National Database of

Residential Property Value Assessment

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1. Introduction

The Property Tax Base project is intended to meet new data requirements from Finance Canada for the renewal of the Equalization program, in which property tax base (residential and non-residential combined) is one of the important components. The new data requirements include property values at market price, property and property-related revenues, and population estimates.

For the time being, the property value component of the project focuses entirely on residential property assessment. Statistics Canada is producing such estimates on behalf of Finance Canada, incorporating conceptual and methodological adjustments suggested or approved by Finance Canada.

The property value component refers to annual aggregated property values at the provincial and municipal level, stratified by general property groupings such as residential, non-residential, agricultural, engineering, and other category. The current database is limited to residential values which are adjusted to reflect common valuation base date and state date in order to enhance inter-provincial comparability.

- A ***base date*** is the reference date for the valuation of all properties using a market value standard.

- A ***state date*** is the date that refers to the physical state of the property to be valued.

The Equalization program requires that, for taxation year t, the residential values reflect a base date on July 1 in year t-1, and they correspond to a state date on January 1 in year t when all current residential properties are reflected in the inventory.

The values are also broken down by their taxation status, including taxable, exempt, and where applicable, provincial and federal grants-in-lieu.

2. Key definitions

- Residential property comprises all types of property categorized as residential for assessment purposes in the majority of provinces. It includes single and multi-family properties, farm residences, cottages and vacation homes, mobile homes, institutional and communal residences, and vacant lands which are lawfully usable for residential purposes.

- Taxable property is defined as all property for which owners actually pay property tax to municipal governments or local taxing authorities in the majority of provinces.

- Exempt property is defined as all property which is exempt from taxation in the majority of provinces.

- Provincial/federal grant-in-lieu property is defined as provincial/federal government-owned property for which owners in the majority of provinces actually pay grant in lieu of tax to municipal governments or local taxing authorities.

- The term ‘majority of provinces ’is defined presently on the basis of the number of provinces. However, Finance Canada is considering alternative definitions, such as the provinces weighted by the total property values or population.

3. Data sources and scope

Data were collected from municipal assessment rolls managed and maintained by provincial/municipal assessment entities. Data respondents agreed to provide the data on a regular basis either through formal agreements or responding per request.

Data are reported at the municipality level. The municipalities covered by original data are matched to census sub-divisions (CSD) updated annually by Statistics Canada's standard geographical classification system. Some CSD types are out of scope according to Finance Canada and property assessment values cannot be found.[1] Also excluded from the database are some specific CSDs which are treated as Indian reserves although their types are not in the out-of-scope list.

4. Methodology

Starting from the raw data obtained from the provincial/municipal assessment entities, and consistent with the project's objectives for valuations that reflect a common state date and base date, methodological adjustments prescribed by Finance Canada are performed. These include imputation of missing values, as well as price and volume adjustments.

a) Imputation

Residential assessment values are missing for some CSDs which were not matched to municipalities provided by data respondents for a given taxation year. In most cases, those CSDs are subdivisions of unorganized areas. This necessitates the imputation of the missing values, which are performed based on information from previous years, adjusting for price and inventory changes, or from the last Census if previous years' data are not available.

- **Imputation from previous year data**

Consider CSD_i for taxation year t with missing data. The imputation process is as follows:

$$N_t = N_{t-1} + BP_t \qquad (1)$$

where N_t is the unknown number of residential properties in year t; N_{t-1} is the number of properties known from the previous year; BP_t is the number of building permits issued for year t, the information of which is available from Statistics Canada's Building Permits survey. The residential building permits' data is an indicator of residential construction intentions.

[1] The out-of-scope types include IGD (Indian government district), IRI (Indian reserve), NL(Nisga'a land), NV(Northern village), NVL(Nisga'a village), S-É (Indian settlement), SÉ (Settlement), TC (Terres réservées aux Cris), TI (Terre inuite), TK (Terres réservées aux Naskapis), TL(Teslin land), TR (Terres réservées), VC (Village cri), VK (Village naskapi) and VN (Village nordique). Also note that TR in Quebec was replaced by TC and TK since 2006.

