The Housing Market and Central Banking Policy Implications: Chinese Taipei’s Experiences

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Abstract

This paper uses the user cost of housing framework to understand Chinese Taipei house price dynamics over the past decade. We identify the strong expectations for future house price appreciation as the most significant influence on the user cost over this period. In addition, we assess the effectiveness of the policy measures undertaken by Chinese Taipei authorities to address the housing boom. We find that four rounds of targeted macro-prudential measures implemented since June 2010, combined with government policy efforts towards a reasonable property tax levy, have successfully helped lower credit growth, and restrain activity in the housing market as well as expectations for rising housing prices.

1. Introduction

The recent developments in the global housing markets have attracted the attention not only of scholars but also of policy makers as housing cycles are at the core of many financial crises. Prolonged periods of substantial capital inflows, booming real estate markets and rapid credit growth have raised financial stability challenges across many parts of Asia since the mid-2000s (IMF, 2014). Chinese Taipei is no exception; over the past decade, Chinese Taipei experienced continuously rising house prices (Figure 1), prompting concerns about housing bubbles in the making, and the potential negative impact on financial stability and the overall economy.

The housing market is a central financial stability policy concern in Chinese Taipei due to the significant proportion of property loans in bank balance sheets and the high weight of housing in household wealth. In April 2015, the real estate loan made up 35.1% of banks' loan portfolios, while household invested 33.2% of their gross wealth in real estate at the end of 2012. At the same time, the Chinese Taipei property market

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1 Real estate loan includes loans for house-purchases and house-refurbishments, and construction loans.
plays an important role in a country’s economic development, since it possesses industrial relevance and has a locomotive effect on the economy. In 2014, the construction industry as well as real estate and ownership of dwelling services accounted for 10.8 percent of gross domestic product (GDP).

Figure 1 House Price Indices in Chinese Taipei

Note: For comparison purposes, both indices use the same base year of 2010.
Sources: Cathay Real Estate and Sinyi Real Estate Inc.

Understanding the key factors behind the house price rise is important for assessing the risks to financial stability. Like other assets, house prices are influenced by interest rates, and thus monetary policy has come under scrutiny as a possible factor contributing to the escalation in housing prices. Nevertheless, there is still substantial disagreement among policymakers and academics as to what drove the housing boom. Some argue that the housing bubble was inflated by low interest rates due to loose monetary policy (e.g., Taylor, 2007) or a global savings glut while others emphasize a reduction in down payment requirements as a primary driver of the boom (e.g., Favilukis, Ludvigson, and Van Nieuwerburgh, 2013). Moreover, a third view is highlighting the role of overly optimistic expectations about future price gains in driving rapid house price appreciation (Glaeser, Gottlieb, and Gyourko, 2013).²

To understand developments in house prices, we need to recognize the dual nature of housing both as a durable consumption good and as an asset. A house is an important asset for many households, so factors such as expected capital gains can further influence house prices.³ The user cost theory (Poterba, 1984) considers the aforementioned asset feature of housing. In this paper we apply the user cost framework to explain movements in Chinese Taipei house prices for the past sixteen years. In addition, in addressing the housing market risk concerns, the Central Bank, Chinese

² See the article by Fuster and Zafar (2014).
³ See the article by Peterson and Zheng (2011).
Taipei (hereafter “the CBC”) have taken several macro-prudential measures since June 2010 to rein in banks’ real estate-related risks and support the soundness of the housing markets. In this article we assess the effectiveness of these measures by a cursory look at financial indicators and using a simplified model to analyze the interaction between macro-prudential policy and Chinese Taipei housing market variables.

The remainder of the article is structured as follows: Section 2 presents a brief overview of the user cost literature, describes the methodology of the user cost for the Chinese Taipei housing market, and interprets the estimates of the user cost for Chinese Taipei. Section 3 reviews the history of the housing sector-related prudential measures in Chinese Taipei, and describes the findings of policy impact on housing market activities, and in section 4 we conclude.


2.1 A Brief Review of the User Cost Framework and Existing Literature

There are two basic theories of housing price determination (Muellbauer, 2012). The first is based on the demand and supply of housing. The second is based on asset pricing theory and the simple proposition that market forces should equate the one-year cost of renting with the annual all-in risk-adjusted cost of home ownership. The no arbitrage equality is expressed as

\[ R_t = P_t \times UC_t \] (1)

Where \( R \) is the rent, \( P \) is the house price, and the fraction \( UC \) is known as the user cost of housing. Rearranging equation (1) gives the following expression of the correlation between the rent-to-price ratio and user cost:

\[ \frac{R_t}{P_t} = UC_t \] (2)

The formula for the annual cost of home ownership is the sum of six components representing both costs and offsetting benefits (Himmelberg et al., 2005). The first component is the funding cost of the investment in a house. It can be interpreted in two ways (Nakajima, 2011). If a person buys a house with a mortgage loan, he has to pay interest on the mortgage every year. The total mortgage interest payment is approximately the annual mortgage interest rate multiplied by the house price. If a person buys a house with cash, there is an opportunity cost, which is the forgone profit by taking alternative asset. The forgone interest income can be expressed as the risk-free interest rate multiplied by the house price. The second component is the one-year cost...
of property taxes, calculated as house price times the property tax rate. The third component is an offsetting benefit to owning, namely, the tax deductibility of mortgage interest and property taxes. This can be estimated as the effective tax rate on income times the estimated mortgage and property tax payments. The fourth term reflects maintenance costs, including depreciation costs, expressed as a fraction of house price. The fifth term represents an additional risk premium to compensate homeowners for the higher risk of owning.

