A Guide to House Price Indexes

Australia

2006

A Guide to House Price Indexes

Australia

2006

Dennis Trewin
Australian Statistician

INQUIRIES

- For further information about these and related statistics, contact the National Information and Referral Service on 1300 135 070.

CONTENTS

•••

INTRODUCTION

··

This guide

The purpose of this guide is to provide an overview of house price indexes produced by the Australian Bureau of Statistics including: the concepts, sources and methods underlying them; how to use the price indexes; and how the Established House Price Index (HPI) is calculated. It discusses some general issues relating to the measurement of house prices and describes the data now used in compiling the HPI. This guide also provides background on the stratification used to minimise the impact of varying levels of house sales in different regions within each city.

The HPI

The HPI is a Laspeyres index that measures the inflation or deflation in the price of established houses over time. Separate indexes are produced for each capital city in Australia, and these indexes are combined to produce a weighted average index of the eight capital cities. The HPI is published quarterly by the Australian Bureau of Statistics (ABS) in *House Price Indexes: Eight Capital Cities* (cat. no. 6416.0).

History of the HPI

The HPI was originally designed to meet the specific data requirements for the construction of a price measure for mortgage interest charges, which were included in the Consumer Price Index (CPI) from 1986 to 1998. The timing basis used was the date of final settlement of the house as that was the time at which mortgage interest started to be charged. The weighting patterns appropriate for mortgage interest charges were housing finance commitments. House prices were obtained from a range of sources, with varying coverage within each of the eight capital cities. The main sources of data were the State/Territory[1] Land Titles Office or Valuers-General (VGs) Office, or equivalent[2] and the State Real Estate Institutes.

When mortgage interest was removed from the CPI in 1998 as part of the 13th Series CPI Review, the ABS continued to publish the price index of established houses because of user interest in the series. A time series is available as a spreadsheet in Table 10 of House Price Indexes: Eight Capital Cities (cat. no. 6416.0) on the ABS website <www.abs.gov.au>. The series commences in June quarter 1986 and concludes in June quarter 2005.

The HPI in its current form was first published in December 2005, with the HPI series backdated to March quarter 2002. The series based on the previous methodology is published for historical purposes for users who may be interested in an indicator of established house price movements over a longer period than is available using the current methodology. Note that because of the different methodologies used to calculate this historical series and the current HPI series, it is recommended that caution be exercised when the historical series is used as a proxy for back-casting (or linking to) the new HPI series for periods prior to March quarter 2002.

Renovating the HPI

During the early 2000's, house prices were increasing rapidly and it became clear that the HPI was not sufficiently robust to cope with the situation. The data sources and the coverage of sales differed across States and Territories and the timing point for pricing was not consistent between States. Further, the underlying weights were based on housing finance data, which remained from the days when mortgage interest was included in the CPI.

---

1 State/Territory is referred to as 'State' for the remainder of this Guide.
2 These data sources are referred to as 'VGs' for the remainder of this Guide.

··

Renovating the HPI
continued

The ABS commenced a review of the HPI in 2004. The objectives of the review were to:

- determine specific user requirements for a revamped HPI;
- identify possible data sources that were consistent and comprehensive;
- assess the costs and the strengths and weaknesses of these alternative data sources; and
- develop a strategy to deliver an improved HPI.

Arising from the review, there were four important aspects of the data series identified as needing to be changed or improved:

- the timeliness of the HPI release;
- the time at which prices are recorded — from settlement date to the date of exchange of contracts;
- the effects of compositional changes — to be reduced by adopting a finer level of stratification to take better account of compositional shifts: and
- the coverage of the index — to include 'other dwellings' (townhouses, units and apartments), and dwellings covering the regions in each State outside the capital cities.

The ABS has to date made good progress against these required improvements. The HPI is now released closer to the period of reference (though there is scope for further improvement). The time at which prices are recorded has been changed to the date of exchange of contracts, and the effects of compositional change have been reduced through improved stratification. The ABS has decided to concentrate initially on upgrading the index for detached houses only. Therefore, the aim of developing new indexes for other residential dwellings (units, townhouses, apartments etc) remains a longer term objective. Likewise, the ABS is not yet able to move towards producing national, capital city and rest of state HPIs each quarter. For the immediate future, the geographic scope will continue to be restricted to the eight capital cities, including a total for them.

A number of users also expressed a strong desire for the ABS to release average prices (mean and/or median) for each city in addition to the price index. The ABS feels that it is not possible to publish stratified price level measures that will be meaningful. However, unstratified, or 'raw' measures of median house prices have been made available. In addition, the number of properties transacted in each city each quarter is being published.

Despite some user interest in a monthly HPI, the ABS does not believe that the currently available data are sufficient to support the construction of a reliable monthly series. The datasets underlying the HPI are not large, particularly once the requirement for increased stratification is taken into account. Based on the experience with the quarterly data, the ABS considers that a monthly HPI would be too "noisy" for publication. That is, the monthly movement would be likely to jump around dramatically, making it difficult to detect either changes in trends or turning points.

The September quarter 2005 issue of publication *House Price Indexes: Eight Capital Cities* (cat. no. 6416.0) was the first to incorporate the changes outlined above. For a more detailed discussion on the outcomes of this review, refer to Information Paper: *Renovating the Established House Price Index* (cat. no. 6417.0).

WHAT IS THE HPI?

OBJECTIVE AND CONCEPTS

The objective

The objective of the HPI is to provide an accurate measure of the contemporary rate of change in the prices of the stock of established houses in the 8 capital cities. The scope for the HPI is restricted to those dwellings where the primary purpose is residential (i.e. excluding commercial properties) regardless of ownership or tenure of the occupants (i.e. including government-owned properties and properties owned by private landlords).

What the HPI measures

The HPI measures the rate of change in the prices of the stock of established houses, including the land component, in the 8 capital cities. Each capital city HPI is produced as a weighted average of cluster indexes. The national HPI is a weighted average of the indexes for the 8 capital cities.

Definition of a house

For the HPI, an established house is defined as a free standing/detached residential dwelling on its own block of land regardless of age i.e. including new houses sold as a house and land package as well as second-hand houses. Price changes, therefore, relate to changes in the total price of houses and land. Only houses within capital city statistical divisions (SD), as defined in Australian Standard Geographical Classification (ASGC) are included.

