London Property Pricing: To What Extent Has COVID-19 Had An Impact

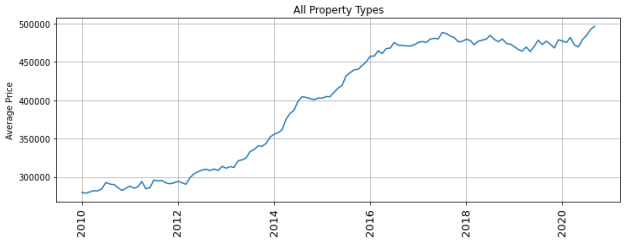
Abstract

The purpose of this report is to analyse the relationship between COVID-19 and property prices for London. This is done by gaining a background into historic property prices, property prices during the COVID-19 pandemic and how prices differ from each borough of London. Using many data sets, which have been prepared for analysis, we have been able to derive key data and construct a series of models to determine; how property prices have changed over the last ten years, the potential impact it has had on property prices in 2020 and enable us to determine which boroughs of London may have been most affected by COVID-19.

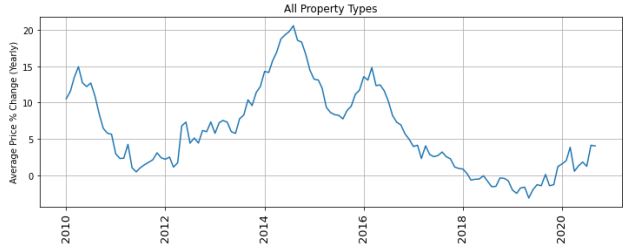
I. INTRODUCTION

Context

It is well known the London is the most expensive area in the UK to purchase property in 2020 and as preliminary research shows it has been steadily rising year on year.



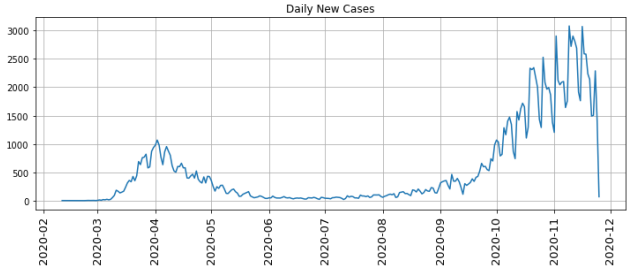
Although the overall change in property price has become more stable since 2017 and even decrease in from 2018, prices do appear to be increasing once again.



House prices are set by a balance between supply and demand. However, property like any other asset is vulnerable to and dependent on several external factors other than the need for housing, the ability to pay for it and the desire to buy it. Therefore, these external factors may impact the cost of doing business, wages and even job security which in turn have an impact on affordability of housing.

Motivation

Coronavirus disease (COVID-19) as I am sure most of your reading this will know, is an infectious disease caused by a newly discovered coronavirus.



COVID-19 in particular is one such external factor which has had an impact on job security and the cost of doing business which preliminary research seems to indicate an impact on property pricing. The motivation behind this paper is to delve further into this impact and to determine how and why COVID-19 has affected the housing market.

II. ANALYTICAL QUESTIONS AND DATA

The objective of this report is to what effects of COVID-19 have been, by how much have these effected property price and why that might be the case. The report will attempt to uncover these facts through the following questions:

- How have house prices changed over the last 10 years?

Firstly, we will be looking at the overall landscape of the property market and gain a good understanding of the any significant changes in property price over the last 10 years.

- Has COVID-19 had an impact in property prices?

We will then compare the property price data with COVID-19 data to attempt to uncover any correlation between the two and determine the reasons behind where there is correlation and where there is not. The answer to this question may be very interesting if there is a correlation where we did not expect it.

- In which areas of London have housing prices changed the most?

Finally, we will have a deeper look at property price data per borough of London, comparing this with COVID-19 data to analyse any potential differences from borough to borough to identify any significant relationships. This may allow us to distinguish any boroughs that reacted differently.

The property price data being utilized has been provided by the UK House Price Index (UKHPI). UKHPI was chosen as it is the most reliable source with complete data. This data set provides the average price of each type of property for each borough of London which is invaluable in answering our questions.

The COVID-19 data has been gathered directly from government statistics to ensure the data has been collected and processed by a reputable source. This data set contains daily new infections recorded from positive tests within each borough of London.

