The Size of the Affordable Mortgage Market: 2015-2017 Enterprise Single-Family Housing Goals

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PREFACE

This Federal Housing Finance Agency (FHFA) research paper discusses the forecast models used in establishing housing goal benchmarks for 2015 through 2017. The paper is part of FHFA's ongoing effort to enhance public understanding of the nation's housing finance system. The paper was prepared by Jay Schultz, Senior Economist, National Mortgage Database Team, Office of Chief Operating Officer.

August 2014

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A. 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 housing goals for Fannie Mae and Freddie Mac (the Enterprises).[1] The goals for the single-family mortgage market are based on mortgages acquired and include separate goals for home purchase and refinance mortgages. Only mortgages associated with 1-4 unit owner-occupied properties are counted.

This paper documents the methodology used to estimate the market size for the Low-Income Borrower Home Purchase Housing Goal (share of borrowers with incomes no greater than 80 percent of the area median income (AMI)), the Very Low-Income Borrower Home Purchase Housing Goal (share of borrowers with incomes no greater than 50 percent of AMI), the Low-Income Area Home Purchase Housing Subgoal (share of borrowers living in low-income areas (where census tract median income is no greater than 80 percent of AMI) and high minority areas), and the Low-Income Borrower Refinance Housing Goal (share of borrowers with incomes no greater than 80 percent of AMI).[2]

The single-family housing goals are defined in terms of percentages of mortgages on owner-occupied properties, either home purchase or refinance, acquired during a calendar year. For example, the low-income borrower home purchase goal is expressed as the percentage of home purchase mortgages where the borrower's income is no greater than 80 percent of the area

[1] 12 U.S.C. 1331(a)

[2] High minority areas are defined as census tracts where the percent minority is at least 30 percent of the population and the census tract median income is less than AMI. There is also a provision for designated disaster areas in the Low-Income Areas Home Purchase Goal.

median income. Likewise, the low-income borrower refinance mortgage acquisitions are relative to all owner-occupied property refinance mortgages acquired.[3] The results of the market estimation model are provided in **Table 1,** and the remainder of this paper describes the process used to produce these projections.

[3] To be eligible to count toward the housing goals, mortgages acquired have to meet certain counting rules. These counting rules are defined in 12 CFR part 1282.

Table 1

Enterprise Single-Family Housing Goals
Market Estimates 2013 - 2017

Year [1]	Low-Income Borrower Home Purchase Goal	Very Low-Income Borrower Home Purchase Goal	Low-Income Area Home Purchase Goal	Low-Income Borrower Refinance Goal
2004	27.2%	6.6%	16.7%	28.0%
2005	24.2%	5.7%	15.3%	26.0%
2006	24.0%	5.9%	15.8%	24.7%
2007	26.0%	6.1%	16.2%	24.2%
2008	25.3%	6.5%	14.1%	23.4%
2009	29.6%	8.8%	13.0%	20.8%
2010-11 Benchmarks[2]	**27%**	**8%**	**13%**	**21%**
2010 [3]	27.2%	8.1%	12.1%	20.2%
2011 [3]	26.5%	8.0%	11.4%	21.5%
2012-14 Benchmarks	**23%**	**7%**	**11%**	**20%**
2012 [3]	26.6%	7.7%	13.5%	22.3%
2013 [4]	23.4% ± 3.0%	6.5% ± 1.0%	13.4% ± 1.7%	22.4% ± 3.3%
2014 [4]	21.4% ± 5.2%	5.5% ± 1.5%	14.3% ± 3.3%	27.6% ± 5.4%
2015 [4]	20.9% ± 6.7%	5.8% ± 1.9%	14.7% ± 4.3%	31.0% ± 6.8%
2016 [5]	20.2% ± 7.9%	5.7% ± 2.1%	14.7% ± 5.2%	33.5% ± 8.1%
2017 [5]	19.8% ± 9.0%	5.6% ± 2.4%	14.2% ± 6.0%	34.2% ± 9.2%

[1] Historical market performance is based on historical HMDA data for first-lien, conventional, ARRA-equivalent conforming limit loans, excluding higher-cost and HOEPA loans (see Section C).

[2] The 2010-11 refinance goal benchmark includes a +200 basis point adjustment to account for the impact of loan modifactions on Enterprise performance.

[3] Historical market performance, the refinance goal market performance does not include the impact of loan modifications.

[4] Estimated (95% confidence), does not include adjustment for loan modifications.

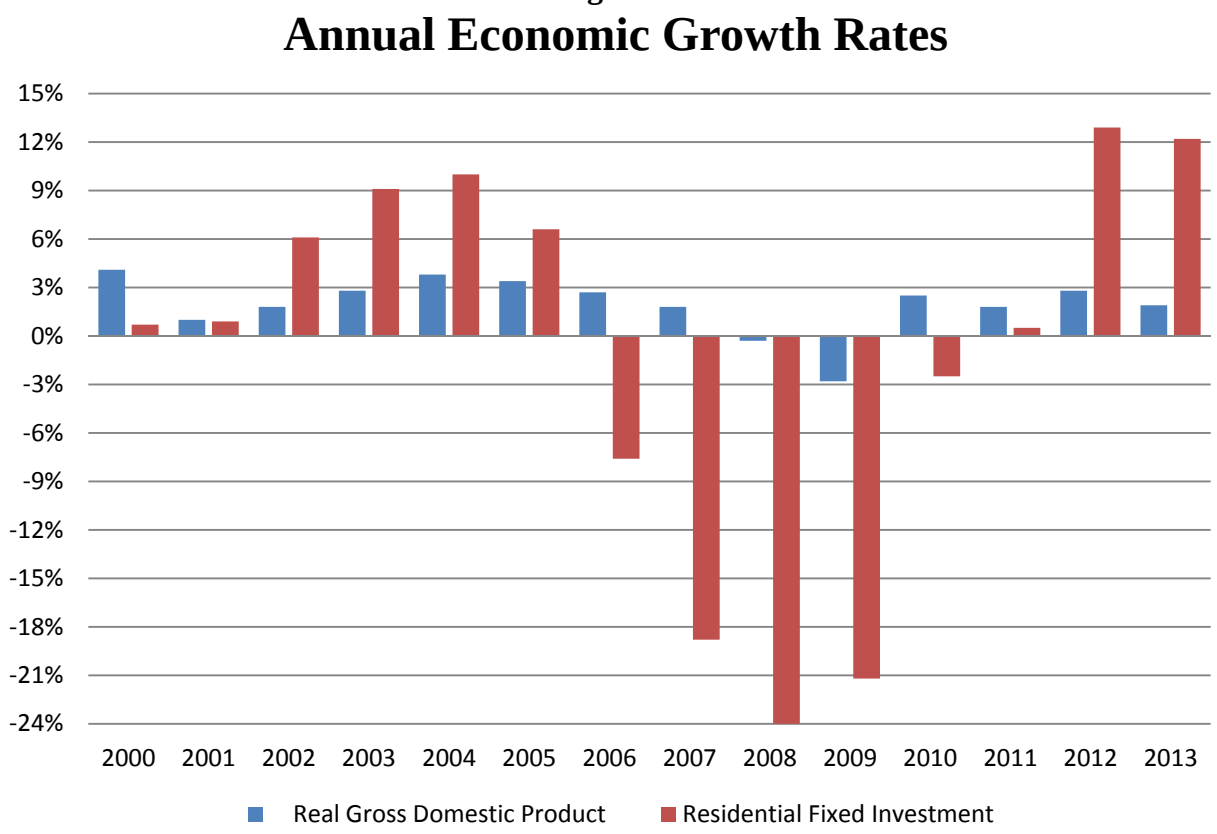
[5] Estimated (95% confidence), primarily a function of time trends, does not include adjustment for loan modifications.

Section B discusses current economic and market conditions, and provides descriptions of the economic drivers in the mortgage market. Section C describes the economic and market forecast data used to project the market size of each of the single-family mortgage housing goals. Section D presents the housing and mortgage market forecasts by government agencies and industry participants. Section E provides the four econometric time series models used to estimate affordability in the market. Finally, conclusions are provided in Section F.

B. CURRENT MARKET CONDITIONS

The economic recovery is in its fifth year and it's been nearly six years since the collapse of the housing and mortgage markets. The economy has yet to grow at a rate more than three percent over an entire year since the 2009 recession, see **Figure 1**. Although the housing market was hit hard by the recession, Residential Fixed Investment posted growth rates above 12 percent in 2012 and 2013. Since their peak in 2007, house prices bottomed out in 2011 and are increasing again while home sales remain generally flat.

Figure 1

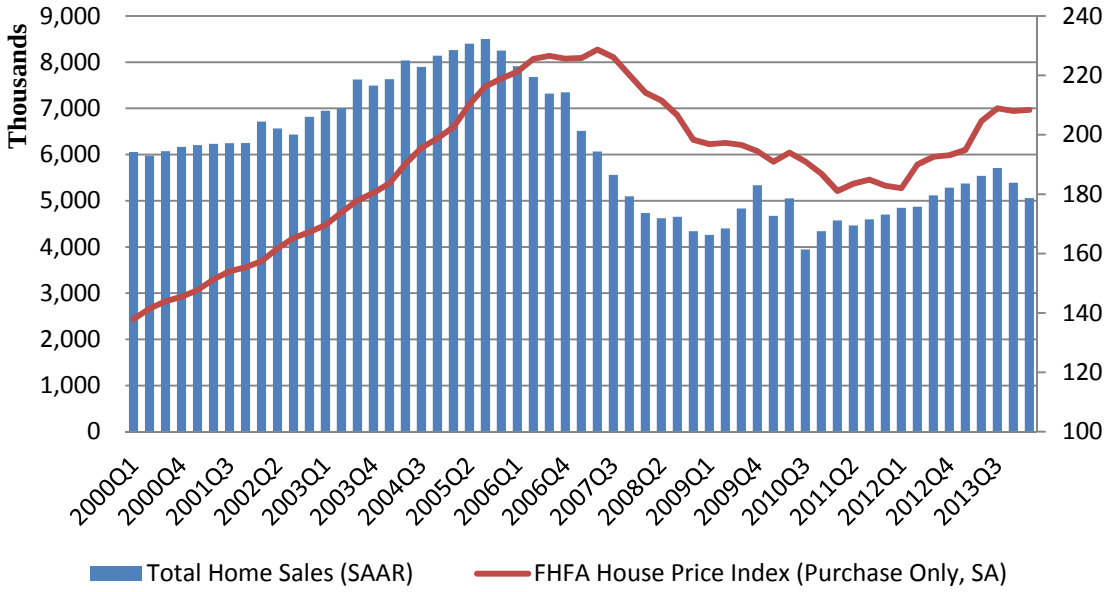


Source: US Department of Commerce, Bureau of Economic Analysis

Figure 2 shows both home sale volume and FHFA's House Price Index for home purchase mortgages. New and existing home sales remain generally flat. Home sale volume is well below the peak of 8.5 million units and is still below the pre-2004 volume of 6 million units.

Figure 2

Housing Market Indicators

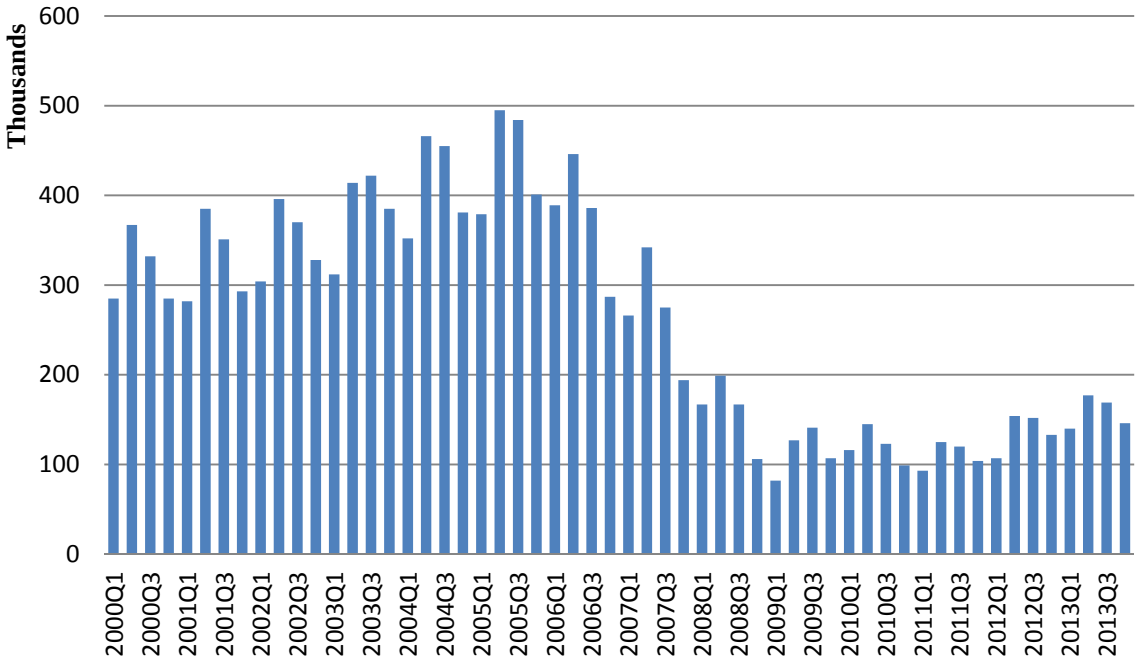


Sources: US Department of Commerce, Bureau of the Census, National Association of Realtors, and the Federal Housing Finance Agency.

Housing starts have grown slowly but are still well below the levels in the early 2000s. Prior to 2004 housing starts averaged nearly 350,000 units per year. Housing starts peaked in the second quarter of 2005 at 495,000 units, see **Figure 3**. However, during 2012 and 2013, housing starts averaged only 150,000 starts.

Figure 3

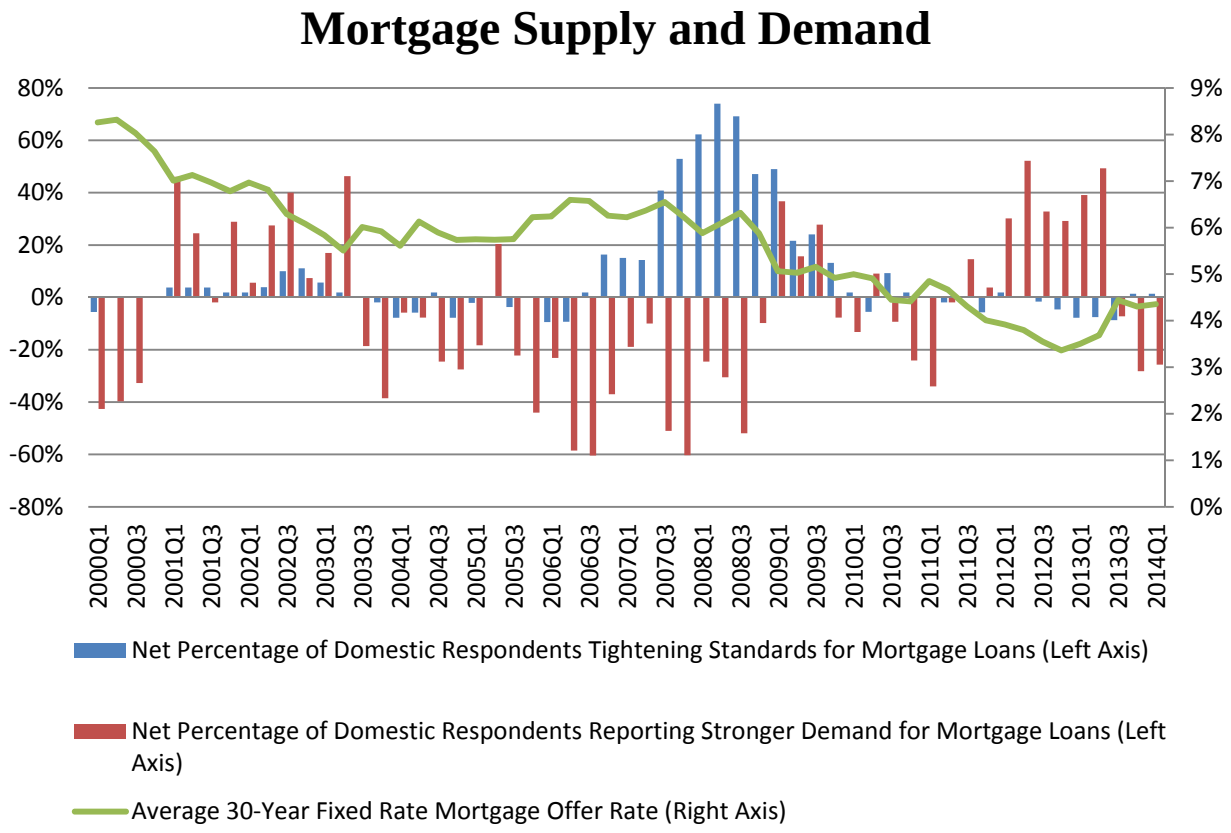
Total Single-Family Housing Starts



Source: US Department of Commerce, Bureau of the Census.

As mortgage interest rates rose in 2013, demand for mortgage loans decreased, as indicated by the quarterly Survey of Senior Loan Officers, see **Figure 4**.[4] As **Figure 4** shows, in general, mortgage demand has an inverse relationship to changes in the mortgage interest rate. **Figure 4** also shows the loan officers' observations on underwriting standards and a notable tightening of underwriting standards coincided with the mortgage market bubble and collapse during 2006 through 2009.

Figure 4



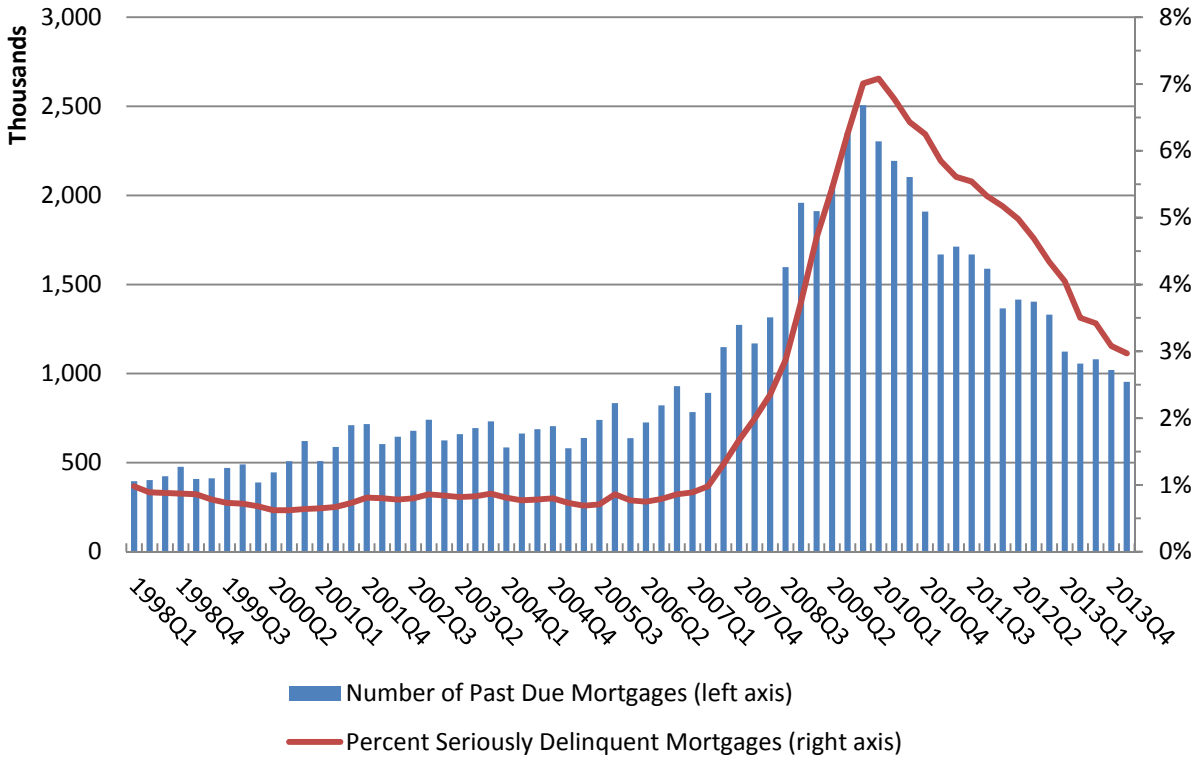
Sources: Board of Governors of the Federal Reserve System and Freddie Mac's Primary Mortgage Market Survey..

[4] Board of Governors of the Federal Reserve System, Senior Loan Officer Opinion Survey on Bank Lending Practices, http://www.federalreserve.gov/econresdata/statisticsdata.htm.

Mortgage defaults are on a downward trend, although still at a higher rate than the pre-2004 average. According to the Mortgage Bankers Association's National Delinquency Survey the number of past due mortgages were below 1 million in the first quarter of 2014 after peaking at nearly 2.5 million in the fourth quarter of 2009, see **Figure 5**.[5] Seriously delinquent mortgages were down to 3.0 percent of all outstanding prime mortgages at the beginning of 2014, after reaching a high of 7.1 percent in the first quarter of 2010.

Figure 5

Defaults in the Prime Mortgage Market



Source: Mortgage Bankers Association.

