Housing Prices at the Time of QEs in California: Effect of Mortgage Rates

Yalan Feng[1], Donald C. Keenan[2], Taewon Kim[1] & Daniel C. Lee[1]

[1] College of Business and Economics, California State University Los Angeles, Los Angeles, USA

[2] Universite de Cergy Pontoise, Cergy-Pontoise cedex, France

Correspondence: Yalan Feng, Department of Finance and Law, CBE, Simpson Tower, California State University Los Angeles, Los Angeles, CA 90032, USA. Tel: 1-323-343-2863.

Received: January 23, 2017 Accepted: February 13, 2017 Online Published: February 28, 2017

doi:10.5430/ijfr.v8n2p1 URL: http://dx.doi.org/10.5430/ijfr.v8n2p1

Abstract

In this paper we look at the impact of mortgage rates on California's housing prices during the Great Recession when the quantitative easing (QE) programs were implemented. We find that the relationship between mortgage rates and housing prices is not strong and it becomes weaker, the closer the period gets to the Great Recession. Our analysis confirms some of the existing literature on the relationship between interest rates and housing prices; that in the boom-bust housing market cycles, interest rates do not play a major role one would expect in determining the demand for housing. Our analysis shows that, even as interest rates were high in the run up to the housing market peak in 2007, housing prices kept going up; and that after the bubble burst, even as rates were kept low, housing prices did not start recovering until 2011.

Keywords: mortgage rate, economic recession, housing boom, housing recession, quantitative easing

1. Introduction

Following the global financial crisis of 2007-08, the Federal Reserve implemented "Quantitative Easing", an unconventional monetary policy, in order to lower interest rates and increase the money supply. It's not surprising that a direct impact on the housing market is the lowering of mortgage rates. An interesting questions is whether such low rates would have helped drive up the real estate market, which suffered substantial loss during the crisis. In this paper, we try to explore the relationship between mortgages rates and housing prices by looking at housing prices in California from 1998 to 2014, a period that covers a long housing boom, the Great Recession and the start of rising house prices from 2011 on in California

A first look at the time series of California state level housing price (Figure 1) and the 30 year fixed mortgage rates (Figure 2) reveals no clear relationship between the two. During the period, mortgage rates exhibit a downward trend overall while housing price exhibit an obvious cycle with a peak and a trough.

