



CoreLogic

CoreLogic Home Value Hedonic Indices FAQs

NEW ZEALAND

CORELOGIC NEW ZEALAND
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1. Describing the index

1.1. What is an Index?

An index is a statistical device that summarises a particular underlying quantity (e.g. prices, values, or rental returns) for a given segment of the market in a single base figure. This figure is then used as a benchmark for measuring the change in the underlying quantity over time. The base figure is usually assigned an arbitrary value of 100 at a particular base date (all of CoreLogic's indices have a base date of 31/01/2018) and the values for all subsequent dates is expressed in relation to this base figure.

For example, an index value of 110 two years after the base date means that the underlying quantity has increased by 10% over the intervening two years.

1.2. What does the index value mean?

The index value itself has no intrinsic meaning – it simply serves as a means of benchmarking the changes in the underlying quantity. What's important to understand is how one index value relates to another index value as at a different point in time. The difference between these values expresses how much the underlying quantity has changed between the two points in time.

1.3. Why are there multiple price indices in the market?

Unlike shares on the NZSX, bonds or commodities, there are two key characteristics of the property market that makes it difficult to create an accurate read of growth in the market:

1. Residential property as an asset class is not homogeneous – one property may not be a direct substitute for another property. This means that the agreement to purchase a specific property does not mean another property will settle with the same or similar value.

Additionally, existing properties are constantly evolving independently with new properties being constructed, changing the composition of the residential property market on a continuous basis.

2. Property markets exhibit much lower liquidity and turnover. where only a small percentage of all residential properties across New Zealand are transacted in any given 12-month period.

As a result, multiple methodologies exist to try and combat these inherent pitfalls, creating different readings that can be interpreted differently. Additionally, because there is no centrally managed source of property transactions, the underlying data used by other

providers will be different and hence the resulting outputs can also be different. For example, CoreLogic figures cover sales by both estate agents and private individuals, whereas this isn't always the case for other providers.

The index also uses unconditional sales agreements (an early stage in the transaction process), not settlements or title transfers.

1.4. What is meant by a 'market segment'?

The market segment is simply a collection of properties that share a common underlying attribute for which we are attempting to summarise (all the detached dwellings in a particular suburb, or all apartments in a specific city are examples of a market segment).

2. Describing the hedonic regression

2.1. What is the Hedonic Index?

A hedonic index uses the Hedonic Regression methodology for estimating the underlying value of a particular quantity (e.g., prices, rents). The Hedonic Regression assumes that the quantity itself can be broken down into its constituent characteristics to obtain estimates of the contributory value of each characteristic. Within the real estate world, this means that the sale value or rental value of a particular property can be attributed to characteristics such as the number of bedrooms, number of bathrooms, land size, floor area, location, etc.

By understanding the contributory value of each characteristic, we are able to infer the value of every property in the country and subsequently index the change in property values over time without requiring an actual transaction to be observed.

CoreLogic has robust partnerships with multiple industry-leading data suppliers to ensure our property datasets are both comprehensive and up-to-date. The richness of our data enables us to develop a compositionally adjusted index using hedonic regression, a data-intensive statistical modelling method.

The model employs a sophisticated set of unique property attributes, enabling us to accurately assess each attribute's impact on property value. Some of the key attributes are bedrooms, bathrooms, car spaces, floor area, and property categories. The methodology document provides a detailed list of attributes.

2.2. Why Hedonic methodology?

The two fundamental aspects of the property market explored in section 1.3 create a number of issues that need to be addressed when trying to identify the growth in a given market:

1. Observing only transacted properties creates a compositional bias – due to the homogeneity of property assets, the distribution of properties transacted does not accurately reflect or represent the entire underlying stock and you risk creating a view of the market that is informed by a small sample of the population. For example, if first home buyers show a larger than normal level of participation in the market, there is a potential for median or average price measures to be skewed lower due to more activity occurring across lower price points.
2. Older transactions inform current views of market prices – due to the low turnover rate in the property market, prices from transactions dated many months prior are often used in order to produce enough observations to make sure there is a sufficiently representative sample of transactions being used to infer market prices.
3. Capital works factors significantly influence the overall change in the property market – as properties constantly evolve and in particular, new properties are introduced to the market, there is often a premium paid for the generally higher quality of the new stock that does not accurately reflect the organic growth attributed to existing stock.
4. CoreLogic's hedonic index does not put heavy reliance on capital value (CV) data, which is typically updated every three years by the district valuation roll (DVR) and can vary across councils. This infrequent updating can cause inconsistencies and volatility in the index. Instead, CoreLogic leverages comprehensive property attribute datasets to estimate property values, ensuring our index remains stable and consistent, reflecting market changes accurately and promptly without being affected by CV updates.

