Geospatial Visualization with R Using Real Estate Market Data: Data Analysis for Decision Making (WS 2025/26)

Idelle Sablay

Fresenius University of Applied Sciences

Author Note

Correspondence concerning this article should be addressed to Idelle Sablay, Email: sablay.idelle@stud.hs-fresenius.de

Geospatial Visualization with R Using Real Estate Market Data: Data Analysis for Decision Making (WS 2025/26)

Introduction

''Geospatial visualization'' refers to information that specifies the spatial position of something on the Earth's surface and describes their associated characteristics. It usually combines three parts: the location (such as coordinates on a map), details about the thing or event (its features or characteristics), and time (when it happened or how long it lasted).

Importance: By mapping property data, geospatial visualization aids in our understanding of real estate markets.

Objective: To utilize R in turning real estate market data into visual representations.

Data Sources of Real Estate Market Data

- Government Open Data Portals https://www.govdata.de/ (GovData Germany) https://www.statistikportal.de/de/open-data (Statistikportal.de) https://offenedaten-koeln.de/ (Cologne Open Data Portal)

- Public APIs (Real Estate Platforms) https://www.zillowgroup.com/developers/ (Zillow Group APIs)) https://www.attomdata.com/news/attom-insights/best-apis-real-estate/ (ATTOM Data API)

R tools for Geospatial Visualization

Package	Purpose	Example Visualization	Best Real Estate Data Use
ggplot2	General plotting	Scatter map of property prices	Property listings with latitude/longitude
sf	Modern spatial data handling (vector data)	Convert property points into spatial objects	Raw property coordinates, shapefiles of districts

Package	Purpose	Example Visualization	Best Real Estate Data Use
leaflet	Interactive web maps	Clickable map of rental listings	Real estate ads with location + price
tmap	Thematic maps (static/interactive)	Choropleth map of average rent per district	Aggregated rent or price per neighborhood

Package	Purpose	Example Visualization	Best Real Estate Data Use
maps	Quick access to world/country maps	Base map of Germany or Cologne	Background maps for property overlays
raster	Work with raster data (grids)	Heatmap of housing density	Population density or land-use data

Steps for Visualization in R (Find Real Estate Market Data)

Step 1: Choose Data Source

Step 2: Load Libraries

```r
library(readxl)

library(dplyr)

library(tidyr)

library(ggplot2)
```
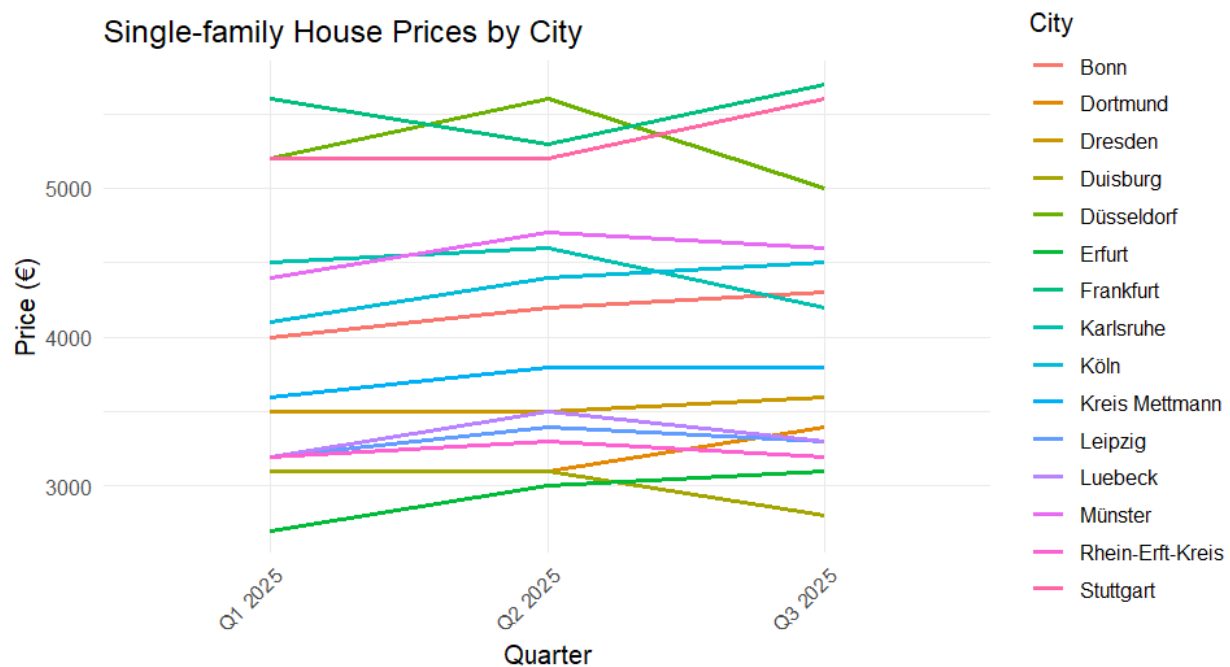
Step 3: Import the Excel File

```r
df <- read_excel("C:/Users/sabla/OneDrive/Desktop/

Hochschule Fresenius/1st Semester/

Data Analysis for Decision Making/Presentation/

GREIX_nominal.xlsx")
```