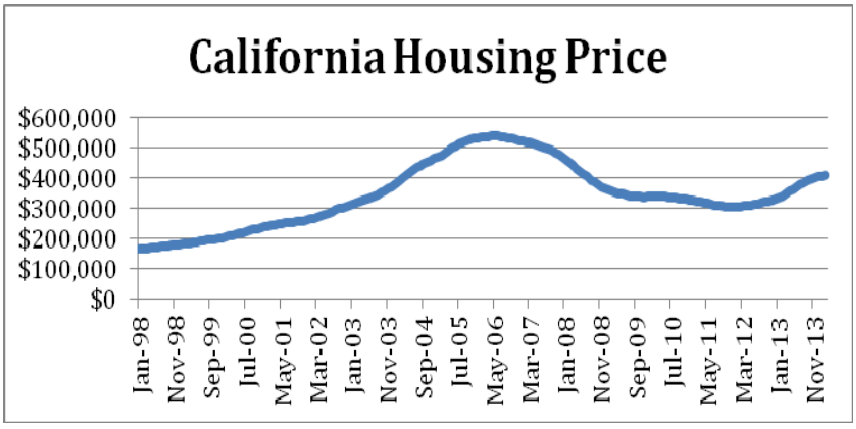

Figure 1. Time series of California hosing price 1998-2014

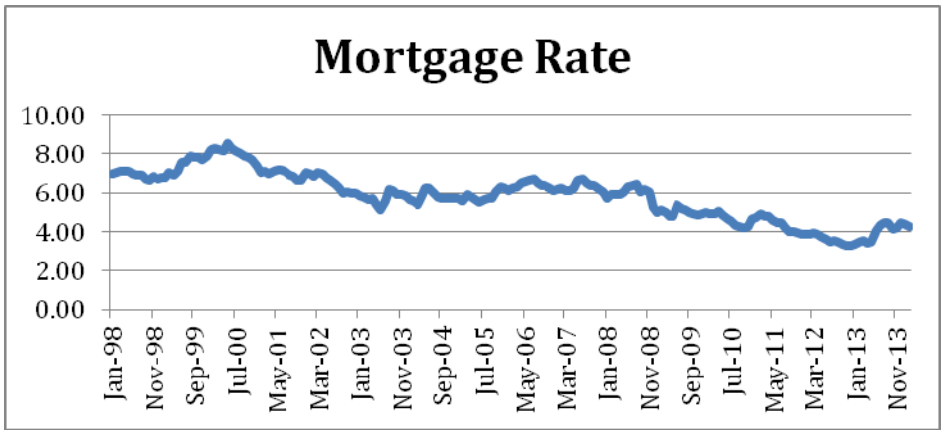

Figure 2. Time series of mortgage rates 1998-2014

Through further econometric analysis, we find that the relationship between mortgage rates and housing prices is not strong and it becomes weaker, the closer the period gets to the Great Recession. Our analysis confirms existing literature; that in the boom-bust housing market cycles, it is the expectations of future property appreciation that play a major role, rather than interest rates, in determining demand for housing. Our findings here would be useful for those working in real estate research, as well as for policy makers interested in estimating the impact of their interest rate intervention on the rest of the economy including the real estate market. We picked 1998 as the starting date of our work, which is one year preceding the long real estate boom of 1999 – 2006.

In the following sections, we present our methodology, empirical analysis and results, and conclusion.

2. Method

We estimate housing prices (dependent variable) using two panel regression models with mortgage rate as the independent variable together with other control variables.

The local unemployment rate, the traditionally important housing-value determinant (Kim, Lee and Tran, 2014, Kau, Keenan and Kim 1993 & 1994) is an independent variable common to both models. We also employ lagged housing price variables since housing price changes have a strong serial correlation as noted by, among others, Titman, Wang and Yang (2013). Capozza, Hendershott and Mack (2004) present similar serial correlation in housing price changes for metropolitan areas, as do Case and Shiller (1989). In order to isolate this persistent serial correlation problem, we include lagged housing prices up to four months. Note that Miller, Sklarz and Thibodeau (2005) employ the lagged values up to five months in their study of the impact of mortgage rates and employment rates on metropolitan housing prices. Likewise, we include monthly lagged mortgage rates and lagged unemployment rates, again in order to correct for serial correlation.

The first model regresses the natural logarithm of housing prices on the natural logarithm of mortgage rates:

$$LHP_{it} = \beta_0 + \beta_1 \times LMR_t + \beta_2 \times LMR_t(-1) + \beta_3 \times LMR_t(-2) + \beta_4 \times LUNR_t + \beta_5 \times LUNR_t(-1) + \beta_6 \times ERecess + \beta_7 \times HRecess + \beta_8 \times LHP_{it}(-1) + \beta_9 \times LHP_{it}(-2) + \beta_{10} \times LHP_{it}(-3) + \beta_{11} \times LHP_{it}(-4) + u_i + \varepsilon_{it} \quad (1)$$

Where,

LHP_{it}= the natural logarithm of housing price for the i^{th} city at time t,

LMR_t = the natural logarithm of mortgage rate at time t. This data is not available for individual cities over time,

$LUNR_t$ = the natural logarithm of the unemployment rate at time t.

ERecess = 1, recession period as defined by the National Bureau of Economic Research (NBER), i.e. for period from March 2001 to November 2001 (denoted as Recess 1 in Figure 2B), and for period from December 2007 to June 2009 (denoted as Recess 2 in Figure 2B), and 0 otherwise,

HRecess = 1, March 2006 to Jan 2012 (Period in which housing prices were falling), and 0 otherwise (Period in which housing prices were rising from February 1996 to February 2006 and February 2012 to February 2014).

Here u_i represents between-city errors created by all other unobserved time-invariant variables that influence the

dependent variable. The term ε_{it} is the random disturbance for the i^{th} city at t^{th} period with E $[\varepsilon_{it}] = 0$. It is assumed that ε_{it} is uncorrelated with other independent variables and u_i such that $COV(\varepsilon_{it}, \varepsilon_{is}) = 0$ for $t \neq s$.