III. Analysis

As all the data used has come from reputable sources there are only a few adjustments that need to be made in order for the data to be fit for our purposes.

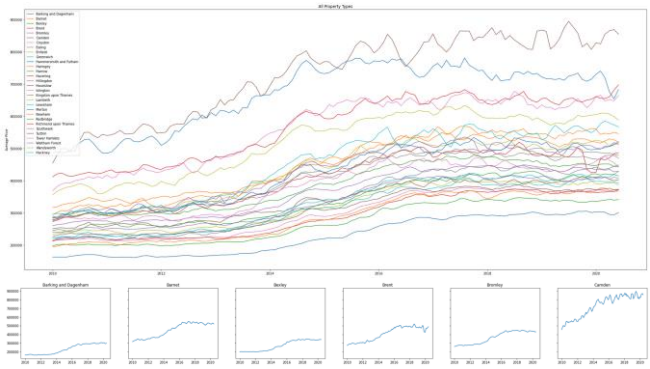
A. *Data Preparation*

1: Identifying missing values/removing missing values.

Firstly, we must look at the data carefully so that we are able to identify any missing values that could potentially distort any analysis. The property price data set for example did have some missing values, some of these values did not have any effect on the data we are using however, the last two rows which include property data for July 2020 and August 2020 have a considerable amount of missing values and therefore in an effort to preserve the reliability of the data, these two months have been removed.
This was a tough decision as the COVID-19 data which will be used for analysis only January 2020 and there is data available until October 2020. However, initial analysis of the data does suggest there are some interesting trends from January 2020 and June 2020, which this report will focus on.

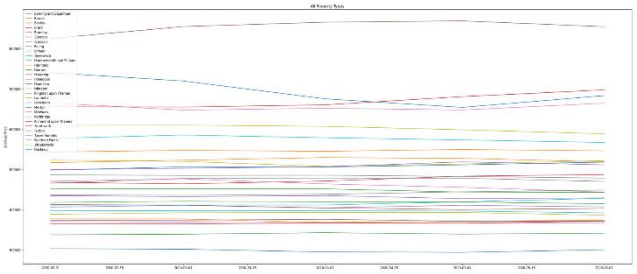
2: Combining and pre-processing data from all London boroughs.

Although there is data available on COVID-19 infection rates and property sold prices for London as a whole, it is important to look deeper into each local authority of London for analysis. There are thirty-two boroughs plus the City of London district which make up London and therefore thirty-three data sets. Instead of checking each one of these data sets one at a time for missing values, the data was combined into a single csv file which was able to quickly give more information about the data.



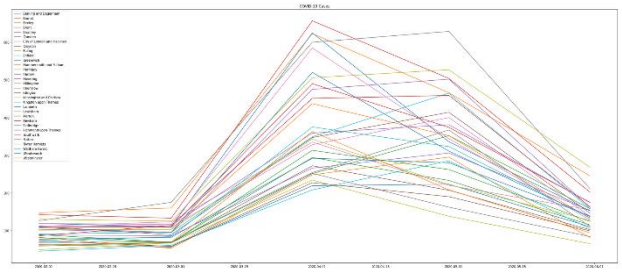
3: Filtering COVID-19 and Property Price data to be within the same time scale.

As previously mentioned, there were missing values in the property price data sets and therefore the months of July and August 2020 were removed, these data sets provide property price information to as far back as 2010 until June 2020.
The COVID-19 data on the other hand provides infection rates from February 2020 until October 2020.
Therefore, to enable analysis these data sets were placed



within the same time scale, from February 2020 until June 2020.
This filtering process was completed on the data sets including COVID-19 and Property data for London as well as for each individual borough of London to enable further analysis as a later stage.

Data sets also had to be resampled so that data could be represented in a way that aids analysis between COVID-19 and Property data. The data sets containing property data were on a monthly basis, whereas the COVID-19 data was daily. Therefore, the COVID-19 data was resampled into monthly data.



B. *Data Derivation*

4: Calculating changes in Price and COVID-19 rates of infection.

A percentage change column was created for both COVID-19 and Property data to determine which boroughs had the most/least change in property price and COVID-19 transmissions. This allowed for further analysis of specific boroughs to determine the reasons for this change or lack thereof.

