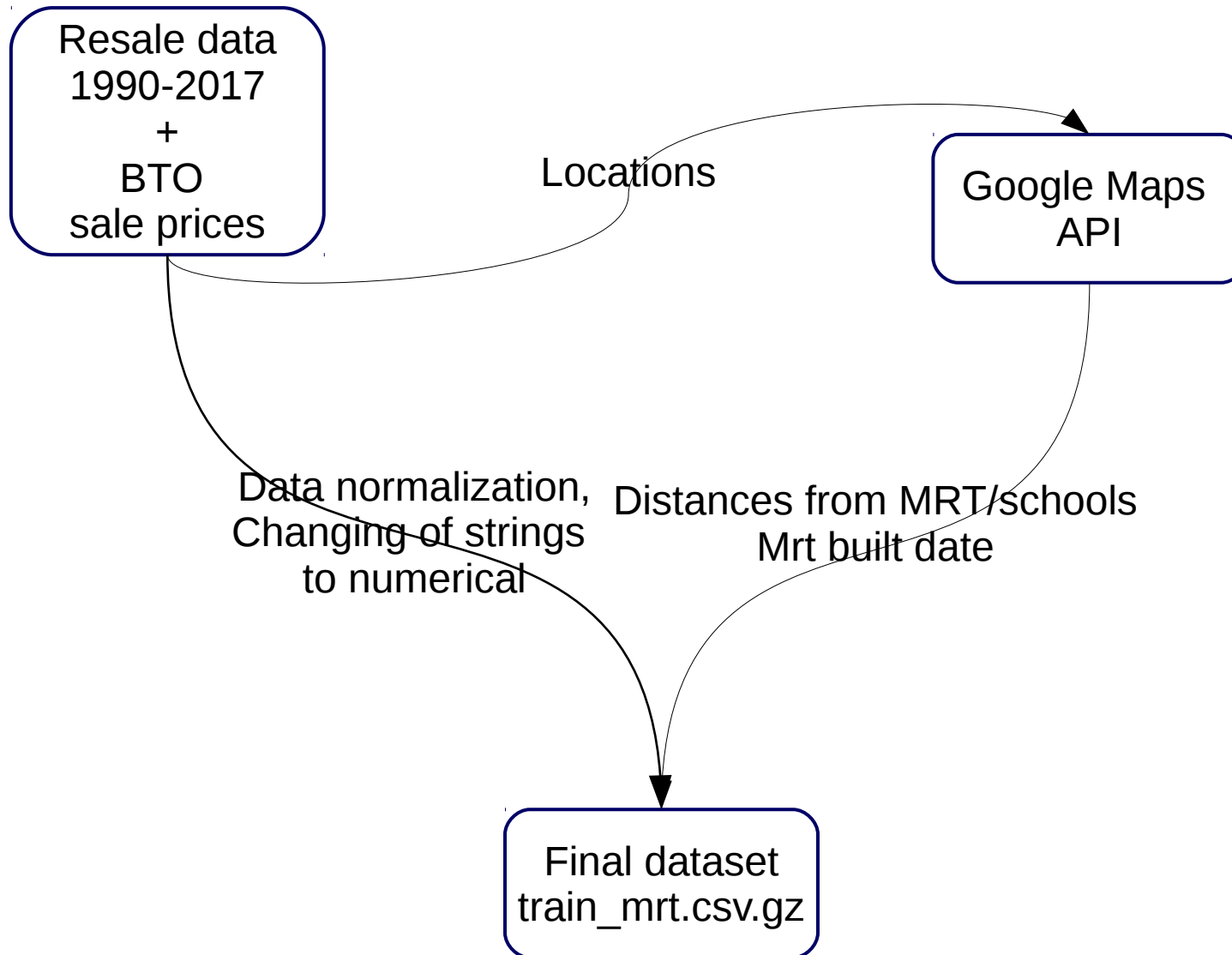# Resale HDB prices

Data sources

- https://data.gov.sg/dataset/resale-flat-prices from year 1990-2017
- Google maps API data for geospatial cordinates
- Wikipedia for MRT and primary school data

