PropTrack

PropTrack Home Price Index Methodology

Updated July 2025

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Introduction

Overview

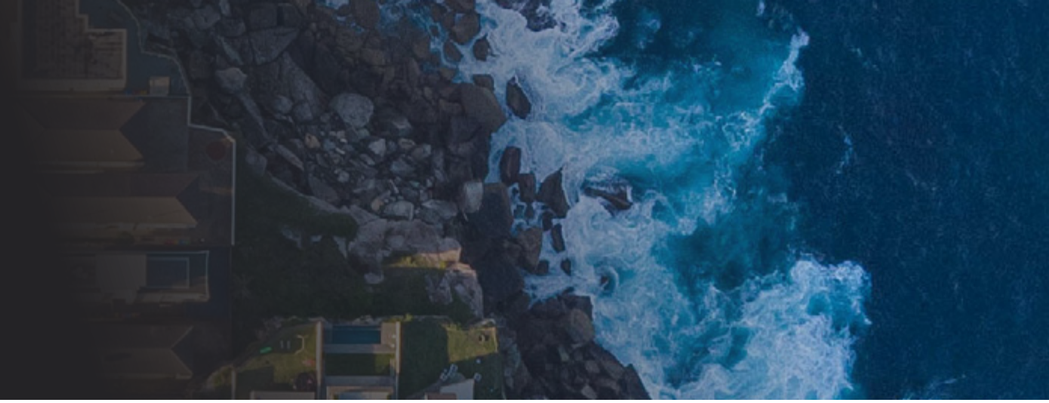
The PropTrack Home Price Index (HPI) model measures changes in residential dwelling values across Australia. It aims to provide an up-to-date and accurate assessment of housing market performance and trends. The PropTrack HPI is calculated daily and reported monthly. It includes all properties that are defined as residential and are grouped as residential units, houses and all dwellings.

Measuring the change in the value of homes can be challenging because the size and quality of dwellings that transact over time are not representative of the broader stock of dwellings. The PropTrack HPI overcomes this by implementing an adjacent period hedonic imputation methodology. This captures the rate of change of home values by adjusting for the compositional differences in property attributes. The model leverages hedonic regression by measuring the relationship between observed prices and property features, including information about each property's location and time of sale.

The methodology used by the PropTrack HPI is preferred by many statistical agencies and regulators globally [1].

The PropTrack HPI is a revisionary index. The full history is recalculated each month, and index values for the latest three years are revised. This is an important feature because it compensates for the delay in the receipt of comprehensive official records of sales transactions after settlement occurs. The revisionary nature of the PropTrack HPI mitigates significant revisions when new data are received.

Overview



Index representation

Each month, the PropTrack HPI produces an index value in nominal terms, with no adjustment for general price inflation. The change in values can therefore be interpreted as the average change in the prices paid for homes across Australia, excluding observed compositional changes, in current dollar terms.

The PropTrack HPI is not seasonally adjusted.

Time period

The PropTrack HPI is recalculated at the end of every calendar month, with a base value of 100 set on 31st January 2010. While the series extends to as early as January 1980, its availability depends on the data accessible for earlier periods.

Geographic coverage

PropTrack aligns to the Australian Statistical Geography Standard (ASGS) as defined by the Australian Bureau of Statistics [2]. Statistical Area levels 1 to 4 are defined within this standard and are referred to in this methodology paper.

Each month, aggregate indices are produced for the regions shown in Table 1. Indices for other regions can be produced on request.

Table 1. Geographic coverage of PropTrack HPI.

Region	Description
COUNTRY	National level (all Australia)
State	Australian states and territories
GCCSA	Greater capital cities and regional areas for each state and territory
GCCSA 8	All capital cities
GCCSA 8 Regional	All regional areas of GCCSA
SAL	Suburbs and localities
POA	Postal areas
SA2, SA3, SA4	Statistical Area Levels 2 to 4

Revisions

The HPI is a revisionary index. The latest three years of the indices are recalculated each month. The revisionary nature of the index guarantees that as soon as sales transactions are observed, they are incorporated into the index to provide the most complete and accurate assessment of the change in dwelling values over time.

This is an important and distinguishing feature of the PropTrack HPI because it compensates for the delay in receiving the official records of sales transactions, after they settle, from State and Territory Valuer General offices. Calculations of the Index for the most recent month are based primarily on agent-advised sale information. Once sales transactions are provided by the Valuer General offices, the official prices replace the agent-advised prices.