Examples of house types in scope are:
- Ordinary detached house
- House with office
- House with flat
- Rural residential houses (within a capital city SD and not part of a farming business).

Examples of house types not in scope are:
- Town houses
- Cluster houses on single title
- House with farm engaged in primary production.

Which date?

In the Australian context, there are four significant dates related to the purchase of a residential dwelling. A general timeline of the stages of the sale of residential dwellings is as follows:
- verbal agreement to purchase at a negotiated price
- approval of mortgage financing
- exchange of contract
- settlement of the property sale.

For the purposes of measuring price changes for houses, it is desirable to select the earliest date at which the final purchase price is set. The point in time at which the price is first determined is when verbal agreement is reached. However, there is no effective way to capture this information and it is possible for the originally agreed sale price to be renegotiated before the exchange of contracts. Approval of mortgage finance data is limited to those sales that involve mortgages. A house price index constructed on a settlement date basis incorporates a lag in identifying the turning points in housing prices as the settlement date can occur several weeks or months after the exchange of

<table>
<tr><td>

Which date? continued

</td><td>

contract. It is for these reasons that, in compiling the HPI, the date of exchange of contract is the preferred date.

</td></tr>
<tr><td>

DATA

Market Prices

</td><td>

Ideally, the HPI would be compiled using the current and historical market prices of the entire stock of houses. In practice, market prices for any particular period are only available for those houses that are actually traded (sold/purchased) in the period. Such sales account for only a very small proportion of the total housing stock in any quarter and so it is necessary to draw inferences about the price behaviour of the whole stock from these small samples. The assumption behind this procedure is that the median sales price of the houses traded each quarter is indicative of the median price of all houses.

</td></tr>
<tr><td>

Valuers-General

</td><td>

Each property transaction, regardless of type or location, needs to be registered at some point to enable the relevant State government authority to maintain a record of property ownership and to facilitate the collection of stamp duty. The most obvious source of comprehensive information on house prices are the State VGs offices. The data held by these agencies represent the ABS's preferred source for compiling the HPI because they provide the most comprehensive dataset currently available on house sales. The information contained in these records varies between jurisdictions. All include data on the sale of the property (date, price, etc.). In some jurisdictions, information is also available on the physical characteristics of the property.

</td></tr>
<tr><td>

Delays in Valuers-General data

</td><td>

A disadvantage of the VGs administrative datasets is the lengthy delays experienced before all data become available. Different jurisdictions have different legislation governing the reporting requirements of parties to property transfers. In general, the requirement is for the property transfer to be registered within 60-90 days of settlement. When combined with a lag between exchange of contracts and final settlement of 4 to 6 weeks on average, but up to 3 or 4 months in some cases, the delay between the date of contracts being exchanged and all transactions relating to a particular month being received by the ABS can be 6 months or more.

A further concern about obtaining reliable price measures is that properties with higher prices generally take longer to settle. The consequence is that details received by the ABS relating to the property sales in a particular quarter are distributed in a biased way. In general, the median price of properties exchanged in a particular quarter increases as the dataset becomes more complete. The resulting bias in early reported data is always downwards but its magnitude is not consistent, either between cities or over time within any one city. As a result, it is necessary to obtain an almost complete dataset for each quarter before it is possible to determine the most accurate measure of the median house prices. As noted above, it takes several months for all transactions relating to a particular quarter to be finally settled, recorded by the relevant State agency and then passed on to the ABS. Clearly, it is not possible to produce a timely HPI from this administrative data source.

</td></tr>
</table>

Mortgage Lenders

A more timely data source that can be used to supplement the VGs data is property loan applications from mortgage lenders. A large percentage of house sales involves mortgages, and such applications are generally processed shortly after the exchange of contracts. Loan documents and the systems used by most mortgage lenders do not capture the actual date of exchange. Fortunately, the recorded loan application approval date has proven to be a satisfactory proxy.

A number of financial institutions are providing the ABS with loan approvals data. They have also provided this information going back to the early 2000s enabling the ABS to analyse the behaviour of the series to determine how well it tracked a HPI series based on the VGs data. Although the data do not cover all house sales, the ABS has found that when combined with early VGs data it can produce a reliable prediction of the final price changes.

Biases in the datasets

As stated above, different States have different legislation in place concerning the length of time in which an owner must register the property title transfer. Further, there is a bias in early VGs data caused by the tendency of properties with higher prices to take longer to settle and therefore appear in the VGs dataset. The VGs data available for the two most recent quarters are biased downwards because of this tendency for cheaper properties to be settled more quickly than relatively expensive properties.

The mortgage lenders' data are also biased. Loan documents do not necessarily record the actual sale price of the property, rather these records often contain the security valuation amount, which can differ markedly from the sale price. Though the most obvious of these records are identified and excluded, the median prices derived from mortgage approvals data are generally higher than median prices derived from the complete VGs dataset.

Estimating the date of exchange for Adelaide and Darwin

For most States, the VGs data includes information on the date of exchange of contracts. However, the contract exchange date is not captured in either South Australia or the Northern Territory. For Adelaide and Darwin, the ABS estimates the contract exchange date from the settlement date. The estimates are modelled on the relationship between the settlement and exchange dates in Brisbane, where similar administrative arrangements exist. These models are updated from time to time to ensure their continuing effectiveness and relevance.

CONSTRUCTION OF HOUSE PRICE INDEXES
The "compositional change effect"

The standard procedure for constructing price indexes is to select a sample of representative items and to re-price the identical items through time (a matched sample). This approach is not viable in the case of established houses as the observable prices in each period invariably relate to a different set of houses. In other words, the sales prices observed for any pair of consecutive quarters are completely independent datasets.

There is little in the way of international standards and practice regarding the construction of dwelling price indexes. The most comprehensive discussion is contained in the International Monetary Fund's (IMF's) 'Compilation Guide on Financial Soundness Indicators' - Chapter Nine 'Real Estate Price Indices'. The following extract from that guide (paragraph 9.4) is instructive:

The "compositional change effect" continued

'Constructing representative real estate price indices is challenging. Difficulties can arise because real estate markets are heterogeneous, both within and across countries, and illiquid. There may be no unambiguous market price. Moreover, such diversity and lack of standardization results in the need to gather a wide range of data to compile indices that are characteristic of the various market segments; this would contribute to high data collection costs and may require greater technical sophistication. Representative real estate prices in residential and commercial markets can be hard to measure accurately given the small samples that are often available, as there may be disparate prices for apparently similar properties and prices may be volatile.'