The information including number of dwellings authorized and value of construction projects is available at the CSD level[2].

$$V_t = V_{t-1} * (1 + R_{MLS(t-1,t)}) + \frac{V_{t-1}}{N_{t-1}} * BP_t * (1 + R_{NHPI(t-1,t)}) \quad (2)$$

where V_t is the total residential value imputed for year t; V_{t-1} is the total residential value known for year t-1; $R_{MLS(t-1,t)}$ is the rate of change for average MLS price from t-1 to t, for CSD_i, where MLS represents multiple listing service database compiled by the Canadian Real Estate Association (CREA) to report time series of residential resale values by province and major metropolitan centers[3]; $R_{NHPI(t-1,t)}$ is the rate of change for new housing price index (NHPI) from t-1 to t, for CSD_i, where NHPI is a statistical program maintained by Statisitics Canada at the provincial and census metropolitan area (CMA) levels.[4]

Note that in cases where building permits' information is not available for CSD_i, equation (2) reduces to:

$$V_t = V_{t-1} * (1 + R_{MLS(t-1,t)}) \quad (3)$$

- **Imputation from the last Census data**

Consider CSD_i for taxation year t, where data are not available and need to be imputed. The imputation process is as follows:

$$N_t = N_C + BP_t \quad (4)$$

where N_C is the number of private dwelling units from the last (2006) Census.

$$V_t = \overline{V}_C * N_C * (1 + R_{MLS(2006,t)}) + \overline{V}_C * BP_t * (1 + R_{NHPI(2006,t)}) \quad (5)$$

where $\overline{V}_C$ is the average value of owner-occupied private dwellings obtained from the 2006 Census; $R_{MLS(2006,t)}$ is the rate of change for average MLS price from 2006 to t, for CSD_i; $R_{NHPI(2006,t)}$ is the rate of change for NHPI from 2006 to t, for CSD_i.

If no data is available for BP_t, equation (5) reduces to:

$$V_t = \overline{V}_C * N_C * (1 + R_{MLS(2006,t)}) \quad (6)$$

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[2] See http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=2802&lang=en&db=imdb&adm=8&dis=2 for definitions, data sources and methods of the building permits survey.

[3] MLS data for major metropolitan centers are used in case that CSD_i belongs to the given center. Otherwise, provincial MLS data are used to approximate the residential re-sale market for CSD_i.

[4] The NHPI for CMAs is used in case that CSD_i belongs to the given CMA. Otherwise, provincial NHPI data are used to approximate the new house market for CSD_i.

- **Imputation of farm residence values**

Some farm residence values are imputed for a consistent treatment of the residential category. For example, in Saskatchewan, most farm residences are not assessed and therefore their values are not reflected in the original database. As the majority of provinces report farm residence values, those in Saskatchewan need to be imputed. Imputation is also required when farm residence values are included in the farm category rather than the residential category.

The imputation makes use of data from the Census of Agriculture conducted by Statistics Canada. For CSD_i, the formula to impute farm residence value is shown by equation (7):

$$FRV = \overline{RHP} * N_F \quad (7)$$

where FRV is the farm residence value; $\overline{RHP}$ is the average rural house price at the provincial level, derived from the 2006 Census involving each CSD containing less than 10,000 people in the province; N_F is the total number of farms found in the 2006 Census of Agriculture.

In case that FRV is included in the farm category, it is deducted from the total farm value and re-distributed to the residential category.

b) Other Adjustments

Adjustment of residential values is made to reflect the common base date and state date. The imputed value is not further adjusted because the imputation procedure has already adjusted for price and inventory changes, as shown above.

For the raw data, in adjusting the base date, monthly average MLS price by province or major metropolitan centers are annualized to determine multipliers which are applied to adjust residential values. This represents a price adjustment. It is further ensured that properties reflect a common state date through a volume adjustment mechanism that utilizes Statistics Canada's building permits survey data to add or deduct the number of new properties to the inventory.

- **Price adjustment**

For taxation year t, provincial residential values are required to reflect a common base date on July 1 of year t-1. It is believed that the closer the provincial base date is to the common base date, the less adjustment is required and hence the more accurate the data will be. Price adjustment is not necessary if for province i, the assessment base date for Δt happens to be on July 1, t-1, where Δt is a taxation year other than year t. Volume adjustment will be needed though because t is not equal to Δt.

Price adjustment is made at the CSD level using MLS data. MLS data for major metropolitan centers are used if CSD_i falls within the geographic hierarchy of a given CMA. Otherwise, provincial MLS data are used to approximate the residential resale market for CSD_i.

For a given CSD, the first step of price adjustment is to annualize the monthly MLS data, as shown by equation (8):

$$P_{A,t} = \sum_{m=1}^{12} (P_m * \frac{U_m}{\sum_{m=1}^{12} U_m}) \quad (8)$$

where $P_{A,t}$ is the annualized average residential MLS price for year t; P_m is the monthly average MLS price; U_m is the monthly residential units sold. All series are seasonally unadjusted.

The 12-month series is not necessarily consistent with a calendar year. For a given date, the 12-month period comprises the six months before the date and the six months after the date. In other words, the annualized MLS price is a 12-month weighted moving average that considers the impact of the units sold each month on the whole year.

The second step of price adjustment is to determine the ratio between the price on targeted base date and the price on the provincial base date. For taxation year t:

$$Ratio = \frac{P_{A,t-1}}{P_{A,0}} \quad (9)$$

where $P_{A,\,t-1}$ is the annualized MLS price on July 1, t-1; $P_{A,0}$ is the annualized MLS price on date 0, the original base date for province i.

