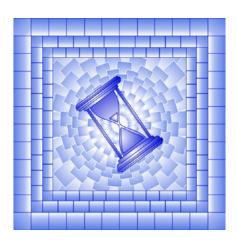
#### **Prices Analytical Series**

## Shelter in the Canadian CPI: An overview, 2023 update

by Rebecca Lehto

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#### Shelter in the Canadian CPI: An overview, 2023 update

#### by Rebecca Lehto

The Canadian Consumer Price Index (CPI) is an indicator that measures price change experienced by Canadian consumers by comparing, through time, the cost of a fixed basket of goods and services. This fixed basket contains goods and services that typical households purchase over a specified period of time. Prices for goods and services across the country are collected on a monthly basis.¹ These collected prices are used to calculate price indices and produce the CPI according to international standards and methods, which are regularly updated and reviewed by price statistics experts.

The CPI basket of goods and services is organized into eight major components: food; shelter; household operations, furnishings and equipment; clothing and footwear; transportation; health and personal care; recreation, education and reading; and alcoholic beverages, tobacco products, and recreational cannabis.

Shelter has the largest basket weight of the eight major components in the CPI. As shown in Table 1 below, it accounts for nearly one-third of the total expenditures on goods and services in the CPI basket. Rented accommodation and owned accommodation are the most important components of the shelter index.

This article attempts to clarify concepts and practices related to the construction of the shelter component of the Canadian CPI and discuss precautions to be taken when making comparisons to other measures of housing prices.

Table 1
Relative shares of shelter and its subcomponents in the 2022 CPI basket

	Relative share in the CPI basket of goods and services	
Components	percent	
Shelter	28.34	
Rented accommodation	7.03	
Owned accommodation	17.96	
Water, fuel and electricity	3.35	

<sup>1.</sup> Weights at basket link month prices.

**Source:** Statistics Canada, Table 18-10-0007-01 Basket Weights of the Consumer Price Index.

#### **Basket weights**

The CPI includes all goods and services in scope for all Canadian consumers, whether they own their homes or not. Each of these goods and services is assigned a relative importance (or weight) in the CPI, which is determined by actual expenditures of Canadian consumers across the country.

The shelter index is a weighted average of sub-indexes representing price changes associated with shelter-related expenditure categories. Basket weights are derived primarily using consumer expenditures from the national Household Final Consumption Expenditure (HFCE) series, in addition to data from the Survey of Household Spending (SHS). Alternative sources of data, including external measures of housing prices, are also used at more detailed levels for some CPI components, such as the homeowners' replacement cost index and the other owned accommodation expenses index. More information on the CPI basket weights can be found in the following paper: An Analysis of the 2023 Consumer Price Index Basket Update, Based on 2022 Expenditures. Detailed weights for shelter sub-indexes can be found in Table 18-10-0007-01.

#### Rented accommodation

The largest weighted component in the CPI's measure of rented accommodation is the rent index, which has a 2022 basket weight of 6.79% of the entire CPI basket.

<sup>1.</sup> Some goods and services are on an intermittent basis (quarterly, semi-annual, etc).

Rent data are collected using a supplementary questionnaire included in the Labour Force Survey (LFS). Each month, the LFS contacts roughly 56,000 households to gather information on the Canadian workforce. Households in sample are surveyed for a period of 6 months and one-sixth of the sample is replaced every month. The dwellings are followed (not the households), so the tenants might change during the survey period. Approximately one-quarter of the selected households (approximately 12,500 units) rent their dwelling and can therefore be considered for the calculation of the CPI rent index. Subsidized dwellings, retirement homes and units used for business purposes are excluded from the rent sample. After taking into consideration all exclusions and non-responses, approximately 8,000 units can be used in the CPI rent index calculations each month.

Starting with the January 2019 CPI, the Canadian rent index is calculated using a characteristics approach hedonic methodology. This is a type of statistical modelling that decomposes the variables being measured, in this case the rental price, into its contributing characteristics. The hedonic model is a log-linear regression in which the explanatory variables include observed dwelling characteristics such as services included, age of dwelling, number of bedrooms, dwelling type and locational characteristics captured by postal codes.

