Monetary Policy and Housing Bubble in Ireland

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Abstract. This paper discusses monetary policy and economic performance in Ireland in the early 21st century. Based on empirical analysis, it analyzes the causes of the emergence of the Irish housing bubble with the aim of exploring whether "monetary policy is the crucial cause of the formation of the housing bubble".

Keywords: monetary policy; housing bubble; house price.

1. Introduction

1.1 A Review of the Global Economic Crisis and Housing Bubble

The financial crisis, which swept through the major markets of the world from 2007 to 2009, began with the subprime mortgage crisis in the United States. The subprime mortgage crisis in the United States, which also known as the subprime mortgage crisis, began to emerge in the spring of 2006. From 2000 to 2006, U.S. interest rates were low, the housing market continued to boom, and the subprime mortgage market grew rapidly. In 2006, the U.S. housing market cooled, short-term interest rates increased, and subprime mortgage repayment rates rose, resulting in an increased burden on house buyers. After that, large batches of loan borrowers could not repay the loans on time. Banks still lost a lot of money even if they recovered their houses, which triggered a subprime housing credit crisis. Since the crisis, investors have begun to lose confidence in the value of mortgaged securities, and even central banks repeatedly pumping huge sums of money into financial markets have not been able to prevent the financial crisis.

By September 2008, the financial crisis began to spiral out of control, leading to the collapse or takeover of several large financial institutions. After the financial crisis swept the world, many European countries also experienced economic recessions of varying degrees.

The bursting of the housing bubble appears to have been the initiator of the 2008 financial crisis in the United States. Many scholars have carried out corresponding research on the housing bubble. Christopher Mayer(2011) pointed out that bubbles will occur when house prices rise more than fundamentals in boom times, and fall more than fundamentals in depressions. Mayer also discusses common methods for measuring home prices and fundamentals, including using a user-based cost model to compare home prices with the current discounted value of rents. Rising house prices within the normal range can drive the development of related industries and promote economic growth. However, the rapid rise in housing prices has a net crowding out effect on consumption and investment, resulting in a decline in total factor productivity, widening the income gap, and objectively promoting the rise of leverage ratio in the economy, seriously threatening the stable and healthy development of the macroeconomy. The sharp rise in real estate prices will drive the production scale of the related industrial chain to expand, resulting in excessive expansion of means of production. When the real estate industry drops to a certain extent with the social demand, the price declines, and the related industrial chain has surplus means of production, losing the conditions for living, making ends meet, or even going bankrupt, forming an overall economic downturn with real estate as the main economic form, which will form a real estate bubble. Regarding the causes of the real estate bubble, the relationship between the real estate bubble and monetary policy have been studied. John B. Taylor(2009) provided an empirical study of the role of government action and intervention in the August 2007 financial crisis, showing that the excessive loose monetary policy in the United States accelerated the housing boom, which eventually led to the bursting of the housing bubble. Jane Dokko(2011) and others measured the possible role of monetary policy in the

development of the housing market by studying two empirical models, the Federal Reserve Board's FRB/US model and a simplified vector autoregressive model. The conclusion was that only weak linkages between monetary policy and house prices.

Although many literatures on the housing bubble are based on the United States, many advanced countries experienced some sort of boom and burst in house price. With the experience of previous studies analyzing the US housing bubble and monetary policy, this paper attempts to analyze the connection between Ireland's housing bubble and monetary policy. The second section discusses Irish monetary policy and analyzes whether it is loose or tight. The third section discusses the economic operation mode of Ireland from the late 20th century to the early 21st century and the causes for rising house prices, and analyzes the Irish real estate bubble. The fourth section studies the relationship between monetary policy and housing bubbles by empirical analysis. The last part concludes and summarizes, answering the question "Is monetary policy the cause of housing bubble?"

2. Monetary Policy between 2000 and 2008

As a member of the European Economic Community, Ireland's monetary policy is set by the European Central Bank with the objective of maintaining price stability. The Central Bank of Ireland is responsible for the effective implementation of monetary policy to ensure that prices remain stable in Ireland and to monitor the overall liquidity of the banking system. Price stability is the most important monetary policy objective. The ECB's strategy is intended to achieve an annual increase of no more than 2 percent in the unified consumer price index for the entire euro area. Similarly, the U.S. Federal Reserve system has been given a dual mandate—to pursue the economic goals of maximizing employment and price stability. It needs to manage financial conditions to achieve this equilibrium through the use of policy instruments that encourage progress toward its dual mission – in other words, the implementation of monetary policy. In addition, the Fed needs to maintain a benchmark for the 2% personal consumption expenditure inflation figure, which is a medium-term goal because regular economic blows consume trickle down time for monetary policy. Both the ECB and the Federal Reserve have certain similarities in the formulation and implementation of monetary policy. For example, the 2% range is designed to better adjust the quality of monetary policy while avoiding deflation.