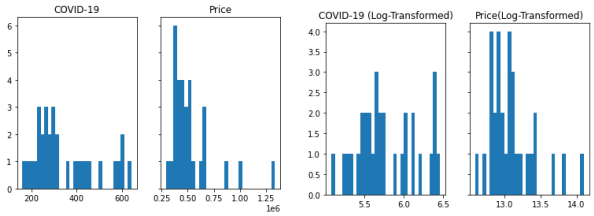
The percentage change in property price for all boroughs of London was also calculated to determine the difference between 2020-03 and 2020-05. This allowed us to delve further into boroughs which maybe did not behave as expected.

C. *Construction of Models*

5: Linear regression

We began by building a linear regression model for the smaller data set containing aggregated data for London as a whole. As suspected initial results suggest heteroscedasticity meaning there is a high likelihood that the coefficient estimates are less accurate. The model slope describes how an increase in 1 COVID-19 infection would decrease the Property Price by £0.11. Since the data is not normally distributed a log transformation was applied and the data was visualized with a second-order curve.

However, as the data was monthly it only allowed for five data points from the datasets and therefore a model was created for a cross-sectional analysis off all boroughs of London during the peak of COVID-19 transmission.
For the cross-sectional regression model, we initially utilized the data without transforming it to allow for more accurate and easily interpretable results.
However, as the was skewed, the data was also log-transformed, and a model was also built from this data as it now had a more normal distribution. Creating multiple models like this allowed for easier interpretability as well as enabling selection of best models.



Therefore, in total four linear regression models where built. The first two model looked at datasets containing aggregated data (smaller datasets).
The other two were cross-sectional linear regression models using a dataset that contained data for each borough of London (larger datasets).

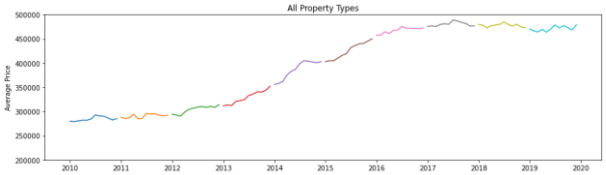
D. *Validation of Results*

6: K-fold cross validation

K-fold cross validation was selected as it shuffles the dataset and splits the dataset into groups, which are split into test and training groups, then a model is fit on the training set and evaluated. This is done several times (or folds) and reports results from each run. This form of validation has been used in all models created and is a great tool to estimate the accuracy and even any detect overfitting in a model.
The scatterplot demonstrates that there is a negative correlation between the variables. The regression lines look quite similar so it suggests that the model isn't overfitting and is appropriate to be generalizable.

IV. FINDINGS, REFLECTIONS AND FURTHER WORK

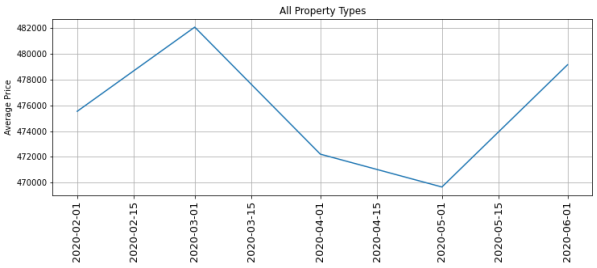
In January 2010 the average property price in London (for all property types) was £279,724, as of January 2020 the average property price in London is £477,440, that's in increase of 41.14%.



Between 2012 and 2017 was were the highest rise in price is seen. The average property price in January 2012 was £294,360, in 2017 this average property price increased to £475,619, a 38% increase.

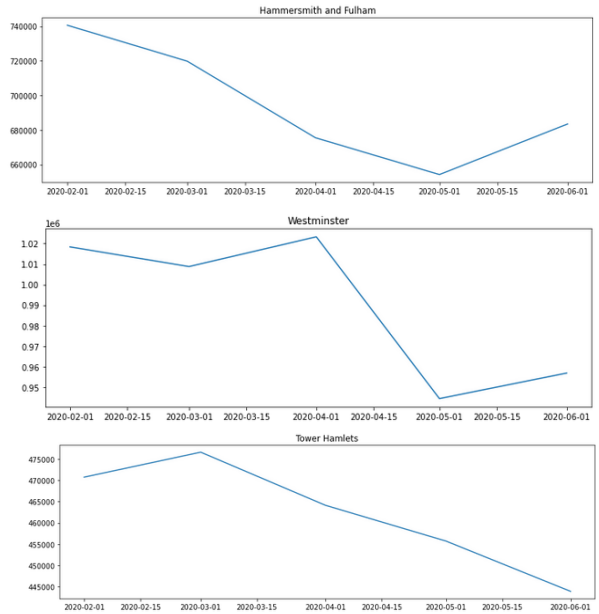
It was during 2017 that London property prices peaked in comparison to the rest of the UK, where property prices in London were 154% higher than the rest of the UK.

