

# Commercial property prices: What should be measured?

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## 1 Introduction and motivation

The real estate sector plays a major role for the real economy, the financial system, financial stability and not least the monetary transmission process. However, unlike the case of residential property, official data on commercial property markets is hardly available. This asset class is usually defined through the generation of an income stream from its possession. The focus is thus more investment-oriented than in the case of owner-occupied residential property. Commercial objects are frequently categorised by their main forms of usage. Common clusters include: office property, retail property, industrial property and – if developed for commercial purposes – residential property. Roughly 34% of all fixed assets of German non-financial corporations were classified as real estate in 2009 (Deutsche Bundesbank 2011). Naturally, commercial property often serves as collateral; around 50% of all loans in Germany are secured by mortgages.<sup>2</sup> According to BulwienGesa AG, a German real estate consulting firm, total market value of commercial property accounted for over €2.1 trillion in 2009 – almost the same size as the economy's activity in terms of gross domestic product at current prices. At €960 billion, retail and office properties correspond to roughly 45% of total commercial property value. The largest share is represented by industrial real estate amounting to €1.1 trillion.

The IMF included commercial property prices in its Financial Soundness Indicator set (IMF 2006). In spite of this, due to limited data availability and methodological difficulties, indicators on commercial property have hardly been published yet. The IMF and the Financial Stability Board brought up this issue again in their report on the financial crisis and information gaps to the G-20 finance ministers and central bank governors and recommended the collection of price indicators on commercial property (FSB 2009). As one result, an international conference on commercial property price indicators was jointly organised by the BIS, the ECB, Eurostat, the IMF and the OECD in June 2012 (ECB 2012). Eurostat envisaged the compilation of a “Handbook on Commercial Property Price Indicators”; with the intention of defining the methodological framework for reconciling the efforts towards an indicator set at an international level, in order to eventually bridge the data gap.

This paper argues that, despite the quest for swiftly disseminated indicators, it is of utmost importance to set up a valid and reliable methodological framework first. The various data

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<sup>2</sup> The ratio is calculated as mortgage loans by banks in Germany to domestic non-financial enterprises and households over total lending.

users make substantially different demands on the index concepts. These, in turn, need to be tailored for the distinctive purposes. In what follows, different approaches to the measurement of commercial property prices are presented. Furthermore, the paper seeks to outline the operationalisation of the theoretical framework. Available price indicators for Germany are discussed and classified according to statistical criteria in a separate section. Selected data uses are briefly reviewed thereafter. The final section concludes and outlines the challenges ahead.

## **2 Measurement aims**

A (commercial) property is a bundle of goods. To determine its value, one can take different vantage points (Rosen 1974). From a producer's perspective, the property value is driven by the costs of purchasing the land and building the structure on that lot. From a purchaser's view, the value of a property is the sum of his willingness to pay for each component, i.e. the land and the structure. From a commercial bank's view, properties are valued as collateral in order to reduce credit risk. Various professions and stakeholders observe real estate. The perspectives vary and, therefore, property price indices need to be tailored to the needs of data users. First, however, it is necessary to analyse the composition of real estate prices and possible indices derived from a land-structure split and the decomposition of values into price and volume components.

### **2.1 Land-structure split**

At the beginning we concentrate on two main components of any (commercial) real estate. A developed property's value is determined by the cost of the land and the cost of the structure – the building itself. For example for the purpose of National Accounts, land values are commonly excluded since land does not represent a produced asset (Lequiller and Blades 2006). Hence, a land-structure split as in Equation (1) is applied.

$$\text{Property value} = \text{Land value} + \text{Structure value} \quad (1)$$

Values of land and structures are driven by various factors and types of use. To begin with, indicators based on the value of land are largely governed by location characteristics. A specific lot obtains its value from various determinants such as the proximity to the city centre, the economic structure of the surrounding area or its shape and size (Özdilek 2011). In comparison, the value of the structure is defined by the costs of producing the characteristics such as office and retail space, technical facilities or logistic areas.

However, both components are rather difficult to separate in practice. The value of commercial property is determined by the (expected) income stream, i.e. the sum of the discounted cash flow of the rents. Should this approach be applied to the structure value one ignores that rents, too, are driven by location. Hence, a structure value thus determined will also be influenced by land-specific characteristics. The issue of whether or not the land value should be part of an index has also been addressed for owner-occupied housing as well (Eurostat 2011a).

In order to answer the question for the measurement aim, “what should be measured?”, and to categorise available information on commercial property into a statistical framework, it is not enough to differentiate between the land and the structure value. In fact, it is necessary to reconsider implications from index theory for discriminating sharply between the value, the price, the volume and the quantity of commercial property.

