better fit to the data in that form.

During the model development process, we grouped the factors that are expected by housing market economists to have an impact on the market share of affordable housing into seven broad categories. They are:

- Demand-side factors such as per capita income and household debt service indicators;
- Interest rate environment including the 30-year FRM mortgage rate;

¹⁸ Lagged variables are reported with a subscript such as t_{-1} in the tables for the regression coefficients.

- Expectation factors and indicators of the health of the economy such as the unemployment rate, labor force participation rate, the consumer confidence index and consumer confidence index;
- House price level including FHFA’s house price indices and the Housing Affordability Index;
- Supply-side factors including indicators of existing home sales;
- Underwriting standards including the Senior Loan Officer Opinion survey; and
- Other factors including the share of government insured or guaranteed mortgages.

For each category of variables, many variables were tested but only retained when they exhibited predictive power. For each model, we tested and succeeded in including at least one driver variable per category. We concentrated on the theoretical and behavioral implications when selecting the driver variables but since our goal was to develop robust forecasting models (rather than developing explanatory models), we retained driver variables depending on the strength of the explanatory power.

Market Forecast for Low-Income Home Purchase Goal (LIP)

Exhibit 8 reports the final set of model driver variables that we have selected for the low-income home purchase goal. It also reports the regression coefficients, their level of statistical significance, and model diagnostics.

The driver variables that were found to be statistically significant are:

- Consumer confidence
- Housing affordability index
- FHFA’s purchase-only House Price Index
- Sale of existing homes
- Share of government insured or guaranteed mortgages

The Chi-square statistics and other model fit measures reported at the bottom of the table are reasonable for forecasting models for this kind of data. The Pr(Chi-square) statistic, for instance, indicates the probability that, after including the relevant driver variables in the model, the regression residuals are following a white noise distribution (therefore random).

To test for reliability and accuracy of the model’s forecasts, we have conducted an out-of-sample test where we withhold the last 6 months (July 2022-December 2022) of the HMDA series and estimated the model using the remaining data series (that is, January 2004-June 2022). We then compared the model forecasts in the “hold-out” period (July 2022-December 2022) to the actual values in the same period (July 2022-December 2022). Results of this analysis are presented in Exhibit 9. The blue line represents the historical HMDA series, while the red line represents the model forecasts. Focusing on the out-of-sample forecast period (July 2022-December 2022) while the two lines do not track each other perfectly, the forecast model is able to capture the downturns and upturns in the actual data (blue line), albeit with a lag. This is an indication of the robustness of the model specification.

Exhibit 8: Regression Coefficients of Market Forecast Model for the Low-Income Home Purchase Goal

Outcome Variable (First Difference)	
Share of Borrowers with Low Income	
Driver Variable (First Difference)	<i>Coefficient Estimate</i>
Unemployment Rate	0.0021 (0.0013)
Ln(Consumer Confidence)	0.0193 ** (0.0008)
Consumer Price Index (CPI) _{t-1}	-0.0008 (0.0037)
Housing Affordability Index	0.0005 * (0.0003)
FHFA House Price Index (HPI) - Purchase Only	0.0010 ** (0.0004)
Sale of Existing Homes	0.0106 ** (0.0042)
Household Debt Service Ratio _{t-2}	0.0140 (0.0115)
Per Capita Disposable Income _{t-1}	-0.0007 (0.0011)
Labor Force Participation Rate _{t-1}	-0.0035 (0.0044)
Yield Curve _{t-1}	0.0032 (0.0037)
Senior Loan Officer Opinion Survey: Percent of lenders reported tightening of underwriting	-0.0008 (0.0095)
Share of Government-Insured or Guaranteed Mortgages	0.2096 *** (0.0450)
AR(1)	-0.0629 (0.0709)
AR(2)	0.0277 (0.0715)
<i>Model Diagnostics</i>	
χ^2	8.35
Prob(> χ^2)	0.08
AIC	-1636.82
SBC	-1551.19
Notes: All variables are in first-difference format. Model includes monthly dummy variables that control for seasonal variations. Standard Errors are reported in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.	

Exhibit 9: Robustness Test of Market Forecast Model for the Low-Income Purchase Goal

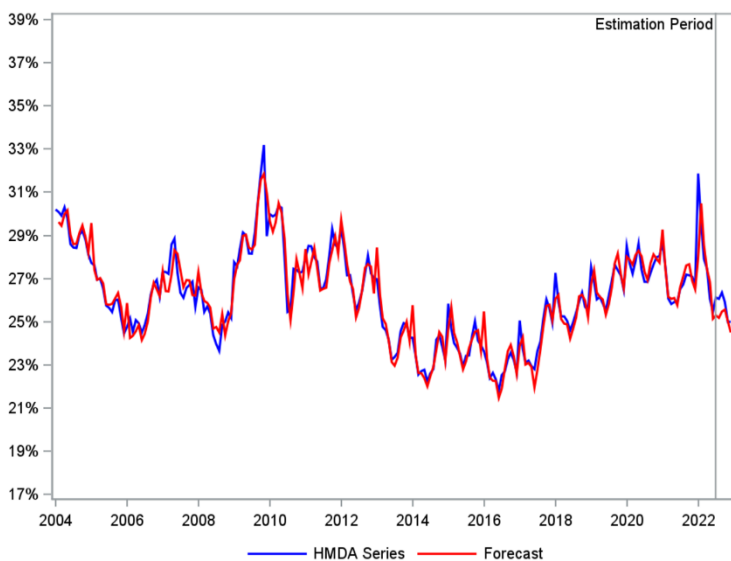


Exhibit 10 plots the monthly forecasts generated by the model for 2023-2027 period. The red line represents the forecast, while the yellow lines are the corresponding confidence intervals. The LIP market share is shown to rise gradually from 2023 to 2025 before declining for the rest of the goal period.

