

A transactions-based commercial property price index for Portugal

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Presentation's Outline

- 1. Motivation**
- 2. Data**
- 3. Methodology**
- 4. Results**
- 5. Conclusions**

Need for statistics on the real estate market:

- Latest financial crisis have demonstrated how real estate markets influence the economy and highlighted the need to monitor prices;
- While progress has been achieved for residential property price indexes, commercial property price indexes have remained a less explored area;
- At national level: House Price Index (HPI), but data gaps on commercial property prices remained to be addressed;
- *Instituto Nacional de Estatística* and *Banco de Portugal* have combined efforts to fill this particular data gap.

Targeted CPPI:

- Based on transactions prices;
- National index;
- Able to tackle quality change and changes in the mix of sold properties;
- Sales-based index (as opposed to stock-based index).

Main purposes:

- Monitoring price developments in the commercial property market;
- Input for the National Accounts.

Main difficulties *vis-à-vis* the HPI:

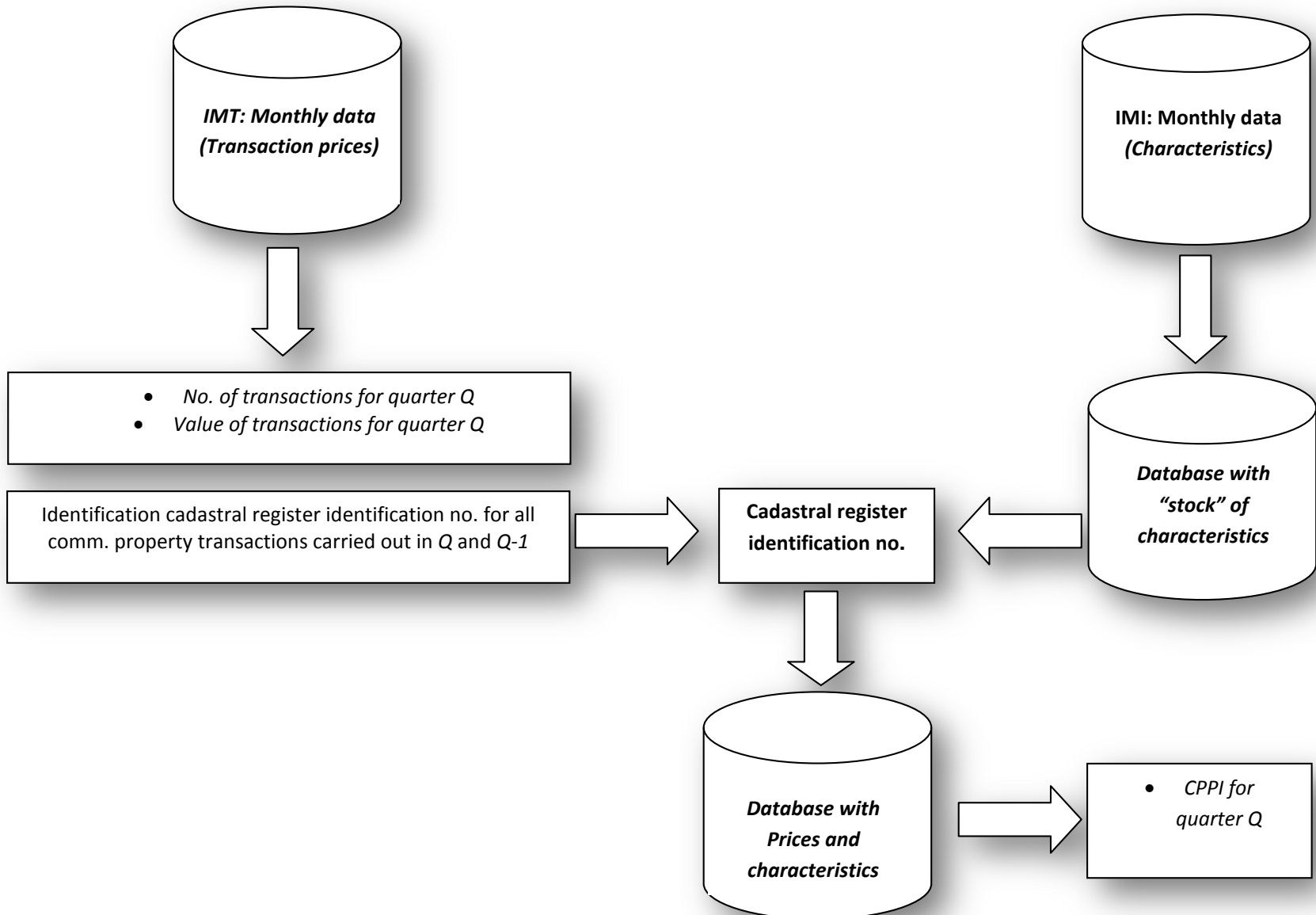
- Conceptual scope not clearly defined:
 - How to define a commercial property?
 - What type of commercial properties exist?
 - Buy-to-let properties to be included?
- Less transactions available for price index compilers;
- More heterogeneous good than residential properties.

