

A Hedonic Analysis of Price Movements in Commercial Properties in the Retail Sector

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Abstract

The global financial crisis has increased the importance of commercial real estate markets in the economy and revealed the significance of good quality price statistics. Despite its well-known importance, it is still a less explored area due to the challenges in data availability, lack of methodological guidelines and a heterogeneous range of properties in the market. In order to address this data gap in Turkey, this paper analyzes the price movements in retail properties of İstanbul from 2015Q1 to 2018Q3 by using a hedonic price model. We use the adjacent time dummy method and construct the hedonic index using data from valuation reports. Results reveal diverging aspects of commercial property prices compared to house prices in İstanbul and a close relation between the growth rate of the retail property price index and GDP.

Keywords: Commercial property price index, Hedonic time dummy approach, Quality adjusted price index.

1. Introduction

The global financial crisis has revealed the significance of commercial real estate markets in the economy and demonstrated the importance of good quality price statistics. Before the crisis, the availability and comparability of Commercial Property Price Indices (CPPIs) were inadequate. In order to address this issue, G20's Data Gaps Initiative (DGI) which focuses on closing data gaps highlighted by the global financial crisis, included a recommendation on CPPIs to encourage data dissemination and to enhance methodological guidance on CPPI compilation (FSB and IMF, 2009).

Compiling CPPI is critical for monitoring the changes in commercial property prices, which in turn contributes to acquire and maintain the market stability. Moreover, monitoring price developments of this market is crucial for financial regulation, risk management and monetary policy design since commercial real estate assets can be used as collateral for other types of loans and commercial property loans are one of the most volatile components of the bank portfolios (Özyurt, 2014). Additionally, price cycle in this market has been more severe during the global financial crisis in most countries compared to residential real estate market (Ellis and Naughtin 2010). Since the prices of commercial properties are more reactive to business cycles and macroeconomic conditions than residential market, they are more volatile than the latter (Davis and Zhu, 2009). In this respect, as an input for official statistics, CPPIs are useful for analyzing financial stability and economic trends and also for composing economic and macro-prudential policy.

Despite its well-known importance, it is still a less explored area due to the challenges of compilation. While constructing CPPI, the first challenge is the availability of official data on commercial properties. Official CPPI data are limited and available data have various frequencies and length. In this market, there is also a wide and heterogeneous range of properties and diversity occurs remarkably by sector and by country. Another challenge comes from diverse compilation methods across countries. In more detail, variations in national definitions, coverage and data sources occur in methodology and compilation stages. In this regard, it is very important to examine existing data sources and methodologies in CPPI studies by sharing experiences and exchanging views of different countries.

In Eurostat study (2017), the target index for a CPPI is defined as a transaction-based constant-quality price index. Yet, as mentioned before, there are challenges in the compilation of CPPIs. Since there are no harmonized methodological framework and detailed methodological guidance available for compilers, construction of a CPPI becomes a difficult issue (FSB and IMF, 2018). When investigating the methods currently used to construct CPPI, one encounters with the same methods used for compiling residential property price indices (RPPI). Hedonic price model is one of these methods and in fact, is the main mechanism recommended for RPPI estimation used by countries (Silver, 2016). Moreover, a number of countries (Japan, Portugal and Poland) currently compiling official CPPI use this method as well. This method is used in CPPI estimation since commercial property market is heterogeneous not only because of different property types (office, retail properties, land etc.) but also because of its various characteristics (location, age, size etc.). Therefore, changes in

property prices can reflect pure price changes as well as changes in the quality of properties. In this framework, it is important to control observed characteristics of properties and measure pure price changes by using hedonic price method.

Available information about commercial property market in Turkey comes from private sector analyses, which mainly focus on office and shopping malls' rental value and vacancy rates. These reports are valuable in terms of monitoring market performances for investors. Yet, from a central bank point of view, monitoring the effects of price developments in this market to financial system becomes a more important issue.

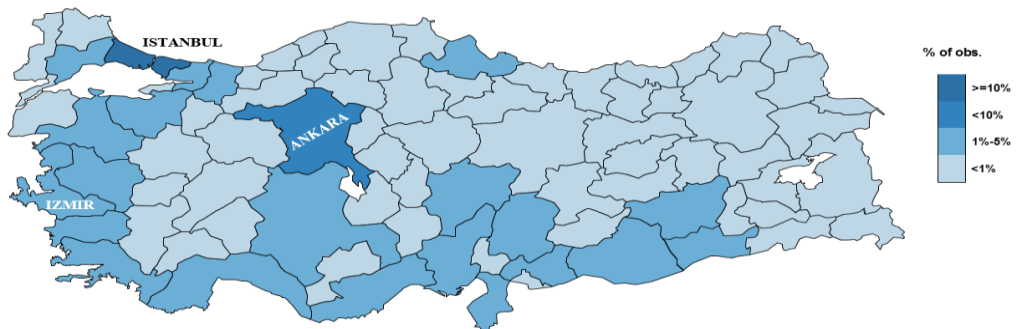
In Turkey, despite significant progress has already been made by Central Bank of the Republic of Turkey (CBRT) in the construction of CPPI, an official CPPI has not been published yet. In order to address this information gap, the primary purpose of this paper is to analyze the price movements of retail property market in İstanbul from 2015Q1 to 2018Q3 by using hedonic price model method. This is the first study conducted to analyze the evolution of commercial property prices by using hedonic time dummy method in Turkey.