Exhibit 10: Model Forecast for the Low-Income Purchase Goal

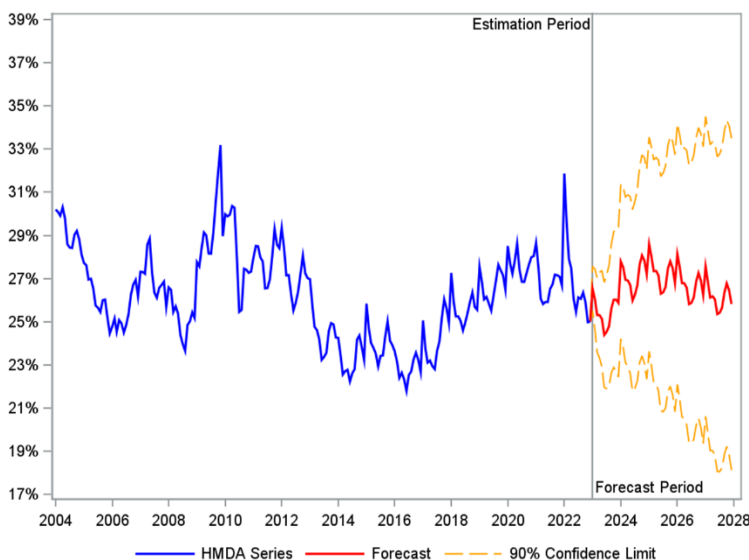


Exhibit 11 presents a summary of the annual forecasts (and their confidence intervals), together with the historical market shares (HMDA) and the benchmark levels that FHFA set for the Enterprises in the past couple rulemaking cycles. As a reference, it also shows the model forecasts for the 2022-2024 period that FHFA published in the Federal Register for the 2022 Final Rule. Forecasts from the new model are shown in the last row: 27.2 percent for 2025, 26.6 percent for 2026, and 26.1 percent for 2027. The average annual forecast across the 2025-2027 period is 26.6 percent.

Exhibit 11: Historical Performance and Model Forecast for the Low-Income Purchase Goal

	Historical Performance				Projected Performance				
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Actual Market	26.6	27.6	26.7	26.8					
Benchmark	24	24	24	28	28	28			
2022 Final Rule Market Forecast			27.5 +/- 2.3	26.6 +/- 3.9	25.7 +/- 5.0	25.5 +/- 5.9			
Current Market Forecast					25.4 +/- 2.5	27.0 +/- 4.3	27.2 +/- 5.5	26.6 +/- 6.5	26.1 +/- 7.3

Market Forecast for Very Low-Income Home Purchase Goal (VLIP)

The market model for the very low-income home purchase goal includes the same set of driver variables that are included in the model for the low-income home purchase goal. The coefficient estimates and their level of significance are, of course, different from those for the model of the low-income home purchase goal. Exhibit 12 presents the model driver variables and the corresponding coefficient estimates as well as the model fit diagnostic measures.

The driver variables that were found to be statistically significant are:

- Housing affordability index
- Sale of existing homes
- Share of government insured or guaranteed mortgages

Exhibit 13 presents the out-of-sample robustness test with the red line representing the model estimated on January 2004-June 2022 data and the blue line representing the actual HMDA estimates for the entire period. As can be seen in the graph, for the out-of-sample period (July 2022-December 2022), the model forecast (red line) does a good job capturing the turns in the actual data for July 2022-December 2022 (blue line), indicating the robustness of the model specification.

Exhibit 14 plots the monthly forecasts generated by the model for 2023-2027 period. The red line represents the forecast, while the yellow lines are the corresponding confidence intervals. It shows that the VLIP market share is predicted to rise in from 2024 to 2026 then decline slightly in 2027.

Exhibit 15 presents a summary of the annual forecasts (and their confidence intervals), together with the historical market shares (HMDA) and the benchmark levels that FHFA set for the Enterprises in the past. As a reference, the graph also shows the model forecasts for the 2021-2024 period that FHFA published in the Federal Register for the 2022 Final Rule. Forecasts from the new model are shown in the last row: 6.6 percent for 2025, 6.7 percent for 2026, and 6.6 percent for 2027. The average annual forecast across the 2025-2027 period is 6.6 percent.

Exhibit 12: Regression Coefficients of Market Forecast Model for the Very Low-Income Purchase Goal

Outcome Variable (First Difference)	
Share of Borrowers with Very Low Income	
Driver Variable (First Difference)	<i>Coefficient Estimate</i>
Unemployment Rate	0.0003 (0.0005)
Ln(Consumer Confidence)	0.0052 (0.0042)
Consumer Price Index (CPI) _{t-1}	-0.0001 (0.0003)
Housing Affordability Index	0.0002 ** (0.0001)
FHFA House Price Index (HPI) - Purchase Only	0.0002 (0.0002)
Sale of Existing Homes	0.0042 ** (0.0018)
Senior Loan Officer Opinion Survey: Percent of lenders reported tightening of underwriting	-0.0034 (0.0040)
Share of Government-Insured or Guaranteed Mortgages	0.0660 *** (0.0189)
AR(1)	-0.0040 (0.0700)
<i>Model Diagnostics</i>	
χ^2	13.02
Prob(> χ^2)	0.02
AIC	-2029.39
SBC	-1960.89
Notes: All variables are in first-difference format. Model includes monthly dummy variables that control for seasonal variations. Standard Errors are reported in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.	

