Do housing prices decrease when interest rates go up?  
Housing prices and interest rates: understanding the positive correlation across five countries

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Abstract. This paper investigates the relationship between changes in interest rate and house prices from the period 1975 to 2023 in five countries: United States, United Kingdom, China, Germany and Indonesia. Results show that contrary to the paradigm of real estate pricing, housing prices increase with interest rates. Furthermore we find that changes in house prices are independent of monetary policies and interest rate changes set by the central bank. Economically developed nations exhibit a stronger correlation between the two variables. We demonstrate that this is due to the 2008 financial crisis, where houses fell by nearly 30%, creating a fear of recession and the resulting policy of low interest rates to encourage investment.

Keywords: Interest rates; housing prices; central banks; monetary policies.

1. Introduction

In recent decades, the global economy has been characterized by substantial volatility in the growth of house prices. While factors such as pandemics and conflicts (war) have all played a role in the fluctuations (Li et al., 2022), interest rates are taken as the variable directly impacting house prices due to its link to monetary measures. However, empirical evidence (Kneeshaw & Bergh, 1985) indicates that countries exhibit varying degrees of responsiveness in house prices to interest rates. These differences can be attributed to a range of factors, including variations in monetary policies, such as the implementation of quantitative easing, and banking structures.

This paper specifically delves into the countries of China, Germany, Indonesia, United Kingdom and United States in which the responsiveness of house prices to changes in short-term interest rates are compared and analysed in the years of 1975 to 2023. Empirical data suggests that changes in short-term interest rates and home price appreciation have had a positive but weak relationship (Goodman & Neal, 2022). Yet, this conclusion seems to contradict with logic where the higher the interest rate, the greater the opportunity cost to purchase real estate, driving down demand and hence lower prices (negative relationship). As explained later, there are two reasons behind this unexpected result discussed more deeply in later parts of the paper: consumer confidence under inflationary periods and real estate as a hedge against inflation.

The focus of the paper is then returned to explain the large discrepancies between the slopes (changes in interest rate as the x-axis and growth in house prices as the y-axis) of the respective countries. There are several results obtained from this research paper. First, data modelling suggests that emerging countries are associated with the lowest slopes (as low as 0.14 in Indonesia) while the economically-developed nations are seen with higher slopes (as high as 1.9 for UK). Second, we find that the higher slope between changes in interest rates and house prices in economically developed countries (US, UK) is due to the 2008 financial crisis, where low house prices coincided with low interest rates as the house bubble burst. Third, we find that house prices are volatile and fluctuate regardless of the central bank monetary policies and their banking structure for all 5 countries investigated.

The paper is organized as follows. Section 2 includes a literature review. Section 3 presents the empirical models and data. Sections 4 discusses the empirical data in which the relationship between changes in housing prices and interest rates is analysed. Section 5 concludes.
2. Literature review

Motivating the paper is the fundamental theory of housing prices and interest rates. A stylized general equilibrium model shows that monetary easing decreases the mortgage payment burden, thereby it would raise house prices (Beraldi & Zhao, 2023).

The negative relationship between changes in housing prices and interest rates, illustrated by the general equilibrium model, was strengthened by the dividend discount model, which suggests that the lower interest rate would increase the ratio between house prices and net rentals, and with a lower housing risk premium, increase the housing price (Weeken, 2005).

Table 1. Conclusion of previous theories that demonstrate a negative relationship between interest rate and housing prices

<table>
<thead>
<tr>
<th>Theory (citation)</th>
<th>Summary</th>
<th>Correlation between interest rate and housing prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>fundamental theory of housing</td>
<td>Low interest rates make mortgages cheaper and effective housing prices lower thereby increasing demand and equilibrium price</td>
<td>negative</td>
</tr>
<tr>
<td>(Beraldi &amp; Zhao, 2023)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dividend discount model</td>
<td>Lower interest rates would increase ratio between house prices and net rentals, and alongside a decrease in premium risk, increase real estate prices</td>
<td>negative</td>
</tr>
<tr>
<td>(Weeken, 2005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(McQuinn &amp; O’Reilly, 2008)</td>
<td>House price demand is adequately represented by the average amount borrowed, which is determined by income and interest rates</td>
<td>Long-run relationship</td>
</tr>
<tr>
<td>(Gimeno &amp; Martínez-Carrascal, 2010)</td>
<td>High house prices create illusion of wealth, underestimating debt level</td>
<td>Interdependent in long-run</td>
</tr>
</tbody>
</table>

