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Inflation and the Measurement of Saving and Housing Affordability

Andrew Coleman

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Author contact details

Andrew Coleman
Motu Economic and Public Policy Research
andrew.coleman@motu.org.nz

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Motu Economic and Public Policy Research
PO Box 24390
Wellington
New Zealand

Email info@motu.org.nz
Telephone +64-4-939-4250
Website www.motu.org.nz

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Abstract

This paper analyses the effect of inflation on the measurement of saving and housing affordability in New Zealand. When the inflation rate is positive, the income and saving of lenders is overstated and the saving of borrowers is understated because a portion of the interest earnings on capital are not true earnings but merely compensation for inflation. Because New Zealand has a large international debt position, this distortion means aggregate saving is understated, possibly by 2 percent of gross domestic product per year. In addition, a standard measure of the cost of financing the purchase of a house is overstated by approximately fifty percent, as a large part of mortgage payments are actually saving. Nevertheless, at the end of 2007 the cost of financing house purchase in New Zealand was at a cyclical high, approximately 40 percent higher than its average level since 1990.

JEL classification
E01, E40

Keywords
inflation, real interest rates, housing affordability

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1 Introduction

While the way inflation erodes the value of money is widely understood, the way that it distorts the measurement of income and saving is frequently overlooked. When the inflation rate is positive, the income and saving of lenders is overstated and the saving of borrowers is understated because a portion of the interest earnings on capital are not true earnings but merely compensation for inflation. Although the effects on borrowers and lenders can be surprisingly large even when the inflation rate is low, in most countries the net effect on macroeconomic statistics can be ignored because the effects on lenders and borrowers offset each other. When a country has a large net foreign asset position, however, aggregate saving measures can be significantly distorted because of inflation.

This paper analyses the effect of inflation on the measurement of saving in New Zealand. Since the inflation rate has been around 3 percent in the last five years, the amount of saving done by borrowers has been significantly understated, currently by $4000 per year a household with an average sized ($133000) mortgage. Since New Zealand has a large international debt position, the effects on borrowers and lenders do not offset each other and aggregate saving is understated, possibly by 2 percent of gross domestic product.

There is another consequence of this mis-measurement of saving because of inflation. Since the inflation component of mortgage payments should be regarded as saving rather than a part of the cost of financing homeownership, some standard measures of housing affordability may overstate the cost of housing by 50 percent. To better understand the cost of housing, a new measure of housing affordability that makes an adjustment for inflation is proposed. This index shows that the cost of financing the purchase of a house is significantly lower than suggested by alternative measures that do not take inflation into account. Nonetheless, like other measures, it indicates housing affordability has deteriorated sharply since late 2005. Housing affordability is currently as bad but not worse than it was in the early 1990s.

2 Real interest rates, mortgage payments, and saving

Saving is generally taken to be the difference between disposable income and consumption.[1] While this definition is not controversial, the measurement of saving differs according to the way that income and consumption are defined. For example, a country's saving rate will increase if expenditure on education is classified as an investment good rather than a consumption good. The saving rate will also depend on whether or not capital gains and losses are included in income, and the way interest earnings are treated. In most countries, income and thus saving is measured without taking into account capital gains and losses, and in this paper I adopt this convention.[2] Rather, the focus of this paper is the way that income and savings measurements should be adjusted to take into account the effect of inflation on interest payments.[3]

It is generally recognized that a portion of the interest earnings on capital are not true earnings but merely a compensation for inflation.[4] By failing to make an adjustment for inflation, one overstates the real earnings of the lender and the real payments made by the borrower. For example, if someone lends $100 000 at 9 percent interest for a year when the inflation rate is 3 percent, they are not really earning $9000 because when they get their original money back $100 000 only buys what $97000 bought a year earlier. Rather, they need to split the $9000 interest two ways: $6000 real interest earnings, and $3000 compensation for inflation.[5] If they add the $3000 to their original $100000 they have the same in price-adjusted terms as what they started with. If they spend the $3000, they have reduced their original capital in price-adjusted terms and have dissaved. Similarly, the borrower is only making a real interest payment of $6000, plus an additional

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[1] See United Nations (1993) "System of National Accounts" for standard definitions, especially sections 8, 9, and 19. For example, in section 9.19 they say "Saving represents that part of disposable income that is not spent on final consumption goods and services." The System of National Accounts guidelines is published jointly by the United Nations, the Commission of the European Communities, the International Monetary Fund, the Organisation for Economic Co-operation and Development, and the World Bank.