So, how effective is the monetary policy set by the European Central Bank in various countries? First of all, comparing the Irish money market interest rate and the policy rate, it can be found that the average market interest rate in Ireland was lower than the policy rate of the European Union from 1999 to 2007 (panel a). It is also clear from the trends in money market interest rates in Ireland from 1972 to 2012 (panel b) that interest rates in Ireland remained almost at a low level in the early 21st century. In addition, the statistics of currency issuance in Ireland are shown in the figure below. Panel c is M1 supply and panel d is M2 supply.
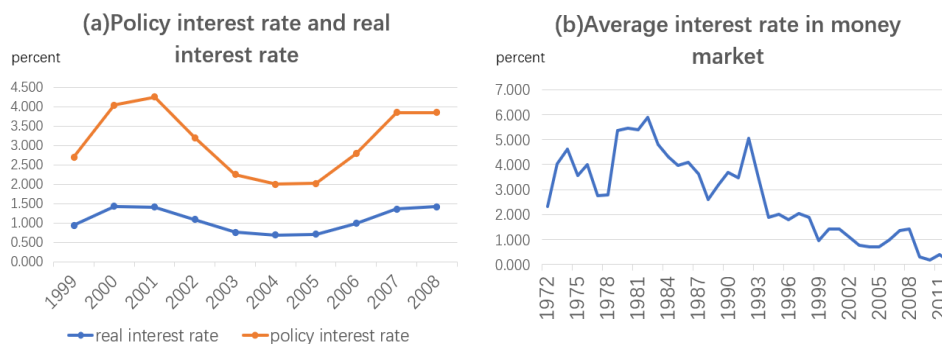
Source: IMF, Trading Economics, Irish Central Statistics Office, CEIC Data
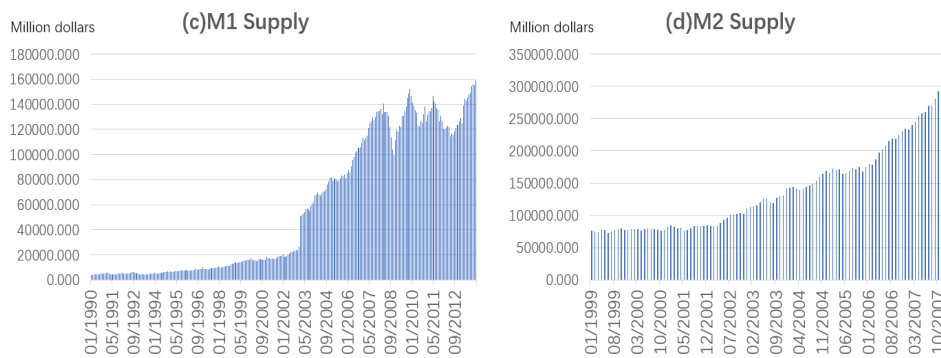
Source: Trading Economics, World Bank,   CEIC Data

Figure 1:Monetary policy indicators

These can be seen as some specific manifestations of Ireland's monetary policy, but how to judge the degree of tightness of monetary policy? In the process of studying American monetary policy and housing bubble, some scholars have suggested that the excessively loose monetary policy in the first five years of this century led to a bubble in U.S. housing prices(John B. Taylor,2008). To study the connection between monetary policy and housing bubbles, a standard for measuring the effect of monetary policy should be set.

The problem is that the measurement of monetary policy is difficult to determine. Much of the research on monetary policy is based on Taylor rule. Taylor Rule is an interest rate forecasting model developed by economist John Taylor in 1993. Although this model has certain limitations and cannot clearly take into account all the specific factors that occur in reality, it can also be used as a guideline for judging the degree of monetary policy tightness as a rule worth referring to in the field of macroeconomics.

Taylor principle states that nominal interest rates move by more than 1:1 to inflation. This is because monetary policy works with a lag. Policy decisions must be forward-looking. Effective monetary policy must take into account the predicted value of the target variable, not the current value.

