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Exploring the determinants of residential property values in a crisis: evidence from Greece

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Outline

- ✓ Specific features of the Greek housing market
- ✓ Residential Property Prices and Growth Rate
- ✓ Indices of apartments prices by age and geographical area
- ✓ Determinants of residential property values in 25 Greek cities
- Conclusions
- ✓ Further research



Characteristics and recent developments in the real estate market in Greece





- High transaction costs
- Significant impact of fiscal measures in the housing market
- The construction industry in Greece is fragmented (particularly in the residential market)
- ✓ Difficulties in monitoring the real transaction prices



Residential Property Prices and Growth Rate



Indices of apartments prices by age and geographical area

(Annual average percentage changes)

	Annual average percentage changes									
Indices of apartments prices by age and geographical area	2008	2009	2010	2011	2012	2013	2014 Q1	2007 - 2013	2007 (aver. level) up to 2014 Q1	2008 Q3 (peak) up to 2014 Q1
All apartments (Greece)	1.7	-3.7	-4.7	-5.5	-11.7	-10.3	-7.5	-30.1	-33.3	-34.7
a1. New (up to 5 years old)	2.3	-2.0	-4.2	-5.0	-12.1	-10.4	-7.6	-28.2	-31.3	-33.3
a2. Old (5 years old and above)	1.3	-4.8	-5.0	-5.8	-11.4	-10.2	-7.5	-31.3	-34.6	-35.7
b1. Athens	0.9	-4.6	-3.2	-6.4	-11.8	-11.9	-10.6	-32.2	-37.1	-37.3
b2. Thessaloniki	1.5	-6.0	-7.4	-6.8	-13.6	-8.8	-7.4	-35.1	-36.9	-37.3
b3. Other cities	1.8	-2.7	-5.3	-4.1	-10.7	-10.1	-5.3	-27.8	-29.9	-31.7
b4. Other areas	3.3	-1.9	-5.8	-4.4	-11.6	-7.9	-3.8	-25.8	-27.3	-31.7
c1. Urban areas	1.5	-4.3	-4.4	-5.5	-11.8	-10.5	-8.4	-30.7	-34.3	-35.3
c2. Other urban areas (excl. Athens) ¹	2.6	-2.9	-6.7	-7.5	-12.2	-11.5		-33.1		

✓Gradual decline in price resilience during the current crisis

Stronger decline for old apartments



✓Stronger decline in the two major urban centers, Athens and Thessaloniki

•An even greater price reduction according to real estate agents

BANK OF GREECE EUROSYSTEM <u>Source:</u> BoG, valuation data collected from credit institutions ¹Data collected from real estate agencies, cumulative decline refers to 2008Q3-2013Q4

Determinants of residential property values in Greek cities



Determinants of residential property values in Greek cities: Initial data sample



- **Initial data sample:**
 - Valuations data
 - Initial sample of 637 thousand observations





Determinants of residential property values in Greek cities: Data management

Data sample:

- #347,509 observations
- Reference period: Jan. 2006 Dec. 2013
- Coverage: 25 major cities in the country
- ✓ Data Filtering:

Selection of apartments and maisonettes (detached houses were excluded)

✓ Final sample:

- **By Property Type:** apartments (91.6%), maisonettes (8.4%)
- **By Age:** New (up to 5 years): 34.8%, Old (over 5 years): 65.2%
- **By Geographical Area:** Athens 41.3%, Thessalonica 10.3%, big cities 27.7%, other areas 20.7%



Determinants of residential property values in Greek cities

The analysis aims at capturing the most important determinants of residential property values within the Greek market and examining the cross city variation in house prices, with reference to four categories of parameters:

- i. Socio-economic influences (prefecture's population density and GDP)
- ii. Location characteristics (e.g. road network accessibility)
- iii. Infrastructure (e.g. proximity to airport) and other amenities
- iv. Property technical characteristics, primarily age, type, area, floorlevel, construction quality, storage area, parking space, etc.
- v. Sustainability and environmental characteristics (at the municipality level)



	Variable name	Variable description				
Dependent variable	In_value	Ln of property value (Dependent variable)				
	TM TOTAL SPACE AREA	Total space area in square meters excluding ouliers				
	TM_SQ	Property area square				
_	AGE	Age at the time of valuation				
ica S	AGE_SQ	Age square at the time of valuation				
stic	FLOOR	Floor level. Values from -2 to 8.				
tec	AUXIL	Area of auxiliary spaces in square meters				
act	Dummy variables					
pel	maisonette	Property type: maisonette				
2 2	d_store	Existing store rooms				
_	d_park	Existing parking spaces				
	quality	Excellent construction quality				
	renovated	Recent refurbishment				

