
Project 2: Singapore Housing Modelling

DSI-41
Constance, Gabriel, Sharifah, Wenzhe

Content

- Background
- Problem Statement
- Analysing the data
- Recommendations
- Consideration of Other Potential Factors affecting Resale Price
- Conclusion



Background



The Housing Development Board (HDB) was setup to tackle the housing crisis in 1960s and now serves as the sole agency for public housing.

HDB homes more than 80% of Singapore residents, across 24 towns and 3 estates.

Key features of HDB's public housing policy includes the sale of public houses to residents, but with a limited 99 year lease and it can be bought back by the government.



Consideration for buyers

Eligibility

- Singapore Citizen or Singapore Permanent Resident

Financing

- Payments that you need to make by using cash and CPF savings
- The amount of housing loan
- CPF housing grant(s)
- No income ceiling for existing resale flats

Other considerations

- Age of Unit
- Flat types and models
- Location
- Amenities available



Consideration for buyers: Flat Types

- Wide range of flat types to suit the space and budgeting needs of different residents
- Variety of features depending on flat type
 - Number of bedrooms
 - Number of bathrooms
 - Size of common spaces (e.g. kitchen, dining, living, study)
 - Utility room / service yard
 - In-house shelter
 - Other design features (e.g. balcony)



Town Areas by HDB



Town Areas by HDB

The Neighbourhood Concept

- shops, schools and integrated facilities

Hierarchy of Facilities

- malls, sport complexes, libraries and CCs

Planning for Connectivity

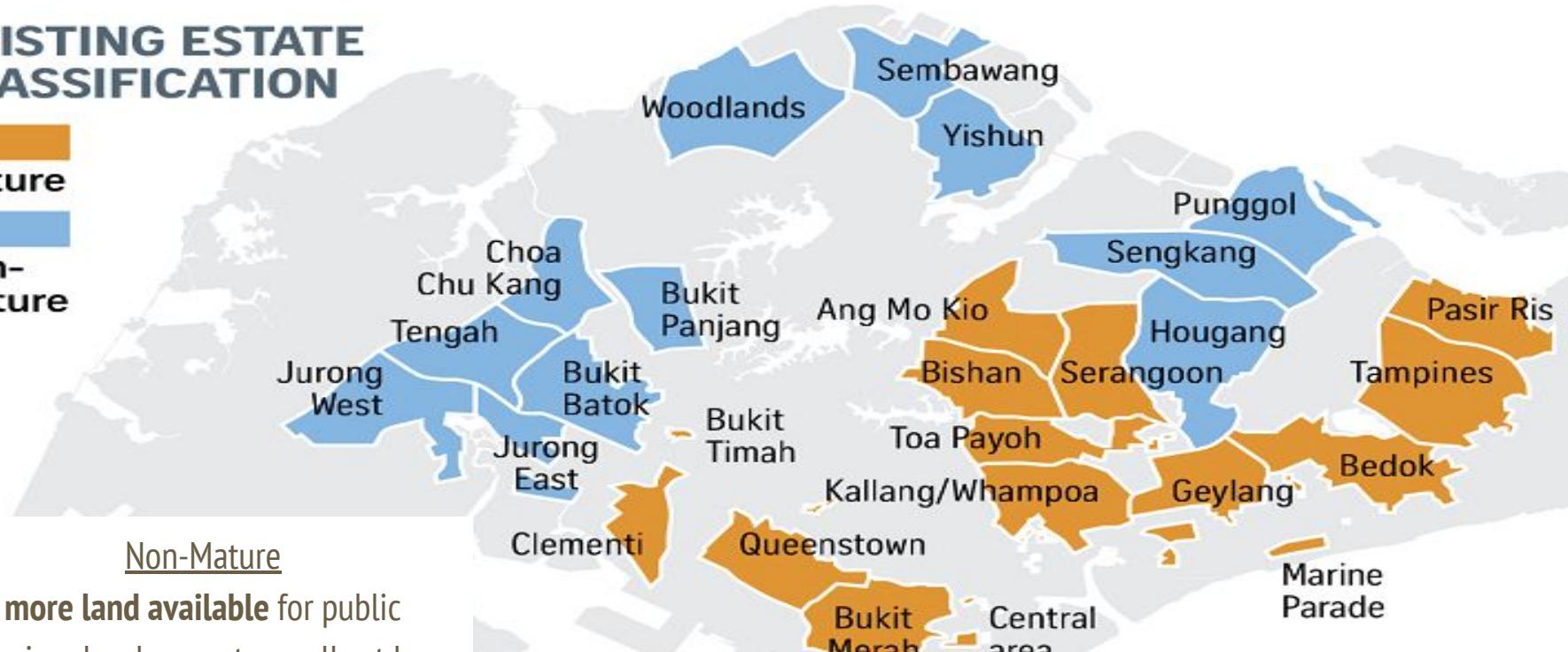
- transport hubs like MRT and bus stations / interchanges, cycling and pedestrian networks

Checkerboard Concept

- mix of high- and low-rise developments like schools and parks for visual and spatial relief



EXISTING ESTATE CLASSIFICATION



Non-Mature
more land available for public
housing development; usually at less
central locations with **fewer amenities**

Mature
land for public housing development was
limited yet demand was high; usually at more
central locations and have **more amenities**

Distribution of Singapore Towns

Region	Mature Towns	Non-mature Towns
North		Sembawang, Woodlands, Yishun
North-East	Ang Mo Kio, Serangoon	Hougang, Punggol, Sengkang
East	Bedok, Pasir Ris, Tampines	
West	Clementi	Bukit Batok, Bukit Panjang, Choa Chu Kang, Jurong East, Jurong West, Tengah
Central	Bishan, Bukit Merah, Central Area, Geylang, Kallang/Whampoa, Marine Parade, Queenstown, Toa Payoh	



Problem Statement

As property buyers in Singapore, the affordability of a HDB unit and potential factors that can influence the price are of interest because this can guide them in their planning process before making a purchase.

We make use of a regression model to give insights to prospective buyers on factors relating to the HDB unit that affect resale prices.



Overview of the Dataset

The Singapore Housing Dataset contains historical data related to resale transactions for Housing Development Board (HDB) flats that took place between the period of March 2012 to April 2021.