Data processing

Resale data
1990-2017
+
BTO
sale prices

Google Maps
API

Locations

Final dataset
train_mrt.csv.gz

Data normalization,
Changing of strings
to numerical

Distances from MRT/schools
Mrt built date

File list

- Initial data file

  resale-flat-prices-based-on-approval-date*.csv

- MRT/Primary school location files

  Primary_school, mrt_date.csv, where.data_mrt

- Preprocessed files

  train_mrt.csv.gz

- Scripts

  notebook_preprocess.ipynb

  notebook_analysis.ipynb

Why study HDB prices

- HDB is the largest expense in many people's life

- Study how prices of HDB changes over time

- Learn about the overall trend of HDB prices over the past 40 years

General Prices of HDB

- General trend similar to one reported by gov.data.sg (below)
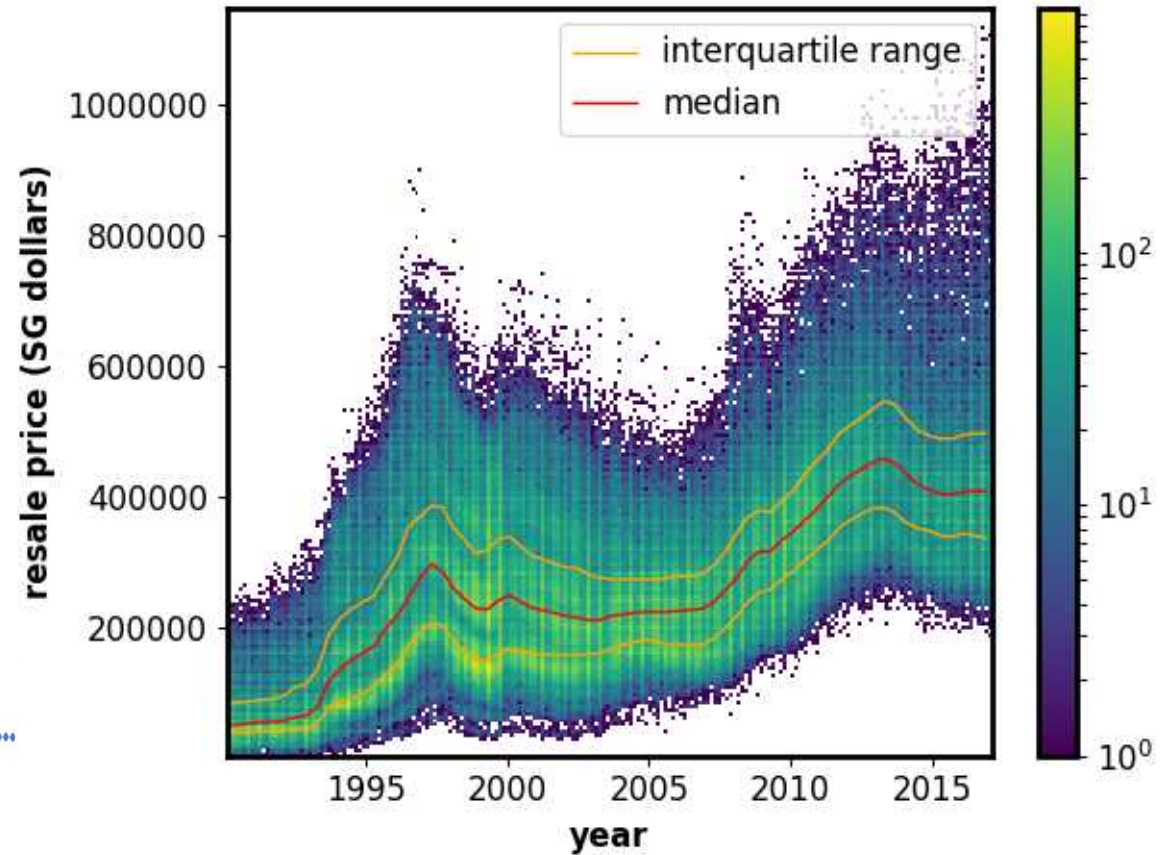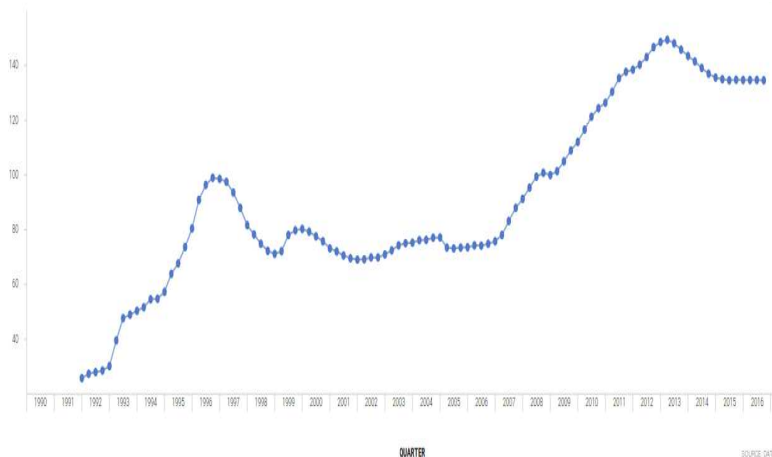
Main predictors of HDB flats