Exhibit 13: Robustness Test of Market Forecast Model for the Very Low-Income Purchase Goal

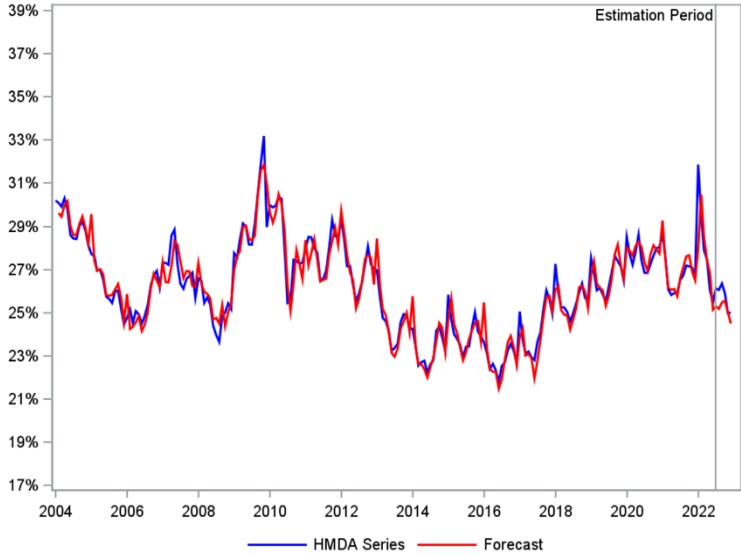


Exhibit 14: Model Forecast for the Very Low-Income Purchase Goal

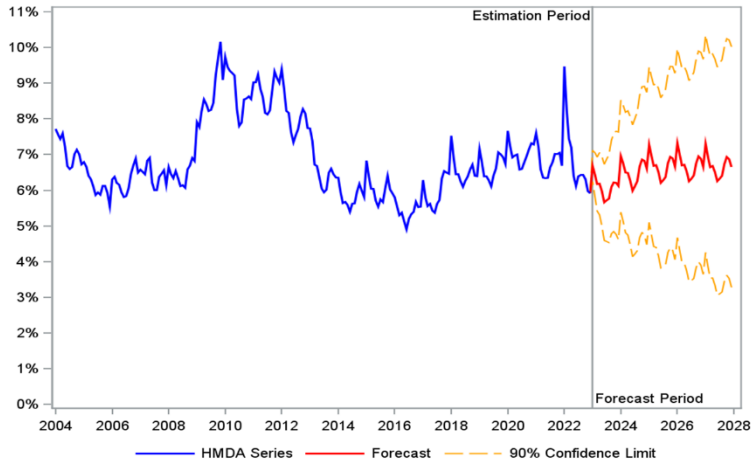


Exhibit 15: Historical Performance and Model Forecast for the Very Low-Income Purchase Goal

					Projected Performance				
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Actual Market	6.6	7	6.8	6.8					
Benchmark	6	6	6	7	7	7			
2022 Final Rule Market Forecast			6.7 +/- 0.8	6.2 +/- 1.4	6.1 +/- 1.8	6.2 +/- 2.1			
Current Market Forecast					6.1 +/- 1.1	6.5 +/- 1.9	6.6 +/- 2.4	6.7 +/- 2.8	6.6 +/- 3.2

Market Forecast for Minority Census Tracts Subgoal (MCT)

The driver variables and regression coefficient estimates for the minority census tracts subgoal are shown in Exhibit 16. The driver variable that was found to be statistically significant is:

- FHFA’s purchase-only House Price Index

The Chi-square statistics reported at the bottom of both tables indicate that, after including the relevant driver variables in the model, the regression residuals are distributed randomly (following a white noise distribution).

Results of the out-of-sample forecast robustness tests are reported in Exhibit 17. Once again, the blue line represents the historical HMDA series, while the red line represents the model forecast. The red line tracks the blue line closely for the July 2022-December 2022 out-of-sample period, showing the robustness of the model estimates.

Exhibit 18 plots the monthly forecasts. The red lines represent the forecasts, while the yellow lines are the corresponding confidence intervals. The forecasts exhibit noticeably seasonal and cyclical patterns. Over the 2025-2027 period, the market share of borrowers qualifying for the minority census tracts subgoal is forecast to increase in 2024 then level off.

Exhibit 19 presents a summary of the annual forecasts (and their confidence intervals), together with the historical market shares (HMDA) and the benchmark levels that FHFA set for the Enterprises in the past. As a reference, the graph also shows the model forecasts for the 2021-2024 period that FHFA published in the Federal Register for the 2022 Final Rule. Forecasts from the new model are shown in the last row: 12.4 percent for 2025, 12.5 percent for 2026, and 12.4 percent for 2027. The average annual forecast across the 2025-2027 period is 12.4 percent.

**Exhibit 16: Regression Coefficients of Market Forecast Model for Minority Census Tracts
Purchase Subgoal**

Outcome Variable (First Difference)	
Share of Borrowers Residing in Minority Census Tracts	
Driver Variable (First Difference)	<i>Coefficient Estimate</i>
Household Debt Service Ratio _{t-1}	-0.0003 (0.0047)
10-Year Treasury Yield	-0.0009 (0.0018)
Yield Curve _{t-1}	0.0013 (0.0017)
Labor Force Participation Rate (Working Age)	-0.0006 (0.0018)
Consumer Confidence _{t-2}	0.0001 (0.0001)
Consumer Price Index (CPI) _{t-1}	-0.0001 (0.0004)
Housing Affordability Index _{t-1}	0.0000 (0.0001)
FHFA House Price Index (HPI) - Purchase Only	0.0003 * (0.0002)
Sale of Existing Homes	-0.0010 (0.0017)
Senior Loan Officer Opinion Survey: Percent of lenders reported tightening of underwriting	0.0011 (0.0046)
Share of Government-Insured or Guaranteed Mortgages	0.0185 (0.0220)
AR(1)	-0.1349 * (0.0725)
AR(2)	-0.0489 (0.0730)
<i>Model Diagnostics</i>	
χ^2	6.36
Prob(> χ^2)	0.17
AIC	-1947.77
SBC	-1865.57
Notes: All variables are in first-difference format. Model includes monthly dummy variables that control for seasonal variations. Standard Errors are reported in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.	

