

## Measurement of house price bubbles: a case in Sydney

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### Abstract

Recent debates have been focusing on whether there is a housing-price bubble in Sydney. The Median Multiple (median house price divided by gross annual median household income) for Sydney is nine times, compared to 6.2 times in New York and 7.3 times in London (Demographia, 2014). The median price of an established home in Sydney has now reached \$811,837, i.e., 17 per cent increase in the year to June 2014 (APM, 2014). A US economist and demographer (Dent, 2014), predicts that Australia's property prices could drop by as much as 50 percent in the coming years. In contrast, others believe that the Sydney housing price will not fall dramatically.

Real estate markets play an important role in the overall economy. The unsustainable housing prices greatly impact on the banking industry, distort consumer confidence and induce collapse or instability into the normal economic activities. Changes in housing prices are caused by the fundamental factors of demand and supply. An unsustainable bubble exists when 'fundamental' factors do not seem to be justified; i.e., the high prices today are caused by investors who believe that the selling price is higher tomorrow. This research analyses the Sydney housing price performances over the last ten years and compares the local rentals and income to detect indicators which lead to overheating in the housing market. The analysis will contribute to the prediction of house price trends for the future and assist government to formulate relevant housing policies.

**Keywords:** House prices, bubble, price to income ratio, price to rent ratio, and Sydney

### Introduction

Sydney house prices are continuing to grow since the mid-year 2013. According to the Australian Bureau of Statistics (ABS), the un-stratified median price of established houses was \$650,000 for the June quarter 2013 and it has now passed \$800,000 for the June quarter 2014 (ABS: 6416). This is similar for apartments and units. There are debates locally in the public circles; and international economists are also predicting a housing bubble and burst in Sydney.

In recent years, the Reserve Bank of Australia (RBA) is significantly concerned with the double digit percentage increases for house prices in Sydney and Melbourne. Demographia's housing affordability survey (2014) also warned that bubbles will lead to house price declines in Australia sooner or later, due to the inherent instability and unsustainability of the housing markets. Dent (2014), a widely respected US economist and demographer, predicted that Australia's property prices could drop by as much as 50 per cent in the coming years. The main arguments Dent presented were: a) falling affordability where house prices are ten times the average income; and b) the bubble would burst after a crash within the stock market and also an anticipated crash in the Chinese property market.

In contrast, some of the local property experts, as well as developers believe that Sydney housing prices will not fall dramatically. The news.com (2014) included some of the opinions. They are that:

- Catherine Cashmore, Market commentator, agreed with the outcome from Mr Dent's analysis. However, she considers his prediction of collapse as premature.
- Time Lawless, RP Data senior analyst, said neither Sydney nor Melbourne were in bubble markets. However,

- Real Estate Institute of Australia president Peter Bushby said Mr Dent's predictions were heavily focused on particular markets, like inner Sydney, and did not account for a broader range of factors.
- Australian Treasurer Joe Hockey and Economics commentator Alan Kohler focused on the market fundamentals with a shortage of supply to meet demand for housing.
- David Rees, head of Australian research at Jones Lang LaSalle, said there was no housing bubble since property prices were responding to fundamentals such as low interest rates, population growth and an undersupply of new housing.

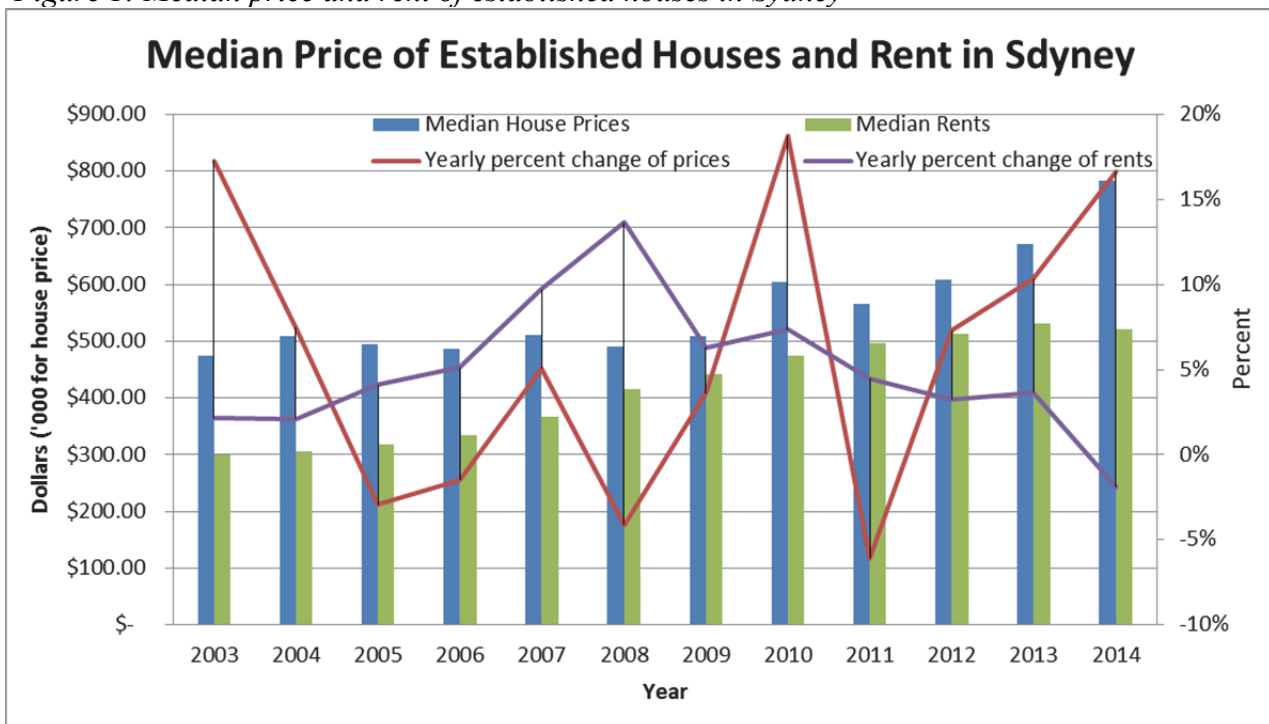
Both for and against arguments on house price bubbles in Sydney presented a reasonable amount of evidence. A question to consider is how a house price bubble is measured, and is there an existence of a bubble in the Sydney housing market? This paper investigates measurements of house price bubbles and analyses house price performances in Sydney over the last ten years, as well as a comparison on the local rents and income, to detect indicators for an overheating in the housing market.