Finally, the sixth term is the expected capital gain (or loss) during the year. The expected capital gain on the house is a benefit to ownership when owner sells the house, so the expected amount of this gain should be subtracted from the cost of ownership. However, overly optimistic expectations for capital gains can drive prices above fundamental values (Schiller, 2006). In the analysis of user costs, the variable of expected house price appreciation is difficult to measure. Methods employed in similar analyses include consumer survey for house price expectations and historical average of capital gains, where expectations were assumed to be backward-looking. However, due to short of conducting a survey of housing market participants, the backward-looking assumption is standard in the literature. For example, Krainer (2002) use a 1-year average in the United States study, Bourassa and Yin (2006) use a 3-year average in Australian, and Browne et al. (2013) use a 4-year average in Ireland. Similarly, both Poterba et al. (1991) and Mayer and Sinai (2007) use a 5-year average in the United States, and Kivistö (2012) uses a 5-year average in Finland. Further, Muellbauer (2012) suggests using a 4-year average as a candidate for measuring user cost. In contrast to expectations proxy by a short rolling average, Fox and Tulip (2014) adopt a long-term average in Australian.

Nevertheless, several limitations of the user cost approach are worth noting. First, the user cost analysis is partial equilibrium. Second, there are many influences on the housing market which the user cost of capital approach does not, and cannot, take into account. Supply constraints in the housing market can play a big role in the long-term. Third, the estimates of user cost usually involve several simplifications: (i) taking rent and expected capital appreciation as exogenous. (ii) assuming partial components (e.g. risk premium) as constant. In a realistic model, components change over time and

Some researchers have different views on the risk premium to compensate homeowners. For example, Fox and Tulip (2014) argue that it is not clear that the financial risks of home ownership should outweigh renters’ insecurity of tenure and uncertainty regarding future rents, or how this might be quantified. Kivistö (2012) states that for homeowners, owning their house may be taken as protection against insecurity for which they are willing to pay, and, hence, the risk premium could even be negative. To investors, in turn, housing is generally a less liquid asset than for example equities and deposits, which sets the required risk premium well above zero.
interact.

The user cost approach is extensively employed to the detection of housing bubbles by comparing the user cost of housing with rents. To give some examples, Baker (2002), McCarthy and Peach (2004), Himmelberg, Mayer and Sinai (2005) and Gallin (2005) value houses using the user cost in the United States. Kivistö (2012) and Browne et al. (2013) conduct similar studies for Finland and Ireland, respectively. The OECD (2005) provides international comparisons. In addition, a growing number of studies apply the user cost approach to explore the key factors behind the fluctuations in house prices. Krainer (2002) constructed estimates of the user cost for the United States housing market, and found that the strong housing demand at the early 2000s was due primarily to strong expectations for future price appreciation. Likewise, Fox and Tulip (2014) decomposed housing values into contributions from rents, interest rates, expected appreciation and other factors, and found that the boom in Australian house prices in 2002-2003 can largely be attributed to expectations of further capital appreciation.

Applying the user cost model, Peterson and Zheng (2011) demonstrated that both the falling real interest rates and the expectations for rising house prices have contributed to the reduction in the user cost of capital during 2000s, and thus could help to explain the rise in house prices. Kivistö (2012) adopted the user cost concept to discuss the development of housing prices in Finland, and concluded that the key determinants of user cost dynamics are house price expectations and level of interest rates; in particular, the interest rate fall, has had a significant impact on the reduction in user costs and, hence, housing prices. Similarly, Browne et al. (2013) employed the user cost framework to describe Irish house price dynamics since 1980, and found between 2002 and 2007, a combination of factors including rapid house price appreciation and the prevailing fiscal and monetary environment created a strong bias towards homeownership.

2.2 Estimation of the User Cost for Chinese Taipei Housing Market

In the following analysis, we will apply the user cost framework to Chinese Taipei data for 1999-2014. All variables are on a quarterly basis. For the house price data, we adopt the Sinyi housing price index (for existing buildings) and the Cathay housing price index (for new constructions) compiled by the private real estate companies, as there were no official aggregate house price series. My source for rent data is the rent component from the Consumer Price Index (CPI) published by the Directorate General

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5 See the article by Fox and Tulip (2014).
of Budget, Accounting and Statistics (DGBAS).

The user cost for Chinese Taipei housing market is calculated following a concept proposed by Himmelberg et al. (2005). It is a sum of six components, including the funding costs, property tax, depreciation cost, maintenance cost, the risk premium on residential investment, and the expected appreciation of property value. Unlike the U.S., property tax payment is not tax deductible under the tax system in Chinese Taipei. The user cost of housing (measured as a percentage of the property value), $UC$, is thus defined as:

$$UC_t = [\psi r_t^{rf} + (1-\psi) r_t^m (1-\tau)] + \omega + \delta + m + \gamma - E[\%\Delta P],$$

(3)

The first term in the user cost is real after-tax funding cost ($[\psi r_t^{rf} + (1-\psi) r_t^m (1-\tau)]$), a composite of the opportunity cost of owner’s equity (weighted by equity ($\psi$)) and the mortgage rate (weighted by debt ($1-\psi$)). The real interest rate on 10-year government bonds (deflated by annual consumer price inflation) is assumed to be the opportunity cost ($r_t^{rf}$). The gross opportunity cost is therefore this rate per period multiplied by the cash portion ($\psi$, assumed to be constant at 30%; in other words, assuming a 70% loan-to-value ratio) used in the acquisition of the house. The direct debt cost of funding is captured by real after-tax mortgage interest rate (deflated by annual consumer price inflation). For mortgage interest rate ($r_t^m$), we use the interest rate of new loans for house-purchasing extended by five leading banks. Mortgage interest can be deducted from income subject to tax, so this element of user cost should also be reduced by the income tax rate. The tax variable ($\tau$) used is the average effective income rate from 1999 onwards. Two interest rates are included in the total funding cost, a government bond rate and a mortgage rate. Both series are sourced from the CBC’s Financial Statistics Monthly, and the quarterly data are averaged from monthly data. The data of annual consumer price inflation in a quarterly frequency are averaged from monthly data taken from DGBAS.

