

Method Description New Residential Buildings: Output Price Index for Construction Costs

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Summary: This document describes the Output Price Index for Construction Costs of new residential buildings. It elaborates on the calculation method of the index.

Keywords: Method, price index, construction costs, new construction, residential buildings

1. Introduction

This is a method description for the statistic New Residential Buildings; Output Price Index for Construction Costs (O-PINW). The description pertains solely to the methodological aspects of the O-PINW. Therefore, the focus will be on a description of the regression model and its components, such as chaining.

2. Index Calculation

The output price index for construction costs of new residential buildings is a chain index. The calculation involves the following steps, starting with the calculation of sub-series and then the main series for the Netherlands as a whole.

Step 1: Calculating Short Index Series

Initially, short series per year are calculated to compute the O-PINW. The O-PINW is based on the hedonic regression method, which is a multiple regression analysis where multiple independent variables influence the dependent variable. For the O-PINW, this means that the relationship between the sales price of the house and various house characteristics is calculated. This allows for price development to be adjusted for quality differences between building permits in successive periods.

The following regression model is used to calculate a hedonic price index:

$$\log(p_i^t) = \beta_0^t + \beta_1^t x_{i1} + \dots + \beta_k^t x_{ik} + \varepsilon_i^t$$

In this case $\log(p_i^t)$ in period t is the natural logarithm of the sales price, and x_{ik} is the k^{e} the characteristic of the i^{e} the house sold in period t . The characteristics included in the model are determined based on their contribution to explaining the price. Only significant characteristics are included. The house characteristics considered are: cubic meter volume (m^3) and province.

Based on the coefficients yielded by the regression analysis, a sales price is estimated. This estimated sales price is then used as input for calculating a price development. In this study, it was chosen to estimate the sales price for both the reference period and the reporting period. This method of hedonic regression is also known as the double imputation method.

The double imputation method has three variants of hedonic regression: Laspeyres, Paasche, and Fisher. All three are based on the same regression model but differ in how the price index is subsequently constructed. The Fisher double imputation method was found to be the most suitable for calculating an index for the Netherlands as a whole. This index is the geometric mean of the Laspeyres index and the Paasche index.

The following formula represents the Hedonic Double Imputation Laspeyres Index (IHDIL):

$$I_{HDIL}(t,0) = \frac{\exp\left(\sum_{k=1}^K \beta_k^t \bar{x}_k^0\right)}{\exp\left(\sum_{k=1}^K \beta_k^0 \bar{x}_k^0\right)}$$

The following formula represents the Hedonic Double Imputation Paasche Index (IHDIP):

$$I_{HDIP}(t,0) = \frac{\exp\left(\sum_{k=1}^K \beta_k^t \bar{x}_k^t\right)}{\exp\left(\sum_{k=1}^K \beta_k^0 \bar{x}_k^0\right)}$$

The following formula represents the Hedonic Double Imputation Fisher Index (IHDIF):

$$I_{HDIF}(t,0) = (I_{HDIL}(t)I_{HDIP}(t))^{1/2}$$

In deze formules geeft $\hat{\beta}_k^t$ voor de geschatte coëfficiënt weer voor het k^e kenmerk in periode t , \bar{x}_k^0 staat voor het gemiddelde van het k^e kenmerk in periode 0, \bar{x}_k^t staat voor het gemiddelde van het k^e kenmerk in periode t en K geeft het aantal woningkenmerken weer dat is gebruikt in het hedonische model.

In these formulas $\hat{\beta}_k^t$ represents the estimated coefficient for the k^e the characteristic in period t , \bar{x}_k^0 represents the average of the k^e the characteristic in period 0, \bar{x}_k^t represents the average of the k^e the characteristic in period t and K represents the number of house characteristics used in the hedonic model.

The annual series are calculated by determining the development for each quarter relative to the fourth quarter of the previous year. In the first year, development is calculated relative to the first quarter. Unrounded O-PINW figures are used. The first period of the short series is set to 100.