Changes in housing prices, though, is not solely influenced by interest rates. Previous research tends to analyze how income also affected changes in housing prices (McQuinn & O’Reilly, 2008). They posited that there is a long-run relationship between housing prices and the amount individuals can borrow, which in turn is influenced by the interest rate. In another paper, the relationship between house purchase loan and interest rates is studied, offering valuable insights into how inflated house prices created an illusion of wealth where people underestimate the risks associated with high levels of debt. (Gimeno & Martínez-Carrascal, 2010).

Adding to the relationship between housing prices and interest rates, there are other factors such as future expectations, credit constraints, and the 2008 financial crisis, that impacted the two variables. Recent research cautions against focusing too much on the role of real interest rates driving house price booms and busts to the exclusion of other key factors (Muellbauer et al., 2021). For example, a recent paper indicates that house prices respond more to interest rates in areas with more restrictive housing supply, like London and the South East of England (BankUnderground, 2023).

The changes in interest rates can be attributed to the workings of different countries’ central banks. Numerous research has investigated central banks laws in different countries and their respective monetary policies (Parkin & Bade, 1978). This early research was expanded to explore central banks as drivers for economic development and institutional change (Epstein, 2007). Central banks were then connected with interest rates in later studies that illustrated how the quantity of reserves had no effect on the interest rate for most countries (Friedman & Kuttner, 2010).

In addition, when discussing how central banks control interest rates, pre-existing papers mainly focused on the large spillover effects (economical influences on other countries) the Federal Reserve or the European Central Bank has on other country's financial conditions (Ca' Zorzi et al., 2020). It should also be noted that other related papers do exhibit data on how different central banks operate and target their interest rate (Canzoneri & Dellas, 1998). Adding on, additional research has also investigated the communication between central banks and how that contributes to the formulation of monetary policies (Connolly & Kohler, 2004). This is significant as the different banking structures
may contribute to how interest rates are set, which in turn will have various effects on housing prices generally.

The biggest inspiration for this paper is a BIS working paper that delved into the response of house prices to changes in interest rates in 47 different advanced and emerging countries in which it showed both the spill-over effects (changes created to other countries due to the US) of the US's interest rate and how modest cuts in monetary policies are unlikely to rapidly increase house prices (Sutton et al., 2017).

The current paper focuses on the relationship between the changes in interest rate and house prices in 5 different countries and their respective central banks, monetary policies, and societal background. Results show that there is a weak but positive relationship between changes in interest rate and changes in house prices; also, fluctuations of housing prices are not affected by changes in monetary policies (changes in interest rates).

3. Methodology

Data of the past 5 decades from the BIS data portal and OECD website (resources will be added in the appendix section) was used for regression models/scatter plots where the quarterly change in interest rates is plotted on the x-axis and the quarterly growth in house prices is plotted on the y-axis, as is (Sutton et al., 2017). The data set covers five countries: US, UK, China, Germany, Indonesia. Data for the US and Germany are available from 1975 to 2023 with the other countries having a more limited timeframe. The results are shown in the empirical work section.

4. Empirical work & results

In each of the five sets of graphs below, the graph on the left is the regression model where the x-axis is the change in interest rate and y-axis the change in the house price value; each dot represents the data in one year.

The line graph on the right illustrates a line graph where the blue line is the change in interest rate and the orange line is the change in house prices; here, the x-axis is the time period while the y-axis the change in value.

Figure 1. United Kingdom’s regression model and line graph.
Figure 2. United States’ regression model and line graph.