The second component in the user cost is property tax rate ($\omega$). Unlike the regime observed in most countries where properties are usually taxed in a lamp-sum fashion, called real estate tax, the property tax in Chinese Taipei is composed of a house tax and a land tax. In Chinese Taipei, for owner-occupied residential usage, the stipulated tax rates for land and house are 0.2% and 1.2% respectively. However, the assessment of the tax bases for those two taxes are not based on their market values, as most countries

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6 The data of effective rate on income after the year 2012 are not released yet. The effective income rates for Chinese Taipei ranged from 4.99% to 6.69% over the reference period (1999~2012), with an average rate of 5.9%. 

do, but rather on official appraisal committee. The tax bases determined by the official appraisal committee are far below the market values of the properties due to historical or political reasons; thus, the actual amounts of tax paid by property owners are far below the amounts that should have been paid if market values are taken as tax bases instead (Wu and Wang, 2007). As reported in Academia Sinica (2014), the effective property tax rate account roughly for only one-tenth of the nominal rate stipulated. The study by Peng, Wu, and Wu (2007) reached the similar conclusion; the average effective tax rates for properties in two of the districts of Taipei for the year 2005 are only 0.09% and 0.13% respectively. Thus, the (effective) property tax rate used is set at 0.1%.

Following Mayer and Sinai (2007), the combined cost of depreciation (δ) and maintenance (m) is assumed to be equal to 2% of the value of the property per year. The fifth input to user cost is the risk premium (γ). Since γ is not observable, we will estimate it in two ways. The first specification is set at a 2% of low risk premium, which has been commonly used in similar analyses (Himmelberg et al. 2005; Mayer and Sinai, 2007). The second approach is that a risk premium is modelled in terms of a measure of house price volatility, suggested by Muellbauer (2012). We use the sample mean of house price volatility as a proxy for high risk premium. Over our sample period, the real house price volatilities of Sinyi housing price index and the Cathay housing price index were 14.4% and 9.6% respectively.

The final component in the user cost is the expected house price appreciation (E[ΔP_t]). It is also not observable, and must be relied upon to impute the estimates. While there is not a universal law of precisely how house price expectations are formed, a number of observers of the housing market in the US and elsewhere, attribute wild house price swings to backward-looking expectations (Browne et al., 2013). The same assumption is made here. Using a similar timeframe to Poterba et al. (1991) and so on, the average of annual real house price growth over the past 5 years forms the price expectations. Expectations of house price appreciation have a relatively large impact on developments in user costs. For robustness, we calculate the user costs using several alternative assumptions on house price expectations, including a 1-year rolling average, a 3-year rolling average, 4-year rolling average, and a long-term average of house

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7 The housing price volatility, hpvol, is defined as a moving average of the absolute deviation of changes in log real housing prices, lnhp, from their mean, m, as follows: $hpvol_t = abs(\Delta_t lnhp_t - m + 0.7 \times abs(\Delta_{t-4} lnhp_{t-4} - m) + 0.7^2 abs(\Delta_{t-8} lnhp_{t-8} - m) + 0.7^3 abs(\Delta_{t-12} lnhp_{t-12} - m))/(1 + 0.7 + 0.7^2 + 0.7^3)$

8 The analysis is constrained by data limitations. We use the sample-period average of real house price appreciation as the long-term average proxy. Over our sample period, the average of annual real house price growth for Sinyi housing price index and the Cathay housing price index were 5.35% and 2.36% respectively.
price appreciation. Nevertheless, we find the trend in estimated user cost using a 5-year average appreciation displays highly correlated with the trend in rent-to-price ratio (see details in section 2.3).

2.3 Interpretation of the User Cost for Chinese Taipei Housing Market from 1999 to 2014

The previous section outlined the various components of the user cost of housing. Aggregating the components of equation (3), Figure 2 shows our estimates of the real user cost of housing and its components (measured as a percentage of the property value) from 1999Q1 to 2014Q4. To avoid clutter, this chart only exhibits the estimates of user costs with a 5-year rolling average for house appreciation. We estimated two kinds of the user cost for Chinese Taipei housing market: one for existing buildings (the Sinyi housing price index) and one for new constructions (the Cathay housing price index). We make three observations about Figure 2.

1. Higher expected house price appreciation the key factor behind the decline in user cost

The user cost trends down over our sample. It is clear that the user cost has been reduced by the decline in real interest rates as well as by the increase in house price expectations. The higher expected appreciation, in particular, has had a major impact on the reduction in user costs, while decline in real interest rate made moderate contributions. To illustrate, over the sample period, the user costs of Sinyi housing price index have fallen about 19 percent. This reflects a decline in interest rates, contributing 4.9 percentage points, and a rapidly increasing expected appreciation, contributing 14.1 percentage points. Likewise, the user costs of Cathay housing price index have declined about 15 percent. This reflects a falling in interest rates, contributing 4.9 percentage points, and a higher expected appreciation, contributing 10.1 percentage points.

Falling real interest rates have been a global phenomenon over the past decade. Advanced economy policy rates did indeed fall strongly and rapidly in the wake of the two financial busts since 2000, and concerns about unwelcome capital flows and exchange rate movements in turn have transmitted low interest rates in core advanced economies to emerging market economies (EMEs)\(^9\). Mohanty (2014) also states that both the short and long-term interest rates of EMEs have been heavily influenced by those in the advanced economies. Owing to the global low interest rate environment, and the aim to promote domestic economic growth in view of global economic uncertainties as well as a negative domestic output gap after the global financial crisis,

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\(^9\) See the article by Hofmann and Bogdanova (2012)
the domestic interest rate now stays at a lower level, when compared with the early 2000s.