The remainder of the paper is organised as follows. The next section describes the house price and rental performances in Sydney over the last ten years. The measurements of house price bubbles are then reviewed following the establishment of models for the ‘user cost’ of housing for the owner-occupiers and investors. Discussions and concluding remarks are contained in the final section.

### Housing market performance in Sydney for the last ten years

House prices in Sydney have increased substantially over the last ten years. Figure 1 below depicts the median price of established houses in Sydney for the period from 2003 to 2014. The average median price of established houses was \$473,630 in 2003 and reached up to \$782,670 in 2014, an increase by 65 per cent. There were three apparent years of price upswings, namely, 2006-2007, 2009-2010 and 2012-2014; as well as three slumps, i.e., 2005, 2008 and 2011. In comparison to house prices, the rental growth was steady over these years. The changes in rent increased from 2003 to 2007 and then decreased from 2008. These trends over the last ten years are also indicated in the Figure 1 below.

Figure 1: Median price and rent of established houses in Sydney



(Source: ABS: 6416; REIA)

In the year 2000, the Federal government introduced the First Home Owners Grant (FHOG) which was \$7,000 for an established home and \$14,000 for newly built homes. This schedule was valid from March 2001 to December 2001; however, the scheme was subsequently extended until 30 June 2002. The original \$7000 grant under the FHOS currently remains in place for eligible first home buyers. The FHOG aims to increase the first home buyers' ability to purchase a house by assisting them in meeting the initial loan deposit requirements. From July 2000 to January 2004, around \$4.3 billion was granted to over 550 000 home buyers through the initial and additional grants (Commonwealth of Australia, 2004). Together with a reduction of interest rate in early 2001, the FHOG contributed to an increase in demand for housing around the time that the original and additional grants were introduced.

The impact of the sharp increase in house prices for many parts of Australia triggered an inquiry during 2004, to evaluate the affordability and availability of housing for first home buyers. The Commonwealth of Australia (2004) productivity commission report identified several factors that had contributed to the rapid increase in real estate prices, including overall fairness of the tax system, lending regulations, lower interest rates and planning issues. Additionally, there had been a large increase in the number of households purchasing rental properties which played a very important role on the sharp increases for house prices during that period. Some recommendations arises from the report included, a) to make the FHOG target the housing needs of lower income households and to set a price ceiling; b) to encourage savings, allow access to superannuation and reduce initial deposit or repayment requirements, and c) to enhance housing supply.

The housing market in Sydney has shown a recovery from the effects of global finance crisis and government stimulation programs. The house prices have jumped 19 per cent from 2009 to 2010. A Senate Select Committee on Housing Affordability was established in 2008. On October in the same year, the First Home Owners Grant Boost (FHOGB) was introduced, which included an extra \$14,000 to first home owners buying or building a new home, and \$7,000 for established homes in addition to the FHOG. Also, First Home Saver Accounts were introduced, where the Federal Government contributed up to \$850 per annum towards savings for a deposit to purchase housing. The Foreign Investment Review Board (FIRB) allowed temporary visa holders including students to buy established houses. The cash rate reduced to the lowest level of 3 per cent in 2009 from a peak of 7.25 per cent during the first half year in 2008. The introduced policies and the monetary policies pushed house prices up significantly recorded 4 and 19 per cent growths in 2009 and 2010 respectively (ABS: 641604).

In 2010, the FHOGB was removed in January, which resulted in a 21.2 per cent reduction in mortgage applications. The new housing loans approved by Australian banks fell by 5.6 per cent to a 10-year low in February (Uren, 2010). The rules that allowed foreign investment in real estate were also withdrawn in April 2010 and the temporary residents were required to sell their Australian property when they left Australia. The housing markets were also affected by the Australia's Future Tax System (AFTS) Review (also called 'Henry Tax Review') that made a number of policy recommendations. At the same time, the cash rate went up to 4.75 per cent from the end of 2010 to the end of 2011. In Sydney, the median established house prices dropped by 6 per cent from 2010 to 2011 (ABS, 641604).

Since November 2011, the Reserve Bank of Australia (RBA) cut interest rates continuously throughout 2012 and 2013 to the lowest point of 2.5 per cent. The rate has not changed since then. House prices have soared substantially. By June 2014, the value of outstanding home loans financed by the Authorised Deposit-Taking Institutions (ADIs) in Australia was \$1.312 trillion, where \$445 billion of that amount was for investment housing loans and \$867 billion was for owner occupied housing (ABS:5609012). Australian house prices continued to rise strongly throughout 2013 and 2014. It recorded a total of 34 per cent growth for the median established house in Sydney from 2012 to 2014 (ABS: 641604).

The changes with house prices and rentals during the last ten years were contributed by factors which impacted on the demand and supply of houses. The main factors contributed to the increase in prices were the increased of population, greater availability of credit, low interest rates from 2008 onwards, limited housing supply, a tax system that favours investors and existing home owners, and government housing policies.

### **Measurements of house price bubbles**

A house price bubble consists of characteristics including rapidly rising prices (Baker, 2008), unrealistic expectations of future price increases (Case and Shiller, 2003), the departure of prices from fundamental value (Garber, 1990) or a large drop in prices after the bubble burst (Siegel, 2003, p. 3). Traditionally, a house price bubble is measured by using the growth rate of house prices, ratios of house prices to income or rents, or mortgage payment to income ratios.

The growth rate of house prices measures the changes of house prices for a certain period. For example, house prices have risen over 10 per cent in the last 12 months in Sydney (RBA, 2014). The increased house prices cannot be diagnosed as house price bubbles. The growth of house prices reflects demand for housing exceeding the supply of housing. Therefore, this is not an evidence of that housing is over-valued (Himmelberg, et al., 2005).