## 2.2 Components of an index

The market value provides a nominal measure for commercial property. In what follows values might refer to those of structure and land, respectively, or both, i.e. the whole property. If quantities (floor space or lot size in square metres, say) are available, dividing the value in euro by that quantity yields a so-called unit value in euro per square metre. Thus, the value can be split up as follows:

$$\text{Value} = \text{Unit value} \times \text{Quantity.} \tag{2a}$$

However, the unit value in Equation (2a) depends on the quality of the building and not just on floor space, or the location of the lot and not only its size. Since price indices aim for a quality-adjusted indicator prices here denote a constant quality numéraire.<sup>3</sup> As will be discussed at great length in the next section, it is possible to decompose the value into a constant-quality price and a volume measure that inherits quality changes:<sup>4</sup>

$$\text{Value} = \text{Price} \times \text{Volume.} \tag{2b}$$

Therefore, an index for property prices in its pure form will reflect movements in prices that are stripped of quality changes. The latter are included in the volume as shown in Equation (2b). Eventually, the ultimate statistical goal is splitting up the value into a quality-adjusted price, the quality component itself and a quantity measure independent of quality.

$$\text{Value} = \underbrace{\text{Price} \times \text{Quality}}_{\text{Unit value}} \times \overbrace{\text{Quantity}}^{\text{Volume}} \tag{2c}$$

Following Equation (2c), the value is obtained via multiplying the constant-quality price of a unit by a dimensionless mark-up (or mark-down) for the desired level of quality and the

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<sup>3</sup> Valuers, however, have a different notation of the terms used in official statistics. The Royal Institution of Chartered Surveyors, for example, makes the following distinction between values and prices (RICS, 1997): Where the value indicates an estimate of the obtainable price in the event of a transaction, the price reflects the actually observed amount of money at the time of the transaction.

<sup>4</sup> At a given point in time, constant quality means some sort of average quality at a building level. For intertemporal price comparisons, this means that the quality of a particular building is held constant.

nominal quantity of the structure or the land. This mark-up can reflect characteristics such as the age of the building or its year of construction.

### 2.3 Aggregation of values and prices

So far the basic components of a specific property's value (land and structure on the one hand; price, quality and quantity on the other) have been introduced. The next step towards the compilation of an index is the aggregation of values and their (price) components. The first half of this process is described in Equation (3). For each time period  $t$ , the summation runs over the distinct properties  $i$ .

$$\sum_{i \in I} \text{Value}_i^t = \sum_{i \in I} \text{Price}_i^t \times \text{Quality}_i^t \times \text{Quantity}_i^t \quad (3)$$

This sum can be calculated over two different populations, denoted by the index set  $I$  in the equation. Firstly, this is the building stock, i.e. all commercial properties in an economy are at the centre of interest. Secondly, building flows, i.e. transactions of newly built, or used and transferred commercial property, may be relevant for market analysis. The distinction between the two is essential. While flows tend to better depict market activity and movements, stock-based figures reflect the endowment of the economy with commercial property. In a stringent system of accounting the nominal stock at the beginning of the period plus the net flow in this period yield the stock at the beginning of the subsequent period. In order to obtain such equality, gross flows need to be adjusted for depreciation or demolition of buildings, and for appreciation, i.e. renovations.

Then again, changes in nominal values of either the stock or flows are not the same as changes in real terms. The difference is the price component – the second half of the aggregation process. Yet the construction of the price index at the aggregate level from individual data depends on its use. A Paasche-type price index will be the appropriate measure for deflating value aggregates yielding Laspeyres-type volume measure, e.g. in National Accounts in Europe (in the framework of chain indices). In spite of this, a Laspeyres-type price index, as displayed in Equation (4), is more appropriate for analysing “pure” price developments (European Commission 1995). Therefore, and in line with other statistical price indices, a CPPI should adequately follow this method.

$$P_L = \sum_{i \in I} (p_i^1 / p_i^0) \times w_i^0, \quad \sum_{i \in I} w_i^0 = 1 \quad (4)$$

The choice of what should be used for weighting price information (the  $w$ 's) has to be governed by the actual application of the index. Transactions at market values can serve as weights for a price index based on flows in order to reflect market movements across regions, say. Transaction-weighted indices place a higher weight on more liquid markets. Weights derived from economic activity such as regional income or output figures can step in if information on transactions is not provided in sufficient detail. In contrast, for price indices relating to the building stock weights linked to the nominal stock or the num-

ber of enterprises (in absence of precise data on the stock) will generally be more appropriate.