**Figure 2 Chinese Taipei: Historical Estimates of the User Cost and its Components**

(a) Sinyi Housing Price Index (for existing buildings)

(b) Cathay Housing Price Index (for new constructions)

Note: The user cost is calculated on the basis of low risk premium. Source: author’s calculations

2. User cost turned negative since 2010 as a result of strong expectations for future appreciation

The Figure 2 indicates that the user cost for Chinese Taipei housing market was positive before the mid-2000s, and then turned negative during the period of rapid growth in house price, from the late 2000s until 2014. Since mid-2009, bolstered by an influx of capital inflows, low interest rates in the wake of the financial crisis, the domestic economic recovery and the upgrading of five cities, housing prices have kept rising. During a housing boom, expectations regarding future house prices are typically optimistic (Case and Shiller, 2003; Bolt et al., 2014), and, in turn, reduce user costs.
Nevertheless, in the second half of 2014, the launch of fourth round of macro-prudential measures taken by the CBC, associated with the proposed implementation of tax act against the short-term property speculation, helped restrain expectations for rising housing prices, and the fall in user costs has come to a halt.

Irish Fiscal Advisory Council (2014) pointed out that significantly negative user costs are often associated with speculative bubble-type behavior, as was the case in Ireland prior to the crash. Thus, as argued by Muellbauer (2012), central banks and other policymakers need to conduct regular surveys of the housing price expectations of potential housing market participants to help assess the overshooting. In order to monitor the development of real estate market and safeguard the financial stability, the CBC has quarterly surveyed a panel of bankers regarding their expectations on future house prices for the main metropolitan areas from mid-2000s.

3. The limited impact of taxation on the estimated user cost

Figure 2 indicates that, rather than increasing the cost of home ownership, the taxation effect has been negligible throughout the sample period. This is because the relative low effective property tax rates in Chinese Taipei. As reported in Wu and Wang (2017), the overly low property tax incidences have greatly distorted the homeowners’ user cost downward to an incredibly low level which, in turn, results in an overly distorted preference in favor of owning rather than renting and hence bring about the extraordinary high rent multipliers (defined as the a ratio of house price to the monthly rent) for the case of Taipei.

Concerning about the low tax burdens for property ownership in Chinese Taipei, the academic sector has urged the government to conduct tax reform to curb unreasonable property prices and provide a fairer property tax system. Recently, the government passed amendments to the Income Tax Act that combine the separate taxations on house and land sales as part of an overhaul of the nation’s property tax system (see details in section 3.1). Under the new bill, the government is moving toward taxing the actual gains from the sale of both the land and the house. This policy will prevent people from avoiding taxes when the two items are taxed separately. It is also expected to bring Chinese Taipei’s real estate tax system more in line with the rest of the world.

2.4 The Relationship between the User Cost and the Rent-to-Price Ratio

Assessments of user costs are sensitive to assumptions about expected capital gains. Figure 3 shows the estimates of the user cost of housing using five alternative assumptions on house price expectations. The estimated user cost using 1-year rolling
average of house price appreciation displays more volatility that the estimate of user cost using the alternative expectation assumptions. Nevertheless, the figure illustrates that the trends in the user cost are similar under alternative assumptions on house price expectation. In particular, under the medium term (3 to 5 years) memory assumptions, the user cost turns negative from the late 2000s.

**Figure 3 The User Cost and Rent-to-Price Ratio in the Chinese Taipei Housing Market: under the Alternative Expectation Assumptions**

(a) Sinyi Housing Price Index

(b) Cathay Housing Price Index

Note: The user cost is calculated on the basis of low risk premium.
Source: author’s calculations

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Expectation assumption</th>
<th>1-year historical average appreciation</th>
<th>3-year historical average appreciation</th>
<th>4-year historical average appreciation</th>
<th>5-year historical average appreciation</th>
<th>Sample-period (16-year) historical average appreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinyi Housing Price Index</td>
<td>0.69</td>
<td>0.85</td>
<td>0.89</td>
<td>0.92</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Cathay Housing Price Index</td>
<td>0.69</td>
<td>0.83</td>
<td>0.86</td>
<td>0.86</td>
<td>0.54</td>
<td></td>
</tr>
</tbody>
</table>

Note: The user cost is calculated on the basis of low risk premium.
Source: author’s calculations

Based on the user cost framework, we can compare the user cost measure to the rent-to-price ratio. Over the sample, the rent-to-price ratio in the Chinese Taipei housing market has shown a declining trend, as housing prices have increased more rapidly than rents. The movement of the rent-to-price ratio, on average, is consistent with that of the user cost, as shown in the Figure 3. If we focus on 5-year historical expectations, the relationship between these series is very close, which can be further verified by the
correlation (Table 1). The correlation coefficient between the user cost and the rent-to-price ratio is the highest when the user cost measured with 5-year average appreciation. Further, the development of user costs and the rent-to-price ratio is analyzed in comparison to the base year 2011 (Figure 4). We find the volatility of the user cost series is greater than that of the rent-to-price ratio series, which is similar to an empirical phenomenon of the US data (Blackey and Follain, 1996).

In sum, irrespective of the approach taken to measuring user costs, we may draw the conclusion that the decline in the rent-to-price ratio over the past decade largely reflected in the reduction of user costs. User cost developments would actually have explained a rapid increase in the Chinese Taipei housing prices.

**Figure 4 The User Cost and Rent-to-Price Ratio in the Chinese Taipei Housing Market: the Base Year 2011**

(a) Sinyi Housing Price Index

(b) Cathay Housing Price Index

Notes: 1. The user cost is calculated on the basis of high risk premium.
2. The base year for the comparison of user costs and the rent-to-price ratio does not mean it is the market equilibrium point.
Source: author’s calculations

3. The Effectiveness of Recent Macro-Prudential Measures in Chinese Taipei

3.1 Overview of the Housing Sector-Related Prudential Measures

10 The user cost measured with the low risk premium can take on negative values if rates of capital appreciation in housing price exceed interest rate and other costs of owning a home. In order to indexation, we need to introduce the high risk premium to get positive values of user costs.