Manufactured housing is an important source for affordable housing. Loans used to purchase a manufactured housing unit can be placed in two categories. In the first category, the

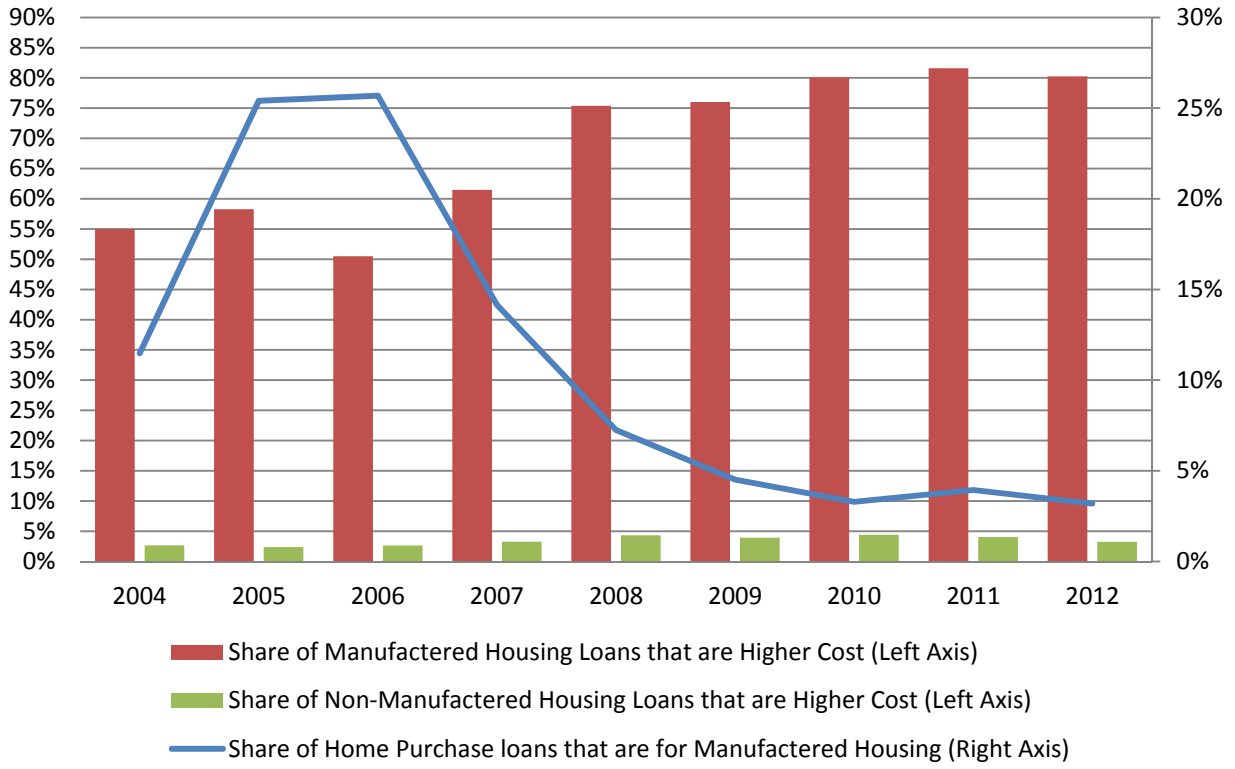
[5] Mortgage Bankers Association, http://www.mortgagebankers.org/ResearchandForecasts/ProductsandSurveys/NationalDelinquencySurvey.htm

manufactured housing unit and the land on which it sits are considered real estate and the loan used to acquire it is called a mortgage loan. In the second category, the manufactured housing unit is considered personal property, or chattel, and the loan used to acquire it is called a chattel loan. A loan on manufactured housing may only count toward a housing goal if it is secured by real estate. Therefore, any purchases of chattel loans do not count as mortgage purchases for purposes of the housing goals.[6] Because it is a personal property loan, chattel loans generally have higher contract interest rates and terms than a mortgage loan would have. Over the period 2008 through 2012, a total of 235,000 home purchase loan originations (4.0 percent of all home purchase loan originations) were for purchase of manufactured housing. Of those 235,000 units, 78.3 percent were higher cost loans (see **Figure 6**). This compares to 4.7 percent of non-manufactured housing mortgages being identified as higher cost.[7]

[6] 12 CFR Part 1282.1, and "2010–2011 Enterprise Housing Goals; Enterprise Book-entry Procedures; Final Rule." 75 Federal Register 177 (14 September 2010), p. 55894.
[7] Home Mortgage Disclosure Act (HMDA) data.

Figure 6

Manufactured Housing Home Purchase Loans



Source: Home Mortgage Disclosure Act (HMDA) data.

C. ECONOMIC AND MORTGAGE MARKET DATA

Historical monthly time series data used in the housing goals forecast models were obtained from a variety of sources. Gross Domestic Product, the unemployment rate, inflation rates, median prices for new homes, housing starts and new housing sales are from the Census Bureau, the Bureau of Economic Analysis and the Bureau of Labor Statistics.[8] Constant maturity interest rates on Government notes and bonds came from the U.S. Department of the Treasury, while mortgage interest rates are provided by Freddie Mac's Primary Mortgage Market Survey.[9] Median house prices for existing homes and the Housing Affordability Index were obtained from the National Association of Realtors (NAR), and FHFA produces House Price Indices for all transactions and for home purchase loans. For 2012 and previous years the refinance rate and FHA market share were calculated from Home Mortgage Disclosure Act (HMDA) data. [10] Preliminary refinance rates for 2013 are as reported by the Mortgage Bankers Association. For the complete list of data sources, see Appendix E.

FHFA measures the market performance for the single-family owner-occupied property mortgage housing goals by analyzing HMDA data. HMDA data are loan level records of mortgage applications, originations and acquisitions that occurred during a calendar year and are considered to be broadly representative of the mortgage market in the United States.[11] The Federal Financial Institutions Examination Council (FFIEC) has made available a monthly nationwide time series from the loan level HMDA records with various attributes and

[8] U.S. Department of Commerce and the U.S. Department of Labor.
[9] U.S. Treasury constant maturity interest rates were obtained from the Federal Reserve Bank of St. Louis' FRED database.
[10] HMDA data are made available from the Federal Financial Institutions Examination Council, http://www.ffiec.gov/hmda/default.htm.

[11] Bhutta, Neil, et al. "Mortgage Market Conditions and Borrower Outcomes: Evidence from the 2012: HMDA Data and Matched HMDA-Credit Record Data." Federal Reserve Bulletin, (November 2013) Vol. 99, No 1. The 2012 HMDA data covered 7,400 home lenders including the nation's largest mortgage originators.

specifications, including the performance of the four single-family housing goals and the one subgoal. For the purposes of estimating the single-family mortgage market for goal qualifying loans, FHFA defines the market as conventional conforming first lien, prime home purchase (or refinance) mortgages.[12]

The HMDA data used to produce the market affordability forecasts begins in 2004, when HMDA data began including (1) rate-spread information for high-cost loans, an indicator for manufactured housing loans, and (2) an identifier for first-lien mortgages. The rate-spread and manufactured housing information helps to better identify subprime and chattel loans.

One of the issues with regard to HMDA data is the considerable delay in releasing the database. At this time the most current, publicly available, HMDA data are for 2012. To inform the forecasted estimates with more current information two supplemental data time series are used. Estimates of the goal qualifying shares for the three home purchase goals and subgoal are calculated from FHFA's Monthly Interest Rate Survey (MIRS) data through December 2013. The refinance goal time series is also extended using the combined Enterprise goal performance through March 2014.

[12] To be consistent with the conforming loan limits established in the American Recovery and Reinvestment Act (ARRA 2009), the conforming loan limit is defined as 1.15 times the Area Median House Price (from NAR), where the maximum (ceiling) must not exceed 1.75 times the original conforming limit for the given year. A loan is considered not prime (subprime) if the contract rate is 300 or more basis points above the 30-Year Treasury Note Yield.

D. HOUSING AND MORTGAGE MARKET FORECAST

On average, industry forecasters project the economy to continue to grow during the 2015 through 2017 period, with real Gross Domestic Product (GDP) growing at rates around 3.0 percent in each year. As shown in **Figure 1**, residential investment is correlated with swings in the growth of the economy (GDP) in general, however with much greater amplitude. Residential Fixed Investment is expected to grow by 12.0 percent in 2015 and 12.6 percent in 2016 (see **Table 2**). The effects of interest rates, unemployment, inflation, refinancing, house prices, and the overall housing market enter the estimation equations for the housing goal market performance as explanatory variables.

Interest Rates. Mortgage interest rates are affected by many factors. Trends in interest rates on longer term financial instruments such as mortgages typically follow the fluctuations of the 10-Year Treasury note yield, with approximately a 165 to 170 basis point spread reflecting the differences in liquidity and credit risk expected for the 2015 through 2017 period. This is similar to the past five years, but lower than the 181 basis point average spread during 2005 through 2008. Overall, interest rates in the United States 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. In its June 17-18, 2014 meeting, the FOMC stated that it is committed to a low federal funds rate policy (at 0 to 0.25 percent) in the near term:

> "[t]o support continued progress toward maximum employment and price stability, the Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate. In determining how long to maintain the current 0 to 1/4 percent target range for the federal funds rate, the Committee will assess progress--both realized and expected--toward its objectives of maximum employment and 2 percent inflation. This assessment will take into

> account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. The Committee continues to anticipate, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored."[13]

Affordability in the mortgage market depends in part on the interest rate environment. The longer term 30-year fixed-rate mortgage interest rate, after falling to a low of 3.4 percent in the fourth quarter of 2012, has gradually risen to 4.2 percent in the second quarter of 2014.[14] Shorter term fixed- and adjustable-rate mortgage interest rates remain at historical lows—Freddie Mac reported that the one-year adjustable-rate mortgage rate averaged 2.4 percent in the second quarter of 2014. As a major contributor to the cost of mortgage financing, lower interest rates directly affect the affordability of buying a home or refinancing a mortgage. As the economic recovery continues it is expected that interest rates, particularly longer term interest rates, will rise. For the 2015-2017 period, as shown in **Tables 2 and 3**, forecasts show that all interest rates are expected to increase, including the interest rate on a 30-year fixed-rate mortgage, which is expected to increase to 5.0 percent by the fourth quarter of 2015 and 5.4 percent in 2016. The 10-Year Treasury Yield is expected to increase to 3.4 percent in 2015, 4.0 percent in 2016 and 4.2 percent in 2017.

[13] Federal Reserve Board of Governors. Federal Open Market Committee Statement, Press Release, June 18, 2014.
[14] Freddie Mac, Primary Mortgage Market Survey. (2012-2014).

Table 2

Economic and Mortgage Market Outlook

	2012				2013				2014				2015									
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	2012	2013	2014	2015	2016	2017
Low-Income Borrower HP Share [1]	26.6%	24.6%	24.8%	25.9%	24.8%	23.7%	22.1%	22.9%	21.9%	21.1%	20.8%	21.6%	21.5%	20.9%	20.4%	20.9%	26.6%	23.4%	21.4%	20.9%	20.2%	19.8%
Very Low-Income Borrower HP Share [2]	8.0%	6.9%	7.0%	7.3%	6.9%	6.7%	6.1%	6.3%	6.0%	5.6%	5.0%	5.4%	6.3%	5.8%	5.3%	5.6%	7.7%	6.5%	5.5%	5.8%	5.7%	5.6%
Low-Income Area HP Share [3]	13.2%	12.3%	12.1%	12.8%	13.2%	12.5%	12.4%	13.4%	13.8%	13.0%	12.9%	13.7%	14.1%	13.4%	13.3%	14.1%	13.5%	13.4%	14.3%	14.7%	14.7%	14.2%
Low-Income Borrower Refi. Share [4]	20.2%	23.0%	21.4%	21.1%	20.4%	20.8%	22.9%	25.5%	26.6%	27.1%	27.5%	29.0%	30.0%	30.9%	31.1%	32.0%	22.3%	22.4%	27.6%	31.0%	33.5%	34.2%
Real GDP [5]	2.2%	1.6%	2.5%	0.1%	2.7%	1.8%	4.4%	3.5%	-2.1%	3.9%	1.7%	3.0%	2.8%	2.9%	2.9%	2.9%	2.3%	2.2%	1.9%	2.8%	2.9%	2.6%
Nominal GDP [5]	4.3%	3.5%	4.3%	1.6%	4.2%	2.8%	6.1%	4.9%	-0.8%	5.9%	3.4%	4.9%	4.7%	5.0%	4.9%	4.9%	4.2%	3.7%	3.5%	4.8%	4.6%	n.a.
Real Personal Consumption [5]	2.7%	1.3%	1.9%	1.9%	3.5%	1.8%	2.0%	3.7%	1.2%	2.4%	3.2%	2.7%	2.6%	8.7%	2.4%	2.4%	1.8%	2.4%	2.4%	3.8%	5.4%	12.4%
Real Residential Construction [5]	23.3%	4.3%	13.4%	18.9%	7.6%	17.7%	10.8%	-8.8%	-5.4%	7.3%	12.4%	12.5%	12.0%	11.0%	11.1%	11.1%	13.5%	11.9%	3.1%	12.0%	12.6%	n.a.
Inflation Rate (CPI, Y/Y % Change) [5]	2.8%	1.9%	1.7%	1.9%	1.7%	1.4%	1.6%	1.2%	1.4%	2.1%	1.7%	2.3%	2.1%	1.6%	2.2%	2.3%	1.9%	1.2%	1.2%	1.4%	2.1%	2.1%
Core Infl. Rate (CPI, Y/Y % Change) [5]	2.2%	2.3%	2.0%	1.9%	1.9%	1.7%	1.7%	1.7%	1.6%	1.9%	1.9%	1.9%	2.0%	1.8%	2.0%	2.0%	1.9%	1.7%	1.7%	1.6%	1.9%	2.0%
Core Infl. Rate (PCE, Y/Y % Change) [5]	2.0%	1.9%	1.8%	1.7%	1.5%	1.2%	1.2%	1.2%	1.1%	1.3%	1.3%	1.4%	1.6%	1.7%	1.8%	1.9%	1.7%	1.2%	1.2%	1.1%	1.3%	n.a.
Unemployment Rate	8.2%	8.2%	8.0%	7.8%	7.7%	7.5%	7.2%	7.0%	6.7%	6.2%	6.1%	6.0%	5.9%	5.9%	5.8%	5.8%	8.1%	7.3%	6.3%	5.8%	5.5%	5.6%
10-Year Treasury Yield	2.0%	1.8%	1.6%	1.7%	1.9%	2.0%	2.7%	2.7%	2.8%	2.6%	2.8%	2.9%	3.1%	3.4%	3.6%	3.7%	1.8%	2.4%	2.8%	3.4%	4.0%	4.2%
1-Year Treasury Yield	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.3%	0.4%	0.4%	0.5%	0.2%	0.1%	0.1%	0.4%	1.8%	n.a.
Prime Rate	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.4%	3.7%	3.7%	3.3%	3.3%	3.3%	3.5%	4.9%	5.9%
Federal Funds Target Rate	0.10%	0.15%	0.14%	0.16%	0.14%	0.12%	0.08%	0.09%	0.07%	0.09%	0.10%	0.20%	0.20%	0.30%	0.70%	0.90%	0.14%	0.11%	0.12%	0.53%	1.80%	n.a.
Consumer Confidence	67.4	65.3	65.0	70.4	62.6	75.1	81.0	74.2	80.6	83.4	85.0	83.0	82.0	83.0	85.0	85.0	67.0	73.3	83.0	83.8	89.0	89.0

Note: Shaded area indicates historical values. Forecasts are an average forecast of Mortgage Bankers Association (MBA), Fannie Mae, Freddie Mac, National Association of Realtors, Wells Fargo, PNC Financial,the National Association of Home Builders, Standard and Poor's, the Wall Street Journal Survey, the Conference Board, Raymond James Financial, the Federal Reserve Bank of Philadelphia and the Federal Open Market Committee.

[1] Share of home purchase mortgage originations made to low-income borrowers in that quarter (year).

[2] Share of home purchase mortgage originations made to very low-income borrowers in that quarter (year).

[3] Share of home purchase mortgage originations on properties located in low-income areas, excluding those in designated disaster areas, in that quarter (year).

[4] Share of refinance mortgage originations made to low-income borrowers in that quarter (year).

[5] Quarter over quarter change, annual rate.

n.a. Not available at this time.

Unemployment. In addition to being an indicator of the health of the economy in general, the employment situation affects the housing market more directly because buying a house is considered a large investment and a long-term commitment that requires stable employment. The unemployment rate has steadily fallen from 9.1 percent in August 2011 to 6.1 percent in June 2014. The labor force participation rate remains at 62.8 percent in June, the same rate for the third consecutive month.[15]

One of the stated objectives of the FOMC's interest rate policy is supporting of maximum employment. Given the foreseeable monetary policy and the continued growth in the economy, the unemployment rate is expected to fall to an average 5.8 percent in 2015, 5.5 percent in 2016 and 5.6 percent in 2017 (see **Table 2**). To the extent that lower-income jobs are affected more by the employment situation, the affordable home purchase market is affected.

Inflation. The second stated objective of the FOMC in determining their interest rate policy is for price stability.As shown in **Table 2**, industry observers expect core inflation (excluding food and energy) to remain at or below 2.0 percent through 2017.

House Prices. 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.[16] In periods of price depreciation or price uncertainty, home sales and mortgage originations tend to decrease as risk-averse homebuyers are reluctant to enter the market. House prices generally fell during 2009 through 2011, but turned around in 2012 with an increase of 5.6 percent in FHFA's Purchase Only Home Price Index. In 2013, home prices increased at a rate of 7.7 percent. House prices are expected to continue to increase,

[15] Bureau of Labor Statistics, News Release: The Employment Situation – June (July 3, 2014).
[16] House prices and home sales can have a circular relationship, as they had between 2000 and 2006. As prices rose, and expectation of continued growth, demand grew. As demand grew, house prices rose even more.

however, at much more modest rates of 6.5 percent in 2014, 3.4, 2.3 and 1.9 percent in 2015, 2016 and 2017 respectively (see **Table 3**).

The expected increase in interest rates and home prices leads to an expected decrease in housing affordability. Housing affordability, as measured in **Table 3** by the National Association of Realtors' Housing Affordability Index, is expected to drop from an index of 200 at the end of 2012 to 115 by 2017.

Housing market. An active housing market is generally good for the affordable home market. When there are more homes for sale, potential home buyers have more options, prices tend to be more competitive and the search costs to find affordable housing decrease. Houses for sale volumes, as measured by months' supply (the ratio of houses for sale to houses sold), reached a seasonally adjusted high of 12.2 houses for sale to every house sold in January 2009 to a low of 3.9 in January 2013 and has steadily increases since, to 6.0 houses for sale to every house sold in July 2014 (which is just under the long-run average of 6.1).[17]

Refinance Rate. 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"), and 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 will decrease. Likewise, refinancings that occurred when interest rates were high tended to have a higher proportion of lower income

[17] U.S. Census Bureau, "Houses for Sale by Regions and Months' Supply at Current Sales Rate," seasonally adjusted numbers.

Table 3

Housing and Mortgage Market Outlook

	2012				2013				2014				2015									
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	2012	2013	2014	2015	2016	2017
Housing Starts [1]	707	739	780	909	947	865	882	1,024	925	980	1,065	1,118	1,197	1,243	1,272	1,287	784	930	1,023	1,250	1,305	1,069
Housing Starts, 1-Unit [1]	486	515	549	599	626	596	599	662	603	619	696	742	827	871	923	934	537	621	666	889	1,155	n.a.
Total Home Sales [2]	4,847	4,871	5,115	5,282	5,373	5,548	5,706	5,390	5,034	5,289	5,484	5,528	5,591	5,636	6,034	5,722	5,030	5,505	5,336	5,747	5,401	4,834
New Home Sales [1]	351	360	376	386	447	447	381	446	431	419	485	511	547	569	590	596	368	430	462	576	618	518
Existing Home Sales [1]	4,496	4,511	4,740	4,896	4,926	5,101	5,324	4,945	4,603	4,870	4,999	5,018	5,044	5,068	5,444	5,126	4,662	5,074	4,874	5,171	4,783	4,316
Single-Family Originations [3]	$373	$395	$471	$511	$524	$537	$401	$293	$226	$310	$306	$251	$261	$312	$286	$245	$1,750	$1,755	$1,093	$1,104	$924	$950
Refinance Mortgage Share [4]	72%	64%	68%	72%	74%	66%	51%	53%	49%	39%	35%	33%	32%	26%	25%	26%	69%	61%	39%	27%	18%	13%
FHA Home Purchase Market Share [5]	29%	27%	25%	24%	29%	25%	24%	17%	19%	20%	20%	20%	20%	20%	20%	20%	26%	24%	20%	20%	n.a.	n.a.
ARM Market Share	5%	6%	5%	5%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	15%	5%	7%	11%	14%	n.a.	n.a.
Investor Share	14.1%	12.6%	12.4%	13.5%	14.5%	12.2%	12.1%	12.3%	12.3%	10.7%	10.4%	10.5%	12.0%	10.1%	10.1%	10.3%	13.2%	12.8%	11.0%	10.6%	10.4%	10.6%
30-Year Mortgage Fixed Rate [6]	3.9%	3.8%	3.6%	3.4%	3.5%	3.7%	4.4%	4.3%	4.4%	4.2%	4.3%	4.5%	4.8%	4.9%	5.0%	5.0%	3.7%	4.0%	4.3%	4.9%	5.4%	4.2%
5/1 ARM Rate [6]	2.8%	2.8%	2.8%	2.7%	2.6%	2.7%	3.2%	3.0%	3.1%	3.0%	3.1%	3.4%	3.6%	3.7%	3.9%	4.1%	2.8%	2.9%	3.2%	3.8%	n.a.	n.a.
1-Year ARM Rate [6]	2.8%	2.8%	2.7%	2.6%	2.6%	2.6%	2.7%	2.6%	2.5%	2.4%	2.5%	2.6%	2.7%	2.8%	3.0%	3.0%	2.7%	2.6%	2.5%	2.9%	4.2%	n.a.
Change in Housing Prices (FHFA ALL) [7]	-1.4%	-0.6%	-1.1%	-0.7%	1.1%	3.4%	4.7%	4.9%	4.9%	5.9%	7.1%	8.5%	8.8%	8.1%	7.4%	6.7%	-0.7%	4.9%	8.5%	6.7%	n.a.	n.a.
Change in Housing Prices (FHFA PO) [8]	0.5%	3.5%	4.1%	5.6%	7.1%	7.6%	8.5%	7.7%	6.9%	5.5%	6.1%	6.5%	3.8%	4.3%	3.4%	3.4%	5.6%	7.7%	6.5%	3.4%	2.3%	1.9%
Change in Housing Prices (CS HPI) [9]	-3.6%	-1.1%	1.3%	4.6%	8.6%	11.6%	12.7%	13.7%	13.1%	7.9%	5.2%	4.7%	3.1%	1.1%	2.9%	2.9%	4.6%	13.7%	4.7%	2.9%	3.2%	n.a.
Housing Affordability Index [10]	196	194	199	200	195	184	169	166	164	165	146	144	140	119	111	111	200	166	144	111	107	115
Median Sales Price - New Homes [11]	$234	$236	$248	$250	$258	$268	$262	$272	$274	$276	$277	$280	$283	$288	$287	$288	$242	$265	$277	$287	n.a.	n.a.
Median Sales Price - Existing Homes [11]	$158	$181	$184	$179	$176	$203	$207	$197	$191	$212	$213	$204	$198	$217	$219	$212	$175	$196	$205	$211	$211	$215

Note: Shaded area indicates historical values. Forecasts are an average forecast of Mortgage Bankers Association (MBA), Fannie Mae, Freddie Mac, National Association of Realtors, Wells Fargo, PNC Financial, the National Association of Home Builders, Standard and Poor's, the Wall Street Journal Survey, the Conference Board, Raymond James Financial, the Federal Reserve Bank of Philadelphia and the Federal Open Market Committee.