This dataset was obtained from the following link:

<https://www.kaggle.com/competitions/dsi-sg-project-2-regression-challenge-hdb-price/data>

Analysing the data - selecting relevant features (I)

Flat-related

Transaction details

tranc_yeарmonth: year + month of resale transaction
tranc_year: year of resale transaction
tranc_month: month of resale transaction

Unit specifications

flat_type: room type (e.g. 3-room)
flat_model: any of 20 possible build layouts (e.g. DBSS)
full_flat_type: 'flat_type' + 'flat_model'
floor_area_sqft: in square feet
floor_area_sqm: in square metres

Storeys

storey_range: e.g. level 07 to 09
mid_storey: median value of 'storey_range'
lower: lower floor within 'storey_range'
upper: upper floor within 'storey_range'
mid: mid-floor within 'storey_range'
max_floor_lvl – highest floor of resale flat

Age of flat

lease_commence_date: year when 99-year lease started
hdb_age: in years, from lease commencement to 2021
year_completed: year construction completed

Dwelling mix

total_dwelling_units - total no. of residential units in blk
1room_sold - no. of such residential units in blk
2room_sold - no. of such residential units in blk
3room_sold - no. of such residential units in blk
4room_sold - no. of such residential units in blk
5room_sold - no. of such residential units in blk
exec_sold - no. of such residential units in blk
multigen_sold - no. of such residential units in blk
studio_apartment_sold - no. of studio apts in blk
1room_rental - no. of such rental units in blk
2room_rental - no. of such rental units in blk
3room_rental - no. of such rental units in blk
other_room_rental - no. of such rental units in blk

Location of flat

town – one of 24 HDB towns
block – block number of resale flat
street_name: of resale flat
address: 'block' + 'street name'
postal – 6-digit postal code
latitude – of flat location
longitude – of flat location
planning_area – any of 32 URA planning areas

Analysing the data - selecting relevant features (II)

Amenities-related

General

residential – whether blk has residential units?
commercial – whether blk has commercial units?
multistorey_carpark – whether blk has such carpark?
precinct_pavilion – whether blk has pavilion?

Market / Hawker

market_hawker – whether flat has market/hawker centre?
hawker_nearest_distance – in metres
hawker_within_500m – no. of such hawker ctrs
hawker_within_1km – no. of such hawker ctrs
hawker_within_2km – no. of such hawker ctrs
hawker_food_stalls – no. of such stalls in nearest hawker ctr
hawker_market_stalls – no. of such stalls in nearest hawker ctr

Mall

mall_nearest_distance – in metres
mall_within_500m – no. of such malls
mall_within_1km – no. of such malls
mall_within_2km – no. of such malls

MRT

mrt_nearest_distance – in metres
mrt_name – of nearest one
bus_interchange – whether nearest MRT is also bus interchange?
mrt_interchange – whether nearest MRT is also train interchange?
mrt_latitude – of nearest one
mrt_longitude – of nearest one

Bus

bus_stop_nearest_distance – in metres
bus_stop_name – of nearest bus stop
bus_stop_latitude – of nearest bus stop
bus_stop_longitude – of nearest bus stop

Schools

pri_sch_nearest_distance – in metres
pri_sch_name – of nearest pri sch
vacancy – no. of vacancies of nearest pri sch
pri_sch_affiliation – whether nearest pri sch has affiliated sec sch?
pri_sch_latitude – of nearest pri sch
pri_sch_longitude – of nearest pri sch
sec_sch_nearest_dist
sec_sch_name – of nearest sec sch
cutoff_point – PSLE cut-off of nearest sec sch
affiliation – whether nearest sec sch has pri sch affiliation?
sec_sch_latitude – of nearest sec sch
sec_sch_longitude – of nearest sec sch

Analysing the data - selecting relevant features (III)

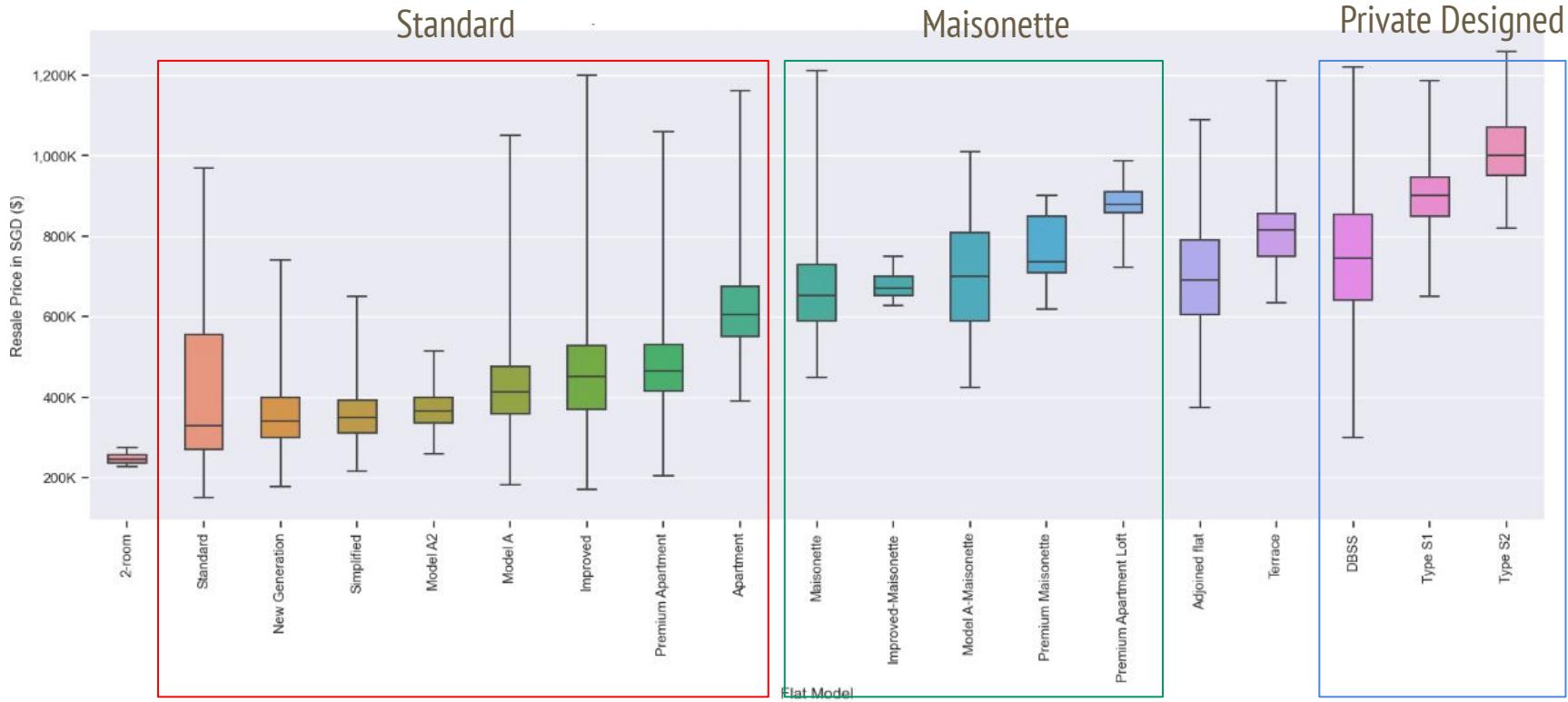
- Keeping only key housing features that are as unique as possible, i.e. excluding features that relate to duplicated housing-related aspects
- Keeping analysis to data-points that represent typical relationships with resale prices
 - Exclusion of uncommon resale types that may affect our pricing analysis:
1-room flats/Multi-gen flat-types; Terrace/Adjoined flat models
- Grouping granular categories into broader ones so that our model does not become overly complex
- Computing new features based on domain knowledge:
 - Age of HDB flat at transaction
 - Units per floor (i.e. dwelling density)
 - Has rental units or not
 - Town region
 - Model category