11 For Sinyi housing price index, the standard deviation of the user cost series is 1.5 times of that of the rent-to-price ratio series. For Cathay housing price index, the standard deviation of the user cost series is 3.4 times of that of the rent-to-price ratio series.
1. Targeted macro-prudential measures on real estate loans taken by the CBC

In response to surging house prices in specific areas in Chinese Taipei and banks’ excessive concentration of credit in real estate related loans, the CBC has adopted four rounds of targeted macro-prudential measures governing housing loans in the stipulated Specific Areas, and high-valued housing loans and land collateralized loans nationwide since June 2010 (Table 2). These measures aimed primarily at dampening property and land speculation fueled by bank credit, while urging financial institutions to enhance risk management associated with credit extension so as to protect depositors’ rights and promote financial stability.

Table 2 Summary of the CBC Targeted Prudential Measures

<table>
<thead>
<tr>
<th>Items</th>
<th>Effective date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing loans in Specific Areas</td>
<td></td>
</tr>
<tr>
<td>Applicable Areas</td>
<td>Taipei city and 10 other districts in New Taipei City</td>
</tr>
<tr>
<td>Maximum LTV ratio on individuals' second (or more) housing loans</td>
<td>70%</td>
</tr>
<tr>
<td>Maximum LTV ratio on corporate legal persons' second housing loans</td>
<td>60% (for properties in Specific Areas and properties deemed as high-priced housing)</td>
</tr>
<tr>
<td>Land collateralized loans</td>
<td>Maximum LTV ratio</td>
</tr>
<tr>
<td>High-value housing loans</td>
<td>Maximum LTV ratio</td>
</tr>
<tr>
<td>Loans for third (or more) home purchase(s)</td>
<td>Maximum LTV ratio</td>
</tr>
<tr>
<td>Housing loans by corporate legal entities</td>
<td>Maximum LTV ratio</td>
</tr>
</tbody>
</table>

Source: CBC; author’s summary.

(1) Regulations to govern the extension of housing loans in specific areas by financial institutions in June 2010
The CBC approved the promulgation of the *Regulations Governing the Extension of Housing Loans in Specific Areas by Financial Institutions* in June 2010. Under the Regulations, housing loans extended to borrowers who have taken out second (or more) outstanding housing loans cannot exceed 70 percent of the collateral value and have no grace period. The Regulations apply to the area of Taipei city and ten other districts in New Taipei City.

(2) The amendment of regulations to housing loans in specific areas and land collateralized loans in December 2010

Concerning about the increasing credit extension of banks’ housing loans in other unregulated regions neighboring the specific areas, and mounting problems that mortgage risk management would be inconsistent between public banks and private banks in terms of various loan standards, the CBC amended the *Regulations Governing the Extension of Housing Loans in Specific Areas by Financial Institutions* in December 2010. Major amendments included the following: (i) three districts in New Taipei City were added to the scope of Specific Areas in the Regulations; (ii) lowering the maximum LTV ratio on second housing loans for home purchases in Specific Areas from 70 percent to 60 percent; (iii) land collateralized loans became subject to a maximum loan-to-value (LTV) ratio of 65 percent of the acquisition cost or the evaluation value, whichever is lower, where 10 percent of the approved loan amount cannot be disbursed until construction commences.

(3) Additional measure targeting high-value housing loans in June 2012

In view of banks having granted high-value housing loans with overly high LTV ratios, which went against sound principles of credit risk management and undermined banks’ soundness, the CBC adopted targeted prudential measures with respect to high-value housing loans. Housing loans for properties located in Taipei City or New Taipei City with an appraisal or sale value of NT$80 million or above, or those located elsewhere in Chinese Taipei with an appraisal or sale value of NT$50 million or above shall be subject to a loan-to-value ratio capped at 60% with no grace period.

(4) The amendment of regulations to real estate loans in June 2014

In order to further strengthen financial institutions’ management of real-estate associated credit risks, the CBC amended the *Regulations Governing Home mortgage Loans and Land Loans Extended by Financial Institutions* in June 2014. Important amendments included: (i) expanding the scope of Specific Areas to include four more districts in New Taipei City and four districts in Taoyuan City; (ii) introducing a LTV ratio cap of 50% on a new housing loan taken out by a single borrower for his/her third
or more home purchase, applicable to properties across the country; (iii) revising the
definition of high-valued housing\(^{12}\), of which the LTV ratio ceiling was lowered to 50%;
(iv) lowering the LTV ratio ceiling on housing loans taken out by corporate legal
entities to 50%.

Besides the above mentioned regulations, the CBC also asked financial institutions
to pay attention to risk management when handling the following mortgage-related
business. Important measures included: (i) For real estate lending in “non-specific areas”
with considerable housing price surges, financial institutions were urged to formulate
and implement prudential measures for self-discipline. (ii) Financial institutions were
urged to exercise caution regarding loans collateralized against industrial area land,
rigorously observe credit regulations in extending such loans, and refrain from relying
solely on collateral appraisal or borrowers’ status as principals of large companies to
grant a large credit line.

In addition, the CBC noted that domestic banks mostly adopted floating-rate
mortgage loans. Meanwhile, the ratio of mortgage expenditure to household income
exceeded 30% in Chinese Taipei. As a consequence, the CBC continuously alerted
borrowers to pay attention to the risk of interest rate fluctuations in the future and to
prepare a well-developed financial plan in advance.

2. Risks management measures for real estate loans undertaken by the FSC

In line with the CBC’s targeted prudential measures, in March 2011, the Financial
Supervisory Commission (FSC) announced three measures to supervise the real estate
lending risks of banks, including: (i) clearly defining self-use residence loans and
raising capital charges for non-self-use residence loans\(^{13}\); (2) requesting banks to
strengthen concentration risk management of real estate lending, ascertain the purpose
of loans and cautiously determine real estate values; (3) including the extension of real
estate lending into one of the key items subject to financial examination.

