impact-on-property-prices

July 26, 2025

1 Project Milestone 5 - Merging the Data and Storing in a Database/Visualizing Data

[2]:
```
import sqlite3

# Connect to SQLite database
conn = sqlite3.connect("housing_income_weather.db")
cursor = conn.cursor()

# Drop the table if it exists
DropQueryBostonHousing = "DROP TABLE IF EXISTS BOSTON_HOUSING"
DropQueryWeather = "DROP TABLE IF EXISTS WEATHER"
DropQueryIncome = "DROP TABLE IF EXISTS INCOME"

# Create the table
tables = {
"BOSTON_HOUSING": """
CREATE TABLE BOSTON_HOUSING (
    STREET_NUMBER INTEGER,
    STREET_NAME TEXT NOT NULL,
    CITY TEXT NOT NULL,
    ZIP_CODE TEXT NOT NULL,
    CATEGORY TEXT NOT NULL,
    BUILDING_TYPE TEXT NOT NULL,
    LIVING_AREA INTGER,
    TOTAL_VALUE INTGER,
    YEAR_BUILT INTGER,
    PRICE_PER_SFT INTGER
)
""",
"WEATHER": """
CREATE TABLE WEATHER (
    ZIP_CODE TEXT NOT NULL,
    CITY TEXT NOT NULL,
    AQI_CATEGORY TEXT NOT NULL
)
""",
```

```
"INCOME": """
CREATE TABLE INCOME (
    ZIP_CODE TEXT NOT NULL,
    MEDIAN_FAMILY_INCOME INTEGER
)
"""
}

# List of tables to drop
tables_to_drop = ["BOSTON_HOUSING", "WEATHER", "INCOME"]

for table in tables_to_drop:
    cursor.execute(f"DROP TABLE IF EXISTS {table}")

# Execute each CREATE TABLE statement
for table_name, create_query in tables.items():
    cursor.execute(create_query)
    print(f"Table '{table_name}' created successfully")

conn.commit() # Commit changes
```

```
Table 'BOSTON_HOUSING' created successfully
Table 'WEATHER' created successfully
Table 'INCOME' created successfully
```

[3]:
```
import csv

# Open CSV file and insert data
with open("housing_data_boston.csv", "r") as file:
    reader = csv.reader(file)
    headers = next(reader)  # Skip header row if present

    for row in reader:
        cursor.execute("""
            INSERT INTO BOSTON_HOUSING (STREET_NUMBER, STREET_NAME, CITY,␣
 ↪ZIP_CODE, CATEGORY, BUILDING_TYPE, LIVING_AREA, TOTAL_VALUE, YEAR_BUILT,␣
 ↪PRICE_PER_SFT)
            VALUES (?, ?, ?, ?, ?, ?, ?, ?, ?, ?)
        """, row)

# Commit and close the connection
conn.commit()
```

[4]:
```
# Open CSV file and insert data
with open("weather_data.csv", "r") as file:
    reader = csv.reader(file)
    headers = next(reader)  # Skip header row if present
```

```
    for row in reader:
        cursor.execute("""
            INSERT INTO WEATHER (ZIP_CODE, CITY, AQI_CATEGORY)
            VALUES (?, ?, ?)
        """, row)

# Commit and close the connection
conn.commit()
```

[5]:
```
# Open CSV file and insert data
with open("income_data.csv", "r") as file:
    reader = csv.reader(file)
    headers = next(reader)  # Skip header row if present

    for row in reader:
        cursor.execute("""
            INSERT INTO INCOME (ZIP_CODE, MEDIAN_FAMILY_INCOME)
            VALUES (?, ?)
        """, row)

# Commit and close the connection
conn.commit()
```

[6]:
```
# Query to fetch and display all rows
select_query = "SELECT * FROM BOSTON_HOUSING LIMIT 10"

rows = cursor.execute(select_query).fetchall()

print("Data in the BOSTON_HOUSING table:")
for row in rows:
  print(row)
```

```
Data in the BOSTON_HOUSING table:
(243, 'LEXINGTON ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl -
Colonial', 1122, 388100, 1910, 345)
(33, 'PRESCOTT ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl -
Colonial', 1968, 530800, 1900, 269)
(246, 'PRINCETON ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cp - Cape',
1110, 533600, 1920, 480)
(112, 'PUTNAM ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl -
Colonial', 1648, 715400, 1900, 434)
(110, 'PUTNAM ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl -
Colonial', 1816, 763900, 1900, 420)
(1, 'LAWSON PL', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl - Colonial',
1798, 567000, 1905, 315)
(426, 'SARATOGA ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl -
Colonial', 1197, 620300, 1860, 518)
```

```
(289, 'LEXINGTON ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Sd - Semi-
Det', 1255, 447000, 1900, 356)
(303, 'LEXINGTON ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cv -
Conventional', 1414, 593800, 1900, 419)
(305, 'LEXINGTON ST', 'East Boston', '2128', 'Single Fam Dwelling', 'Cl -
Colonial', 1190, 466500, 1900, 391)
```

