Discussion of "Commercial Property Prices: What Should be Measured" by Jens Mehrhoff and Elena Triebskorn Deutsche Bundesbank

by

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Introduction

- **I will discuss most sections of the paper in some detail but I will leave a couple of sections out for the authors to cover in their response to my presentation of their paper.**

- **I found the paper to be a very useful one with really nothing much to complain about.**

2.1 Measurement Aims and the Land-Structure Split

- **For many purposes, constant quality price indexes for commercial properties are required.**
- **But a commercial property has two main components: a land component and a structure component as is noted in the authors' equation (1):**

(1) Property value = Land Value + Structure Value.

- **For national income accounting purposes, we need a decomposition of these two value components into constant quality price and volume components.**
- **The Balance Sheet Accounts in the SNA require this decomposition and the production accounts in the SNA also require this information if the national statistical agency produces extended production accounts that calculate quarterly or annual industry Multifactor Productivity (or Total Factor Productivity) estimates.**

2.1 Measurement Aims and the Land-Structure Split (cont)

- **The authors note that it is difficult to obtain the property value decomposition defined by (1) in practice, because sales (or appraisals) of commercial properties are for the entire property value (and not for the two components separately).**
- **The authors also note that there is another approach to determining commercial property value and that can be represented by the following equation:**

(1)* Property value = discounted cash flows that the property is expected to yield until demolition of the building
+ value of the land plot at the time of demolition.

- **The authors do not explain exactly how equations (1) and (1)* can be reconciled; Diewert and Fox (2016) make an attempt at this reconciliation.**

2.2 Components of an Index

- **The authors note that the property value decomposition defined by (1) is just the beginning of our measurement problems: the land and structure components on the right hand side of (1) need to be decomposed into price and quantity components.**
- **They first note that dividing property value by the floor space of the property or by the area of the land plot that the structure sits on does not lead to a constant quality price index.**
- **They note that what is wanted is a value decomposition into a constant quality price component times a volume component:**

(2b) Value = Price × Volume.

2.2 Components of an Index (cont)

- **But they further note that the Volume component will be the product of a quality component times an independent quantity measure (like floor area or land area):**

(2c) Value = Price × Quality × Quantity.

- **The authors note that Price × Quality will usually turn out to be some sort of unit value index and the desired Volume index in (2b) should equal Quality × Quantity.**
- **Perhaps the authors should explicitly point out that there is a need to separately decompose the two components of property value (the structure value and the land value) into price and quantity components and of course, it is not easy to do this. (See the references at the end of this presentation for some attempts to provide such a decomposition).**

2.2 Components of an Index (cont)

- **A major problem associated with the construction of commercial property price indexes is that the structure component does not remain as a constant quality component from period to period due to structure depreciation and periodic structure renovations. This problem is also present for residential property price indexes.**
- **A second problem associated with the construction of commercial property price indexes is that transactions of commercial properties are very sparse and this fact combined with the extreme heterogeneity of commercial properties makes index construction very difficult; much more difficult than the problems associated with constructing residential property price indexes.**
- **A possible solution to the above problems is to use appraised values for commercial properties; see Diewert and Shimizu (2016).**

2.3 Aggregation of Values and Prices

- **The authors note that more than one Commercial Property Price Index can be calculated:**
  - **(i) An index for all commercial properties in the economy (or in selected sectors) or**
  - **(ii) An index of commercial property transactions in a time period for the economy (or for selected sectors of the economy).**
- **The authors also assert that standard index number theory can be used to form the desired commercial property aggregates.**
- **I would like to point out that it is not always possible to apply standard index number theory to form commercial property price indexes. The problem is that each property is unique in its location and also in time, due to depreciation and renovations changing the quality of the structure for a given property.**

2.3 Aggregation of Values and Prices (cont)

- **If a hedonic regression approach is followed, then constant quality price indexes can be constructed using the hedonic imputation procedure that is explained in the *Handbook on Residential Property Price Indices* Eurostat (2011; 95-96).**
- **Furthermore, if an ongoing hedonic regression approach is implemented for commercial properties, then we do not have to limit ourselves to Laspeyres or Paasche indexes; Fisher indexes can be constructed. See the RPPI Handbook or section 6 in Diewert and Shimizu (2016) for a worked example.**

2.4 Performance Measures

- **In this section, the authors explain some commercial property performance measures that are popular in real estate economics.**
- **A capital growth index;**
- **An income return index and**
- **A total return index.**
- **The authors describe these three indexes as follows (I quote from the paper here):**

"Departing from a real estate portfolio the capital growth (CG) between two periods is defined as:

(5) $CG_t \equiv [V_t - V_{t-1} + \text{Receipts}_t - \text{Expenditures}_t]/[V_{t-1} + \text{Expenditures}_t]$

where V_t represents the portfolio value at time t. It is therefore the change in values plus the sum of capital receipts from sales minus capital expenditures (e.g. for new objects) divided by the capital employed (calculated as the value of the portfolio in period t-1 and capital expenditure in period t)."

2.4 Performance Measures (cont)

"The income return at a given period in time equals the net income, I_t, divided by the portfolio value at time t-1 (again corrected for capital expenditure in period t):

(6) $IR_t \equiv I_t/[V_{t-1} + Expenditures_t]$."

"The total return (TR) is the sum of the two components:

(7) $TR_t \equiv CG_t + IR_t$."