Figure 1. Short Series

Korte reeksen	
2015 Q1	
2015 Q2	
2015 Q3	
2015 Q4	2015 Q4
	2016 Q1
	2016 Q2
	2016 Q3
	2016 Q4

Step 2: Calculating Development Relative to the Previous Period

For each period, the development relative to the previous period is calculated. The development is calculated by dividing the value of the respective quarter by the value of the previous quarter.

$$(2) \quad \text{Development subseries_PNK } q, q-1 = \frac{I_{\text{subseries_PNK}}^q}{I_{\text{subseries_PNK}}^{q-1}}$$

Step 3: Calculating the Long Index Series

Using the calculated development per period, an index for the entire period can be calculated. The first period of the series is set to 100. The remaining periods are calculated by multiplying the development by the index figure of the previous period. This process is known as chaining, and it ensures that the influence of the starting period does not persist in subsequent periods.

Step 4: Rescaling

The index is rescaled to the base year. The average index of the base year is calculated. The index figures of all periods are then divided by this average and multiplied by 100.

Step 5: Rounding

Finally, the figures are rounded to one decimal place.

3. Data

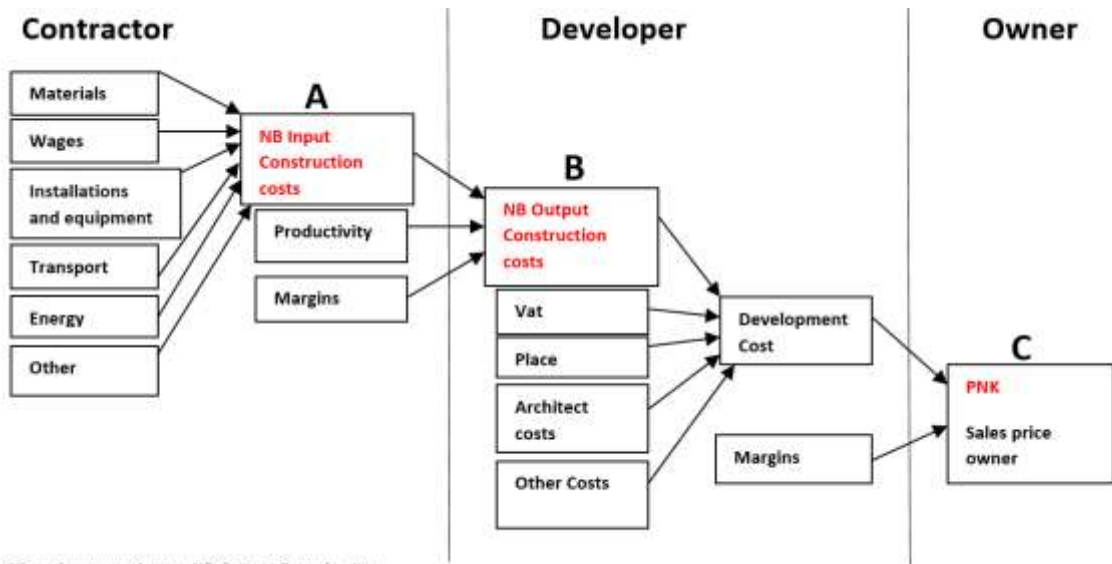
The O-PINW is based on the statistic Granted Building Permits (Vb). This statistic provides information on all building permits for new residential buildings issued by municipalities. A building permit consists of one building project, which may comprise multiple dwellings. This means that the observed price pertains to the entire project. A price per dwelling can be calculated since the number of dwellings in a project is also known.

4. Publication

The Output Price Index for New Residential Buildings is calculated quarterly and subsequently published on Statline and in the Statistical Bulletin.

5. Schematic representation of the construction process.

Statistics Netherlands publishes various price statistics within the construction process. The diagram below shows the position of the input price index for buildings costs on new dwellings (NB input construction costs), the output price index for building costs on new dwellings (NB output prices) and the Price Index for Newly built dwellings (PNK) in the construction process.



Nieuwbouwwoningen: NB Output Bouwkosten

Data

Publication