In [18]:

```
# Created by: Michael Cullen
# 08/10/2024
```

In [ ]:

```
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
import ipywidgets as widgets
from sklearn.metrics import r2_score
```

In [20]:

```
df = pd.read_csv('Average-prices-2024-06.csv', header=0)  # Header=0 to use the fir

df.head()
```

Out[20]:

	Date	Region_Name	Area_Code	Average_Price	Monthly_Change	Annual_Change
0	1968-04-01	Northern Ireland	N92000001	3661.485500	0.0	NaN
1	1968-04-01	England	E92000001	3408.108064	0.0	NaN
2	1968-04-01	Wales	W92000004	2885.414162	0.0	NaN
3	1968-04-01	Scotland	S92000003	2844.980688	0.0	NaN
4	1968-04-01	London	E12000007	4418.489911	0.0	NaN

In [21]:

```
area_set = {i for i in df['Region_Name']}


dropdown = widgets.Dropdown(
    options=sorted(area_set),
    description='Area:',
    disabled=False,
)

# below code created by chatgbt

# Define a function to filter the DataFrame based on dropdown selection
def filter_data(change):
    global area_of_interest
    global df_area  # Define df_area as a global variable
    area_of_interest = change['new']
    if area_of_interest:  # If a selection is made
        df_area = df[df['Region_Name'] == area_of_interest]
        display(df_area)

# Observe dropdown changes
dropdown.observe(filter_data, names='value')

# above code created by chatgbt

display(dropdown)
```

```
Dropdown(description='Area:', options=('Aberdeenshire', 'Adur', 'Amber Valley', 'Ang
us', 'Antrim and Newtownab…
```

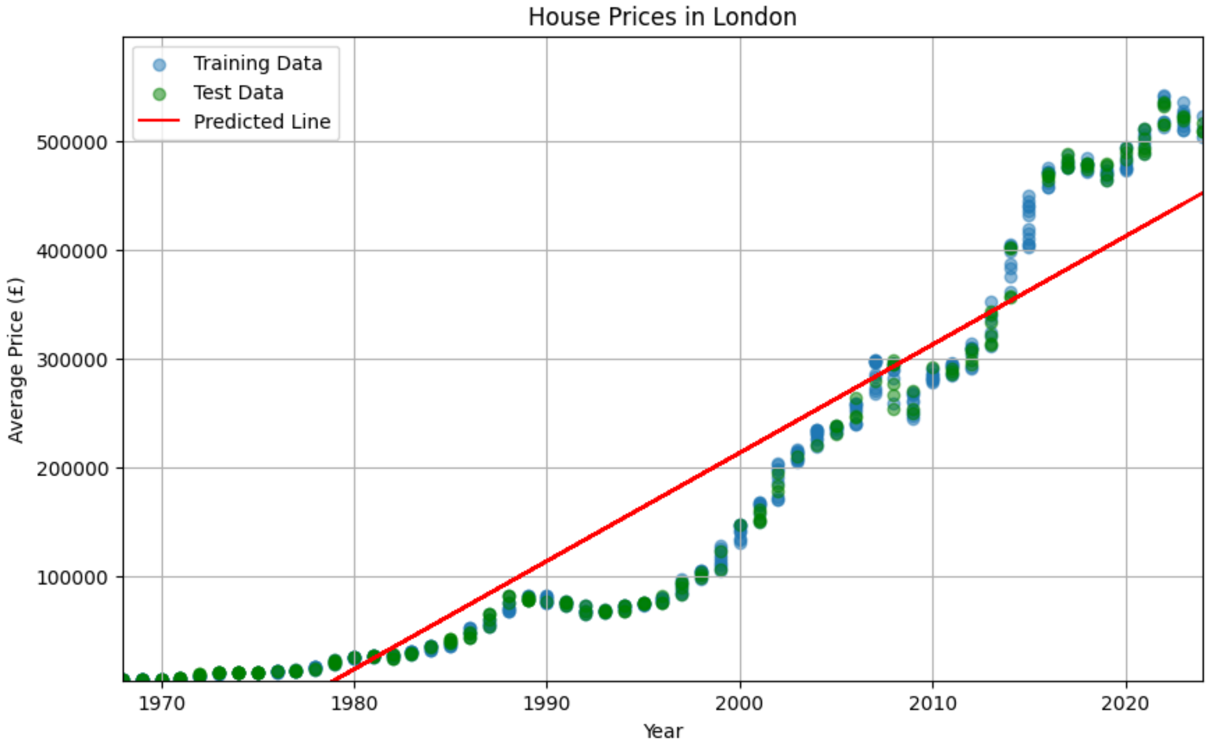
	Date	Region_Name	Area_Code	Average_Price	Monthly_Change	Annual_Char
4	1968-04-01	London	E12000007	4418.489911	0.000000	N
16	1968-05-01	London	E12000007	4418.489911	0.000000	N
24	1968-06-01	London	E12000007	4418.489911	0.000000	N
34	1968-07-01	London	E12000007	4544.732480	2.857143	N
45	1968-08-01	London	E12000007	4544.732480	2.857143	N
...	...	...	...	...	...	
139807	2024-02-01	London	E12000007	509620.000000	-0.400000	-
140203	2024-03-01	London	E12000007	509518.000000	0.000000	-
140588	2024-04-01	London	E12000007	504048.000000	-1.100000	-
141024	2024-05-01	London	E12000007	517017.000000	2.600000	-
141410	2024-06-01	London	E12000007	523134.000000	1.200000	

675 rows × 8 columns

In [27]:

```
if 'df_area' not in globals() or df_area.empty:
    print(f"No data found for region: {area_of_interest}")
else:
    # Work with the filtered DataFrame `df_area`
    df_area['Date'] = pd.to_datetime(df_area['Date'], errors='coerce')
    df_area['Years'] = df_area['Date'].dt.year

    # Define features (X) and target variable (y)
    X = df_area[['Years']]
    y = df_area['Average_Price']

    # Split the data
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random

    # Train the model
    model = LinearRegression()
    model.fit(X_train, y_train)

    y_pred = model.predict(X_test)

    # Plot the data
    plt.figure(figsize=(10, 6))
    plt.scatter(X_train, y_train, alpha=0.5, label="Training Data")
    plt.scatter(X_test, y_test, color='green', alpha=0.5, label="Test Data")
    plt.plot(X_test, y_pred, color='red', label="Predicted Line")

    plt.xlabel('Year')
    plt.ylabel('Average Price (£)')
    plt.title(f'House Prices in {area_of_interest}')
    plt.xlim(df_area['Years'].min(), df_area['Years'].max())
    plt.ylim(df_area['Average_Price'].min() * 0.9, df_area['Average_Price'].max() *
    plt.grid(True)
    plt.legend()
    plt.show()
```

```
C:\Users\mjcul\AppData\Local\Temp\ipykernel_3632\1478049061.py:5: SettingWithCopyWar
ning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/u
ser_guide/indexing.html#returning-a-view-versus-a-copy
  df_area['Date'] = pd.to_datetime(df_area['Date'], errors='coerce')
C:\Users\mjcul\AppData\Local\Temp\ipykernel_3632\1478049061.py:6: SettingWithCopyWar
ning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/u
ser_guide/indexing.html#returning-a-view-versus-a-copy
  df_area['Years'] = df_area['Date'].dt.year
```



In [28]:

```
# Calculate regression metrics
r2 = r2_score(y_test, y_pred)
print(f"R² Score: {r2:.2f}")

# Display model parameters
print("Model slope:    ", model.coef_[0])
```

```
R² Score: 0.88
Model slope:     9957.15671499438
```