There is speculation as to why prices rose so sharply, it may have been due to the stronger levels of immigration and population growth in London as well as interest rates being at record lows.



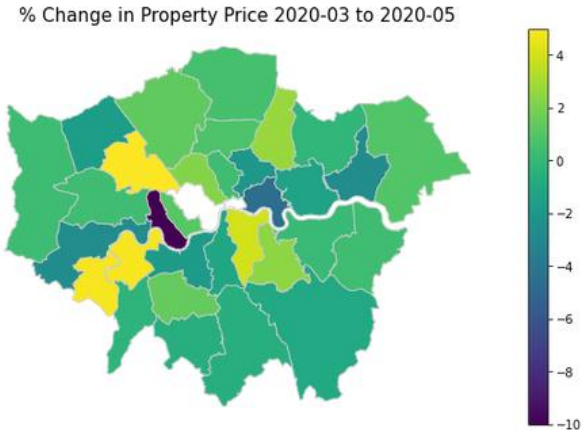
As you can see in the graph above, there was a sudden drop in property prices for March 2020, however, prices quickly and sharply began to rise again from May 2020.
But was this the case for all boroughs of London?

During 2020 most boroughs of London did see a drop in property price between 2020-03 and 2020-05 some of the worst hit were; Hammersmith and Fulham (-9.11%), Westminster (-4.79%) and Tower Hamlets (-4.39%).

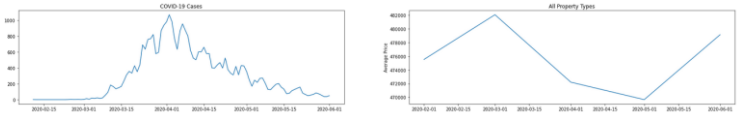


On the other hand, the average property price for some boroughs have continuously increased between the same time period. This could suggest that either COVID-19 infection rates were low in these boroughs or there are some other factors at play.
London boroughs where property price has been increasing include; Brent (+4.11%), Richmond upon Thames (+3.98%) and Southwark (+3.19%).

In terms of average property price between March 2020 and May 2020 the data demonstrates that 16 boroughs saw an increase in price (+20.8% in total) and 16 saw a decrease (-35.76% in total).

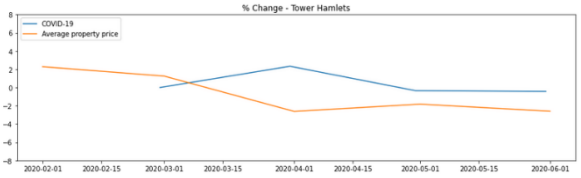


The graphs below demonstrate a negative correlation, COVID-19 could have directly or indirectly contributed to the decrease in the average London home.

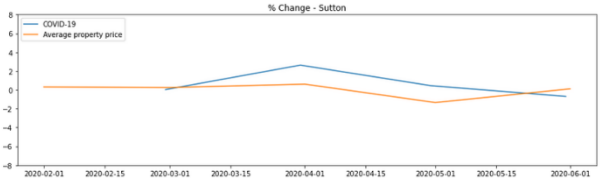


When comparing percentage changes in property price with percentage changes in COVID-19 rates of infection on most boroughs of London there were some noticeable trends:

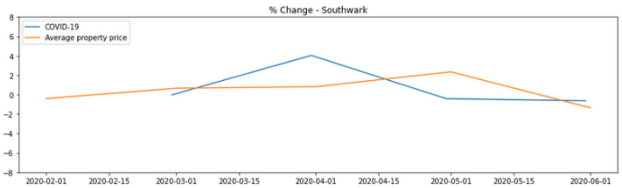
1. As soon as the rate of infection began to increase, price immediately begins to drop.