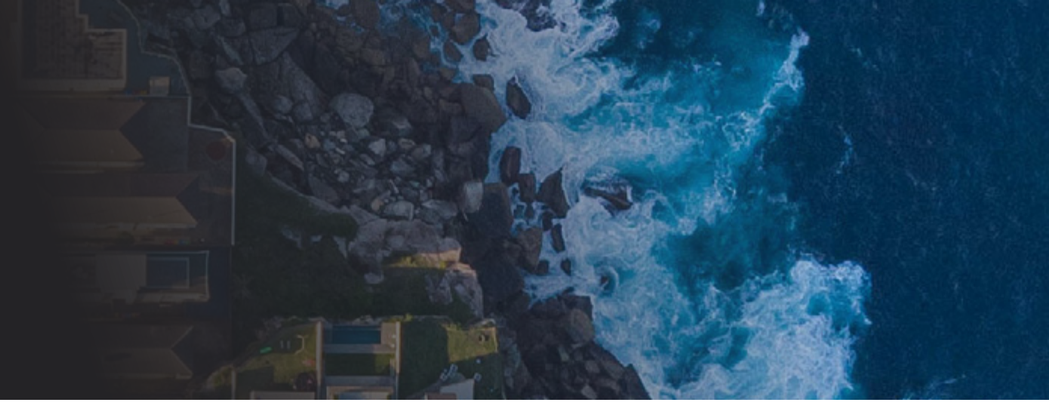
The revisionary index therefore avoids significant revisions when new data are incorporated.

Each month, aggregate indices are produced for the regions shown in Table 1. Indices for other regions can be produced on request.

Index validation

The implementation of this methodology by PropTrack has been validated internally using benchmarking, predicted sale price error analysis, and comparisons with other publicly available home price indices. This has ensured that the PropTrack HPI tracks price trends in the Australian property market in line with its intended purpose.

Eligibility Criteria



Data sources

The primary data source of arm's-length sales data used by the PropTrack HPI is the Valuer General (VG) from each state and territory. VG data has comprehensive coverage of all property sales, and sales are generally disclosed after the settlement date of each property transaction and titles are exchanged [3]. This typically occurs 12 weeks after contracts are signed but can vary from state to state.

The delay in the availability of prices from VG data is mitigated by incorporating reported sales data from realestate.com.au for a significant share of sales across the country, which gives an up-to-date view on the market and allows timely

Index universe

The PropTrack HPI uses sales for all Australian residential dwellings and is calculated for houses, units and all combined dwellings (houses and units).

Dwellings are categorised as a 'house' if they have a Torrens title, with Strata and other titled dwellings categorised as 'units'.

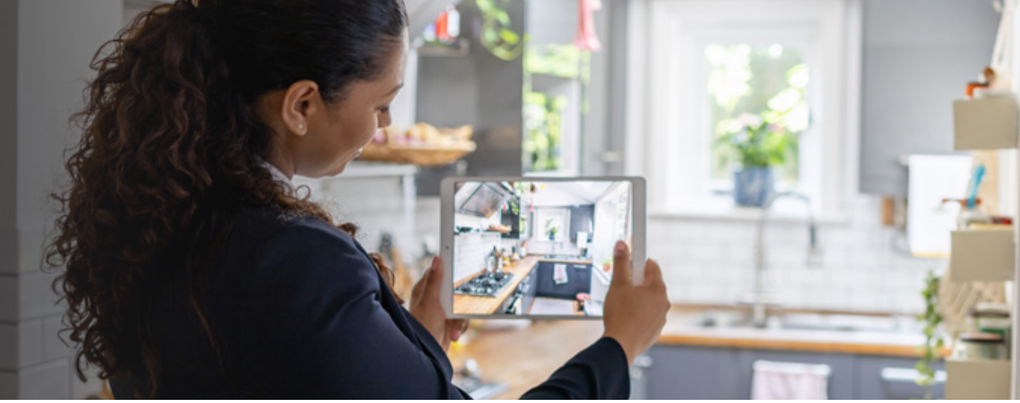
Transactions of other dwelling types, such as land, acreage, serviced apartments, retirement villages and some rural properties are excluded from the calculation of the PropTrack HPI.