The rest of the paper is organized as follows. Section 2 reviews the data source and methodology of the hedonic price index model used in the study. Section 3 provides the results and compares the newly constructed index with other macroeconomic indicators. Lastly, section 4 presents the conclusions of the study.

2. Data and Methodology

In this study, due to lack of transaction data, valuation data provided by banks and compiled by CBRT since 2015 are used as a proxy for price. The actual sale or utilization of the loan is not required and all appraised commercial properties are included in the scope. Dataset is rich in terms of property types and characteristics. Different commercial properties such as land, office, retail, industrial and touristic properties are included in the dataset. Moreover, for each type of property, there are property type specific variables besides common variables. Compared to other commercial property types, due to the sufficient number and quality of data, we analyzed the price developments of retail properties in İstanbul in this study. When we have examined the data coverage by location between 2015Q1 and 2018Q3, we have found out that almost 25% of data comes from İstanbul (Figure 1). Therefore, observations from İstanbul retail property market form the basis for this analysis.

Figure 1. Data Distribution Map of Turkey



Time dummy variable approach is one of the hedonic price methods and makes possible to pool the data over a number of periods. Because of the infrequent number of commercial property data, a pooled dataset is an advantage while constructing a CPPI. Therefore, in this study retail property price index is constructed by using the hedonic method with time dummy approach in which two adjacent quarters of data are used to estimate the quarterly price change. The adjacent time dummy hedonic function used for index construction is:

$$\ln P_i^t = \beta_0^t + \sum_{\tau=1}^T \delta^\tau D_i^\tau + \sum_{k=1}^K \beta_k^t z_{ik}^t + \varepsilon_i^t$$

where

$\ln P_i^t$ is the logarithm of price level of the i^{th} dwelling appraised in quarter t

β_0^t is the intercept term

δ^τ is the time dummy parameter

D_i^τ is the time dummy (value=1 if in time period τ otherwise 0)

β_k^t is the characteristics parameter

z_{ik}^t is the value of the k^{th} characteristic of the i^{th} appraised dwelling in quarter t ,

ε_i^t is error term.

Using time dummy variable approach enables calculation of index directly from the hedonic equation (Eurostat, 2013). Exponential of the parameter of the time dummy ($\hat{\delta}^\tau$) estimates the change in price between two adjacent period by assuming that the implicit prices of the characteristics (β_k^t) are constant over every two quarters. Chain formula is used in order to estimate the price variation between two non-adjacent periods.

2.1. Model Selection

First, duplicate and mass valuation data were removed from the dataset and then outlier analysis conducted by applying Tukey's Hinges method. In this method, respectively unit prices and total value that qualify the following equation:

$$m^2 \text{ unit price} < Q1 - 3*(Q3 - Q1) \text{ or } m^2 \text{ unit price} > Q3 + 3*(Q3 - Q1) \text{ and}$$

$$\text{total value} < Q1 - 3*(Q3 - Q1) \text{ or } \text{total value} > Q3 + 3*(Q3 - Q1)$$

where:

Q1: Lower Quartile and Q3: Upper Quartile

were accepted as extreme values and excluded from the analysis.

Later, statistically significant independent variables at 5% level were selected. According to results, 26 districts (as dummy variables) out of 34 districts and 13 characteristics variables out of 22 variables satisfied the necessary condition and composed the hedonic function (Table 1).

Table 1. Model Variables

Districts		Characteristics
Ataşehir	Güngören	Gross area of use (sq.m.)
Bahçelievler	Kadıköy	On the main street
Bakırköy	Kağıthane	Frontal view (good, partly good)
Bayrampaşa	Küçükçekmece	Commercial activities (high, medium)
Bağcılar	Maltepe	Proximity to branded housing projects
Başakşehir	Sarıyer	Security service
Beylikdüzü	Sultangazi	Parking area
Beşiktaş	Silivri	Quality of construction
Beyoğlu	Tuzla	Building permit
Çekmeköy	Ümraniye	Number of floors
Esenler	Üsküdar	Year of construction
Eyüpsultan	Şişli	
Fatih	Zeytinburnu	

3. Results

We estimated the pure price change in İstanbul retail property market as 24.48% from 2015Q1 to 2018Q3 by using hedonic price model (Table 2 and Graph 1).