Moreover, in order to address potential risks resulting from house price declines,
the FSC required domestic banks to carry out stress tests in May 2014 using financial
data as of the end of 2013. The test result showed that all banks’ capital adequacy ratios

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\(^{12}\) The definition of high-valued housing is revised as follows: (i) properties located in Taipei City with
an appraisal or sale value of NT$70 million or above; (ii) properties located in New Taipei City with
an appraisal or sale value of NT$60 million or above; (iii) properties located elsewhere in Chinese
Taipei with an appraisal or sale value of NT$40 million or above.

\(^{13}\) The FSC issued a directive on 21 April 2011, allowing the use of either a 45% risk weight or 35%/75%
risk weight under the LTV method for new self-use residence loans granted by banks, while non-self-use
residence loans were assigned a risk weight of 100%. Self-use residence loans refer to loans applied for
by nationals without domestic residence for the purpose of purchasing residences for self-use.
were higher than the minimum standard of 8% under the stress scenarios, indicating that banks were still able to react to potential losses arising from house price declines. Subsequently, in December 2014, the FSC has announced that banks are now required to maintain a loss provision ratio of at least 1.5% against loans for home purchase, refurbishment, or construction for the purpose of improving the risk-bearing capacity of banks.

3. Real estate tax reform undertaken by the MOF

The policy stance of the CBC and the FSC in the risk management of mortgage finance has been in coordination with the “Plan to Enhance the Soundness of the Housing Market” formulated by the government. In June 2011, the Ministry of Finance (MOF) joined the line to improve a sound housing market by reinforcing tax audits with a focus on speculative real estate transactions. The MOF introduced the Specifically Selected Goods and Services Tax, or the so-called “luxury tax”, which imposes a tax of 10%-15% on the sale price of non-self-use residences and city land with building permits (land for construction in urban planning areas) that were bought less than two years ago, while not applicable to reasonable, ordinary or involuntary transfers of properties.

Furthermore, in June 2015, Legislative Yuan approved a tax reform plan proposed by the MOF that will impose a capital gains tax of up to 45 percent on profits obtained from properties held for less than a year. The new tax plan has been scheduled to take effect on January 1, 2016. Gains on the sale of property are currently taxed based on government-assessed property values, which are much lower than the actual market value. The tax rate falls to 35% if the property has been held for 1 to 2 years, 20% if it has been held between 2 and 10 years, and 15% for properties held more than 10 years. Non-resident foreign nationals or foreign institutions headquartered overseas will face the same 45% tax rate when they dispose of a property after owning it for less than a year, but the 35% tax rate will apply to gains on sales of all properties held for more than one year. People who live in the homes they own will get a tax break if they sell their home after living in it for at least 6 years. In those cases, gains of up to NT$4 million will be tax exempt, and any gains above NT$4 million will be taxed at a 10%.
prices, but they will be taxed based on the actual gains made in the future. Once the new capital gains tax takes effect, the luxury tax enforced since June 2011 will be abolished.

4. Improving housing information measures by the MOI

Following the steps of the CBC, the FSC, and the MOF, in October 2012, the Ministry of Interior (MOI) set up a property transaction price registration system and established a data warehouse that allows the public to inquire about the related information via the Internet. It is aimed to increase the transparency of real estate transaction information, thus decreasing the differentiation of anticipated prices between buyers and seller, and, in turns, increase the effectiveness of the real estate market.

3.2 Positive Policy Effects

Ever since the CBC launched the above-mentioned regulations to govern real estate-related loans of banks, in conjunction with several measures adopted by the FSC to supervise the real estate credit risks of banks, the continuous promotion of real estate tax reform, strengthening of tax audits on real estate transactions and improving the property transaction price registration system, the effort has been come to fruition.

The CBC and the FSC policy measures to tighten risk management on the real estate-related loans of banks have eased the concentration of real estate lending in banks' loan portfolios. Banks were also found to have granted loans for housing in the designated Specific Areas and high-valued housing across the country at lower LTV ratios and higher mortgage rates. This is conducive to sound banking operation and to the attainment of financial stability.

Figure 5 Annual Growth Rates of Real Estate Loans in Chinese Taipei

- Loans for house-purchases and house-refurbishments (LHS)
- Construction loans (RHS)

Notes: 1. Based on monthly data from domestic banks and local branches of foreign banks.
2. LTV1~LTV4 refer to effective dates of four rounds of targeted macro-prudential measures governing housing loans introduced by the CBC.
Source: Financial Statistics Monthly, CBC.
1. The concentration of housing loans by financial institutions improved

A cursory look at real estate credit developments suggests that the measures were effective: housing loans growth slowed considerably after the first measures were taken in June 2010 (Figure 5). As a result, the concentration of housing loans by financial institutions decreased from 27.62% in June 2010, before the promulgation of the new regulations, to 26.69% in April 2015. In addition, the concentration of housing loans in the stipulated Specific Areas also decreased from 70.20% in June 2010 to 53.43% in March 2015 (Figure 6).

![Figure 6 Housing Loans Ratios in Chinese Taipei](image)

Notes: 1. Housing loans include loans for house-purchases only.
2. Based on data from domestic banks and local branches of foreign banks.
Sources: Financial Statistics Monthly, CBC; Financial Stability Report, CBC.

2. The LTV ratio of real estate-related loans slid significantly, while mortgage interest rates gradually increased

(1) The average LTV ratio of housing loans in Specific Areas fell by 7.01 percentage points to 56.90 percent, and the average mortgage rate rose to 2.15 percent in March 2015 (Figure 7(a)).

(2) The average LTV ratio of newly-extended land collateralized loans declined to 61.89 percent, and the average mortgage rate climbed to 2.87 percent in March 2015 (Figure 7(b)).

(3) The efforts of the aforesaid policy measures had successfully pushed the average LTV ratio of high-valued housing loans down to 48.36 percent, and brought the average mortgage rate upwards to 2.20 percent in March 2015 (Figure 7(c)).
(4) The average LTV ratio on loans for third home purchase dropped sharply to 48.70 percent, while the average mortgage rate trended up to 2.29 percent in Dec. 2014 (Figure 7(d)).