ERecess, the general economic recession period dummy variable, and *HRecess,* the housing recession period dummy variable help isolate the impact of mortgage rate from the impact of economic and housing cycle variables on housing values. Note that during the period covered in this paper, the real estate downturns in California occurred at different times from the two general economic recessions as determined by National Bureau of Economic Research (the period when the GDP growth was negative).

To summarize, in model 1, the independent variables are the mortgage rate and its monthly lags, the unemployment rate and its lags, and the recession dummy variables, *ERecess* and *HRecess.*

Model 2 is similar to model 1. We apply first differences of the natural logs of hosing price, mortgage rate, and unemployment variables. The rest of the independent variables are identical in both models, so as to isolate the impact of the mortgage rates on housing values, without any other changes.

$$DLHP_{it} = \beta_0 + \beta_1 \times DLMR_t + \beta_2 \times DLMR_t(-1) + \beta_3 \times DLMR_t(-2) + \beta_4 \times DLUNR_t + \beta_5 \times DLUNR_t(-1) + \beta_6 \times ERecess + \beta_7 \times HRecess + \beta_8 \times DLHP_{it}(-1) + \beta_9 \times DLHP_{it}(-2) + \beta_{10} \times DLHP_{it}(-3) + \beta_{11} \times DLHP_{it}(-4) + u_i + \varepsilon_{it} \quad (2)$$

Our sample comprises sixty-one cities in California with the population of over 100,000 as of 2005. The data come from Zillow.com/data and they are the cities of Anaheim, Antioch, Bakersfield, Berkeley, Burbank, Chula Vista, Concord, Corona, Costa Mesa, Daly City, Downey, El Monte, Escondido, Fairfield, Fontana, Fremont, Fresno, Fullerton, Garden Grove, Glendale, Hayward, Huntington Beach, Inglewood, Irvine, Lancaster, Long Beach, Los Angeles, Modesto, Moreno Valley, Norwalk, Oakland, Oceanside, Ontario, Orange, Oxnard, Palmdale, Pasadena, Pomona, Rancho Cucamonga, Richmond, Riverside, Roseville, Sacramento, Salinas, San Bernardino, San Diego, San Francisco, San Jose, Ventura, Santa Ana, Santa Clara, Santa Clarita, Santa Rosa, Simi Valley, Stockton, Sunnyvale, Thousand Oaks, Torrance, Vallejo, Visalia and West Covina. One other city, Elk Grove, meets the population requirement but lacks pricing data.

Mortgage rate data are from the Saint Louis Federal Reserve Data Center for 30-year, fixed-rate mortgages.

3. Empirical Analysis and Results

The results of the research are summarized in Table 1 for Model 1 and in Table 2 for Model 2 below. We employed staggered data sets starting with 1998-2014, followed by 1999-2014, 2000-2014 and so on, with 2007-2014 being the last set. As the results show below, there is no negative relationship one might expect to see between mortgage rates and the housing price.

This seemingly counter intuitive result is, in fact, quite well documented in the literature. Gelain, Lansing and Natvik (2015), in their study of the U.S. housing boom and bust cycles between 1995 and 2012, find that relaxing loan to equity ratios on the part of the mortgage lenders and the ensuing credit boom were more important in explaining housing booms than lower mortgage interest rates. In his study of the monetary policy and housing, Taylor (2007) presents that low money market rates led to housing booms both before and after the 1980s; and that the housing booms continued even when low money market rates were returned to the normal higher levels, as long as the long-term rates remained relatively low providing and ensuring abundant credit. In fact, both of these papers indicate that the biggest factor running up to housing booms was the belief on the part of the homebuyers that the housing price will keep appreciating; this in turn brought in many new, first time homebuyers as well as investors-speculators alike.

Our research confirms this existing literature. Table 1 and Figure 3 show no negative relationship between the log of mortgage rates *LMR* and the log of housing price *LHP*. The *LMR* coefficients clearly indicate that even as mortgage rates went up, housing prices went up, though at a decreasing rate, until we reach the period 2000-2014, where, as the mortgage rates went up, the housing price went up at a faster rate reflecting the housing market bubble. That trend continues without interruption until 2007-2014. In other words, throughout our research period, through the housing booms, the economic recession and housing recession, higher mortgage rates did not negatively impact housing prices. However, the negative correlation coefficients apply to the economic and the housing recession dummy variables *Erecess* and *Hrecess* and are both statistically significant throughout.