The regression specification is as follows:

$$y^* = \beta_0 + \beta_1 services + \beta_2 age + \beta_3 bedrooms + \beta_4 dwelling + \beta_5 FSA + \epsilon$$

where:

 $v^*$  is the log of observed rent,

services represents whether the rent cost includes furniture, a washing machine, a refrigerator, cable or heat, age represents the age of the building,

bedrooms represents the number of bedrooms,

dwelling represents the type of the building, and

FSA (forward sortation area) is a vector of dummies defined from the first three digits of the postal codes.

The intercept ( $\beta_0$ ) represents the baseline observation that all others are compared to, which is a studio in a highrise apartment that is over 40 years old with no included services, in FSA C1A, which is the most sampled FSA in the LFS data.

More information on the hedonic model and aggregation methodology can be found in the paper on the <u>New</u> approach for estimating the rent component of the Consumer Price Index.

The CPI rent index takes into account both new and existing rental leases, as it is designed to measure changes in rental costs incurred by all renting Canadians. This means that the CPI rent component includes rent paid by new tenants who take over a unit, existing tenants who renew their lease and existing tenants that are in the middle of their lease. In the case of a new tenancy arrangement, the current market price is reflected. When a tenant renews an existing lease, they might be living in a rent-controlled unit. When a tenant is in the middle of the lease, there is usually no change from one month to the next. As a result, the rent index reflects what Canadians actually report paying.

Price changes in the rent component of the CPI are often compared with changes in average rent prices from other data sources, which may show different results. These other rent price statistics may be different because of differences in methodologies used. For example, they do not take into account quality changes in the stock of rental units, often resulting from renovations or new units having entered the market, leading to a difference in price. Moreover, some comparison data correspond to advertised rental costs for vacant units. Research shows that large rental price increases occur when a new tenant takes over a unit. Unlike new tenants that typically face market prices, tenants renewing a lease are often protected by government regulations restricting the extent of rent increases. As a result, rental cost indicators based on advertised prices for vacant units may overestimate average rental costs faced by all renters.

#### **Owned accommodation**

This section will discuss approaches to measuring owned accommodation, as well as the approach used by the Canadian CPI.

#### Approaches to measuring owned accommodation

Determining what "owned accommodation" measures and how it is measured is one of the most complex and challenging issues faced by national statistical agencies when developing consumer price indices.

There is no clear consensus regarding the best methodology for measuring price change for owned accommodation. However, there are a number of internationally recognized approaches:<sup>2</sup> payment, net acquisition, rental equivalence, user cost, and simply excluding owned accommodation from the CPI. As to which approach should be used, the suitability of an approach depends on the main purpose of a country's CPI (indexation, deflation of expenditures or incomes, monitoring monetary policies), as well as data availability and the characteristics of the housing market. Depending on these factors, statistical agencies adopt a version of one of these approaches to measure price change in owned accommodation.

The **payment** approach is based on the assumption that owned accommodation services correspond exactly to the actual payments made by homeowners such as mortgage interest payments and operating expenses like maintenance and repairs and homeowners' insurance. An advantage of this approach is that it reflects actual transaction costs, and not imputed costs. Some economists argue that the payment approach is not fully consistent with cost-of-living indexing since it ignores replacement cost. The payment approach is considered to be appropriate for a CPI that is primarily used for indexing monetary incomes. Currently, the Republic of Ireland uses this approach.

The **net acquisition** approach treats owner-occupied dwellings like all other durable goods in the CPI. It includes the consumable part (the structure) of the house and excludes the asset part (the land) from the CPI. In this approach, dwelling purchase costs are only attributed to the acquisition period, even though the useful life of the dwelling spans well beyond this period. As a result, net dwelling purchases in the reference year would be used as the expenditure weight for owned accommodation. Since the net acquisition approach does not take into account the stream of services generated by owned accommodation, or the ongoing costs of owning a home, across time, it is less favoured for a CPI that is used primarily for indexation. Currently, Australia and Finland use this approach.

The **rental equivalence** approach estimates the cost of services derived from an owner-occupied dwelling to be the same as the cost of services from a similar dwelling on the rental market. Since this cost does not correspond to any financial transaction, it must be imputed using the rent paid by tenants for similar accommodations. It is assumed that services generated by owned dwellings and rented dwellings are the same. In this case, the asset component to owning a home is not included. This approach may not be suitable where the rental market is small or not well established, the type of housing available for rent differs from that owned by households (e.g., condominiums versus single-family homes), or the rental market is affected by rent controls. Given that this approach does not directly reflect changes in house prices on the CPI, it has limited usefulness for monitoring monetary policy. However, it is beneficial for a CPI that is primarily used for indexation. Currently, United States, Mexico, United Kingdom, Germany, Japan and South Africa use this approach.