Table 2. Retail Property Price Index for İstanbul

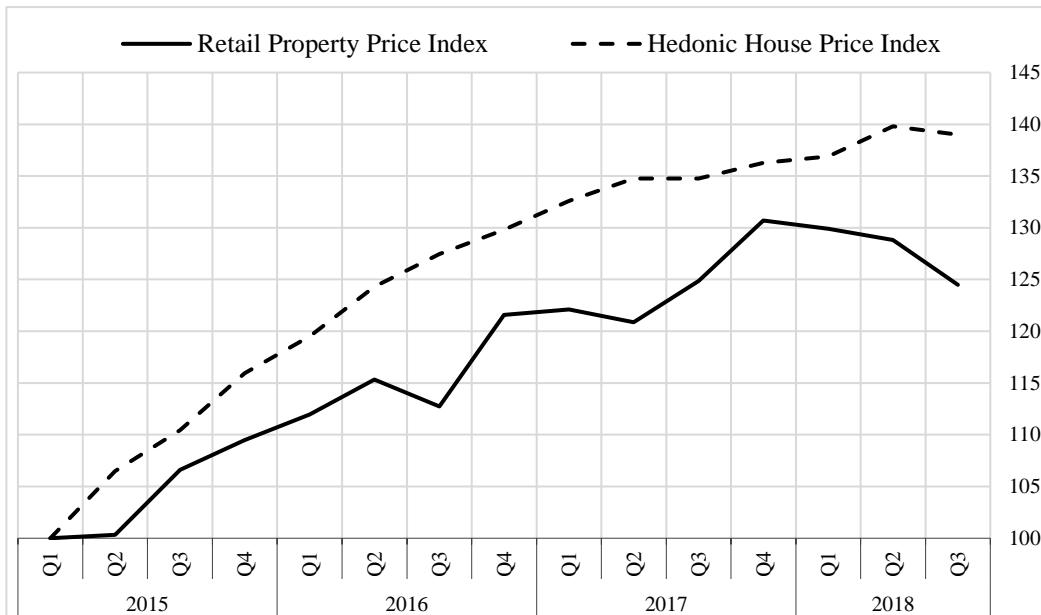
Period	Retail Property Price Index
2015Q1	100.00
2015Q2	100.33
2015Q3	106.61
2015Q4	109.49
2016Q1	111.97
2016Q2	115.35
2016Q3	112.74
2016Q4	121.59
2017Q1	122.10
2017Q2	120.88
2017Q3	124.86
2017Q4	130.70
2018Q1	129.89
2018Q2	128.82
2018Q3	124.48

Graph 1. Retail Property Price Index for İstanbul



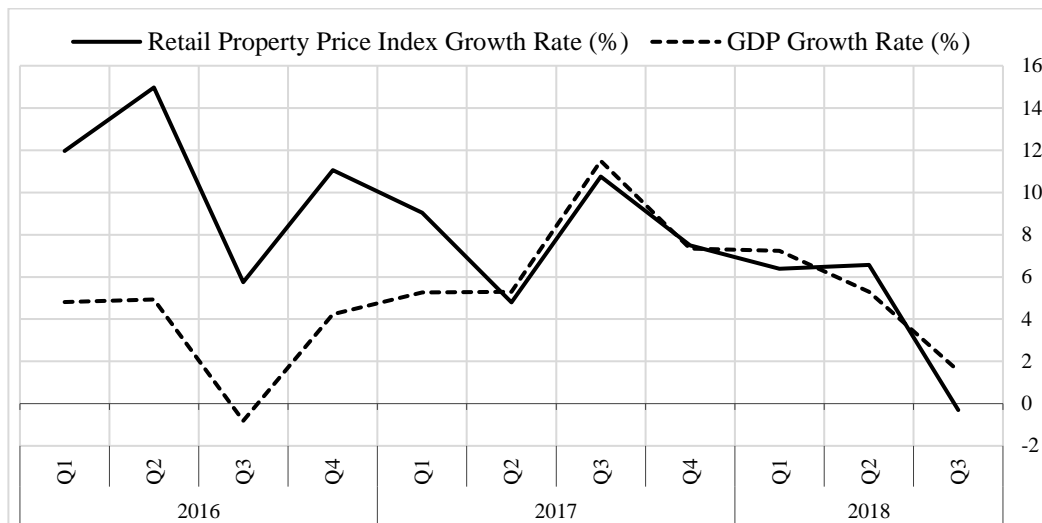
Graph 2 compares the estimated retail property price index to the hedonic house price index (HHPI) for İstanbul in the analysis period. Results reveal diverging aspects of commercial property prices compared to house prices in İstanbul. As seen from the Graph 2, retail property price index presents more volatility than the HHPI as expected.

