The Negative Influence of the Tilt Effect and Lending Constraints on Housing Markets, Economic Recessions and the Phillips curve

Xavier Barrull i Melcior
The Negative Influence of the Tilt Effect and Lending Constraints on Housing Markets, Economic Recessions and the Phillips curve

Xavier Barrull i Melcior
ESADE Business School, Ramon Llull University

June 2012

Abstract

Although economic theory suggests that inflation should not have any significant influence on real housing prices and activity, inflation variations are the main drivers of housing price variability (Tsataronis and Zhu, 2004) and increases in inflation have preceded housing and economic recessions. The combination of the tilt effect (Lessard and Modigliani, 1975) and rigid lending constraints can help us understand these relationships, as well as explaining the failure of the Phillips curve in the USA from the late 1960s onwards. Inflation-indexed mortgages can avoid the tilt effect and help mitigate this type of economic recession. The inflation indexing of the main economic contracts would help to implement measures of demand stimulus.

Keywords: "Phillips curve", "tilt effect", inflation, unemployment, mortgage, recession, housing, index, constraint

JEL Classification Codes: E31, E32, E44, G21
1. Introduction

Economists have long associated inflation with economic activity. Increasing rates of inflation have been seen as the result of a monetary phenomenon (Friedman and Schwartz, 1963) or an increase in demand and economic activity and consequently, high or accelerating inflation levels have been linked with soaring economic activity and low unemployment. However, we can observe many puzzling situations where increases in inflation have preceded or are involved in an economic downturn. For example, inflation is the main driver of real housing price variability (Tsasaronis and Zhu, 2004) and increases in inflation have preceded housing (Ahearne et al, 2005) and economic recessions. Another puzzle is why US unemployment and inflation data fits with the Phillips curve or the NAIRU (Non-Accelerating Inflation Rate of Unemployment) model until the late 1960s – but fails to do so from then on. This paper tries to answer these questions and explore the economic causes.

2. The inflation-housing recession puzzle

In the 1970s, as inflationary pressures arose in OECD economies, there was concern about the effects of inflation on the residential mortgage market (Cohn and Lessard, 1976) but the decline in inflation levels during the 1980s also diminished the interest in the issue. However, inflation still has a significant negative influence on housing prices and activity although economic theory suggests it should not. Inflation variations, ceteris paribus, should not have any significant influence on real housing prices, as the main methods of housing valuation prove. Poterba (1992) proposed a User cost formula to relate housing prices with rents.

\[ R = (i + \tau + \beta + m + \delta - \pi)P \]

Where \( R \) is the rental value, \( P \) is the housing price, \( i \) is the interest rate, \( \tau \) is the property tax, \( \beta \) is the risk premium for housing investments, \( m \) is the maintenance
cost, δ is the depreciation cost and π is the owner’s capital gain. According to the formula and without taxation distortions, inflation should not have any influence on real housing prices because it is included in +i and -π.

Similarly, inflation does not change the net present value (NPV) of a rented house.

\[
NPV = \sum_{t=0}^{n} \frac{R(1+a)^t}{(1+i)^t}
\]

Where R is the rental value, a is the rate of growth in rents, i is the interest rate and t is time. Inflation is both present in a and i. As a result, inflation is neutral for the net present value of a rented house.

In contrast, Tsatsaronis and Zhu (2004) found that inflation was the main driver of housing prices and offered two potential explanations for their findings: firstly, households invest in real estate when there is considerable uncertainty about inflation levels in order to hedge against the risk that inflation erodes their wealth; and secondly, the tilt effect. Inflation tilts the real stream of loan payments to the early years of mortgages with nominal interest rates (Lessard and Modigliani, 1975) increasing the amount of the initial loan payments. When interest rates rise, ceteris paribus, granted loan amounts decrease due to the combination of higher initial loan payments and constant lending conditions like the front-end ratio. As a result, prices, sales and residential construction decline. The opposite effect happens when interest rates fall. If nominal interest rates vary due to a variation in inflation then the tilt effect is the cause of the changes in granted loan amounts.

Similarly, inflation variations, ceteris paribus, should not influence housing activity, yet empirical observations in the US market show a negative relationship. Graph1 shows the strong relationship between variations of inflation (reverse scale) and housing activity with a correlation of -0.56 between the two variables. Other economists observed the same negative relationship. Kearl (1979) refers to the negative influence of unanticipated inflation and points out to the high inflation

\[^{1}\text{We could expect a slightly positive influence if inflation rises due to an increase in demand.}\]
levels of the 1970s as the cause of a loss of housing stock. Debelle (2004) points to the decline in inflation and nominal interest rates as the reason for the greater number of households borrowing and the increase in the average level of debt per borrowing household since the 1980s. These results point out to the tilt effect as the main driver of the relationship between inflation and housing activity.\footnote{The correlation between inflation and the risk of wealth erosion is positive.} There is another finding supporting this view. The consequences of the tilt effect diminish over time and Tsatsaronis and Zhu (2004) found that the contribution of inflation to price variability was larger in the short-run than the long-run: around 90% for the one-quarter horizon, about two-thirds for the one-year horizon and more than 50% for the five-year horizon.