[2] The SNA accounts recommend that the definition of saving does not include capital gains. See section 8.15.

[3] For further discussion on the measurement of saving, see the excellent discussion in the Australian Bureau of Statistics article "Saving, borrowing, investment and wealth" (2001).

[4] Earlier New Zealand authors who have discussed the problem of inflation and the measurement of interest income include White (1979) and Clements (1984).

[5] More precisely, the real earnings are $6000/1.03.

$3000 payment to compensate the lender for the erosion of the value of the initial capital. The latter is counted as saving because by making it the borrower has reduced their remaining debt to the lender to $97000 in price-adjusted terms. Even though they still owe $100000 in dollar terms, this sum neither buys so much nor takes so long to earn, because incomes will have increased by 3 percent. While these adjustments for the effects of inflation on savings are not made in the New Zealand's National Income and Outlay Accounts, such adjustments are straightforward to make and are recommended by the System of National Accounts guidelines.[6]

The size of these adjustments is rather large. In 2007 the average fixed mortgage was $133000 and the inflation rate was 3.2 per cent. Consequently, the inflation adjustment for someone with an average mortgage was $4200; in the last three years, it has totalled over $12000. Failure to take into account the inflation adjustment results in a considerable understatement of the amount of saving made by households with mortgages. In total, the understatement amounts to $4 billion on the $145 billion of residential mortgages held by registered banks in the year to December 2007. Of course, the saving of lenders is also overstated, as part of their "income" is compensation for inflation. To the extent that the mortgage interest is earned by New Zealanders and taxed by the New Zealand government, the understatement of the saving of borrowers and the overstatement of the saving by lenders cancel each other out in the national saving statistics. However, since the net borrowing by New Zealand residents and corporations is large – nearly $170 billion – the net effect due to mortgage debt is not zero. Indeed, if one assumed that all mortgage debt were financed from offshore borrowing, the understatement of saving would be of the order of 2-3 percent of GDP. For the same reason, the current account deficit could be overstated by 2 percent of GDP per year.[7] Coleman (2006) discusses this issue more fully.

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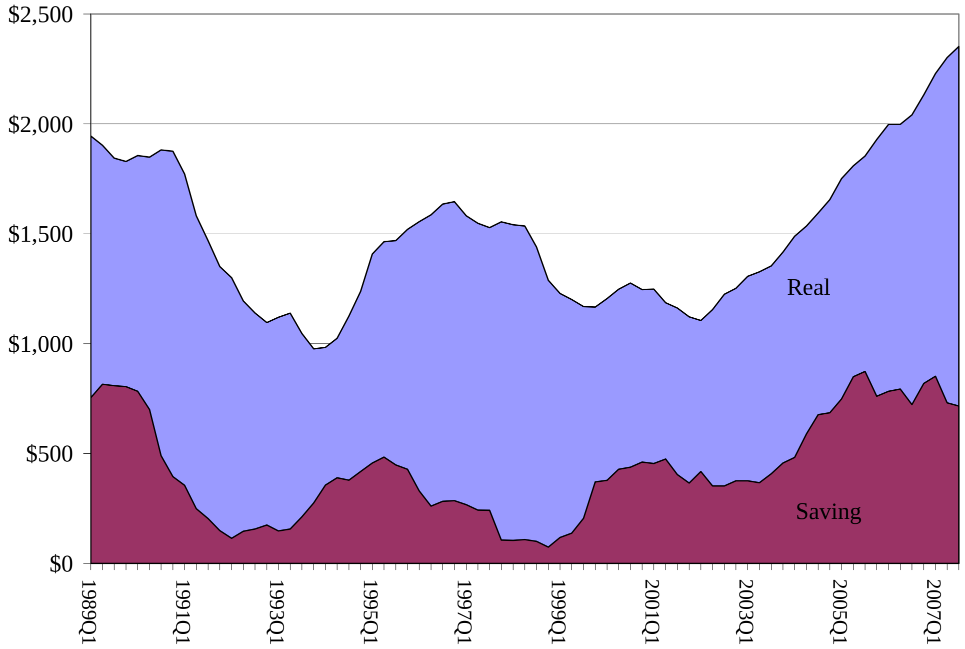
[6] See section 19.82 of the 1993 System of National Accounts.

