



**SMU**

SINGAPORE MANAGEMENT  
UNIVERSITY

**ISSS608**

**Visual Analytics**

**REALVIS**

**Making Smart Real Estate Decisions Using  
Visual Analytics**

**Shiny Dashboard User Guide**

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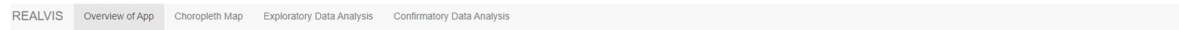
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# 1. Overall Dashboard Navigation

Upon launching the app, users will be shown the app overview tab where users can have a deeper understanding of our project and why we chose to create an app to help users make smart real estate decisions using visual analytics.

The app contains 3 main tabs with each tab having their own sections. User can select the sections on the sidebar at the top of the screen. Here's the overall layout of the dashboard

- Choropleth Map
  - Target Analysis
    - Filter by Type of Housing, Sale & Year
  - Exploratory Data Analysis
    - Private Property Transactions Overview
      - Filter by Year & Property Type
    - Property Type Price Trends
      - Filter by Planning Region, Planning Area & Years
  - Confirmatory Data Analysis
    - Landed vs Condo Price
    - Freehold vs Leasehold Price
    - Floors vs Price



## Making Smart Real Estate Visualisations

### Introduction

Real estate is an industry where information is critical to make the right decisions for customers. Timely information can help potential buyers decide where and what they should invest time and resources to look into and reduce time wasted and effort spent. In Singapore, information for real estate transactions is openly available on government websites for the public to download and use. Our team members were introduced to these data sets through various analytics classes where we used them to do various types of analysis. However, for most members of the public, the raw data sets that are provided are as good as none since they lack in training regarding data analytics and visualization, without which it is nearly impossible to identify trends or items of interest from within the data set. Our project application provides users with visualizations that help them to breakdown and understand the data that is provided easily.

### Motivation

There are applications that perform visualizations and analysis similar or more complicated than ours out there in the market. Unfortunately, these applications are often targeted towards property agents with a substantial annual fee that make them unattractive and inaccessible to others. For non-agents to access them, they will need to contact a property agent who can help them with accessing the reports and visualizations.

This usually occurs when a client engages the property agent to help them source for suitable houses with a commission fee. Thus non-buyers or those unwilling to engage an agent will need to look elsewhere and this is where we come in.

### Our Application

The Shiny App we created using R consists of 3 modules.

- 1) **Choropleth Map, AKA a Heat Map of Singapore**
- 2) **Exploratory Data Analysis, which includes a Tree Map and a Ridge Plot (Joyplot) to identify distribution patterns**
- 3) **Confirmatory Data Analysis, which shows some statistical test results**

The first two modules will be suitable for most people without background knowledge of statistics to understand and use. The third module is more for us and others to test and confirm some common perceptions regarding the real estate industry.

### Data Source

We have only used data sets for Private Property Transactions obtained from the URA REALIS database (<https://www.ura.gov.sg/reis/index>).

Specifically, we used the data sets for residential transactions from Jan 2017 to Dec 2021 as we wanted to focus the application towards residential home-buyers.

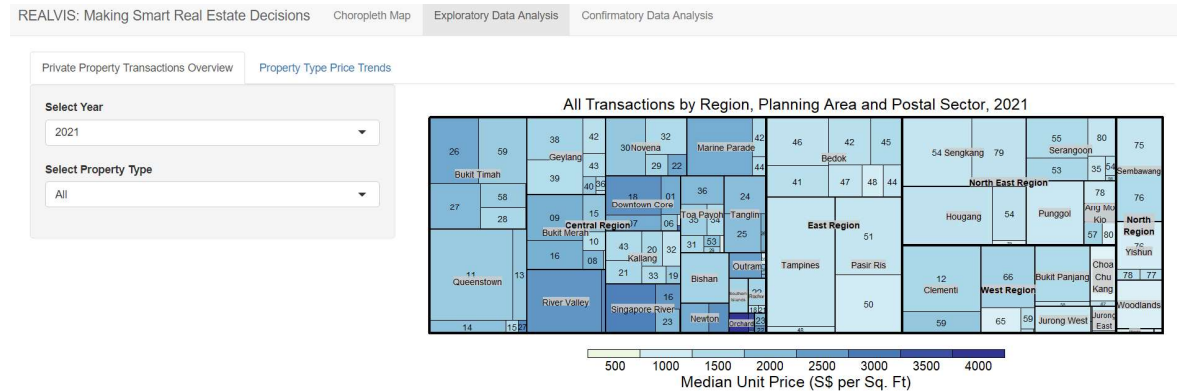
### Project Link

For more information, please refer to our website at <https://g5vaproject.netlify.app/>.