The Hedonic method has been designed in part to combat each of these issues to create a more robust reading of the property market.

2.2.1. How does the Hedonic method account for compositional bias?

By estimating the values of all properties irrespective of whether they have transacted or not, the hedonic index creates a consistent apples-to-apples comparison when determining change, ensuring that all properties are included in the indexation process.

2.2.2. How does the Hedonic method account for property market illiquidity and delays in property transaction information?

By estimating the values of all properties irrespective of whether they have transacted or not, it fills the gaps for any information that is missing based on the available information.

This allows it to create a contemporary view of the state of the entire housing portfolio despite only a small sample of observations being available. This process is improved by giving more weighting to newer records when determining the price contribution of the various hedonic attributes. This helps the index to produce accurate trends in real time in spite of data delays.

Additionally, the index is revised for 12 months following each release. This allows for the delayed transactions to be received and improves the historical accuracy of the index. Early indications are that the scale of these revisions could be up to +/- 0.3% (for the monthly percentage changes) for about two months after the initial release.

2.2.3. How does the Hedonic method account for changes in underlying stock?

By re-valuing all properties across the country based on their constituent characteristics, we are also able to isolate from any injection of capital (e.g., adding new bedrooms, expanding the land size or building new properties) that may artificially increase the overall value of properties or artificially inflate growth measurements. This is done during the indexation process when we compare the total value of properties in one period to the next, but only include properties that have not changed in characteristics between the two periods (i.e., only properties whose constituent characteristics have remained the same and existed in both periods are included in the comparison).

Effectively we are able to mathematically isolate the change in value associated with the passing of time as opposed to the changes in attributes.

2.3. What are some shortcomings of the hedonic method?

Inferred, not strictly factual – the hedonic method uses an estimate of the underlying quantity for every indexation point using observed transactions. The small number of observed transactions relative to the population of properties means that the majority of the indexation is driven by the model's ability to estimate the contributory value of underlying characteristics of residential properties.

Heavily dependent on data coverage – as the method relies on a model to break down the contribution of underlying characteristics to estimate values, significant breadth and depth of data is required to accurately and consistently compute the estimates. The model relies on the abundance of detailed property level information to make up for the absence of sufficient transaction observations, but the risk is effectively managed by CoreLogic comprehensive dataset.

2.4. How is this connected to Automated Valuation Models (AVMs) produced by CoreLogic?

The AVMs produced by CoreLogic are a completely different analytical solution and should not be confused with the Hedonic Index. Although both solutions leverage the hedonic methodology in some way to impute an estimated value for every property in New Zealand, they do so with different objectives and as such are optimised differently.

CoreLogic's AVMs are produced for the sole purpose of gaining insight into an individual property as at a particular point in time, and therefore optimised for estimating the likely sale value of the given property right now based on all available information. It takes into account more sources and additional algorithmic enhancements for this sole purpose.

CoreLogic's Indices are produced for the purpose of measuring market movement and therefore are less concerned about being optimised for estimation accuracy of individual properties and more concerned with optimising for consistency in order to better understand how the portfolio value of properties change over time.

2.5. Where can I find a detailed technical documentation of the model implementation?

All technical documentation, methodology white papers and associated audit statements can be found on our website at <https://www.corelogic.co.nz/our-data/hedonic-index/>.

3. Describing the CoreLogic Hedonic regression methodology

CoreLogic established the CoreLogic hedonic index methodology in Australia over ten years ago. It underwent several methodological improvements and overhauls throughout the years. The Hedonic Index developed for New Zealand is highly aligned with the Australian methodology and shares some key features and benefits. This section covers questions that may arise regarding the improvements introduced.

3.1. What are the key features of the CoreLogic Hedonic Methodology?

CoreLogic (previously RP Data) first published a Hedonic index in conjunction with Riskmark International in Australia in 2006. With nearly 20 years of experience, CoreLogic has continually refined and enhanced our methodologies through several major upgrades and improvements. In 2017, a major update was implemented to improve the model in a number of ways such as reducing volatility through a longer regression window and dynamic filtering method. In 2023 the hedonic index was updated again to allow revision in

a rolling 12-month window in order to improve historical performance. The model we are introducing in New Zealand receives the same benefits from these important methodology features highlighted below:

3.1.1. Revising the index in a 12-month window

CoreLogic's Hedonic Index benefits from receiving sale transactions through an agent's advice pipeline, as well as standard local council sources. By securing the early disclosure transactions ('recent sales capture'), CoreLogic ensures a more accurate representation of the underlying quantity of house price movements that it measures.