Exhibit 17: Robustness Test of Market Forecast Model for Minority Census Tracts Subgoal

Minority Census Tracts Subgoal

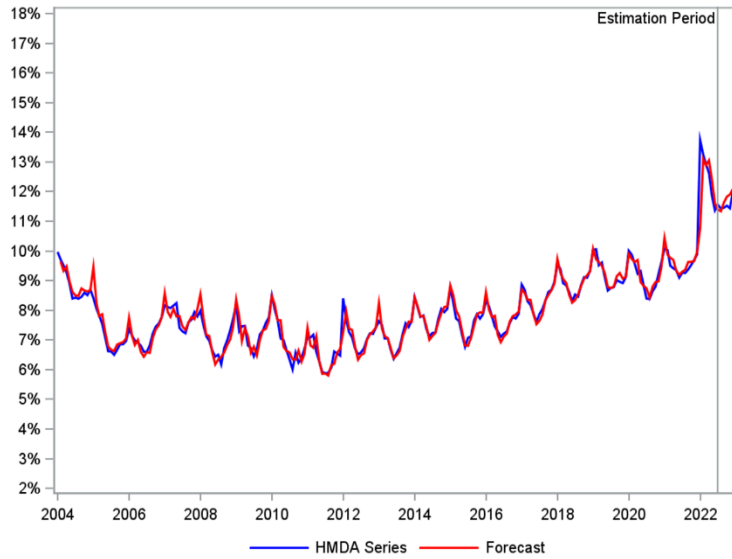


Exhibit 18: Model Forecast for Minority Census Tracts Subgoal

Minority Census Tracts Subgoal

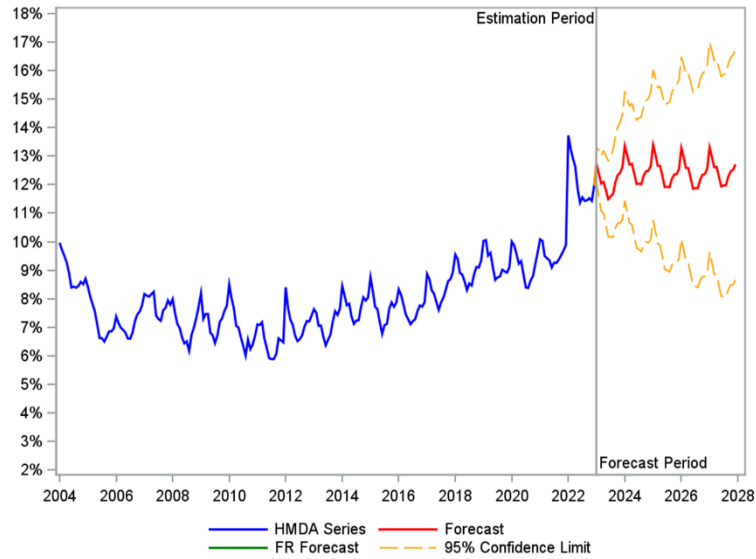


Exhibit 19: Historical Performance and Model Forecast for Minority Census Tracts Subgoal

Minority Census Tracts Subgoal

					Projected Performance				
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Actual Market	9.2	9.2	9.5	12.1					
Benchmark				10	10	10			
2022 Final Rule			9.3	9.2	8.9	8.7			
Market Forecast			+/-	+/-	+/-	+/-			
			0.9	1.4	1.8	2.1			
Current Market Forecast					12.0	12.5	12.4	12.3	12.4
					+/-	+/-	+/-	+/-	+/-
					1.4	2.3	2.9	3.4	3.9

Market Forecast for Low-Income Census Tracts Home Purchase Subgoal (LCT)

The variables and coefficient estimates for the low-income census tracts subgoal are reported in Exhibit 20.

The driver variables that were found to be statistically significant are:

- Per capita income
- Consumer confidence
- Housing affordability index

The Chi-square statistics reported at the bottom of both tables indicate that, after including the relevant driver variables in the model, the regression residuals are distributed randomly (following a white noise distribution).

Results of the out-of-sample forecast robustness tests are reported in Exhibit 21 with the blue line representing the historical HMDA series and the red line representing the model forecast. The red line tracks the blue line closely for the July 2022-December 2022 out-of-sample period, showing the robustness of the model estimates.

Exhibit 22 plots the monthly forecasts. The red lines represent the forecasts, while the yellow lines are the corresponding confidence intervals. The forecasts exhibit noticeably seasonal and cyclical patterns. Over the 2025-2027 period, the market share of borrowers qualifying for the low-income census tracts subgoal is expected to decline slightly.

Exhibit 23 presents a summary of the annual forecasts (and their confidence intervals), together with the historical market shares (HMDA) and the benchmark levels that FHFA set for the Enterprises in the past. As a reference, the graph also shows the model forecasts for the 2021-2024 period that FHFA published in the Federal Register for the 2022 Final Rule. Forecasts from the new model are shown in the last row: 10.0 percent for 2025, 9.9 percent for 2026, and 9.9 percent for 2027. The average annual forecast across the 2025-2027 period is 9.9 percent.