Although the IMF Guide does discuss a number of techniques, the material is not comprehensive.

The central issue is how to utilise prices for an essentially heterogeneous set of dwellings to construct measures of price change for homogeneous dwellings. There are three general approaches that might be used to achieve this: hedonics, repeat sales and stratification.

METHODS TO CONTROL FOR COMPOSITIONAL CHANGE

Hedonic price indexes

The hedonic approach views products (such as dwellings) as bundles of characteristics that are not individually priced, as the consumer buys the bundle as a single package. Through the use of regression techniques, the objective is to "unbundle" the characteristics to estimate how much they contribute to the total price.

There are several ways in which this approach can be employed in practice. A hedonic technique has recently been introduced with respect to pricing computers in the 15th Series CPI. Details of the methods used for computers are set out in Information Paper: *The Introduction of Hedonic Price Indexes for Personal Computers* (cat. no. 6458.0). A similar approach could be adopted for housing although, of course, the type and number of price-determining characteristics would be different. An advantage of the hedonics approach is that it generally makes use of more price data than other approaches.

However, the effectiveness of hedonics is critically dependent on the availability of data on the price-determining characteristics. Analysis by the ABS has shown that the single most important price-determining characteristic is location, followed by an indication of the socio-economic conditions of the area[3], and then by the physical characteristics of the dwelling (such as outer-wall construction, overall size, number of rooms, number of bathrooms).

While various characteristics exist for different datasets for different cities, the detailed characteristics data required to support an hedonic approach are not readily available nationally for house sales in Australia at this time.

Repeat Sales

The repeat sales approach controls for compositional change by maintaining a historical record of property sales. When properties are sold repeatedly over time, price changes between successive sales dates are calculated. Regression techniques are used to calculate the overall price index for each quarter.

---

3   The analysis used the ABS' Socio-Economic Index for Areas (SEIFA) which ranks geographic areas according to their social and economic conditions.

Repeat Sales continued

To be effective, this approach requires a long time series of price data for individual properties, given their infrequent turnover. As the methodology is premised on the assumption that the 'quality' of the individual properties is constant over time, this approach may be more suited to some property types than others (e.g. units), or require supplementary information on property renovations. The nature of the estimation technique also means that at least the tail end of the series is subject to potentially significant revision. The ABS does not have sufficient data to use this method.

Stratification

The stratification approach involves grouping the observations for the 'most like' or 'most similar' dwellings into clusters. The objective is to optimise the physical homogeneity of dwellings within each stratum. Apart from their physical characteristics, houses that are close share the same neighbourhood characteristics and so the finer the level of stratification available, the more similar or homogenous the cluster of houses is likely to be. However, the finer the level of stratification, the fewer observed property sales will occur. So the clusters defined have to balance the homogeneity of housing characteristics and the number of observations required to produce a reliable median price. The lowest level geographical classification that is commonly available across datasets is the suburb, so suburbs are the building blocks on which the clusters are based.

Ideally, each suburb would form its own cluster as this would maximise the homogeneity of the cluster given the details available on the characteristics of established houses. However, there are insufficient numbers of observations from quarter to quarter to support this methodology. As a result, the approach adopted has been to group together similar suburbs to form clusters with sufficient ongoing observations to determine a reliable median price.

In building the stratifications, the pool of suburbs used were restricted to each statistical subdivision (SSD) within each capital city statistical division (SD), as defined by the ASGC. This approach ensured that suburbs with similar characteristics were only clustered with other geographically close suburbs

The effectiveness of the stratification approach is determined by the degree of stratification possible and the availability of stratification variables. It may not be feasible to employ fine level stratification if there are insufficient observations per stratum to produce reliable movements. For example, stratifications defined for Canberra, Hobart and Darwin tend to be more volatile than those for the larger cities because they do not always have sufficient sales each quarter to enable as fine a level of stratification as is possible in the larger cities.

Method chosen

Given the absence of a comprehensive national dataset to enable the use of either the hedonics or repeat sales approaches, the only option currently available in practice to construct an HPI which controls for compositional effects is the stratification approach. Note that stratification will not adjust for quality changes such as the size of the dwellings increasing over time.

CALCULATING THE HPI

. . . .

CALCULATING THE HPI

METHODS OF THE HPI
Stratification

As mentioned previously, the only approach currently available to control for compositional effects is the stratification approach. ABS research has shown that geographical location of suburbs is one of the key determinants of the price of established houses. Accordingly, location (suburb) is used to define strata.

The clusters within each capital city were determined using principal components analysis. The logic behind this approach is that it groups suburbs into clusters so that observations in the same cluster are more similar to one another than they are to observations in other clusters.

A number of different factors were considered to impact upon the median price of houses sold in the property market. Even though data relating to these characteristics were not available for each individual house, the census of population and housing provided information to allow the following characteristics to be established for each suburb:

- percentage of three bedroom houses
- percentage of four bedroom houses
- percentage of detached houses
- percentage of townhouses
- percentage of owner-occupied houses
- percentage of rented houses
- SEIFA - Socio-Economic Indexes for Areas (SEIFA) ranks geographic areas according to their social and economic conditions (see Information Paper: *Census of Population and Housing - Socio-Economic Indexes for Areas, Australia* (cat. no. 2039.0))
- distance to the CBD
- distance to hospitals
- distance to shops.

Analysis was undertaken to identify which of these variables were the 'principal components' or, in other words, which variables were the most significant determinants of price. After undertaking this principal components analysis, it was determined that in each cluster, the SEIFA index, percentage of three bedroom houses, and percentage of owner-occupied houses could be considered as the primary determinants of price. In practice, many of the above factors were highly correlated with the SEIFA index, meaning that the variability in price was largely described by this index. The result was that clusters could be compiled most effectively using the SEIFA index and the percentage of three bedroom houses as the primary price related characteristics.

After the theoretical stratifications were determined, they were tested using the available data on transactions to assess the performance of median prices over time and the distribution of prices within clusters. If it was discovered that groups of houses of disparate price levels were included in the one cluster, then this cluster was split accordingly (subject to the presence of sufficient observations).