Assumptions and limitations

There are several assumptions and limitations considered as part of the construction of the PropTrack HPI. They are summarised as follows:

- Data errors in dwelling transaction databases could result in inaccurate estimates of dwelling price growth. Appropriate outlier detection and price filtering operations mitigate the effects of data errors.
- Sales data providers use property databases that may not always align to the same address convention. Address matching solutions have been developed to identify the location of dwelling transactions and match transactions from different sources. There is a risk that this may be imprecise and subject to error. Mismatched or mislocated records may result in duplicated transactions or the creation of erroneous records. PropTrack has created sophisticated data processing rules to identify and remove duplicated transactions. PropTrack's address matching solution undergoes continuous improvement activities and thus reducing the number of errors. The improvements flow through into the PropTrack HPI in real time through the revisionary process, which reduces the risk of restating indices by a significant margin.
- The PropTrack HPI is designed with an assumption that variations in the unobserved characteristics do not systematically skew data across regions, ensuring a balanced representation overall.

Index construction



Calculations steps

The steps to estimate the HPI are as follows:

- Collect historical transaction data and aggregate across sources.
- Exclude data that do not meet the eligibility rules either due to insufficient data, or outlier and filtering rules.
- For each SA level (SA2, SA3, SA4), property type and a 10 year rolling window, fit a hedonic regression model for sales prices as long as the sample size threshold of 1,000 or more sales are met.
- Impute the monthly value of all properties using the hedonic coefficients for the latest three years of the model window for each region.
- For each geographical region (see Table 1) calculate the Fisher index accounting for when the property was available to the index based on its date of construction.

Estimation equation

The hedonic regression model uses the observed sales price as the dependent variable and attribu es or characteristics as the independent variables, with the monthly time component expressed as time dummies:

$$\log Y = X\beta + T\gamma + \varepsilon$$

where:

- Y is the price of the property.
- X is the data matrix that encodes attributes for each price observation.
- β is the regression coefficient for each attribute.
- T is the time dummy matrix, where the number of columns is equal to the number of time periods.
- γ is the regression coefficient for each time dummy.
- ε is the error term, assuming errors follow a normal distribution.

Each variable used in the PropTrack HPI is shown in Table 2.

Table 2. Hedonic variables and their transformations

Variable name	Description	Transformation
Bedrooms	Number of bedrooms for the property, treated as categorical.	Winsorised at 5th & 95th percentiles for the property's SA2 level and property type. Missing values are treated as a separate category.
Bathrooms	Number of bathrooms for the property, treated as categorical.	Winsorised at 5th & 95th percentiles for the property's SA2 level and property type. Missing values are treated as a separate category.
Garages	Number of car (or garage) spaces for the property, treated as categorical.	Winsorised at 5th & 95th percentiles for the property's SA2 level and property type. Missing values are replaced with 0.
Planning zone	The state, territory or local government planning zone assigned to the property, reflecting the general intention of the relevant planning schemes.	For houses, the categories used are: • residential • rural/primary production • other For units, the categories used are: • residential • mixed use • commercial/business • special use
Street class	Classification of the street nearest to the property.	For units, the categories used are: • residential • other
Primary roof material	Classification of the property's primary roof material.	For units, the categories used are: • tile • metal • fibreglass/plastic • other and missing values are grouped together
Roof type	Classification of the property's roof pitch.	This variable has the following categories: • flat • moderate pitch • steep pitch • missing values

Table 2. Hedonic variables and their transformations

Variable name	Description	Transformation
Floorplate	The area of land (or footprint) the main residence covers, in square metres.	Values at 20 or less are set to NA. Values at 5,000 or greater are set to NA. This variable is log transformed.
Land area	Land area of the property, in square metres (houses only).	This variable is log transformed.
Living area	Total living area under roof of the property.	This variable is log transformed.
Density	Measure of housing density defined as the number of properties for the local mesh block [2] per square kilometre.	This variable is log transformed.
Volume	Estimated volume of the building, in cubic metres.	This variable is log transformed, where zeroes are treated as missing values.
Roof height	Height in metres above ground surface of the identified maximum roof height.	Values less than 3 are set to NA. This variable is log transformed.
Swimming pool	Boolean value indicating whether or not the property has a swimming pool.	This variable has the following categories: • yes • no Missing values are treated as “no”.
Solar panel	Boolean value indicating whether or not the property has a solar panel.	This variable has the following categories: • yes • no Missing values are treated as “no”.
Eave height	Height in metres above the ground surface of the identified eave of a building.	This variable is log transformed, where zeroes are treated as missing values.
Address count	Number of addresses detected for the property.	This variable is log transformed.
Building count	Number of free-standing structures detected on the property.	Winsorised at 5th & 95th percentiles for the property’s SA2 level and property type. This variable is log transformed.
Spatial dependence	Matrix capturing spatial dependence.	Refer to the following section (Spatial dependence) for more information.