- Variables are month of sale, HDB town, flat type, bock, street name, level of flat, floor area, lease commence date, nearest MRT, consumed lease length, distance to MRT

- Correlation of numerical variables show that floor area and month of sale are most important numerical factors with pearson coefficient of 0.65 and 0.58 respectively.

```
Name: resale_price, dtype: float64
>>> train[['month','storey_range','floor_area_sqm','dist_nearestMRT','Time_since
MRTbuilt','lease_length','resale_price']].corr()['resale_price']
month                0.579766
storey_range         0.174023
floor_area_sqm       0.650346
dist_nearestMRT      0.021082
Time_sinceMRTbuilt   0.295540
lease_length        -0.033021
resale_price         1.000000
Name: resale_price, dtype: float64
>>>
```
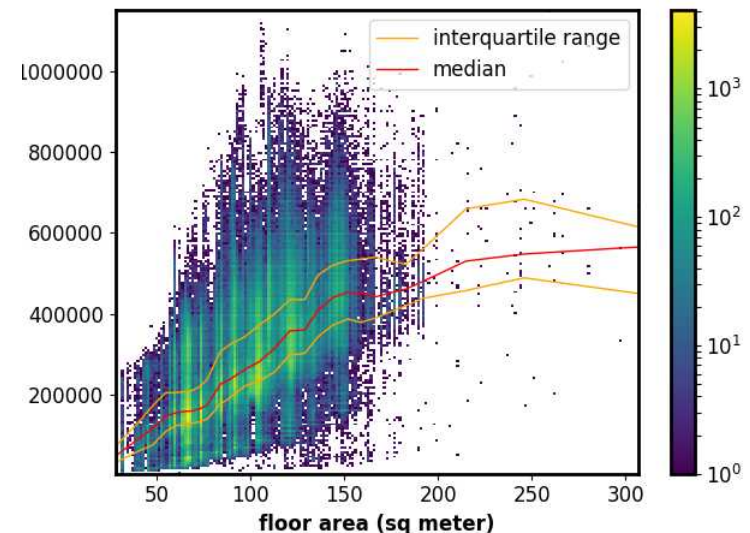
Categorical variables