The house price-to-rent ratio measures the cost of owning or renting housing. When house prices are too high relative to rentals, households may choose to rent instead of buying. House prices are adjusted when there is less demand for buying houses. A house price bubble is considered to be in existence when price-to-rent ratios remain high for a prolonged period.

The house price-to-income ratio measures the cost of house ownership relative to the ability to pay for a house. If the growth of house prices outpaces the growth of household income, it implies that the bubble may be developed as less households can afford to purchase houses, given that borrowing capacity is unchanged. When borrowing capacity increases, households have a greater ability to purchase housing. As a result, prices can be increased more than the increase in income (Fox and Finlay, 2012). Mortgage payment to income ratios plays a similar role, where households borrow more than their ability to service loans, and so a bubble is being developed.

Himmelberg, et al. (2005) suggested that traditional methods of measuring house price bubbles like the growth rate of house prices, the price-to-rent ratio, the price-to-income ratio can be misleading. This is because they fail to account both for the time series pattern of real long-term interest rates and predictable differences in the long-run growth rates of house prices across local markets. They argued that the interest factor is theoretically sensitive to house prices; in particular, when interest rates are already low. It is important to include the interest factor in measuring house price bubbles as the rates are more sensitive where the long-run rate of house price growth is high. In addition, these traditional measures are inadequate to assess whether the housing market is in the grip of a speculative bubble. The research constructed measures of the annual cost of single-family housing for 46 metropolitan areas in United States over the last 25 years and compared this with local rentals and income as a way of assessing the level of housing prices. They found that house prices were over-valued in many of the same cities that subsequently experienced the largest house price falls during the 80s. They also found that the cost of owning raised somewhere relative to the cost of renting, but not to the levels that made houses over-valued for the period of 1995-2004.

Cameron, et al. (2006) provided a similar view as Himmelberg, et al. (2005). They indicated these ratios were not very informative in assessing bubbles because of ignoring a range of other important factors, such as demographic and population changes, housing supply and credit conditions. They developed a dynamic equilibrium-correction equation system for annual house prices in nine regions of Britain. The model consisted of a system of inverted housing demand equations with the

predetermined regional housing stock appearing as an explanatory variable. The demand factors included regional incomes, real and nominal interest rates and demographics and incorporated spatial parameter heterogeneity. They used 1972 – 1996 data to estimate a model which was used to forecast for 1997 – 2003. One of the advantages of the inverted demand function approach was that the results were data consistent, with plausible long-run solutions and this included a full range of explanatory variables. No evidence of a bubble was found in their model.

Smith and Smith (2006) also pointed out that a traditional measure of housing bubbles comparing movements in housing price indexes with movements in other indexes or with the values predicted by regression models are flawed. This is because the assumption is that market prices fluctuate randomly around fundamental values. They said that none of these measures can gauge whether housing prices are above or below fundamental values, i.e., the projected net rental savings, discounted by a required rate of return. They used net present value method to answer the key question of whether housing prices are justified by the value of the services provided by a home. Firstly, they estimated the fundamental value of a home from rental data. Secondly, they compared the actual house price performances with the estimated fundamental value. If a bubble exists, market prices will rise far above fundamental values. The critical point they made was not how much prices have increased in the past or how fast people expect them to increase in the future, but whether, at current prices a home is still a fundamentally sound investment. Their empirical analysis suggests that no evidence of a bubble in their study areas.

Black, et al. (2006) adopted a time-varying present value, a similar approach as Smith and Smith (2006) to study the real house prices relative to fundamental house values using quarterly UK data for the periods from 1973:4 to 2004:3. They found an existence of an explosive rational bubble due to non-fundamental factors.

Other measures include Bjorklund and Soderberg (1999) who explored the reasons of significant price increase during the up-phase of the property cycle. A panel data method was used to analyse the value of the Gross Income Multiplier and found that the Swedish market for income real estate may have been partly driven by a speculative bubble during the 1980s. In their view, income, income growth and required rate of return are the direct fundamental factors to house prices. Macroeconomic variables such as interest rate, unemployment and the Gross Domestic Product (GDP) were indirectly affecting the prices in the real estate market.

Therefore, each of the measurements has its unique advantages and disadvantages. The data of growth rate of house prices, the price-to-rent ratio, the price-to-income ratio are easy to obtain. Their calculations are simple and relatively easy to be understood by most people. Other measurements such as net present value, regression and the user cost of ownership, take into account many factors such as interest rate, etc. and involve assumptions, theories, modellings, as well as calculation complications. The estimated results are not as easy to be understood by non-professionals.

### **The user cost of housing model**

The method of ‘user cost’ of housing was developed by Hendershott and Slemrod (1983) and Poterba (1984). Hendershott and Slemrod (1983) used the method to analyse the tenure decision; whereas Poterba (1984) revised the ‘user cost’ method by incorporating the price to rent ratio in his equation in order to study the house price movement in the US markets. He found that the real user costs could be an important contributory factor in the house price rise of the late 1970s.

The measurement suggested by Himmelberg, et al. (2005) considered ‘user cost of housing’ and predicted the long-term growth rate of house prices across the local markets. Particularly, the model addressed the time series pattern of real long-term interest rates which is important in recent years in Australia, because of the low interest rates that implies the lowest cost with serving loans. The house

price growth is thus high as a result. Fox and Tulip (2014) examined whether it would cost more to own a home or to rent applying the user cost of housing method. They found that if real house prices grow at their historical average pace, then owning a home is about as expensive as renting. No sign of a bubble was found in their study. The user cost of housing model has also been selected for studying the Sydney house market in this paper.

There are two components for owning a house, the initial deposit and the servicing of the annual loan. It is fair to say that if a house can be purchased for one million dollars, the cost of living in that house for one year would not be a million dollars. The user cost of housing model differs from the traditional measurements because the purchase price of a house is different from the annual cost of owning a house (the ‘user cost’). The ‘user cost’ is compared to ‘rental cost’ or ‘income levels’ to determine if the level of housing price is ‘too high’ or ‘too low’, i.e., whether the cost of owning a house is out of line with the cost of renting, or unaffordable at local income levels (Himmelberg, et al., 2005). A housing market has equilibrium when the expected annual cost of owning a house equates to the annual cost of renting ( $R_t$ ). If the annual cost of owning a house is more expensive than the annual cost of renting, house prices will fall. A house price bubble occurs when home purchasers are willing to pay a higher price today because they have high expectations about future capital gains and perceive their user cost to be lower than it actually is.

