London Housing

Exploring Price Trends and Practicing pandas

Goals

- Explore London Housing Market Prices between 1995 and 2021
  - Compare London Borough price trends over time
  - Compare London Borough price trends with other larger associated areas (London Areas, London and England) also over time
- Gain Fluency in pandas
  - Generate dataframes with MultiIndexes that reflect data hierarchy.
  - Perform various data extraction operations including various averages and sorts.
  - Create various plots of the data that result from above

Presentation Approach

Present various stages of the DataFrame development and housing price trends while pointing at methods of note and possible research questions.

Raw Data

	Unnamed: 0	City of London	Barking & Dagenham	Barnet	Bexley	
0	NaT	E09000001	E09000002	E09000003	E09000004	
1	1995-01-01	91448.98487	50460.2266	93284.51832	64958.09036	71
2	1995-02-01	82202.77314	51085.77983	93190.16963	64787.92069	7
3	1995-03-01	79120.70256	51268.96956	92247.52435	64367.49344	7
4	1995-04-01	77101.20804	53133.50526	90762.87492	64277.66881	72

5 rows × 51 columns

Notes: Unnamed: 0 is a good target for columns. Row 0 is a good target for classifying boroughs and other greater aggregate areas in the dataset.

Raw Data - Null Analysis

```
Data columns (total 51 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Unnamed: 0            310 non-null    datetime64[
 1   City of London        311 non-null    object
 2   Barking & Dagenham    311 non-null    object
 3   Barnet                311 non-null    object
 4   Bexley                311 non-null    object
 5   Brent                 311 non-null    object
 6   Bromley               311 non-null    object
 7   Camden                311 non-null    object
 8   Croydon               311 non-null    object
 9   Ealing                311 non-null    object
 10  Enfield               311 non-null    object
 11  Greenwich             311 non-null    object
 12  Hackney               311 non-null    object
 13  Hammersmith & Fulham  311 non-null    object
 14  Haringey              311 non-null    object
 15  Harrow                311 non-null    object
 16  Havering              311 non-null    object
 17  Hillingdon            311 non-null    object
 18  Hounslow              311 non-null    object
 19  Islington             311 non-null    object
 20  Kensington & Chelsea  311 non-null    object
 21  Kingston upon Thames  311 non-null    object
 22  Lambeth               311 non-null    object
 23  Lewisham              311 non-null    object
 24  Merton                311 non-null    object
 25  Newham                311 non-null    object
 26  Redbridge             311 non-null    object
 27  Richmond upon Thames  311 non-null    object
 28  Southwark             311 non-null    object
 29  Sutton                311 non-null    object
 30  Tower Hamlets         311 non-null    object
 31  Waltham Forest        311 non-null    object
 32  Wandsworth            311 non-null    object
 33  Westminster           311 non-null    object
 34  Unnamed: 34           0 non-null      float64
 35  Inner London          311 non-null    object
 36  Outer London          311 non-null    object
 37  Unnamed: 37           0 non-null      float64
 38  NORTH EAST            311 non-null    object
```

Notes:

-Data has all non-null values except for those rows that separate larger sets of aggregate areas. (see lines 34 and 37)

-Sole exception here is line 0 where a datapoint is null, which will disappear once line 0 becomes a column index.

Set Columns

	Unnamed: 0	NaN	1995-01-01 00:00:00	1995-02-01 00:00:00	1995-03-01 00:00:00	
1	City of London	E09000001	91448.98487	82202.77314	79120.70256	
2	Barking & Dagenham	E09000002	50460.2266	51085.77983	51268.96956	
3	Barnet	E09000003	93284.51832	93190.16963	92247.52435	
4	Bexley	E09000004	64958.09036	64787.92069	64367.49344	
5	Brent	E09000005	71306.56698	72022.26197	72015.76274	

5 rows × 312 columns

	London Borough	ID	1995-01-01 00:00:00	1995-02-01 00:00:00	1995-03-01 00:00:00	
1	City of London	E09000001	91448.98487	82202.77314	79120.70256	
2	Barking & Dagenham	E09000002	50460.2266	51085.77983	51268.96956	
3	Barnet	E09000003	93284.51832	93190.16963	92247.52435	
4	Bexley	E09000004	64958.09036	64787.92069	64367.49344	
5	Brent	E09000005	71306.56698	72022.26197	72015.76274	

5 rows × 312 columns

Notes: Dataset transposed. More meaningful column names created.

Set Indexes

London Borough	ID	1995-01-01	1995-02-01	1995-03-01
City of London	E09000001	91448.98487	82202.77314	79120.70256
Barking & Dagenham	E09000002	50460.2266	51085.77983	51268.96956
Barnet	E09000003	93284.51832	93190.16963	92247.52435
Bexley	E09000004	64958.09036	64787.92069	64367.49344
Brent	E09000005	71306.56698	72022.26197	72015.76274