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The hedonic model: Variable description





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Variable name	Variable description
Infra	Infrastructure quality (values: 1=poor to 5=excellent)
BuiltEnv	Built environment quality (values: 1=poor to 5=excellent)
BF_median	Building factor within the municipality
Density	Population density
NaturalEnv	Natural environment quality (values: 1=poor to 5=excellent)
Uses	Compatibility of uses (values: 1=poor to 5=excellent)
Dummy variables	
d_REG	Geographical areas based on GR39 codes (36 variables)
d_level1	Urban areas
d_level2	Semi-urban areas
d_level3	Rural areas
view	Excellent view
depreciated	Depreciated location
university	Existence of University
access	Accessibility
seaside_new	Sea front
mountain_tourist	Mountain touristic location
Hospital	Existence of hospital
Airport	Existence of airport

The hedonic model: Variable description

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		Variable name	Variable description					
	- mic les	Population_nomos	Prefecture population					
	Macro econo variab	GDP_2010_nomos	Gross Domestic Product (prefectures)					
	Se	Dummy variables						
	Time variable	d_Y	Years 2006 to 2013					
		d_Q	Quarters D_Q1, D_Q2, D_Q3, D_Q4 within the year					
	Credit insti- tutions	d_BANK	Dummy variables for credit institutions (44 variables)					



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BANK OF GREECE Source: BoG

Descriptive statistics of the variables used in the hedonic models

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Variable name	# cases	Mean	Median	Min	Мах	Std. Deviation
In_value (LOG of the						
property value)	347,509	11.85	12	8	15	0.60
TM TOTAL SPACE AREA	1 Star					
(excluding outliers)	347,509	97.74	89	20	440	48.49
AGE	294,635	15.65	10	0	163	15.75
FLOOR	342,316	1.80	1	-2	8	1.66
AUXIL	347,509	3.23		0	216	11.86
d_store	347,509	0.21		0	1	0.40
d_park	347,509	0.10		0	1	0.30
Quality	347,509	0.05		0	1	0.21
Renovated	347,509	0.02		0	1	0.14
Depreciated	347,509	0.00		0	1	0.06
Access	339,673	0.80		0	1	0.40
Seaside_new	339,673	0.77		0	1	0.42
Mountain_tourist	339,673	0.04		0	1	0.19
Hospital	339,673	0.27		0	1	0.44
Airport	339,673	0.17		0	1	0.38
GDP_2010_nomos	341,977	20,743	20,318	10,213	30,860	5,348



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Descriptive statistics of the variables used in the hedonic models

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Variable name	# cases	Mean	Median	Min	Max	Std. Deviation
d_REG	347,509			0	1	
d_level1	347,509	0.82		0	1	0.39
d_level2	347,509	0.12		0	1	0.32
d_level3	347,509	0.05		0	1	0.21
view	347,509	0.02		0	1	0.13
d_Y	347,509			0	1	
d_Q	347,509			0	1	
d_Bank	347,509			0	1	
Infra	25,387	3.84		2	5	0.80
BuiltEnv	25,387	3.51		3	5	0.65
BF_median	25,387	1.00		0	2	0.34
Density	25,387	7.27		0	15	3.89
NaturalEnv	25,387	2.87		2	5	0.86
Uses	25,387	3.20		1	5	0.87



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Descriptive statistics of main variables used in the hedonic models for the 25 big cities of Greece





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Hedonic model summary results: beta-coefficients



Dependent variable: In_value	Greece	Atnens	Inessaioniki	Atnens North
Adjusted R Square	0.76	0.82	0.69	0.81
Explanatory Variables	Greece	Athens	Thessaloniki	Athens North
(Constant)	10.324	10.908	10.506	10.674
TM TOTAL SPACE AREA (excluding outliers)	0.016	0.017	0.020	0.016
TM_SQ	-0.000	-0.000	-0.000	-0.000
AGE	-0.016	-0.018	-0.014	-0.018
AGE_SQ	0.000	0.000	0.000	0.000
maisonette	0.044	-0.013	-0.122	-0.025
FLOOR	0.036	0.035	0.044	0.028
AUXIL	-0.002	-0.002	-0.004	-0.002
quality	0.102	0.090	0.171	0.062
view	0.048	0.041	0.111	0.008
depreciated	-0.141	-0.151	-0.167	-0.112
D_STORE	0.103	0.090	0.078	0.075
D_PARK	0.057	0.060	0.074	0.051
access	0.044			
Airport	0.002			
D_LEVEL1	0.099			
D_LEVEL2	0.057			
D_Y2013	-0.298	-0.329	-0.359	-0.257
seaside_new	0.094			
GDP_2010_nomos1	0.015			
Infra				0.022
BuiltEnv				0.121
BF_median				-0.083
Density				-0.009
NaturalEnv				0.013
Uses				0.028