[1] Thousands of units

[2] Thousands of units, forecasted amount does not equal the sum of the existing plus new home sales because of differences in forecasts.

[3] FHFA and MBA, Billions of dollars

[4] The refinance shares for 2004-2009 are calculated from Home Mortgage Disclosure Act (HMDA) data. Preliminary estimates in 2010 are as reported by MBA.

[5] The FHA market shares for 2008 are calculated from HMDA data. Preliminary estimates for 2009 are the FHA endorsements (FHA Outlook) share of home sales (Census Bureau), scaled to match the mortgage market FHA market share.

[6] Freddie Mac, Primary Mortgage Market Survey

[7] FHFA House Price Index, all transactions (Y/Y % Change)

[8] FHFA House Price Index, purchase transactions only (Y/Y % Change, Seasonally Adjusted)

[9] Standard & Poor's Case-Shiller 10 City Index (Y/Y % Change, Seasonally Adjusted)

[*] Freddie Mac's Conventional Mortgage Home Price Index (Y/Y % Change, Annual Rate)

[10] National Association of Realtors

[11] Thousands of dollars

n.a. Not available at this time.

homeowners who were consolidating their debts or who were drawing equity out of their homes for other uses.

In 2014, for the first time in more than five years less than half of mortgage originations are expected to be for the purpose of refinancing an existing mortgage. As interest rates continue to rise, the share of originations from refinancing is expected to fall to 26 percent of mortgage originations in 2015 and less than 20 percent in 2016 and 2017, see **Table 3**.

Market Performance of Housing Goal Eligible Mortgages. The estimates of the market performance for the two single-family owner-occupied home purchase housing goals and one subgoal, and the refinancing mortgage housing goal, are provided at the top of **Table 2**. The estimates for the low-income borrower shares of the home purchase mortgage market are 20.9 percent in 2015, 20.2 percent in 2016 and 19.8 percent in 2017. The estimates for the very low-income borrower shares of the home purchase mortgage market are 5.8, 5.7 and 5.6 percent, respectively, in 2015, 2016 and 2017. The estimates for the share of goal-qualifying mortgages in low-income areas in the home purchase mortgage market, excluding designated disaster areas, are 14.7 percent of home purchase mortgages in 2015, 14.7 percent in 2016 and 14.2 percent in 2017. The estimates for the low-income refinancing goal are 31.0 percent in 2015, 33.5 percent in 2016 and 34.2 percent in 2017.

To arrive at these market projections, forecasts were compiled from thirteen industry and government sources (industry observers). The list of forecasters, along with each forecaster's annualized projections for 2014 through 2017 of the market indicators are provided in **Tables 4 and 5**. The forecasts are all provided on either a quarterly or annual basis for each market indicator. An econometric state space methodology was used to extend the trends of the market

Table 4

Forecasts of Economic Indicators by Source

Forecast[1]	Real GDP Growth Rate			Residential Constr. Growth Rate			Inflation Rate (CPI)[2]			Inflation Rate (Core CPI)[2]			Inflation Rate (Core PCE)[2]			Unemployment Rate			10-Year Const. Mat. Treas. Yield			1-Year Const. Mat. Treas. Yield			Prime Rate			Federal Funds Rate		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Mortgage Bankers Association[3]	2.9%			10.2%			2.1%									5.7%			3.2%									0.8%		
Fannie Mae[4]	2.7%			14.9%			1.7%			2.0%						5.9%			3.0%			0.6%						0.4%		
Freddie Mac[5]	3.3%						2.0%									6.0%			3.5%			0.3%								
National Association of Realtors[6]	2.8%						3.5%									5.9%			3.6%						3.8%			0.8%		
Wells Fargo[7]	3.0%			10.9%			2.4%			2.2%						5.7%			3.0%						3.6%			0.6%		
PNC Financial[8]	2.8%	2.5%		8.0%	4.9%		2.2%	2.3%					1.9%	2.0%		5.8%	5.3%		3.4%	3.8%					3.3%	4.1%		0.2%	1.1%	
Standard and Poor's[9]	3.3%	3.3%		19.0%	15.2%		1.7%	1.5%		2.0%	1.8%					6.0%	5.7%		3.3%	3.9%								0.4%	2.2%	
National Association of Home Builders[10]																			3.7%	4.4%		0.3%	1.8%		3.3%	4.8%		0.3%	1.8%	
The Conference Board[11]	3.0%																													
Wall Street Journal Survey[12]	3.0%	2.9%					2.1%	2.4%								5.6%	5.3%		3.6%	4.0%								0.8%	2.2%	
Federal Open Market Committee[13]	2.8%	2.9%	2.4%										1.8%	1.9%		5.6%	5.3%	5.4%												
Merrill Edge[14]	2.5%	3.3%	3.1%				3.0%	1.6%	1.6%	1.7%	2.0%	2.0%				6.7%	5.9%	5.9%	4.0%	3.9%	3.9%				3.6%	5.9%	5.9%			
Raymond James Financial[15]	3.0%			9.2%			1.9%			2.0%			1.9%			5.6%			3.7%									0.6%		
Philadelphia FRB Survey[16]	3.1%	3.1%	2.9%	11.1%			2.1%	2.2%		2.2%	2.1%		1.8%	1.9%		5.9%	5.6%	5.5%	3.5%	4.0%	4.5%									
Average[17]	2.8%	2.9%	2.6%	12.0%	12.6%	n.a.	1.4%	2.1%	1.6%	1.6%	1.9%	2.0%	1.1%	1.3%	n.a.	5.8%	5.5%	5.6%	3.4%	4.0%	4.2%	0.4%	1.8%	n.a.	3.5%	4.9%	5.9%	0.5%	1.8%	n.a.
Minimum	*2.5%*	*2.5%*	*2.4%*	*8.0%*	*4.9%*	*0.0%*	*1.7%*	*1.5%*	*1.6%*	*1.7%*	*1.8%*	*2.0%*	*1.8%*	*1.9%*	*0.0%*	*5.6%*	*5.3%*	*5.4%*	*3.0%*	*3.8%*	*3.9%*	*0.3%*	*1.8%*	*0.0%*	*3.3%*	*4.1%*	*5.9%*	*0.2%*	*1.1%*	*0.0%*
Maximum	*3.3%*	*3.3%*	*3.1%*	*19.0%*	*15.2%*	*0.0%*	*3.5%*	*2.4%*	*1.6%*	*2.2%*	*2.1%*	*2.0%*	*1.9%*	*2.0%*	*0.0%*	*6.7%*	*5.9%*	*5.9%*	*4.0%*	*4.4%*	*4.5%*	*0.6%*	*1.8%*	*0.0%*	*3.8%*	*5.9%*	*5.9%*	*0.8%*	*2.2%*	*0.0%*

[1] Forecasts are annual averages of quarterly forecasts, where applicable.

[2] Fourth Quarter over Fourth Quarter Percent Change.

[3] Last Updated 7/15/2014

[4] Last Updated 7/10/2014

[5] Last Updated 7/18/2014

[6] Last Updated 7/1/2014

[7] Last Updated 7/9/2014 , U.S. Economic Forecast and 7/9/2014 , U.S. Housing Market Forecast.

[8] Last Updated 6/24/2014

[9] Last Updated 6/25/2014

[10] Last Updated 6/30/2014

[11] Last Updated 7/9/2014

[12] Last Updated 7/1/2014 , survey of 57 forecasters.

[13] Last Updated 6/18/2014 , midpoint of the central tendency projection.

[14] Last Updated 7/17/2014

[15] Last Updated 6/11/2014

[16] Last Updated 5/16/2014 , survey of 45 forecasters.

[17] Averages include actual values for months when available. Therefore the average line may not equal the average of the above numbers.

Table 5

Forecasts of Housing and Mortgage Market Indicators by Source

Forecast[1]	Housing Starts[2]			Housing Starts (1-Unit)[2]			Total Home Sales[2]			New Home Sales[2]			Existing Home Sales[2]			Single-Family Originations[3]			Refinance Mortgage Rate			FHA Market Share			ARM Market Share		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Mortgage Bankers Association	1,163			783			6,256			503			5,753			$1,130			35.5%								
Fannie Mae	1,274			913			5,834			606			5,228			$1,097			26.6%						13.3%		
Freddie Mac	1,400						5,800									$1,085			21.7%			20.0%			14.8%		
National Association of Realtors	1,404			990			5,975			697			5,278														
Wells Fargo	1,178			811			5,910			540			5,370														
PNC Financial	1,036	1,058					5,570	5,748		471	487		5,099	5,261													
Standard and Poor's	1,370	1,570																									
National Association of Home Builders	1,312	1,523		947	1,155					696	849																
The Conference Board	1,300																										
Wall Street Journal Survey	1,236																										
Merrill Edge	1,096	1,069	1,069				4,810	4,823	4,834	516	518	518	4,294	4,305	4,316												
Federal Open Market Committee																											
Philadelphia FRB Survey																											
Average[4]	1,250	1,305	1,069	889	1,155	n.a.	5,747	5,401	4,834	576	618	518	5,171	4,783	4,316	$1,104	n.a.	n.a.	27.1%	n.a.	n.a.	20.0%	n.a.	n.a.	14.0%	n.a.	n.a.
Minimum	*1,036*	*1,058*	*1,069*	*783*	*1,155*	*0*	*4,810*	*4,823*	*4,834*	*471*	*487*	*518*	*4,294*	*4,305*	*4,316*	*$1,085*	*$0*	*$0*	*21.7%*	*0.0%*	*0.0%*	*20.0%*	*0.0%*	*0.0%*	*13.3%*	*0.0%*	*0.0%*
Maximum	*1,404*	*1,570*	*1,069*	*990*	*1,155*	*0*	*6,256*	*5,748*	*4,834*	*697*	*849*	*518*	*5,753*	*5,261*	*4,316*	*$1,130*	*$0*	*$0*	*35.5%*	*0.0%*	*0.0%*	*20.0%*	*0.0%*	*0.0%*	*14.8%*	*0.0%*	*0.0%*

Forecast[1]	30-Year Mortgage Fixed Rate			5/1 ARM Rate			1-Year ARM Rate			Change in Home Prices (FHFA ALL)[5]			Change in Home Prices (FHFA PO)[5]			Change in Home Prices (Case-Shiller)[6]			Housing Affordability Index[7]			Median Sales Price - New Homes[8]			Median Sales Price - Existing Homes[8]		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Mortgage Bankers Association	5.0%									3.0%												$282			$206		
Fannie Mae	4.6%			3.5%			2.8%						5.7%	4.5%	4.3%							$294			$218		
Freddie Mac	5.1%			4.2%			2.7%									0.8%											
National Association of Realtors	5.4%						3.2%												111			$288			$218		
Wells Fargo	4.5%						2.9%						3.0%	3.0%	3.0%	3.3%						$283			$210		
PNC Financial	5.2%	5.6%														3.0%	3.2%										
Standard and Poor's	5.0%	5.7%																									
National Association of Home Builders	5.4%	6.1%					2.8%	4.2%																			
The Conference Board																											
Wall Street Journal Survey										14.4%																	
Merrill Edge	4.2%	4.2%	4.2%										0.5%	0.7%	0.7%												
Philadelphia FRB Survey																											
Average[4]	4.9%	5.4%	4.2%	3.8%	n.a.	n.a.	2.9%	4.2%	n.a.	6.7%	n.a.	n.a.	3.4%	2.3%	1.9%	2.9%	3.2%	n.a.	111	n.a.	n.a.	$287	n.a.	n.a.	$211	n.a.	n.a.
Minimum	*4.2%*	*4.2%*	*4.2%*	*3.5%*	*0.0%*	*0.0%*	*2.7%*	*4.2%*	*0.0%*	*3.0%*	*0.0%*	*0.0%*	*0.5%*	*0.7%*	*0.7%*	*0.8%*	*3.2%*	*0.0%*	*111*	*0*	*0*	*$282*	*$0*	*$0*	*$206*	*$0*	*$0*
Maximum	*5.4%*	*6.1%*	*4.2%*	*4.2%*	*0.0%*	*0.0%*	*3.2%*	*4.2%*	*0.0%*	*14.4%*	*0.0%*	*0.0%*	*5.7%*	*4.5%*	*4.3%*	*3.3%*	*3.2%*	*0.0%*	*111*	*0*	*0*	*$294*	*$0*	*$0*	*$218*	*$0*	*$0*

[1] Forecasts are annual averages of quarterly forecasts, where applicable. See Table 2 for update information. The FOMC and Raymond James & Associates only provide forecasts on basic macroeconomic series and therefore are omitted from the mortgage/housing forecast table (see Table 2).

[2] Thousands of units

[3] Billions of dollars

[4] Averages include actual values for months when available. Therefore the average line may not equal the average of the above numbers.

[5] Federal Housing Finance Agency: All transactions and home Purchase only home price indicies (Q4/Q4 % Change).

[6] Standard & Poor's / Case-Shiller Home Price Index, 10-City Composite (Q4/Q4 % Change).

[7] Housing Affordability Index (4th Quarter), National Association of Realtors. Forecasts are scaled to NAR's quarterly HAI series.

[8] Thousands of dollars

performance for each goal, based on the monthly time series database provided by the FFIEC and the Federal Reserve Board. For the low-income areas goal, this model produced only the market estimates for the subgoal. The remainder of the market estimates for this goal relates to the designated disaster areas. The 2015 through 2017 estimates of the share of home purchase mortgages that will qualify for the designated disaster areas portion of the low-income areas goal will be provided in January of each year, based on data provided by the Federal Emergency Management Agency (FEMA).[18]

[18] http://www.fema.gov/disasters.

E. STATISTICAL MODELS OF THE SINGLE-FAMILY HOUSING GOALS

As stated previously, one of the issues with HMDA data is that data on mortgage originations will lag from 9 to 21 months behind the current month. At this point in time the most recent year for which HMDA data are available is 2012. Fortunately there exists more recent data that can be used to inform the forecasts and econometric techniques to take advantage of them.

To estimate the 2015 through 2017 market shares for the four single-family housing goals, a state space form (SSF) is incorporated with the associated algorithms of the Kalman filter and smoother.[19] This SSF approach is a method by which the time series gap left by HMDA data can be statistically filled in with a similar time series which is highly correlated with it. For the home purchase goals, an estimate of monthly market affordability levels for the home purchase goals from the Monthly Interest Rate Survey (MIRS) data is used.[20] The market size for the refinance goal is estimated using the SSF approach based on the combined Fannie Mae and Freddie Mac goal shares for January 2004 – March 2014.

Several specifications of the auto-regressive (AR) model were tested for each housing goal. All of the time series, both the dependent (goal qualifying share) and independent (explanatory), were found to be stationary when integrated at the first level.[21] While several exogenous variables had the expected sign, many were found to be insignificant at a 10 percent level of confidence. The equations were fitted with monthly binary variables to capture

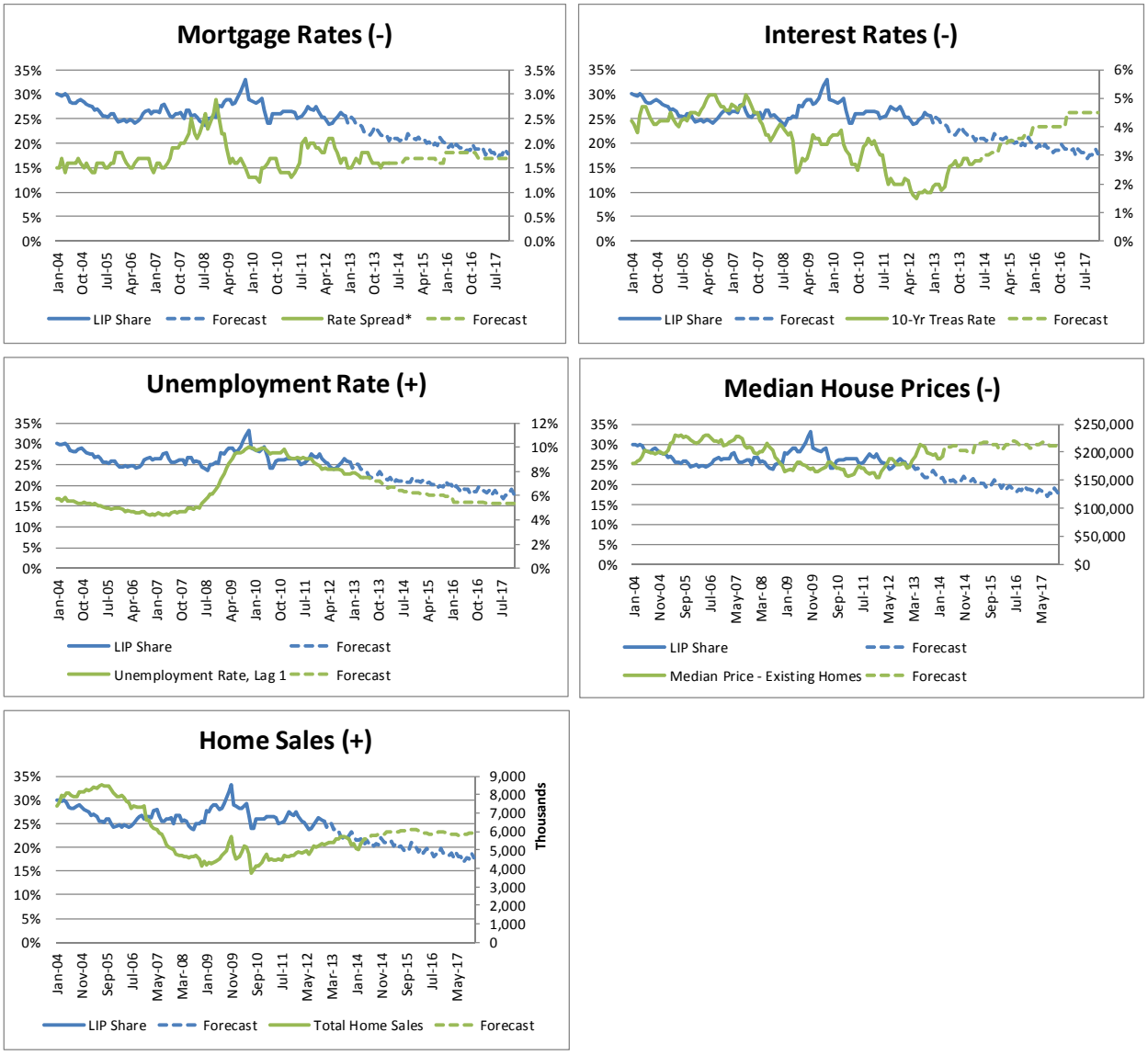
[19] The methodology followed is an adaptation of a state space model developed by Freddie Mac, Housing Analysis and Research. For a thorough discussion of the state space approach see Harvey, Andrew. "Forecasting with Unobserved Components Time Series Models," in Handbook of Economic Forecasting. G. Elliott, C.W.J. Granger and A. Timmermann eds. North Holland, 2006, pp. 327-412.
[20] This is an estimated time series of goal-qualifying shares based on MIRS date from 2004 through 2013.
[21] In simple terms, a stationary time series has no trend, has a constant variance over time, has a constant autocorrelation structure and has no periodic fluctuations (seasonality).

seasonality effects, as opposed to moving average terms which have no forecasting value. The best fitting estimation equations for each of the goals are described in the following sections.

Low-Income Borrower Income Home Purchase Goal. The four drivers of the Low-Income Borrower Home Purchase Goal are presented in **Figure 7**. Three of the four show a positive correlation with affordable share of mortgage originations. The positive correlation with home sales is as expected in that a more active market leads to a higher share affordable mortgage originations. The negative correlation with interest rates, the rate spread between the 10-Year Treasury and the 30-Year Mortgage, and median house prices also follow what is expected. The positive relationship with the unemployment rate mirrors the negative correlation of affordability trends with growth in the economy in general.

The AR model estimation results for the Low-Income Borrower Income Home Purchase Goal (LIP) are presented in **Table 6**. The best fitting equation was found to be a first differenced seasonal AR model with two autoregressive terms, *AR(1)* and *AR(2)*, both significant. In addition to the time series components, drivers of this housing goal include log of total home sales, *ln(SALES)*, the 10-Year Treasury rate, *TREAS_10*, the rate spread between the 10-Year Treasury and the 30-Year Mortgage, *SPREAD_T10_F30*, the unemployment rate lagged one month, $UNEMP_{t-1}$, and the median house price for existing homes, *ln(MEDPRICE_E)*. The Chi-Square statistic indicates that the hypothesis that the residuals are white noise cannot be rejected. For more information on the LIP model, see **Appendix A**.

Figure 7
Drivers of the Low-Income Borrower Home Purchase Goal



*Rate Spread between the 30-Year Fixed Rate Mortage and the 10-Year Treasury Yield.