Data sources:

- Transaction prices taken from the municipal transfer tax (IMT)
 - Covers the population of transactions (proof of payment of the tax has to be shown by the buyer before a sale effectively takes place);
 - Done some days or on the same day in which the transaction takes place.
- Characteristics of commercial properties obtained from the municipal property tax (IMI)
 - Value of properties classified according to their location, dimension, age, conservation state, ... => rich dataset.
- Data sources already being used in the compilation of the House Price index (HPI)

2. Data Data Sources

Same data appropriation process as in the HPI



Main restrictions to raw data:

- Zero valued transactions;
- Repeated and cluster sales: e.g., same dwelling is traded more than 2 times during the same day;
- Classifications of property differ in IMI and IMT registers.

- 8% of raw data ruled out from calculations.

- Data on transaction prices and characteristics from 2009Q1 to 2016Q1;
- Around 77 300 thousand transactions of commercial properties, disaggregated into three strata:
 - Retail (52%);
 - Services (26%);
 - Industrial (22%).

- The strata have been defined according to the “function” or main use of the property, as registered in the IMT;
- Rental residential not taken into account;
- Chosen not to compile a separate index for offices (included in “Services”).

3. Methodology

CPPI calculated using:

- Three elementary indexes: Retail, services and industrial;
- Annual weighting and chaining: weights based on sales of the previous year;
- Hedonic price indexes: In the end chosen the adjacent time dummy approach:

For all pairs of contiguous periods $q=(Q-1,Q)$ of a given strata j , the following regression is estimated with Ordinary Least Squares (OLS):

$$\log(P) = \alpha + \sum_{k=1}^K \beta_k X_{i,q,k} + \theta D_{i,q} + \epsilon_{i,q}$$

Where $\log(P)$ is the logarithm of the price level of the i^{th} dwelling transaction in quarter q , $X_{i,q,k}$ is the value of the k^{th} characteristic of the i^{th} transacted dwelling in period q ; $\epsilon_{i,q}$ is the error term and $D_{i,q}$ is a time dummy defined as follows:

$$D_{i,q} = \begin{cases} 1, & \text{if } q = Q \\ 0, & \text{otherwise} \end{cases}$$

Where the evolution of prices between periods $Q-1$ and Q is approximated by:

$$I_{Q-1,Q}^j = \exp(\hat{\theta})$$

The development of CPPI involved obtaining answers on four main issues:

- Choosing an appropriate specification for the hedonic price model;
- Adequacy of OLS estimator;
- Robustness of results;
- Use of different hedonic time dummy approaches (choice of the length of the time window).

Common variables to models:

<p>Area variables</p> <ul style="list-style-type: none"> ◆ Log(Gross Floor Area) 	<p>Age variables</p> <ul style="list-style-type: none"> ◆ Dwelling age at the moment of transaction ◆ Square of dwelling age at the moment of transaction 	<p>Macro location variables</p> <ul style="list-style-type: none"> ◆ NUTS II areas
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Specific variables to models:

<p>Area variables</p> <ul style="list-style-type: none"> ◆ Number of floors ◆ Number of divisions 	<p>Age variables</p> <ul style="list-style-type: none"> ◆ New buildings ◆ Bad conservation state ◆ Improvements 	<p>Micro location Variables</p> <ul style="list-style-type: none"> ◆ Location near the sea/ ports, airports ◆ Postal code dummies 	<p>Quality and Comfort Variables</p> <ul style="list-style-type: none"> ◆ Air conditioning, <ul style="list-style-type: none"> ◆ Lift ◆ Electric power <ul style="list-style-type: none"> ◆ Sewage
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Battery of tests:

- Heteroskedasticity tests;
- Analysis of robust t-statistics;
- Analysis of VIFs to detect excess multicollinearity;
- R squares; Reset test (also to look for evidence of parameter stability).