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Question: Which are the factors affecting residential property values? Property technical characteristics

- **Total space area:** +1.6%
- Age: -1.6%
- Property type: maisonette +4.4%
- **Floor level:** +3.6%
- Construction quality: +10.2%
- View: +4.8%
- **Storage area:** +10.3%
- Parking spaces: +5.7%



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Location (country and regional level)

- Accessibility: +4.4%
- Depreciated area: -14.1%
- **Urban areas:** +9.9%
- **Semi-urban areas** +5.7%
- **Other amenities:** limited effect (e.g. Airport +0.2%)
- Regional submarket: strong effect
- Level of economic development: +1.5%



Source: BoG



Location (city/town level) – Case study for Northern greater Athens Area

- Infrastructure: +2.2%
- **Built environment:** +12.1%
- **Building Factor:** -8.3%
- Population Density: -0.9%
- Natural environment: +1.3%
- **Compatibility of uses:** +2.8%



Source: BoG

Residential property price changes during the crisis (hedonic results) GREECE: -29.8%

	Cities	# cases	Median value (€)	Median Value (€/sq.m)	Price changes (hedonic est.) during the crisis	Estimated hedonic value (€)	Actual vs estimated value
	Athens	155,102	165,000	1,950	-30.6%	156,774	5.2%
	Thessaloniki	13,243	124,000	1,567	-36.0%	115,264	7.6%
	Patra	8,500	115,000	1,398	-23.1%	104,012	10.6%
	Larissa	5,511	127,000	1,303	-25.4%	116,411	9.1%
	Heraklion	4,268	159,500	1,701	-28.9%	143,327	11.3%
51	Volos	4,709	119,000	1,346	-16.8%	121,463	-2.0%
	Ioannina	4,729	145,000	1,555	-20.6%	130,256	11.3%
	Trikala	2,182	120,253	1,199	-32.7%	109,706	9.6%
	Chalkida	2,946	142,920	1,589	-41.0%	130,703	9.3%
	Serres	2,051	100,000	1,081	-26.0%	92,535	8.1%
	Alexandroupoli	2,793	121,114	1,395	-23.5%	115,710	4.7%
	Xanthi	2,426	107,000	1,190	-20.7%	112,024	-4.5%
	Katerini	3,313	116,954	1,177	-35.9%	114,484	2.2%
	Kalamata	2,125	130,000	1,499	-23.7%	119,082	9.2%
	Kavala	1,791	130,000	1,398	-29.8%	116,288	11.8%
	Chania	3,402	161,410	1,673	-24.6%	159,154	1.4%
	Lamia	2,893	121,000	1,350	-32.1%	115,193	5.0%
	Komotini	2,061	100,560	1,250	-20.2%	93,500	7.6%
	Rodos	4,331	160,000	1,684	-25.6%	143,386	11.6%
	Agrinio	2,790	106,148	1,096	-21.6%	116,627	-9.0%
	Drama	1,410	100,189	1,000	-22.2%	107,105	-6.5%
	Veria	2,009	112,000	1,127	-21.5%	101,021	10.9%
	Kozani	2,341	107,800	1,192	-29.3%	103,909	3.7%
	Karditsa	1,964	104,286	1,050	-18.2%	116,483	-10.5%
	Rethimno	2,206	158,250	1,798	-24.0%	141,831	11.6%



Conclusions



- The regional submarket has a strong effect on values, at the country level
- Similarly, the sustainability and environmental factors are significant in determining the value of the property, within the city
- Amenities like the existence of an airport, university or hospital appear to have a limited effect



Further research in the hedonic models



- Collection and quantification of qualitative location data (environmental factors etc.) at the country or municipality or neighborhood level
- Insertion of additional macroeconomic and demographic variables (unemployment, disposable income, population density, dominant employment sectors etc.) in order to identify further interrelations and new balances among the variables and their effect on the values, at the country level



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 Investigation of the differentiation of the effect of the explanatory variables on residential property values before and after the crisis

Visit our website in Real Estate Market Analysis Section

http://www.bankofgreece.gr/Pages/en/Statistics/realestate/default.aspx



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Thank you!

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