The **user cost** approach estimates the cost of owned accommodation services as the costs of owning and occupying a dwelling. It includes interest costs (mortgage interest and/or opportunity cost associated with funds that are attached to the dwelling that could have otherwise earned interest), replacement costs and other operating costs such as maintenance and repairs, property taxes and homeowners' insurance premiums. The user cost approach also includes the expected capital gain, which is simply the expected change in the price of the dwelling over the observation period. This anticipated capital gain is challenging to measure and can create volatility in the index and is the reason this approach is not widely used. Currently, Sweden and Iceland use a variation of this approach.

<sup>2.</sup> The four approaches that have gained recognition are highlighted in paragraphs 11.87-11.145, p. 246-254 of the International Monetary Fund's Update of the Consumer Price Index Manual.

#### Owned accommodation in the Canadian CPI

Given all the options and data sources available and considering the structure and composition of the housing market in Canada, the owned accommodation index in the official Canadian CPI is based on a variant of the user cost approach, measuring changes in the cost of using a fixed stock of dwellings. The CPI does not include the purchase of property because it is not considered a consumer good. Instead, an owned dwelling is considered a capital good, which is an asset. Although the purchase price of a house is not directly included, changes in the housing market are reflected through the majority of owned accommodation components. Furthermore, the capital gain and the opportunity cost associated with capital invested in the dwelling are excluded, since they are considered investments rather than consumer goods. This approach is most suitable for the Canadian CPI, due to data availability and the combined uses of the index, such as indexation and contract escalation as well as a tool for setting and monitoring economic policy.

Nearly all elements of the owned accommodation index in the official Canadian CPI represent monetary payments and would therefore be covered by the payment approach. These include mortgage interest costs, property taxes, homeowners' insurance premiums, maintenance and repairs, and other owned accommodation expenses. The only exception is that the Canadian CPI includes a measure of homeowners' replacement cost, which represents essential expenditures to replace the loss of value due to normal depreciation of the dwelling.

The owned accommodation index of the Canadian CPI covers six essential components:

- 1. Mortgage interest cost
- 2. Homeowners' replacement cost
- 3. Property taxes and other special charges
- 4. Homeowners' home and mortgage insurance
- 5. Homeowners' maintenance and repairs
- 6. Other owned accommodation expenses

#### Mortgage interest cost

The mortgage interest cost index estimates the impact of price changes on the amount of mortgage interest owed by the target population on their mortgage balance. It is the product of two components: a component estimating the impact of changing house prices and another measuring the impact of changes in interest rates. When house prices increase, the amount of the loan required to finance the purchase of a dwelling increases, which results in a corresponding increase in the interest cost, provided that the interest rate is constant. On the other hand, an increase in mortgage interest rates, with the mortgage balance remaining constant, also results in an increase in the interest amount owed.

Consequently, the monthly mortgage interest cost index,  $M_{t/t-1}$ , is defined as a product of two monthly indices:

$$M_{t/t-1} = H_{t/t-1} \times I_{t/t-1}$$

where:

 $H_{t/t-1}$  is an index that estimates the effect of changes in dwelling prices between t and t-1 on the amount of principal outstanding, assuming a fixed stock of mortgaged dwellings and constant conditions of their financing, and

 $I_{t/t-1}$  is an index that estimates the effect of changes in interest rates between t and t-1 on the amount of mortgage interest owed, assuming a fixed amount of principal outstanding.

Since the total value of houses purchased during a given period is always a small proportion of the total stock of dwellings with mortgages, the total amount of mortgage interest owed each month continues to reflect the impact of past changes in house prices for a very long period. The house prices that enter into the estimation of the mortgage interest cost index each month represent the weighted average house price of the previous 25 years. The weights reflect the distribution of mortgage balances by mortgage vintage, such that older mortgages have a relatively lower weight. This is because newer mortgages generally have a higher principal owing than older

mortgages. Past mortgage interest rates also continue to be reflected in the current month index, because new interest rates only affect the index through mortgages newly initiated or renegotiated. These are generally a rather small proportion of the stock of existing mortgages. The following sections examine these two components of the mortgage interest cost model in greater detail.