Based on the Taylor Rules, the International Monetary Fund has studied the degree of monetary policy easing or tightening in 20 countries by measuring the average deviation between the monetary policies of those countries during the same period and the standard version of Taylor Rules (Fatás and others, 2009). According to the calculations, the vast majority of countries surveyed, whether in European countries such as Ireland, Spain, the Netherlands, New Zealand, or the United States, Australia, and Canada, have looser monetary policies than the Taylor rule. This study result was also expounded by Ben S. Bernanke, chairman of the Federal Reserve System, in a speech at the annual meeting of the American Economic Association in Atlanta. No matter from the conclusion of IMF research or the result of comparing Ireland's real interest rate and policy interest rate in reality, Ireland's monetary policy in the early 21st century is too loose.

3. Formation of Irish Housing Bubble

3.1 Mode of operation of the Irish economy

Before discussing the Irish property bubble, it is necessary to clarify how the Irish economy works. Ireland's GDP growth accelerated steadily from 1985 to 2010. It is worth noting that the rapid growth of the Irish economy needs to benefit from the rapid development of the real estate industry. In 1996, the share of real estate in Ireland's GDP was 5%, and by 2006 it had reached 10%. In Ireland, GDP per capita and personal consumption expenditure increased. Residents' quality of life became better and better.

With more savings and spare money to invest, investing in public housing has become an option for a large proportion of Irish residents.

Why are most residents willing to put idle funds into real estate, which eventually leads to rising house prices, or even detached from fundamentals, forming a real estate bubble? To explore this problem, we need to use the positive feedback trading model proposed by De Long and others(1990). The positive feedback trading model can explain the emergence of bubbles to a certain extent, which is mainly derived from investors' psychological expectations. The initial rise in house prices comes from fundamentals, and when investors receive good feedbacks from fundamentals, the prices naturally rise; After that, the price increase causes traders who adopt a positive feedback trading strategy to follow suit, further pushing up house prices. Just as the market discovers a high-yield investment, individuals with savings keep pouring it in, and as long as the desire to earn excess returns beyond the fundamentals continues, the frenzy will continue. If the price rises sharply due to the positive feedback model, an asset bubble will form. Kindleberger (1978) stated that a bubble is "the abrupt rise of an asset or series of assets in a continuous process, and the initial price increase leads to the expectation that the price will rise again, thus attracting new buyers." These people generally just want to make a profit by buying and selling, and are not interested in the use of the asset itself and the ability to generate profit. This partly explains the soaring rise in Irish house prices. In the 90s of the 20th century, the Irish real estate industry developed rapidly. When many residents make investment choices, the limited information obtained from the market leads investors to have good psychological expectations for the real estate industry. Indeed, house prices in Ireland were rising rapidly during that time, and they are also showing a trend that they will continue to rise in the future. With the follow-up effect of others choosing real estate for investment, more and more people put their money into the real estate basket.
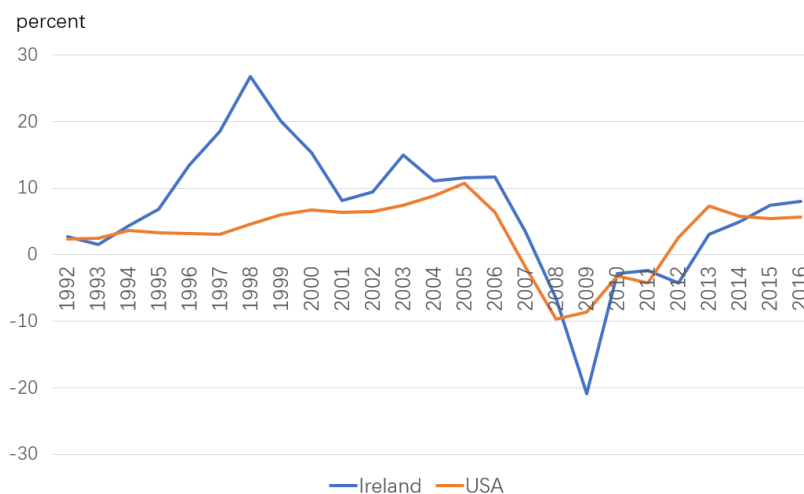
Source: Irish Central Statistics Office, CEIC Data, Trading Economics

Figure 2: Year-on-year growth rate of house prices

Between 1995 and 2000, 3.3 billion euros were invested in housing. The figure even reached 10.5 billion euros between 2000 and 2006. Against this backdrop, house prices in Ireland skyrocketed in the end of the 20th century. And the year-on-year growth rate of house prices in Ireland and the United States from 1992 to 2016 is shown in figure 2.