Table 1. Panel Regression on the natural logarithm of housing prices with the natural logarithm of mortgage rates

Model 1 (Mortgage rates vs Housing prices)

Dependent Variable: LHP

Variable	1998-2014.2	1999-2014.2	2000-2014.2	2001-2014.2	2002-2014.2	2003-2014.2	2004-2014.2	2005-2014.2	2006-2014.2	2007-2014.2
LMR	0.033 ***	0.032 ***	0.038 ***	0.045 ***	0.055 ***	0.057 ***	0.066 ***	0.064 ***	0.068 ***	0.074 ***
LMR(-1)	-0.020	-0.022	-0.024 *	-0.026 *	-0.047 ***	-0.039 **	-0.035 **	-0.040 **	-0.035 *	-0.035
LMR(-2)	-0.023 ***	-0.022 **	-0.030 ***	-0.031 ***	-0.019 *	-0.024 **	-0.027 **	-0.027 **	-0.042 ***	-0.039 ***
LUNR	-0.015 ***	-0.020 ***	-0.030 ***	-0.029 ***	-0.027 ***	-0.025 ***	-0.026 ***	-0.028 ***	-0.030 ***	-0.031 ***
LUNR(-1)	0.010 **	0.012 ***	0.015 ***	0.012 **	0.008	0.005	0.006	0.005	0.002	-0.003
ERecess	-0.012 ***	-0.012 ***	-0.014 ***	-0.016 ***	-0.019 ***	-0.020 ***	-0.020 ***	-0.020 ***	-0.020 ***	-0.019 ***
HRecess	-0.018 ***	-0.018 ***	-0.015 ***	-0.015 ***	-0.014 ***	-0.015 ***	-0.017 ***	-0.015 ***	-0.012 ***	-0.014 ***
LHP(-1)	1.059 ***	1.051 ***	1.037 ***	1.028 ***	1.019 ***	1.007 ***	1.001 ***	0.991 ***	0.969 ***	0.949 ***
LHP(-2)	-0.163 ***	-0.162 ***	-0.159 ***	-0.153 ***	-0.150 ***	-0.142 ***	-0.140 ***	-0.139 ***	-0.131 ***	-0.128 ***
LHP(-3)	-0.012	-0.007	-0.007	-0.013	-0.016	-0.019	-0.023	-0.024	-0.028	-0.028
LHP(-4)	0.114 ***	0.111 ***	0.113 ***	0.117 ***	0.122 ***	0.124 ***	0.125 ***	0.135 ***	0.144 ***	0.139 ***
Constant	0.072 ***	0.129 ***	0.263 ***	0.339 ***	0.372 ***	0.450 ***	0.534 ***	0.541 ***	0.670 ***	0.949 ***
# obs.	11834	11102	10370	9638	8906	8174	7442	6710	5978	5246

Values in parentheses are t-statistic. Significance at 10%, 5%, and 1% levels are reported by *, **, and *** respectively.

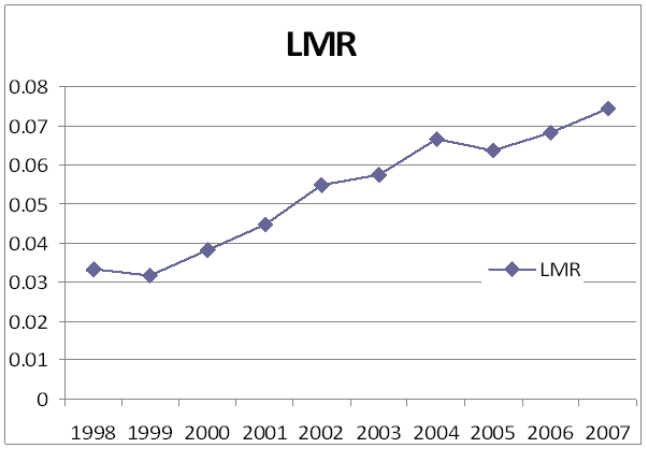

Figure 3. The coefficients for Log MR (β_1) with staggered data sets

We run the same regressions using the first difference of the log of variables to look at the marginal impact of these rates on housing as shown in model 2. The results (shown in Table 2 and Figure 4) do not show any different conclusions from what we have found in model 1.