## 2. Exploratory Data Analysis

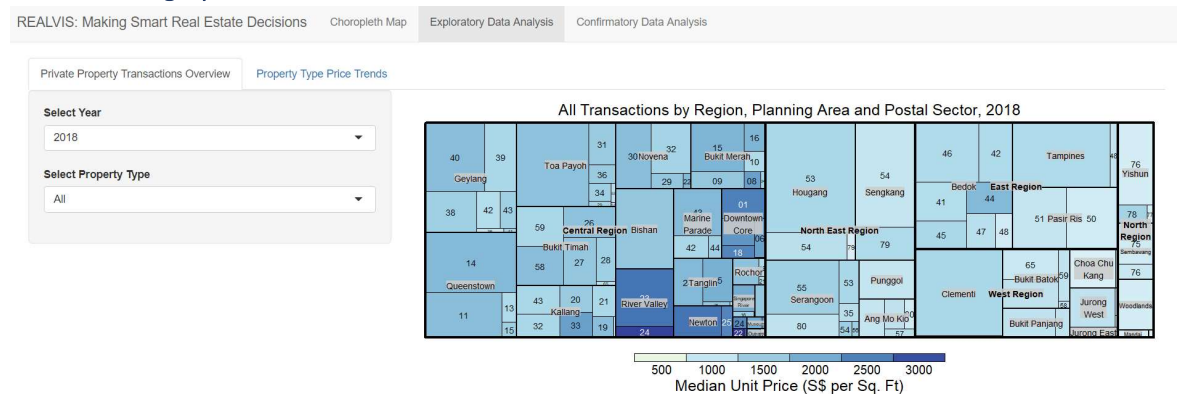
Upon clicking on the tab, the user will be brought onto the page to perform Exploratory Data Analysis for property trends in Singapore

### 2.1 Private Property Transaction Overview



The size of the tiles indicates the number of transactions in each region, planning area and postal sector. The colour of the tiles indicates the median unit price (S\$ per square foot) and the user can refer to the legend at the bottom to view the transaction trends in the each areas.

#### 2.1.1 Filtering by Years



Private Property Transactions Overview
Property Type Price Trends

Select Year

2021

2017

2018

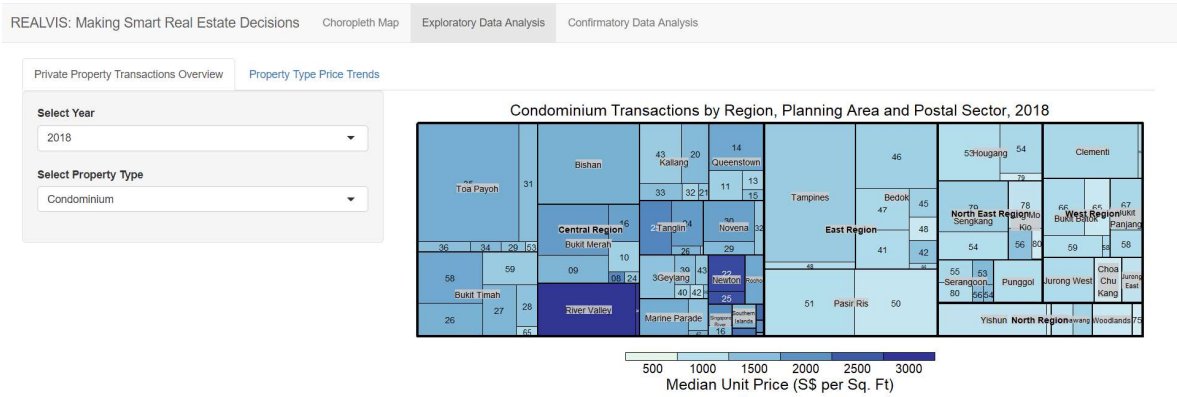
2019

2020

2021

By clicking on the “Select Year” users can choose the year they are interested in from “2017 to 2021”. After selecting the year, the chart will be transformed to display transactions performed in that particular year.