- Flat type and town were import variables
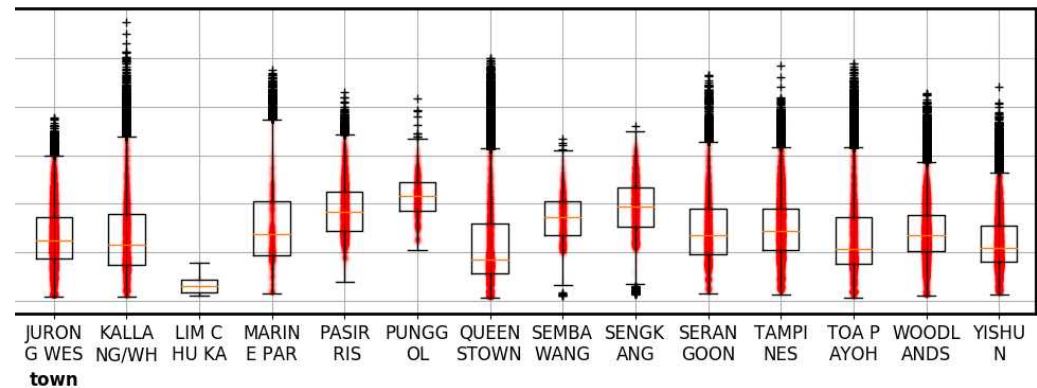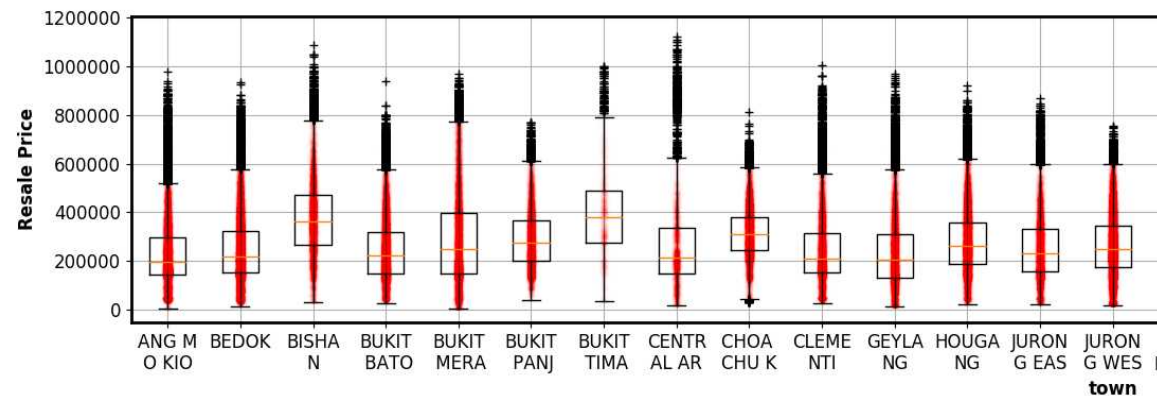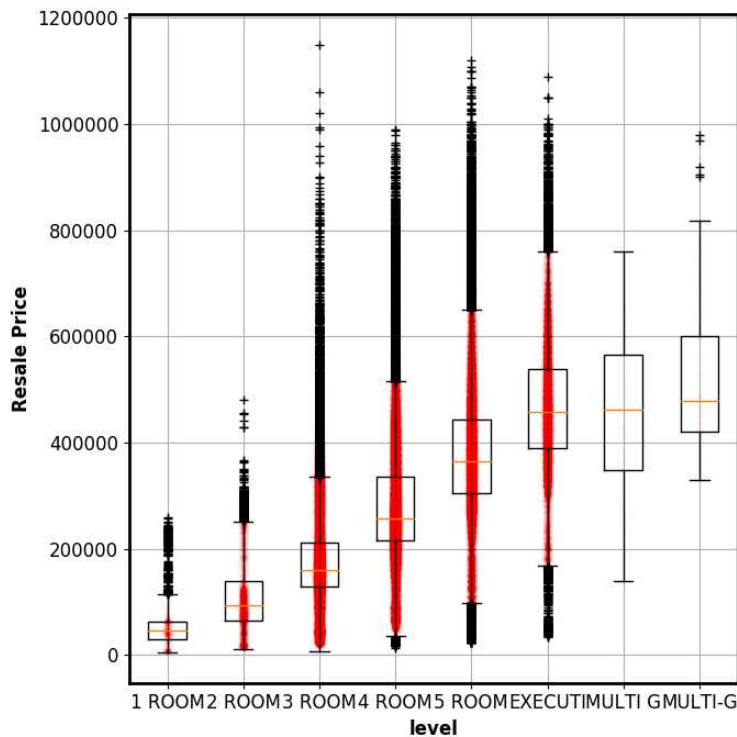
Normalizing the price across years and floor area

- Prices are dependent on inflation and economic climates, we need to normalize across different years.

- Normalized price by area and median resale price per month to get relative price across years
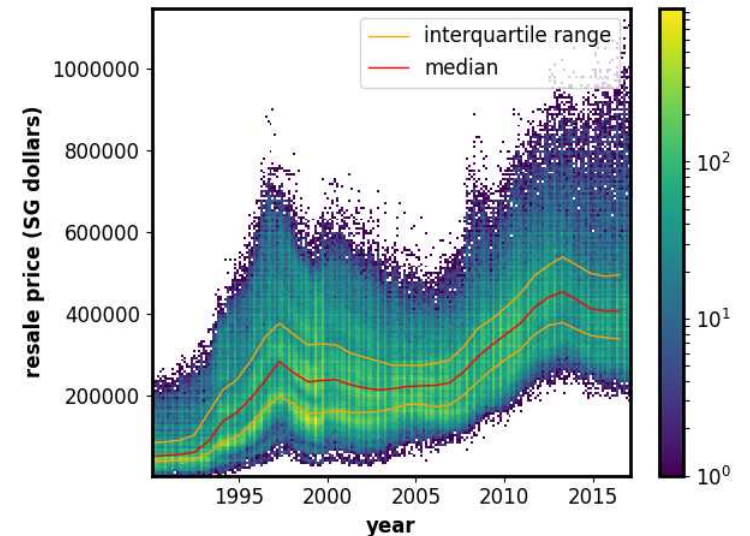
$$Normalized\ Price_{month}/sqm = \frac{resale\ value}{floor\ area * \sum_{month} resale\ value/n}$$