However, it is not possible to capture all relevant transactions before each index value is initially reported. As a result of these unobserved transactions, each publication of the index will show a slight variance in monthly growth over time, which can produce more substantial discrepancies over extended periods.

By revising the index in a 12-month rolling window, the final growth reported for each period incorporates a complete view of all relevant transactions. This ensures the historical validity of the index without jeopardising its integrity in real time. The number of transactions recorded more than 12 months after each index publication is low, so it is not necessary to revise beyond this time.

3.1.2. Weighting the hedonic regression

CoreLogic applies exponential weighting to the hedonic regression component of the index to help it adapt to trends in the market. Before the change was introduced, the regression treated all transactions within a 12-month window as being of equal importance when establishing the value of the various hedonic attributes that make up a residential property. In practice, the significance of transactions correlates with their recency. By prioritising newer transactions, the index is more agile in identifying emerging trends. While this approach does heighten the sensitivity of the index to the natural volatility of housing prices, empirical tests confirm its overarching effectiveness. The overall mechanism of exponential weighting has been proven effective in improving the performance of the index.

3.1.3. What property types are used in CoreLogic?

There are five types of property classes used by CoreLogic: Houses | Flats | Apartments | Lifestyles | Lands. They are based on the Property Category published by District Valuation Roll (DVR), and in line with market trends product, to ensure the index series published by CoreLogic stays relevant.

4. Other index construction methodologies

4.1. What other methods of index construction are traditionally used?

There are multiple other approaches used across the industry for measuring prices, each with their own strengths and weaknesses due to the way in which the methods try to get around the heterogeneous and illiquid nature of the property market. There are various formulations of other hedonic indices, as well as non-hedonic methods – for the most part these alternative methods are selected due to simplicity, ease of implementation, and insufficient data. These methods include:

1. Sales price appraisal ratio (SPAR) indices
2. Hedonic time dummy indices
3. Median and stratified median indices
4. Repeat sales indices

CoreLogic New Zealand also publishes a SPAR index as well as median/mean and repeat sales indices as an alternate house price measure to the hedonic index.

4.1.1. What is the sales price appraisal ratio (SPAR) method?

SPAR method calculates the house price index by comparing the sale prices of properties to their previous appraised values provided by government agencies. For each property that has transacted, the average ratio of the sale price to the appraised value is calculated for properties within each area, and price change comparisons can be made with previous periods.

4.2. What are the pros and cons of other methods?

These other methods are typically less timely and less robust at assessing more granular segments of the market when compared to the hedonic imputation method.

However, they can still provide an additional point of reference due to the unique angles through which they address the heterogeneous and illiquid nature of the property market.

4.2.1. What are the pros and cons of the SPAR method?

The SPAR method is simpler relative to the hedonic imputation method, as sales prices and appraisal values are the only inputs to the model.

The benefits of a SPAR index are:

1. The model is easy to understand and implement.

2. Capital values (the appraisal values) are set by local authority / council for the purpose of determining payable property rates and therefore are regulated and updated regularly.

The disadvantages of a SPAR index are:

1. It does not explicitly consider how property characteristics impact the value and does not adjust for changes in the characteristics over time.
2. It relies heavily on the availability, accuracy and frequency of the appraisals.

4.3. How do the different methods' results compare to each other?

Generally speaking, the Hedonic index shows less volatility than other series and can be seen to identify changes or inflection points in the market much earlier than other methodologies. The hedonic methodology benefits from utilising all data to assess price movements, while other methods tend to use a subset of available property data. The model uses a carefully selected set of representative property attributes to evaluate property value. It has minimal reliance on appraisals, making it less affected by the availability and accuracy of appraisal data, unlike other methods such as SPAR.

5. What can I obtain as a subscriber?

5.1. What indices are available?

Hedonic indices are our primary offering, but we also provide a variety of other measures as listed below. Additional information is available upon request.