New Features

Name of feature	Remarks
Age of HDB at Transaction	Transaction year - Lease commencement year
Units per floor (dwelling density)	Average number of units in each floor of the block (total dwelling units divided by max floor level)
Has rental or not	Whether the block has <i>any</i> rental units
Town region	Region and maturity of HDB estate as defined by HDB <ul style="list-style-type: none">- North (Non mature)- South (Non mature, Mature)- East (Mature)- West (Non mature, Mature)- Central (Mature)
Model category	Broad categories of flat models available <ul style="list-style-type: none">- Standard- Maisonette- Private Designed

New Features

Example: Re-classifying ‘Flat Model’ into broader categories



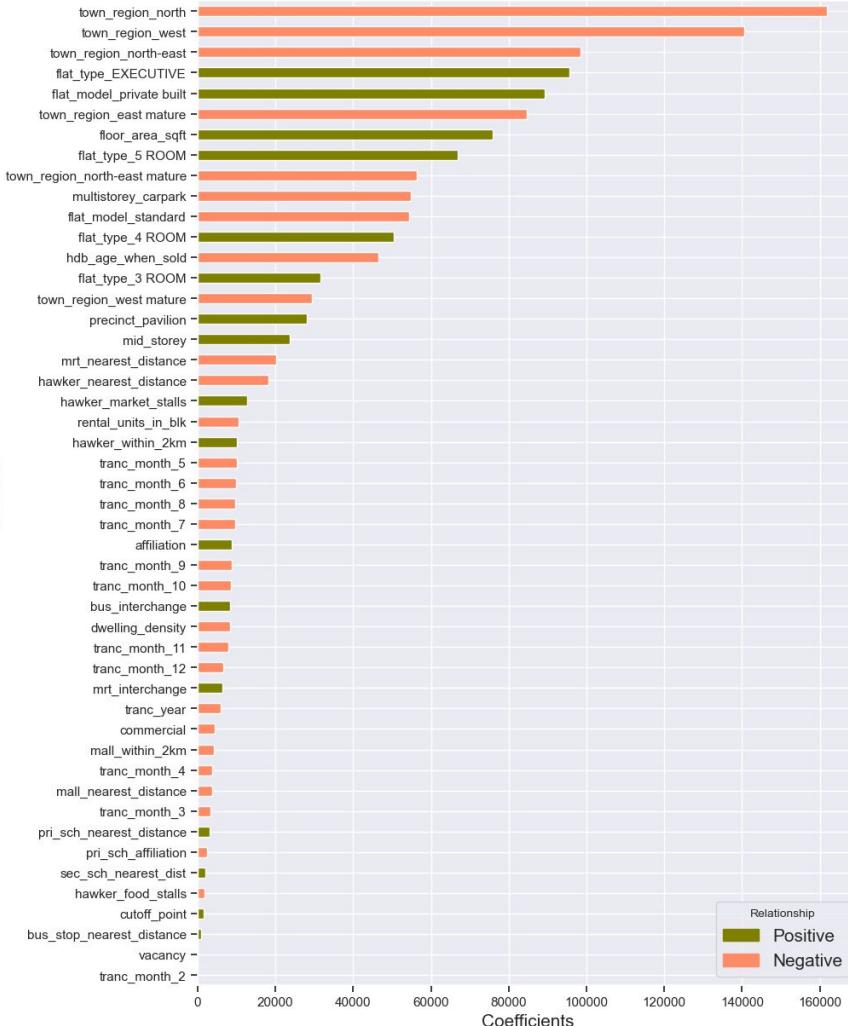
New Features

Example: Re-classifying 'Flat Model' into broader categories

'Model Category' (Newly defined)	Description	Flat models included
Standard	<ul style="list-style-type: none">- 'basic' flat models with slightly different layout or characteristics- represents the bulk of HDB flats sold	'Standard', 'New Generation', 'Simplified', 'Model A', 'Model A2', 'Improved', 'Apartment', 'Premium Apartment'
Maisonette	<ul style="list-style-type: none">- HDB flats with two floors	'Maisonette', 'Improved-Maisonette', 'Model A-Maisonette', 'Premium Maisonette', 'Premium Apartment Loft'
Private Designed	<ul style="list-style-type: none">- designed by private developers- typically with unique external features, e.g. balconies; full-length glass windows	'DBSS', 'Type S1', 'Type S2'

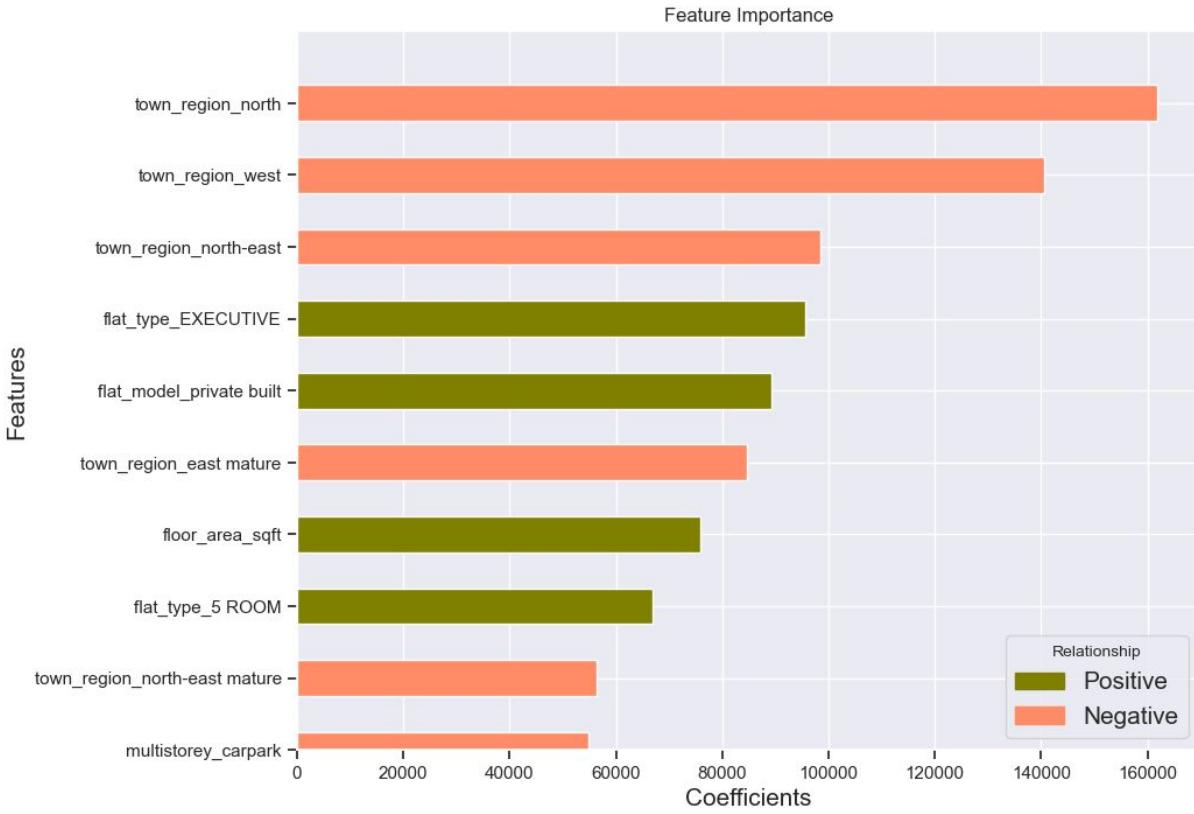
General Findings

- These are the list of features we considered
- Arranged the features in magnitude order of their importance
- Green colour: These features drive resale prices higher
- Orange colour: These features cause resale prices to drop