Average resale price for Month

Normalized price per sqm over time

- Peak Prices at 5 year mark and lowest at 20 year mark accounting for inflation and floor area.

- Older flats above 40 years are sold for higher prices than new flats
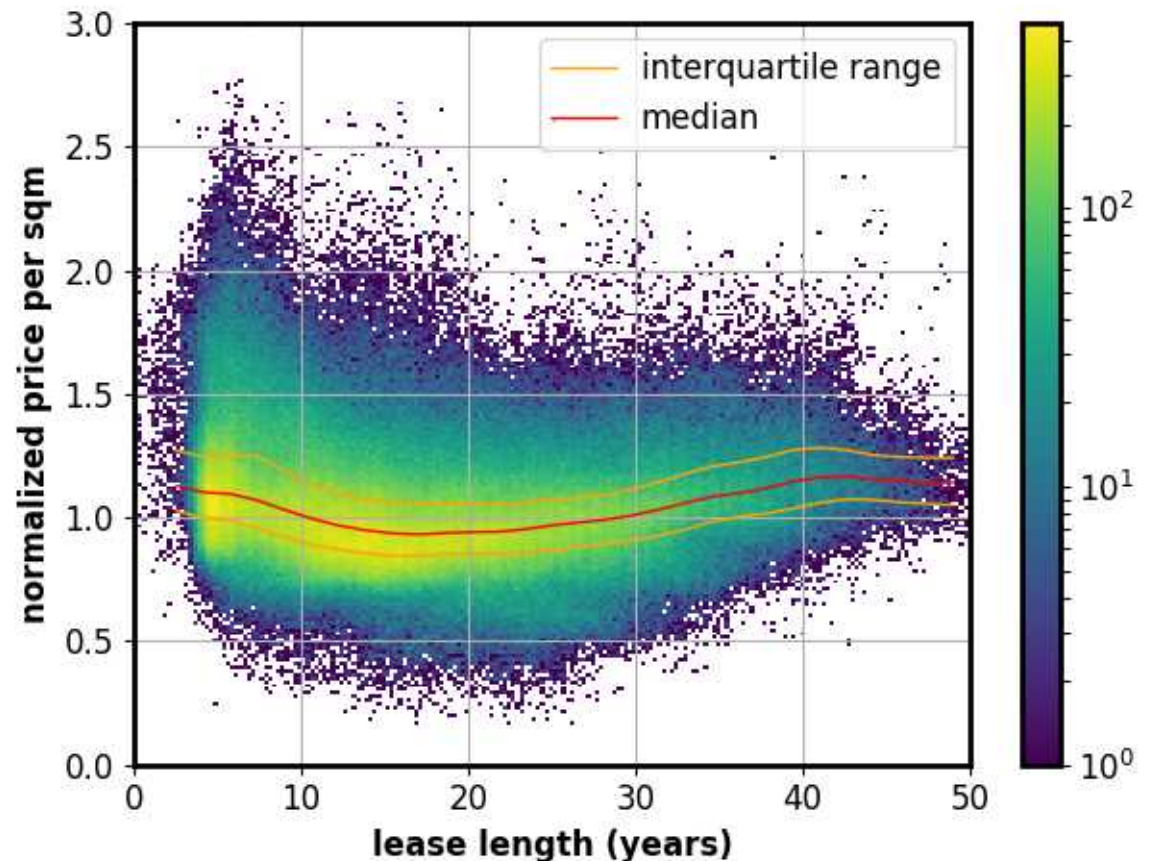
Normalized price per sqm over time (by town)