The following table shows the number of strata resulting for each city:

. . . .

8   ABS • A GUIDE TO THE HOUSE PRICE INDEX • 6464.0 • 2006

Stratification continued

No. of Strata

Sydney	55
Melbourne	39
Brisbane	51
Adelaide	27
Perth	14
Hobart	8
Darwin	5
Canberra	14

Weighting

The HPI is compiled using weights relating to the stock of established houses. The weights are expressed in terms of stock values (currently derived from the 2001 census of population and housing). An initial value of the established housing stock in each cluster was estimated by aggregating suburb counts to clusters and valuing them at March quarter 2002 mean prices (March quarter 2002 is the first quarter for which the HPI is available on its current basis). It is important to understand that it is not the stock values that are held constant from period to period. What is held constant is the number of houses underpinning these values. The ratio of the observed median prices of the clusters for the current and previous quarters (known as the price relative) is used to move forward these stock values for each cluster in each city. Algebraically, this produces the same outcome as weighting together prices for each cluster in each quarter using quantities as the weights but it is much easier to implement operationally.

The current weights, based on the 2001 census, will be updated once data become available from the 2006 census. At that time, the ABS will also re-examine the existing clusters to determine whether they need to be revised for any of the cities. Please refer to Appendix 1 for the weights used in the HPI and Project Homes indexes.

Determining Price Movements

The HPI is compiled using the ratio of median prices. The median is value of the middle observation from among an ordered ranking of house prices. Medians are preferred as, unlike arithmetic mean or geometric mean calculations, they are not affected by extreme or outlier values, and give the most robust and consistent measure of central tendency. The price relative calculated from two medians is the most reliable measure of price change.

TWO STAGE APPROACH

The benchmark series

Though a complete coverage of property sales data can eventually be obtained from the VGs, this data is not available on a timely basis for the most recent quarters. As a result, the ABS has adopted a two-stage approach to produce the HPI. The first stage is to compile a benchmark series based on the complete, or near complete, VGs dataset for each quarter. In practice, the data underlying the benchmark series for any quarter is not sufficiently complete until two more quarters of data has been received. For example, the benchmark HPI for March quarter each year will not be available until it is released with the September quarter issue of the HPI publication.

The benchmark series of indexes are compiled as a weighted average of indexes derived from movements in median house prices, stratified by cluster, for each city. The national index is compiled in the same way as the benchmark series (i.e. as a weighted average of the eight capital cities).

Compiling the 'leading indicator' series

The second stage, referred to as the 'leading indicator' series, involves compiling price indexes for the two most recent quarters (e.g. in the case above, the June and September quarters) based on a combination of mortgage lenders' data and the VGs data available at that point in time. The price indexes for the leading indicator series are weighted and constructed similarly to that of the benchmark series of indexes.

In merging the VGs and mortgage lenders' datasets for the leading indicator series, any property transactions appearing in both are removed from the mortgage lenders' data. In some cases, an address which identifies a suburb is not available from the mortgage lenders' data so postcode is used as a proxy. Records containing only postcode are allocated to a cluster based on the best match between a cluster and the postcode in those cases for which there is not a 1:1 correspondence between postcode and cluster.

Currently the ABS uses a number of stratification models to assess the best fit estimates of the composite VGs and mortgage lenders' data in terms of predicting the final estimates. The ABS will continue to refine its methods as a longer time series is established and analysed, with a view to developing a single optimal model for predicting final price movements in each city.

Revisions to the leading indicator series

As the VGs based benchmark indexes become available, they are used to progressively replace the leading indicator series. As a result, the most recent two quarters' estimates of the HPI are preliminary, and subject to revision. The expectation is that the second preliminary estimate published for a quarter will be closer to the final estimate than was the first preliminary estimate published.

The latest quarterly observation (labelled with a 'p' in the HPI tables) is the first preliminary prediction based on a combination of the available VGs data and mortgage lenders' data. The second latest observation (also labelled with a 'p') will be the revised estimate from the previous quarter's publication. It will be the second preliminary prediction based on available VGs data (more than were available for the first prediction) and mortgage lenders' data. The third latest observation (labelled with an 'r' if it has been revised since the previous quarter's estimate) is the first publication of the benchmark series compiled from a comprehensive set of VGs data only.

As the methodology for the leading indicator series is in the process of being evaluated, the HPI publication also includes a table stating the size of the revisions applied to these series over time. The first, second and final estimates of the index numbers for any particular quarter are all published (with this information dating back to June quarter 2005, when the first leading indicators were available). The size of the revision between the final index number and the two preliminary estimates is also published. This information eliminates the need to reference previous publications to determine what index number was initially published for a quarter, and also provides a measure of the accuracy of the leading indicator series.

USING HOUSE PRICE INDEXES

DESCRIPTION OF A PRICE INDEX

Why a price index?

As the name indicates, the HPI is presented as a price index. Price indexes provide a convenient and consistent way of presenting price movement information that overcomes problems associated with averaging across diverse items. An index number on its own has little meaning. The value of a price index stems from the fact that index numbers for any two periods can be used to directly calculate price change between those periods. For example, the HPI Sydney index number of 93.5 in December quarter 2005 says nothing more than Sydney house prices have fallen by 6.5% from the base year 2003-04 (when the index was set to 100.0).

It is important to note that the capital city indexes measure price movements over time in each city individually; they do not measure differences in price levels between cities. Having a higher index value in one city compared with another simply means that the price change since the base period has been greater in the first city.

Price indexes produced by the ABS

The HPI is one of a range of price indexes published by the ABS. Other price indexes available include:

- the consumer price index (CPI)
- producer price indexes
- international trade price indexes
- labour price indexes
- chain price indexes of selected national accounts aggregates.

Having determined that a price index is required for a particular application, it is important for price index users to carefully consider the range of available indexes and select the one that best meets the specific requirement. The ABS can provide statistical and technical guidance but it does not provide advice on indexation practices and it cannot advise users of which index they should use for particular indexation purposes.

Contract indexation

A general description of the issues that should be taken into account by parties considering a contract indexation clause is contained in Appendix 2 (Price Indexes and Contract Price Indexation) in this Guide.