[7] According to the author's calculations, the inflation component of net foreign investment earnings has averaged 1.5 per cent of GDP since the beginning of the low inflation era (1992) and 1.9 per cent of GDP since 2000. This means the average current account deficit has been 3.2 per cent of GDP, not 4.7 per cent of GDP over this period.

The amount of "hidden" saving obviously varies with the inflation rate and amount of mortgage debt. It has increased sharply in the last five years, as the inflation rate has drifted upwards and the size of the average loan has increased as house prices have increased. One way of demonstrating this variation is to calculate the interest payments and saving on a loan equal to the median house price over time. Figure 1 shows these amounts, converted into 2007 dollar equivalent terms. It indicates that at the end of 2007, a household paying the interest on a mortgage equal to the median house price would have saved $750 per month. This figure has increased from $350 in 2002, and less than $100 in 1997, when the inflation rate was almost zero.

Figure 1: Monthly interest payment on a mortgage equal to the median house price, adjusted to 2007 dollar terms



3 Inflation and the measurement of housing affordability

One way of measuring the cost of housing is to calculate the interest paid on a mortgage sufficient to purchase an average priced house. Often this measure is converted into a measure of housing affordability, by dividing it by the average wage: it then can be interpreted as the fraction of an average wage that is needed to pay the interest on a mortgage equal to the average house price. Examples in New Zealand are the AMP Home Affordability Index and the Fairfax Media Home Loan Affordability. However, measures of the cost of housing based on the nominal interest cost of servicing a mortgage will overstate the true cost of financing home ownership since the inflation component of mortgage payments should be treated as saving. Using the above figures, if the mortgage rate were 9 percent while the inflation rate were 3 percent, only $6000 or two thirds of the $9000 annual interest payment on a $100000 mortgage should be considered part of the cost of purchasing the house. It is true that the household would have to find $9000 per $100000 of mortgage to pay the bank each year, and that this might place it under considerable cash-flow pressure if it were unable to borrow to make the payment. Nonetheless, a third of the cash-flow pressure comes from the requirement that the household make $3000 in savings per $100000 of mortgage as part of the scheduled repayment scheme, and it is not at all clear that this saving should be considered part of the expense of borrowing to own a home any more than (say) making a contribution to a pension fund should be considered an expense.

3.1 A real affordability index

An alternative measure of the cost of housing is a real housing affordability index, calculated using real rather than nominal interest rates. Figures 2 and 3 shows how affordability indices based on real and nominal interest rates have evolved in the last two decades. The real interest rate is calculated by deflating the nominal interest rate by the average of the previous four quarters' and the forthcoming four quarters' change in the CPI.[8] The nominal interest rates is the average mortgage rate on fixed and floating mortgages, sourced from the Reserve Bank of New Zealand. In each case, the interest cost is divided by average hourly earnings (from the Quarterly Employment Survey). The formulae for the two indices are:

$$\text{Nominal affordability index} = \frac{\text{nominal interest rate x Quotable Value house price index}}{\text{QES average hourly earnings.}}$$

$$\text{Real affordability index} = \frac{\text{real interest rate x Quotable Value house price index}}{\text{QES average hourly earnings.}}$$