Step 4: Plot

```r
df_long <- df %>%

  pivot_longer(

    cols = -date,                      # all columns except 'date'

    names_to = "City",

    values_to = "Price"

  ) %>%

  mutate(

    # Ensure quarters are ordered correctly

    date = factor(date, levels = unique(date))

  )


ggplot(df_long, aes(x = date, y = Price, color = City, group = City)) +

  geom_line(size = 1) +
```

```r
labs(title = "Single-family House Prices by City",

     x = "Quarter",

     y = "Price (€)") +

theme_minimal(base_size = 12) +

theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Figure 1

Single-family House Prices by City

Steps for Visualization in R (Find, Download and Load geospatial data)

Step 1: Download raw OSM data (osm.pbf) or shapefiles (.shp.zip)

Figure 2

Geoboundaries

https://www.geoboundaries.org/index.html
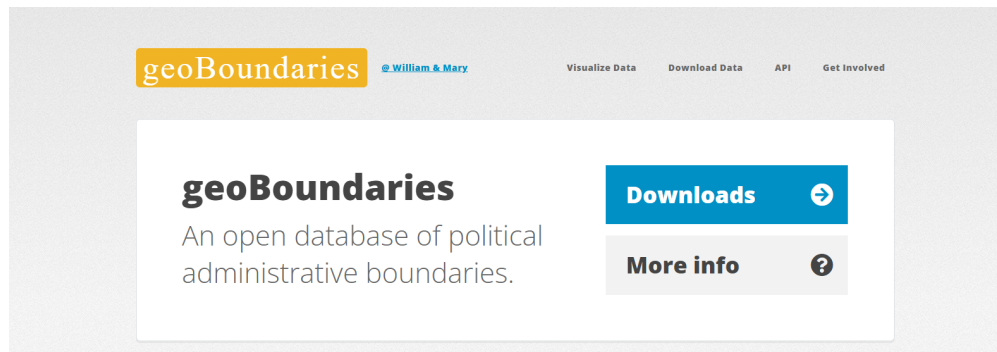
Step 2: Install additional packages

```r
install.packages(c("sf", "ggplot2", "dplyr", "readxl", "tidyr", "viridis"))
```

Step 3: Load packages

```r
library(sf)
library(ggplot2)
library(dplyr)
library(readxl)
library(tidyr)
library(viridis)
```

Step 4: Read the .xlsx file

```r
df <- readxl::read_excel("C:/Users/sabla/OneDrive/Desktop/

Hochschule Fresenius/1st Semester/

Data Analysis for Decision Making/Presentation/
```

```
GREIX_nominal.xlsx")


df_q3 <- df %>%

  filter(date == "Q3 2025") %>%

  pivot_longer(-date, names_to = "City", values_to = "Price")
```


Step 5: Extract the boundaries and join with housing data