#### The House sub-index

The House sub-index ( $H_{t/t-1}$ ) compares weighted average housing prices over 300 months between the current and previous period, making the assumption that a standard mortgage is amortized over 25 years (300 months) at a fixed rate.

As of the release of the February 2021 CPI, prices for both new and resale housing are incorporated into the model for the previous 25 years. Prior to the February 2021 CPI, the model used only the New Housing Price Index (NHPI) as a measure of the change in residential housing prices. The NHPI measures the change over time in builders' selling prices of newly built houses (single/semi-detached and row) in 27 census metropolitan areas (CMAs).

With the March 2022 CPI release, the <u>Canadian Real Estate Association (CREA) MLS Home Price Index (HPI)</u> replaced Statistics Canada's <u>Resale Residential Property Price Index (RRPPI)</u> as the source for resale data. Resale housing prices are now incorporated into the mortgage interest cost model, along with the NHPI, for six CMAs: Montreal, Ottawa, Toronto, Calgary, Vancouver and Victoria. For the remaining 21 CMAs, the NHPI is the indicator used for housing prices. Research is under way to evaluate adding resale housing prices for additional cities.

For the CMAs that include resale data, monthly NHPI and Resale House Price Index (RHPI) data are combined using a weighted average prior to entering the House sub-index calculation. In general, the RHPI is allocated a weight of approximately three-fourths, with the remaining one-fourth assigned to the NHPI. The weights represent the value share of new and resale properties and are updated annually.

To construct the 300-month history required by the mortgage interest cost model, published data from the CREA's MLS HPI are supplemented by data from the Teranet-National Bank House Price Index.

The sub-index  $H_{t/t-1}$  can therefore be written as follows:

$$H_{t/t-1} = \frac{\sum_{g=1}^{300} (\alpha N H P I_{t+1-g} (1 - \beta \omega_{RHPI}) + \beta R H P I_{t+1-g} (1 - \alpha \omega_{NHPI})) (\gamma_g \times \varphi_g)}{\sum_{g=1}^{300} (\alpha N H P I_{t-g} (1 - \beta \omega_{RHPI}) + \beta R H P I_{t-g} (1 - \alpha \omega_{NHPI})) (\gamma_g \times \varphi_g)}$$

where:

 $\alpha$  and  $\beta$  represent dummy variables indicating whether data is available for NHPI and RHPI respectively for a given city or geographical region,

 $NHPI_{t+1-g}$  and  $NHPI_{t-g}$  represent the New Housing Price Index (NHPI) respectively for month t+1-g and month t-g,

 $RHPI_{t+1-g}$  and  $RHPI_{t-g}$  represent the Canadian Real Estate Association (CREA) MLS Home Price Index (HPI) or Teranet-National Bank House Price Index for month t+1-g and month t-g,

 $\omega_{\it NHPI}$  and  $\omega_{\it RHPI}$  represent the annual weights associated with the value share of new and resale properties respectively, where  $\omega_{\it NHPI} + \omega_{\it RHPI} = 1$ ,

 $\gamma_g$  represents the proportion of principal that remains to be paid on a mortgage initiated g months ago. This proportion is based on a standard mortgage amortized over 300 months at a fixed interest rate, and

 $\varphi_g$  is the proportion of households that hold a mortgage initiated g months ago. This information is taken from the SHS and would be the only data coming from that survey. It is approximated as of the date on which the household moved into the dwelling.

#### The Interest sub-index

The Interest sub-index ( $I_{t/t-1}$ ) employs A4 data collected monthly by the Bank of Canada to measure changes in interest rates. This dataset provides the amounts of new mortgage loans as well as the corresponding interest rates for the country's nine largest banks. In addition to allowing for monthly updates of mortgage loans by term, this information covers a broad spectrum of interest rates, including variable rates and a variety of term fixed rates.