[7]:
```
# Query to fetch and display all rows
select_query = "SELECT * FROM WEATHER LIMIT 10"

rows = cursor.execute(select_query).fetchall()

print("Data in the WEATHER table:")
for row in rows:
  print(row)
```

```
Data in the WEATHER table:
('02110', 'Boston', 'Good')
('02199', 'Boston', 'Good')
('02210', 'Boston', 'Good')
('02109', 'Boston', 'Good')
('02116', 'Boston', 'Good')
('02108', 'Boston', 'Good')
('02114', 'Boston', 'Good')
('02111', 'Boston', 'Good')
('02129', 'Boston', 'Good')
('02467', 'Brookline', 'Good')
```

[8]:
```
# Query to fetch and display all rows
select_query = "SELECT * FROM INCOME LIMIT 10"

rows = cursor.execute(select_query).fetchall()

print("Data in the INCOME table:")
for row in rows:
  print(row)
```

```
Data in the INCOME table:
('02110', 196518)
('02199', 146786)
('02210', 223411)
('02109', 162045)
('02116', 134875)
('02108', 153618)
('02114', 169107)
('02111', 88333)
('02129', 98445)
('02467', 148396)
```

[9]:
```
import sqlite3

cursor.execute("""
DROP TABLE IF EXISTS housing_income_weather_data
""")

# Step 1: Create the new table
cursor.execute("""
CREATE TABLE IF NOT EXISTS housing_income_weather_data (
    street_number INTEGER,
    street_name TEXT,
    city TEXT,
    zip_code TEXT,
    category TEXT,
    building_type TEXT,
    living_area INTEGER,
    total_value INTEGER,
    year_built INTEGER,
    price_per_sft INTEGER,
    median_family_income INTEGER,
    aqi_category TEXT
);
""")

# Step 2: Insert the joined data into the new table
insert_query = """
INSERT INTO housing_income_weather_data (
    street_number, street_name, city, zip_code, category, building_type,
    living_area, total_value, year_built, price_per_sft,
    median_family_income, aqi_category
)
SELECT DISTINCT bh.street_number, bh.street_name, bh.city, i.zip_code,  bh.
 ↪category, bh.building_type,
    bh.living_area, bh.total_value, bh.year_built, bh.price_per_sft,
    i.median_family_income,
    w.aqi_category FROM BOSTON_HOUSING bh, INCOME i, WEATHER w
WHERE CAST(bh.zip_code AS INTEGER) = CAST(i.zip_code AS INTEGER)
AND CAST(bh.zip_code AS INTEGER) = CAST(w.zip_code AS INTEGER)
"""

# Execute the query to insert the data
cursor.execute(insert_query)

# Commit changes to the database
conn.commit()

# Verify by selecting all data from the new table
```

```
cursor.execute("SELECT * FROM housing_income_weather_data where␣
 ↪zip_code='02108'")
rows = cursor.fetchall()
for row in rows:
    print(row)
```

```
(8, 'SPRUCE CT', 'Boston', '02108', 'Single Fam Dwelling', 'Sd - Semi-Det',
1140, 1093500, 1900, 959, 153618, 'Good')
(18, 'CEDAR LANE WY', 'Boston', '02108', 'Single Fam Dwelling', 'Re - Row End',
1664, 1764500, 1920, 1060, 153618, 'Good')
(5, 'W CEDAR ST', 'Boston', '02108', 'Single Fam Dwelling', 'Re - Row End',
2322, 1816100, 1899, 781, 153618, 'Good')
(11, 'W CEDAR ST', 'Boston', '02108', 'Single Fam Dwelling', 'Rm - Row Middle',
2884, 2869800, 1900, 994, 153618, 'Good')
(52, 'CEDAR LANE WY', 'Boston', '02108', 'Single Fam Dwelling', 'Rm - Row
Middle', 1643, 1559800, 1890, 949, 153618, 'Good')
(102, 'CHESTNUT ST', 'Boston', '02108', 'Single Fam Dwelling', 'Rm - Row
Middle', 2924, 2265900, 1855, 774, 153618, 'Good')
(160, 'MT VERNON ST', 'Boston', '02108', 'Single Fam Dwelling', 'Rm - Row
Middle', 3849, 2924700, 1890, 759, 153618, 'Good')
```