Table 6

Low-Income Borrower Home Purchase Goal

Variable	Parameter Estimates	t-stat
AR(1)	-0.3960	(-4.29) ***
AR(2)	0.4895	(5.29) ***
TREAS_10	-0.6408	(-2.49) **
SPREAD_T10_F30	-1.0289	(-2.21) **
$UNEMP_{t-1}$	0.6612	(2.14) **
ln(MEDPRICE_E)	-0.1183	(-3.69) ***
ln(Sales)	0.0958	(8.85) ***
JAN	-0.0055	(-1.97) **
FEB	0.0075	(3.42) ***
MAR	-0.0096	(-3.61) ***
APR	0.0131	(4.95) ***
MAY	-0.0065	(-2.28) **
JUN	0.0034	(1.15)
JUL	-0.0106	(-3.92) ***
AUG	0.0062	(2.40) **
SEP	-0.0031	(-1.15)
OCT	0.0111	(5.23) ***
NOV	-0.0092	(-4.09) ***

$\sigma^2 = 0.000032000$

$\chi^2 = 13.48$

$Prob(\chi^2) = 0.0361$

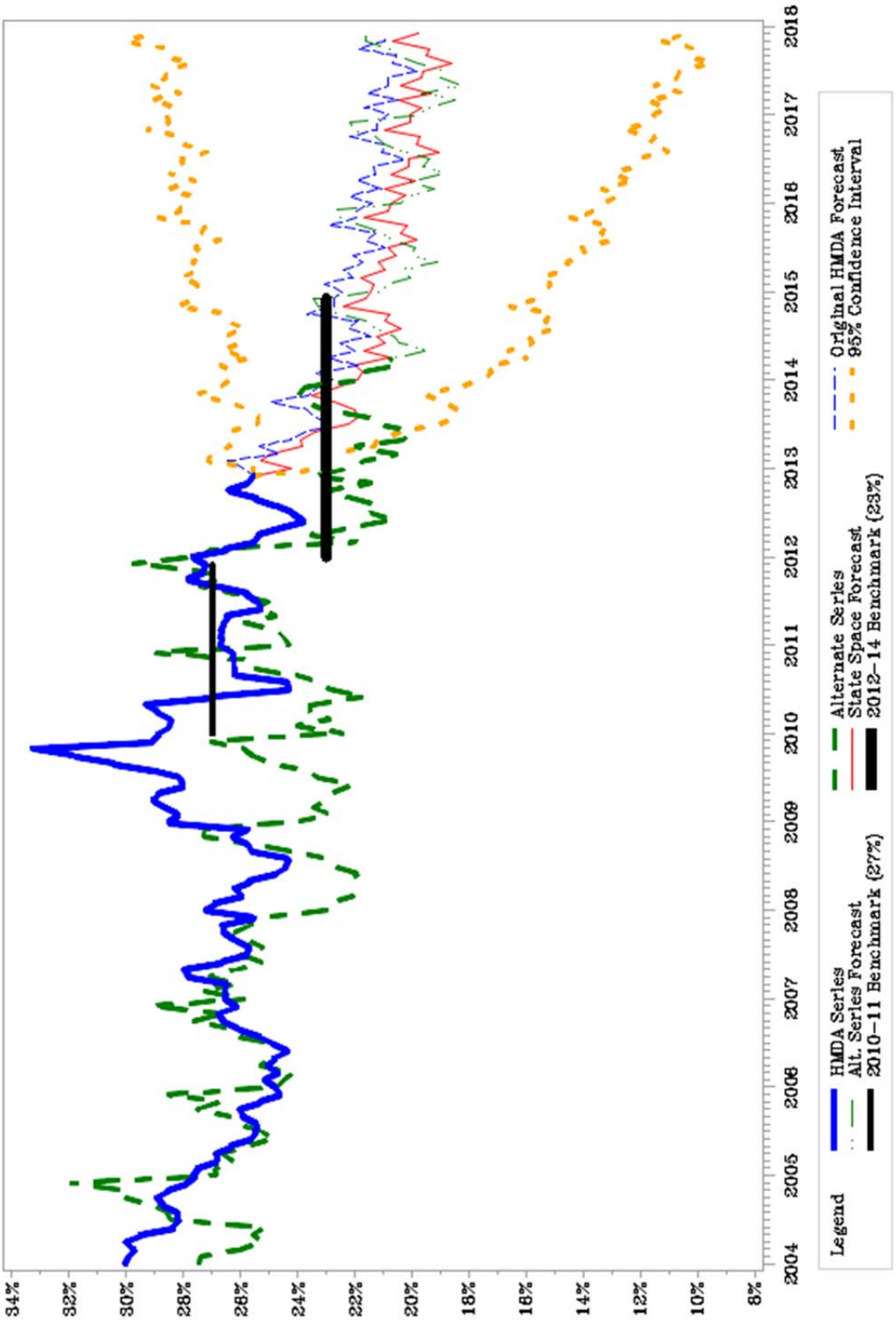
* Significant at 10 percent level.

** Significant at 5 percent level.

*** Significant at 1 percent level.

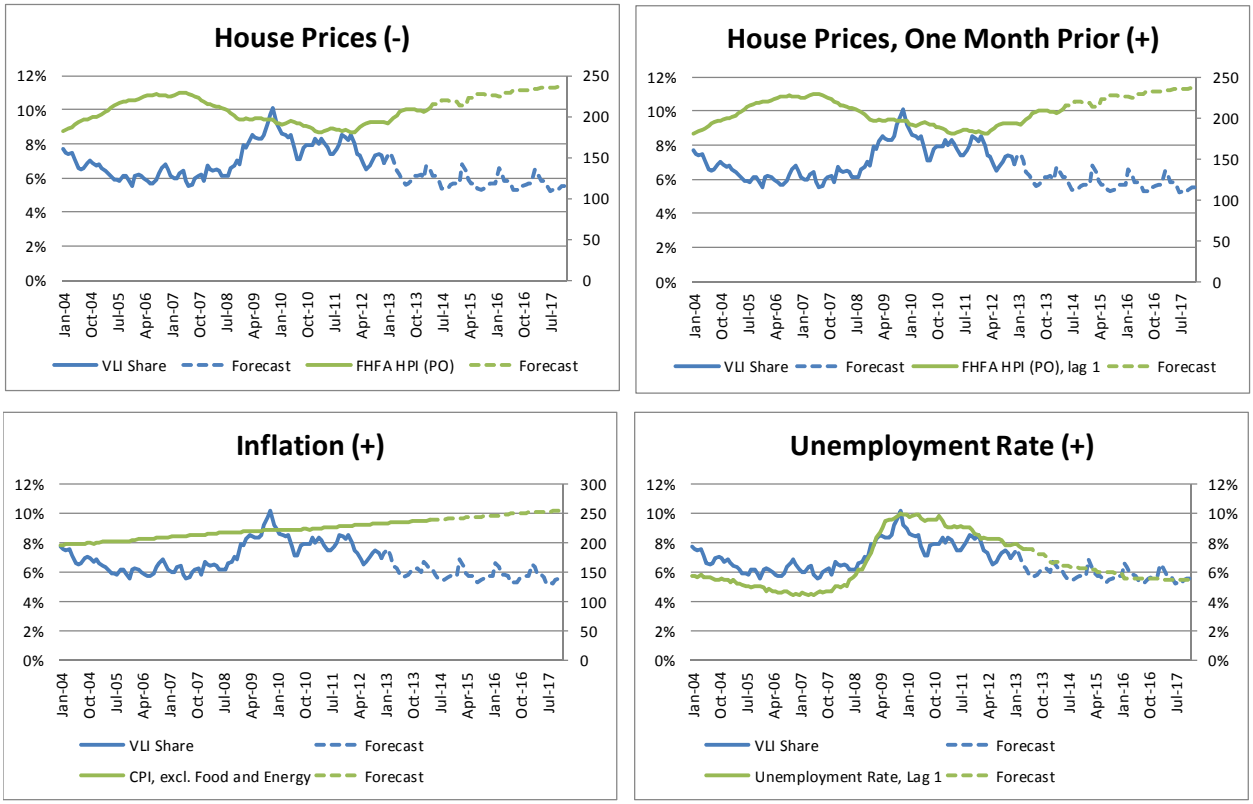
The forecasts for the Low-Income Borrower Income Home Purchase Goal are shown in **Figure 8**. While the state space form provides the best forecast, the forecasts based on HMDA data alone and where the HMDA time series is merely amended with the alternative time series are shown in **Figure 8**. The state space form forecast averages 20.9, 20.2 and 19.8 percent in 2015 through 2017, respectively. Also, for reference, the figure is annotated with the 2010-2011 goal benchmark (27 percent) and the 2012-2014 benchmark (23 percent).

Figure 8
Low–Income Borrower Home Purchase Goal



Very Low-Income Borrower Income Home Purchase Goal. The four drivers of the Very Low-Income Borrower Home Purchase Goal are presented in **Figure 9**. Three of the four show a positive correlation with the share of mortgage originations made to very low-income borrowers. The negative sign on house prices is as expected, however the sign on house prices one month in the past is positive. The positive correlation with the unemployment is obvious from **Figure 9** and reflects the cycle correlation of the housing market with the economy in general, as illustrated in **Figure 1** (above). The positive correlation with inflation reflects the general long term increase in affordable mortgage originations over time. As expected, an increase in house prices leads to a smaller share of mortgages from very low-income borrowers.

Figure 9
Drivers of the Very Low-Income Borrower Home Purchase Goal



The model estimation results for the Very Low-Income Borrower Income Home Purchase Goal (VLIP) are presented in **Table 7**. The best fitting equation was found to be a first differenced seasonal AR model with three autoregressive terms, with all three significant. In addition to the time series components, drivers of this housing goal include the trend in house prices, both the current month, *ln(HPI)*, and lagged 1 month, $ln(HPI)_{t-1}$, as measured by the log of the FHFA house price index, the rate of core inflation, *ln(CORE_CPI)*, and the unemployment rate lagged one month, $UNEMP_{t-1}$. The Chi-Square statistic indicates that the hypothesis that the residuals are white noise cannot be rejected. For more information on the VLIP model, see **Appendix B**.

The forecast for the Very Low-Income Borrower Income Home Purchase Goal is shown in **Figure 10**. While the state space form provides the best forecast, the forecasts based on HMDA data alone and where the HMDA time series is merely amended with the alternative time series are shown in **Figure 10**. The state space form forecast averages 5.8, 5.7 and 5.6 percent in 2015 through 2017, respectively. Also, for reference, the figure is annotated with the 2010-2011 goal benchmark (8 percent) and the 2012-2014 benchmark (7 percent).

Table 7

Very Low-Income Borrower Home Purchase Goal

Variable	Parameter Estimates	t-stat	
AR(1)	0.1951	(2.61)	***
AR(2)	-0.1576	(-2.12)	**
AR(3)	-0.2968	(-4.01)	***
ln(HPI)	-0.0815	(-2.06)	**
$\ln(HPI)_{t-1}$	0.0763	(1.92)	*
ln(Core CPI)	0.3590	(2.04)	**
$UNEMP_{t-1}$	0.3946	(3.86)	***
JAN	0.0072	(7.90)	***
FEB	-0.0018	(-1.76)	*
MAR	-0.0048	(-5.15)	***
APR	-0.0013	(-1.68)	*
MAY	-0.0023	(-3.02)	***
JUN	-0.0036	(-4.91)	***
JUL	-0.0005	(-0.67)	
AUG	-0.0006	(-0.85)	
SEP	0.0016	(2.21)	**
OCT	-0.0003	(-0.39)	
NOV	0.0003	(0.44)	

$\sigma^2 = 0.000006565$

$\chi^2 = 4.61$

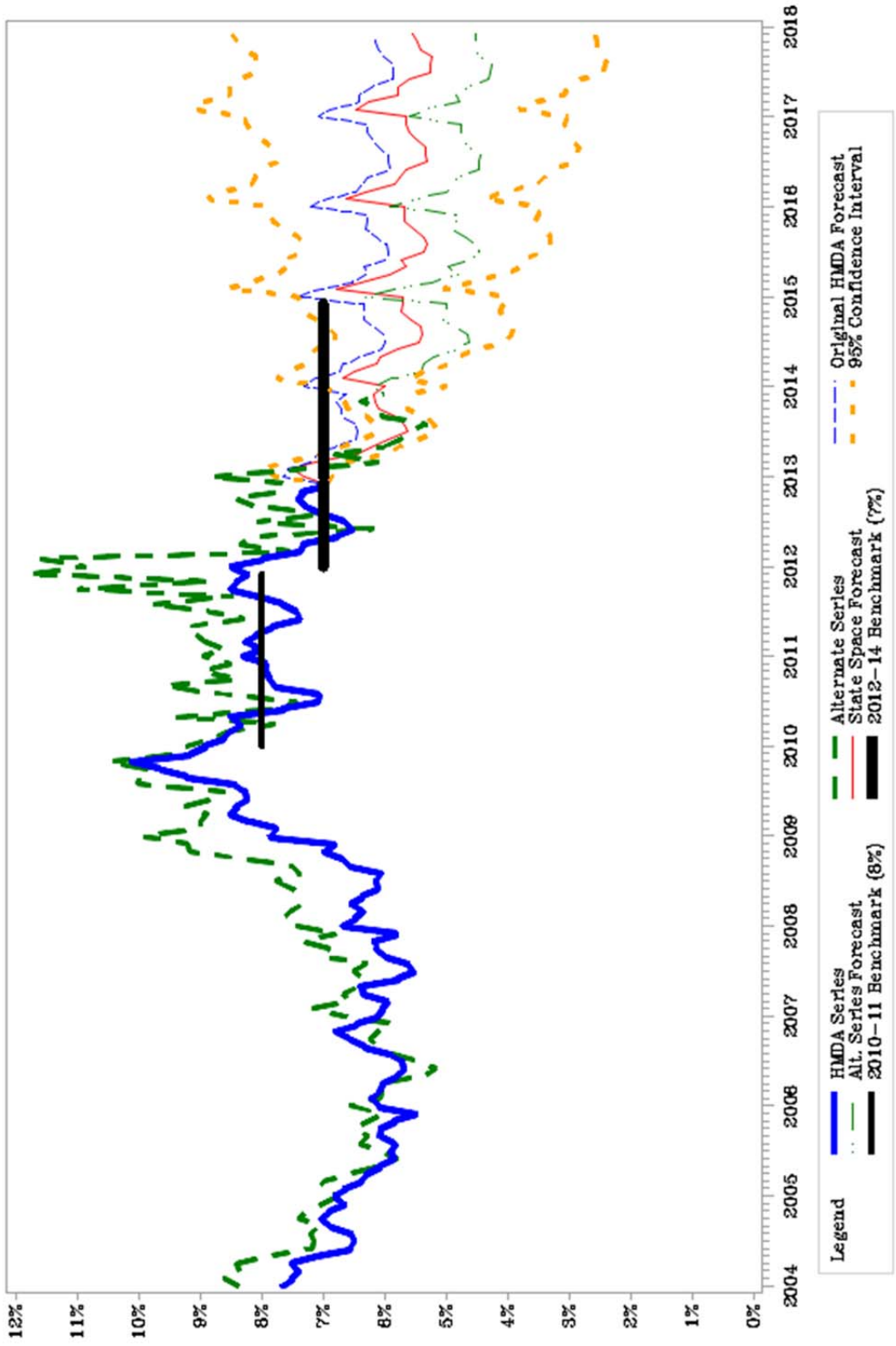
$Prob(\chi^2) = 0.2030$

* Significant at 10 percent level.

** Significant at 5 percent level.

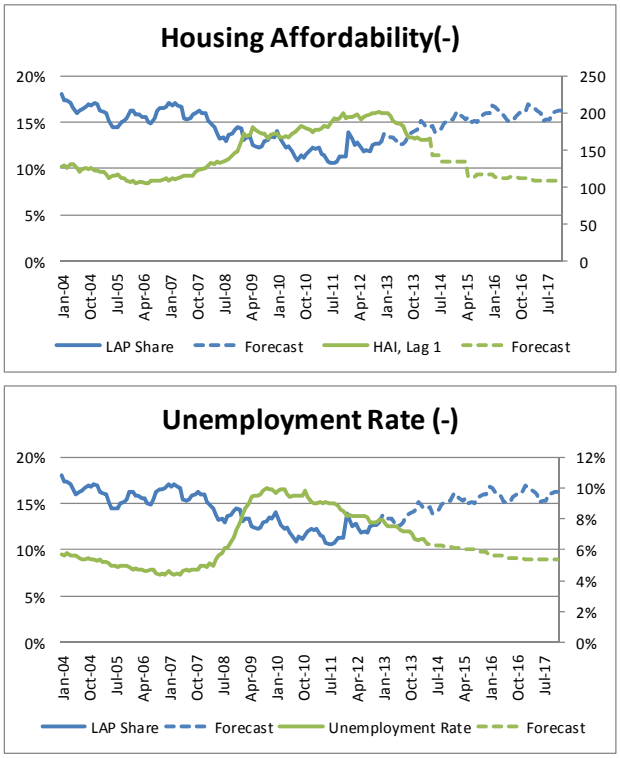
*** Significant at 1 percent level.

Figure 10
Very Low—Income Borrower Home Purchase Goal



Low-Income Areas Home Purchase Subgoal. The two drivers of the Low-Income Areas Home Purchase Subgoal are presented in **Figure 11**. Both drivers show a negative correlation with the share of mortgages originated in low-income areas. The negative sign on the housing affordability variable reflects the effect that affordability rises and falls more in non-low income areas than low income areas. The negative correlation with the unemployment rate results from low income areas being hit harder by economic downturns.

Figure 11
Drivers of the Low-Income Areas Home Purchase Subgoal



The model estimation results for the Low-Income Areas Home Purchase Subgoal (LAP) are presented in **Table 8**. The best fitting equation for the LAP subgoal was found to be a first differenced AR model with six AR terms, where only the sixth term, *AR(6)*, is significant. Additionally, the drivers of this housing goal include housing affordability one month past,

ln(HAI)$_{t-1}$, and the unemployment rate, *UNEMP*. The Chi-Square statistic indicates that the hypothesis that the residuals are white noise cannot be rejected. For more information on the LAP model, see **Appendix C**.

Table 8

Low-Income Area Home Purchase Goal

Variable	Parameter Estimates	t-stat	
AR(1)	-0.0955	(-1.28)	
AR(2)	-0.0410	(-0.54)	
AR(3)	0.0714	(0.94)	
AR(4)	-0.0104	(-0.14)	
AR(5)	0.0219	(0.29)	
AR(6)	0.1452	(1.95)	*
$\ln(HAI)_{t-1}$	-0.0394	(-2.73)	***
UNEMP	-0.4509	(-2.58)	***
JAN	0.0078	(7.73)	***
FEB	-0.0029	(-2.93)	***
MAR	-0.0030	(-3.10)	***
APR	-0.0019	(-1.98)	**
MAY	-0.0040	(-4.06)	***
JUN	-0.0063	(-6.80)	***
JUL	0.0005	(0.54)	
AUG	0.0004	(0.37)	
SEP	0.0052	(5.50)	***
OCT	0.0025	(2.57)	**
NOV	0.0010	(1.07)	

$\sigma^2 = 0.000014000$

$\chi^2 = 6.81$

$\text{Prob}(\chi^2) = 0.3387$

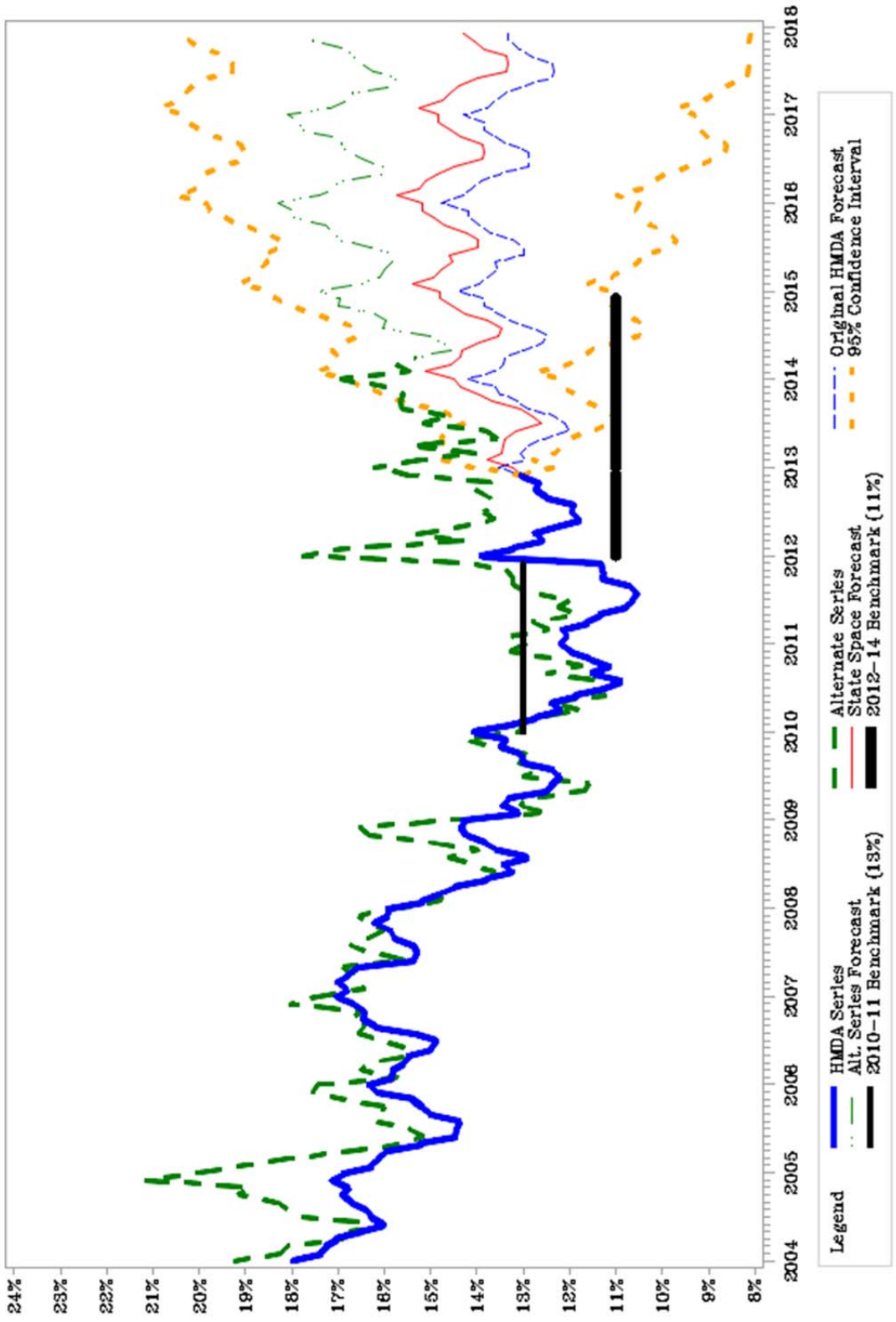
* Significant at 10 percent level.