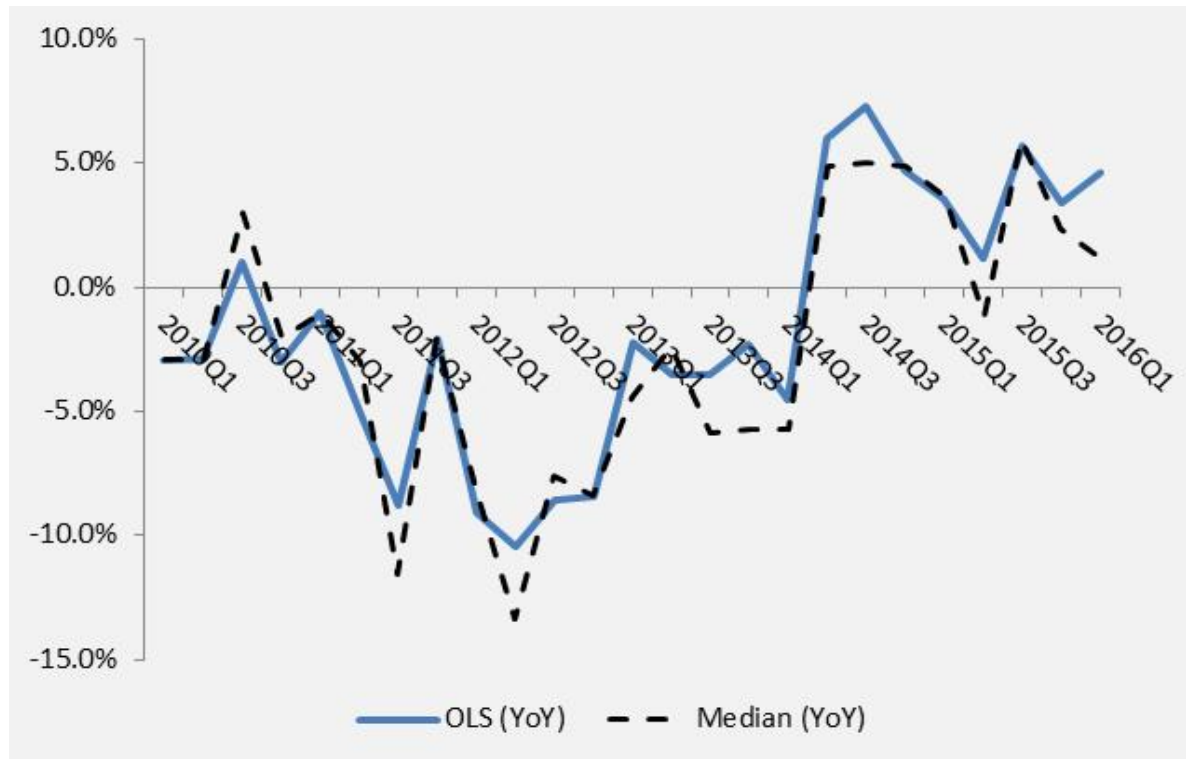
Robustness of results:

- Results with and without observations categorized as influential and with large residuals;
- Use of other estimator (median regression);
- Results support the use of the OLS estimator:
 - with and without influential and large residuals data points do not show dissimilar results;
 - results taken from the use of the median regression model are not very different from OLS results.

4. Results

Adequacy of the models

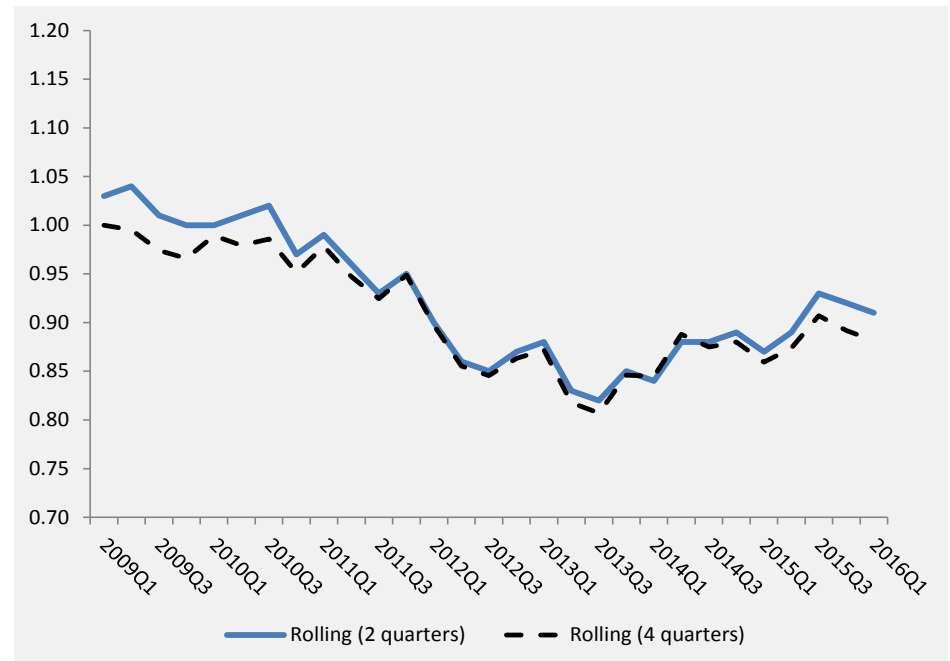
CPPIs using OLS and median estimators (Year on year rates of change):



