

# HOUSE PRICE AND AFFORDABILITY IN REGIONS OF ENGLAND AND WALES

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## 1. INTRODUCTION

House price has changes dramatically over the past few years. Such changes are drawing attentions as they are leading to housing affordability issues. For example, house price in London increased drastically these years, as a result, house price is becoming unaffordable to most of the residents. Analysis of how the house price changed and to what extent the affordability is affected by that changes is provided.

This paper is intend to explore this issue based data about house prices and affordability measurements. In general, there are four sections, Initial Question, Data Processing, Information Visualisation and Evaluation. In Initial Questions section, issues related to house prices will be discussed therefore research questions will be proposed. As for Data Processing part, information about dataset used in this paper will be briefly introduced and how it was processed and data cleaning and transformation process will be explained. Visualisation strategies will be discussed in Information Visualisation section alongside visual encoding. As for the Evaluation part, justifications of choice of visual encodings and strategies will be provided and also the general reflection of development process.

## 2. INITIAL QUESTIONS

As mentioned above, the increase of house price lead affordability concerns. A better understanding of the house market, and affordability of the locals are necessary to study this issue. For instance, how the house price changed and to what extent that change has influenced affordability. Hence the research questions are proposed as follow.

1. How the mean house price across the regions changed from 2000 onward and Which region has cheapest house.
2. How the ratio of house price to workplace-based earnings changed from 2000 onward and which region has the most affordable houses.
3. How the house price and affordability was affected by the economy crisis in 2008.

## 3. DATA PROCESSING

The dataset, obtained from office for national statistics, contains annual data from 1997 to 2018 about the median house price across regions of England and Wales, the median gross annual earnings based on working place associated with different regions and the ratio of median house price to median gross annual earnings.[1] [2] In each part, only annual data is provided.

The data is grouped by regions, counties and local authorities. Data of median house price, median affordability ratio and lower quartile house price is provided for each group. The affordability ratio refers to the ratio of house price to annual gross earnings. In this case the Affordability ratio was calculated as the ratio of median house price to annual gross workplace-based earnings. (work-based earnings refers the earnings based on where a person work and does not necessarily reveal the earnings of the local residents.)

Data cleaning and filtering process is essential for the project as the dataset has quite a few garbage data. As those initial questions suggest, data from 2000 to 2018 will be preserved and analysed, therefore, data out of this range will be purged. As the data provided is completed so the missing data problem does not need to deal with. Since the data is also consistant, the entity resolution will not be a problem.

Type conversion is an issue specifically related to the R programming language. The original data came in xls form with the correct type for each category of data. But when loading those data into R, the default data type was character. This issue may cause severe problem whrm performing numeric analysis and visualisation. Therefore, data of house price, affordability ratio and data indicating time need to be converted into numeric type.

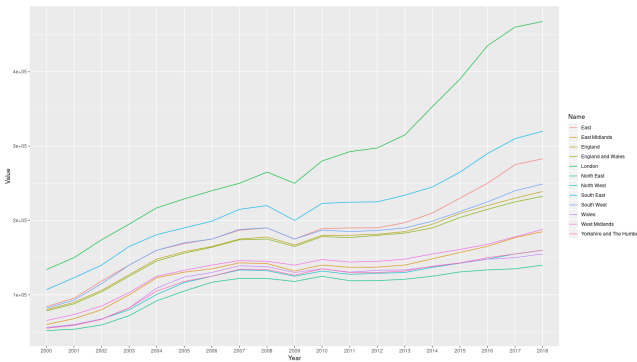
As the the annual data is presented seperately in different columns, transformation is needed for further data analysis. The original data was put seperately in columns by each year, which would be difficult to analyse changes based on timeline. Hence, the data was trnasformed into three-column form. Name of region, year, and the actual values of price (or earnings, or ratios) were in three individual column.

## 4. INFORMATION VISUALISATION

In this section, all three initial question proposed earlier will be discussed with visualisation. For each question, visualisation strategies and visual encoding will be explained in detail and critical discussions of visualisation design will be included in this section. After the three initial questions were explored, exploratory process of proposing new question and visualisation of that question will be explored.

### 4.1. House Price Visualisation

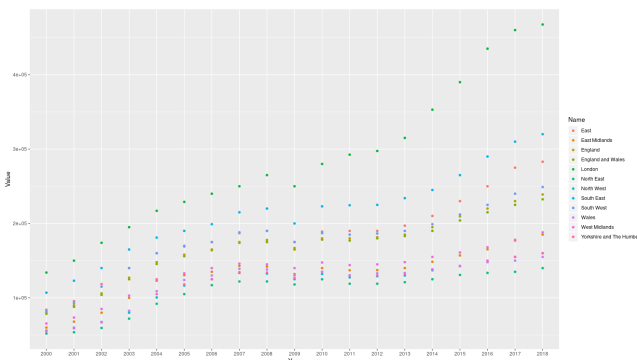
As mentioned earlier, the first question is intend to examine how the house price changed from 2000 to 2018 and to further probe which region has the lowest house price. As data processing operations described above. The first graph can be obtained.



