

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

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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

Figure 1

German Real Estate Index



Step 2: Load Libraries

```
library(readxl)
library(dplyr)
library(tidyr)
library(ggplot2)
```

Step 3: Import the Excel File

```
df <- read_excel("C:/Users/sabla/OneDrive/Desktop/
Hochschule Fresenius/1st Semester/
Data Analysis for Decision Making/Presentation/
GREIX_nominal.xlsx")
```

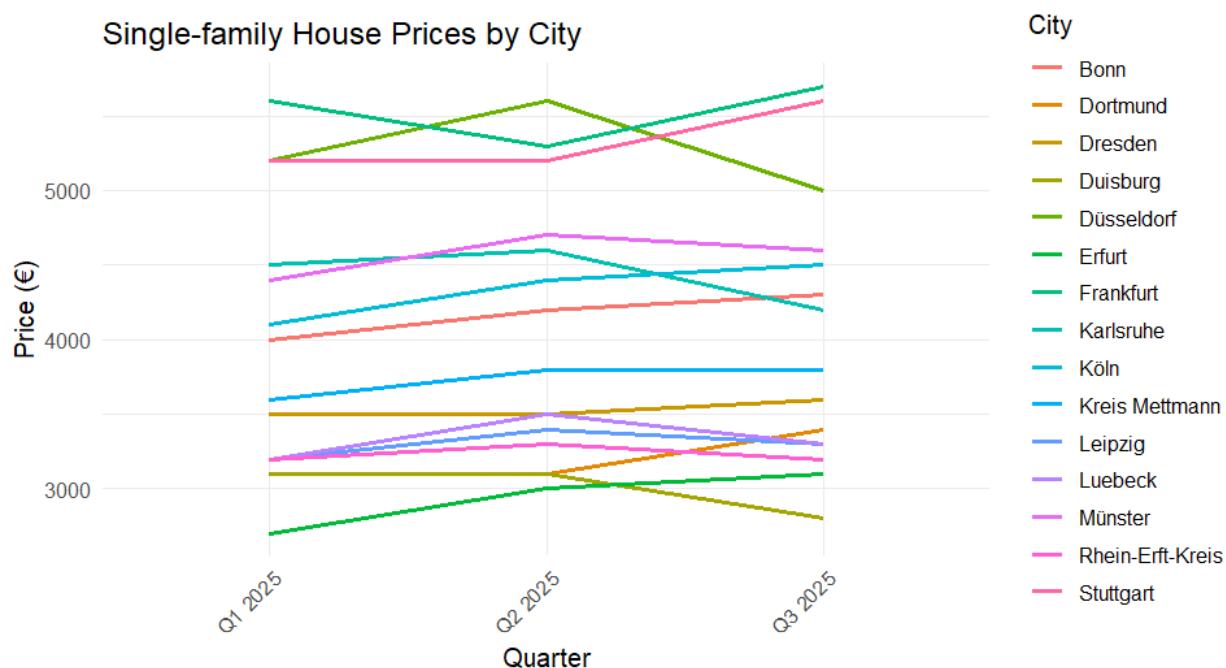
Step 4: Plot

```
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))
  )
```

Step 4: Plot

```
ggplot(df_long, aes(x = date, y = Price, color = City, group = City)) +
  geom_line(size = 1) +
```

```
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 2*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)



<https://download.geofabrik.de/>

Step 2: Install additional packages

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

Step 3: Load packages

```
library(sf)
library(ggplot2)
library(dplyr)
library(readxl)
library(tidyverse)
library(viridis)
```

Step 4: Read the .xlsx file

```
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

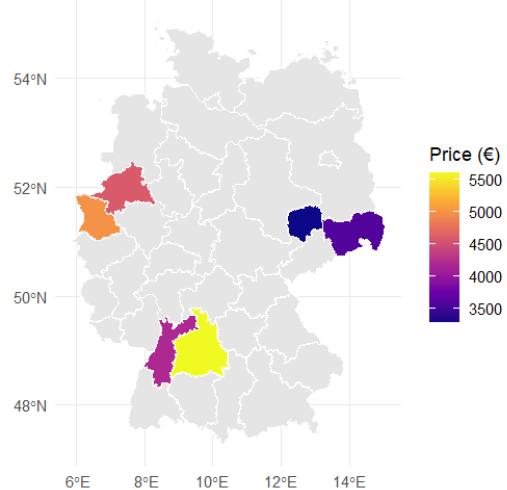
```
germany_map <- st_read("C:/Users/sabla/OneDrive/Desktop/
Hochschule Fresenius/1st Semester/
Data Analysis for Decision Making/
```

```
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

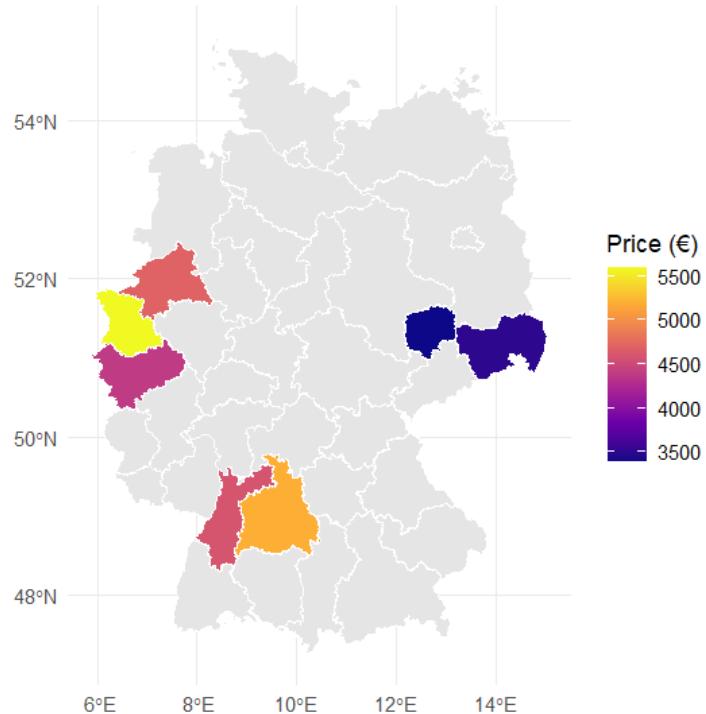
Geospatial Visualization

Single-family House Prices (Q3 2025)

**Exercise**

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

Single-family House Prices (Q2 2025)



Thank you!