It can be seen that Ireland has experienced a skyrocketing house price between 1995 and 1998, In 1998, Ireland's house price growth rate was even as high as nearly 30%. As a result of the initial price increase, arbitrageurs began to increase the supply of financial derivatives of the asset. This arbitrage behavior is undoubtedly the key cause of every price bubble. Arbitrageurs only hold these assets at the beginning. When bubbles reach their climax, official institutions often do not explicitly stop or oppose them, which allows the bubble to last for a while. But in the end, bubbles burst, and the profits will be lost by traders who follow the trend to invest.

Of course, the reasons affecting the rise in house prices are not only investor psychology. In general, there are several factors that can affect house prices.

The first is the economic factor. If the economic environment is good, more people will be willing to buy houses, which will affect the distribution of supply and demand for houses. Indicators that can be used to measure the economic situation include: GDP, per capita income, or inflation. Inflation can affect house prices through channels such as cost effects, income effects, and bank credit effects. Inflation increase the total cost of real estate, and real estate companies will compensate for the loss caused by inflation by raising housing prices. In addition, inflation also increases the nominal income and nominal purchasing power of residents. The consumption capacity of residents increases, and the demand for real estate purchases will be affected. Persistent inflation will lead to a gradual decline in real interest rates, which will benefit residents who buy loans. It will also increase the demand for buying homes through lending channels.

The second is policy factors. There are many policies that affect housing prices. It is worth noting that monetary policy also affects house prices. The indicator that can be used to discuss monetary policy is interest rates. When real interest rates are low or negative, saving money is tantamount to "losing money", and people's wealth is threatened with shrinking, which forces people to convert their savings into other assets that can preserve and increase their value. With poor access to investment and no marginal return on capital to their savings, house is an ideal investment option because it is an asset with a stable future income. Investment purchases push up house prices. Other policies that may affect housing prices are land development planning, real estate tax system, housing policy and so on.

In addition to the factors detailed above, there are many factors that can also affect house price changes. Such as scarcity, cost factors, demographic status, social welfare, and so on. Ireland's property industry is booming for a number of reasons. However, house prices in Ireland have grown too rapidly, with Ireland changing by 12% higher than many European countries in comparing the annual average house price changes in European countries from 1999 to 2005. This also warns of the inflated real estate prices and the bursting of the real estate bubble.

3.2 Housing Bubble

In the last section, the definition of "bubble" has been basically obtained. Bubble economy means that the price of an asset (generally tangible assets) suddenly rises after a certain period of continuous trading and speculation, which seriously deviates from the value of this asset. When it rises to an unbearable level, the relationship between supply and demand loses balance. Market regulation is difficult to maintain, and prices plummet, just like bubbles burst. Housing bubble is based on real estate. The real estate speculation caused a serious deviation between the real estate price and its value. Originally, the sharp rise in the house price led to the continuous expansion of the production scale of the related industrial chain, resulting in excessive expansion of the means of production.

This paper discusses the real estate bubble in Ireland. Then it needs to be clear first, how to measure the bubble? This paper chooses descriptive index method. Construct relevant indicators to observe the degree of housing price bubble. This paper selects the average house price and the average wage of residents in Ireland from 1995 to 2016 to construct the ratio of house price to income. Considering that the annual income needs to deduct the basic living expenses, the amount that can be used to buy a house can be obtained by multiplying the annual savings rate by the annual income, which is the average annual savings amount. Taking 15 years as a boundary , which means that a person can usually afford a house after working for 15 years. Exceeding 15 means that the house price is too high and the housing bubble can be seen.

The calculated results are as follows:
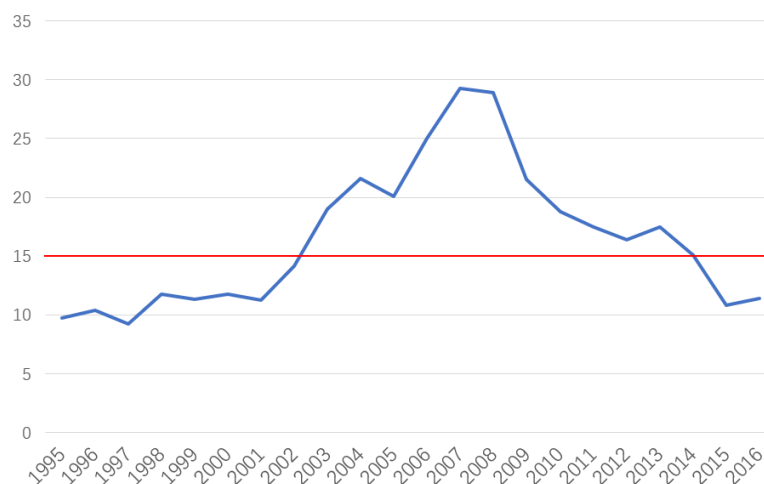
Source: Irish Central Statistics Office, CEIC Data, OECD Data