Exhibit 20: Regression Coefficients of Market Forecast Model for Low-Income Census Tracts Purchase Subgoal

Outcome Variable (First Difference)	
Share of Borrowers Residing in Low-Income Census Tracts	
Driver Variable (First Difference)	<i>Coefficient Estimate</i>
Household Debt Service Ratio _{t-2}	-0.0004 (0.0026)
Per Capita Income _{t-1}	0.0005 ** (0.0002)
10-Year Treasury Yield _{t-12}	0.0000 (0.0007)
Yield Curve	-0.0002 (0.0008)
Labor Force Participation Rate	-0.0002 (0.0008)
Consumer Confidence _{t-2}	0.0001 ** (0.0000)
Consumer Price Index (CPI)	-0.0002 (0.0002)
Housing Affordability Index	-0.0002 *** (0.0001)
FHFA House Price Index (HPI) - Purchase Only	0.0000 (0.0001)
Sale of Existing Homes	-0.0008 (0.0008)
Senior Loan Officer Opinion Survey: Percent of lenders reported tightening of underwriting _{t-4}	0.0004 (0.0021)
Share of Government-Insured or Guaranteed Mortgages	-0.0029 (0.0111)
AR(1)	-0.3215 *** (0.0709)
AR(2)	-0.1284 * (0.0715)
<i>Model Diagnostics</i>	
χ^2	4.57
Prob(> χ^2)	0.33
AIC	-2230.68
SBC	-2145.05
Notes: All variables are in first-difference format. Model includes monthly dummy variables that control for seasonal variations. Standard Errors are reported in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.	

Exhibit 21: Robustness Test of Market Forecast Model for Low-Income Census Tracts Subgoal

Low-Income Census Tracts Subgoal

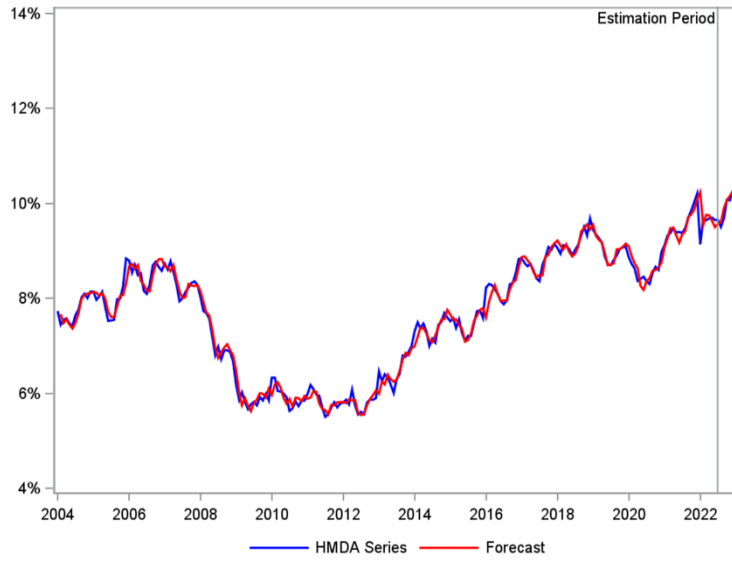


Exhibit 22: Model Forecast for Low-Income Census Tracts Subgoal

Low-Income Census Tracts Subgoal

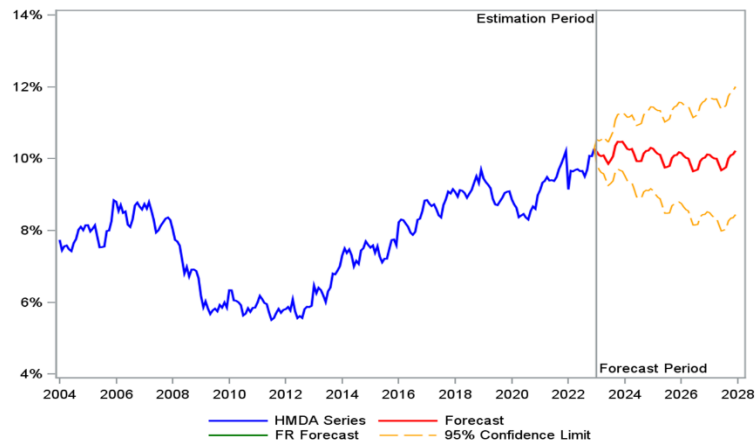


Exhibit 23: Historical Performance and Model Forecast for Low-Income Census Tracts Subgoal

Low-Income Census Tracts Subgoal

					Projected Performance				
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Actual Market	8.9	8.5	9.6	9.7					
Benchmark				4	4	4			
2022 Final Rule			9.7	10	10.2	10.3			
Market Forecast			+/-	+/-	+/-	+/-			
			0.6	1.0	1.2	1.5			
Current Market Forecast					10.2	10.1	10.0	9.9	9.9
					+/-	+/-	+/-	+/-	+/-
					0.6	1.0	1.3	1.5	1.7

Market Forecast for Low-Income Refinance Goal (LIR)

The model for forecasting the share of low-income refinances is shown in Exhibit 24. As expected, the driver variables are quite different from those for the home purchase goal models because different factors determine a borrower's refinance decisions.

The driver variables that were found to be statistically significant are:

- Refinance application share (MBA's refinance index)
- Refinance incentive, measured as a spread between the prevailing 30-year fixed rate and the moving average of the monthly 30-year fixed rates from previous 3 years
- Housing affordability index
- Refinance share of the mortgage originations

The Chi-square statistics reported at the bottom of the table indicate that, after including the relevant driver variables in the model, the regression residuals are distributed randomly (following a white noise distribution).