Type	Metric	History
Price Indices	<ul style="list-style-type: none">Hedonic Home Value IndexRepeat Sales Price IndexStratified Median Sales Price IndexSimple Median Imputed Home ValueHedonic High / Medium / Low Home Value IndicesHedonic Decile Strata Home Value Indices	From 2018 onwards
Rental Indices	<ul style="list-style-type: none">Hedonic Yields IndexHedonic Rents Index	From 2018 onwards
Total Return	<ul style="list-style-type: none">Hedonic Accumulation Index	From 2018 onwards
Supporting Measures	<ul style="list-style-type: none">Simple Median Sales PriceTotal Sales Volumes	From 1981 onwards
	<ul style="list-style-type: none">Simple Median Rents	From 2018 onwards
	<ul style="list-style-type: none">Median Time on MarketMedian Vendor Discounting	From 2003 onwards

5.2. How far back does the historical timeseries go?

See 5.1 above.

5.3. What geographies are available?

The Home Value index covers results for all of the following across New Zealand:

1. National
2. Major Cities (Auckland / Wellington / Christchurch City / Dunedin / Hamilton / Tauranga)
3. Regions
4. Territorial Authorities

The indices are also aggregated to a number of Geographies smaller than those provided within the standard suites, down to the level of postcode and suburb.

5.5. When will the product open for subscription?

On August 1st 2024, the product will open for subscription. Please consult your account manager or reach out to the CoreLogic sales team to understand the process and pricing.

5.6. Can I have custom indices?

Yes – these can and will be produced on a bespoke basis. Please consult your account manager or reach out to the CoreLogic sales team to understand the process and pricing for the production of bespoke series.

5.7. What is the plan and timeline for future index releases?

CoreLogic is passionate about providing market-leading property research and analytic solutions. As part of our commitment to innovation and excellence, we are continuously looking for ways to enhance our data and solutions. Should future improvements be identified, customers will be notified prior to implementation. Smaller changes may be introduced as required.

6. Why should I use CoreLogic Indices?

CoreLogic Indices are built upon one of the most comprehensive property databases in Australia and New Zealand, with deep coverage across the entire property lifecycle. This breadth and depth of data combined with over 40 years of experience aggregating and managing property data in both Australia and New Zealand, allows us to create New Zealand's only Hedonic Imputation Index suite.

Through CoreLogic's extensive relationship with the Real Estate Industry, we also have access to one of the timeliest datasets.

The Hedonic Home Value Index was one of the most sophisticated and trusted property value measures in Australia since 2006. The model has broad industry acceptance and is relied upon by real estate agencies and banks, which, more importantly, the Reserve Bank of Australia also cites. This shift is expected to meet the needs of the Reserve Bank of New Zealand, financial institutions, and real estate companies while also engaging the general public with more accurate and timely property market information.

6.1. How can I trust the results being published?

CoreLogic is committed to ensuring a high standard of quality when it comes to our analytical processes, and we put all our models through an extensive governance process that includes both internal and external audits:

1. We have multiple tiers of internal governance to review the model performance by applying rigorous out of sample testing before it is assessed against global best practice by our overseas counterparts.
2. In 2017 we also commissioned audits from KPMG and Academics from the University of Sydney and Macquarie University to assess whether the:
 - a. technical methodology adheres to global industry best practice;
 - b. performance of the model meets benchmarking standards; and
 - c. technical methodology is implemented as documented within CoreLogic's whitepaper.
3. The technical implementation of the model itself is also aligned to the methodology published by Eurostat (the Stats NZ equivalent of the European Union) legislated for use by the European Commission and endorsed as best practice by the Internal Monetary Fund and Bank for International Settlements.

Since the time of publication for both the Eurostat report and the audits, the field of index theory has not shifted significantly. As a result, the new model has only received small changes beyond being made revisionary, and still aligns with industry best practices.

The whitepapers and reference documents can all be found on our website (<https://www.corelogic.co.nz/our-data/hedonic-index/>)

6.2. Why don't other providers publish a hedonic index?

In order to create a Hedonic Index, there are a number of requirements from a data and processing perspective:

1. It requires timely data – the absence of timely data means the results will be volatile and less accurate when you try to estimate the values of properties at a point in time.
2. Depth of data – because the hedonic approach is underpinned by the ability to assign contributory value to underlying characteristics of the property, a shallow coverage of property characteristics greatly limits the ability to leverage the hedonic methodology.
3. Analytical rigour – the computational complexity of a hedonic approach means that simple differences in data or implementation can require significant theoretical assessments to understand the mathematical implications, the absence of which can result in inaccurate readings of the market.
4. Significant infrastructural requirements – the estimation of values for every property in the country every day is a very computationally intensive process that would require significant investment in the underlying production environments in order to maintain.