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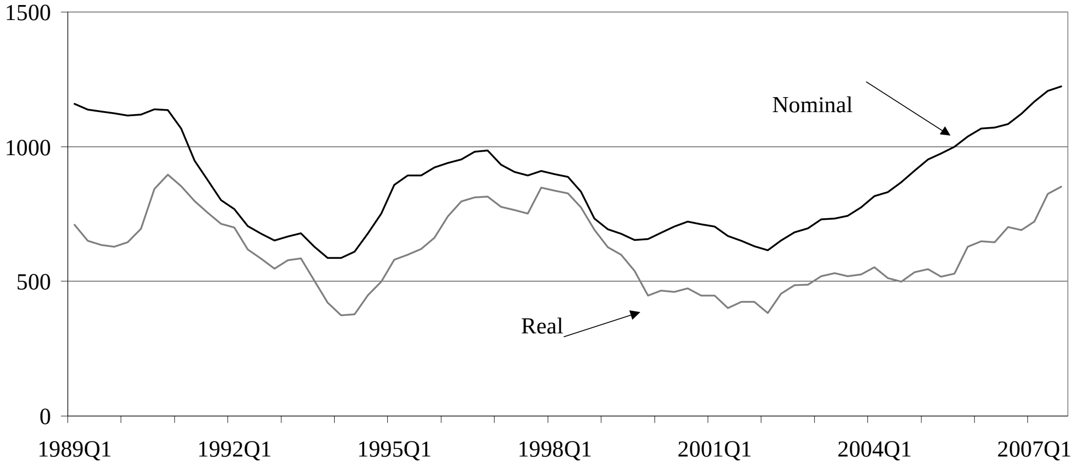
[8] The real interest rates for 2007 assume the CPI increases at 0.6% per quarter from March 2008 onwards.

In figure 2, the indices are rebased so the Quotable Value price index is equal to $295000 in March 2006, the median house price in that quarter. The indices thus have the natural interpretation of the number of hours work needed to pay the nominal or real interest cost of a mortgage just large enough to purchase a median value house. In figure 3 the indices are rebased so that they both have an average of 1000 for the period March 1992 – March 2007, to enable easy comparability. It should be noted that a rise in the index means that housing is *less* affordable to those contemplating borrowing to purchase a house.

Figure 2: Real and nominal affordability indices: Number of hours to pay interest cost on median house

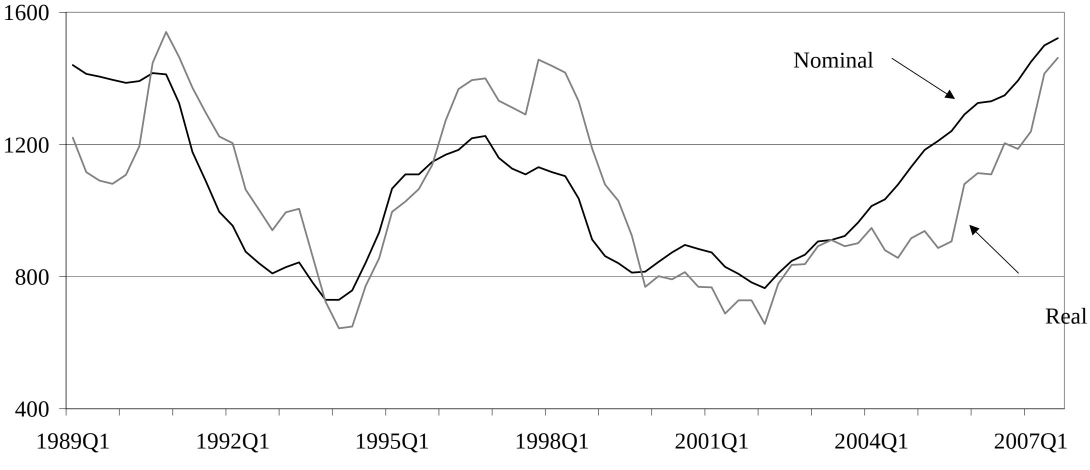


Four features of the graphs stand out. First, from figure 2, it is apparent that the number of hours required to service the nominal interest cost of a mortgage is considerably larger than the number of hours required to service the real interest cost of a mortgage. In September 2007, it took 1224 hours to service the nominal interest cost, versus 852 hours for the real interest cost, or 44 percent more. In the high inflation environment prevailing in the five years to September 2007, it took an average of 59 percent more hours to make nominal interest rather than real interest payments: in the five years to March 2002 and the five years to March 1997, it was only 33 percent more. It follows that part of the deterioration in nominal housing affordability in the last five years simply reflects the higher average inflation rate. Households have to make higher nominal payments to service their mortgages, but an increasing fraction of these payments are saving.