For example, for taxation year 2006, Newfoundland and Labrador valued its residential property based on January 1, 2002, and the Equalization program requires the value to reflect a common date on July 1, 2005. Since the province updated its value in 2007 to reflect a new base date on January 1, 2005, which is closer to the common base date, it is recommended that the 2007 data be used with less price adjustment to represent data for 2006. In this scenario, 2006 is year t, 2007 is year Δt, and January 1, 2005 is date 0 to be adjusted to reflect the targeted base date of July 1, 2005. Thus, $P_{A,\,2005}$ is derived as the weighted average MLS price for the 12-month period from January 2005 to December 2005; $P_{A,0}$ is calculated as the weighted average MLS price for the 12-month period from July 2004 to June 2005; Ratio is then generated by dividing $P_{A,\,2005}$ by $P_{A,0}$.

The third and last step is to adjust the total residential value for taxation year t by multiplying the ratio:

$$V_{Adj,\,p,t} = V_0 * Ratio \quad (10)$$

where $V_{Adj,p,t}$ is the price-adjusted residential value for taxation year t; V_0 is the original value reflecting a base date of 0, corresponding to the taxation year of either t or Δt, the base date of whichever is closer to July 1, t-1, the targeted base date.

- **Volume adjustment**

For taxation year t, provincial residential values are required to correspond to a targeted state date on January 1 in year t, when all residential properties are reflected in the inventory.

The volume adjustment is made using monthly building permits' data and it can be described by equation (11).

$$V_{Adj,v,t} = \sum_{m=1}^{M} BP_m * P_m \qquad (11)$$

where $V_{Adj,v,t}$ is the volume-adjusted residential value for taxation year t; BP_m is number of building permits approved for month m, the information of which is available from Statistics Canada's building permits survey;[5] M is the total number of months required to be adjusted, which is the difference between provincial state date corresponding to taxation year t or Δt, and the targeted state date on January 1 in year t.

Note that $V_{Adj,v,t}$ is negative if the provincial state date chosen happens to be greater than the targeted state date, in which case a backward volume adjustment is in effect. Also, the final total residential value for province i is derived as the sum of $V_{Adj,p,t}$ and $V_{Adj,v,t}$.

Take the above scenario of Newfoundland and Labrador as an example. The provincial state date for 2007 (Δt) is January 1, 2007, and the targeted common state date for 2006 (t) is required to be January 1, 2006. Therefore, the total building permit value for the 12-month period from January 2006 to December 2006 is deducted from the price-adjusted value to derive the final total value, reflecting the common base date on July 1, 2005 and the common state date on January 1, 2006.

5. Quality control

To ensure data harmonization across provinces, Finance Canada prescribes several adjustments which are applied to the raw data. Moreover, Statistics Canada also researches options and proposes methodological adjustments, such as the usage of price indexes among existing alternatives and methods of imputation. All necessary methodological adjustments used to arrive from the raw data obtained to the output data are either prescribed or ultimately approved by Finance Canada.

The quality of the raw data collected from provincial/municipal assessment departments/agencies can not be assessed against Statistics Canada's quality assurance framework, which requires an assessment of data relevance, accuracy, timeliness, accessibility, interpretability and coherence. However, in close consultation with Finance Canada, a series of steps is undertaken in order to establish common standards and data comparability.

More specifically, geographic coverage analysis is conducted to match in-scope municipalities covered by original data to CSDs, updated annually by Statistics Canada's standard geographical classification system. Missing residential assessment values for some CSDs are imputed.

[5] See http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=2802&lang=en&db=imdb&adm=8&dis=2 for definitions, data sources and methods of the building permits survey.

Building type concordance tables are established at the provincial level[6] to link building types administered by Statistics Canada to property use types reported by the original data sources. Property groupings are further defined based on the concordance tables. In addition, confrontational analysis is performed to compare the source data to existing statistical programs.

Within the residential group defined by the concordance tables, the coherence of the data on the numbers and values of property is examined by census coverage analysis, which compares the source data to private dwelling counts and values registered in Statistics Canada's 2006 Census. Any irregularities identified are carefully analyzed and corrections are made before the official release of the data.

Further analysis of data coherence across different parts of the Property Tax Base program was carried this year. This includes additional steps in the validation and analysis of data received from the respondents. For example, comparing provincial data with published annual reports; verifying with the respondent that totals received from micro data files correspond to their summary reports for a taxation year; explaining the source of any revisions made; confronting the residential estimates with the trends of other data sources.

[6] Municipality level concordance tables are developed for cities of St. John's, Saskatoon, Regina, Swift Current and Prince Albert, which provide property assessment services on their own.