The observation of values and prices generally yields different results. The change in market values between two consecutive periods does not necessarily reflect the pure, i.e. quality-adjusted, change in prices. It is rather a mixtum compositum of quality changes due to depreciation and renovation as well as the quality-adjusted change in prices; if quantities remain the same. Let, for example, the population be equal in the two periods under consideration. Due to depreciation the quality of all buildings will be lower on average. Ceteris paribus, it follows that in such a situation values decrease although quality-adjusted prices have remained constant. The concepts developed in this section are summarised in Table 1.

Table 1: Different aggregates and the respective uses

Measurement aim	Aggregate type	Use for the concept
Value	Transaction-based	Nominal wealth traded on the market
	Stock-based	Nominal wealth in the whole economy
Price	Transaction-based	Pure price movements
		Deflation
	Stock-based	Pure price movements
		Deflation
Volume	Transaction-based	Real wealth traded on the market
	Stock-based	Real wealth in the whole economy
Quantity	Transaction-based	Number of transactions
	Stock-based	Physical stock of the economy

As commercial property is even more heterogeneous than residential property, say, the observation of prices for identical items – independent of any quality change – is hardly possible if at all. Therefore, in order to operationalise measurement, statistics are in need of alternatives, particularly, quality adjustment methods. These concepts are described below.

### 3 Operationalisation methods

In order to measure price developments, it would be ideal if the whole building stock in an economy were transacted in an (information) efficient market once in each period at a

constant quality (without depreciation or renovation) and prices for the structure and land were reported separately. Due to the segmentation, the degree of heterogeneity and complexity, a lack of transparency and non-fungibility of real estate it is hardly possible to obtain reliable measures for the value and the price (Geltner et al. 2007). Therefore, this section first turns to the issue of obtaining a constant-quality price index. The discussion then addresses the problem of obtaining a value for land (or, at least, how to adjust for land characteristics). Last, the problem of unobservable prices for the building stock and in the case of illiquid markets is discussed.

The academic literature offers a broad variety of treatments on the matter of constant-quality prices (Malpezzi 2008). The most common quality adjustment methods include stratification, the repeat-sales method and hedonic regressions. Where stratification methods measure price movements within comparable strata under the assumption that within these groups qualities remain constant, the repeat-sales method measures price changes between two consecutive sales of the same objects. Hedonic regressions build upon the perception that a property consists of various characteristics (see the discussion in the previous section) which are measurable and that these carry implicit prices. Then, the value  $V$  is a function of the price  $p$ , several quality characteristics  $C$ , and the quantity  $q$  (to reiterate, these are the components of the value defined earlier):

$$V = f(p, C, q). \quad (5)$$

Provided building values along with certain characteristics are obtainable, Equation (5) can be estimated and will provide quality-adjusted prices. However, land values are in general not available for whole properties and land will only seldom be transacted in certain regions. In such a case, valuation-based estimates can be drawn on. A valuer's assessment of a building should, at least theoretically, yield a market price. Certainly, for the case of land values, it is hard to obtain reliable assessments since comparables are rare. Additionally, indices constructed from valuations tend to be smoothed and lagged compared to those based on transaction prices (Geltner 1991). This has consequences for data users as risk management concepts, for example, are heavily founded on volatility measures.

Property values are decomposed into the main drivers for land and for the structure by applying a land-structure split. We therefore build upon the above exposition and split the (observed) property values into land values  $V^L$  and structure values  $V^S$ . The characteristics in Equation (6) strictly separate between location-specific aspects that pertain to the land and structure-specific aspects that pertain to the building itself (Eurostat 2011).

$$V = V^L + V^S = f(p^L, C^L, q^L, p^S, C^S, q^S) \quad (6)$$

However, values for existing buildings are only available for the small part of the stock that is transacted in a period. What is more, just a fraction of these transferred objects will be observed. Therefore, it is necessary to either impute from the transactions at hand to the

whole stock and the entire flows or, again, rely on valuations. Still, in order to impute from samples (of size  $n$ ) detailed information on the population (of size  $M$ ) must be available. Only this way can the estimated values be used for drawing conclusions on the whole stock or all transactions. The nominal value of the building stock and flows is then estimated in Equation (7) as the sum of observed and estimated values.

$$V = \sum_{i=1}^n V_i + \sum_{j=n+1}^N \hat{V}_j \quad (7)$$

The reliability of market aggregates may be assessed from the liquidity of the market measured by the number of transactions. Obtaining aggregates for illiquid markets is a major challenge. Illiquid or small markets have few or close to no transactions (depending on the length of the period deemed as appropriate). Hence, observation of trustworthy market values is very problematic. In any case, illiquid markets are more susceptible to biases from structural effects and to an increased volatility due to random shocks. For liquid markets it is more likely that the latter cancel out while structural effects receive lesser weight because of the increased number of transactions. Then again, valuations may be suitable to fill the gap for illiquid markets – similar to the situation for the building stock.