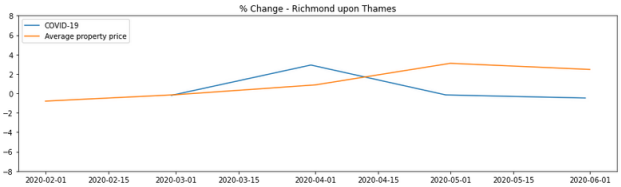
2. Some borough property prices only began to drop upon reaching the peak of COVID-19 infection.



3. Other boroughs property prices continued to rise through the start of the pandemic and the peak only to begin dropping after May 2020.



4. Finally, there were the select few boroughs where property price continued to rise from February 2020 until June 2020.

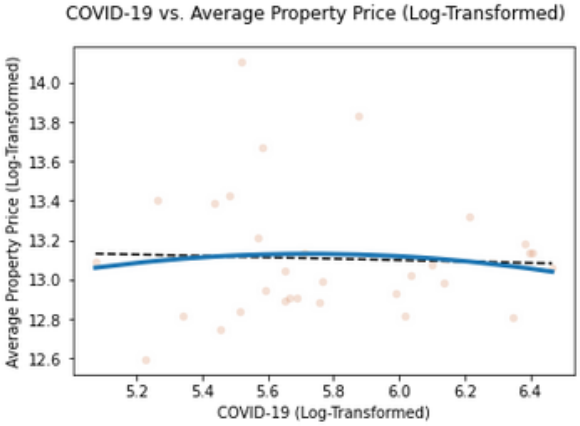


The data indicates that COVID-19 has had an impact in most London Borough property prices, however, some boroughs were more sensitive to changes in demand caused by the rising cases of COVID-19 or the lockdown that soon followed it.

The results from all four linear regression models showed an albeit small but present negative correlation between the dependent (property price) and independent (COVID-19) variables.

For the models created using the smaller data set which included data for London as a whole, the R2 value described only between 0.03 and 0.04 (Log-Transformed) of the variance in Property Price being due to COVID-19.

For the cross-sectional models using the larger data sets showed R2 values between 0.01 and 0.002 (Log-Transformed).
In this case it demonstrates that only a very small amount of the variance is responsible by the independent variable (COVID-19).



It would be interesting to test other socio-economic factors to determine other factors that would have an impact on price, as this report did not cover many other aspects that could have impacted price in detail.

REFERENCES

Coronavirus (2020) *Who.int*. Available at: https://www.who.int/health-topics/coronavirus#tab=tab_1 (Accessed: 14 December 2020).

UK House Price Index (2020) *Landregistry.data.gov.uk*. Available at: https://landregistry.data.gov.uk/app/ukhpi/browse?from=2019-11-01&location=http%3A%2F%2Flandregistry.data.gov.uk%2Fid%2Fregion%2Funited-kingdom&to=2020-11-01&lang=en (Accessed: 15 December 2020).

Official UK Coronavirus Dashboard (2020) *Coronavirus.data.gov.uk*. Available at: https://coronavirus.data.gov.uk/ (Accessed: 15 December 2020).

Interpreting Log Transformations in a Linear Model | University of Virginia Library Research Data Services + Sciences (2020) *Data.library.virginia.edu*. Available at: https://data.library.virginia.edu/interpreting-log-transformations-in-a-linear-model/ (Accessed: 16 December 2020).

(2020) *Globalpropertyguide.com*. Available at: https://www.globalpropertyguide.com/Europe/United-Kingdom/Price-History (Accessed: 15 December 2020).

Timeline of key coronavirus events since the UK was put into lockdown six months ago (2020) *The Independent*. Available at: https://www.independent.co.uk/news/uk/home-news/coronavirus-uk-timeline-lockdown-boris-johnson-pubs-test-and-trace-vaccine-b547630.html (Accessed: 17 December 2020).

Marsden, J. (2015) "House prices in London – an economic analysis of London's housing market", *GLAECONOMICS*.

WORD COUNTS	
Abstract	***106/150 words***
Introduction	***211/300 words***
Analytical Questions and Data	***292/300 words***
Analysis	***893/1000 words***
Findings, Reflections and Further Work	***596/600 words***
TOTAL:	***2,098/2,350 words***