[10]:
```
import sqlite3
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Connect to SQLite database
conn = sqlite3.connect("housing_income_weather.db")

# Load the data from the joined_data table into a DataFrame
query = "SELECT * FROM housing_income_weather_data"
df = pd.read_sql_query(query, conn)

# Close the connection
conn.close()
```

[11]:
```
df.shape
```

[11]: (29167, 12)

1.0.1 Final Dataset

[13]:
```
df.head()
```

[13]:

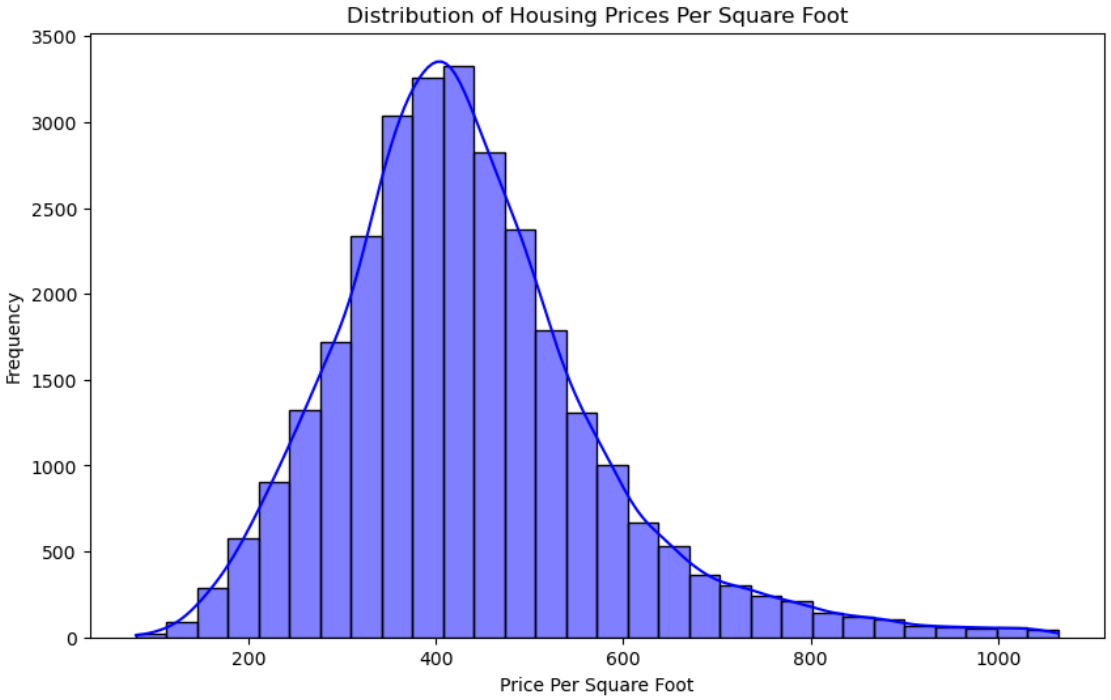
	street_number	street_name	city	zip_code	category	\
0	243	LEXINGTON ST	East Boston	02128	Single Fam Dwelling	
1	33	PRESCOTT ST	East Boston	02128	Single Fam Dwelling	
2	246	PRINCETON ST	East Boston	02128	Single Fam Dwelling	

```
3            112     PUTNAM ST  East Boston    02128  Single Fam Dwelling
4            110     PUTNAM ST  East Boston    02128  Single Fam Dwelling

   building_type  living_area  total_value  year_built  price_per_sft  \
0  Cl - Colonial         1122       388100        1910            345
1  Cl - Colonial         1968       530800        1900            269
2      Cp - Cape         1110       533600        1920            480
3  Cl - Colonial         1648       715400        1900            434
4  Cl - Colonial         1816       763900        1900            420

   median_family_income aqi_category
0                 49470         Good
1                 49470         Good
2                 49470         Good
3                 49470         Good
4                 49470         Good
```