The high leverage of mortgages with long maturities implies that even small interest rate changes have, ceteris paribus, a strong influence on granted loan amounts. As we can see in Table 1, a mere 2% immediate increase in interest rates (from 3% to 5%) implies a fall of 21.5% in the granted amount of a 30-year mortgage loan. A 3% interest rate increase implies a fall of almost 30%. Given that mortgages play a key role on the housing market, these small changes in interest rates are able to distort the market, principally in the short-run. Since most mortgages in the USA bear a reference to nominal interest rates and conforming loans have rigid lending conditions,\footnote{Changes in conforming loan lending conditions such as the front-end ratio or the loan-to-value ratio occur occasionally.} inflation plays a negative role in US housing recessions and prices – although it should not.

The significance of the tilt effect and rigid lending conditions is enhanced by the fact that is almost the only variable that can explain housing recessions. Increases in inflation and the tightening monetary policies preceded housing recessions in major industrial economies (Ahearne et al, 2005) and main economic variables like unemployment, household income or corporate investment not only poorly explain the antecedents of housing recessions (Tsatsaronis and Zhu, 2004) but they also deteriorate after the beginning of housing recessions (Davis and Heathcote, 2005; Leamer, 2007).
3. Implications on economic recessions and the Phillips curve

In recent years there has been a growth in the literature studying the role of housing on economic recessions (Case, 2000; Davis and Heathcote, 2005; Iacoviello, 2004; Calza et al, 2009) due to the evidence of the relationship between real estate prices and financial crises (Allen and Rogoff, 2010). This strong link and the link between inflation and housing recessions implies that increases in inflation may have an influence on economic recessions, unemployment and the performance of the Phillips curve. In fact, increases in inflation have preceded housing and economic recessions in the USA for the last five decades (see Graph 2).

If we examine graphs 3 to 8 and follow the data chronologically, we observe a process with two main stages. During the first stage, we observe an upward trend with inflation rising and unemployment declining. In the second stage, matching with economic recessions, the trend is downwards, with unemployment rising and inflation tending to fall.

3.1 Initial stage. Economic growth, housing and durable goods deterioration

During the initial stage, economic activity is positive, unemployment rates fall and inflationary tensions arise. Davis and Heathcote (2005) or Leamer (2007) point out that housing recessions and falls in the consumption of durable goods usually precede economic recessions. Their observation implies that housing recessions occur during the upward stage of the process when the economy and inflation are growing. This fact is still not well understood but the “increase in inflation – housing recession” relationship due to the tilt effect could help provide an explanation. The tilt effect mainly influences activities related to long-term credits, such as housing, although it can also influence other activities related to credit such as the consumption of durable goods. Housing is mainly influenced by this relationship because of its significant effects on long-term contracts, while the consumption of durable goods can be influenced in many ways.
Firstly, some consumers use credit to buy such products and the tilt effect raises the initial loan payments above the increase in inflation, causing the same effect as an increase in prices, namely, a reduction in demand. Secondly, some durable goods such as furniture or household equipment are highly correlated with residential investment. A fall in residential investment reduces demand for these goods. Thirdly, increases in interest rates can boost adjustable rate mortgage (ARM) loan payments above the increase in income. Consequently, ARM borrowers need to reduce their consumption. Durable goods have a higher short-run income elasticity of demand than non-durable goods and ARM borrowers mainly reduce the consumption of these goods.

As inflation rises, at the end of the initial stage, the fall in real housing prices and/or activity intensifies and employment in residential construction and the durable goods industries starts to decline.

3.1.2 Second stage. The economic recession

Notice in graphs 3 to 8 that the second stage begins when inflation has increased to around 2% or 3% regardless of the initial inflation level. This fact is consistent with the influence of the tilt effect, as its consequences are due to inflation variations and not inflation levels. This means that increases in inflation have also negative effects in low-inflation economies.