3. Real estate market cooled off as downward trends on house prices and trading volume growth

The macro-prudential policies do not aim at targeting house prices but may help to dampen the amplitude of property-price cycles. House price and transaction volume growth decelerated following the housing sector-related prudential measures introduced since June 2010 (Figure 8). The annual growth rates of the Sinyi housing price index (for existing buildings) and the Cathay housing price index (for new constructions)
fluctuated with a downward trends. The number of building ownership transfers for transaction also saw a decrease. All prudential measures had an immediate impact on house price and transaction volume growth, but while the effect of June 2012 measures tapered off somewhat.

**Figure 8 Annual Growth Rates of House Price and Building Ownership Registrations for Transaction in Chinese Taipei**

![Graph showing annual growth rates](attachment:figure8.png)

Notes: 1. The statistic data of building ownership registrations for transaction in quarterly frequency start from 2007Q1.
2. LTV1~LTV4 refer to effective dates of four rounds of targeted macro-prudential measures governing housing loans introduced by the CBC, and Tax refers to effective date of luxury tax introduced by the MOF.

Sources: Real Estate Information Platform, MOI, Cathay Real Estate and Sinyi Real Estate Inc.

In addition, on a quarter-on-quarter basis, compared with pre- and post-regulation windows, tightening of LTV regulations and the introduction of the luxury tax tend to be associated with a sharp decline in the speed at which transaction volume and house price increase. Specifically, the quarterly growth rate of building ownership transfers fell on average by 10.6 percent in Chinese Taipei after regulations, compared with the corresponding rate of increases during the pre-regulation six-quarter period (Figure 9(a)). Similarly slowdown effect on the house price growth also existed but at a mild pace: the growth in house unit price fell on average by 3.6 percent in Chinese Taipei after regulations (Figure 9(b)). For the stipulated Specific Areas (Taipei city and New Taipei city), regulations have stronger cooling effects on transaction volume and house price increase in most cases.

Meanwhile, as Chinese Taipei has experienced real estate boom in recent years, in the most of times, homebuyers are optimistic about future house price movements in the survey (Figure 10). This phenomenon is similar to Bracke (2010)’s finding that expectations of future appreciation are linked with past observed appreciation by
Figure 9 Quarterly Growth Rates of House Unit Price and Building Ownership Registrations for Transaction in Chinese Taipei

(a) Building Ownership Registrations

(b) Average House Unit Price

Notes: 1. The statistic data of building ownership registrations for transaction in quarterly frequency start from 2007Q1. The statistic data of average house unit price (per ping) for transaction in quarterly frequency start from 2007Q3.

2. Pre-restriction bars refer to average quarterly growth rate over the six-quarter period before targeted macro-prudential regulations. Post-restriction bars refer to average quarterly growth rate over the eighteen-quarter period after targeted macro-prudential regulations.

3. The data are in quarterly frequency and span the period from 2009Q1 to 2014Q4.

Source: Real Estate Information Platform, MOI.

Figure 10 Composite Scores for House Price Trend in Chinese Taipei

Notes: 1. The composite scores for house price trend compiled by the MOI range from 0 to 200. A score of 100 indicates that the number of people expecting prices to rise is equal to the number of those expecting the opposite, while a score above 100 indicates that more people expect prices to rise, and vice-versa. The scores data start from 2002Q1.

2. LTV1~LTV4 refer to effective dates of four rounds of targeted macro-prudential measures governing housing loans introduced by the CBC, and Tax refers to effective date of luxury tax introduced by the MOF.

Source: Real Estate Information Platform, MOI.

analyzing some of the survey information. While composite scores for house price trend (an indicator for public confidence in house prices) did decelerate in next quarter(s)
following the first three rounds of macro-prudential measures, they stayed a score above 100, indicating that more people expect prices to rise. Nevertheless, the introduction of the fourth round of macro-prudential measures, combined with government policy efforts towards a reasonable property tax levy, have successfully helped restrain expectations for rising housing prices. In 2014Q4, composite scores for house price trend dropped below 100 points.

4. Estimating the effect of macro-prudential regulations

In the following analysis, we will assess on whether targeted prudential policy is an appropriate tool for stabilizing real estate-related risks. A proper empirical analysis of the effectiveness of these measures requires controlling for other factors in which they were taken. Krznar and Morsink (2014) constructed two separate equations for mortgage credit and house prices to evaluate the impact of macro-prudential measures in Canada, after controlling for the impact of other economic and financial factors. Similarity to their approach, we estimate the baseline regression as follows:

\[ Y_t = \alpha + \beta'X_t + \gamma D_t + \epsilon_t \] (4)

where \( Y_t \) is mortgage loan or house price year-on-year growth rate; \( X_t \) is a matrix of control variables (lagged); \( D_t \) is a dummy variable (current or lagged) that takes on the value of 1 when macro-prudential measures are in place and zero otherwise (in the mortgage credit equation). We isolate the effects individual rounds of measures, and dummy variable takes a value of 1 until the end of the sample. In other words, the effect of subsequent measures is estimated taking into account the existence of previous measures. The mortgage loan equation includes the house price growth, the mortgage interest rate, the wage growth, and the unemployment rate. In the house price equation, we include mortgage loan growth, growth in coincident business index, and the number of building sales (converted to natural logarithms). There are no macro-prudential dummies in the house price equation since it is assumed that macro-prudential measures

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17 Similar studies such as Igan and Kang (2011), which used OLS to regresses housing and mortgage market variables in separated single equations for Korea case; and HKMA (2014), which constructed a vector auto-regression (VAR) model to analyze the Hong Kong case.

18 The analysis is constrained by important data limitations. There are no publicly available housing loans broken down by regions. Therefore, the analysis focuses on aggregated measures of mortgage loans. Moreover, house price in monthly frequency are only available for the metropolitan area of Taipei compiled by the Sinyi Real Estate Inc. Thus, we use Sinyi Housing Index- the metropolitan area of Taipei for analysis.

