

Real estate prices in Paris:

A multivariate study of the location criterion.

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Introduction

The fourth most expensive metropolis in the world [1], Paris has seen its real estate prices quadrupled in 20 years. According to the Paris Notary Chamber [2], a new record should be reached in the spring of 2019 with an average of 9730 euros/m², an increase of around 7% in one year. If the permanent soaring benefits all boroughs, all are not equal. Average prices currently range from 7930 euros/m² in the '19th arrondissement' to 13150 euros/m² in the '6th'. At the neighborhoods scale, the gaps are even greater, with an average range of 7460 euros/m² in 'La Chapelle' (18th) to 17410 euros/m² in 'Odéon' (6th), nearly 15 times the net minimum income.

Real estate specialists generally consider that the location of a property is the primary criterion in estimating its market value. Benefits such as the number of services and shops, local amenities, public transport or schools are regularly cited to explain that one area is valued more than another. But what about the City of Lights? Does that kind of rationality also drive the invisible hand of the Parisian market?

This is the question that this study proposes to answer, by measuring the link between several variables related to location and the average price of real estate by borough. It should allow to establish a grid of parameters and a cartography for the use of professionals such as real estate agencies and notaries, but also of any potential buyer wishing to understand what weighs objectively in the price of a good according to its situation in the French capital, especially when this price appears to be inappropriate with the intrinsic qualities of the property in question (eg high price for a narrow area, obsolete facilities, absence of an elevator, ...).

The problem is:

'What can explain the differences in the price of real estate from one Parisian borough to another, all other things being equal?'

Stakeholders are:

Real estate agencies, notaries, and buyers themselves.

Methodology

1. Data

The data were selected on criteria of reliability, transparency on their origin, recency, as well as on the presence of a division by Parisian borough, with the aim of bringing together a variety of factors likely to explain the price variability according to the location.

Thus, official sources and open institutional or government databases have been favored:

- the French national institute for statistics and economic studies (INSEE),
- the Paris Notary Chamber (Chambre des Notaires de Paris),
- Paris City Hall,
- the Regional Council of Ile-de-France (Greater Paris)
- the French Ministry of Education

FourSquare API provided User Generated Content about popular venues in each borough.

Data content and use	Source	Information link	Update
1. Average real estate prices by borough _ the target variable	Chambre des Notaires de Paris	http://notairesdugrandparis.fr/fr/cart-e-des-prix#paris	January, 2019
2. Geodata _ get the latitude and longitude of each Parisian borough so to send queries to the FourSquare API and create a map _ also get areas to calculate the density per square kilometer of each independent variable	Paris City Hall	https://opendata.paris.fr/explore/dataset/arrondissements/information/	-
3. Population _ calculate the population density per km2 of each borough as a possible predictor of real estate prices	INSEE	https://www.insee.fr/fr/statistiques/fichier/3677781/dep75.pdf	January, 2019
4. Service offering _ list and count the different categories of services available in each borough as possible predictors	Regional Council of Ile-de-France	https://www.data.gouv.fr/fr/datasets/les-services-aux-particuliers-par-commune-ou-arrondissement-base-permanente-des-equipements-idf/	March, 2016

5. Shop offering _ list and count the different categories of stores and shops available in each borough as possible predictors	Regional Council of Ile-de-France	https://www.data.gouv.fr/fr/datasets/les-commerces-par-commune-ou-arrondissement-base-permanente-des-equipements-idf/	March, 2016
6. Popular venues _ list and count the most common categories of venues in each borough as a possible predictors	FourSquare API	https://fr.foursquare.com/	March, 2019
7. Municipal facilities _ list and count the different categories of collective facilities in each borough as possible predictors	Paris City Hall	https://opendata.paris.fr/explore/dataset/equipements_de_proximite/information/	May, 2013
+ Rail transport (refers to 'Municipal facilities') _ list and count the rail transports (metro, tramway, train) available in each borough as a possible predictor	Regional Council of Ile-de-France	https://data.iledefrance.fr/explore/dataset/gares-et-stations-du-reseau-ferre-dile-de-france-par-ligne/information/	November, 2018
8. Education offering (a) Primary & secondary schools _ list and count public and private primary and secondary schools available in each borough as possible predictors	French Ministry of Education	https://data.education.gouv.fr/explore/dataset/fr-en-adresse-et-geolocalisation-etablissements-premier-et-second-degre/information/	February, 2019
(b) Public higher education establishments _ list and count public higher education establishments available in each borough as a possible predictor	Regional Council of Ile-de-France	https://data.iledefrance.fr/explore/dataset/implantations-des-etablissements-denseignement-superieur-publics/information/	October, 2017
(c) Private higher education establishments _ list and count private higher education establishments available in each borough as a possible predictor	Regional Council of Ile-de-France	https://data.iledefrance.fr/explore/dataset/idf_universites/information/	May, 2013
9. Social housing _ list and count the different categories of social housing built or acquired in each borough as a possible predictor	Paris City Hall	https://opendata.paris.fr/explore/dataset/logements-sociaux-finances-a-paris/information/	February, 2019

2. Variables and Indicators

In this study, **6 groups of key variables** are analyzed as possible predictors of real estate prices in Paris.

After data preprocessing and transforming stages (details communicated later with the code part), a total of **48 indicators** were identified and then standardized on their densities per square kilometer to allow comparison between borough.

2.1 Private / Public Service offering

This dataset was reduced from 31 to 14 attributes listed below:

- Law Enforcement
- Courts
- Tax Office
- Employment Agencies
- Banks
- Automotive Services
- Building Craft
- Personal Care
- Estate Agency
- Restaurants
- Post Office
- Veterinary
- Laundry / Dry cleaning
- Death Care

2.2 Shops offering

This dataset was reduced from 23 to 8 attributes listed below:

- Supermarkets
- Convenience Stores
- Food Shops
- Personal Goods
- Household Goods
- Books and Stationery
- Florists
- Gas stations

2.3 Popular Venues

Due to many duplicates and redundant categories, this dataset was reduced from 195 to 9 attributes listed below:

Accommodation
Bars, Pubs & Cafés
Culture & Entertainment
Easy Food
Nightclub
Restaurants
Shops & Markets
Sites
Sport & Personal Care

2.4 Municipal facilities

This dataset was reduced from 41 to 4 attributes listed below:

Daycare
Socio-Cultural
Sport
Square & Garden

2.5 Education offering

The primary and secondary education dataset was reduced from 18 to 2 categories that are "primary" and "secondary" and divided by status "private" vs "public"; public and private higher education datasets were treated as the two modalities of the category "Higher Education":

Public primary schools
Private primary schools
Public secondary schools
Private secondary schools
Public higher education establishments
Private higher education establishments

2.6 Social housing

This dataset was reduced from 15 to 7 attributes listed below:

for Dependent persons

for Families

for Young adults

for Poor people

for Migrants

by Construction (covers the previous)

by Acquisition (covers the previous)