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CREATION OF HOUSING PRICE INDICES:
INTERNATIONAL EXPERIENCE

House prices are subject to "boom-bust" changes during economic cycles. These changes can affect economic activity through housing investment and consumption, borrowing and spending decisions. It is important to measure the pure house price changes correctly because results are often used by policy makers for development of macroeconomic policy, by researches who analyze the movements in housing wealth and its effects on consumption, for investors that analyze the past returns from investment in housing and make portfolio decisions. And in more general meaning it is important to assess whether house price changes reflects the changes in fundamentals such as population, housing stock, disposable income, interest rates etc.

It is difficult to measure changes in prices in housing market due to the changes in composition of properties that were sold and changes in the quality of housing during time. The aim of this paper is to provide an overview of the practice of constructing house price indices in different countries and to discuss their pros and cons.

Probably the simplest and most obvious way to measure house prices change is by using mean or median prices and deriving a price index series or a growth rate series. The data about prices includes sales of all existing homes. The index computed by this way is easy to understand because it reflects the measure of the central tendency computed at various points of time. But this method computes change in average price by using a random selection of particular houses being sold rather than a pure price change for entire population of houses.

Pure price change is estimation of changes in price for representative house (or house stock) assuming the constant quality. Housing characteristics can change over time that is why the quality is a heterogeneous factor that affects housing prices. Houses are not sold very often, so only a part of the housing stock provide information about house prices at particular point of time, and since houses are heterogeneous due to unique location of each house, the composition of houses sold can be quite different during different periods. For example, one can observe a misleading increase in housing prices estimated by the median measure, if the share of higher quality houses has been higher during certain period of time. In other words trans-

action-based house price measurements without control for compositional change cannot be considered as representative indicator of house price dynamics. At the other hand it is difficult to make adjustment for quality in practice because of the availability of data.

One can find in the research literature several regression-based approaches (Cho, 1996, and Conniffe and Duffy, 1999). They are: hedonic estimations that applies regression analysis onhouse prices against house attributes over time (Case, Shiller, 1987); repeat-sales estimations, that regress price changes over same house over time; and mixed measures (or hybrid), that combine hedonic and repeat-sales measures (Case, Quiley, 1991).

Hansen (2009) provides a summary of the pros and cons of each method.

Overview of the estimation methods according to Hansen (2009)

Method	Compositional change	Quality change	Regression required
Hedonic	Yes	Yes	Yes
Repeat-sales	Yes	Yes	Yes
Median or mean	No	No	No
Mix-adjusted	Yes	No	No

Median measure does not control for compositional change. But median estimation can be volatile, and this can be misleading around inflection points in the housing cycle. For example, estimation of Australian house price change during 1993–2005 made by Hansen shows the median was almost twice as volatile as the alternative measures shown (Hansen, 2009).

Alternative measures such as repeat sales and hedonic estimations can control for compositional change. The price in hedonic regression method is determined as a function of house characteristics such as number of bedrooms, size of lot, or distance to the city center. A hedonic regression equation treats these attributes (or bundles of attributes) separately, and estimates prices (in the case of an additive model) or elasticity (in the case of a log model) for each of them. But hedonic methods also have their advantages and disadvantages. For example, hedonic methods usually use a pooled rather than the panel data regression, as the number of observations varies across each time period. The most important advantage of the hedonic method is that it provides direct estimates of the pure price changes. Disadvantages of the hedonic measurement are that the quality of hedonic estimates depends on the quality of data available. If there are some missing values in the sample it has a significant impact on the estimations. Moreover if the relationship between house attributes is incorrectly specified through incorrect functional form, this can also give biased estimates.

Repeat-sales method was developed by Bailey et al (1963). It can be applied only to properties that have been sold more than once. Repeat-sales method is more accurate since it is based on the sale price of the same house. It requires less data to collect since the most important variables are price, sales date and the location of property. The cons of repeat-sales are that if house characteristics have changed over time it is not considered. The solution to this is to make estimations on the samples where the quality of houses has not changed over time. But this can lead to too small estimation samples that cannot reflect the pure price change of the entire market. The house turnover rate (number of sales time per particular house) can also differ. For example there can be in the sample houses that have been sold only twice during estimated period, and houses, that have been sold several times during the same estimated period. The average change for these two types of houses can be different since the houses that have been sold more than twice can include sales costs in their price level. Moreover, houses that have been sold several times can be over-represented in the sample resulting in wrong price dynamics estimations.

Case and Quigley (1991) proposed a mix-adjusted (or hybrid) method that uses three different equations for three different groups of transactions. One equation is a hedonic regression applied to all properties that are transacted only once during the sample period; one is a repeat sales regression applied to properties that transacted more than once during the sample period, but had no change in the property attributes and in such a way controlling for constant quality; and one is a modified repeat sales regression applied to properties that transacted more than once during the sample period, but have some changes in property attributes. In such a way this method use the pure price change taking into consideration repeat sales as well as prices of houses that have been sold only once.

Other hedonic methods include a spatial hedonic regression, where the transaction price of a house at any given point in time will be determined not only by its structural attributes and the desirability of the neighborhood but also will be subject to absolute price effects from prior sales within its surrounding area. Spatial dependence in the model specification reflects the spatial spillover effects in the operation of local housing markets. Spatial dependence is a local issue and this variable can vary across metropolitan areas as well as over time. With GIS technology and developments in digital communication, it would be possible in future to input interactively the address for a property and get an accurate estimated market value.

Researches done before provide evidence that different methods can arrive to different results depending in the size and quality of sample as well as sample period. However, one can observe a smoothing effect for

estimations results. This means that in case of using large samples the differences between hedonic, repeat sales and mixed-adjusted methods are small.

It is hard to find the best way to construct house price index that can serve as a benchmark. Nevertheless, the similarity between different ways of measurement, the volatility of estimations, and statistical performance provide information about their suitability regarding control for compositional and quality change in the housing market. Hedonic and repeat sales measures provide similar estimates of prices growth and they can also be mix-adjusted. It is obvious that quality of data sample determines the preciseness of estimations and that is why the process of data collection and development of house price index methodology is always of high importance.

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