19 All the control variables enter equations with lags to account for delays in mortgage loan/house price response to the change of their determinants.

20 The effects of macro-prudential policy should be interpreted with caution because of possible endogeneity of macro-prudential measures.
affect house prices indirectly through the mortgage credit. Each equation is estimated using ordinary least squares (OLS) for variable of interest separately. All variables are on a monthly basis in a sample from January 2006 to March 2015. The sample period is limited by data availability. The data definition and source of each variable are provided in Appendix.

Table 3 presents the estimation results of mortgage loan equation. The preliminary empirical results suggest that macro-prudential policies helped to limit the increase in housing loans. The coefficients of policy dummies are negative as expected and highly significant. Policies had a significant impact on mortgage credit growth, around 5.3 percentage points on average during the period when they were in force. By reducing mortgage loan growth, macro-prudential policies also dampened house price growth. The estimated equation for house price growth indicates that mortgage credit growth has almost a one-for-one third effect on house price growth (Table 4). Thus, without prudential measures, the house price growth would have been, on average, higher by about 1.9 percentage point than actually observed since June 2010.

### Table 3 Estimation Result: Mortgage Loan Equation

<table>
<thead>
<tr>
<th>Constant</th>
<th>House price (y/y, lagged)</th>
<th>Mortgage interest rate (lagged)</th>
<th>Wage (y/y, lagged)</th>
<th>Unemployment rate (lagged)</th>
<th>Policy dummy (current)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.59*** (7.76)</td>
<td>0.14*** (0.03)</td>
<td>-6.31*** (1.61)</td>
<td>0.26*** (0.06)</td>
<td>-3.19*** (0.84)</td>
<td>-5.45*** (1.20)</td>
</tr>
</tbody>
</table>

R²: 0.73

Notes: 1. *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level. Standard deviations in italic.
2. The estimation period is from January 2006 to March 2015, using monthly data. Newey-West consistent variance estimator is used to calculate coefficients’ standard deviation.
3. The dependent variable is the y-o-y change in mortgage loan

Source: author’s calculations

### Table 4 Estimation Result: House Price Equation

<table>
<thead>
<tr>
<th>Constant</th>
<th>Mortgage loan (y/y, lagged)</th>
<th>Number of building sales (log values, lagged)</th>
<th>Coincident business index (y/y, lagged)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-36.07** (14.27)</td>
<td>0.36* (0.21)</td>
<td>4.34*** (1.56)</td>
<td>0.22*** (0.05)</td>
</tr>
</tbody>
</table>

R²: 0.40

Notes: 1. *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level. Standard deviations in italic.
2. The estimation period is from January 2006 to March 2015, using monthly data. Newey-West consistent variance estimator is used to calculate coefficients’ standard deviation.
3. The dependent variable is the y-o-y change in house price index

Source: author’s calculations
4. Conclusion

In this paper we use the user cost of housing framework to describe Chinese Taipei house price dynamics over the past decade. We find a reduction in the user costs of housing explains the decline in rents in relation to housing prices. The higher expected appreciation, in particular, has had a major impact on the reduction in user costs, while decline in real interest rate made moderate contributions. Because of the relative low effective property tax rates in Chinese Taipei, the taxation effect on the user cost has been negligible throughout the sample period.

We examine the impact of targeted macro-prudential measures, combined with the property tax reform policy, on banking risk management, real estate market activity, and house price dynamics in Chinese Taipei. We find these measures have eased the concentration of real estate lending in banks' loan portfolios. Furthermore, we find that transaction activity falls considerably following the regulations, while price appreciation slows down but at a mild pace.

In housing markets, expectations are often the key factor to facilitate the bubble. Policymaker should adopt measures that counter the over-confidence of investors in the housing market. As claimed by the evidence presented here, targeted macro-prudential and short-term capital gain tax measures help curb expectations for rising housing prices and discourage speculators. Over the medium term, the authorities could consider structural measures to further improve the soundness of housing finance, such as loosening land use regulation, and improving information transparency.

References


### Appendix: Variables Description and Source

In this section, additional details of the data used to estimate equations for mortgage credit and house prices are provided.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Expected Sign</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage loans</td>
<td>Mortgage loans include loans for house-purchases only</td>
<td>+ in the house price equation</td>
<td>Financial Statistics Monthly, CBC</td>
</tr>
<tr>
<td>House prices</td>
<td>Sinyi Housing Index- the metropolitan area of Taipei (2001=100)</td>
<td>+ in the mortgage credit equation</td>
<td>Sinyi Real Estate Inc.</td>
</tr>
<tr>
<td>Mortgage interest rate</td>
<td>Interest rate of new loans for house-purchasing extended by five leading banks</td>
<td>– in the mortgage credit equation</td>
<td>Financial Statistics Monthly, CBC</td>
</tr>
<tr>
<td>Wages</td>
<td>Average monthly working hours of all employees (industry and services) (s.a.)</td>
<td>+ in the mortgage credit equation</td>
<td>DGBAS</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>Official unemployment rate</td>
<td>– in the mortgage credit equation</td>
<td>DGBAS</td>
</tr>
<tr>
<td>Policy dummy</td>
<td>Dummy equals 1 for the period of June 2010 to March 2015, 0 otherwise</td>
<td>– in the mortgage credit equation</td>
<td>CBC</td>
</tr>
<tr>
<td>Number of building sales</td>
<td>The number of building ownership transfers for transaction- the metropolitan area of Taipei</td>
<td>+ in the house price equation</td>
<td>Real Estate Information Platform, MOI.</td>
</tr>
<tr>
<td>Coincident business index</td>
<td>Official coincident business index (2011=100)</td>
<td>+ in the house price equation</td>
<td>National Development Council</td>
</tr>
</tbody>
</table>