Estimation for index  $I_{t/t-1}$  relies on a standardized function of the amounts of residential mortgage interests charged by banks,  $A_t$ , defined as follows:

$$A_{t} = \sum_{j=1}^{9} \left[ \left( B_{j} - L_{j,t} \right) \times r_{j,t-1}^{eff} \right] + \sum_{j=1}^{9} \left( L_{j,t} \times r_{j,t} \right)$$

where:

 $B_j$  is the balance of mortgage loans for bank j. The amount  $B_j$  is obtained from the Bank of Canada's A4 database. The balance of mortgage loans  $B_j$  remains fixed throughout the period of the CPI basket to ensure that changes in  $A_j$  are solely the result of changes in interest rates and in the distribution of mortgage loans by term,

 $L_{j,t}$  represents the amount of new loans issued by bank j in month t. It is obtained from the Bank of Canada's A4 database,

 $r_{j,t-1}^{\text{eff}}$  is the effective interest rate in the previous month (t-1), for bank j. It is calculated by establishing the ratio between the interest amount for the previous month and the loan balance, and

 $r_{j,t}$  indicates the interest rate negotiated by bank j for its new mortgage loans. This information is also obtained from the Bank of Canada's A4 data.

Thus, the index  $I_{t/t-1}$ , which measures the impact of changes in mortgage interest rates on interest amounts between t and t-1, can be calculated as follows:

$$I_{t/t-1} = \frac{A_t}{A_{t-1}}$$

#### Homeowners' replacement cost

Since the owned accommodation index in the Canadian CPI seeks specifically to reflect the costs of using owned accommodation, the measure includes a "replacement cost" (or depreciation) component.

The replacement cost index measures the portion of the housing stock that is consumed, during a given period, that owners did not replace through maintenance and repairs. Homeowners' replacement cost differs from other owned accommodation components in the CPI because it is not an out-of-pocket expense.

Since depreciation is not an actual payment, but rather a conceptual expense, it must be derived. It corresponds to the hypothetical amount required to replace the portion of the stock of owned accommodation used each year by the target population. The basket weight is derived from data extracted from the SHS, in which respondents are asked how much they would expect to receive for their house if they were to sell it. It is also derived from external measures of housing prices up to the current basket reference year, which are captured by the CREA, as well as the change in owner occupied dwelling units collected from the Census and the Canada Mortgage and Housing Corporation's Starts and Completions Survey. This amount is multiplied by a "house/property" ratio to obtain an estimate of the value of the house, excluding the land, to which a depreciation rate of 1.5% is applied.

For monthly price movements associated with replacement cost, a version of the NHPI which excludes price changes associated with the land (the 'house only' index) is used.

#### Property taxes and other special charges

The property tax index measures changes through time in the amount of taxes levied on a constant sample of owner-occupied dwellings in selected municipalities. This sample of property taxes paid, obtained from municipal offices, is used to obtain an estimate of the average property taxes by city. These average values, which are a function of municipal and provincial tax rates and residential property values, are entered as prices in the current and previous periods' unit value index calculation. Changes in property taxes and related special charges are reflected once a year, in the October reference month of the CPI.

#### Homeowners' home and mortgage insurance

The homeowners' home and mortgage insurance price index calculates pure price changes in the cost of insuring a home and its contents against loss, using prices for a broad range of consumer profiles extracted from an alternative data source. Prices for these policies are determined based on the value of the structure being insured and the factors that affect the risk of a loss, such as the location of the home.

#### Homeowners' maintenance and repairs

The homeowners' maintenance and repairs index measures price changes for material and labour costs in relation to the home. This includes materials such as paint, flooring, carpet, stain, drywall compound, furnace filters, shingles, driveway sealant, caulking and lumber, as well as the labour costs associated with these materials like roofing and painting labour. Data sources for these sub- indexes include price data collected from retailers and the Construction Union Wage Rate Index.

#### Other owned accommodation expenses

Commissions on the sale of real estate are included in the other owned accommodation expenses price index. Data sources for the sub-indexes in this category include the NHPI and CREA's MLS HPI.

### The owned accommodation index and other measures of residential housing prices

The owned accommodation index is often the subject of discussion, as to whether it properly reflects the impact of changes in dwelling prices on the overall inflation level. More specifically, it is compared to data on the selling prices of homes, and it is sometimes argued that housing inflation is under-estimated in the CPI.