Two types of purchasers are involved in the market place, owner-occupiers and property investors. Fox and Tulip (2014) estimated the costs for owner-occupiers only. They suggested that the cost of owner-occupiers consists of opportunity cost, buying and selling costs of houses (such as stamp duty and agent fees), interest repayments, running costs (such as repairs, rates and insurance), cost of depreciation and the expected property appreciation. Their equation included the costs of the real interest rate, running costs such as repairs, rates and insurance, buying and selling costs, depreciation and the expected real appreciation. The tax benefit for investors was not considered in their model. Relatively, property investors benefit with the allowable cost as a tax deduction against the rental income, based on Australian tax law. This allowable cost includes repairs and maintenances, interest costs and charges. However, the investors need to pay capital gain tax once the investment property is sold.

Accordingly, the user cost of housing for the owner-occupiers are based on Fox and Tulip (2014).

$$OP_t u_t = P_t r_t^m + P_t \delta_t + P_t \sigma_t + P_t d_t - P_t g_{(t+1)} \quad (1.1)$$

$r_t^m$  is the mortgage interest rate. Most of the households are required to borrow money in order to access home ownership. The repayments are based on the loan amount with the term of the loan generally between 25 or 30 years for most of the households.

Running costs ( $\delta_t$ ) is a fraction of home value. It includes council and water rates, building insurance, levy on strata and management fee, repairs and other sundry costs.

Purchase and selling fee ( $\sigma_t$ ) comprises of stamp duty, conveyancing and buying fees (such as building inspection, etc.), agents’ commission, advertising and legal costs.

$d_t$  represents depreciation of properties and the real property appreciation rate ( $g_{(t+1)}$ ) is also included.

For the investors, the user cost of housing is estimated by taking into account risk, the tax benefits of owning a house, property taxes, running costs, and any anticipated capital gains from owning the house. Formula 1.2 represents the components of calculating the ‘user cost’ of ownership for investors ( $IP_t u_t$ ).

$$IP_t u_t = P_t(r_t^m + \delta_t + \tau_t + \sigma_t + d_t)(1 - \omega_t) - P_t g_{(r+1)}(1 - \omega_t) \quad (1.2)$$

Mortgage interest and running costs of an investment property are considered as outgoing expenses that can be used as a tax deduction in Australia. There are additional expenses ( $\tau_t$ ) occurring for investors which include land tax, property agent commission, advertising for tenants, travel and sundry expenses such as stationary, telephone and postage. These costs are also eligible for tax deductions. The tax rate is represented by  $\omega_t$ . Capital gain during the year is included in the property appreciation rate by  $g_{(r+1)}$ . Capital gain tax is payable on the profit made when selling the investment property.

By removing the  $P_t$ , from the both sides of formula 1.1 and 1.2, the user cost of housing per dollar for housing value for the owner-occupiers and the investors is stated in formula 1.3 and 1.4.

$$Ou_t = r_t^m + \delta_t + \sigma_t + d_t + g_{(t+1)} \quad (1.3)$$

$$Iu_t = (r_t^m + \delta_t + \tau_t + \sigma_t + d_t)(1 - \omega_t) + g_{(r+1)}(1 - \omega_t) \quad (1.4)$$

As indicated previously, the annual cost of owning a house must equate to the annual cost of renting ( $R_t$ ) at an equilibrium level, i.e.  $P_t u_t = R_t$ . The equilibrium price-to-rent ratio can be rearranged as showing in formula 1.3.

$$\text{Price to rent ratio} = P_t / R_t = 1 / u_t \quad (1.5)$$

The value of user cost changes, and the price-to-rent ratio changes. For example, when interest rate is increased, the value of ‘user cost’ increases, and thus the price to rent ratio increases as well. Assume the ‘user cost’ is 5 per cent, the price-to-rent ratio is 20, which implies the equilibrium house price is 20 times the market rent. Therefore, if a two-bedroom apartment rents for \$25,000 per year, the apartment should be sold for up to \$500,000. If the apartment sells for \$600,000, it is said that the price is too high, or over-valued.

The estimated procedure for applying the model includes:

- Collecting data which includes market house price, market rent, and variables included in the ‘user cost’;
- Calculating the ‘user cost’ based on the model provided in formulas 1.3 and 1.4;
- Estimating the ratio of price-to-rent according to formula 1.5; and
- Analysing the Sydney housing market performances and determining whether a bubble exists.

The next section describes data sources and estimates the ‘user cost’ and analyses whether there is a bubble in the market place using the provided models above.

### **Data and estimated results**

The data used for estimating the ‘user cost’ and bubbles is displayed in Table 1, which contains the data name and sources. Average yearly data from 2003 to 2014 was used in this study. The median price of established houses was sourced from Australian Bureau of Statistics (ABS: 641604), though median prices suffer from a well-known limitation because of their failure to control for quality variation over time (Poterba, 1991). For the last 10 years, the average of Sydney’s house prices appreciated around 5.6 per cent (ABS: 641602). The yearly house prices were derived from the quarterly median price of established houses (unstratified) for Sydney. The quarterly data of median rentals for Sydney houses was from the Real Estate Institute of Australia (REIA). The quarterly