At the turning point between the first and second stage, delinquencies, defaults and foreclosures on borrowers with ARM loans jump – together with unemployment. Lenders increase their losses due to the combination of these issues and higher interest rates. Summing up, household balance sheets, industrial activity and bank capital ratios deteriorate. Lower banking profits and banking regulations cause a reduction in lending due to a bank capital channel of transmission (Meh and Moran, 2010) and so consumption and investment fall: thereby causing an economic recession. Unemployment rises and inflation tends to fall. This stage is very volatile and unpredictable because it depends on highly
sensitive variables and the response of economic agents to the problems originated in the first and second stages. The magnitude depends on variables such as the deterioration of bank capital, solvency and liquidity ratios, the magnitude of the housing recession, the deterioration of household balance sheets and company profits, as well as applied monetary and fiscal policies.

In summary, we observe a common process (see Graph 9) with two main stages. In the first stage, unemployment falls and inflation rises due to economic growth, initiating a housing recession caused by the tilt effect. In the second stage, the bank capital transmission channel and the weakness in residential investment and the industry spread the recession to other economic activities. Unemployment rises and inflation tends to fall.

3.2 Historical differences in the Phillips curve

During the 20th century some economists such as Fisher (1926), Phillips (1958) or Samuelson and Solow (1960) found a negative relationship between unemployment and either inflation or the rate of wage growth. See the Graph 10 for the data of the US inflation and unemployment between 1914 and 1968. Many economists thought there was a causal and stable relation that offered an excellent tool for policy makers who would be able to choose a desired level of inflation and unemployment. The idea of a long-run trade off between inflation and unemployment was criticized by economists such as Friedman (1968) or Phelps (1969) who claimed that expected inflation would limit the influence of monetary policies on unemployment in the long-run and could cause high inflation levels without a reduction in unemployment. Empirical observations from the late 1960s and 1970s with simultaneous observations of high inflation and unemployment rates, known as stagflation, were seen as a confirmation of the Friedman and Phelps view. Even accepting the core of their critics, the fact that there is no fixed inflation rate that is consistent with a specified level of unemployment, Friedman (1976) recognized that unemployment could be kept below the natural level only by an accelerating inflation; or above it, only by accelerating deflation.
Consequently, if we had enough data relating inflation and unemployment we could still expect to see a line like the Phillips curve because periods with accelerating inflation would match with low unemployment rates and periods with decelerating inflation with high unemployment rates. In contrast, the observed data in the USA from the late 1960s onwards (Graphs 11 and 13) not only challenge the Phillips curve but also the NAIRU model and the reasonable expectation of a negative relationship between inflation and unemployment.

Empirical evidence of the influence of monetary policies on the economy (Romer, 1996) led another group of economists to propose new models that took into account the relationship between inflation and unemployment (Calvo, 1983 or Gali and Gertler, 1999). They have focused on proposing models that fit with empirical data and which help to understand the relationship between inflation and unemployment – but there is still a lack of explanations as to why data on unemployment and inflation reasonably matched with the Phillips curve or the NAIRU model until the late 1960s (see graphs 10 and 12) and then failed to do so (see graphs 11 and 13). Changes in the residential and mortgage markets, the behavior of interest rates, the tilt effect and lending constraints may help to explain this phenomenon. Mortgage maturity grew gradually from around 8 years in 1930 to around 17 years in 1940 (Morton, 1956), 20 years in 1960, around 24 years in 1970 and around 27 years in 1980 (Federal Housing Finance Agency, FHFA). The longer the maturity of the loans the greater the impact of the tilt effect on housing markets. As we can see in Table 1, an immediate 3% increase in interest rates implies, ceteris paribus, a fall of 18% in granted loan amounts when loan maturities are 15 years; but a fall of 29.7% when maturities are 30 years. Loan to value ratios (LTV) also grew from around 50% in 1930 to 70% in 1940 (Morton, 1956) and around 75% during the 1970s (FHFA). If we combine the two effects, we find that a 3% increase in inflation has the potential to cause, ceteris paribus, a fall in real housing prices of less than 6% in 1930, around 14% in 1940 and around 20% in 1970.

4 These comparisons are theoretical. The comparison of the 1970s housing mortgage market with the market before the mid-1930s is difficult. Before that date most mortgages were balloon loans and the market was less dependent on credit.
The volatility of interest rates also increased in the late 1960s when the Bretton Woods system started to collapse, increasing the influence of the tilt effect. The fact that US homeownership was around 45% during the first half of the 20th century and 62.9% in 1970 (US Census Bureau); and that household debt rose from around 30-40% of GDP between 1900 and 1945 to around 50% during the 1970s also enhanced the relationship between the housing market, the banking system and the whole economy – and consequently between increases in inflation and economic recessions or unemployment.

In conclusion, the influence of the tilt effect grew significantly after World War II because of changes in the housing and mortgage markets. As this influence grew so did the chances of a failure of the Phillips curve, following the performance shown in graphs 3 to 8.