```
germany_map <- st_read("C:/Users/sabla/OneDrive/Desktop/

Hochschule Fresenius/1st Semester/

Data Analysis for Decision Making/

Presentation/geoBoundaries-DEU-ADM2-all/

geoBoundaries-DEU-ADM2_simplified.shp")  # Level 2 = districts


names(germany_map)

unique(germany_map$shapeName)

unique(df_q3$City)


map_data <- germany_map %>%

  left_join(df_q3, by = c("shapeName" = "City"))


ggplot(map_data) +

  geom_sf(aes(fill = Price), color = "white") +

  scale_fill_viridis_c(option = "plasma", na.value = "gray90") +

  labs(title = "Single-family House Prices (Q3 2025)",

       fill = "Price (€)") +

  theme_minimal()
```
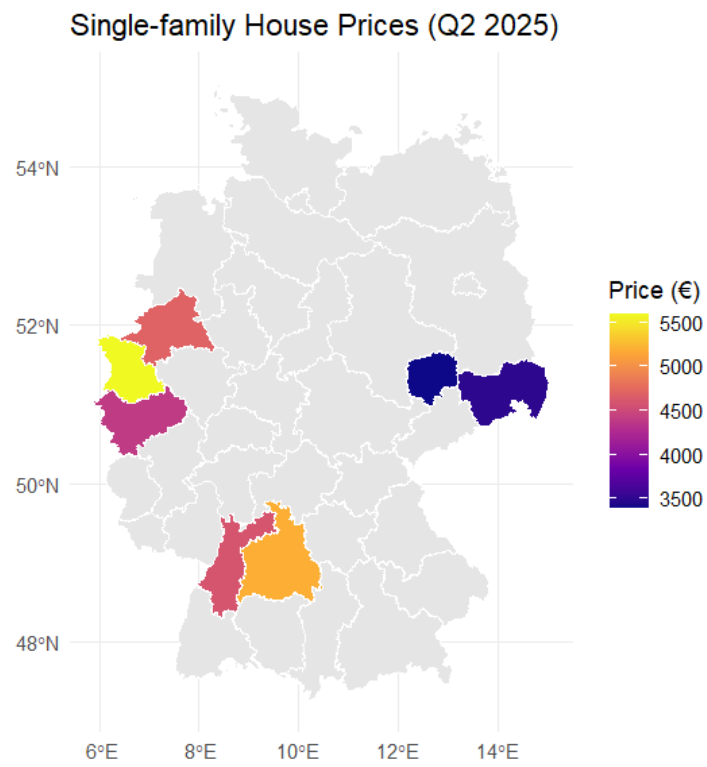
Figure 3

Geospatial Visualization
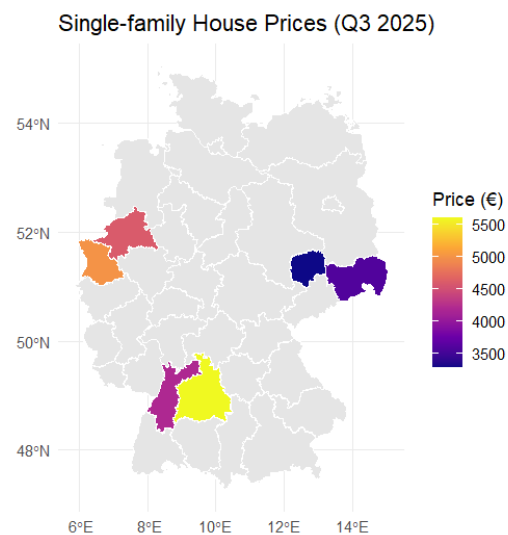
Exercise

Load the real estate market data in the Q2 2025. What are the changes?

Figure 4

Geospatial Visualization

Thank you!