Figure 3. China’s regression model and line graph.

Figure 4. Germany’s regression model and line graph.
Figure 5. Indonesia’s regression model and line graph.

The results of the regression and graph analysis are summarized in table one, where four dimensions of the empirical graphs are given: time period, slope, $R^2$ value and stability of interest rates. These factors can be traced back to a country's monetary policies and easily visualized on the graphs.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Years</th>
<th>Slopes</th>
<th>$R^2$ value</th>
<th>Stability of interest rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>2005-2023</td>
<td>1.9934</td>
<td>0.1746</td>
<td>stable</td>
</tr>
<tr>
<td>US</td>
<td>1975-2023</td>
<td>0.4352</td>
<td>0.4352</td>
<td>stable</td>
</tr>
<tr>
<td>China</td>
<td>2005-2023</td>
<td>0.2909</td>
<td>0.0149</td>
<td>unstable</td>
</tr>
<tr>
<td>Germany</td>
<td>1970-2023</td>
<td>0.2296</td>
<td>0.0167</td>
<td>unstable</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2002-2023</td>
<td>0.1439</td>
<td>0.04</td>
<td>unstable</td>
</tr>
</tbody>
</table>

The UK and US have the highest slopes and $R^2$ value between changes in interest rates and house prices. Additionally, in these two countries, the changes in interest rates have been very stable throughout all the years (as demonstrated by the orange line). This can be partially attributed to the workings of their central banks. In comparison, the countries of Germany, China and Indonesia seem to have illustrated a more volatile change in interest rate line (also the orange line). It is interesting, therefore, that the house prices (blue line) still went up and down regardless of how stable the change in interest rates are.

5. Discussion

As all five countries illustrate, there is a weak but positive relationship between the housing prices and changes in interest rates. There are two main reasons for the positive relationship between growth in house prices and changes in interest rates.

First, during periods of economic expansion, central banks may raise interest rates to curb inflationary pressures. However, inflation may coincide with increased economic activity, rising incomes, and improved consumer confidence (Investopedia team, 2021). This will contribute to a higher housing demand and subsequently drive-up house prices. As can be demonstrated in figure 6 (Norland, 2018), especially in the recent few decades (after 1989), consumer confidence was generally in the same direction as the increase in inflation. This, therefore, indicates how consumers will become more confident in future house prices during periods of economic stability boosting demand for real estate.
Figure 6. Relationship between consumer confidence and HICP inflation (Norland, 2018).

Second, real estate is often considered a tangible asset that can act as a hedge against inflation (Rodhe, 2023). When inflation is low, the purchasing power of currency remains relatively stable, reducing the urgency for individuals to invest in assets like real estate. In contrast, when inflation is high, people may seek to invest in real estate as a means to preserve their wealth and protect themselves from the eroding effects of inflation. In other words, real estate’s limited supply and consistent demand can drive property values high during inflationary periods (Element homes, 2022). This will increase demand for housing and drive-up prices.

This paper shows that these two factors do indeed outweigh the basic theory of housing prices over long periods of time in all five countries studied. However, this negative correlation can be demonstrated with evidence in recent years. In the years spanning 2015 to 2021, a noticeable correlation has emerged in the euro area, whereby the acceleration of housing prices has coincided with low interest rates (Dieckelmann et al., 2023). This has also been supported by the US bank, which observed a similar pattern when the Federal Reserve raised interest rates in 2022 and 2023, resulting in a decline in housing demand and subsequent price decreases (US Bank, 2022).

These two findings have also been proven with empirical data from this research. After going through modelling, it suggests that Germany during the period of 2015-2021 did indeed have a negative relationship (slope = -9.7) and US 2022-2023 also with a negative slope of (slope = -4.9).

However, there still needs to be a reason for why the slope of the UK and US is higher than the other countries analyzed. Analyzing the data, it can be seen that there is one point in those two countries greatly impacting the slope. According to the line graph, the one point directly correlates with the 2008 period, or the 2008 financial crisis. This can be inferred as this point has both low interest rate and low housing prices.