Figure 3:Measurement index of house price bubble

It can be seen that since 2003, Ireland's real estate bubble has been looming, and then it has intensified with the push of the market and the impact of the economic crisis. The bubble has expanded more and more and it reached its peak in 2007 and 2008. The financial crisis in 2007 is more like a trigger device for Ireland rather than the root cause of the bubble. From 2003 to 2008, when the real estate bubble was constantly expanding, the reason for the continuous expansion of the bubble volume was largely due to the fact that the rising range was divorced from the fundamentals of housing prices, and a balance relationship could not be reached with people's income. Even though Ireland's GDP and residents' income were increasing during that period, its growth rate could not keep up with that of housing prices.

As to whether the loose monetary policy in Ireland from 2000 to 2008 caused the housing bubble, combined with previous economists' research and discussion on this topic and a series of analysis on Ireland, it can be preliminarily concluded that loose monetary policy is one of the reasons for the housing bubble. But it is not the loose monetary policy that caused the real estate bubble. The research on the relationship between monetary policy and real estate bubble is further discussed in the following empirical analysis.

4. Relationship between Monetary Policy and Housing Bubbles

4.1 Empirical analysis

Was loose monetary policy a significant contributor to Ireland's housing bubble? Is there a certain causal relationship between them?From the trend chart of the year-on-year growth rate of house prices in Ireland, it can be seen that at the end of the 90s of the 20th century, house prices rose at a rapid rate. Its increase was even higher than that from 2000 to 2005. Therefore, the initial rise in house prices predated the period of highly loose monetary policy. However, the possibility that loose monetary policy will have a certain impact on the real estate bubble cannot be ruled out. To test the strength of the link between monetary policy and housing bubbles, econometric models and statistical knowledge are needed to analyze it.

In order to study the relationship between monetary policy and real estate bubbles in a simple and straightforward way, this paper employs the vector autoregressive model (VAR), a statistical model often used in econometrics to analyze the relationship between macroeconomic indicators. The model has been used many times in the economic field to test the relationship between monetary policy and housing prices (Jane Dokko and others,2009; John B. Taylor,2008; etc.). Many economists have used this model to analyze the time series changes of a set of data.

The model selected 4 variables, and the variable studied is the indicator used to measure the housing bubble constructed above: the price-to-income ratio. Other indicators used for modelling include Irish economic growth (expressed by GDP growth rate), inflation rate, and average money market interest rates. GDP growth rate and inflation rate can reflect the economic environment and the overall situation of the country's economic development over a period of time, while money market interest rates can be regarded as one of the manifestations of monetary policy, and these factors may affect house prices. Data from 1995 to 2016 were selected for modeling. If a historical relationship holds, it can also be used to determine the relationship between variables.

After the unit root test and cointegration, the nonstationary data is turned into stable. Through the information criterion, it is judged that the hysteresis order is lagging one period. Build a VAR model. After the residual normality test, it is concluded that the residual of the VAR model satisfies the normality characteristic. After the residual autocorrelation test, it is concluded that the residual of the VAR model has no autocorrelation problem. To judge the stability of the model, it can be seen from the AR feature root diagram that all feature root values are within the unit circle, which means that the constructed VAR model has good stability.

To investigate the relationship between variables, perform a Granger causal test on variables. The Granger causal test is to explain whether the lagged value of a variable has a predictive effect on the information of the interpreted variable. Although the causal relationship obtained in the Granger causal test may not be a causal relationship in actual economic activities, but it can also provide certain reference value. After the Granger causal test, it is finally concluded that the inflation rate is the Granger cause for the interest rate and the house price-income ratio, and the interest rate is the Granger reason for the inflation rate.