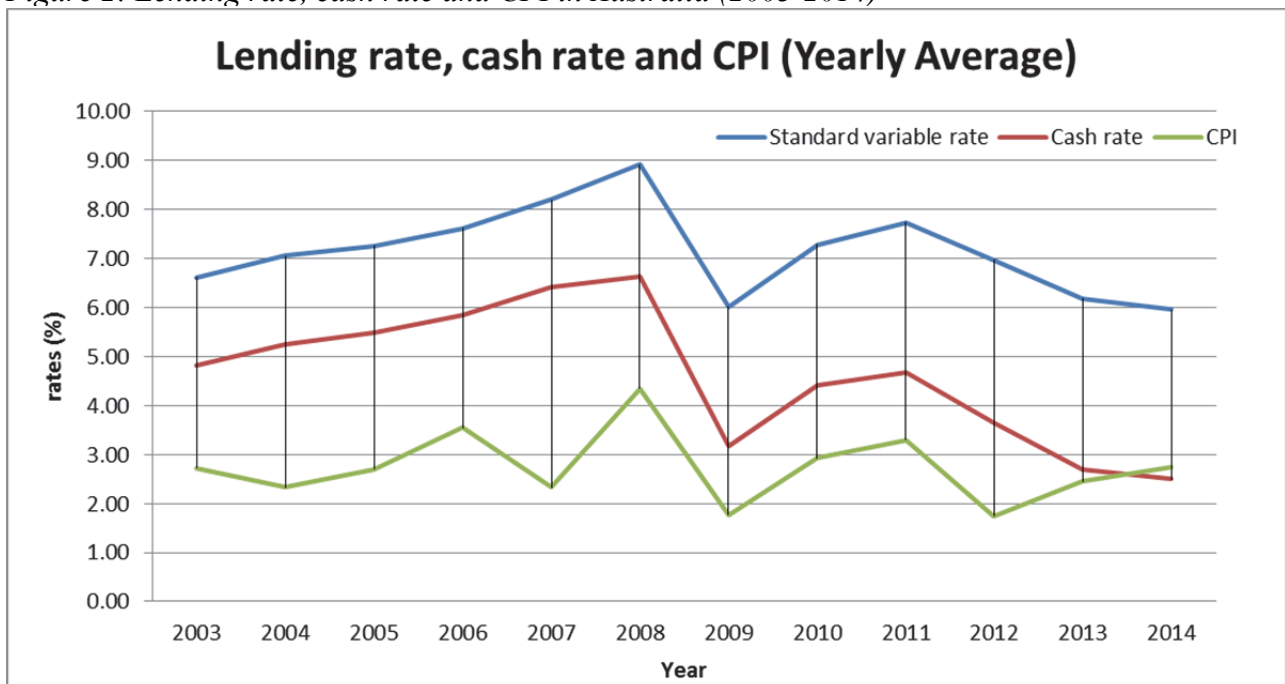
median three-bedroom house rentals for the Sydney middle zone (6-25kms from CBD) were converted to yearly data.

Table 1: Data source

Variables	Source	Data type
House price	The quarterly Median price of established houses (unstratified) for Sydney from ABS (641604)	Convert to yearly time series
Rent	Quarterly median three-bedroom house rent for Sydney middle zone (6-25kms from CBD) from REIA	Convert to yearly time series
Real rate of interest	Standard housing loans variable rate published by RBA	Average yearly variable rate - CPI
Depreciation rate	Australia Tax Office (ATO)	2.50%
Property running costs	Fox and Tulip (2014)	1.50%
Purchase and selling fee	Fox and Tulip (2014)	0.70%
Property appreciation rate	Fox and Tulip (2014)	2.40%
Additional expenses	Fox and Tulip (2014)	0.40%
Tax rate	Assumption	30%

House prices are sensitive to changes in interest rates. Fox and Tulip (2014) used 10-year fixed interest rates while others were used variable rates (Himmelberg, et al., 2005) or standard variable rate (OECD, 2005) to estimate the users cost. The 10-year fixed interest rates are not commonly used by the home purchasers. In addition, the rate consists of a substantial term premium which is hard to separate. Thus, ‘Standard housing loans’ variable rate published by RBA is selected for this study. The real rate of interest was derived by deducting the inflation rate from the standard housing loans. Figure 2 depicts the mortgage standard variable rate as against the cash rate and Consumer Price index (CPI). The patterns of the three rates were similar with a noticeable rate cut in 2009 to address the GFC, and the cash rate is currently at the lowest level remaining at 2.5 per cent. The CPI showed three obvious years in decline being 2007, 2009 and 2012; and the first time in ten years the CPI exceeded the cash rate in 2014 (Figure 2). This implies that the real rate of interest is low and inflation is higher in the market place.

Figure 2: Lending rate, cash rate and CPI in Australia (2003-2014)



(Source, ABS, RBA)