The housing bubble, triggered by the availability of easy credit and relaxed lending criteria, marked the inception of the 2008 financial crisis. As the bubble eventually burst, banks found themselves burdened with trillions of dollars’ worth of worthless investments tied to subprime mortgages. This led to the onset of the Great Recession, causing widespread job losses, depletion of savings, and the unfortunate loss of homes for numerous individuals (Coffee, 2009).

In other words, instead of monetary policies impacting housing prices as the other years seem to suggest, the year of 2008’s housing prices actually was the one that led to monetary changes. This is why the year 2008 has both extremely low interest rate and housing prices, leading to that greater positive slope for the series overall.
Figure 7. US and UK’s regression model after the deletion of 2008 data.

Figure 7 illustrates how the slope would decrease, if the data of 2008 was omitted. The slope for the UK and US would decrease, from 1.99 to 0.39, and 0.44 to 0.12, respectively, and thus be more in line with the other countries studied.

6. Central banks and their monetary policies

In order to understand if there are certain patterns to the setting of interest rates across the 5 respective countries, central bank policies need to be investigated. This includes researching the central bank’s inflation target, objectives, monetary policies and quantitative easing, and response to the 2008 financial crisis.

In the common historiography, the UK and the US had macro-oriented central banks that have used primarily indirect tools of policy (Epstein, 2007). Germany, on the other hand, is part of the European Union, where its central bank needs to simultaneously consider Eu’s needs as a whole. China, with its communist ideologies, has seen a rapid increase in house prices over the last few years, where only recently has it cooled down (amro-admin, 2021). Lastly, Indonesia’s real estate market, although still in a developing economic state, has recently been supported by the government, foreign investors and associations such as World bank in ways such as affordable housing projects (Indonesia Real Estate Market Outlook - Analysis & Report, n.d.).
Table 3. Summary the 5 country’s central bank, their monetary policies and responses to the 2008 financial crisis.

<table>
<thead>
<tr>
<th>Country</th>
<th>Inflation Target</th>
<th>Central Bank’s Objective</th>
<th>Examples of Monetary Policy</th>
<th>Quantitative Easing 2023</th>
<th>Response to 2008 crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>2%</td>
<td>promote the good of the people of the United Kingdom by maintaining monetary and financial stability (Bank of England, 2024)</td>
<td>Adjustments of interest rates, bank rate, effective exchange rate, prices of consumer goods; bonds transaction (Bank of England, 2024)</td>
<td>Quantitative tightening 5.2 (Steil, 2011)</td>
<td>Lowering interest rate from 5.5% to 1%; quantitative easing; strengthening of financial institution; offering of loans; public investments (Emmerson &amp; Tetlow, 2015)</td>
</tr>
<tr>
<td>US</td>
<td>2%</td>
<td>promote Maximum employment, stable prices, and moderate long-term interest rates in the U.S. economy. (Federal Reserve, 2023)</td>
<td>Sets target for federal fund, employment levels; adjusts interest rate, asset prices, exchange rates; open market operations (Federal Reserve, 2023)</td>
<td>Quantitative tightening 5.3 (Steil, 2011)</td>
<td>Fed purchased $800 billion of debt and mortgage-backed securities; federal spending and tax rebates; establishment of HERA (Housing and Economic Recovery Act) (Board of Governors of the Federal Reserve System, 2009)</td>
</tr>
<tr>
<td>China</td>
<td>3%</td>
<td>maintain the stability of the value of the currency and thereby promote economic growth (People’s Bank of China, 2020)</td>
<td>Open market operations; required reserve requirement; standing lending facility (ensures liquidity); adjustments to policy rates (Natàlie, 2023)</td>
<td>Quantitative easing -3.1 (Steil, 2011)</td>
<td>$586 billion (Y 4 trillion) stimulus package; cut of interest rate; fiscal stimulus on infrastructure and transportation (Yueh, 2010)</td>
</tr>
<tr>
<td>Germany</td>
<td>2%</td>
<td>secure price stability in the euro area (Central Bank of the Federal Republic of Germany, 2010)</td>
<td>Adjustments to policy rates, interest rates; liquidity policy instruments; minimum requirements; treasury bill transactions (Monetary Policy, 2010)</td>
<td>Quantitative tightening 4.5 (Steil, 2011)</td>
<td>Stabilization of banking system; private investments; reformation of social welfare &amp; pension system; employment rearrangements (Lesch et al., 2017)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3%</td>
<td>to establish and maintain rupiah stability (Bank Indonesia, 2024)</td>
<td>Interest rate setting; money supply regulation; exchange rates, globalization policies (Pambudi et al., 2019)</td>
<td>Quantitative tightening 2.5 (Steil, 2011)</td>
<td>Secured 5 billion security emergency loans from the US. Limited impact, only on financial and trade channels (Thee, 2012)</td>
</tr>
</tbody>
</table>