Results of the out-of-sample forecast robustness test are presented in Exhibit 25. The blue line represents the historical HMDA series, while the red line represents the model forecast. Focusing on the out-of-sample forecast period (July 2022-December 2022), the forecast does a reasonably good job at tracking the actual HMDA observations.

Exhibit 26 plots the monthly forecasts generated by the model for 2023-2027 period. The forecast for this market segment is particularly impacted by the uncertainty of the future interest rate path. The red line represents the forecast, while the yellow lines are the corresponding confidence intervals. It shows that if interest rates remain elevated and volume correspondingly remains at historical lows, the LIR share is expected to stay high till 2027.

Exhibit 24: Regression Coefficients of Market Forecast Model for the Low-Income Refinance Goal

Outcome Variable (First Difference)	
Share of Refinance Borrowers with Low Income	
Driver Variable (First Difference)	<i>Coefficient Estimate</i>
Refinance Rate	-0.2324 *** (0.0188)
Refinance Incentive _{t-6}	-0.0143 *** (0.0040)
Unemployment Rate	-0.0002 (0.0011)
Housing Affordability Index	-0.0004 * (0.0002)
Senior Loan Officer Opinion Survey: Percent of lenders reported tightening of underwriting	-0.0125 (0.0103)
Share of Government-Insured or Guaranteed Refinance Mortgages	-0.0044 (0.0485)
Refinance Application Volume Index _{t+2}	-0.0492 ** (0.0213)
AR(1)	-0.1288 * (0.0700)
<i>Model Diagnostics</i>	
χ^2	3.47
Prob(> χ^2)	0.63
AIC	-1526.57
SBC	-1461.50
Notes: All variables are in first-difference format. Model includes monthly dummy variables that control for seasonal variations. Standard Errors are reported in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.	

Exhibit 25: Robustness Test of Market Forecast Model for the Low-Income Refinance Goal

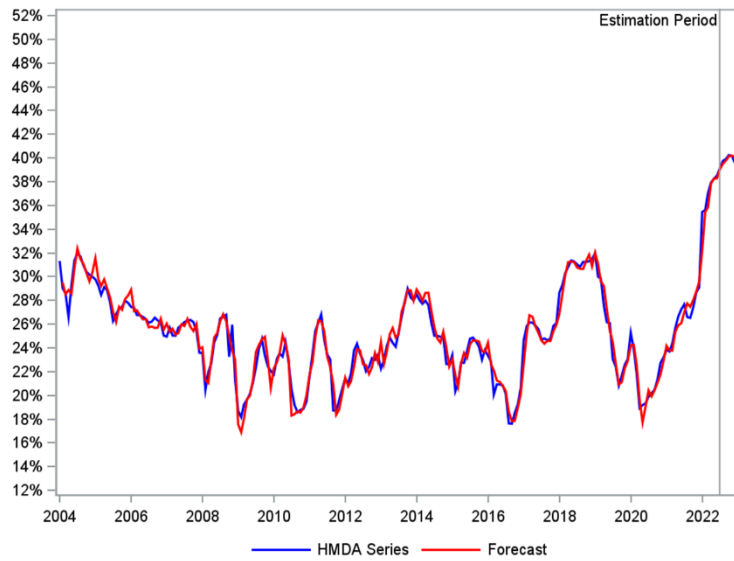


Exhibit 26: Model Forecast for the Low-Income Refinance Goal

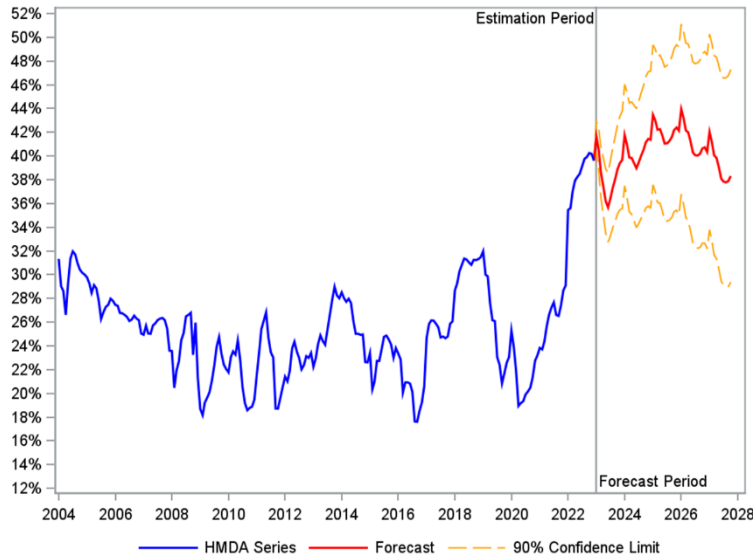


Exhibit 27 presents a summary of the annual forecasts (and their confidence intervals), together with the historical market shares (HMDA) and the benchmark levels that FHFA set for the Enterprises in the past. As a reference, the graph also shows the model forecasts for the 2021-2024 period that FHFA published in the Federal Register for the 2022 Final Rule. Forecasts from the new model are shown in the last row: 42.1 percent for 2025, 41.3 percent for 2026, and 39.1 percent for 2027. The average annual forecast across the 2025-2027 period is 40.8 percent.

Exhibit 27: Historical Performance and Model Forecast for the Low-Income Refinance Goal

					Projected Performance				
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Actual Market	24	21	26.1	37.3					
Benchmark	21	21	21	26	26	26			
2022 Final Rule Market Forecast			24.2 +/- 2.9	22.3 +/- 5.0	25.5 +/- 6.4	29.1 +/- 7.4			
Current Market Forecast					38.4 +/- 2.9	40.4 +/- 5.0	42.1 +/- 6.5	41.3 +/- 7.7	39.1 +/- 8.7

Section 4: Sensitivity of Model Estimates

The modeling team has also investigated the sensitivity of the model forecasts with respect to our assumption of future macroeconomic scenarios. Results are summarized in Appendix A. Overall, we find that the forecasts are rather insensitive to the use of alternative scenarios. Forecast for the low-income refinance goal is an exception: it is sensitive to the scenario assumptions used for the model driver variables.