Legend : 2D histogram plots of normalized price per sqm and lease length of HDB. Red triangles, blue squares and green hexagons are median BTO prices for 3, 4, 5 room flats. Red/orange lines show median/inter-quartile ranges for town while blue lines show median across towns.
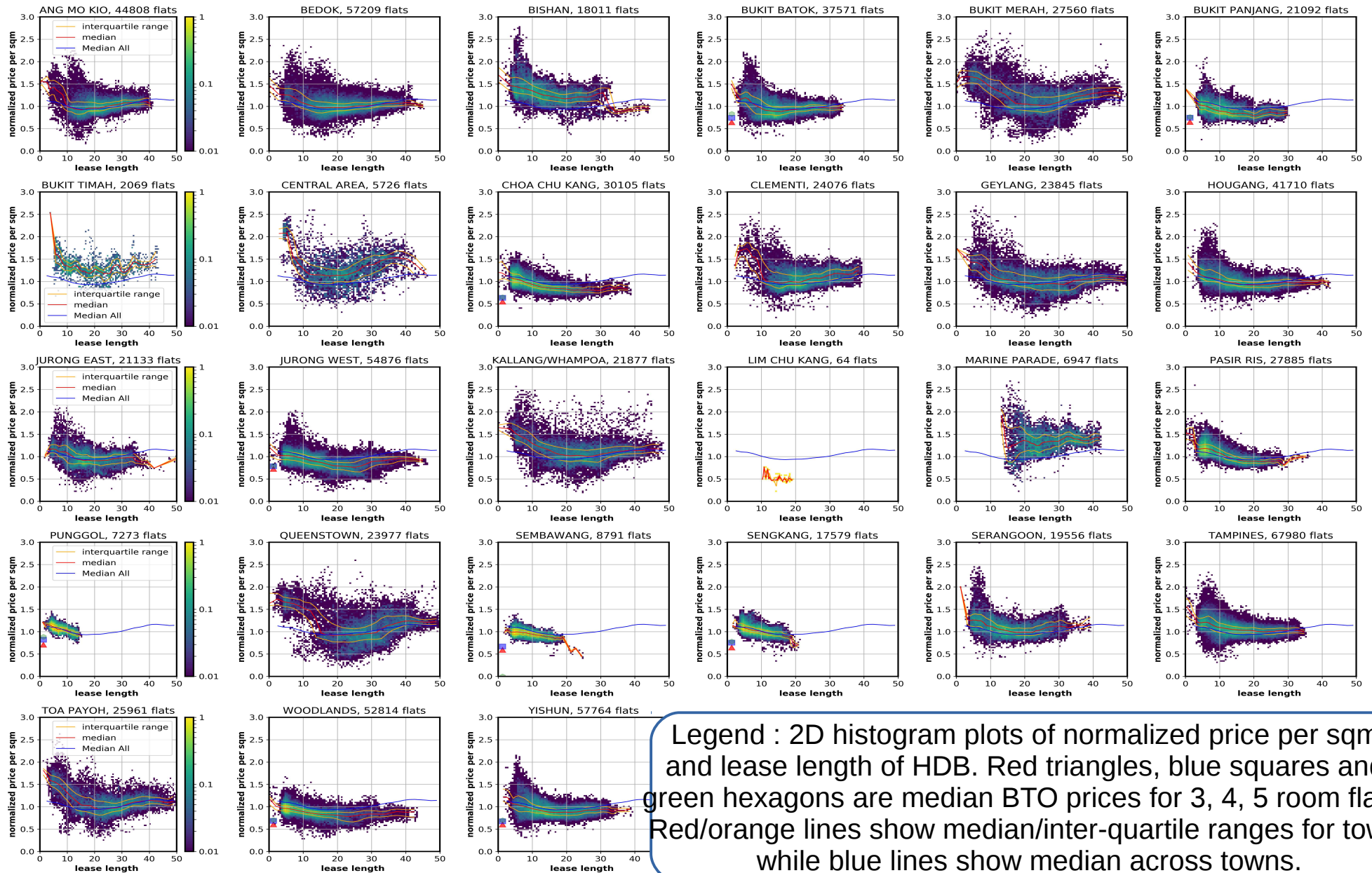
How do flats fare in pricing

- BTOs are lower than most resale flats even comparing with rock bottom prices at 20 year lease.

- Newer estates like Punggol and Sembawang Sengkang show much less variability compared to most mature estates like Ang Mo Kio, Toa Payoh and Queenstown.