## 4 Sources

The conceptual approach provided in the previous sections is confronted in practice with available data sources. Data on commercial real estate is rather sparse and hardly available for some property types such as industrial property. This section seeks to classify the data provider's approaches within the taxonomy derived in sections 2 and 3. A straightforward categorisation is not always feasible since methodology for some indices is not disclosed and the terminology differs between official statistics and real estate professionals.

For Germany, three index providers publish data at a national level. BulwienGesa AG, a German real estate consulting firm, builds upon various data sources such as media coverage, valuers and brokers. A second index is provided by vdp, the association of German mortgage banks. They compile indices from transaction data enclosed to credit applications. Investment Property Databank (IPD) delivers so-called performance indices from data supplied to their data base by institutional investors. The index approaches differ across the firms and the nomenclature used cannot be seamlessly integrated into the concepts discussed in section 2.

To begin with, vdp provides an index with a hedonic quality adjustment which is labelled as capital value index. In the terminology of official statistics, however, it could be treated as a price index. BulwienGesa AG offers data on capital values from a stratified sample. Therefore, this indicator can also be compared to a constant-quality price index. Unfortunately, the weighting schemes are not fully disclosed and the weighting methodology cannot be classified into a standard framework. IPD compiles the indicator in its current form

from their data base with a changing composition via chaining and no quality adjustment. Sticking to the methodology developed above this resembles an index for values but from an arbitrary sample. Table 2 summarises the three data providers along with the main attributes of the respective indices.

Table 2: Data providers in Germany and the characteristics of their aggregates

	<b>BulwienGesa AG</b>	<b>vdp</b>	<b>IPD</b>
<b>Provider's label</b>	German Property Index	Capital value index	Capital Growth Index
<b>Coverage</b>	125 cities	Germany, roughly 40% of market value	Germany, roughly 14% of market value
<b>Quality adjustment</b>	Stratification	Hedonic	None
<b>Property types</b>	Office, residential, industry, retail	Office, residential (upcoming), retail (upcoming)	Office, residential, industry, retail
<b>Aggregation</b>	Weighted average over regions	Not applicable <sup>a)</sup>	Unweighted average of sample
<b>Frequency</b>	Annual	Annual/quarterly	Annual
<b>Time series start</b>	1991	2003/2008	1995
<b>Timeliness</b>	$t-15$ days	$t+40$ days	$t+90$ days
<b>Transparency</b>	Limited	Higher	Lower
<b>Origin of data</b>	Various sources <sup>b)</sup>	Transactions	Valuations
<b>Classification</b>	Constant-quality price index type	Constant-quality price index type	Nominal value index type

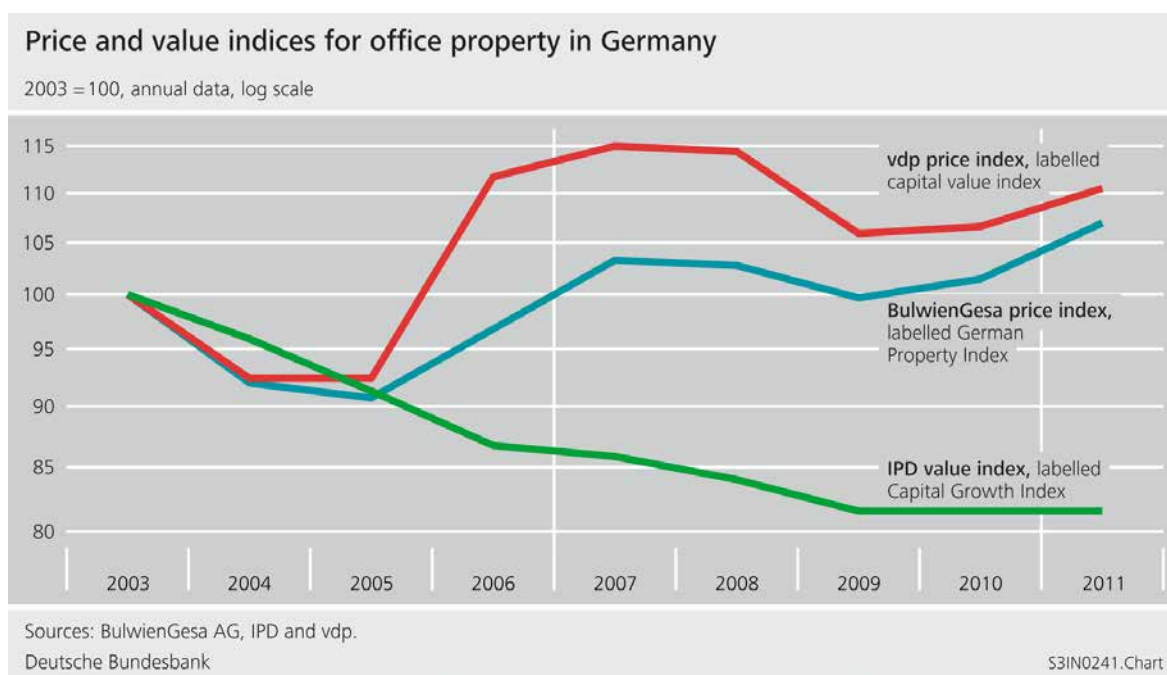
a) The indices are constructed from time dummies. This method does not rely on weighting schemes and aggregation.