** Significant at 5 percent level.

*** Significant at 1 percent level.

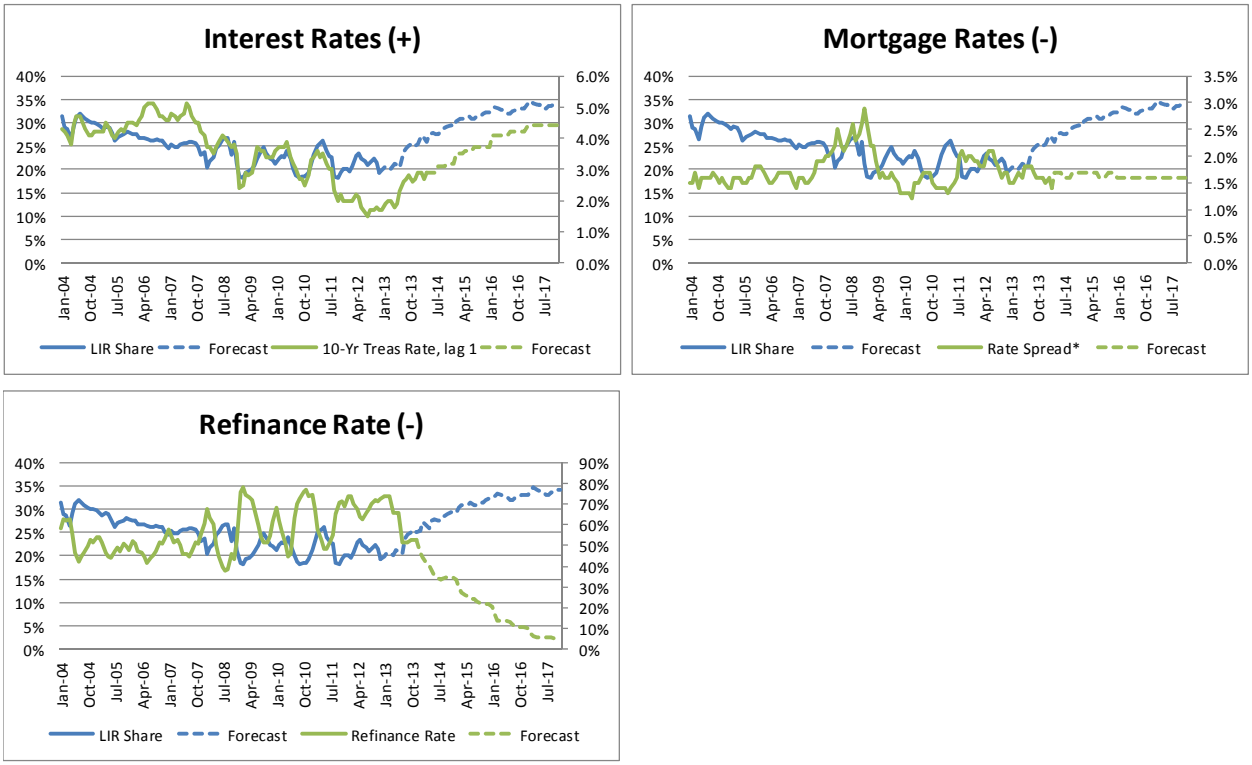
The forecast for the Low-Income Areas Home Purchase Subgoal is shown in **Figure 12**. Due to the increased variability in the alternative data series, the 2012-2014 benchmark was based only on the original HMDA data forecast. The state space form forecast averages 14.7, 14.7 and 14.2 percent in 2015 through 2017, respectively. Also, for reference, **Figure 12** is annotated with the 2010-2011 goal benchmark (13 percent) and the 2012-2014 (11 percent).

Figure 12
Low–Income Area Home Purchase Subgoal



Low-Income Borrower Income Refinance Goal. The three drivers of the Low-Income Borrowers Refinance Goal are presented in **Figure 13**. Interest rates correlate positively with share of refinance mortgages that are from low income borrowers. As interest rates rise rate-and-term refinancers leave the market (and vice versa when rates fall) and since the majority of these borrowers are higher income, the share of lower income borrowers increases. Related to this (but not so much that there are co-linearity problems) is that as higher income borrowers leave (enter) the market the refinance rate falls (rises), resulting in a negative relationship with the share of affordable loans. Finally, the negative correlation between the affordable share of mortgages and the rate spread between the 10-year Treasury yield and the 30-year fixed mortgage rate is that as the rate spread increases, mortgages become relatively more expensive.

Figure 13
Drivers of the Low-Income Borrower Refinance Goal



*Rate Spread between the 30-Year Fixed Rate Mortage and the 10-Year Treasury Yield.

The best fitting equation for the Low-Income Borrower Income Refinance Goal (LIR), shown in **Table 9**, was found to be a first differenced seasonal AR model with one autoregressive term, *AR(1)*, lagged one month. Other drivers of this housing goal include the yield on a 10-year Treasury Note yield lagged one month, $TREAS\_10_{t-1}$, the spread between the 10-year Treasury Note yield and the 30-year Fixed Mortgage rate, *SPREAD_T10_F30*, and the share of mortgages that are refinance loans, *REFI_SHR*. The Chi-Square statistic indicates that the hypothesis that the residuals are white noise cannot be rejected. For more information on the LIR model, see **Appendix D**.

Table 9

Low-Income Borrower Refinance Goal

Variable	Parameter Estimates	t-stat	
AR(1)	-0.2654	(-2.50)	**
$TREAS\_10_{t-1}$	1.8096	(3.97)	***
SPREAD_T10_F30	-1.1648	(-1.93)	*
REFI_SHR	-0.1721	(-7.20)	***
JAN	0.0083	(2.65)	***
FEB	-0.0039	(-1.43)	
MAR	-0.0044	(-1.56)	
APR	-0.0022	(-0.78)	
MAY	-0.0010	(-0.37)	
JUN	-0.0067	(-2.38)	**
JUL	-0.0001	(-0.04)	
AUG	0.0035	(1.26)	
SEP	0.0028	(1.02)	
OCT	0.0037	(1.32)	
NOV	0.0002	(0.08)	

$\sigma^2 = 0.000061000$

$\chi^2 = 1.52$

$Prob(\chi^2) = 0.9105$

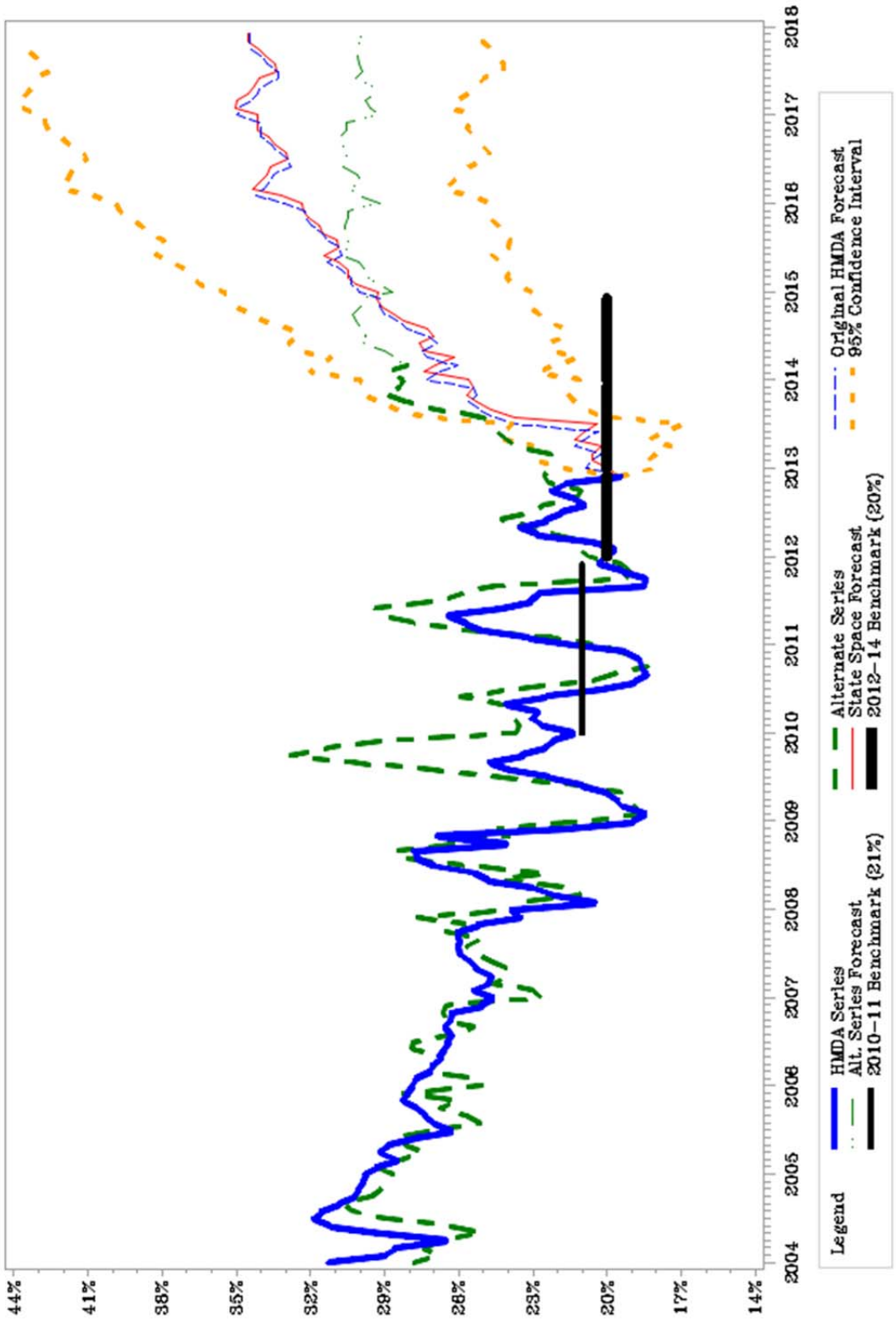
* Significant at 10 percent level.

** Significant at 5 percent level.

*** Significant at 1 percent level.

The forecast for the Low-Income Borrower Refinance Goal is shown in **Figure 14**. While the state space form provides the best forecast, the forecasts based on HMDA data alone and where the HMDA time series is merely amended with the alternative time series are shown in **Figure 14**. The state space form forecast averages 31.0, 33.5 and 34.2

Figure 14
Low–Income Borrower Refinance Goal



percent in 2015 through 2017, respectively. Also, for reference, the figure is annotated with the 2010-2011 goal benchmark (21 percent) and the 2012-2014 benchmark (20 percent).

F. CONCLUSIONS

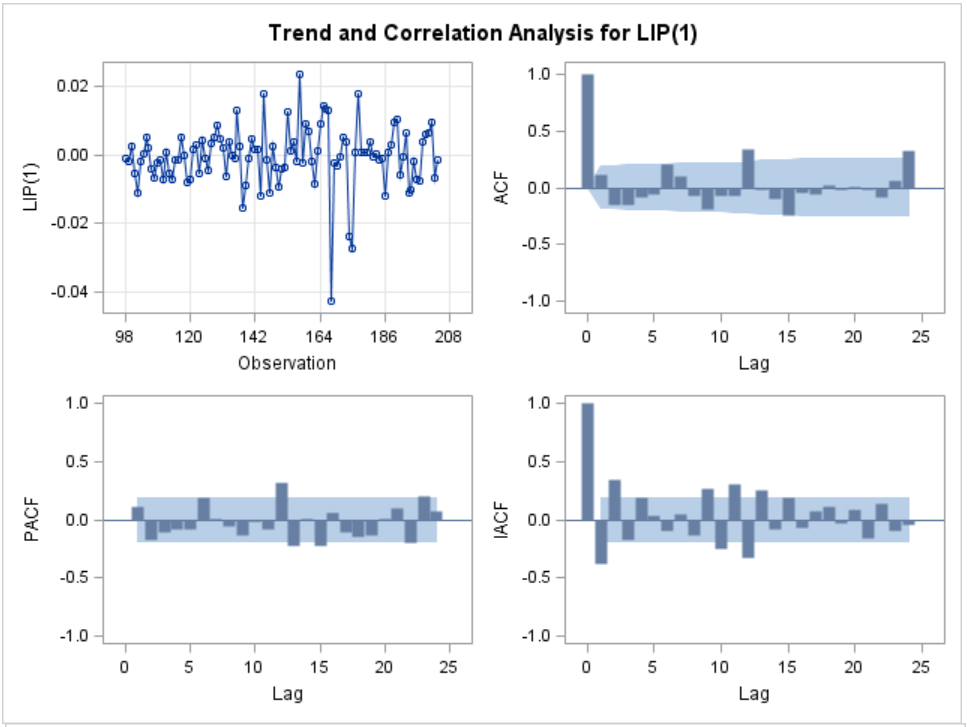
FHFA is required to consider market size when establishing housing goals. This paper describes the methodologies used to estimate the affordable market size for the four single-family housing goals for 2015 through 2017. The 2015-2017 midpoint estimates, with the 95 percent confidence interval-based ranges in brackets, of the affordable share of the prime, conforming conventional mortgage market for the four housing goals are:

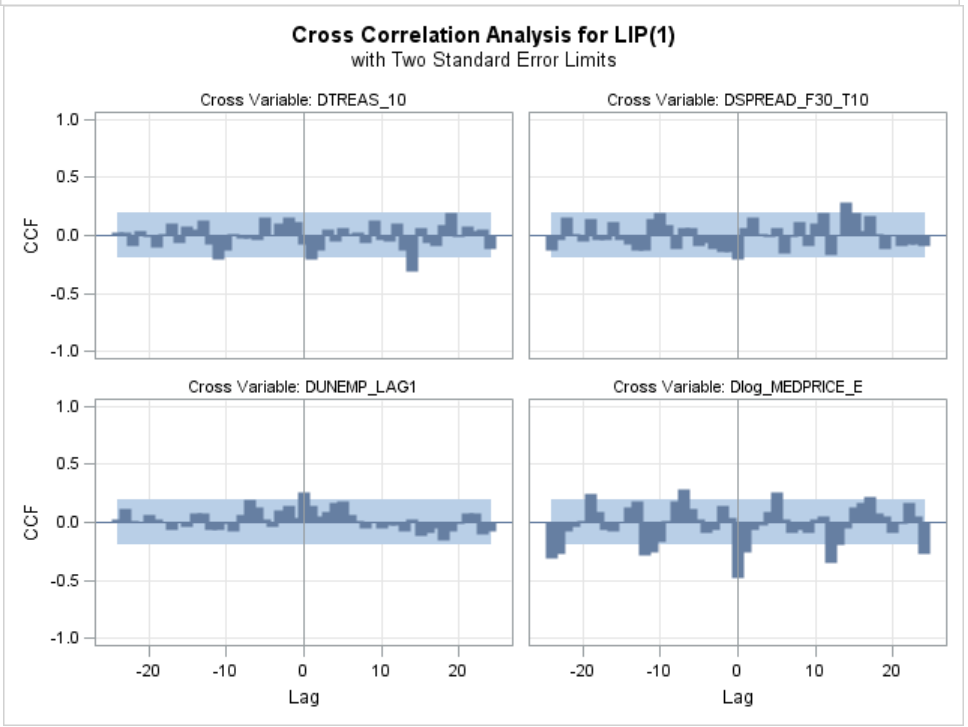
- Low-Income Borrower Home Purchase Goal 20 - 21 % [11 – 29 %]
- Very Low-Income Borrower Home Purchase Goal 5 - 6 % [3 – 8 %]
- Low-Income Area Home Purchase Subgoal 14 - 15 % [8 – 20 %]
- Low-Income Borrower Refinance Goal 31 - 34 % [24 – 43 %]

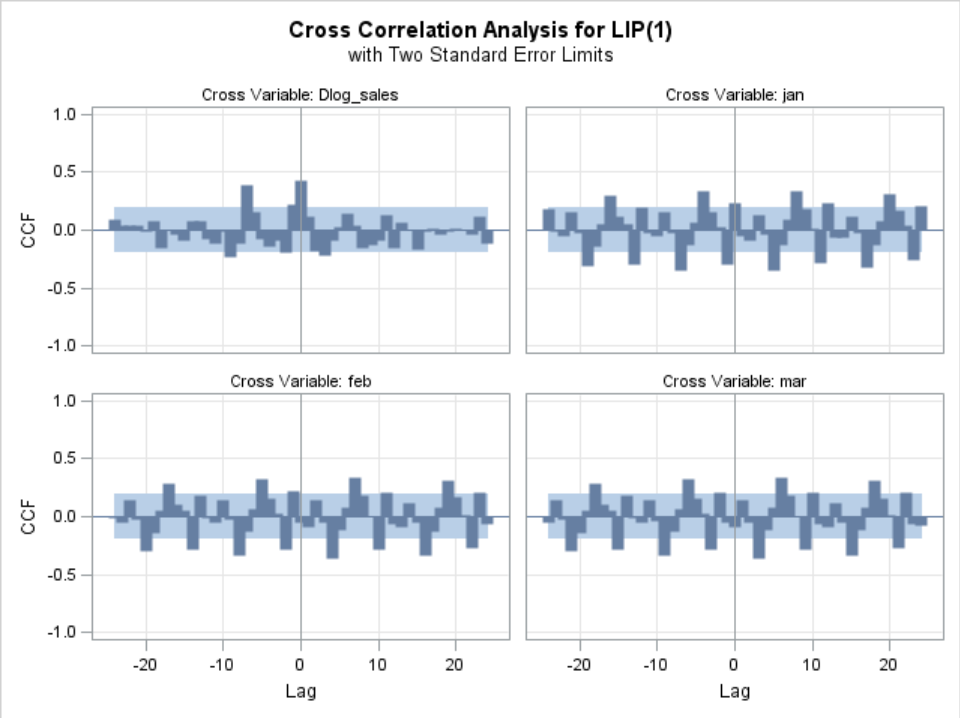
The market projections are based on econometric state space form time series models, incorporating industry and government economic, housing and mortgage market forecasts.