USING PRICE INDEXES

Interpreting index numbers

Movements in indexes from one period to any other period can be expressed either as changes in index points or as percentage changes. The following example illustrates these calculations for the HPI for the weighted average of the eight capital cities between December quarter 2002 and December quarter 2005. This procedure is applicable for any two periods.

For example:

December quarter 2005 index number	104.0
less December quarter 2002 index number	85.0
equals change in index points	19.0
Percentage change	19.0 / 85.0 x 100 = 22.4%

Interpreting index numbers
continued

For most applications, movements in price indexes are best calculated and presented in terms of percentage change. Percentage change allows comparisons in movements that are independent of the level of the index. For example, a change of 2 index points when the index number is 120 is equivalent to a change of 1.7 per cent, but if the index number were 80 a change of 2 index points would be equivalent to a change of 2.5 per cent - a significantly different rate of price change. Only when measuring change from the reference base period of the index will the points change be numerically identical to the percentage change.

The percentage change between any two periods must be calculated, as in the example above, by direct reference to the index numbers for the two periods. Adding the individual quarterly percentage changes will not result in the correct measure of longer-term percentage change. In other words, the percentage change between, say, the June quarter one year and the June quarter of the following year will not necessarily equal the sum of the four quarterly percentage changes. The error becomes more noticeable the longer the period covered and the greater the rate of change in the index. This can readily be verified by starting with an index of 100 and increasing it by 10 per cent (multiplying by 1.1) each period. After four periods, the index will equal 146.4 delivering a through-the-year percentage change of 46.4 per cent, not the 40.0 per cent obtained by adding the four quarterly changes of 10.0 per cent.

Annual index numbers

Price indexes produced by the ABS are published on both a quarterly and a financial year basis. The index number for a financial year is the simple arithmetic average (mean) of the index numbers for the 4 quarters of that year. Index numbers for calendar years are not calculated for the HPI but can be derived by calculating the simple arithmetic average of the quarterly index numbers for the year concerned.

For example, an index number for the year 2005 would be calculated as the arithmetic average of the index numbers for the March, June, September and December quarters of 2005. This characteristic of index numbers is particularly useful. It allows annual price movements to be calculated and compared with those of any other year. It also enables the index number in, say, the current quarter, to be compared with the average prevailing in some prior year.

Reference base period

The reference base of an index series is that period for which the value of the index is set to 100.0. Prices in other periods are expressed as percentages of the price in the base period. For example, if the HPI had increased 15% since the base period the index number would be 115.0; similarly, if it had fallen by 15% the index would be 85.0.

In the case of the HPI the reference base period is the 2003-04 financial year (i.e. 2003-04 = 100.0).

Precision and rounding

To ensure consistency in the application of data produced from the price indexes, it is necessary for the ABS to adopt a set of consistent rounding conventions or rules for the calculation and presentation of data. The conventions strike a balance between maximising the usefulness of the data for analytical purposes and retaining a sense of the underlying precision of the estimates. These conventions need to be taken into account when using price index data for analytical or other special purposes.

Precision and rounding
continued

Index numbers are always published to a base of 100.0. Index numbers and percentage changes are always published to one decimal place, with the percentage changes being calculated from the rounded index numbers. Index numbers for periods longer than a single quarter (e.g. for financial years) are calculated as the simple arithmetic average of the relevant rounded quarterly index numbers. Percentage changes between these periods are calculated from the rounded average index numbers.

OTHER SERIES PUBLISHED WITH THE HPI

OTHER HOUSE PRICE
INDEXES
Other data

There are a number of other price indexes and other data related to housing that are produced by the ABS. A selection of these data are included in *House Price Indexes: Eight Capital Cities* (cat. no. 6416.0). Each of these are described below.

Project homes index

The index for project homes is compiled for use in calculating the House purchase expenditure class of the Consumer Price Index (CPI) where price information is obtained each month from a sample of project home builders in each capital city. For the purpose of the CPI, a project home is defined as a dwelling for construction on a client's block of land, and price changes therefore relate only to the price of the dwelling (i.e. excluding land).

The series for project homes is derived by weighting together the indexes for each of the eight capital cities. In September quarter 2005, data on housing finance collected by the Australian Prudential Regulatory Authority was used to update the aggregate expenditure on secured finance commitments for the purchase of new dwellings by owner-occupiers in 2004-05. The city weights were allocated using data from the Building Activity survey and census data. Refer to Appendix 1 (Eight capital cities weighting pattern) for each capital city's percentage contribution to the Eight Capital Cities for the established house and project home price indexes.

Although the capital city price indexes for project homes are compiled for use in calculating the House purchase expenditure class of the CPI, price movements exhibited in this series and that published witht the established house price index are not directly comparable. The weighting pattern used in the CPI House purchase index differs from that described above for the project homes index. The weights used for CPI purposes relate to the net acquisition of dwellings (excluding land) by private households in each of the eight capital cities (i.e. they refer to dwellings acquired from the government and business sectors and include alterations and additions to existing dwellings).

*Materials used in house
building*

The index for materials used in house building is published for the weighted average of the six state capital cities in *Producer Price Indexes, Australia* (cat. no. 6427.0), re-referenced to a base year of 2003-04 = 100.0. For more information on this index refer to *Producer and International Trade Price Indexes: Concepts, Sources and Methods, 2006* (cat. no. 6429.0)

*Construction industry total
hourly rates of pay*

The index for the construction industry total hourly rates of pay excluding bonuses, private and public, is that published in *Labour Price Indexes, Australia* (cat. no. 6345.0), referenced to a base year of 2003-04 = 100.0. For more information on this index refer to *Labour Price Index: Concepts, Sources and Methods, 2004* (cat. no. 6351.0.55.001)

*Private housing
investment*

This series is the annually-reweighted chain Laspeyres price index for private capital expenditure on new dwellings, as used (but not separately published) in *Australian National Accounts: National Income, Expenditure and Product* (cat. no. 5206.0), re-referenced to a base year of 2003-04 = 100.0. For more information on this index refer to *Australian National Accounts: Concepts, Sources and Methods, 2000* (cat. no. 5216.0)

OTHER HOUSE PRICE
DATA
*Established house transfer
prices and counts*

As well as the price indexes based on stratified weights for each city, the ABS publishes the median price of all established house transfers, and number of established house transfers. Both these series are based on VGs house sales data and, are only available for those quarters for which the benchmark HPI is available. As the ABS receives more data, these figures are revised as necessary.