2.1.2 Filtering by Property Types



Private Property Transactions Overview
Property Type Price Trends

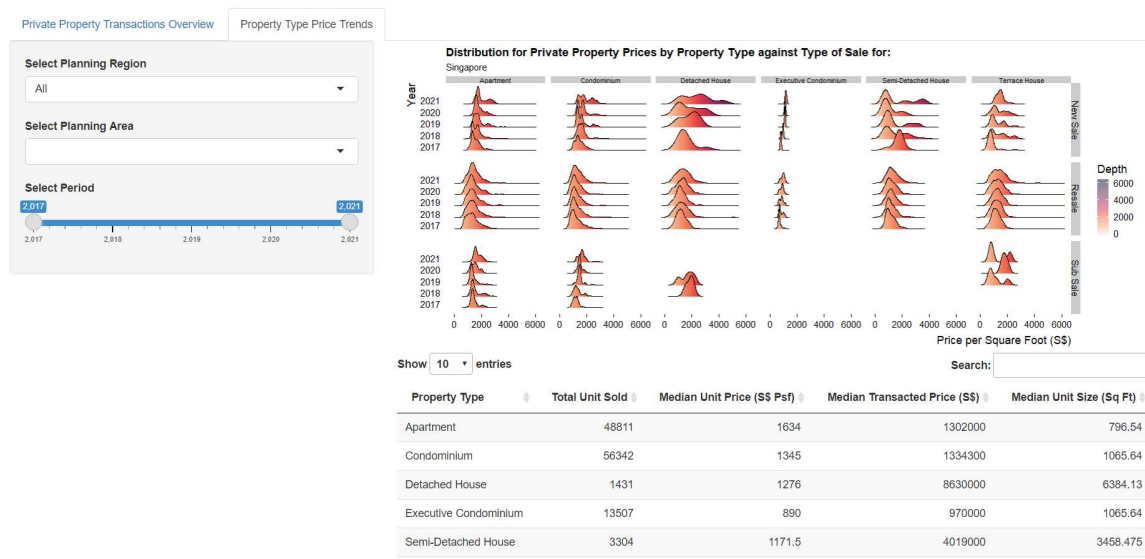
Select Year
2018

Select Property Type
All

All
Apartment
Condominium
Executive Condominium
Terrace House
Semi-Detached House
Detached House

After clicking on the “Select Property Type” users can choose between “Apartment, Condominium, Executive Condominium, Terrace House, Semi-Detached House and Detached Houses.” Upon selecting their preferred property type, the chart will display transactions for that particular property type.

## 2.2 Property Type Price Trends



Upon clicking on the property type price trends, users will be shown a Ridge Plot displaying the distribution for private property prices by property type against type of sales. The rise or fall of the ridgelines indicate the changes in distribution over the selected period. The colours of the ridgeline

plot show the number of transactions performed in that year based on the 'Depth' legend at the right side of the plot. When the ridgeline distribution is skewed towards the right, it indicates a higher price per square foot in transactions.

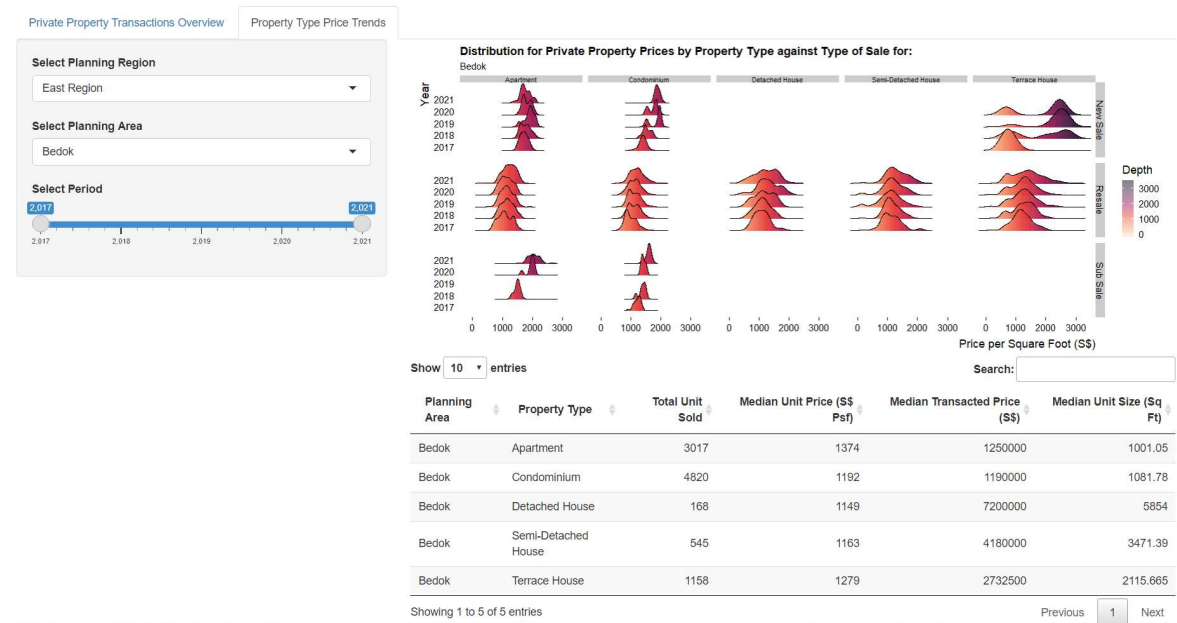
Show  entries Search:

Property Type	Total Unit Sold	Median Unit Price (\$\$ Psf)	Median Transacted Price (\$\$)	Median Unit Size (Sq Ft)
Apartment	48811	1634	1302000	796.54
Condominium	56342	1345	1334300	1065.64
Detached House	1431	1276	8630000	6384.13
Executive Condominium	13507	890	970000	1065.64
Semi-Detached House	3304	1171.5	4019000	3458.475
Terrace House	7171	1237	2700000	2090.37

Showing 1 to 6 of 6 entries Previous  Next

Below the ridge plot, we have a table showing various stats based on the user's selected planning region, planning area and period. The table shows the total number of units sold, median unit price, median transacted price, median unit size for each property type.

### 2.2.1 Filter by Planning Region



**Select Planning Region**

All

All

Central Region

North Region

North East Region

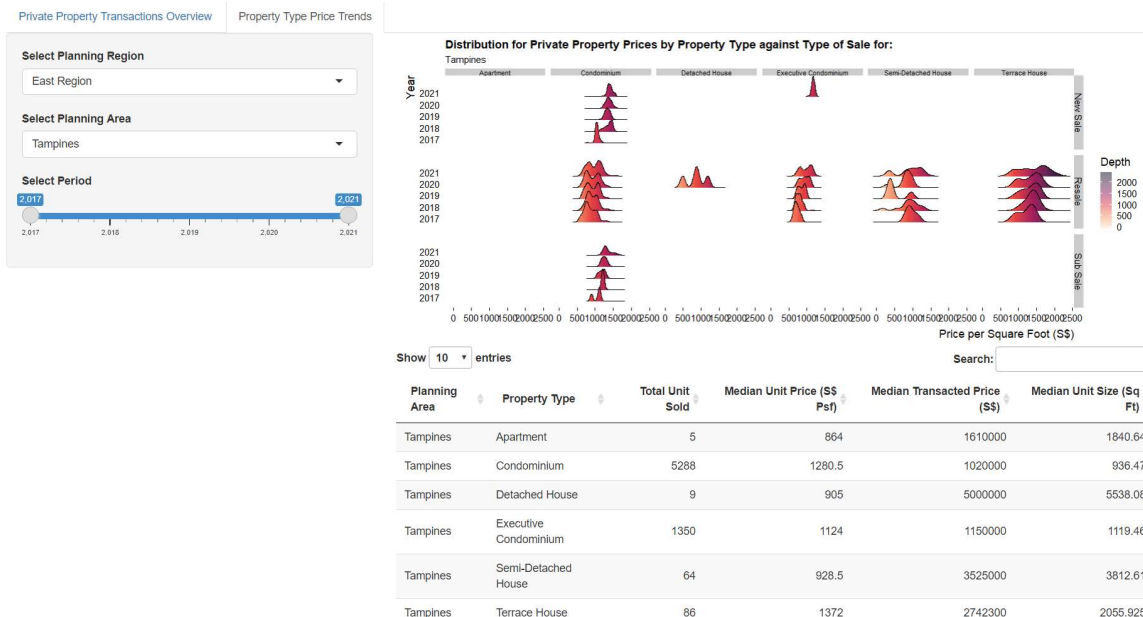
East Region

West Region

2,017 2,018 2,019 2,020 2,021

By clicking on the “Select Planning Region”, users can choose between “All, Central, North, South, East, West regions”. After selecting the Planning Region which they are interested in, the Ridge plot will transform to show the relevant distribution for private property prices by property type against type of sales. The data table below will also transform to show the total number of units sold, median unit price, median transacted price, median unit size for each property type in that planning region.