MRT effect on HDB prices
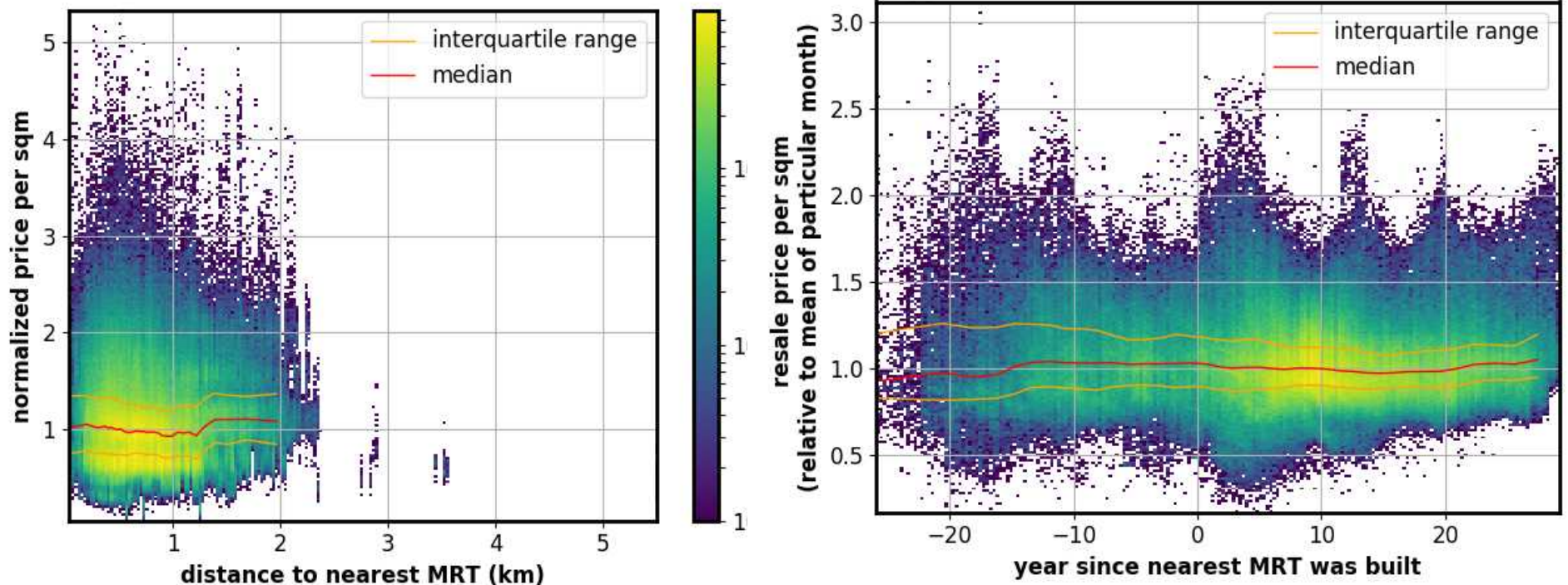
- Building of MRT and distance to MRT does not impact prices per sqm.

Applications of Study

- Investigate trends of data using a normalized measure taking into account inflation and HDB sizes.

- This metric found that relative HDB prices are lowest at twenty years and increases henceforth.

- Future resale prices can be forcasted by obtaining the unnormalized (formula below) price after getting an expert estimate of the mean resale price.

$$Normalized\ Price_{month} / sqm = \frac{resale\ value}{floor\ area * \sum_{month} resale\ value / n}$$

Average resale price of Month can be estimated by experts
This is affected by economic factors and gov policies

Limitations of data

- Current data is based on resale data, which is not truly representation of entire HDB data.

- Size of BTO flat was estimated using medians since it was not given. The prices per sqm meter are thus also estimates.

- It is known that larger HDB flats cost more per sqm meter, this was not taken into account when plotting the prices per sqm per town.

Appendix: Have HDB sizes shrank ?

- HDB flat sizes not shrinking: Khaw Boon Wan

"My comment at that dialogue was in response to a question. I was purely stating that HDB plans (flat sizes) based on certain design norms, and as far as I know, it has not changed for the past 15 years,"

Posted by temasektimes on June 13, 2012

Appendix: HDB resale data

- Taking 15 years back, to 1998 (purple line)

- Flat sizes have been decreasing since 1998, with the decrease mainly from 1998 to 2001

- Flat sizes have not decreased for 10 years since 2001-2012