The median prices are calculated using all available VGs records for each city each quarter, with no clustering (stratification) or weighting applied. These 'raw' medians will not correspond to the published HPI and will not show price movements that are consistent with the HPI.

The number of transfers of established houses recorded each quarter by the VG in each capital city are presented in the HPI publication to provide an indication of sales activity for the city each quarter.

FURTHER INFORMATION

....

FURTHER INFORMATION

PUBLISHING THE HPI

The publication

The HPI is compiled and published quarterly in *House Price Indexes, Eight Capital Cities* (cat. no. 6416.0). The publication is currently released approximately 6-7 weeks after the end of the reference quarter. Each quarterly issue of this publication announces the release dates for the next two quarterly issues; i.e. the publication dates for these statistics are finalised and announced about six months in advance.

Materials released

The statistics released through *House Price Indexes, Eight Capital Cities* (cat. no. 6416.0) are disseminated via several different mechanisms. The publication is available in hard copy (printed product). Also available free of charge on the ABS website <www.abs.gov.au> are:

- the main findings from the publication in HTML format;
- a downloadable version of the full publication in PDF format;
- all tables in the publication, downloadable in Microsoft Excel format;
- historical table of the HPI using previous methodology, downloadable in Microsoft Excel format.

Related Publications

Users may also wish to refer to the following publications which are available from the ABS website:

- Information Paper: *Renovating the Established House Price Index* (cat. no. 6417.0)
- *Australian National Accounts: National Income, Expenditure and Product* (cat. no. 5206.0) - issued quarterly
- *Building Activity, Australia* (cat. no. 8752.0) - issued quarterly
- *Building Approvals, Australia* (cat. no. 8731.0) - issued monthly
- *Consumer Price Index Australia* (cat. no. 6401.0) - issued quarterly
- *A Guide to the Consumer Price Index: 15th Series* (cat. no. 6440.0)
- *Housing Finance for Owner Occupation, Australia* (cat. no. 5609.0) - issued monthly
- *Producer Price Indexes, Australia* (cat. no. 6427.0) - issued quarterly.

Current publications and other products by the ABS are listed in the Catalogue of Publications and Products (cat. no. 1101.0). The Catalogue and all ABS publications are available from the ABS web site <www.abs.gov.au>. The ABS also issues a daily Release Advice on the web site which details products to be released in the week ahead.

CONTACTING THE ABS

If you want to know more about the HPI contact:

Mark King
Assistant Director
Prices Branch
Australian Bureau of Statistics
PO Box 10
Belconnen ACT 2616
Phone: 02 6252 5342
Fax: 02 6252 7060
Email: mark.king@abs.gov.au

....

APPENDIX 1 EIGHT CAPITAL CITIES WEIGHTING PATTERN

WEIGHTS

Each capital city's percentage contribution to Eight Capital Cities for the established house and project home price indexes are presented in the following table:

House Price Index: Eight Capital Cities Weighting Patterns

PERCENTAGE CONTRIBUTION TO EIGHT CAPITAL CITIES(a)

	Established Houses(b)	Project Homes(c)
Sydney	43.5	31.3
Melbourne	27.5	28.1
Brisbane	9.8	14.4
Adelaide	6.3	7.0
Perth	9.2	13.1
Hobart	0.9	1.7
Darwin	0.5	1.3
Canberra	2.3	3.2
8 Capital Cities	100.0	100.0

(a)   Percentages may not add due to rounding.
(b)   As at March quarter 2002.
(c)   As at June quarter 2005.

APPENDIX 2. PRICE INDEXES
AND CONTRACT PRICE
INDEXATION
Introduction

Price indexes published by the Australian Bureau of Statistics (ABS) provide summary measures of the movements in various categories of prices over time. They are published primarily for use in Government economic analysis.

Price indexes are also often used in contracts by businesses and government to adjust payments and/or charges to take account of changes in categories of prices (Indexation Clauses).

This paper sets out a range of issues that should be taken into account by parties considering including an Indexation Clause in a contract using an ABS published price index.

The role of the ABS in respect of Indexation Clauses

Although the ABS acknowledges that the various price indexes it publishes are used by businesses and government to adjust payments and/or charges, it neither endorses nor discourages such use.

The role of the ABS as the central statistical authority for the Australian government includes to publish price index data, and to broadly explain the underlying methodology and general limitations on such data. The ABS may provide information about what price indexes are published by it, but will not recommend or comment on the use (or otherwise) of the price indexes. In addition, the ABS does not advise, comment or assist in preparing or writing contracts and nor does it provide advice on disputes arising from contract interpretation.

Important disclaimer

This paper is intended to summarise information about the various price indexes currently published by the ABS and some of the issues which should be considered by persons in deciding to use such price indexes in Indexation Clauses. It is a brief description only and is not a comprehensive or exhaustive description of price indexes or of the issues which should be considered by persons in deciding to use price indexes or Indexation Clauses.

Neither the ABS, the Commonwealth of Australia, nor their employees, advisers or agents will in any way be liable to any person or body for any cost, expense, loss, claim or damage of any nature arising in any way out of or in connection with the statements, opinions or other representations, actual or implied, contained in or omitted from this paper or by reason of any reliance thereon by any person or body. This paper is not business, investment, legal or tax advice and persons should seek their own independent professional advice in respect of all matters in connection with the use of price indexes published by the ABS and their use in Indexation Clauses.

No representation or assurance is given that any ABS published price indexes are accurate, without error or appropriate for use by persons or that the ABS will continue to publish any of the price indexes, publish them at a particular time or that the methodologies for their determination will not be changed or that they will be suitable for use in any Indexation Clauses.

What price indexes are published by the ABS?

The Consumer Price Index (CPI) is regarded as Australia's key measure of inflation. It is designed to provide a general measure of price inflation for the Australian household sector as a whole. The CPI measures changes over time in the prices of a wide range of consumer goods and services acquired by Australian metropolitan households and it is published quarterly, 3 to 4 weeks after the end of the reference quarter. It is revised only in exceptional circumstances, such as to correct a significant error. As is the case with all price indexes, the reference base (i.e. the period in which the index is set equal to 100.0) will be changed periodically. The index number levels for all periods will be changed by this process and it may also result in differences, due to rounding, between the percentage changes published on the old base and those on the new base.