Table 2. Panel Regression on the first difference of natural logarithm of housing prices with the first difference of natural logarithm of mortgage rates as an independent variable

Model 2 (Mortgage rates vs Housing prices)

Dependent Variable: DLHP

Variable	1998-2014.2	1999-2014.2	2000-2014.2	2001-2014.2	2002-2014.2	2003-2014.2	2004-2014.2	2005-2014.2	2006-2014.2	2007-2014.2
LMR	0.041 ***	0.040 ***	0.045 ***	0.047 ***	0.055 ***	0.058 ***	0.062 ***	0.065 ***	0.075 ***	0.074 ***
LMR(-1)	0.020 **	0.018 *	0.017 *	0.015	0.008	0.015	0.023 **	0.021 *	0.028 **	0.024
LMR(-2)	-0.007	-0.013	-0.003	-0.007	-0.007	-0.005	-0.002	-0.006	0.003	0.003
LUNR	-0.013 ***	-0.016 ***	-0.019 ***	-0.016 ***	-0.015 **	-0.014 **	-0.015 **	-0.017 **	-0.019 **	-0.016
LUNR(-1)	-0.010 **	-0.009 **	-0.009 *	-0.014 **	-0.010	-0.010	-0.012 *	-0.015 *	-0.014 *	-0.020 **
ERecess	-0.012 ***	-0.013 ***	-0.013 ***	-0.013 ***	-0.020 ***	-0.021 ***	-0.021 ***	-0.021 ***	-0.022 ***	-0.021 ***
HRecess	-0.020 ***	-0.021 ***	-0.022 ***	-0.022 ***	-0.020 ***	-0.020 ***	-0.020 ***	-0.019 ***	-0.018 ***	-0.019 ***
LHP(-1)	0.060 ***	0.054 ***	0.048 ***	0.045 ***	0.033 ***	0.023 **	0.022 *	0.007	-0.009	-0.016
LHP(-2)	-0.103 ***	-0.107 ***	-0.112 ***	-0.108 ***	-0.118 ***	-0.119 ***	-0.119 ***	-0.130 ***	-0.140 ***	-0.143 ***
LHP(-3)	-0.115 ***	-0.115 ***	-0.117 ***	-0.119 ***	-0.131 ***	-0.134 ***	-0.138 ***	-0.150 ***	-0.160 ***	-0.162 ***
LHP(-4)	0.001	0.003	-0.005	-0.005	-0.017	-0.019 *	-0.019	-0.028 **	-0.039 ***	-0.044 ***
Constant	0.014 ***	0.015 ***	0.017 ***	0.017 ***	0.017 ***	0.017 ***	0.062 ***	0.015 ***	0.014 ***	0.015 ***
# obs.	11834	11102	10370	9638	8906	8174	7442	6710	5978	5246

Values in parentheses are t-statistic. Significance at 10%, 5%, and 1% levels are reported by *, **, and *** respectively.

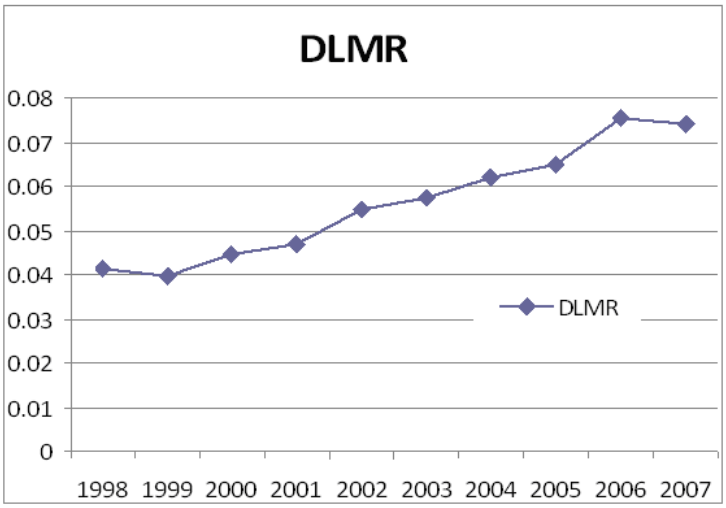

Figure 4. The coefficients for the first difference of Log MR (β_1) with staggered data sets