APPENDIX A

Low-Income Borrowers Home Purchase Goal






Cross Correlation Analysis for LIP(1)
with Two Standard Error Limits
Cross Variable: Dlog_sales
Cross Variable: jan
Cross Variable: feb
Cross Variable: mar
CCF
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0.0
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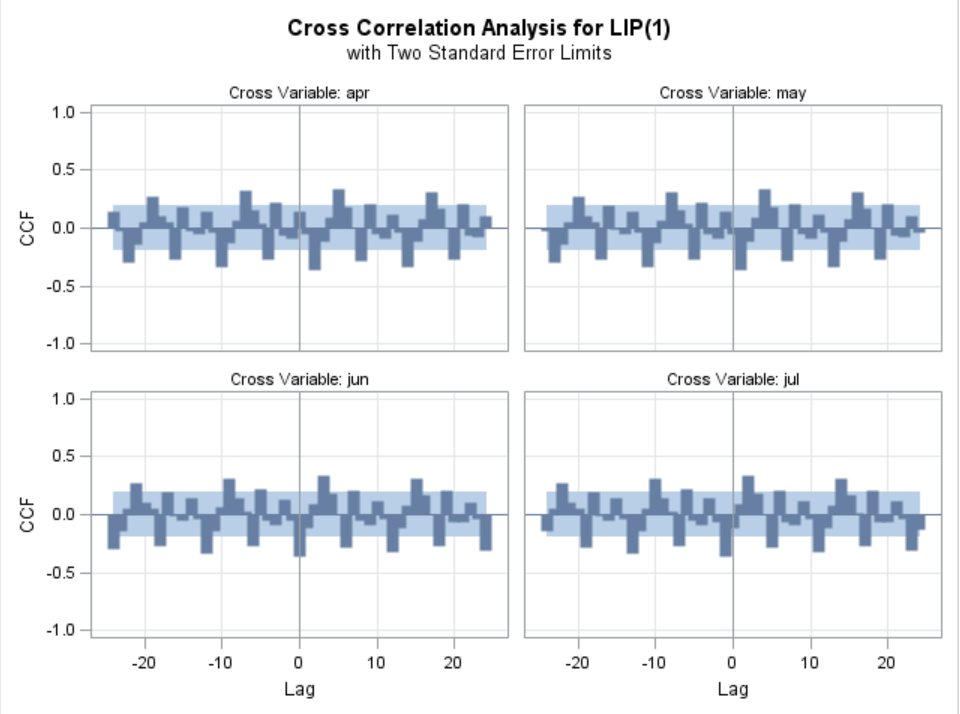
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for LIP(1)
with Two Standard Error Limits
Cross Variable: apr
Cross Variable: may
Cross Variable: jun
Cross Variable: jul
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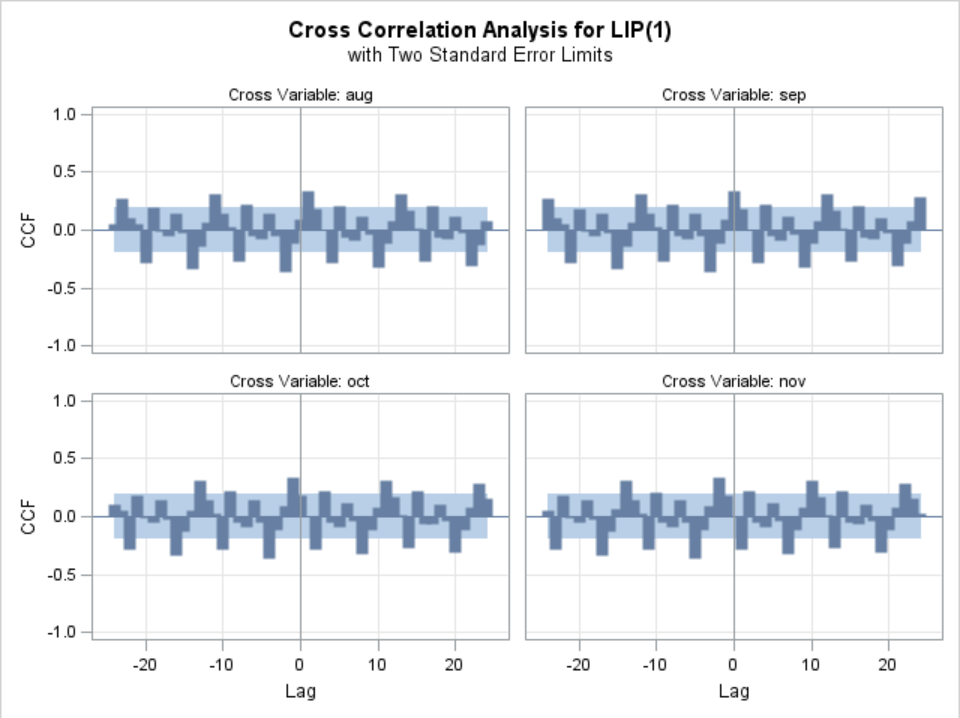
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for LIP(1)
with Two Standard Error Limits
Cross Variable: aug
Cross Variable: sep
Cross Variable: oct
Cross Variable: nov
CCF
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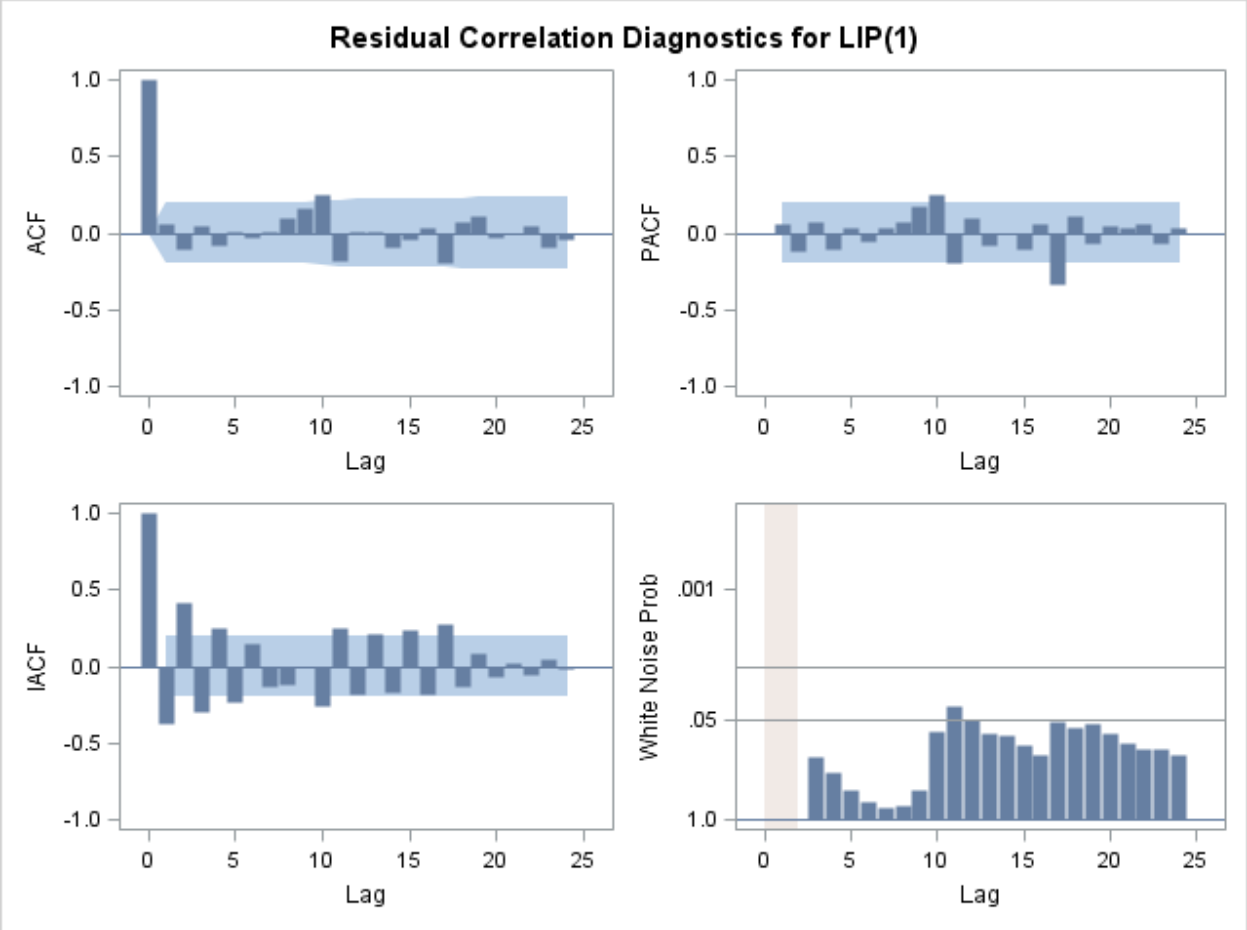
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Residual Correlation Diagnostics for LIP(1)
ACF
PACF
IACF
White Noise Prob
Lag
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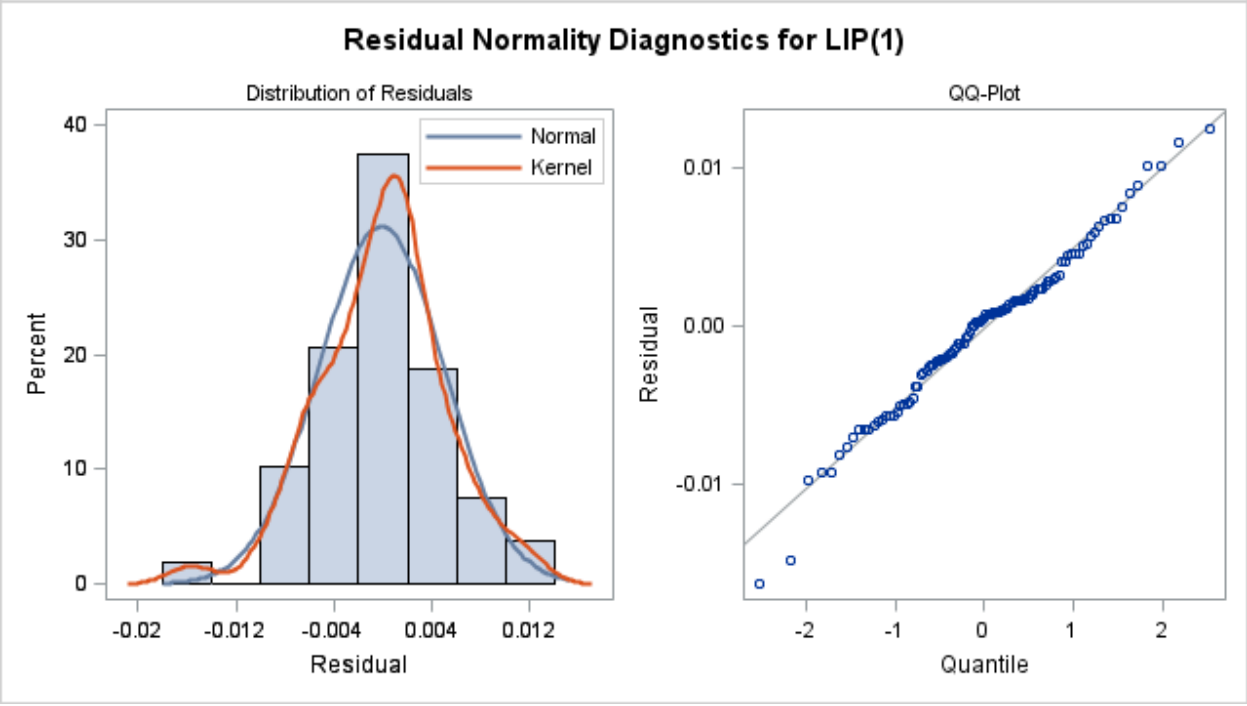
-1.0
0
5
10
15
20
25
.001
.05
1.0


Residual Normality Diagnostics for LIP(1)
Distribution of Residuals
Normal
Kernel
Percent
Residual
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30
20
10
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-0.012
-0.004
0.004
0.012
QQ-Plot
Residual
Quantile
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0.00
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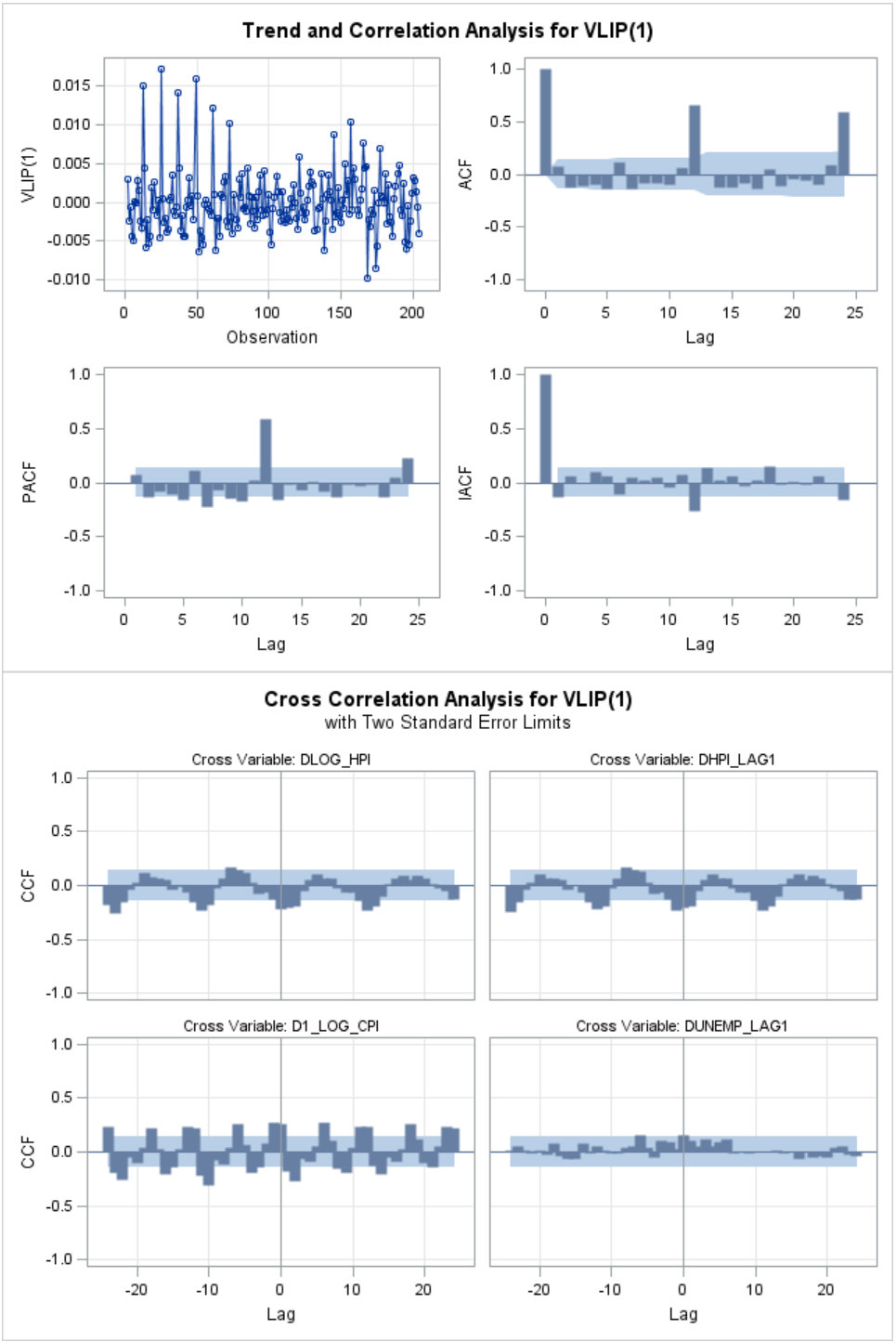
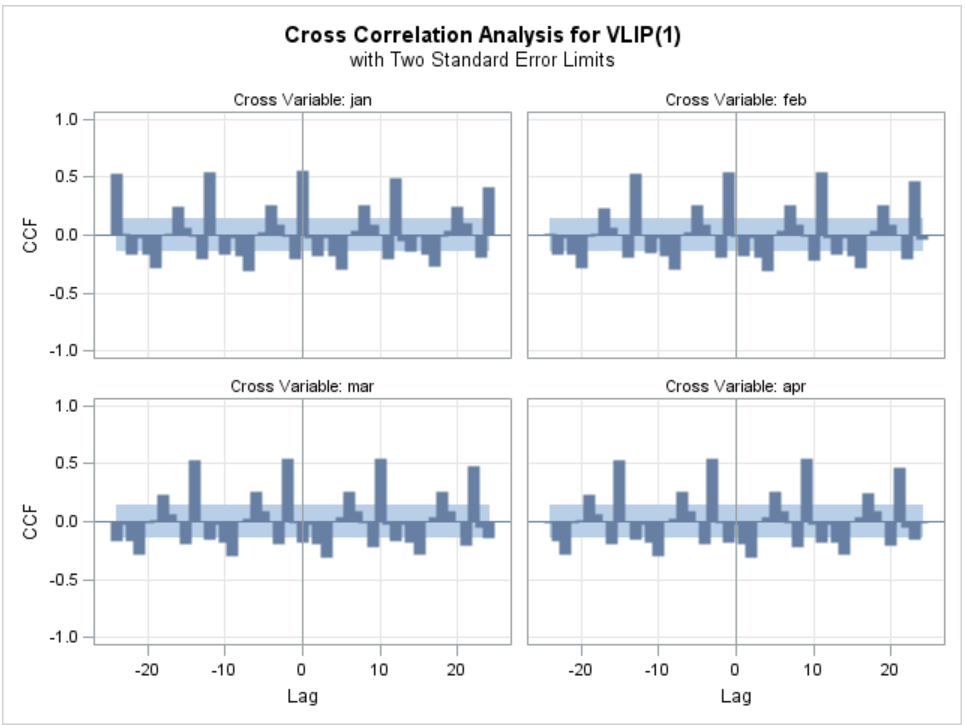
-2
-1
0
1
2

APPENDIX B

Very Low-Income Borrowers Home Purchase Goal




Cross Correlation Analysis for VLIP(1)
with Two Standard Error Limits
Cross Variable: jan
Cross Variable: feb
Cross Variable: mar
Cross Variable: apr
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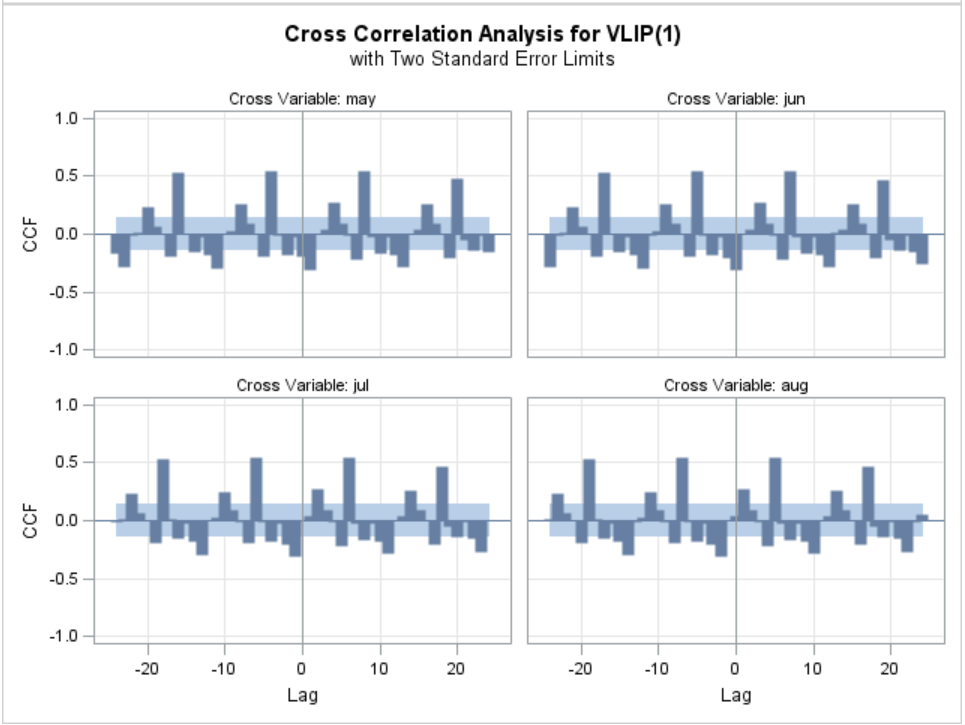
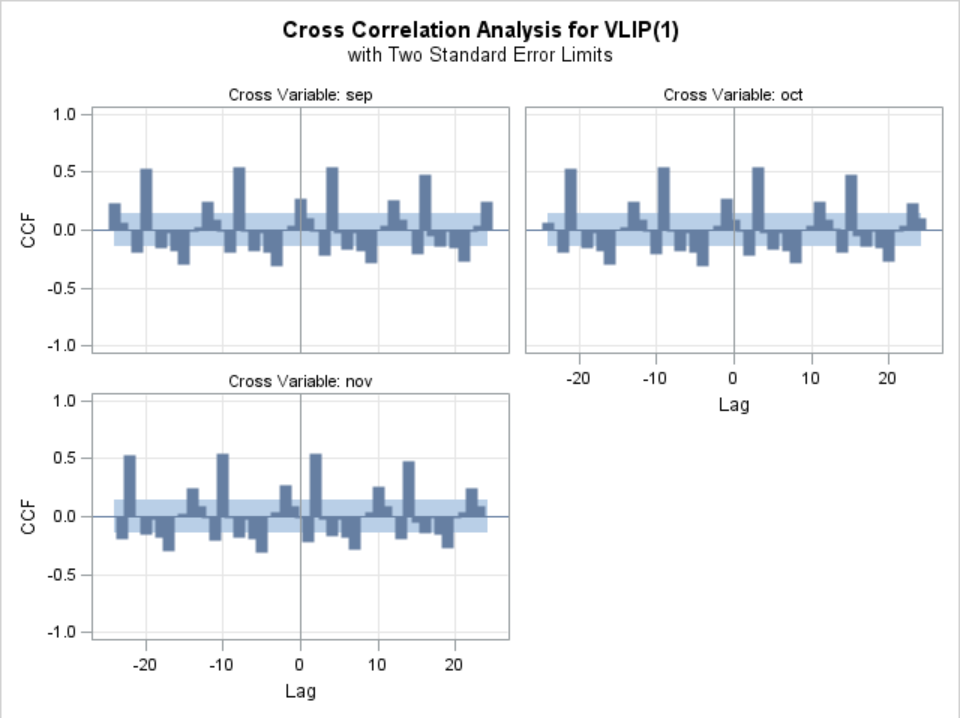
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for VLIP(1)
with Two Standard Error Limits
Cross Variable: may
Cross Variable: jun
Cross Variable: jul
Cross Variable: aug
CCF
1.0
0.5
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for VLIP(1)
with Two Standard Error Limits
Cross Variable: sep
Cross Variable: oct
Cross Variable: nov
CCF
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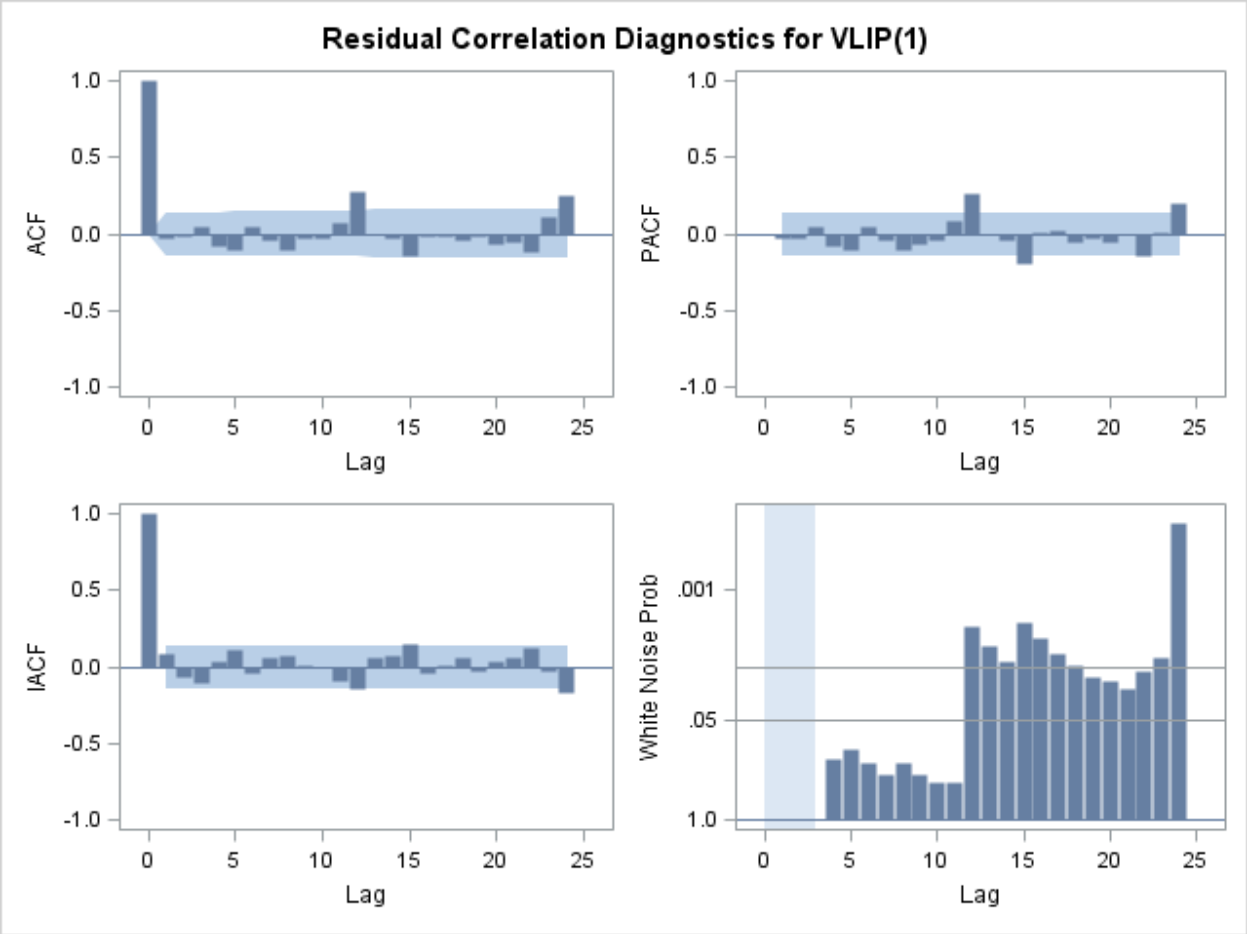
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Residual Correlation Diagnostics for VLIP(1)
ACF
PACF
IACF
White Noise Prob
Lag
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-1.0
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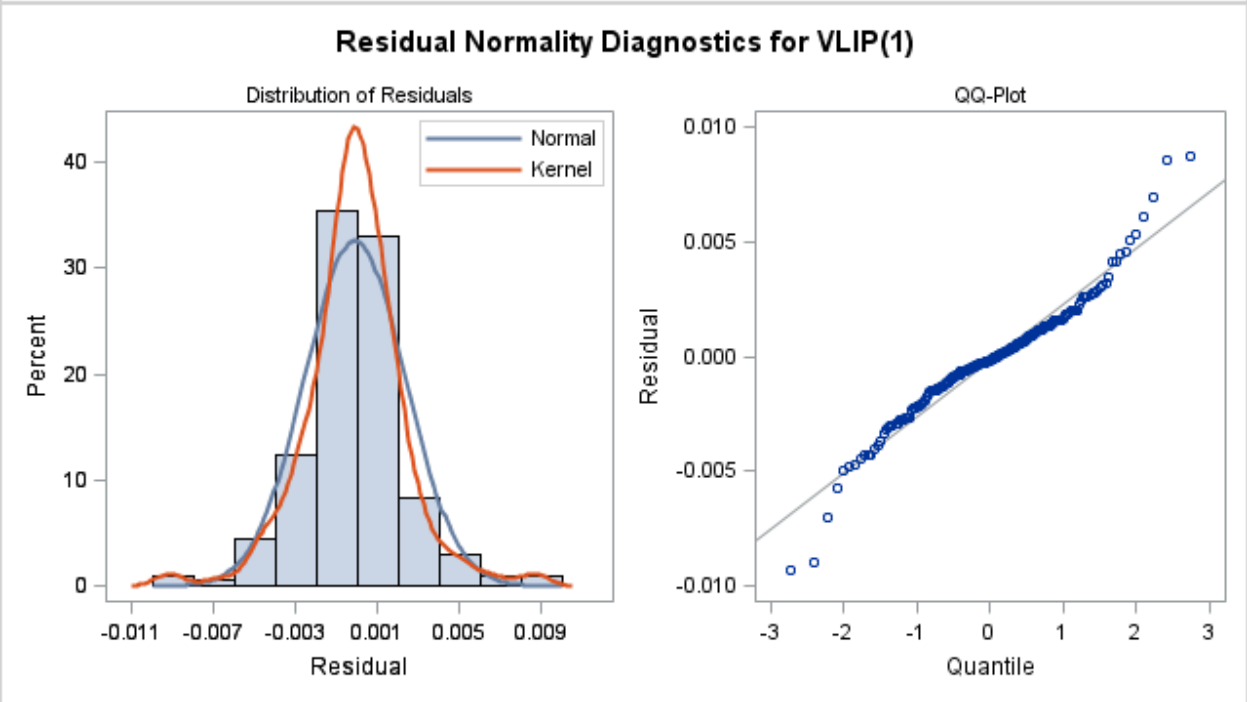
1.0