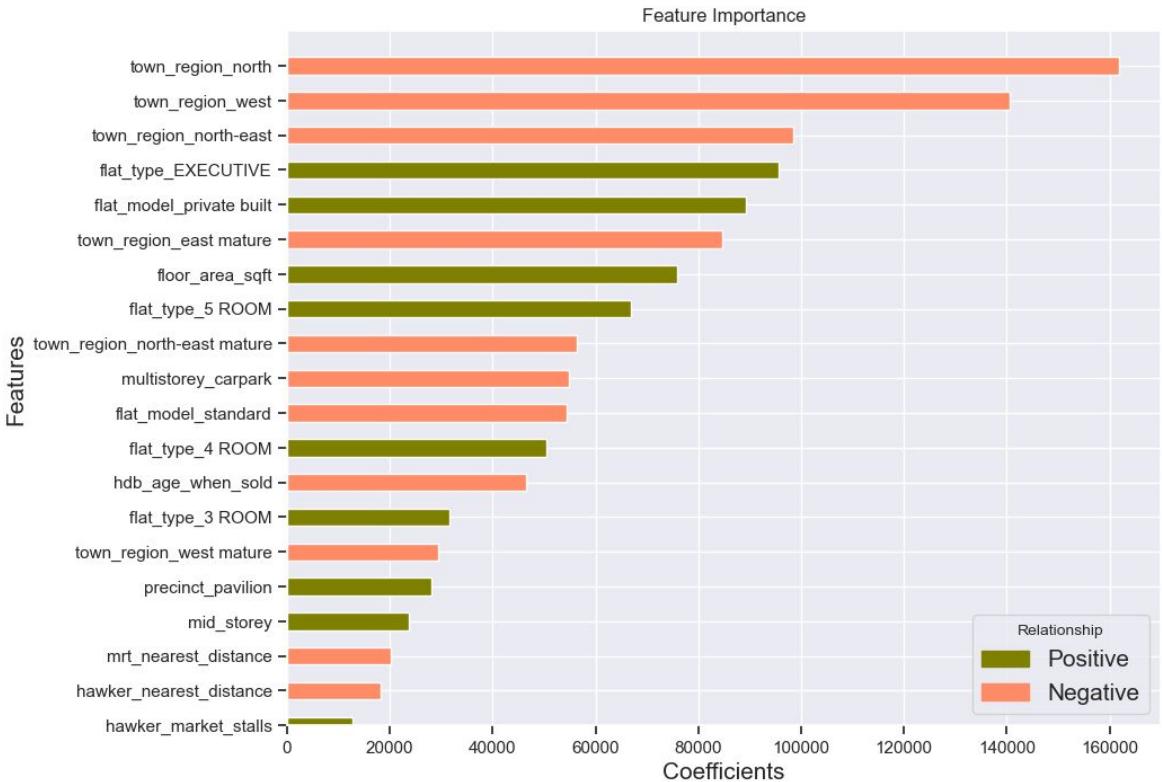
Top 10 features

1. Flats in the North (non-mature)
2. Flats in the West (non-mature)
3. Flats in the North-east (non-mature)
4. Executive flat type
5. Private built flat models
(DBSS, Type S)
6. Flats in the East
7. Floor Area (Sqft)
8. 5 Room flat type
9. Flats in the North-east (mature)
10. Multi-storey carpark presence



Top 10 categories

1. Town Region
2. Flat type
3. Flat model
4. Floor Area (Sqft)
5. Multi-storey carpark presence
6. HDB age at transaction
7. Precinct pavilion presence
8. Mid storey of resale flat
9. MRT nearest distance to flat
10. Hawker nearest distance to flat