Based on the modeling results of the VAR model, ANOVA is performed to analyze the proportion of variables affected. The abscissa of the variance decomposition plot is the order, and the ordinate is the variance decomposition value, which can be used to feedback the variance decomposition changes with the hysteresis order. A larger variance decomposition value means a greater impact, and a variance decomposition value close to 0 means little impact.
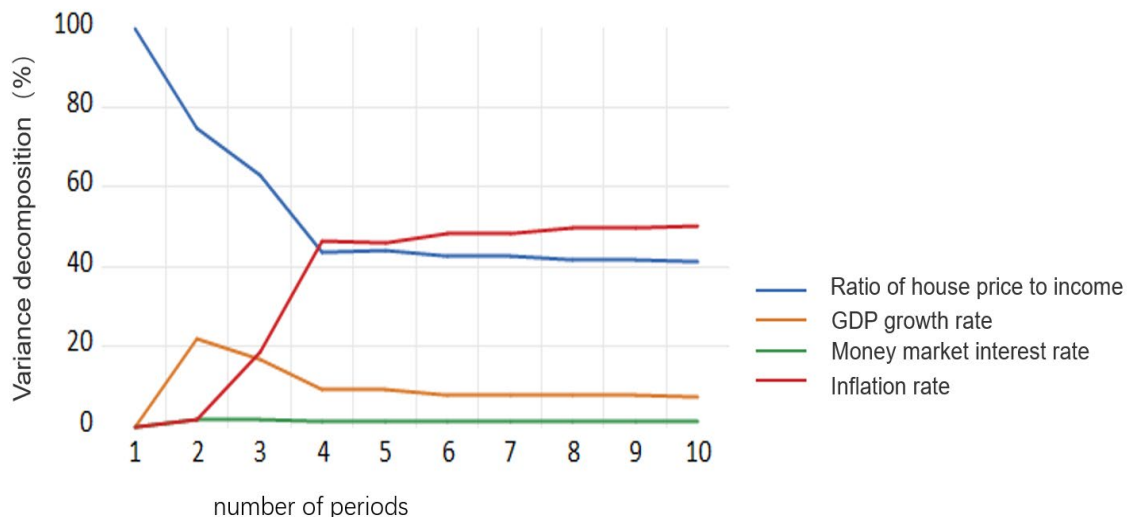

Figure 4:Variance Decomposition of housing bubble

It can be seen from the variance decomposition chart that the price-to-income ratio has a clear downward trend for its own variance decomposition rate. This shows that with the increase of the number of periods, the degree of explanation of the ratio of house price to income gradually decreases. For money market interest rates, the explanation of the house price-to-income ratio is basically low and stable. So it can be seen that money market interest rates have little impact on the housing bubble. For the GDP growth rate, the house-to-income ratio has also remained at a low level. As for the inflation rate, it is interesting to note that the degree of explanation has gradually increased with the

increase in the number of periods, and has stabilized after the fourth period, eventually remaining at about 50%.

From the modeling results, it can be preliminarily believed that there is a connection between housing bubble and loose monetary policy. But the connection is very weak, which is not enough to show that there is a clear causal relationship between loose monetary policy and the emergence of housing bubble.
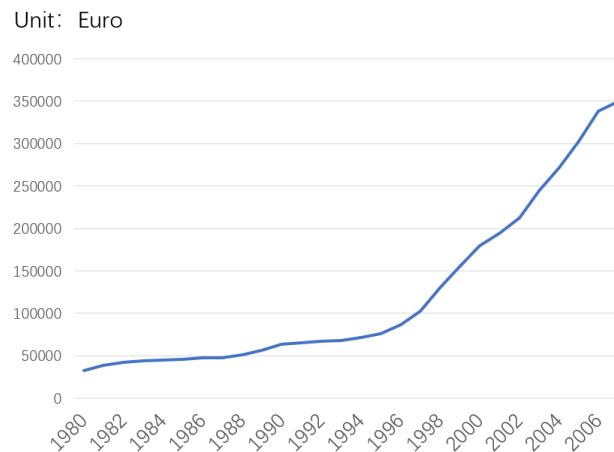
Source: Irish Central Statistics Office

Figure 5:House Price

It can be found that Irish housing prices have basically shown an upward trend since the 1980s. Looking at the chart of year-on-year house price

The formation and expansion of the real estate bubble are largely related to the abnormal rise in housing prices. Observe the trend chart of real house prices in Ireland(Figure 5).It can be found that after 1997, the growth rate of Irish house prices has accelerated significantly, which is reflected in the obvious increase in the slope of the image. Looking at the trend chart of interest rates in the Irish money market, interest rates were at their lowest level between 2000 and 2006 (Figure 1,panel b), which was also the period when monetary policy was loosest. Was the loose and monetary policy at the beginning of the 21st century a significant cause of soaring house prices in Ireland? In order to investigate the relationship between monetary policy and housing prices, reselect the variables and establish a new VAR model. Study the reasons that may affect the rapid rise of housing prices in Ireland.