Secondly, nominal and real affordability are volatile and seemingly cyclical series. The number of hours spent servicing the nominal interest cost of a mortgage has ranged between 587 and 1224 since March 1992: the number of hours to service the real interest cost has ranged from 374 to 852. Both series had local minimums in 1994 and 2002, and local maximums in 1991, 1996 and 2007. The real index also had a maximum in 1998.

The third and fourth points are best considered with reference to figure 3, in which the affordability indices are both normalized so that the average of the period 1992-2007 is 1000. In figure 3, it is apparent that the nominal affordability index reached its highest level over the entire period in 2007, a value of 1521 or 52 percent above its average level. Its previous peaks were 1226 in 1996 and 1441 in 1989, the latter when nominal mortgage rates were over 15 percent. By this measure, housing affordability is the worst it has been since 1989. Moreover, housing affordability has been more than 20 percent above its long run average since the June quarter of 2005.

Figure 3: Real and nominal affordability indices: Average 1992-2007 = 1000



The real affordability index was also high in September 2007 at 1462, or 46 percent above its average level.[9] However, there are two noticeable differences between the recent trends in real and nominal housing affordability.

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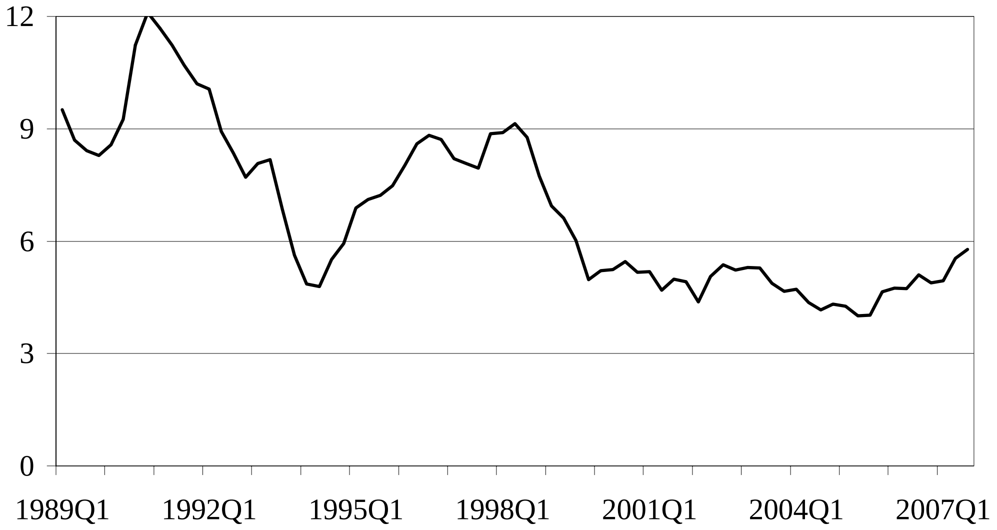
[9] This estimate assumes the annual inflation rate will be 2.5% in 2008. The index will be lower by 12 points or 1.2 percent for every 0.1 increase in the inflation rate.

First, the current value of real housing affordability is lower than it was between September 1990 and June 1991, when it peaked at 1537, and similar to the level it was for a 10 quarter period June 1996 – September 1998, when it peaked at 1454. Secondly, the real affordability index has only been high since the September quarter 2006. In June 2005, when nominal housing affordability was 20 percent above the long run average, real housing affordability was 11 percent below average. The deterioration in real housing affordability has been both more rapid and more recent than the deterioration in nominal housing affordability.

Fourthly, it should be noted that while both real and nominal housing affordability has deteriorated sharply since March 2002, both the nominal and real housing affordability indices were at very low levels between 1999 and 2001 (i.e. housing was relatively affordable). The real housing affordability index was less than 1000 between the September quarter of 1999 and the September quarter of 2005. The deterioration in affordability since March 2002 must be seen in this context.