Section 5: Concluding Remarks

This paper provides the technical details of the econometric models that we have developed to forecast the market share of the goal-qualifying mortgage originations in the mortgage market for each of the four single-family housing goals. Forecasts for the 2025-2027 period are presented. Model diagnostics and reliability of the forecasts have also been discussed. To examine the sensitivity of the model forecasts, we have also provided model forecasts using driver variables embedded in a number of alternative scenarios published by Moody’s.

Appendix A: Sensitivity of Model Estimates to Alternative Macroeconomic Forecast Scenarios

This section analyzes the extent to which our market share estimates are sensitive to the macroeconomic environments that we have assumed. The market share estimates we have reported so far are based on forecast values of the driver variables from Moody's Baseline scenario.

To assess the sensitivity of our market share estimates, we use forecast values of the driver variable from two alternative macroeconomic scenarios from Moody's. They are:

- **Stronger Near-Term Growth (S1) scenario.** This scenario assumes that the US economy will demonstrate more robust economic growth in the near term as compared to the Baseline scenario. It assumes that unemployment declines below the baseline and with the stronger growth in the economy, inflation and interest rates are higher than in the baseline. Consumer confidence increases, accelerating spending and lifting nonresidential investment which adds to growth in real GDP. Strong gains in employment lift household incomes and spending. House prices rise by 4.0 percent and 2.0 percent in 2024 and 2025, compared to 0.7 percent and -1.0 percent in the Baseline scenario.
- **Protracted Slump (S4) scenario.** This scenario assumes that the risk of a prolonged federal shutdown increases substantially, causing business and consumer confidence to plummet. Bank failure fears further reduce consumer confidence and banks tighten their lending standards. Interest rates remain elevated, and the recession begins in 2024. GDP is 0.1 percent in 2024 and -2.7 percent in 2025 compared to 2.3 percent and 1.6 percent in the Baseline scenario. Unemployment rate reaches 8.5 percent in 2025 and house price growth is -17.1 percent in 2024.

The comparison of the driver variables for all scenarios is presented in Exhibit A-1 and, as shown, the differences in many of the variables themselves are more subtle than stark.

Exhibit A-1: Comparison of Forecast Scenarios

		2024	2025	2026	2027
GDP Growth Rate	Baseline	2.3	1.6	2.0	2.2
	Stronger Near-Term Growth	3.1	3.1	2.3	2.4
	Protracted Slump	0.1	-2.7	1.5	3.8
Unemployment Rate	Baseline	3.9	4.1	4.0	4.0
	Stronger Near-Term Growth	3.3	3.2	3.4	3.3
	Protracted Slump	6.1	8.5	8.5	7.5
30-Yr Fixed Rate	Baseline	6.5	6.1	6.0	5.9
	Stronger Near-Term Growth	6.5	6.2	6.0	5.9
	Protracted Slump	5.5	4.3	4.8	5.1
FHFA HPI Growth Rate	Baseline	0.7	-1.0	0.3	1.8
	Stronger Near-Term Growth	4.0	2.0	1.0	2.6
	Protracted Slump	-17.1	-1.8	1.3	2.2
Housing Affordability Index	Baseline	106.2	114.2	119.8	121.5
	Stronger Near-Term Growth	101.6	105.6	111.5	112.4
	Protracted Slump	159.6	162.4	157.9	153.8
Refinance Share Mortgage Applications	Baseline	18.3	20.3	26.6	34.4
	Stronger Near-Term Growth	18.1	19.1	23.9	31.5
	Protracted Slump	23.7	70.2	55.7	41.0

To generate the alternative market share forecasts, we input the forecast values of the driver variables from each of the alternative scenarios into the regression equations. Monthly forecast results are then aggregated into yearly forecasts. We compare these to the market share forecasts based on the Baseline scenario. Exhibit A-2 provides a summary of the results by year, while Exhibit A-3 presents the monthly forecast results. Results for the low-income purchase share are shown in the first panel of Exhibit A-2. The first row of each panel highlights the results based on the Baseline scenario, while the following rows show results from using the alternative scenarios. Average annual market performances over the 2025-2027 period are presented in the last column. The results show that the share forecasts for the low-income home purchase goal change slightly in response to alternative macroeconomic environments.

Exhibit A-2: Summary of Market Model Forecasts Based on Different Scenarios

		2025	2026	2027	2025-2027 Average
LIP	Baseline	27.2%	26.6%	26.1%	26.6%
	Stronger Near-Term Growth	29.7%	29.6%	30.1%	29.8%
	Protracted Slump	21.5%	21.4%	21.8%	21.6%
VLIP	Baseline	6.6%	6.7%	6.6%	6.6%
	Stronger Near-Term Growth	7.4%	7.5%	7.8%	7.6%
	Protracted Slump	5.1%	5.1%	5.5%	5.2%
MCT	Baseline	12.4%	12.3%	12.4%	12.4%
	Stronger Near-Term Growth	13.2%	13.1%	13.3%	13.2%
	Protracted Slump	10.3%	10.4%	10.5%	10.4%
LCT	Baseline	10.0%	9.9%	9.9%	9.9%
	Stronger Near-Term Growth	10.4%	10.3%	10.3%	10.3%
	Protracted Slump	8.5%	8.6%	8.9%	8.7%
LIR	Baseline	42.1%	41.3%	39.1%	40.8%
	Stronger Near-Term Growth	42.9%	42.7%	40.8%	42.1%
	Protracted Slump	28.4%	32.1%	35.1%	31.9%