**US**

The Federal Reserve is the central bank of the US, and is one of the strongest and most dominant international monetary systems where spill-over effects occur often to other countries.

The Fed Open Market Committee (FOMC) determines the setting of the Federal Funds Rate which is the rate large banks charge to lend money to each other overnight. This, in turn, causes the Prime Rate, which is typically three percent above the federal funds target, to go up. Other consumer loans will become more expensive as the Prime Rate increases (What Is the Relationship between Interest Rates and House Prices? How Does One Affect the Other, 2019).

**UK**

Since its inception in 1694, the bank has changed from a private bank that loaned money to the government, to being the official central bank of the United Kingdom (Bank of England, n.d.). It should be noted that the Bank’s frequent use of quantitative easing programs impacts market liquidity.
and supports the housing market in ways such as lowering interest rates and defining policy rates (Bank, 2021).

**Germany**

The Deutsche Bundesbank (connected to the European Union) is the central bank of Germany and plays a key role in monetary policy decisions. This can be attributed to factors such as a more conservative and cautious approach to monetary policy, stricter lending standards, and cultural preferences for renting rather than homeownership. These factors have contributed to a housing market that is less driven by inflation and has experienced relatively modest price growth. Also, there has been a negative interest rate for the last decade in Germany.

**China**

The People's Bank of China (PBOC) is the central bank and implements measures to cool the housing market and prevent excessive price growth. These measures include tighter lending restrictions, increased down payment requirements, and stricter regulations on property purchases. Due to China’s one-party political system, all urban land is controlled by the government.

**Indonesia**

With The Bank Indonesia being the central bank, the housing market in Indonesia is influenced by factors beyond inflation, such as demographic trends, urbanization, and government policies aimed at promoting affordable housing.

An important insight to make based on table 2 is that although the 5 countries faced similar situations, such as the 2008 financial crisis, their responses and monetary policies still varied greatly from each other. With the consideration that local situations nationally also vary, their approach to tools such as quantitative easing and interest rates were nevertheless significantly different. No matter how successful central banks and their monetary policies were, the house prices still fluctuated nonetheless in both countries who had stable interest rates and the countries whose interest rate fluctuated greatly.

7. Conclusion

Four important conclusions can be made from this paper. First, in all five countries investigated, there is a weak positive relationship between changes in interest rates and growth in house prices between the years of 1975-2023. Second, there are shorter periods in which this relationship may be reversed, as indeed suggested by the general equilibrium model of housing. Third, the reason for the high slope in the UK and US is due to the 2008 financial crisis which had both low interest rates and low housing prices. In other words, instead of monetary policies driving house prices, it was the housing prices that led to new monetary policies enactments. Fourth, the volatility of house prices are not affected by changes in monetary policies as the change in house prices fluctuated for all 5 countries regardless of how stable changes in interest rates were.

Acknowledgements

The author thanks Dubravko Mihaljek for confirming the data source in BIS data portal (residential property prices dashboard), and Rebecca M Stein for mentoring, reviewing and giving feedback through the research project.

References