4. Conclusion

In this paper, we show that during our research period of 1998-2014, lower mortgage rates did not result in higher housing prices, and that higher mortgage rates did not result in a slowdown of housing price appreciation. Instead, and possibly contrary to the conventional wisdom, the rate of housing appreciation went up further in the run-up to the crash of 2006, even as mortgage rates went up. Our empirical analysis differs from existing research in that we study the role of mortgage rates during QE period using data of housing prices in sixty cities in California not the aggregate national housing prices.

The result confirms existing literature: in the boom-bust housing market cycles, interest rates do not play a major role in determining demand for housing and hence the price appreciation. Rather, it seems to be an abundance of supply of credit, coupled with an expectation of a future appreciation of housing prices that matters more. Even in the face of higher mortgage rates, as long as there was an expectation of future price appreciation backed by an abundance of credit (Quigley 1999, Gelain, Lansing and Natvik 2015), housing appreciation continued.

The results also have important policy implications. Through unconventional monetary policies such as QE the Federal Reserve did succeed in keeping interest rates low. Yet, as our research confirms, such low rates are neither necessary nor sufficient guarantees for reviving a slumping housing market. Likewise, higher rates do not necessarily dampen housing prices. The policy makers need to keep in mind that, while low rates may not hurt the housing market, it is the expectation of a future appreciation that entices people to buy housing, above all else.

Future research could employ other interest rates to explore their effect on housing prices. For example, Kim, Lee and Tran (2014) employ bond yields as a proxy for mortgage rates in their study of the impact of education industry on housing prices. Comparing the effects of different interest rates on housing prices may yield implications for economic policies.

Acknowledgements

The authors would like to acknowledge the College of Business and Economics, CSULA, for providing a research grant for this paper as well as Tuan Khong for his data collection assistance.

References

Capozza, D., Hendershott, P., & Mack, C. (2004). An Anatomy of Price Dynamics in Illiquid Markets: Analysis and Evidence from Local Housing markets. *Real Estate Economics, 32*(1), 1-32. http://dx.doi.org/10.1111/j.1080-8620.2004.00082.x

Case, K., & Shiller, R. (1989). The Efficiency of the Market for Single Family Homes. *American Economic Review*, *79*(1), 125-137.

Gelain, P., Lansing, K.J., & Natvik, G.J. (2015). Explaining the Boom-Bust Cycle in the U.S. Housing Market: A Reverse-Engineering Approach, *Working Paper Series 2015-02 Federal Reserve Bank of San Francisco*. https://doi.org/10.2139/ssrn.2631424

Kau, J., Keenan, D., & Kim, T. (1993). Transaction Costs, Suboptimal Termination and Default Probabilities. *Real Estate Economics*, *19*(3), 247-163. http://dx.doi.org/10.1111/1540-6229.00610

Kau, J., Keenan, D., & Kim, T. (1994). Default Probabilities for Mortgages. *Journal of Urban Economics*, *35*(3), 278-296. https://doi.org/10.1006/juec.1994.1017

Kim, T., Lee, D., & Tran, D. (2014). Why Does Local Housing Markets' Responsiveness to a Recession Vary? Home Prices and the Education Industry. *International Research Journal of Applied Finance*, *5*(8), 1071-1074

Miller, N.G., Sklarz M.A., & Thibodeau, T.G. (2005). The Impact of Interest Rates and Employment on Nominal Housing Prices. *International Real Estate Review*, *8*(1), 27-43.

Quigley, J.M. (1999). Real Estate Prices and Economic Cycles. *International Real Estate Review*, *2*(1), 1-20.

Taylor, J.B. (2007). Housing and Monetary Policy, *NBER Working paper Series* 13682, 1-16. http://dx.doi.org/10.3386/w13682

Titman, S., Wang, K., &Yang, J. (2014). The Dynamics of Housing Prices, The Dynamics of Housing Prices. *Journal of Real Estate Research, 36*(3), 283-317.