Spatial dependence

Spatial dependence is a technique used to capture the spatial relationship between price observations for neighbouring regions. Prices for properties closer together are assumed to be more similar as compared to prices for properties further away. A spatial weights matrix is created and its data are added as additional features prior to the PropTrack HPI training step.

The spatial weight matrix is the distance between region centroids for each subregion, where centroids are defined as the average latitude and longitude over all properties in the subregion. Regions and subregions are defined in Table 3.

Table 3. Geographic coverage of PropTrack HPI.

Model Geographic Region	Subregions for Spatial Dependence
SA2	Mesh block
SA3	SA1
SA4	SA2

Outlier detection and price filtering

Outlier detection and price filtering are conducted dynamically before the PropTrack HPI model is trained. This process is intended to remove both erroneous transaction records as well as very low or high valued transactions that may lead to inaccurate estimates of typical dwelling price changes.

Examples of erroneous transactions include sales between family members, multiple properties sold at once, or typographical errors. These prices are not representative of normal (and arm's length) prices.

Statistical methods are additionally employed to filter sale prices by dwelling type, time of sale and geographic region.

Outlier and price filtering is conducted in two stages:

1. All sales with a value less than $10,000 or greater than $50,000,000 are removed.
2. Transactions with Z-score above 3.2 or below -3.2 are removed.

Z-scores are calculated for each transaction, based on the distribution of sales for its SA2, property type and time period (shortest time period where 50 sales prices are observed with window length capped at 25 months).

Z-scores are calculated as:

$$Z_i = \frac{x_i - \mu}{\sigma}$$

Where:

- **Zi** is Z score of transaction i
- **Xi** is Price of transaction i
- **μ** is Mean price of transactions in the SA4, property type, and time period
- **σ** is Standard deviation of transaction prices in the SA4, property type, and time period

Index calculation

The PropTrack HPI is a Fisher price index, defined as the geometric mean of Laspeyres and Paasche price indices [1]:

$$p_F(0,t) = \sqrt{p_L(0,t) \cdot p_P(0,t)}$$

The Laspeyres price index [1] is based on the dwelling stock at the start of growth rate period:

$$p_L(0,t) = \frac{\Sigma_{k \in S(0)} \widehat{y_k}(t)}{\Sigma_{k \in S(0)} \widehat{y_k}(0)}$$

The Paasche price index [1] is based on the dwelling stock at the end of growth rate period:

$$p_P(0,t) = \frac{\Sigma_{k \in S(t)} \widehat{y_k}(t)}{\Sigma_{k \in S(t)} \widehat{y_k}(0)}$$

Where:

- S(t) represents the dwelling stock at time t based on the date the property was built. Refer to the following section (Index rebalancing) for more information.
- $\widehat{y_k}(t)$ is the predicted value of property k using the hedonic imputation model at time t.

Index rebalancing

A property is eligible for inclusion in the index for a given date if it has been determined that it existed at that time. The inclusion or exclusion of a property dynamically rebalances the index to ensure that the PropTrack HPI reflects the market it is designed to track for a given month.

For each property, its eligibility for inclusion in the PropTrack HPI is determined from the earliest date (first seen date) of the following:

- Year built (where known).
- Earliest sale date.
- Earliest date it was listed for sale on realestate.com.au
- Earliest date it was listed for rent on realestate.com.au
- Earliest database record creation date.

Where none of these are observed, the property is assigned the earliest first seen date of any property within the same geography, expanding to higher geographies until a value is found. Geographies considered, in order, are:

1. Meshblock
2. SA1
3. SAL
4. POA
5. SA2

Appendix

References

1. European Commission, Eurostat, International Labour Organization (ILO), International Monetary Fund (IMF), Organisation for Economic Co-operation and Development, United Nations Economic Commission for Europe (UNECE), World Bank, “Handbook on residential property prices indices (RPPIs),” OECD Publishing, 2013 edition.

2. Australian Bureau of Statistics, “Australian Statistical Geography Standard (ASGS),” 12 04 2021. [Online]. Available: https://www.abs.gov.au/websitedbs/d3310114.nsf/home/australian+statistical+geography+standard+(asgs).

3. PropTrack, “The importance of revisionary home price indices,” April 2022. [Online]. Available: https://www.proptrack.com.au/wp-content/uploads/2022/04/PropTrack-HPI-Revisionary.pdf.

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buying process, suggesting room for improvement.

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