Several Producer Price Indexes (PPIs) are produced and published. Economy-wide indexes are presented within a stage of production framework together with a set of indexes relating to specific industries (selected manufacturing, construction, mining and service industries). PPIs can be constructed as either output measures or input measures. Output indexes measure changes in the prices of goods and/or services sold by a defined sector of the economy while input indexes measure changes in the prices of goods and/or services purchased by a particular economic sector. PPIs are published quarterly, 3 to 4 weeks after the end of the reference quarter. Once published the PPIs are revised infrequently, sometimes to incorporate improved methods in one or more of the components and occasionally to correct an error. As is the case with all price indexes, the reference base (i.e. the period in which the index is set equal to 100.0) will be changed periodically. The index number levels for all p eriods will be changed by this process and it may also result in differences, due to rounding, between the percentage changes published on the old base and those on the new base.

The International Trade Price Indexes are intended to broadly measure changes in the prices of goods imported into Australia (the Import Price Index (IPI)) and goods exported from Australia (the Export Price Index (EPI)). The prices measured in the indexes exclude import duties, and exclude freight and insurance charges incurred in shipping goods between foreign and Australian ports. As the prices used in the indexes are expressed in Australian currency, changes in the relative value of the Australian dollar and overseas currencies can have a direct impact on price movements for the many commodities that are bought and sold in currencies other than Australian dollars. Both the IPI and EPI are published quarterly, 3 to 4 weeks after the end of the reference quarter. The IPI and EPI are not often revised. As is the case with all price indexes, the reference base (i.e. the period in which the index is set equal to 100.0) will be changed periodically. The index number levels for all periods will be changed by this process and it may also result in differences, due to rounding, between the percentage changes published on the old base and those on the new base.

The Labour Price Index (LPI) broadly measures annual changes in the price of labour in the Australian labour market. The Wage Price Index (WPI) broadly measures changes in the wages paid by Australian businesses to employees and it is compiled and published quarterly, about 6 to 7 weeks after the end of the reference quarter. The non-wage price indexes and the aggregate labour price index are only produced annually in respect of financial years ending 30 June. Individual indexes are compiled for various combinations of State/Territory, sector (private/public), and broad industry groups, with wage price indexes also being produced for broad occupation groups. The 'headline' wage price index is that for the total hourly rates of pay excluding bonuses for Australia and it is published in original, seasonally adjusted and trend terms. The seasonally adjusted and trend series for some quarters are revised as extra quarters are included in the series analysed for seasonal influences, but the non-seasonally adjusted (i.e. original) series is not revised in normal circumstances. As is the case with all price indexes, the reference base (i.e. the period in which the index is set equal to 100.0) will be changed periodically. The index number levels for all periods will be changed by this process and it may also result in differences, due to rounding, between the percentage changes published on the old base and those on the new base.

Price indexes covering a wide range of economic transactions are produced as part of the National Accounts . Two types of national accounts based price index are published. The first type is referred to as chain price indexes which are calculated for all expenditure components and sub-components of Gross Domestic Product (GDP) . The components are: government consumption, household consumption, private capital formation, public capital formation, and imports and exports of goods and services. Chain price

What price indexes are published by the ABS? continued

indexes are also calculated for GDP and other macro-economic aggregates such as Domestic Final Demand and Gross National Expenditure. Chain price indexes use as their weights the volumes of expenditure in the previous financial year (ending 30 June). The second type of price index is referred to as implicit price deflators (IPDs) which are compiled at the same levels as for the chain price indexes but which use for their weights the volumes of expenditure in the current period. IPDs have long been used to provide macro-economic measures of price change and are usually used in seasonally adjusted form. Both chain price indexes and IPDs are compiled quarterly and are published roughly two months after the reference period. Unlike the other price indexes listed above, the National Accounts price indexes are often revised, sometimes to a significant extent. Also, they are re-referenced to a new base year every year so the level of the index changes regularly, although the percentage changes for earlier periods are not normally affected by this process, other than for rounding differences. These two characteristics are important considerations if National Accounts price indexes are to be used in contracts.

General matters to consider when developing Indexation Clauses using a price index

Considerable care should be taken when considering and using Indexation Clauses. Appropriate professional advice should be obtained when considering the use of an Indexation Clause or any ABS published price indexes.

The following are some general matters to consider when considering an ABS published price index in an Indexation Clause. It is not an exhaustive list. These matters are provided subject to the disclaimer outlined above.

Establish the base payment, selling or purchase price subject to indexation. Specify the item subject to indexation as precisely as possible (e.g. rent, wage rate, commodity, etc.). Provide the effective date (e.g. quarter or year) of this base price, because it is the period from which the base payment, etc. will be indexed. Indicate the relationship between the effective date of the base payment, etc. and the price index being used in the indexation (e.g. a contract coming into effect on 5 January 2005 could have a price indexed using the most recent available quarterly data (in this case, September quarter 2004) as its starting point or by using the 2003-04 financial year as the starting point, depending on the intent of the parties).

Select an appropriate index or indexes. The index or indexes selected will affect the price change recorded and should be chosen carefully to best represent the item subject to indexation and the intention of the parties.

Clearly identify the selected index and cite an appropriate source. The Indexation Clause of a contract should identify the selected index by its complete title and any identifying code. For example, in the case of the CPI, it should be specified whether the index to be used is the All groups CPI, or a selected sub-component index of the CPI and also whether it is the weighted average of the eight capital cities or for a particular city. In the case of PPIs, the broad alternatives that could be specified are stage-of-production, or commodity, or industry-based indexes. The specific component index being used should be explicitly identified. For LPIs, the broad characteristics that could be specified are national, state, industry group or occupation group indexes. Contracting parties should cite specific index series rather than table numbers and/or table titles in their indexation contracts because table numbers and the contents of tables are subject to change.