1.1 Data Visualization

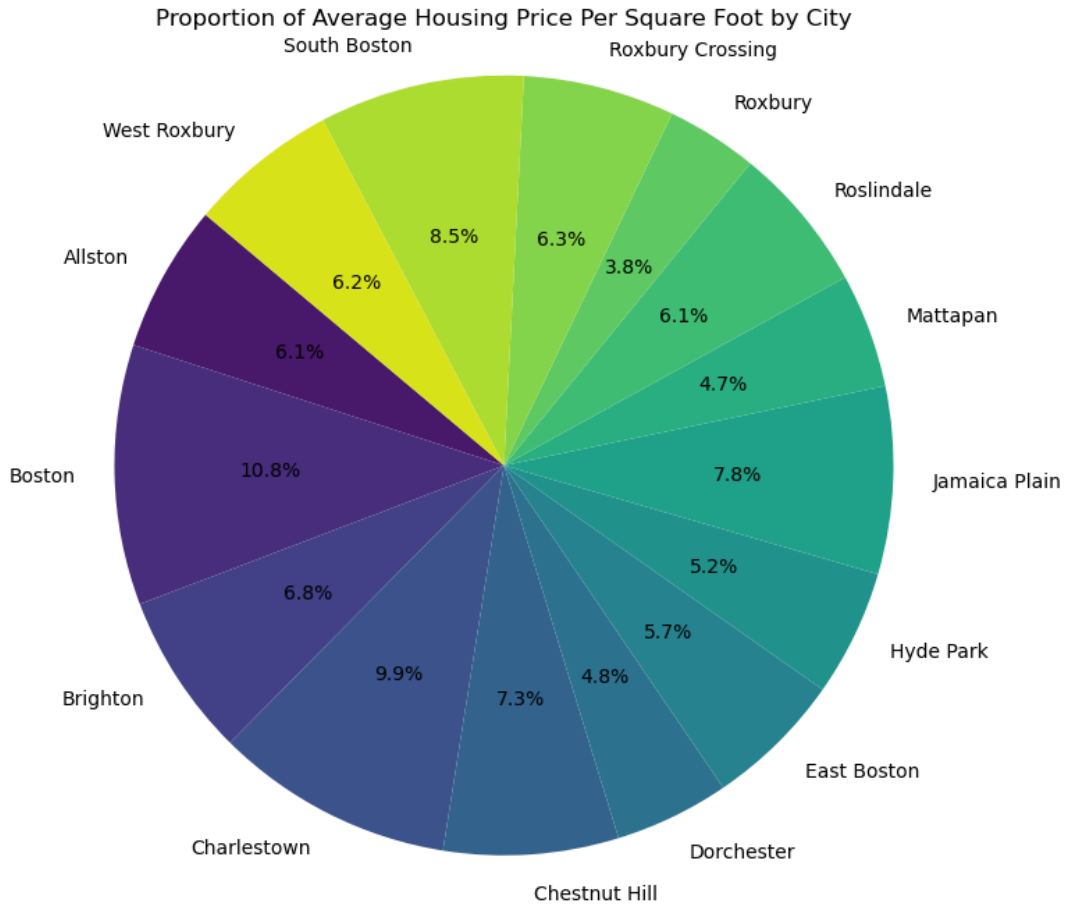
1.1.1 1. Histogram

[16]:
```
# 1. Distribution of Housing Prices Per Square Foot
# This histogram shows the distribution of price_per_sft, helping to identify␣
 ↪price trends.

plt.figure(figsize=(10, 6))
sns.histplot(df['price_per_sft'], bins=30, kde=True, color='blue')
plt.xlabel("Price Per Square Foot")
plt.ylabel("Frequency")
plt.title("Distribution of Housing Prices Per Square Foot")
plt.show()
```



1.1.2 2. Pie Chart

[18]:
```
# 2. Average Housing Price Per Square Foot by City (Single Source: BOSTON_HOUSING)
# This pie chart highlights differences in housing costs across cities.

avg_price_per_city = df.groupby("city")["price_per_sft"].mean()
plt.figure(figsize=(10, 8))
plt.pie(avg_price_per_city.values, labels=avg_price_per_city.index, autopct='%1.1f%%',
        colors=sns.color_palette("viridis", len(avg_price_per_city)), startangle=140)
plt.title("Proportion of Average Housing Price Per Square Foot by City")
plt.axis("equal")
plt.show()
```



1.1.3 3. Scatter Plot (Multi-source: BOSTON_HOUSING + INCOME)