Figure 4 shows the path of real mortgage rates in New Zealand since 1989. Real mortgage rates reached a low of 4 percent in June 2005, and have subsequently increased to 5.75 percent, the highest value since 1999. The 40 percent increase since September 2005 is behind much of the recent deterioration in real housing affordability: house prices increased by 22 percent, offset by a 9 percent increase in hourly earnings, while nominal interest rates only increased by 9 percent. It would appear, therefore, that the recent deterioration in housing affordability has occurred not only because of the large increase in house prices but also because of the Reserve Bank decision to tighten monetary policy.

Figure 4: Real mortgage rates 1989-2007: Nominal rate at t adjusted for average inflation t-4 to t+4



A different way of examining the question of housing affordability is to ask what real interest rates would have to be to make the September 2007 real housing affordability index equal to 1000, the long term average, if house prices and wages were not to change. The answer is that real mortgage rates would have to be 3.95 percent. This is lower than they have been in the last decade – the minimum was 4.0 percent in September 2005 – but certainly not an unrealistic number when compared to mortgage rates in other countries. The average real mortgage rate in New Zealand since March 2000 has been 4.85 percent. Consequently, the real housing affordability index would be 1225 if real mortgage interest rates were at their recent average value, keeping house prices unchanged. While this value indicates that house prices are high given incomes and normal real interest rates, they are by no means at unprecedented levels. If wages were to increase by 8 percent over the next two years, and real interest rates were to reduce to average levels, house prices would only need to decline to the levels seen in September 2006 for the cost of housing to return to post 1992 average levels.

3.2 An alternative interpretation of the real affordability index.

An alternative way to think about the real affordability index is to consider the real value of the stream of nominal payments associated with a standard (money) mortgage. Figure 5 shows the real value of the stream of payments made on a 25 year $100 000 mortgage when the nominal interest rate is 9 percent and the inflation rate is 3 percent. If P is the principal amount borrowed, T is the number of years of the mortgage, and *i* is the interest rate, the annual repayment is

$$annual\ \ payment = \frac{iP(1+i)^T}{(1+i)^T - 1}$$

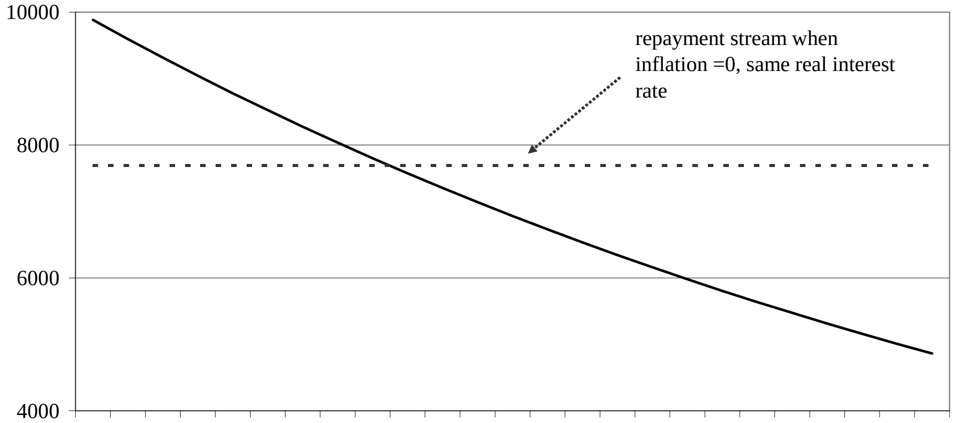
and thus the real value of the payment t years into the mortgage is

$$real\ \ payment_t = \frac{iP(1+i)^T}{(1+\pi)^t\left[(1+i)^T - 1\right]}$$

The graph also shows what the stream of payments would have been with the same real interest rate (5.83 percent) but zero inflation.

The graph indicates that the real value of the nominal payment stream declines rapidly, from $9884 per $100 000 at the end of the first year to $4862 at the end of the 25th year. In contrast, if the inflation rate was zero and the real interest rate was 5.83 percent, there will have been a constant repayment of $7693. When one calculates an affordability index using the nominal interest rate, the *average* lifetime cost of the mortgage is overstated as it does not take into account the expected decline in the real value of the payment stream over the life of the mortgage that occurs because the inflation rate is positive. An index based on the real mortgage rate automatically makes this adjustment.