- **I disagree a bit about the above definitions. Recall definition (5):**

2.4 Performance Measures (cont)

(5) CG_t

$\equiv [V_t - V_{t-1} + \text{Receipts}_t - \text{Expenditures}_t]/[V_{t-1} + \text{Expenditures}_t]$

- **Recall that V_t was defined as the portfolio value of the properties under consideration at time t. Thus V_t should include the effects of property sales and expenditures on capital improvements.**
- **Thus receipts from asset sales less capital expenditure during the period should not be in equation (5) under the above definition of V_t.**
- **Moreover, expenditures made during period t should probably not be included in the denominator of (5). However, these are very small points of clarification.**
- **What is important is that the total return on capital invested at the beginning of the period is an important indicator of performance but it is not an indicator of price change as the authors point out.**

3. A Stylized Framework

- **In this section, the authors introduce a simple model (which is identical to the model that is used to form Jorgensonian user costs of capital) to explain the difference between the capital growth index CG_t defined by (5), the income return index IR_t defined by (6), the total return index defined by (7) and a constant quality price index π_t for commercial properties.**
- **Again, I will simply lift some text out of the authors' paper to explain their model.**

"Let P_t be the price of a given building at time t – stripped of any quality change – and let prices evolve at the time-varying asset inflation rate π_t:

(8) $P_t = P_{t-1}(1+\pi_t)$."

3. A Stylized Framework (cont)

"On the other hand, capital values are influenced by quality change in addition to pure price change. Hence, define the growth of the capital value V_t at time t as the difference between price change and net depreciation. The rate d_t mirrors depreciation net of appreciation and, thus, its sign is not necessarily determined a priori:

(9) $V_t \equiv V_{t-1}(1+\pi_t)(1-d_t)$."

"In the long run, the capital consumption should be amortised. Accordingly, the cash flow I_t at time t of an object is linked to its value at time t-1 via the income return r_t:

(10) $I_t \equiv V_{t-1}r_t$." [This equation serves to define r_t].

"It immediately follows that:

(11) $r_t \equiv I_t/V_{t-1} = IR_t$." [Recall that IR_t is the income rate of return].

"While it is obvious that the price index captures π_t, what information can be revealed from performance measures? An index based on the growth of capital values (CG) gauges

(12) $CG_t \equiv (V_t/V_{t-1}) - 1 = (1+\pi_t)(1-d_t) - 1$ [using (9) above]

$\approx \pi_t - d_t$."

3. A Stylized Framework (cont)

"Using capital values [as a proxy for price change], therefore, introduces quality aspects that, in turn, may lead to a biased measure of pure price change."

"The total return (TR) is frequently used to assess the performance of an investment. Since it assumes the cash flows being reinvested, the total return is sum of the capital growth (capital gains/losses corrected for expenditures and capital receipts) and the income return:

(13) $TR_t \equiv CG_t + IR_t = (1+\pi_t)(1-d_t) - 1 + r_t \approx \pi_t - d_t + r_t$**."**

- **The authors conclude with the following observation:**

"Depending on the prevailing circumstances, the total return can overshoot or undershoot the true price development. What makes it even worse is its architecture being a mixture of three independent measures."

3. A Stylized Framework (cont)

- **I agree with the above analysis but note that the V_t which appears in equations (8)-(13) is not exactly equal to the V_t which appeared in equations (5)-(7): the new V_t is actually the end of period value of the beginning of the period value of the properties under consideration (and not the actual end of period value of the property portfolio, which includes acquisitions less sales of properties). Again, this is not a major problem.**
- **The important thing to note about this section is that the authors have provided an analytic framework to distinguish between various performance indicators that are used by real estate economists and others.**
- **These performance indicators are useful (particularly the Total Return indicator) but they are not at all equivalent to asset price inflation.**

4. Sources

- **This section deals with the 4 major commercial property index providers. The authors describe these indexes and graph them over the period 2003-2013. I will let the authors describe their results in their response to this presentation.**

5. Interpretation Issues Regarding the use of "Total Return" as a Price Indicator

- **The authors do something quite clever in this section.**
- **Recall equation (13) in section 3 which was $TR_t = (1+\pi_t)(1-d_t) - 1 + r_t$. This equation can be solved for the net depreciation rate as a function of the other variables. The authors assert that the solution is given by their equation (14):**

(14) $d_t = (TR_t - \pi_t - r_t)/(1+\pi_t)$.

- **However, this is a typo; the correct solution is the negative of the above formula. (We know that the authors derived the correct formula because their empirical results in their Table 3 agree with the correct formula).**
- **The authors draw on their knowledge of the German commercial property indexes and find values for all of the variables on the right hand side of (14) and thus can obtain estimates for the net depreciation rates for German commercial properties. They find that on average, the net depreciation rate for German offices is 1.5% per year and for German retail properties is 2.9% per year, which are very reasonable estimates.**

6. Selected Data Uses

- **I will let the authors speak about this section.**

7. Conclusion

- **The authors summarize their paper as follows:**

"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 as promising as challenging."

7. Conclusion (cont)

- **I agree with the authors' conclusions. I think that they have written a very useful paper.**
- **I would like to bring to their attention a few of my own papers (with Fox and Shimizu) on commercial property price estimation and the connection of commercial property price indexes with the national accounts:**

Diewert, W.E and K.J. Fox (2016), "Sunk Costs and the Measurement of Commercial Property Depreciation", *Canadian Journal of Economics*, forthcoming.

Diewert, W.E., K.J. Fox and C. Shimizu (2016), "Commercial Property Price Indexes and the System of National Accounts", *The Journal of Economic Surveys*, forthcoming.

Diewert, W.E. and C. Shimizu (2015), "A Conceptual Framework for Commercial Property Price Indexes", *Journal of Statistical Science and Applications* 3:9-10, 131-152.

Diewert, W.E. and C. Shimizu (2016), "Alternative Approaches to Commercial Property Price Indexes for Tokyo", *Review of Income and Wealth*, forthcoming.