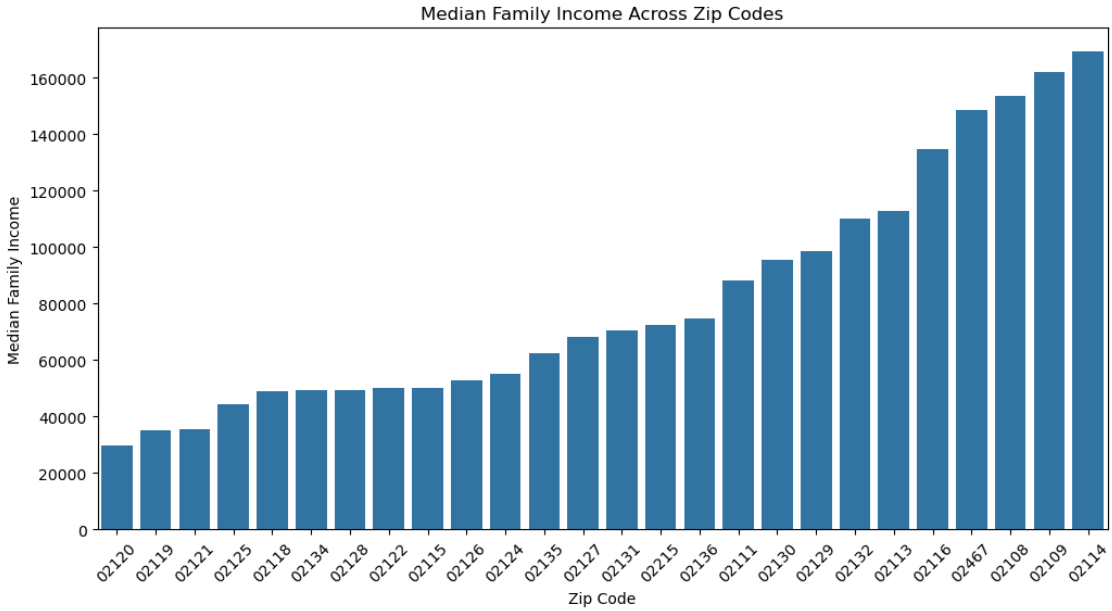
[20]:
```
# 3. Median Family Income vs. Housing Price Per Square Foot (Multi-source:␣
 ↪BOSTON_HOUSING + INCOME)
# This scatter plot visualizes the relationship between income and housing␣
 ↪affordability.

plt.figure(figsize=(10, 6))
sns.scatterplot(x=df['median_family_income'], y=df['price_per_sft'], alpha=0.7)
plt.xlabel("Median Family Income")
plt.ylabel("Price Per Square Foot")
plt.title("Housing Price Per Square Foot vs. Median Family Income")
plt.show()
```

1.1.4 4. Box Plot (Multi-source: BOSTON_HOUSING + WEATHER)

[22]:
```
# 4. Housing Prices Per Square Foot by AQI Category (Multi-source:␣
↪BOSTON_HOUSING + WEATHER)
# This box plot shows how air quality correlates with housing prices.

plt.figure(figsize=(10, 6))
sns.boxplot(x="aqi_category", y="price_per_sft", data=df)
plt.xlabel("Air Quality Index (AQI) Category")
plt.ylabel("Price Per Square Foot")
plt.title("Housing Prices Per Square Foot by Air Quality Index (AQI) Category")
plt.show()
```

1.1.5 5. Bar Chart (Multi-source: INCOME + BOSTON_HOUSING)

[24]:
```
# 5. Income Levels Across Different Zip Codes (Multi-source: INCOME +␣
 ↪BOSTON_HOUSING)
# This bar chart compares median family income across different zip codes.

income_per_zip = df.groupby("zip_code")["median_family_income"].mean().
 ↪sort_values()
plt.figure(figsize=(12, 6))
sns.barplot(x=income_per_zip.index, y=income_per_zip.values)
plt.xlabel("Zip Code")
plt.ylabel("Median Family Income")
plt.title("Median Family Income Across Zip Codes")
plt.xticks(rotation=45)
plt.show()
```


Median Family Income Across Zip Codes
Median Family Income
0
20000
40000
60000
80000
100000
120000
140000
160000
02120
02119
02121
02125
02118
02134
02128
02122
02115
02126
02124
02135
02127
02131
02215
02136
02111
02130
02129
02132
02113
02116
02467
02108
02109
02114
Zip Code