The new model selected 5 variables, including Irish economic growth (expressed by GDP growth rate), inflation rate, real GDP, house prices, and average money market interest rates. These factors may have an impact on house prices. Data from 1975 to 2008 were selected for estimation. If historical relationships hold, it can also be used to predict the behavior of the variables under study. Therefore, after modeling the above variables, the data after 1997 is erased, and the simulation results of the model are tried to predict the value of house prices from 1997 to 2007, when the monetary policy was highly loose.

After the unit root test and cointegration, the nonstationary data is turned into stable. Through the information criterion, it is judged that the hysteresis order is two periods of lag. To investigate the relationship between variables, a Granger causal test is performed on variables. In the end, it was concluded that inflation was the Granger cause for house prices. There is Granger causation between GDP growth rates and money market interest rates. The inflation rate is the Granger reason for interest rates.
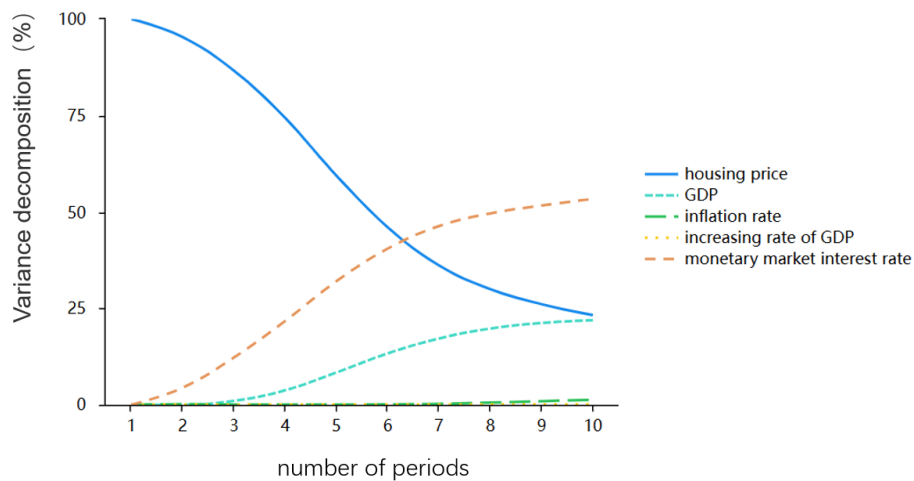
Figure 6:Variance Decomposition of house price

ANOVA is performed again based on the new model. As can be seen from the variance decomposition chart(Figure 6), house prices have a clear downward trend for their own variance decomposition rate. This shows that over time, the degree of explanation of house prices will gradually decrease, and finally basically stabilize at the level of more than 25%. For inflation and GDP growth rates, house prices have basically approached zero and remained stable. As for money market interest rates, it is interesting to note that the strength of house price explanations has gradually increased, and has stabilized after the 7th period, eventually remaining around 50%. This result shows that the money market interest rate has a certain impact on housing prices. It is possible that monetary policy is indeed one of the reasons for the rapid rise of housing prices.

Based on historical data from 1975 to 1997, the model gives house price forecast after 1997(Figure 7). Focuses on data for the period 2000 to 2008. Comparing the predicted house price and the actual house price, it can be found that there is a large gap between the model's prediction results and the actual house prices, and the difference gradually increases with the number of forecast periods. Even if the overall trend of predicted and actual house prices is rising, there is still a large gap in the growth rate. The predicted growth rate of house prices obviously cannot keep up with the actual growth rate.This shows that the historical relationship between the house price examined by the model and several indicators that may have an impact on house price does not provide much reference value for future house price prediction. In reality, Irish house prices also rose significantly faster than fundamentals between 2000 and 2008, which may be caused by a number of reasons. Combined with the results of ANOVA, monetary policy represented by money market interest rates does have a certain impact on house prices, but there is no evidence that loose monetary policy in the early 21st century is the direct cause of the rapid rise in Irish house prices. Although low market interest rates at the beginning of the 21st century also greatly exacerbated the rate of house price growth (it can be seen that the overall trend of house price growth has been the fastest since 2000).