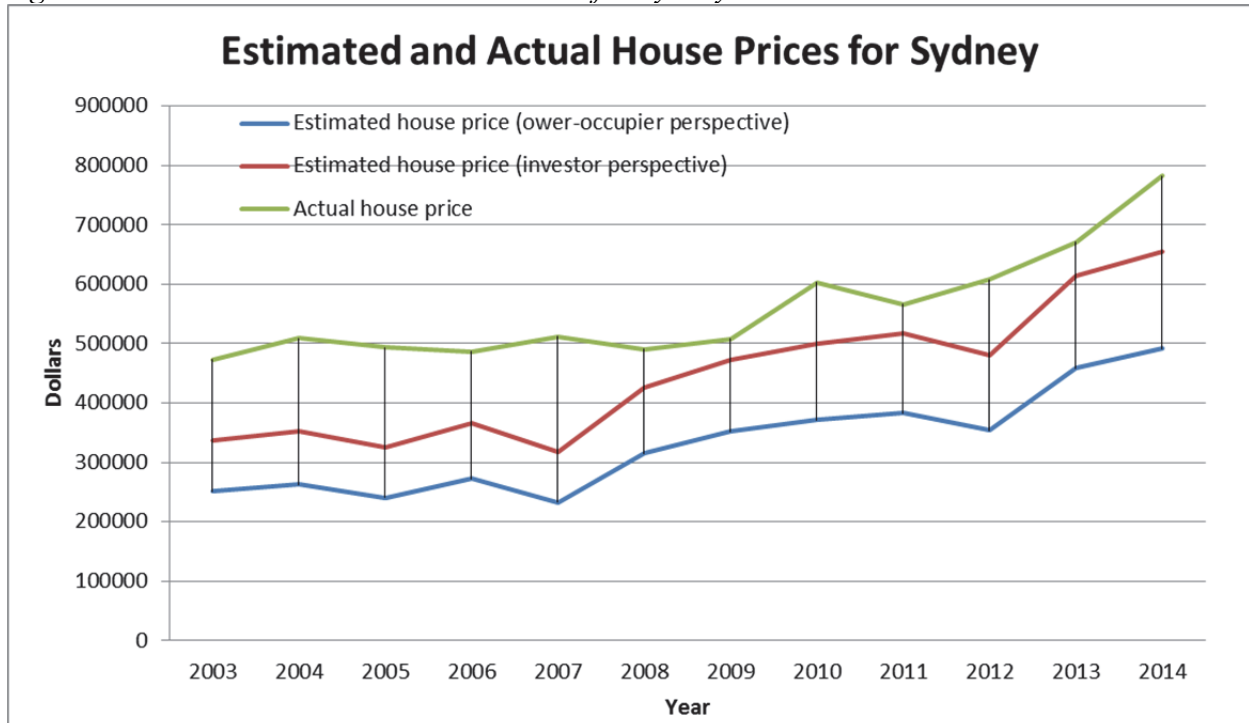


The annual depreciation rate of 2.5 per cent can be applied to the value of purchased property according to the Australia Tax Office (ATO). The rate is similar to the US research (Hill and Syed, 2012). Thus 2.5 per cent is used in the calculation for this cost. The property running costs of 1.5 per cent, purchase and selling fee of 0.7 per cent, and the property appreciation rate of 2.4 per cent were used according to Fox and Tulip (2014). From property investors, an additional 0.4 per cent was included in the equation.

In Australia, property purchasers are required to pay property taxes (such as stamp duty) for property values above \$500,000, which is payable at the time a transfer document is lodged for registration with Land and Property Information (LPI). The stamp duty rates range from 1 to 6.75 per cent based on the value of the property and the state/territory of Australia. In addition to stamp duty there is also a Land Transfer Charge under the NSW State Revenue Legislation Amendment Bill 2010 (1 July 2010). If a purchaser requires a loan, a stamp duty of around 0.04 per cent is charged in NSW on the amount borrowed. The marginal income tax rate of 30 per cent is assumed for a typical home buyer.

Based on the derived data above, the actual and estimated house prices (also ‘imputed rent’) as well as ratios of price-to-rent (using the ‘user cost of housing’ method) in Sydney for the period of 2003 to 2014 were estimated, which are depicted in the Figure 3 and 4. The Figure 3 shows the actual and estimated house prices (or ‘imputed rent’). The actual house prices (in green) exhibits well above the imputed rents for both owner-occupiers and investors. The perceptions of owner-occupiers and investors are different because of the user cost difference between the two categories. Relatively, the imputed rent for investors can be higher than the owner-occupiers as the user cost of housing is low. For example, in 2014, given the user cost of housing, the median price of the established houses should be \$416,000 for owner-occupiers and \$558,539 for investors. However, the actual price in the market was \$778,000, which is 87 per cent higher for the owner-occupiers, and 39.3 per cent for investors.

Figure 3: Estimated and Actual House Prices for Sydney

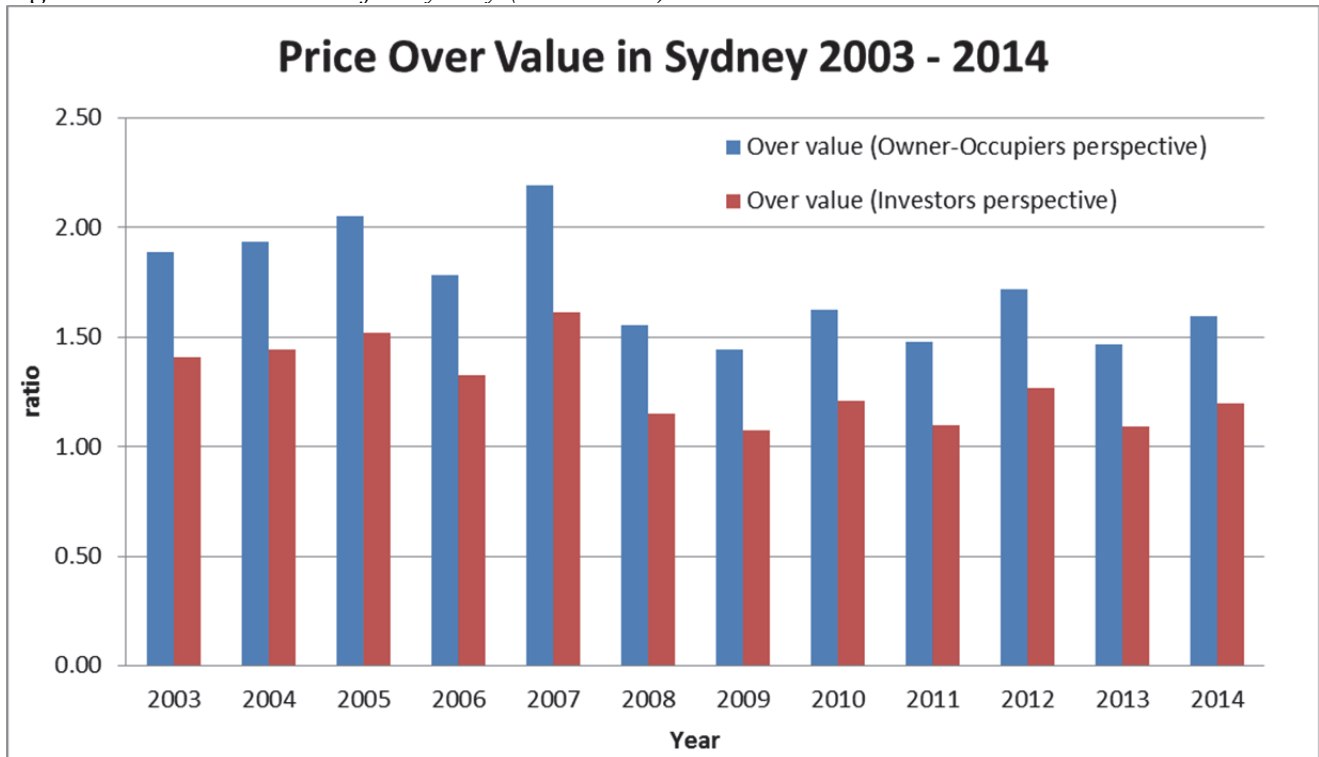


(Source: Author)