Figure 5: Real repayment stream of a 9% 25-year mortgage (inflation = 3%)



4 The usefulness of the nominal housing measure

Conceptually, the real housing affordability measure is more suitable than the nominal measure for measuring the real cost of borrowing to purchase a house, as it properly adjusts for the effects of inflation. However, as Modigliani and Lessard (1975) and Campbell and Coco (2003) argued, if agents can only use money mortgages to borrow to purchase houses, large welfare losses can occur when the inflation rate is positive. This is because agents facing credit constraints will be unable to adequately smooth consumption through time as they will have to make much higher real mortgage payments at the start of a mortgage than at the end of the mortgage. Coleman (2007) extended this argument to show that if agents maximize their utility, home-ownership rates among young households will decline as the inflation rate increases, because households will choose to rent rather than make the large cuts in consumption that would be necessary to make the nominal interest payments on a standard mortgage. In his model, the distortion introduced by inflation has relatively little effect on property prices, but it can have large effects on property ownership patterns, particularly amongst young households. Thus the nominal measure of housing affordability has some uses, as it captures the extent to which credit constrained households will face cash-flow difficulties if they were to borrow to purchase a house. These difficulties are "real" in the sense that they can have large effects on credit constrained households. The nominal house affordability measure may better reflect the difficulties experienced by credit-constrained borrowers who borrow to purchase a house than the real measure of housing affordability. However, since much of this difficulty is not caused by the cost of the house but the contractual need to save large amounts at the beginning stages of home ownership, a nominal housing affordability measure should primarily be used in conjunction with the real measure to indicate the extent to which credit constraints may deter home ownership, rather than the extent to which it affects the cost of home ownership.

5 Conclusion

Inflation distorts the measurements of saving. Even when inflation is in the 1-3 percent range, these distortions are not trivial and may lead to the understatement of national saving by 2 percent of GDP per year. For the same reason, a traditional house price affordability index such as that produced by AMP/Massey or Fairfax Media overstates how much it costs to afford housing, for it does not properly adjust for the effects of inflation. A real housing affordability index can easily be constructed to make these adjustments. In the five years to September 2007, a nominal housing affordability index overstated the cost of housing affordability by more than fifty percent. The bias in the nominal housing affordability measure was worse during the last five years than previously because of the increase in the average inflation rate that took place after 2002.

Between September 1999 and September 2005, the real housing affordability index was below its long term average. Since then it has increased sharply in response to increases in house prices and real interest rates, from 990 in September 2005 to 1238 in March 2007 and 1462 in September 2007. In real terms, housing affordability is as difficult now as it was in 1998 and nearly as difficult as in 1991. Nonetheless, much of the worsening trend in real housing affordability reflects the tightening of monetary policy since late 2005 and is likely to be reversed when the Reserve Bank sees fit to return to a neutral monetary stance, assuming house prices do not increase further.

References

Australian Bureau of Statistics, (2001) *Australian System of National Accounts, 2000-01* (ABS Catalogue number 5204).

Campbell, J Y, and J F Cocco, (2003) "Household risk management and optimal mortgage choice," *The Quarterly Journal of Economics,* 118(4), 1449-1494.

Clements, R, (1984), *Savings in New Zealand during inflationary times*, Reserve Bank of New Zealand Research Paper 38.

Coleman, A (2006) "Income and saving in New Zealand: an age-cohort analysis" conference paper presented at the workshop on 'Housing, savings, and the household balance sheet,' Reserve Bank of New Zealand, 14 November 2006.

Coleman, A (2007) "Credit Constraints and Housing markets in New Zealand" Reserve Bank of New Zealand Discussion Paper 2007/11.

Modigliani, F, and D R Lessard, ed, (1975) *New mortgage designs for stable housing in an inflationary environment*, Federal Reserve Bank of Boston, Boston, MA.

United Nations, (1993) *The System of National Accounts.*

White, R, (1979) "The need for a constant value unit of account: savings," *Reserve Bank of New Zealand Bulletin*, 435-437.