Unit：Euro
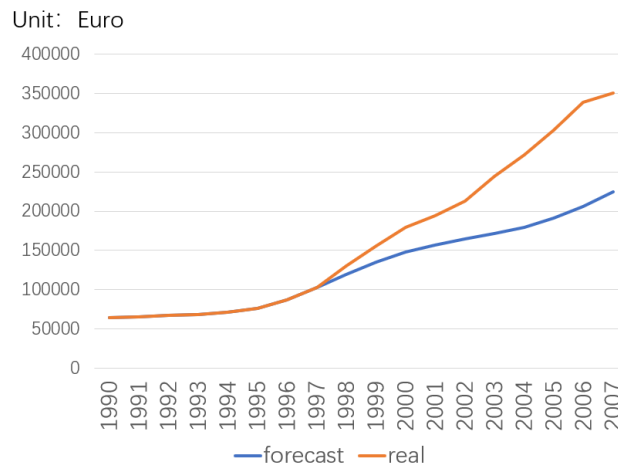
Source: Irish Central Statistics Office, Model prediction

Figure 7:Forecast house price and actual house price

4.2 Causes of the Formation of the Irish Housing Bubble

After establishing two models for analysis, it can finally be concluded that loose monetary policy has a certain impact on the rise of house prices, but it will not be the critical reason for the formation of housing bubbles. Through the empirical analysis of interest rate and the ratio of house price to income, which is an indicator to measure the bubble in the first VAR model, it can be analyzed that the direct connection between monetary policy and housing bubble is very weak. This conclusion is understood. Even if monetary policy will affect the rise in house prices, it will also have an impact on household income. Monetary policy first affects the level of interest rates through changes in the money supply, then changes the level of investment activity through changes in interest rates, and finally leads to changes in income levels. Monetary policy will have an impact on both house prices and household income. And the house price-to-income ratio will weaken or even offset the impact of each other. Therefore, the impact of loose monetary policy on the real estate bubble is weak.

To analyze the causes for the formation of the Irish property bubble, many factors are needed to consider. Focus on the period from 2000 to 2008, when the Irish mortgage market was hot. Currency issuance is unrestrained and most of it flows to the real estate industry. During the same period, the European Central Bank and the Irish Central Bank encouraged Irish banks to borrow and mortgage heavily. Most of the banking loans went to developers and personal mortgages. Ample liquidity spurred house price growth, which in turn encouraged banks to lend more to developers and individuals.

Loose monetary policy did exacerbate the accumulation of housing bubbles, but the real problem was that from 2003 to 2007, a severe credit bubble in the real estate sector was tolerated (Philip Lane, Trinity College Dublin). Because of the lack of adjustment of financial policy by the relevant departments in Ireland, excessive bank lending has led to excessive bank loans, and there are also gaps in the regulatory model. In 2005, the Irish central bank sensed a property bubble. However, the huge benefits that the real estate industry brings to the government and the fact that it drives economic growth have made the regulatory authorities relax their necessary vigilance.

In 2008, under the impact of the subprime mortgage crisis in the United States, Ireland's inflated real estate bubble was instantly punctured. The economic crisis was only one trigger for the bubble to burst, and Ireland's property boom was already crumbling. After the bubble burst, bank assets shrank on a large scale, the risk of credit default increased, builders could not repay loans, personal mortgage buyers could not afford to pay their mortgages, Irish banks were dragged down by weakly regulated loans, the economy also turned from boom to decline, and GDP growth rate was negative for three consecutive years.

5. Conclusion

For the formation of the Irish property bubble, it can be said that monetary policy is one side of the reason, but it should be noted that Ireland's past economic operation model is also problematic. Too much reliance on real estate, bank lending and foreign capital. On the other hand, central fiscal policy and loose supervision also bear some responsibility. Therefore, the causes of the real estate bubble are complex, and it cannot be asserted that "loose monetary policy led to the real estate bubble." Since the role of monetary policy is lagging, considering this, although monetary policy at the beginning of the 21st century was certainly loose, house prices began to rise in the 90s of the 20th century. And although prices rise the fastest when short-term interest rates are at their lowest, the year-on-year growth rate of house price increases is lower than in the 90s of the 20th century. Therefore, the cause of the real estate bubble cannot be attributed to loose monetary policy. At least, the direct connection between the two is weak.

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