Graph 2. Comparison of Retail Property Price Index and HHPI



Graph 3 illustrates the relationship between the annual (same quarter of the previous year) growth rate of estimated retail property price index and the real growth rate of the gross domestic product (GDP).

Graph 3. Comparison of Growth Rate of Retail Property Price Index and GDP



As seen in Graph 3, results indicate a similar trend and turning points, which reveal a close relation between the growth rate of the retail property price index and GDP. This result demonstrates the importance of CPPI as a macroeconomic indicator of economic activity. As noted above, commercial property market shows faster reaction to macroeconomic conditions and CPPIs provide invaluable information while monitoring the stability of this market. Therefore, it is crucial to compile CPPIs for analyzing economic trends and formulating economic policy.

4. Conclusion

Due to high interaction of commercial property markets with the financial system and macroeconomic activity, price movements in these markets have a significant role in policymaking and need to be monitored using a reliable statistic. In this regard, CPPIs are important statistics that enable monitoring financial stability and macroeconomic developments.

This study analyzes the price movements in retail properties of İstanbul from 2015Q1 to 2018Q3 by using a hedonic price model. It is estimated that pure price change is 24.48 % for the analysis period. Results also reveal diverging aspects of commercial property prices compared to house prices in İstanbul and a close relation between the growth rate of the retail property price index and GDP.

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Appendix

Descriptive Statistics

	2015		2016		2017		2018	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Price	683,876.97	400,000.00	730,446.61	450,000.00	795,416.89	480,000.00	856,569.32	505,000.00
Gross area of use (sq.m.)	164.16	110.00	153.77	105.00	157.22	107.00	158.44	108.00
On the main street	0.44	0.00	0.45	0.00	0.45	0.00	0.45	0.00
Frontal view	1.88	2.00	1.86	2.00	1.85	2.00	1.83	2.00
Commercial activities	1.91	2.00	1.95	2.00	1.97	2.00	1.98	2.00
Proximity to branded housing projects	2.26	2.00	2.30	2.00	2.31	2.00	2.31	2.00
Security service	0.15	0.00	0.17	0.00	0.17	0.00	0.21	0.00
Parking area	0.31	0.00	0.31	0.00	0.32	0.00	0.37	0.00
Quality of construction	2.64	3.00	2.59	3.00	2.59	3.00	2.57	3.00
Building permit	0.56	1.00	0.58	1.00	0.60	1.00	0.63	1.00
Number of floors	6.31	6.00	6.39	6.00	6.61	6.00	6.94	6.00
Year of construction	1999	2005	2001	2007	2002	2008	2003	2010

Regression results of the 2018Q3

Variables	logprice	Variables	logprice
Ataşehir	0.443*** (0.0633)	Zeytinburnu	0.398*** (0.0550)
Bahçelievler	0.215*** (0.0588)	Çekmeköy	-0.0826 (0.139)
Bakırköy	0.735*** (0.0984)	Ümraniye	0.0897 (0.0680)
Bayrampaşa	0.147** (0.0600)	Üsküdar	0.557*** (0.106)
Bağcılar	0.335*** (0.0519)	Şişli	0.765*** (0.0716)
Başakşehir	0.321*** (0.0615)	On the main street	0.0979*** (0.0239)
Beylikdüzü	0.154*** (0.0506)	Good frontal view	0.584*** (0.0388)
Beyoğlu	0.598*** (0.111)	Partly good frontal view	0.293*** (0.0326)
Beşiktaş	1.403*** (0.133)	High level of commercial activities	0.309*** (0.0449)
Esenler	0.0923 (0.0830)	Medium level of commercial activities	0.111*** (0.0320)
Eyüpsultan	0.349*** (0.0576)	Proximity to branded housing projects	0.0518** (0.0226)
Fatih	0.573*** (0.0787)	Security service	0.175*** (0.0407)
Güngören	0.676*** (0.0831)	Parking area	0.193*** (0.0318)
Kadıköy	0.631*** (0.0741)	Quality of construction	0.0464** (0.0236)
Kağıthane	0.352*** (0.0726)	Building permit	0.0316 (0.0220)
Küçükçekmece	0.168*** (0.0562)	Ground floor	0.229*** (0.0243)
Maltepe	0.221*** (0.0687)	Gross area of use (sq.m.)	0.00272*** (0.000350)
Sultangazi	0.283*** (0.0450)	Year of construction	0.00519*** (0.00108)
Sarıyer	0.954*** (0.0914)	Time dummy variable	-0.0342 (0.0215)
Silivri	-0.201** (0.0817)	Constant	1.258 (2.168)
Tuzla	0.197*** (0.0545)	Observations	4,102
		R-squared	0.480

Dependent variable is the log of total appraisal value, (**) and (***) denotes significance at 5% and 1% level, respectively. Robust standard errors in parentheses.