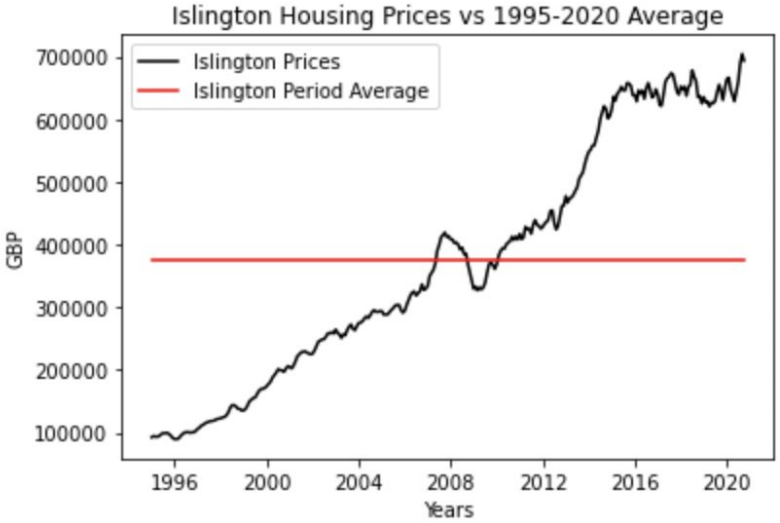
5 rows × 310 columns

London Borough	ID	Area Name	1995-01-01	1995-02-01	1995-03-01
City of London	E09000001	London Boroughs	91448.98487	82202.77314	79120.70256
Barking & Dagenham	E09000002	London Boroughs	50460.22660	51085.77983	51268.96956
Barnet	E09000003	London Boroughs	93284.51832	93190.16963	92247.52435
Bexley	E09000004	London Boroughs	64958.09036	64787.92069	64367.49344
Brent	E09000005	London Boroughs	71306.56698	72022.26197	72015.76274

5 rows × 310 columns

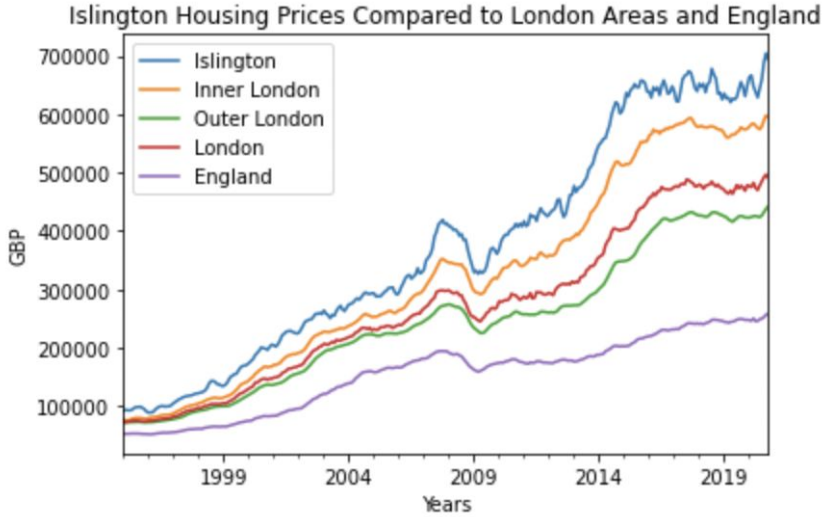
Notes: Indexes set. Area name benefits from noting that ID's starting with 'E09' correspond to London Boroughs and ID's starting with 'E13' correspond to London Areas (Inner/Outer), etc. Column dtype also changed to DateTimeIndex for easier filtering the future.

Islington Housing Price Trend over Time



Notes: We see a persistent increase in Islington prices over the 1995-2020: Almost at 600%.

Islington vs Larger Aggregate Areas



Notes: We see that Islington housing prices outperformed Inner London prices which in turn greatly outperformed Outer London prices. This bit possibly indicates Islington is in Inner London (turns out, indeed it is).

In addition London housing prices have greatly outperformed the national average in England. This might give us new research direction which aims to understand the reason behind this consistent trend.

Final Focus: Inter-borough Price Changes

```
Borough Price Changes from 1998 to 2008 (% chg)
London Borough        ID         Area Name
Hackney               E09000012  London Boroughs    254.810714
Newham                E09000025  London Boroughs    227.714258
Southwark             E09000028  London Boroughs    218.596098
Barking & Dagenham    E09000002  London Boroughs    210.780980
Tower Hamlets         E09000030  London Boroughs    208.794053
Waltham Forest        E09000031  London Boroughs    208.224270
Lewisham              E09000023  London Boroughs    206.177596
Camden                E09000007  London Boroughs    193.647108
Kensington & Chelsea  E09000020  London Boroughs    192.466666
Brent                 E09000005  London Boroughs    190.744249
Wandsworth            E09000032  London Boroughs    190.109927
City of London        E09000001  London Boroughs    188.651824
Islington             E09000019  London Boroughs    188.330473
Lambeth               E09000022  London Boroughs    186.371814
Westminster           E09000033  London Boroughs    183.520239
Greenwich             E09000011  London Boroughs    183.488150
Haringey              E09000014  London Boroughs    182.439496
Redbridge             E09000026  London Boroughs    179.776916
Merton                E09000024  London Boroughs    178.273859
Hammersmith & Fulham  E09000013  London Boroughs    170.871031
Havering              E09000016  London Boroughs    170.406649
Barnet                E09000003  London Boroughs    169.716205
Croydon               E09000008  London Boroughs    167.744449
Kingston upon Thames  E09000021  London Boroughs    166.664112
Ealing                E09000009  London Boroughs    165.238227
Enfield               E09000010  London Boroughs    164.257487
Hounslow              E09000018  London Boroughs    163.614894
Sutton                E09000029  London Boroughs    163.557061
Hillingdon            E09000017  London Boroughs    161.661166
Bexley                E09000004  London Boroughs    160.689465
Harrow                E09000015  London Boroughs    156.712448
Bromley               E09000006  London Boroughs    156.474693
Richmond upon Thames  E09000027  London Boroughs    151.226624
dtype: float64
```

Notes: Benefitting from the DataFrame structure to filter on “Area Name” portion of the Index. Note that all ID’s start with ‘E09’

Also note that the analysis period is different than that of the previous slide.

Conclusion

- Exploratory analysis showed a persistent upward trend in London Housing prices, most notable when viewed from the larger perspective of average housing prices in England.
- Presenter gained experience in working with MultiIndexes and plotting in pandas.