However, the owned accommodation component of the official Canadian CPI was not specifically designed to be an indicator of housing price inflation nor housing affordability. Alternative approaches for measuring housing inflation and affordability are available in a number of Statistics Canada products, including the <a href="housing statistics">housing statistics</a> portal, indicators of household wealth and affordability, and distributions of household economic accounts.

The treatment of owned accommodation in the Canadian CPI serves well in quantifying the rise in price of owning and occupying a dwelling. In particular, it is meant to measure the impact of price changes on a selection of costs specific to homeowners to determine changes in the cost of using a stock of dwellings.

While the cost of purchasing a home is not directly included in the CPI, several components of the ongoing consumer costs of home ownership are influenced by prices in the housing market, so they are included indirectly. The following are a few examples of how changes in housing prices are reflected in the owned accommodation index:

- An increase in the price of newly built homes across the country is reflected in the homeowners' replacement cost index, as the amount of money that would be required to maintain the market value of a home on an existing piece of land would also increase.
- A rise in housing prices contributes to higher mortgage interest costs when consumers initiate a mortgage.

- An increase in home prices impacts the commissions on the sale of real estate, which are included in the other owned accommodation expenses index.
- Higher home prices increase property values, which factor into the calculation of the property taxes and other special charges index and the homeowners' home and mortgage insurance index.

There are a number of other measures available, from both Statistics Canada and external sources, that measure the cost or price of housing. A description and intended use of these indicators are available in Table 2 below.

Table 2 Indexes measuring residential housing prices

Index name	Source	Frequency and availability	Description	Intended use
Consumer Price Index: owned accommodation index	Statistics Canada, Table 18-10-0004-01	Monthly, national data starting January 1949, sub-national and city level data starting January 1971	The CPI is an indicator of the change in consumer prices. It measures price change by comparing through time the cost of a fixed basket of consumer goods and services. The owned accommodation index is based on a variant of the user cost approach to measure the price change arising from the ongoing costs of homeownership.	To provide insight into overall economic conditions and is used for indexation and contract escalation. The owned accommodation index in the CPI is used to measure the impact of price changes on a selection of costs specific to homeowners in order to provide an indicator of price-induced changes in the costs of owning and occupying a dwelling.
New Housing Price Index (NHPI)	Statistics Canada, Table: 10-10-0205-01	Monthly, starting January 1981 for 27 CMAs	This survey measures changes over time in the contractors' selling prices of new residential houses, where detailed specifications pertaining to each house remain the same between two consecutive months. It includes the following dwelling types: new single homes, semi-detached homes and townhomes.	To monitor price trends in the construction sector for new homes.
			The survey also collects contractors' estimates of the current value (evaluated at market price) of the land. These estimates are independently indexed to provide the published series for land. The current value of the structure is also independently indexed and is presented as the house series.	_
Building Construction Price Index (BCPI)	Statistics Canada, Table 18-10-0135-01	Quarterly, starting 2017 Q1 for 11 CMAs	This survey measures change over time in contractors' prices to construct residential structures including a single detached house, a townhouse, a high rise apartment building and a low rise apartment building. The contractor's price reflects the value of all materials, labour, equipment, overhead and profit to construct a new building. It excludes value added taxes and any costs for land, land assembly, building design, land development and real estate fees.	To evaluate the impact of price changes on capital expenditures related to housing construction.

Table 2 Indexes measuring residential housing prices

Index name	Source	Frequency and availability	Description	Intended use
Canadian Real Estate Association's (CREA) MLS Home Price Index (HPI)	External to Statistics Canada	Monthly, available starting January 2005 for 61 areas	The index is produced using transactional data for home sales, available through MLS Systems at participating Canadian Real Estate Boards and Associations. The index is calculated using a hybrid modeling approach that merges the Repeat-sales and hedonic price approaches.	To measure price trends in local real estate markets, primarily for resale home sales.
Teranet–National Bank House Price Index	External to Statistics Canada	Monthly, earliest series starts June 1990, 11 cities	The index is calculated by applying a Repeat-sales approach to property records from public land registries. Only homes that have been sold twice can be incorporated into the model.	To measure price trends in local real estate markets for resale home sales.

Sources: Statistics Canada, Consumer Price Index, New Housing Price Index and Building Construction Price Index. Canadian Real Estate Association MLS Home Price Index.

Teranet-National Bank House Price Index.