Figure 4 exhibits the ratio of price over-valued for the period between 2003 to 2014 in Sydney. It is calculated by the actual house price divided by the estimated user cost of housing. The ratios of both owner-occupiers and investors were relatively higher for the period between 2003 to 2007 (i.e., an average of 97 per cent for the owner-occupiers and 46.2 per cent for the investors) compare to the

period between 2008 to 2014 (i.e., an average of 55.4 per cent for owner-occupiers and 15.5 per cent for investors). The highest point was in 2007, when the ratios were 2.19 and 1.61 times for owner-occupiers and investors respectively. These results indicate that house prices were 119.5 per cent and 61.2 per cent over-valued for the owner-occupiers and the investors respectively in 2007. These ratios declined gradually up to 2013 where there was a 59.3 per cent and 19.6 per cent over-valued respectively. The ratios picked up again in 2014 reaching 87 per cent and 39.3 per cent over-valued. Therefore, the over-valued results represent evidence for a rapid growth in house price. The estimated results also suggest that the ratios were sensitive to the changes in interest rates. The higher the interest rate, the higher the user cost of housing.

Figure 4: Price Over Value for Sydney (2003-2014)



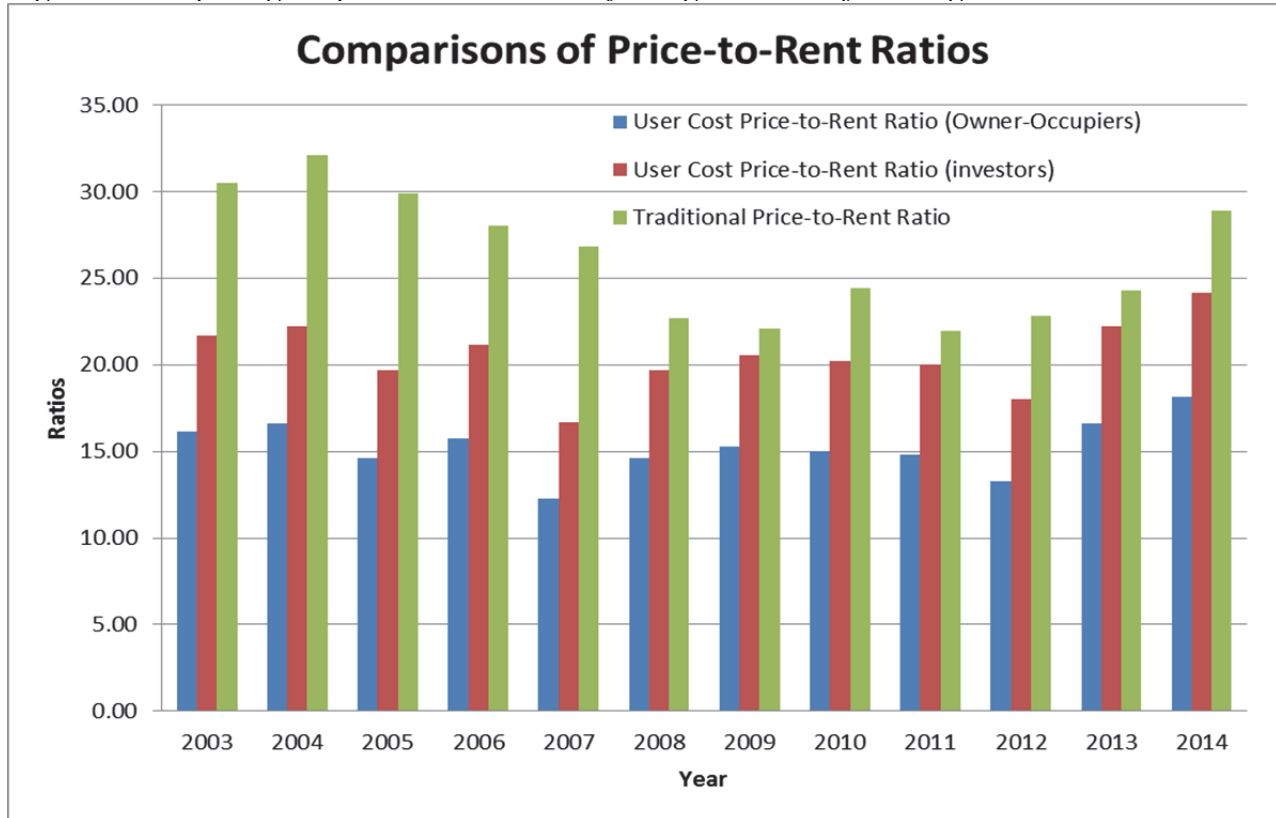
(Source: Author)

The estimated price-to-rent ratio using the user cost method was also compared with the ratios estimated under the traditional method. Figure 5 displays that the price-to-rent ratios estimated by the traditional method, which were much higher than the user cost of housing method. These estimates were on an average 72 per cent higher than the cost of owner-occupiers and 28 per cent higher than the investors for the period between 2003 to 2014. For example, in 2014, the price-to-rent ratio estimated by the traditional method was 28.9, whereas only 18.1 and 24.1 were estimated with the method of the user cost of housing. This is a difference of 11 and 5.7 respectively. Based on the price-to-rent ratio of 28.9 in 2014, the cost of ownership is only 3.5 per cent which is not realistic.

The imputed rent-to-income ratio provides an alternative measure of the house price bubble. Himmelberg, et al., (2005) suggested that the ratio of imputed rent to income provides a better indicator of whether house prices are supported by an underlying demand. If a bubble exists, then the annual cost of home ownership rises faster than income and perhaps to an unsustainable level. Figure 6 displays the price-to-income ratios that are estimated under the traditional method and the user cost of housing. The total earnings for full time adults in New South Wales (ABS: 63020013a) were used as a proxy for median household incomes. Obviously, the results of the traditional method (in blue) are much higher than the imputed rent-to-income ratios. The price-to-income ratios range from 7.7 to 10.1 using the traditional estimated method, whereas 3.8 to 6.4 for owner-occupiers and 5.2 to 8.5 for investors using imputed rent. According to Demographia (2014) housing affordability survey categories, when the median multiple is 5.1 & over housing is severely unaffordable; 4.1 to 5.0 and 3.1 to 4.0 are seriously and moderately unaffordable respectively. The median multiple is derived from

the median house price divided by gross annual median household income. Based on these criteria, the price-to-income ratio using imputed rent for owner-occupiers has fallen into the seriously unaffordable categories. However, the results showed severely unaffordable by using the traditional estimating method which can indicate a misleading conclusion. However, the price-to-income ratio is only a partial indicator of affordability trends. In particular, it does not take into account the cost of housing finance.