4. Economic implications

Most economies have tried to avoid inflation related problems by focusing on price stability and inflation targeting (Fischer, 1996; Feldstein, 1997; Bernanke and Mishkin, 1997). The recent economic recessions (2007-2012) in most OECD economies have shown the weakness of this proposal, its inability to avoid the “increase in inflation-housing recession-economic recession” relationship and its difficulties in solving the present economic recession or implement measures to stimulate economic demand.

The “increase in inflation – housing recession – economic recession” relationship due to the tilt effect has been the main source of economic recessions in the USA for the last 50 years, hindering the achievement of main economic aims such as stable economic growth or low unemployment. It has hampered the implementation of demand and fiscal stimulus policies as these measures may increase inflation – even in the middle of an economic recession. Consequently, the positive effects of these measures on unemployment and economic activity
may be neutralized by the uncertainties and negative consequences of the tilt effect on housing, banking, saving and lending.

In contrast, inflation-indexed mortgages can mitigate or even avoid the relationship between increases in inflation and housing recessions because these mortgages do not cause the tilt effect. The capacity of inflation-indexed contracts to avoid the tilt effect would help to produce a better performance of the relationship between inflation and unemployment and protect savers from inflation variations. Inflation-indexed contracts would also help implement demand-stimulus policies as these contracts would protect economic agents from the negative consequences of a rising inflation.

5. Conclusions

The tilt effect can help us understand the relationship between increases in inflation and real house price variability and housing recessions in the USA; why residential investment and consumption of durable goods tends to precede economic recessions in the USA; and the observed differences in the Phillips curve between pre and post late 1960s data.

As inflation-indexed mortgages do not cause the tilt effect, they can be used to improve the performance of the Phillips curve and help avoid new housing and economic recessions encouraged by increases in inflation. The inflation indexing of the main economic contracts such as bonds, savings, rents or salaries would facilitate implementing measures of economic stimulus as these contracts would protect the economy from the negative consequences of a rising inflation.

This paper has focused on the USA in order to study an economy with few external influences that can distort data. Further studies in other economies would help to improve our knowledge about the effects of the tilt effect and borrowing constraints on the housing market and economy.
References


Appendix

Table 1 – Changes in granted loan amounts depending on loan maturities and instantaneous increases of interest rates. Initial interest rate 3%.

<table>
<thead>
<tr>
<th>Interest rate</th>
<th>Loan Maturity (years)</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>-4.6%</td>
<td>-6.6%</td>
<td>-8.5%</td>
<td>-10.1%</td>
<td>-11.7%</td>
<td></td>
</tr>
<tr>
<td>2%</td>
<td>-8.9%</td>
<td>-12.6%</td>
<td>-15.9%</td>
<td>-18.9%</td>
<td>-21.5%</td>
<td></td>
</tr>
<tr>
<td>3%</td>
<td>-13.0%</td>
<td>-18.1%</td>
<td>-22.6%</td>
<td>-26.4%</td>
<td>-29.7%</td>
<td></td>
</tr>
<tr>
<td>4%</td>
<td>-16.8%</td>
<td>-23.1%</td>
<td>-28.4%</td>
<td>-32.9%</td>
<td>-36.6%</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>-20.3%</td>
<td>-27.7%</td>
<td>-33.7%</td>
<td>-38.5%</td>
<td>-42.5%</td>
<td></td>
</tr>
</tbody>
</table>

Graph 1 – Yearly variations in the housing index and inflation index.

Graph 1 shows the gap between a housing index and the CPI y/y rate with its 3-year average. The housing index is the weighted average of housing starts and new house sales y/y, according to the Federal Housing Finance Agency. The inflation line has been forwarded 15 months.
Graph 2 – Periods of increases in inflation, housing recessions and economic recessions

Graph 3 - The Phillips curve between 1965 and 1970
Graph 4 - The Phillips curve between 1971 and 1975

Graph 5 - The Phillips curve between 1976 and 1983

Graph 6 - The Phillips curve between 1984 and 1992
The Negative Influence of the Tilt Effect and Lending Constraints on Housing Markets, Economic Recessions and the Phillips curve

Graph 7 - The Phillips curve between 1993 and 2002

Graph 8 – The Phillips curve between 2003 and 2009
Graph 9 – Common pattern of the Phillips curve

1. Increase of inflation
2. Housing recession
3. Balance sheets and capital ratios deterioration
4. Economic recession

Graph 10 - The US Phillips curve between 1914 and 1968

Graph 11 - The Phillips curve between 1968 and 2008
Graph 12 - The inflation/unemployment acceleration between 1914 and 1968

Graph 13 - The inflation/unemployment acceleration between 1968 and 2008