State the frequency of price adjustment. The Indexation Clause should specify the frequency at which price adjustments are to be made, such as quarterly, half-yearly, annually etc. It may be useful to set out the method to be used in calculating the indexation factor, particularly if the indexation is half-yearly or annually. For example, different results are generally obtained for annual estimates calculated as the change in the latest quarter over the same quarter of the preceding year (e.g. June quarter 2004

over June quarter 2003) compared with those calculated as the average of the latest four quarters over the average of the preceding four quarters (e.g. the average of the four quarters from September quarter 2003 to June quarter 2004 over the average of the four quarters from September quarter 2002 to June quarter 2003). Similar issues apply to half-yearly changes.

Provide for renamed, varied or discontinued price indexes. Occasionally price indexes can be reviewed or restructured which may result in some component index series being renamed, discontinued or the timing of the publication of the index changed. Sometimes an index is permanently discontinued (for example, when a commodity declines in market importance). Indexation Clauses should contain a default mechanism for determining an equivalent appropriate index or price adjustment mechanism should this occur.

Provide for potential revisions to the price index data. The quarterly and annual movements recorded by the ABS price indexes are not often revised (apart from the seasonally adjusted wage price index and trend wage price index, which can be revised as extra terms are added to the end of the series). Generally, the situations in which revisions do occur include to correct an error that has arisen in the data first published. It could be useful for parties to set out agreed procedures to deal with the possibility of revisions occurring. For example, an Indexation Clause could state that a price is to be indexed by the percentage change first published in the relevant (indexation) series for each period covered by the contract, or it could be indexed by the latest available data at the point at which the indexation clause takes effect.

Avoid locking indexes used for Indexation Clauses into any particular reference base period. Occasionally the reference base period of a price index (i.e. the period in which the index is set equal to 100.0) can be changed. This will result in a change in the index level from that which was previously available. Relative movements of any series over time, however, are not generally affected by a reference base change (except for rounding differences). Indexation Clauses should be drafted by the parties to them to not be adversely affected by a change to the reference base period of a price index.

Define the formula for the price adjustment calculation. Often the change in payments or price is directly proportional to the percentage change in the selected index between two specified time periods. The following CPI example, which has a reference base year of 1989-90 = 100.0, illustrates the computation of percentage change:

Index number for the All Groups CPI for Sydney in 2003-04 144.1

less index number for the corresponding series in 2002-03 141.1

Change in index points 3.0

Percentage change 3.0/141.1 x 100 = 2.1%

Allow for negative price movements. Any potential variations from the recorded price movements should be explicitly set out. For example, in some Indexation Clauses there is no change in the contract price in a period in which there is a fall in the price index being used for indexation. In some cases, there will be a catch-up once the index rises again.

GLOSSARY

．．．

ABS	Australian Bureau of Statistics.
ASGC	Australian Standard Geographical Classification (cat. no. 1216.0). This is the standard geographical classification used in the ABS.
CPI	Consumer Price Index - a general indicator of the rate of change in prices paid by households for consumer goods and services.
Cluster	A suburb or, more commonly, a group of suburbs that have similar characteristics and for which medians are estimated each quarter and aggregated to produce the HPI for each city (they are similar to an "elementary aggregate" in other ABS price indexes).
HPI	The established "house price index".
Indexation	The periodic adjustment of a money value according to changes in a price index.
Index points change	The change in an index number series from one period to another expressed in terms of the difference in the number of index points in each of the index numbers.
Index number series	A series of numbers measuring the change over time from a reference base period value, which is normally presented as an index value of 100.0.
Inflation (deflation)	A term commonly used to refer to changes in price levels. A rise in prices is called inflation, while a fall is called deflation.
Linking	The technique used to join a new index series (e.g. one having a changed composition and/or weighting pattern) to an old index series to form a continuous series. the technique ensures that the resultant linked index reflects only price variations and that introducing the new items and/or weights does not affect the level of the index.
Matched sample	In a matched sample, items that are priced from period to period are identical in all respects or sufficiently similar to be considered the same item.
Percentage change	The change in an index series from one period to another expressed as a percentage of its value in the first of the two periods.
Price index	A composite measure of the prices of items expressed relative to a defined base period.
Price levels	Actual money values in a particular period of time.
Price movements	Or price changes, are changes in price levels between two or more periods. Movements can be expressed in money values, as price relatives or as percentage changes.
Price relative	The ratio of the price level in one period to the price level in an earlier period.
Reference base	The period in which an index series is given a value of 100.0. The reference base should not be confused with the weighting base period - see "Weighting base" below.
Sample	A subset of items to be priced, that acts to represent all items.
SD	Statistical Division, as determined in the Australian Standard Geographical Classification (see "ASGC"). In the HPI, each capital city is defined as those houses contained within the relevant statistical division.
SSD	Statistical Subdivision, as determined in the Australian Standard Geographical Classification (see "ASGC"). In the HPI, each cluster is geographically bounded within a statistical subdivision.
SEIFA	Socio-economic Index for Areas (cat. no. 2039.0). The SEIFA ranks geographic areas according to their social and economic conditions.
Value aggregate	The aggregate value in dollars of the housing stock (including land)
VGs	Valuer-General or equivalent government body in each state/territory responsible for the recording of property transfers.

．．．

Weight	The measure of the relative importance of an item in the index regimen. Weights can be expressed in either quantity or value terms. Value weights are used by the ABS in compiling all official price indexes.
Weighted average	An average that is obtained by combining prices or price indexes according to the relative importance of each price index.
Weighting base	The period to which the fixed quantity weights relate. (See also "Reference base".)

FOR MORE INFORMATION . . .

INTERNET **www.abs.gov.au**   the ABS web site is the best place for data from our publications and information about the ABS.

LIBRARY A range of ABS publications are available from public and tertiary libraries Australia wide. Contact your nearest library to determine whether it has the ABS statistics you require, or visit our web site for a list of libraries.

INFORMATION AND REFERRAL SERVICE

Our consultants can help you access the full range of information published by the ABS that is available free of charge from our web site, or purchase a hard copy publication. Information tailored to your needs can also be requested as a 'user pays' service. Specialists are on hand to help you with analytical or methodological advice.

PHONE 1300 135 070

EMAIL client.services@abs.gov.au

FAX 1300 135 211

POST Client Services, ABS, GPO Box 796, Sydney NSW 2001

FREE ACCESS TO STATISTICS

All ABS statistics can be downloaded free of charge from the ABS web site.

WEB ADDRESS www.abs.gov.au

2646400001063
ISBN 0 642 48256 X

RRP $25.00