Recommendations

For the
budget-conscious



For the
family-oriented



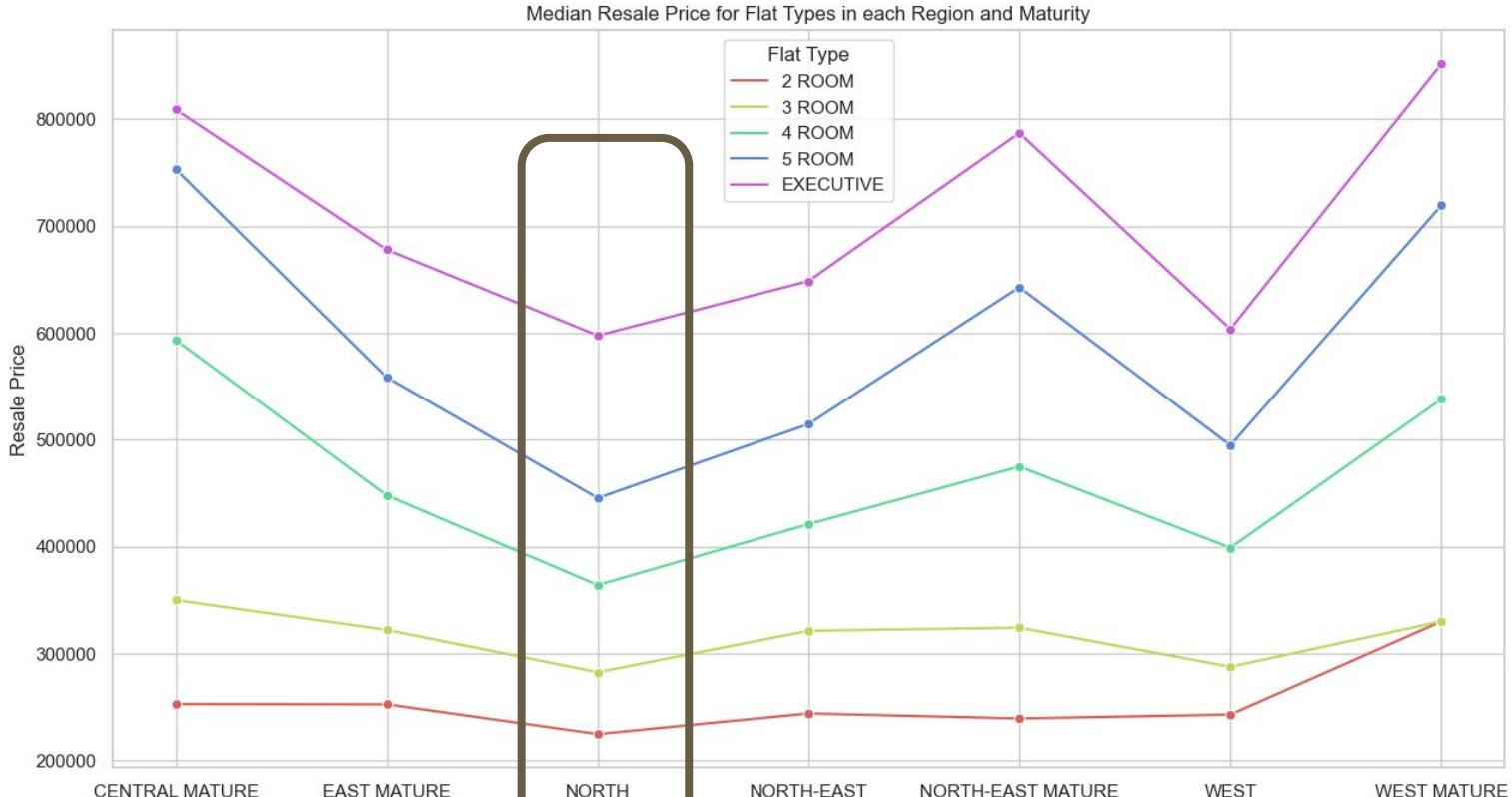
For the
design-conscious



For the budget-conscious

Insights:

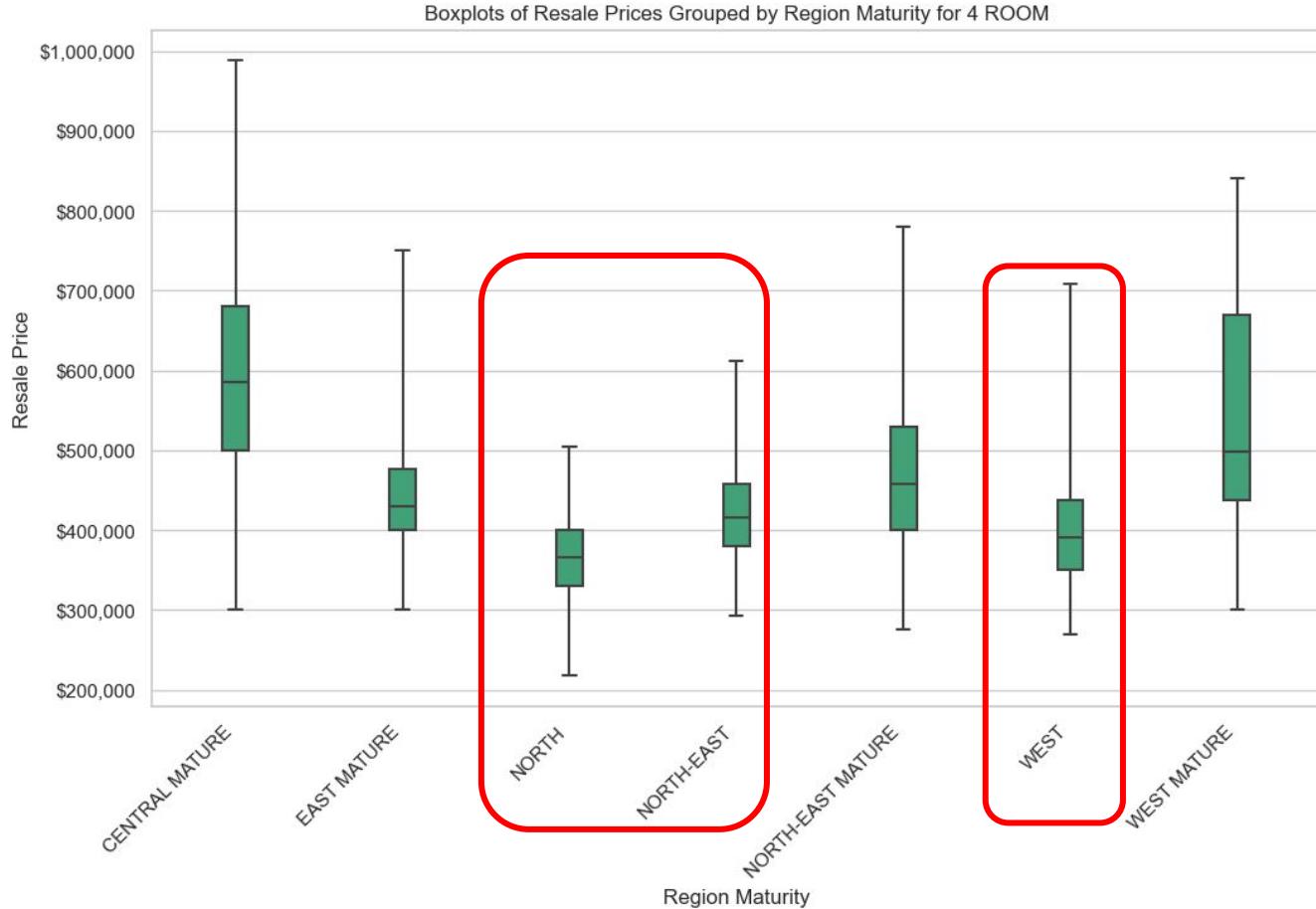
North region
is the cheapest



For the family-oriented (4-room flats)

Insights:

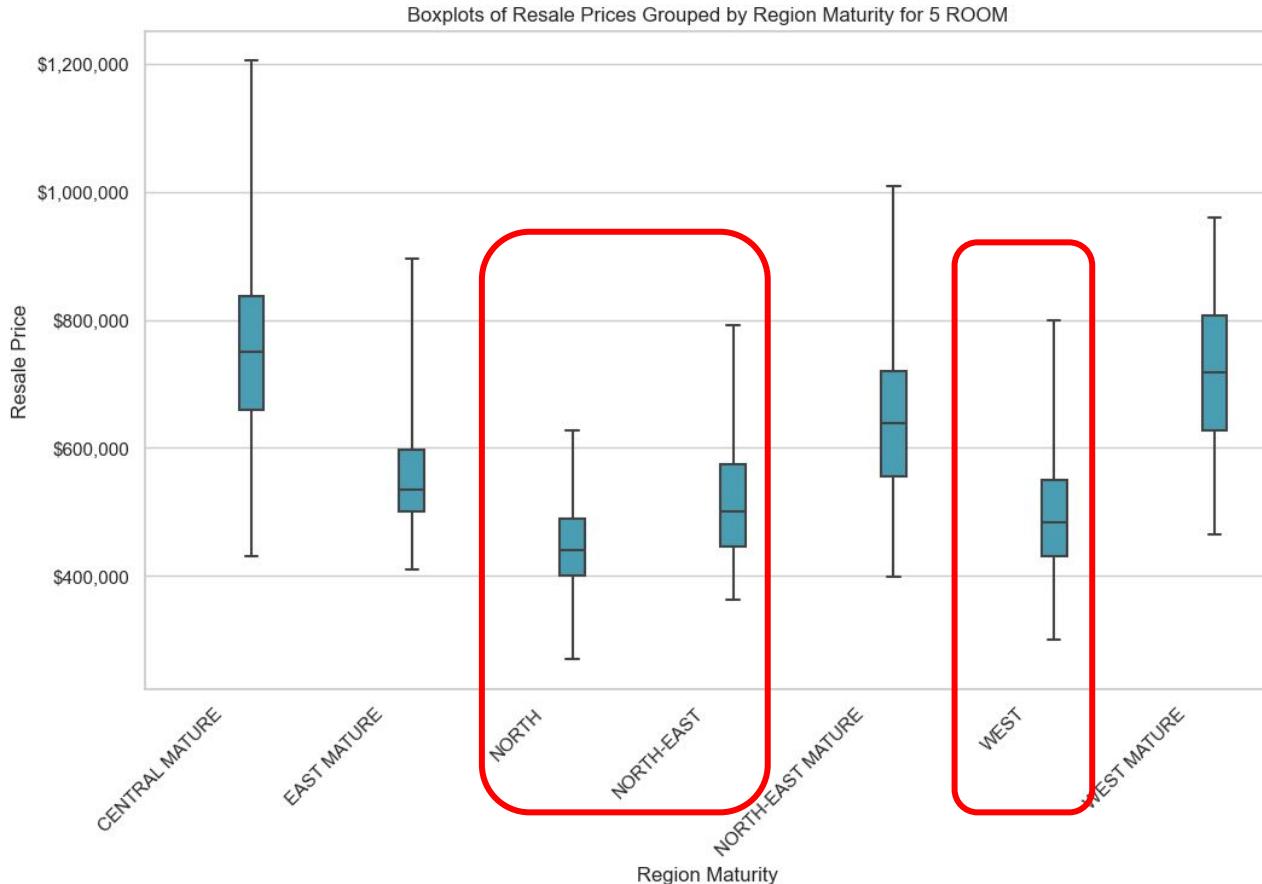
- 3 regions in singapore with the lowest median prices
- All non mature regions



For the family-oriented (5-room flats)

Insights:

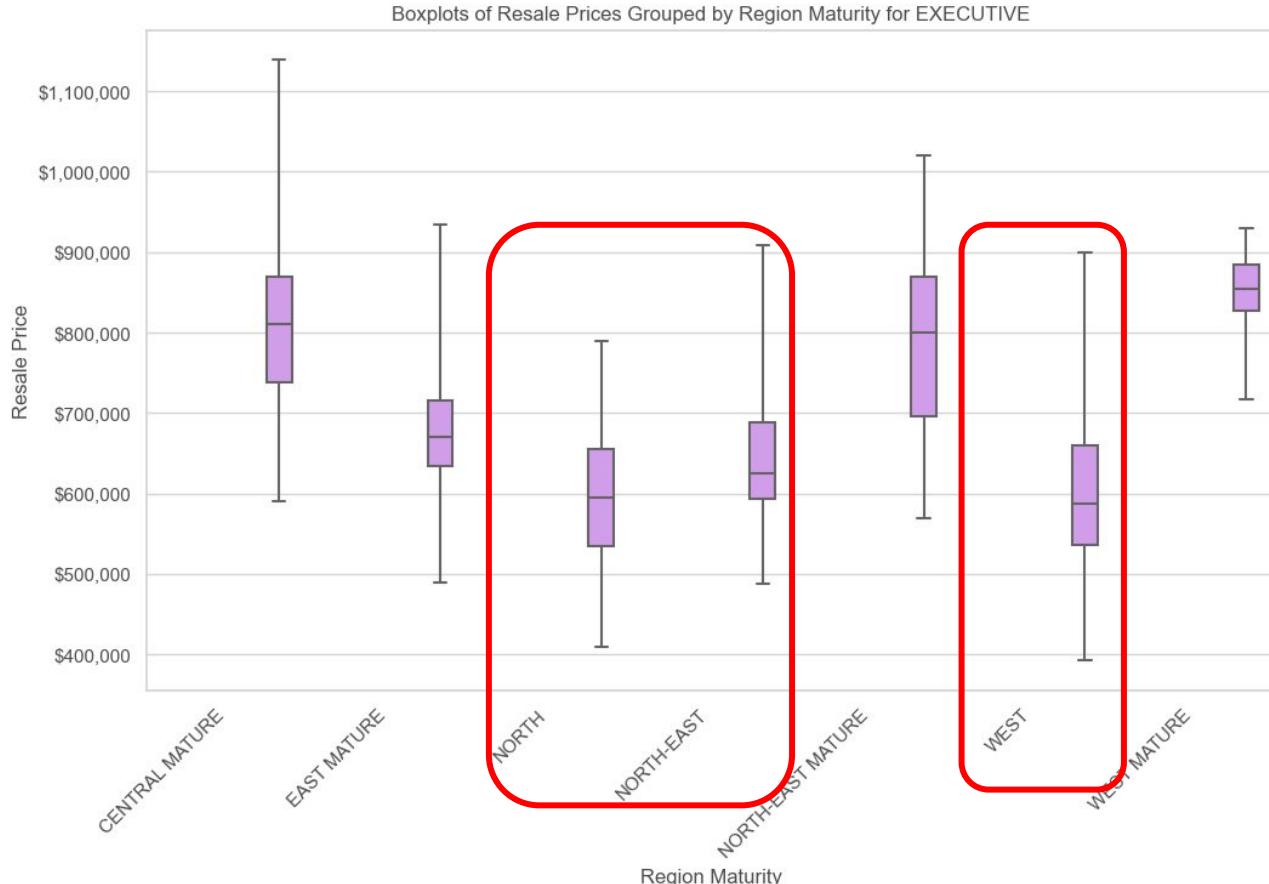
- 3 regions in singapore with the lowest median prices
- All non mature regions