Residual Normality Diagnostics for VLIP(1)
Distribution of Residuals
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Kernel
Percent
Residual
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-0.007
-0.003
0.001
0.005
0.009
QQ-Plot
Residual
Quantile
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-2
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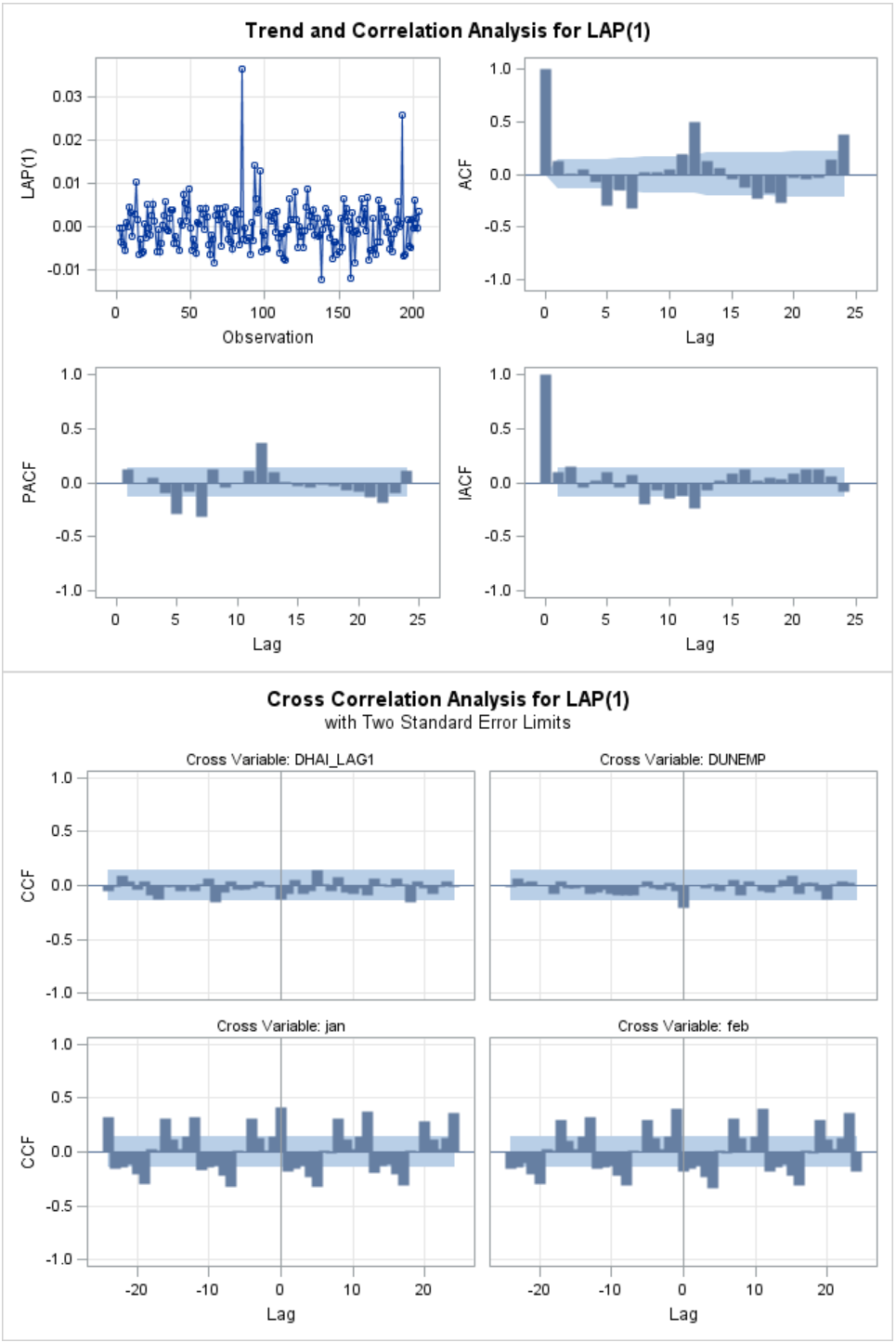
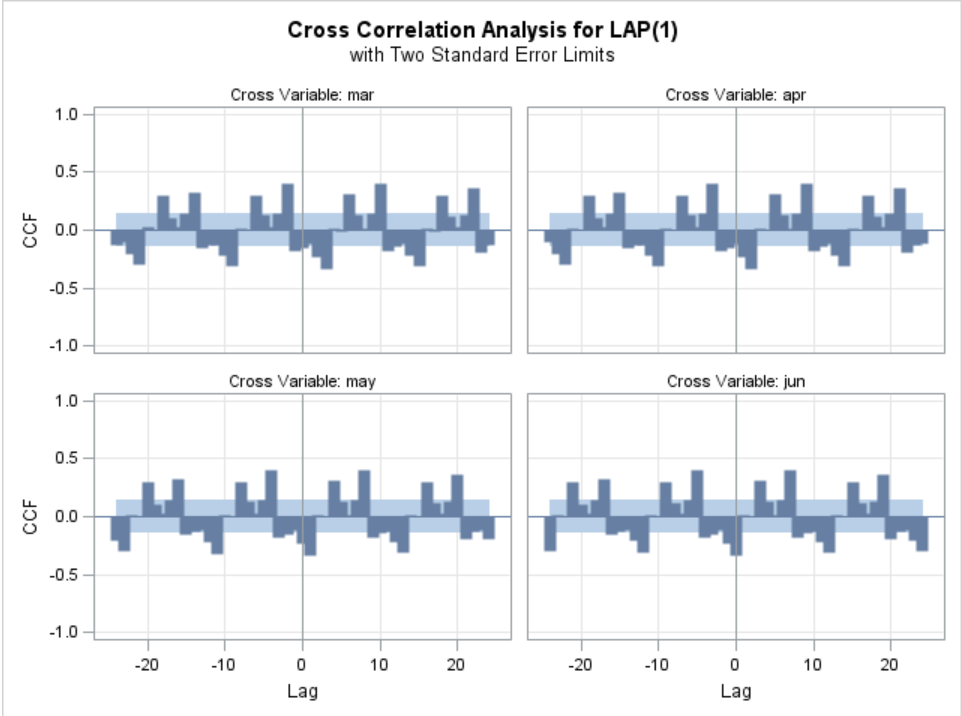
1
2
3

APPENDIX C

Low-Income Area Home Purchase Goal




Cross Correlation Analysis for LAP(1)
with Two Standard Error Limits
Cross Variable: mar
Cross Variable: apr
Cross Variable: may
Cross Variable: jun
CCF
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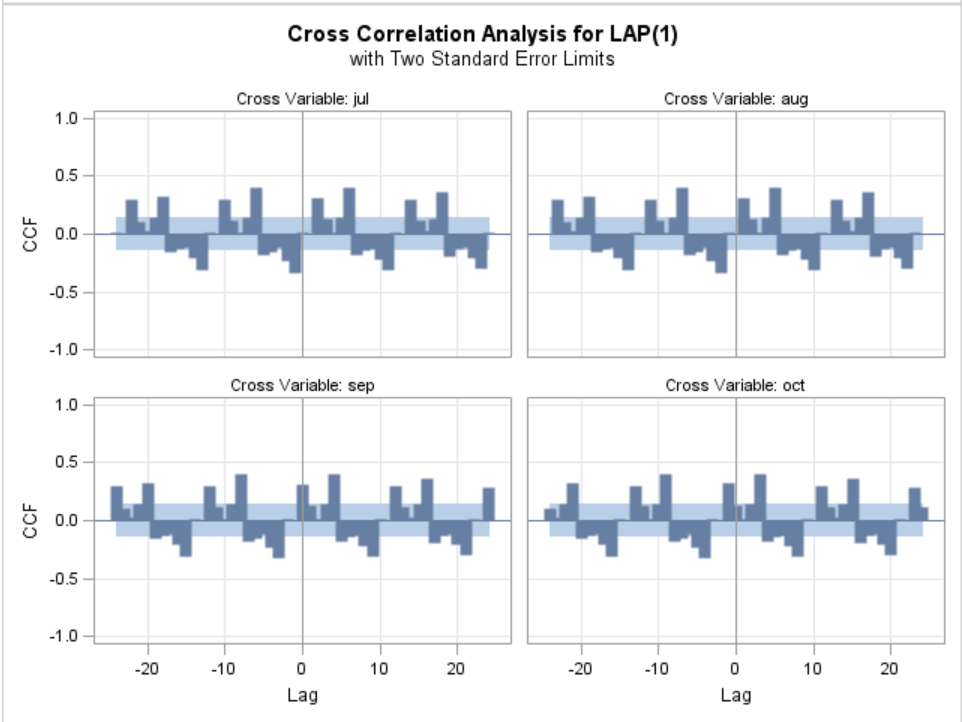
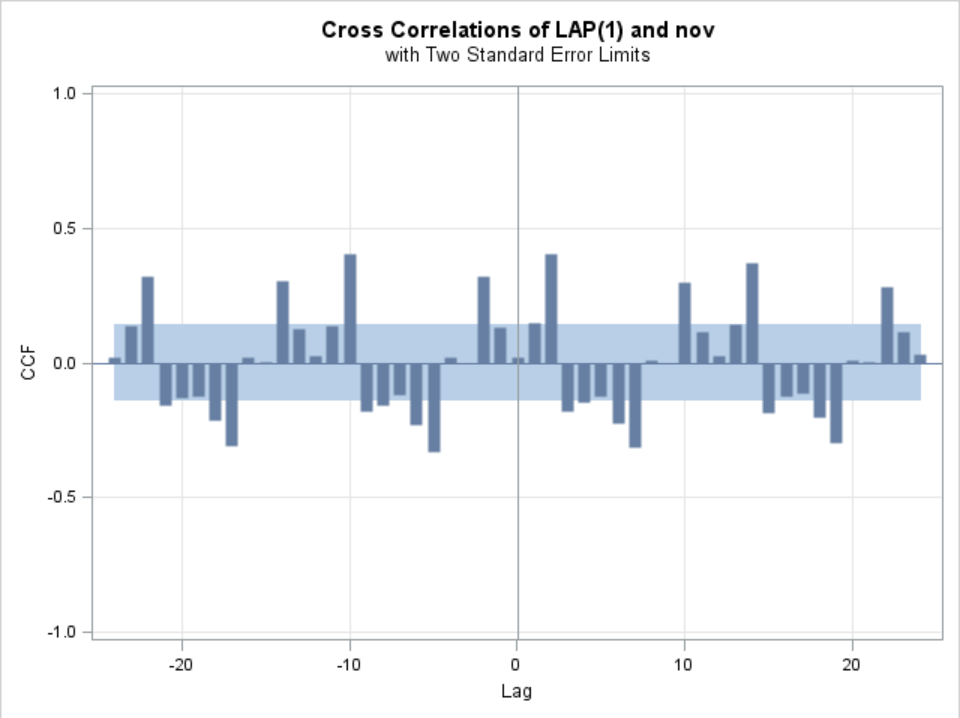
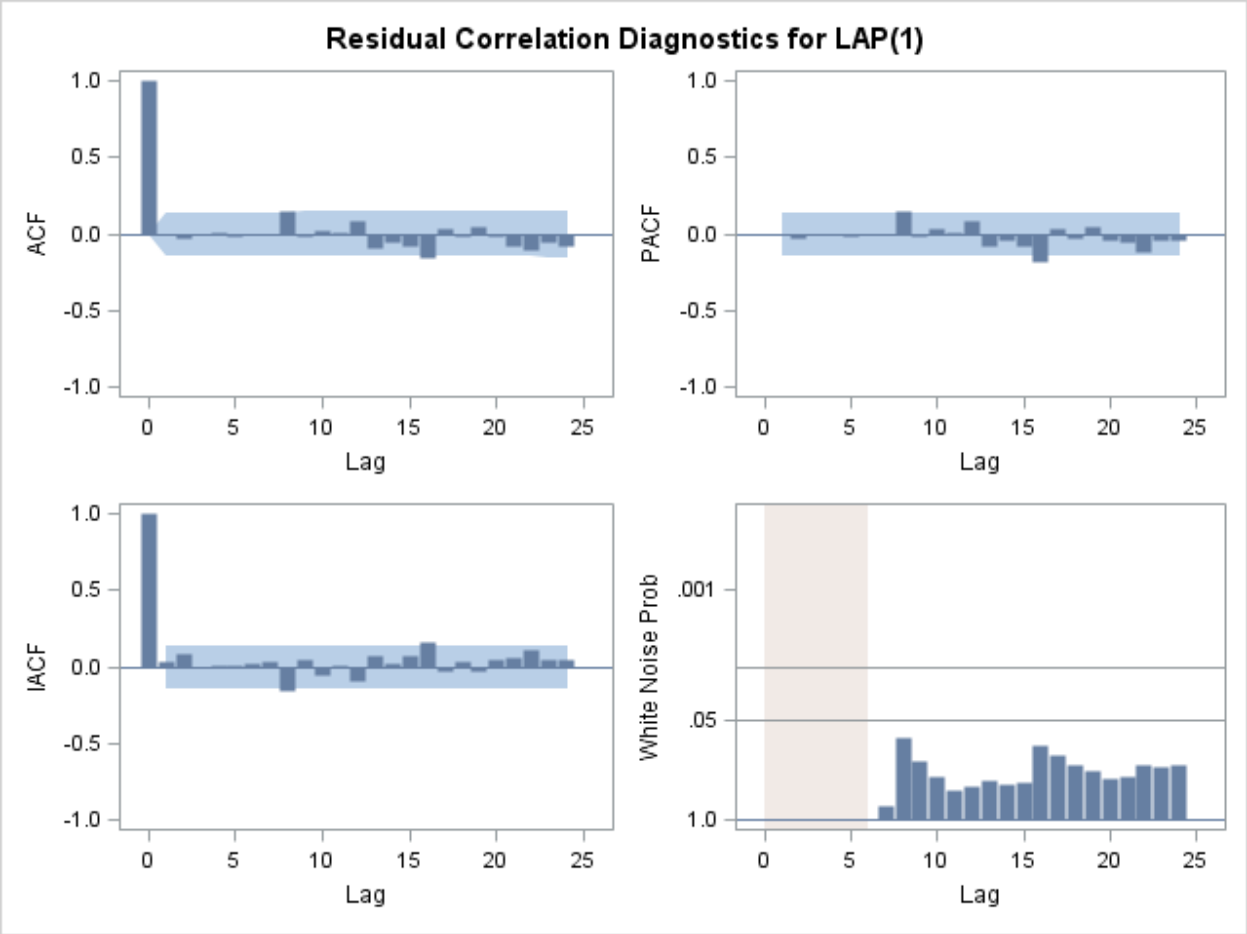
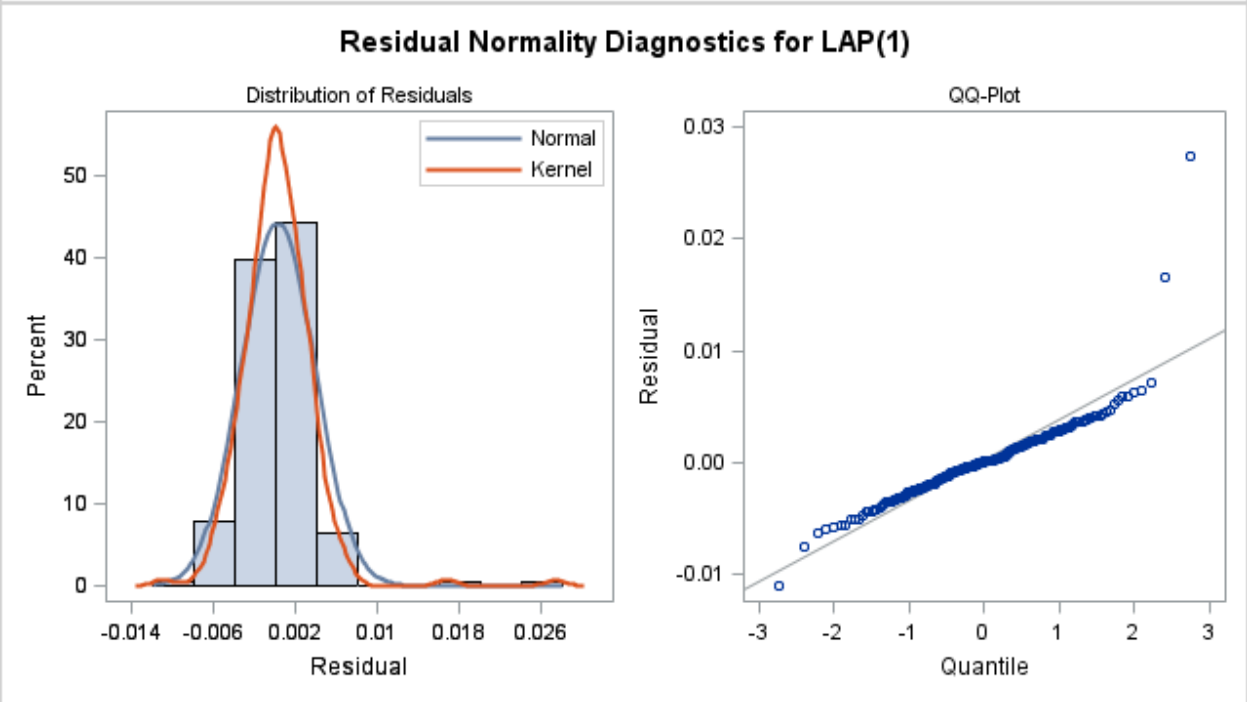
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for LAP(1)
with Two Standard Error Limits
Cross Variable: jul
Cross Variable: aug
Cross Variable: sep
Cross Variable: oct
CCF
1.0
0.5
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag

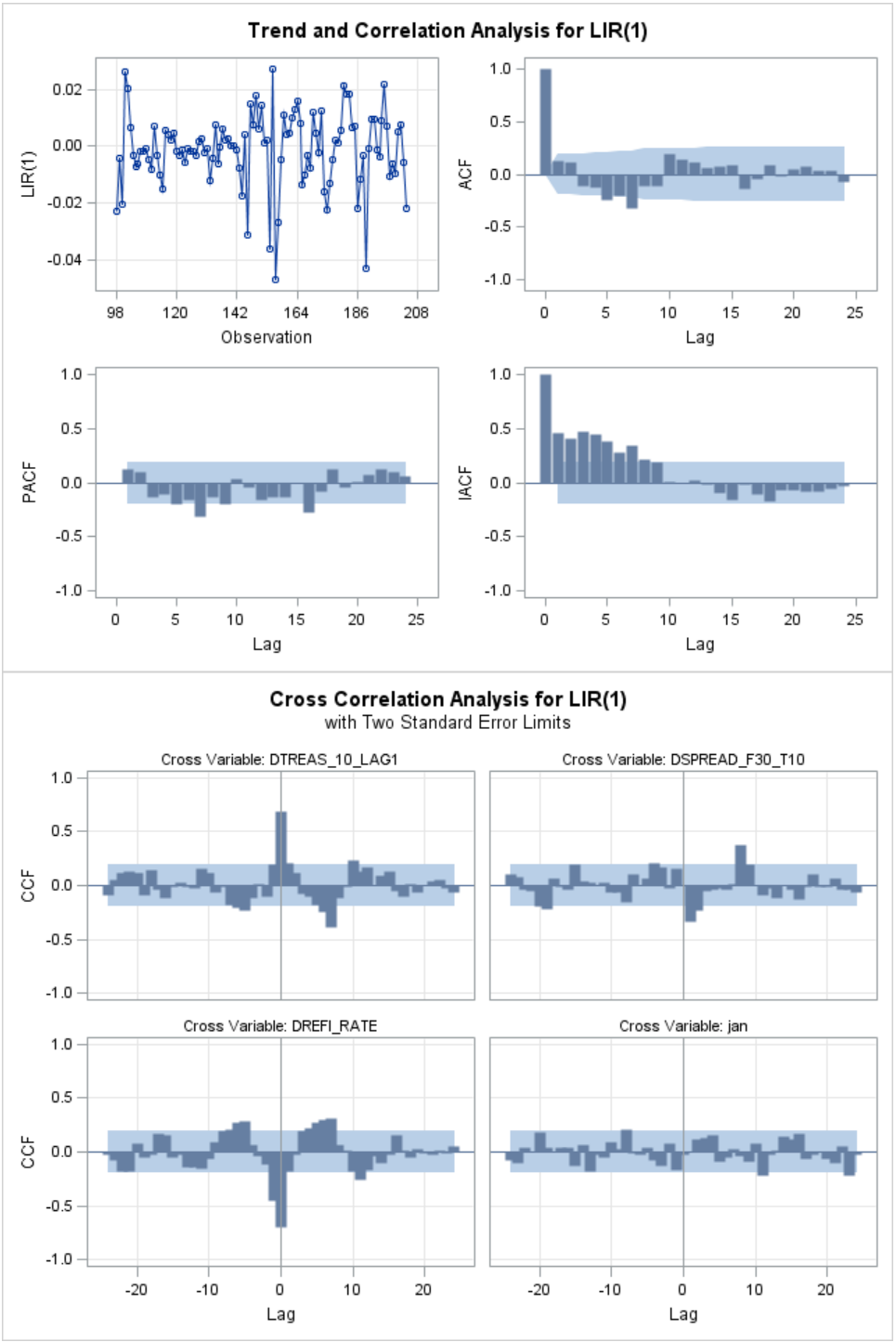

Cross Correlations of LAP(1) and nov
with Two Standard Error Limits
1.0
0.5
0.0
-0.5
-1.0
CCF
-20
-10
0
10
20
Lag

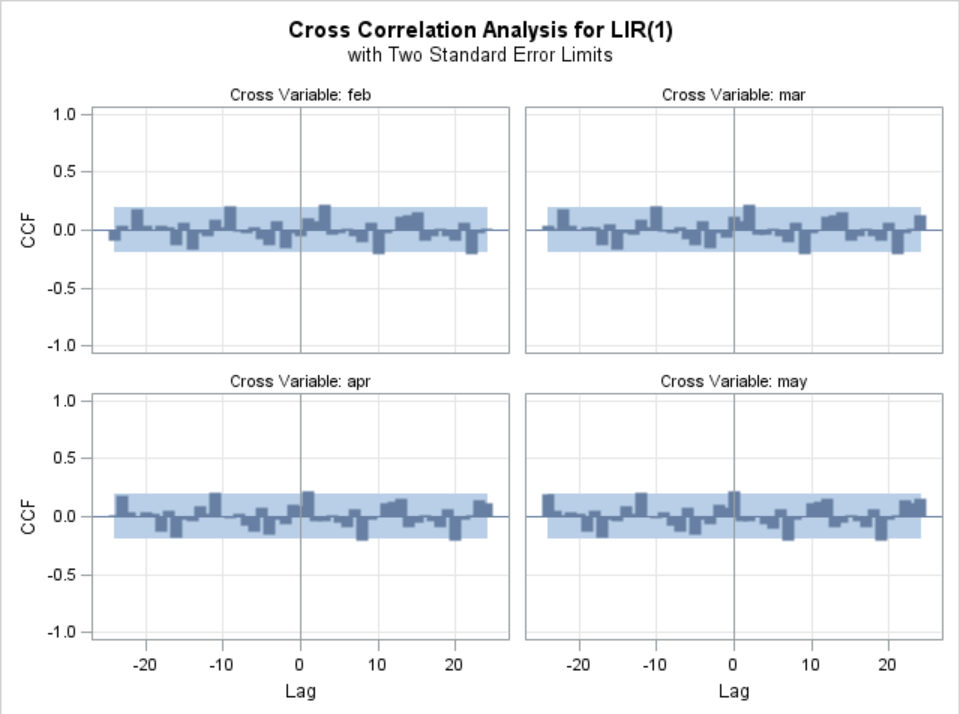

Residual Correlation Diagnostics for LAP(1)
ACF
PACF
IACF
White Noise Prob
Lag
1.0
0.5
0.0
-0.5
-1.0
0
5
10
15
20
25
.001
.05
1.0

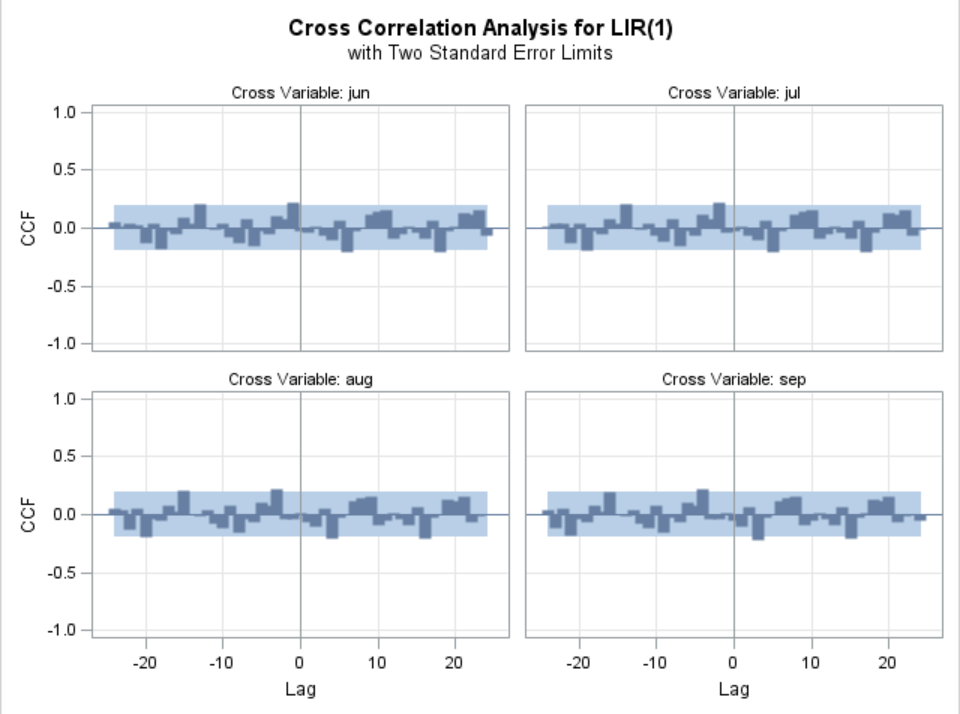

Residual Normality Diagnostics for LAP(1)
Distribution of Residuals
Normal
Kernel
Percent
Residual
50
40
30
20
10
0
-0.014
-0.006
0.002
0.01
0.018
0.026
QQ-Plot
Residual
Quantile
0.03
0.02
0.01
0.00
-0.01
-3
-2
-1
0
1
2
3

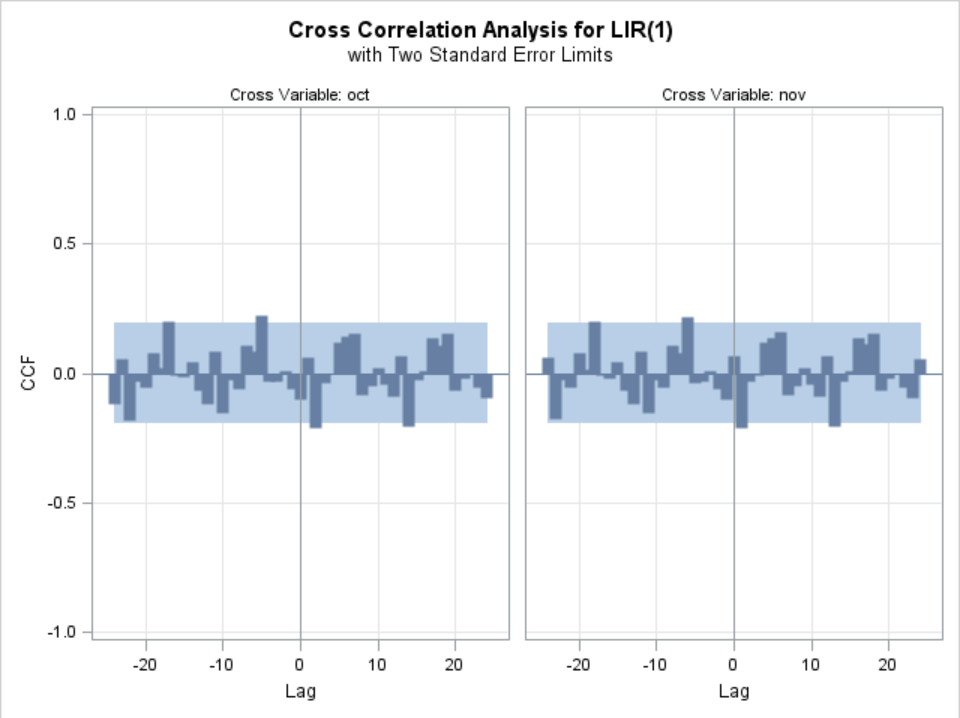
APPENDIX D

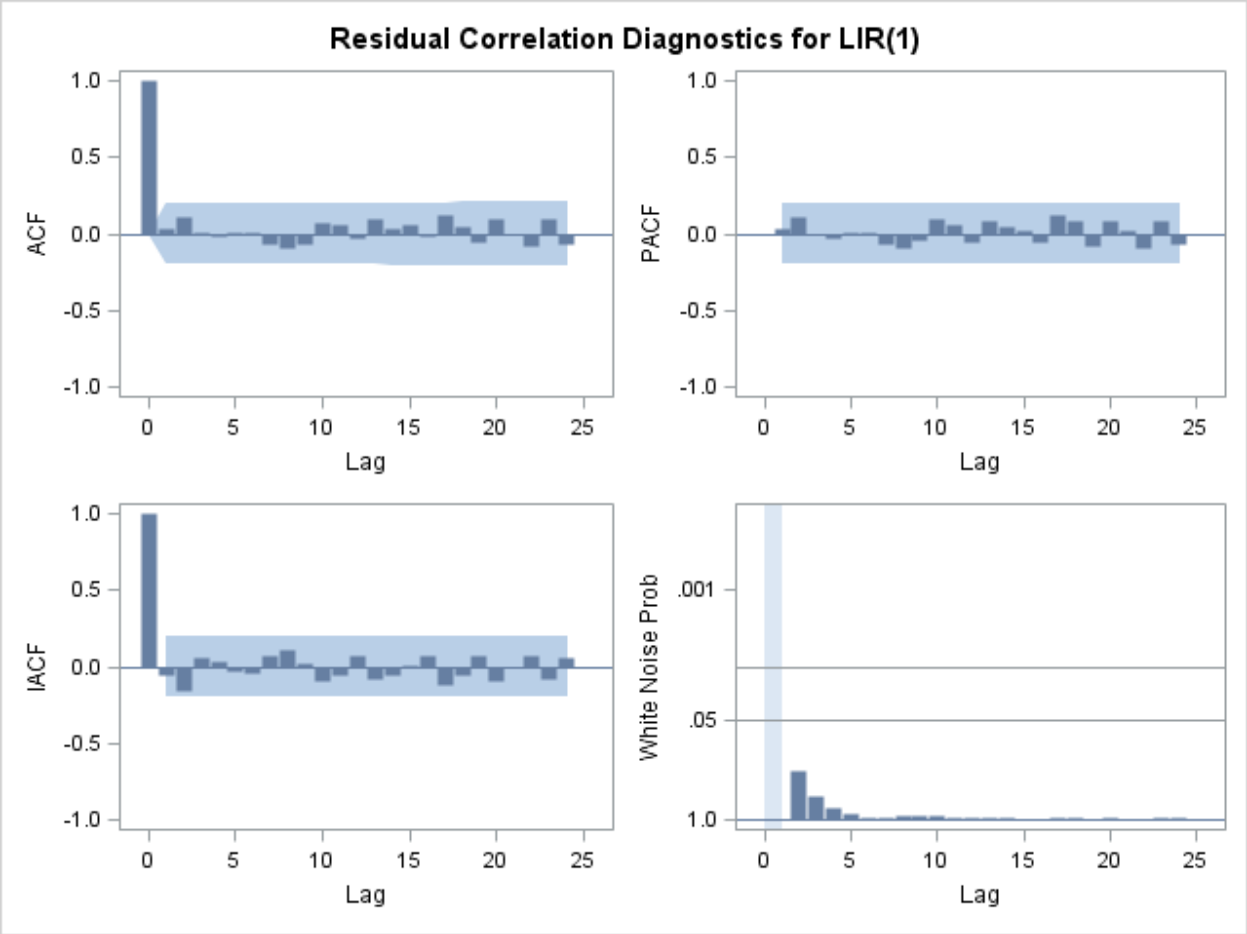
Low-Income Borrowers Refinance Goal

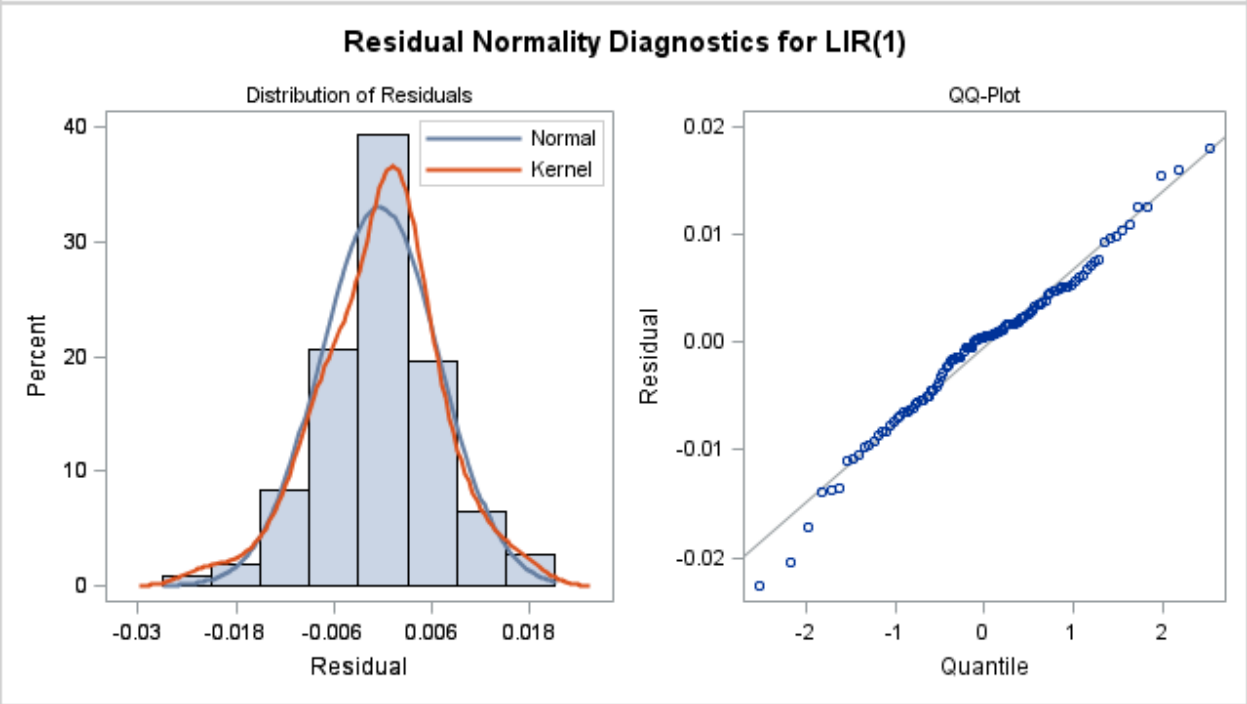



Cross Correlation Analysis for LIR(1)
with Two Standard Error Limits
Cross Variable: feb
Cross Variable: mar
Cross Variable: apr
Cross Variable: may
CCF
1.0
0.5
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for LIR(1)
with Two Standard Error Limits
Cross Variable: jun
Cross Variable: jul
Cross Variable: aug
Cross Variable: sep
CCF
1.0
0.5
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Cross Correlation Analysis for LIR(1)
with Two Standard Error Limits
Cross Variable: oct
Cross Variable: nov
CCF
1.0
0.5
0.0
-0.5
-1.0
-20
-10
0
10
20
Lag


Residual Correlation Diagnostics for LIR(1)
ACF
PACF
IACF
White Noise Prob
Lag
1.0
0.5
0.0
-0.5
-1.0
0
5
10
15
20
25
.001
.05
1.0


Residual Normality Diagnostics for LIR(1)
Distribution of Residuals
Normal
Kernel
Percent
Residual
40
30
20
10
0
-0.03
-0.018
-0.006
0.006
0.018
QQ-Plot
Residual
Quantile
0.02
0.01
0.00
-0.01
-0.02
-2
-1
0
1
2

APPENDIX E

Data Sources

Federal Financial Institutions Examination Council, Home Mortgage Disclosure Act Data

Low-Income Borrower Home Purchase Mortgage Share
Very Low-Income Borrower Home Purchase Mortgage Share
Low-Income Area Home Purchase Mortgage Share
Low-Income Borrower Refinance Mortgage Share
Refinance Mortgage Share, 1993 - 2012
FHA Home Purchase Mortgage Market Share, 1993 - 2012
Investor Share
http://www.ffiec.gov/hmda/default.htm

Federal Housing Finance Agency

House Price Index
http://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx

U.S Department of Commerce, Bureau of Economic Analysis

Gross Domestic Product
http://www.bea.gov/

U.S Department of Commerce, Census Bureau

Housing Starts
http://www.census.gov/construction/nrc/historical_data/

New Home Sales
Median and Sales Price of New One-Family Houses Sold
http://www.census.gov/construction/nrs/historical_data/

U.S Department of Labor, Bureau of Labor Statistics

Consumer Price Index
http://www.bls.gov/cpi/data.htm

Unemployment Rate
http://www.bls.gov/cps/

Federal Reserve Bank of St. Louis

Monthly average of the 10-Year Treasury Constant Maturity Rate
Monthly average of the 1-Year Treasury Constant Maturity Rate
http://research.stlouisfed.org/fred2/categories/115

Mortgage Bankers Association

Single-Family Originations
Refinance Mortgage Share, 2013 Q1 – 2013 Q4
Forecast
http://www.mortgagebankers.org/ResearchAndForecasts/ForecastsAndCommentary

Freddie Mac

Monthly average of the 30-Year Fixed Rate Mortgage Rate
http://www.freddiemac.com/pmms/release.html

Forecast
http://www.freddiemac.com/finance/ehforecast.html

Fannie Mae

Forecast
http://www.fanniemae.com/portal/research-and-analysis/emma.html

National Association of Realtors

Monthly Housing Affordability Index
http://www.realtor.org/topics/housing-affordability-index

Existing-Home Sales
Median Sales Price - Existing-Homes
http://www.realtor.org/topics/existing-home-sales

Forecast
http://www.realtor.org/research-and-statistics

Wells Fargo

Forecast
https://www.wellsfargo.com/com/insights/economics/monthly-outlook

PNC Financial

Forecast
https://www.pnc.com/webapp/unsec/NCAboutMicrositeNav.do?siteArea=/pnccorp/PNC/Home/About+PNC/Media+Room/Economic+Reports

National Association of Home Builders

Forecast
http://www.nahb.org/reference_list.aspx?sectionID=138

Standard and Poor's

Forecast
http://www.standardandpoors.com/home/en/us/

Wall Street Journal Survey

Forecast
http://online.wsj.com/public/resources/documents/info-flash08.html?project=EFORECAST07

The Conference Board

Forecast
http://www.conference-board.org/data/chiefeconomist.cfm

Federal Reserve Board of Governors, Federal Open Market Committee

Forecast
http://www.federalreserve.gov/monetarypolicy/fomccalendars.htm

Raymond James Financial

Forecast
http://raymondjames.com/monit2.htm

Federal Reserve Bank of Philadelphia

Community Outlook Survey
http://www.philadelphiafed.org/community-development/community-outlook-survey/

Forecast
http://www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/