Figure 5: Comparing the price-to-rent ratios by using user cost of housing and traditional methods



(Source: Author)

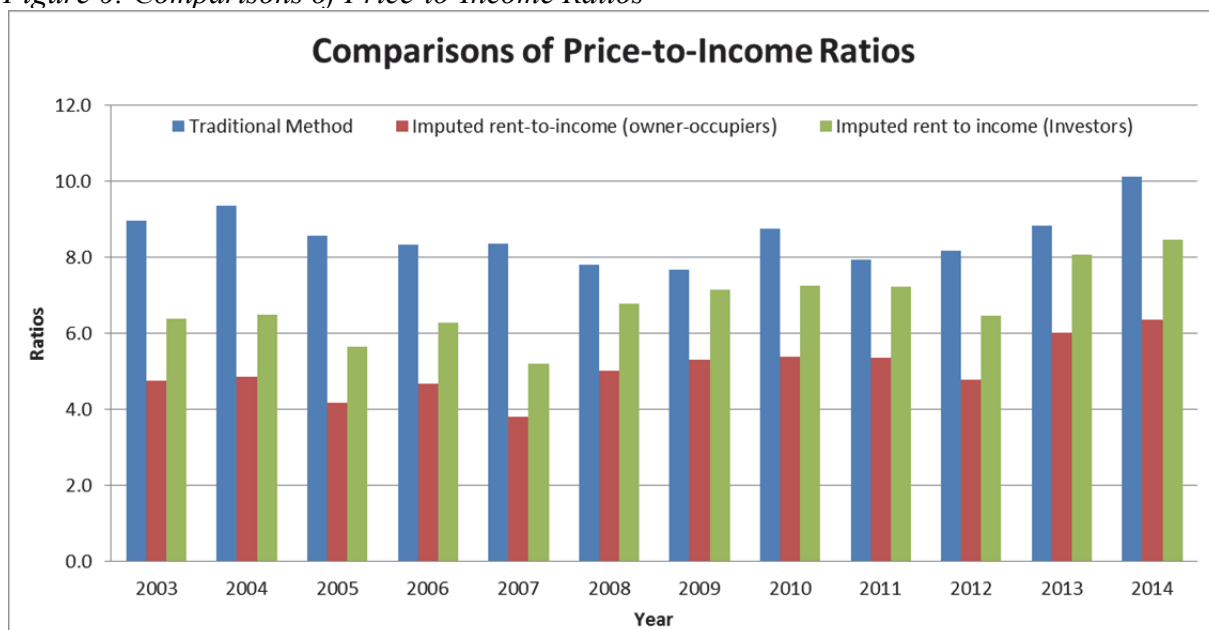
## Conclusion

This paper has reviewed the traditional measures of house price bubbles and estimated the user cost of housing for the Sydney established houses during the period of 2003 to 2014 from the perspective of owner-occupiers and investors. The results of the different methods were compared. The findings are as follows:

- House prices have been on a rapid increase since 2011, in particular the double digital growth during the years between 2013 and 2014.
- The results for price-to-rent ratios are different when using the traditional estimated method and the user cost of housing method. The estimated price-to-rent ratios are much higher using traditional method than the user cost of housing method, i.e., a ratio of 11 more for owner-occupiers' and 5.7 more for investors.
- The user cost of housing is much higher for owner-occupiers relative to investors. This is because the investors are able to claim tax deductions from the running expenses of properties based on Australian Tax Law while owner-occupiers are not entitled to these deductions.
- From the owner-occupiers' position, it was estimated that properties were over-priced by 46.4 per cent in 2012 and by 59.3 per cent and 87 per cent in 2013 and 2014 respectively.
- From the investors' point of view, it was estimated that properties were over-valued by 9.3 per cent 2012 and by 19.6 per cent and 39.3 per cent in 2013 and 2014 respectively.

- f) Changes in house prices are sensitive to changes in real interest rates. When the cash rate was at its lowest level of 2.5 per cent in 2013/2014, the house prices increased rapidly in 2014, i.e., a 17 per cent increase.
- g) The results price-to-income ratios are different by using the traditional estimated method and the imputed rent method. The estimated price-to-income ratios are much higher using the traditional method than the imputed method.

Figure 6: Comparisons of Price-to-Income Ratios



(Source: Author)

The findings of this paper coincide with similar findings from past research conducted by Himmelberg, et al., (2005) where house prices are more sensitive to changes in the real interest rate when the rates are already low. The house price performance in the Sydney market during 2014 is an example, where the real interest rate is very low, and the price increases are higher. As mentioned above, a house price bubble is considered to be in existence when price-to-rent ratios remain high for a prolonged period. Given the results of imputed rent-to-actual rent and imputed rent-to-income ratios, whether there is a bubble in the Sydney property market is inconclusive; however, it can be concluded that house prices are over-valued in Sydney. This is because the increased house prices during recent years are not long enough to determine the existence of a ‘bubble’. As suggested by Rees (2014), although Australian housing was very expensive compared to the rest of the world, there was no housing bubble. On the other hand, the price-to-rent and price-to-income ratios should not be used in isolation to judge whether there is the existence of a bubble. Together with the analysis of demand and supply for houses in the market place it is a critical important to determine whether house price increases move away from the fundamentals. In particular, the impacts of the demand factors on house prices, such as the increase with recent overseas investors and self-management super fund (SMSF) can be studied further. Supply factors such as rising interest rates, more restrictive lending practices, and a balance with the amount of supply in the market place should be investigated. Other factors such as unemployment rate and affordability barriers should also be investigated further. The ‘user cost of housing’ method can be also applied to analyse selected suburbs for further examination and analysis. Therefore, the comparison of ‘user cost’ can be used to assess the demographic features of local suburbs and housing affordability.

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