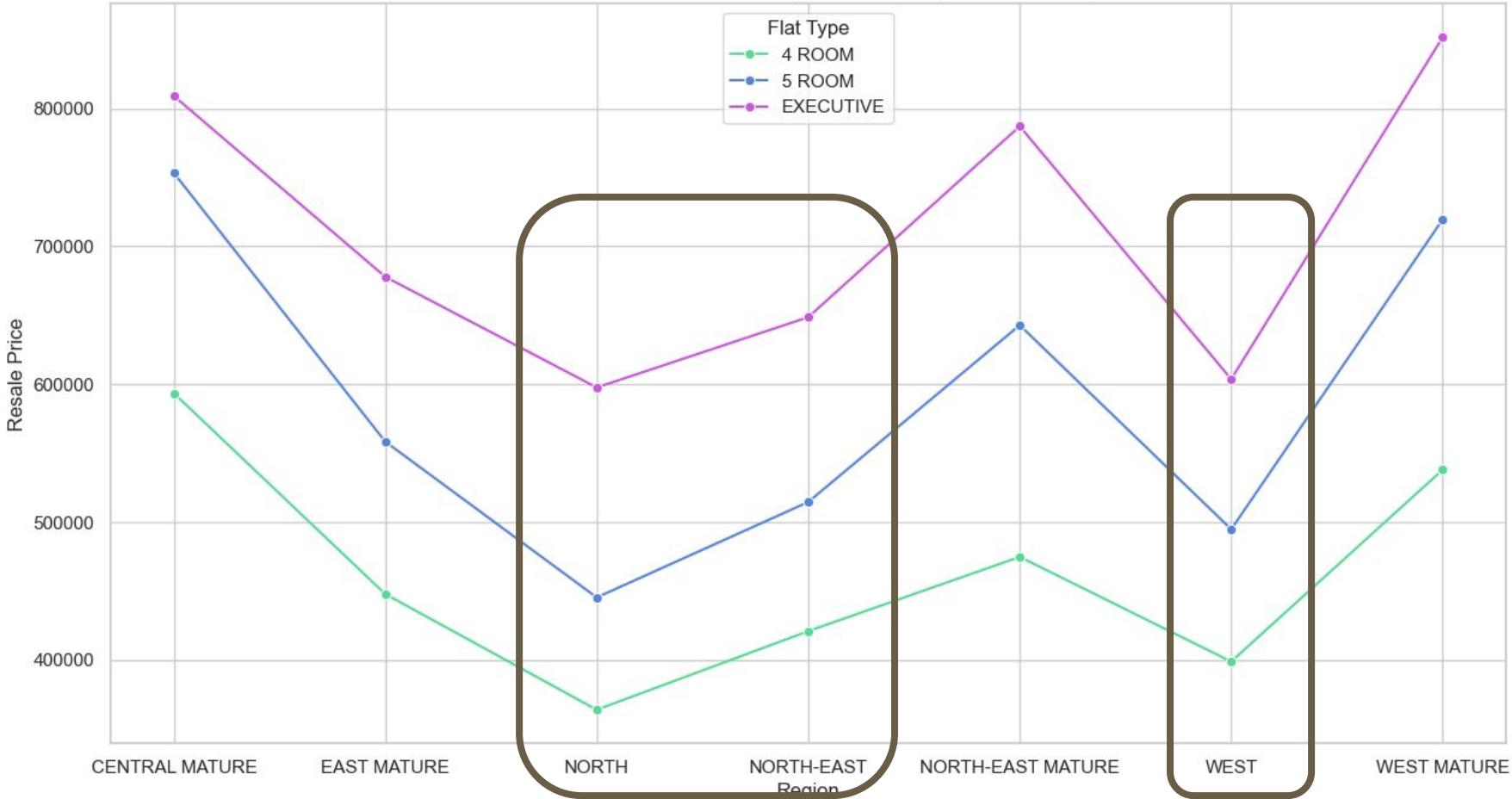
For the family-oriented (Executive flats)

Insights:

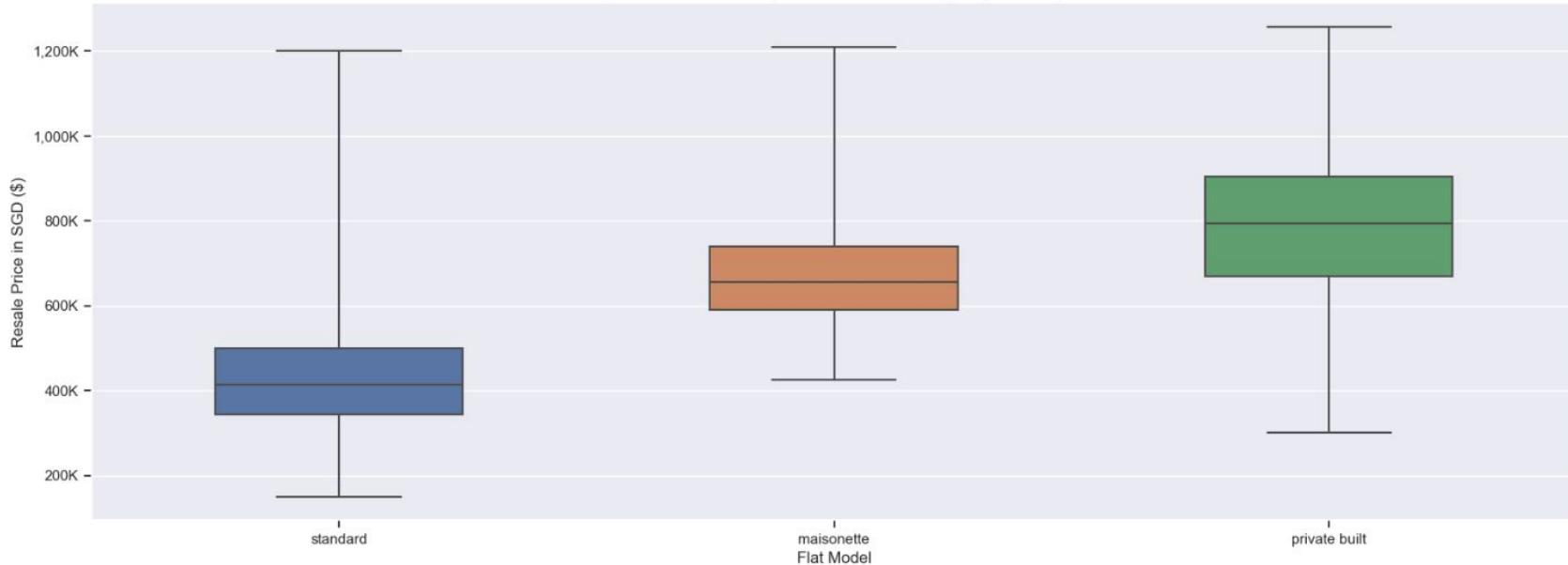
- 3 regions in singapore with the lowest median prices
- All non mature regions



Median Resale Price for Flat Types in each Region and Maturity



For the design-conscious



Insights:

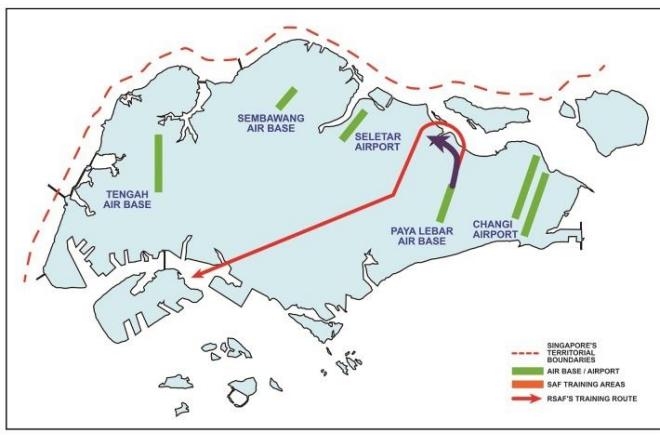
Private built & maisonette models possible considerations

- larger floor area or more central locations
- more “luxurious” than the standard HDB flats