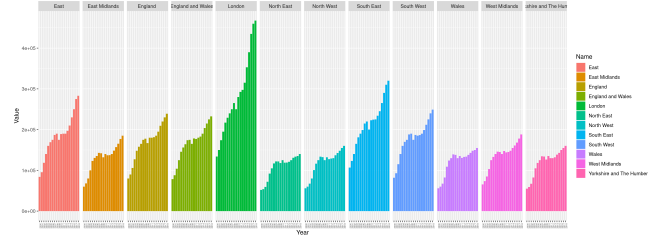
Question 1: Result 1

This line graph illustrate the median house prices in nine regions of England and Wales from 2000 to 2018. England and Wales are also treated as regions and also England and Wales combined. Therefore, there 12 lines in the graph that represent 12 regions individually.

The overall tendency of change for all regions is quite similar. Although fluctuated for a few years, the median house price in 12 regions was all increased from 2000 to 2018.

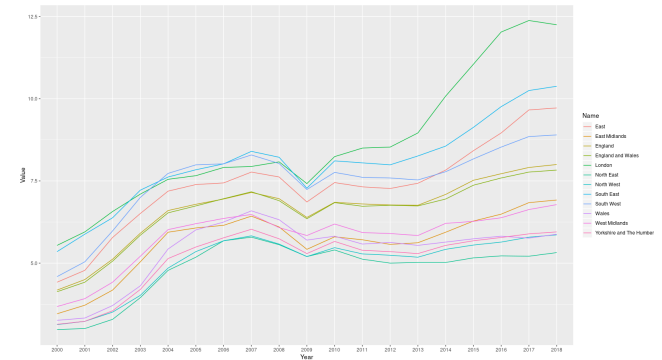


Question 1: Result 2

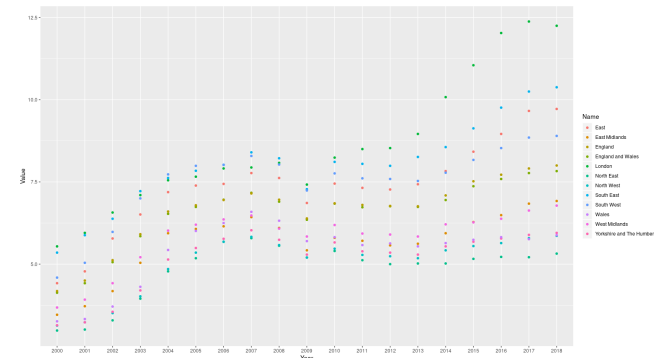


Question 1: Result 3

### 4.2. Affordability Visualisation



Question 2: Result 1

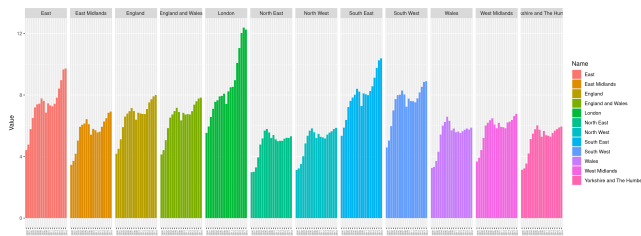


Question 2: Result 2

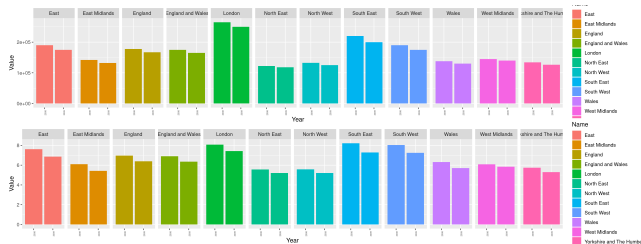
### 4.3. Impact of Economy Crisis

### 4.4. Correlation Coefficients of House Price

## 5. EVALUATION



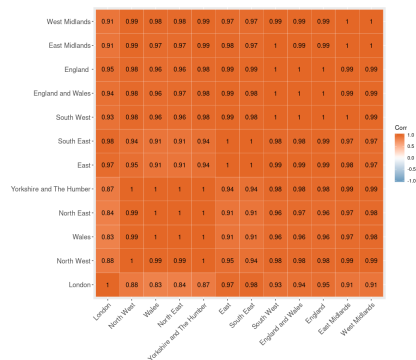
Question 2: Result 3



Question 3: Result

## References

- [1] N. Henretty, *Housing affordability in england and wales: 2018*, Mar. 2019. [Online]. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/housingaffordabilityinenglandandwales/2018>.
- [2] —, *Dataset:house price to workplace-based earnings ratio*, Mar. 2019. [Online]. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/ratioofhousepricetoworkplacebasedearningslowerquartileandmedian>.



Correlation Coefficients: Result