b) BulwienGesa AG uses various sources such as media coverage, market reports, valuers, internet platforms and others.

Thus, all three indices vary inter alia in market coverage and origin of data. Furthermore, all providers construct their indices in a different way. In order to inspect the differences between the index construction types further, Figure 1 depicts the three annual indices for office properties. Regarding growth rates, the BulwienGesa AG price indicator and the vdp time series show the same sign of change in almost every year over the whole 2003-2011 period. However, during 2006, for example, the BulwienGesa AG time series still shows an upswing, while vdp figures flatten. Also the absolute magnitude of vdp growth rates often exceeds those reported by BulwienGesa AG. The IPD index on a changing portfolio, in comparison, shows a steady decline up to 2011. The diversity in operationalisation complicates the comparison, particularly between IPD on the one hand and BulwienGesa AG and vdp on the other. Price indices by BulwienGesa AG and vdp have an inherently different interpretation than IPD's value index. Due to depreciation without ren-



ovation, nominal values from a constant sample are prone to show negative rates of change on average. In contrast, price indices are not determined by age effects. This mechanism may help exploring the patterns observed in the figure. Furthermore, the results emphasise the importance of index construction methodology.



A valuable source, though with less detailed data, is provided by the National Accounts. National wealth accounts in Germany provide data on the nominal and real building stock at replacement costs (Schmalwasser and Schidlowski 2006). By applying the perpetual inventory method, the net stock at the beginning of the period is obtained as the sum of the net stock from the beginning of the period before and the net fixed capital formation during this period. National wealth accounts offer data on the gross and net stock of dwellings and other buildings and structures. This source, therefore, does not allow a breakdown into types of usage. Aggregates include forms of usage such as undeveloped land and property holders (e.g. the public sector) that may not be in the main focus of a CPPI.

## 5 Selected data uses

Data analysts eventually have to choose the most suitable aggregate by purpose of their research. Nominal aggregates – such as aggregated values – are probably best for comparison with other figures in current prices. Nominal stock may best be compared to other economies at this level. Loan-to-value measures will be most appropriately calculated in nominal terms since loans are secured with buildings at market values. The nature of nominal values proposes the use of these figures for users such as banking supervisors. An economy's real wealth will be reflected with volume measures since these depict building values adjusted for price effects. Price developments are naturally reflected in the constant-quality price component. Constant-quality price indices will most probably be used by monetary transmission analysts in order to obtain pure price changes. The chal-

length of separating fundamentally justified changes in prices from price bubbles is key for financial stability.

## **6 Conclusion**

It has become evident that different uses (e.g. monetary transmission analysis or banking supervision, National Accounts and Financial Accounts) require different data (unit value indices, nominal stocks, pure price indices). The question for the measurement aim matters greatly. Substantially different market movements are observed for Germany depending on whether prices or values are analysed (both are confusingly termed capital values by commercial data providers). Growth rates between 5% and 10% or declines of over -15% over an eight year period up to 2011 are currently being reported. In such a surrounding, statistics need to appropriately classify and describe existing indicators offered by real estate professionals. The detailed description of metadata enables data users to make informed choices on the most suitable indicator for the respective analysis.

For international comparisons a stock-taking of existing sources and a classification according to common terms from index theory (price, unit value, value, volume) would be useful. Based on this inventory of indicators international aggregates can be calculated in the future. In conjunction with further information on statistical quality (coverage and the like) it might be possible to describe these indicators along with the relevant metadata. Testing the time series and comparing their features e.g. with macroeconomic developments is indispensable. All in all, there is still a lot of hard work to do for statisticians in this field, but the way forward seems promising.

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## **Annex I: Origin of data**

### **IPD data**

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