4. Results

Use of different approaches

- Evidence that coefficients are reasonable stable across time (support the idea that the time dummy approach can be used for the calculation of the CPPI);
- Rolling window: calculation of indexes using different lengths for the window:
 - No striking differences found between adjacent (rolling window of two periods) and other versions
 - Final decision: use two consecutive periods.



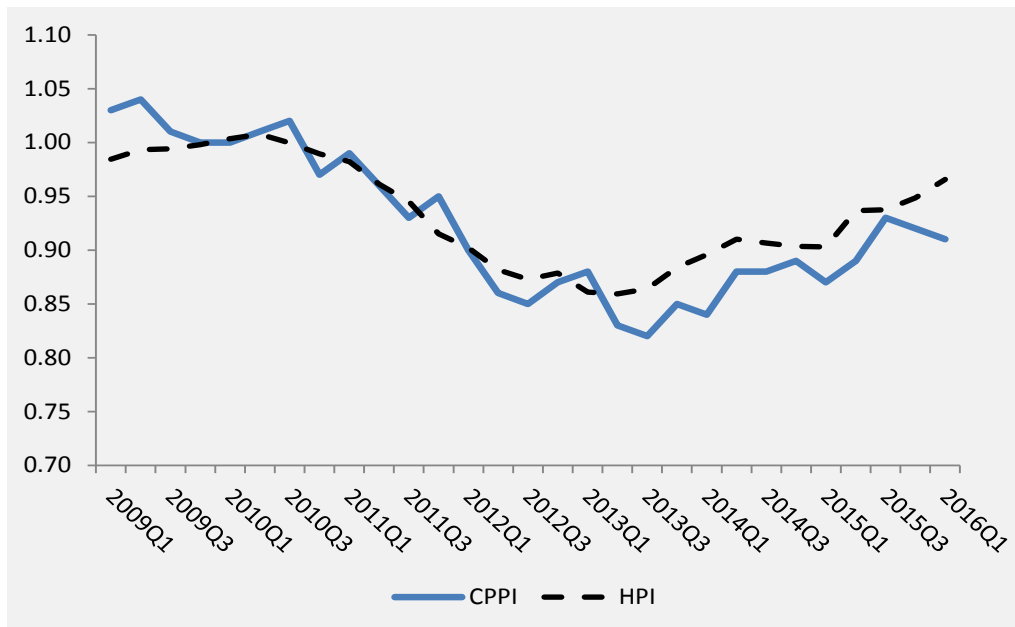
4. Results

Comparison with the HPI

The CPPI presents more volatility than the HPI:

- reduced number of transactions & own nature of the commercial market segment.

But follow same overall price behavior:



- Both commercial and residential property prices decrease until the middle of 2013 and recovered from that period onwards.

4. Results

Comparison with the HPI

- When the market was in recession, prices of commercial properties have fallen more than those of residential properties:
 - A situation that was already reported for other countries
- A possible explanation:
 - Construction of commercial properties take longer to complete than residential properties (e.g., may start in a period where there is demand for office buildings and enter/end in a recession period => loss of value).

5. Conclusions

- The **compilation methodology** and **use of administrative data** is adequate and supportive of regular production and dissemination of a CPPI for Portugal;
- Going to disseminate CPPI results in the second half of 2017;
- Although commercial and residential property markets show **similar trends and turning points**, it is interesting to note that commercial property prices have **decreased more** during the recent financial crisis;
- The differences found between the two asset classes are interesting and should be further investigated in the future.

Thank you for your attention.