Note:

LIP = Low-Income Purchase Goal

VLIP = Very Low-Income Purchase Goal

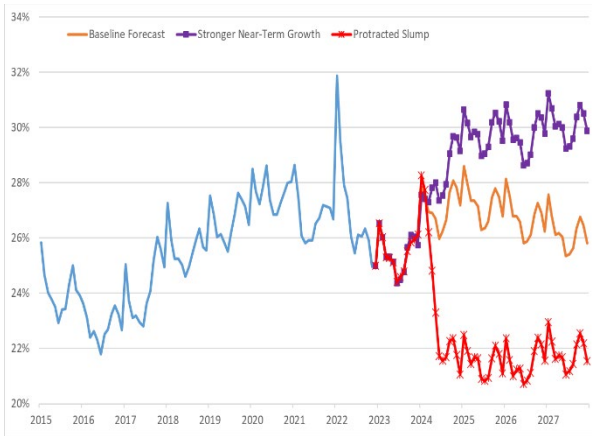
MCT= Minority Census Tracts Subgoal

LCT= Low-Income Census Tracts Subgoal

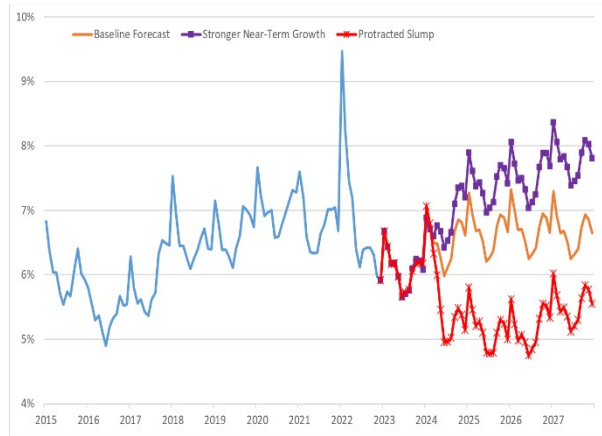
LIR = Low-Income Refinance Goal

Exhibit A-3: Market Model Forecasts Based on Alternative Scenarios

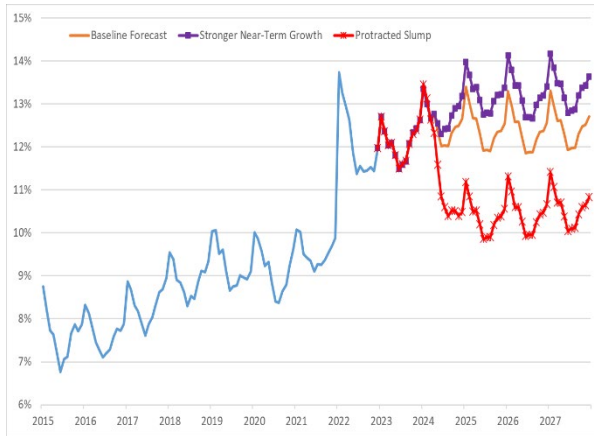
Low-Income Home Purchase Goal



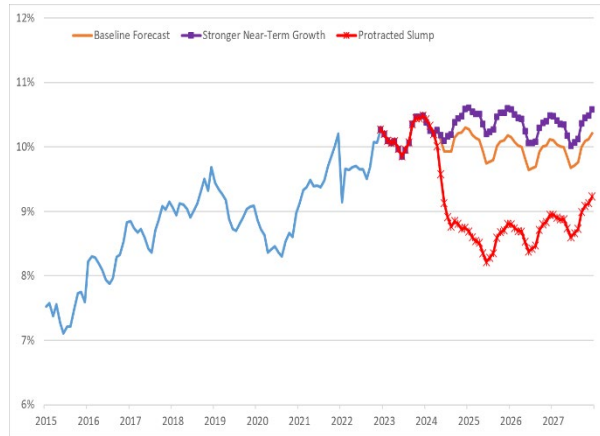
Very Low-Income Home Purchase Goal



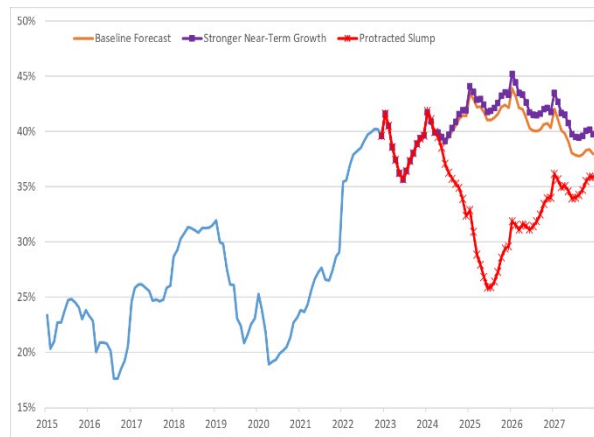
Minority Census Tracts Subgoal



Low-Income Census Tracts Subgoal



Low-Income Refinance Goal



Appendix B: List of Data Sources

Moody's Analytics

<https://www.economy.com/products/tools/data-buffet>

Federal Housing Finance Agency: House Price Index

<https://www.fhfa.gov/data/hpi>

Mortgage Bankers Association

<http://www.mortgagebankers.org/ResearchAndForecasts/ForecastsAndCommentary>

Congressional Budget Office

<https://www.cbo.gov/publication/59946>