Consideration of Other Potential Factors Affecting Resale Price

● Noise

- High ambient noise poses health issues
- Proximity to (for example):
 - MRT tracks and roads
 - Air base (Serangoon has the highest ambient noise)



Resale flat prices: Noisy v non-noisy units

Those facing MRT tracks and expressways tend to be cheaper

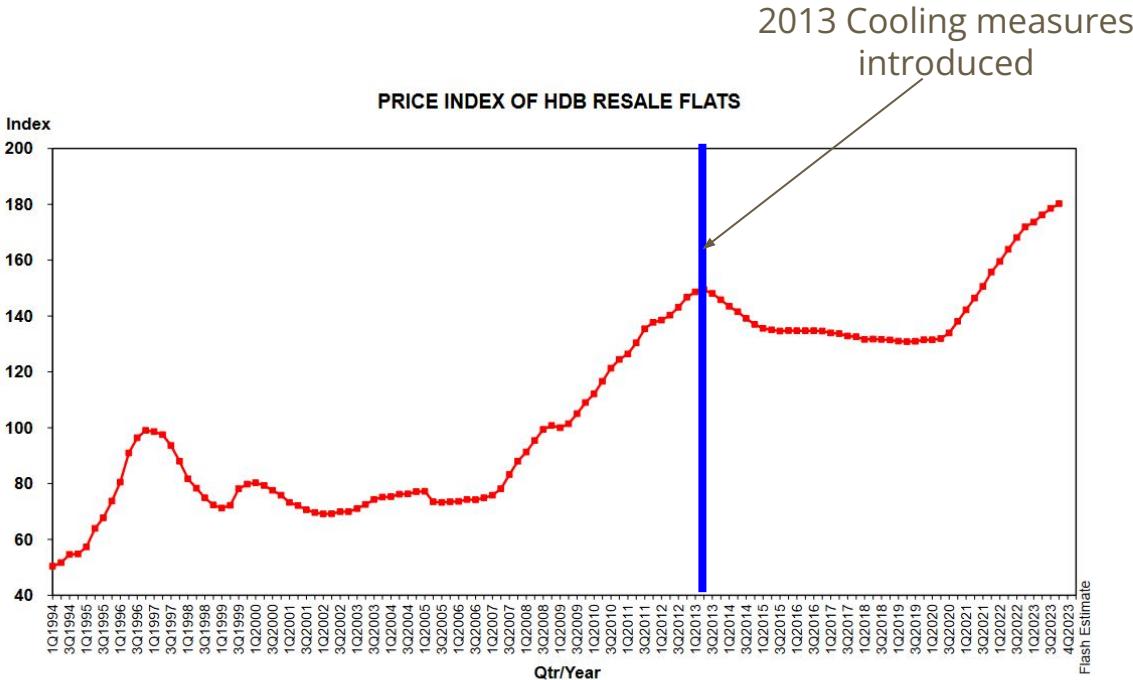
Facing	Location	Flat type	Noise-facing block	Non-noise-facing blocks	Storey	Year of transaction
Expressway	Simei Street 1	4-room	\$370,000 \$360,000	\$430,000 \$435,000		04 to 06 2019
		5-room	\$515,000 \$550,000 \$530,000	\$560,000 \$580,000 \$568,000	\$563,000	04 to 06 2018 07 to 12 2018 01 to 06 2017
		3-room	\$408,000 \$370,000 \$400,000	\$383,000 \$375,000 \$433,000		04 to 06 2019 04 to 07 2018 04 to 06 2018
	Marine Terrace	4-room	\$322,000 \$352,000 \$317,000 \$396,000	\$353,000 \$368,888 \$328,000 \$420,000	\$360,000	04 to 06 2019 13 to 15 2019 04 to 09 2018 07 to 09 2018
		4-room	\$483,000 \$409,000	\$540,000 \$420,888		07 to 09 2019 04 to 12 2019
	Tampines Street 41	4-room	\$410,000 \$400,000	\$413,888 \$395,000		04 to 06 2018 04 to 06 2017

NOTE: The Sunday Times collated a number of transacted prices of HDB flats in the resale market. The focus was on the price difference between flats that face noisy expressways and tracks and those that do not. The flats picked for comparison are in close proximity, built around the same time, of the same size and share the same amenities. This is to minimise the effect of other factors which may affect the price of a flat.

SUNDAY TIMES GRAPHICS

Consideration of Other Potential Factors Affecting Resale Price

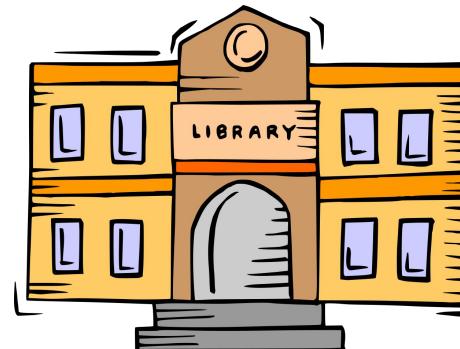
- HDB measures
 - Cooling measures
 - 2013 ABSD
 - Eligibility controls
 - Income ceiling, singles scheme affects demand
 - Grants
 - Increase in grants may drive up resale prices
 - BTO launches
 - Affects supply
 - Ethnic quotas
 - Affects availability of buyers



Resale Price Index based on Q1 2009

Consideration of Other Potential Factors Affecting Resale Price

- Preferential & Community Features
 - Corner units
 - PSF may be higher than non-corner units
 - Orientation / West-facing
 - Unblocked view
 - Block corridor / lift design
 - Proximity to community amenities
 - Community Centers
 - Library
 - Parks



Conclusion

- Top considerations are location and maturity of the estate that the HDB is located in
- Followed by the unit specifications of flat type, flat model, floor area
- HDB units are still under purview of public housing policy and the resale market is subject to policy changes and circumstances
- Personal preferences affect willingness on price



BERESNEV.DESIGN

References

- <https://www.hdb.gov.sg/about-us/history/town-planning>
- <https://www.hdb.gov.sg/residential/buying-a-flat/finding-a-flat/types-of-flats>
- <https://www.straitstimes.com/singapore/housing/14000-income-ceiling-for-families-and-singles-to-buy-plus-flats-on-resale-market-desmond-lee>
- <https://www.hdb.gov.sg/-/media/doc/CCG/20082023-Annexes/Annex-A1.ashx>
- <https://www.hdb.gov.sg/about-us/history/hdb-towns-your-home>
- <https://www.businesstimes.com.sg/property/mobile-spotlight/summary-singapores-property-cooling-measures-1996-present-day>
- <https://www.channelnewsasia.com/singapore/property-cooling-measures-hdb-resale-prices-2013-2018-each-singapore-town-2385831>
- <https://www.propertyguru.com.sg/property-guides/how-the-ethnic-quota-can-affect-your-sellingbuying-ability-6747>
- <https://www.straitstimes.com/singapore/housing/sounds-awful-cant-sleep-cant-talk-because-of-noise>
- <https://cos.sg/blog-post/outside-noise-could-affect-home-prices/>