### 2.2.2 Filter by Planning Area





Select Planning Region

East Region

Select Planning Area

Bedok

Bedok

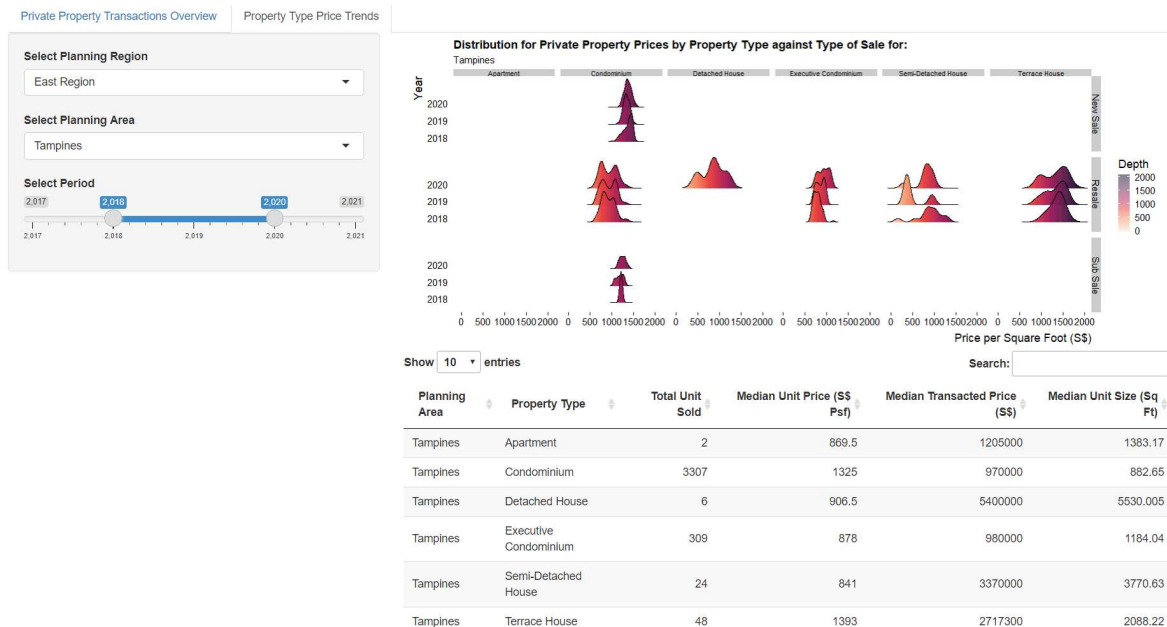
Changi

Pasir Ris

Tampines

By clicking on the “Select Planning Area”, users can choose between planning areas in the region they have selected earlier. After selecting the Planning Area that they are interested in, the Ridge plot will transform to show the relevant distribution for private property prices by property type against type of sales. The data table below will also transform to show the total number of units sold, median unit price, median transacted price, median unit size for each property type in that planning area.

### 2.2.3 Filter by Years



Private Property Transactions Overview

Property Type Price Trends

Select Planning Region

East Region

Select Planning Area

Bedok

Select Period

2,017

2,018

2,020

2,021

2,017

2,018

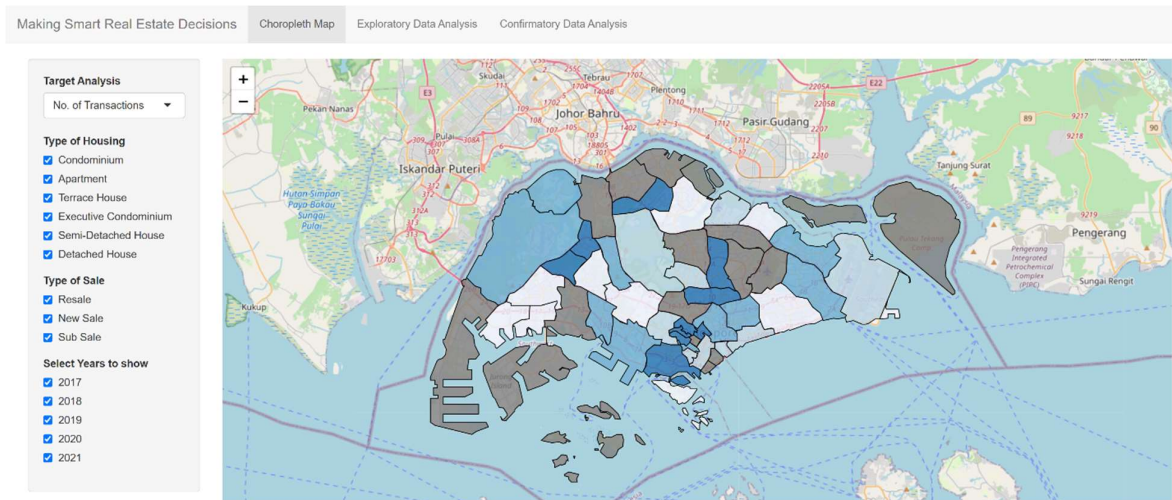
2,019

2,020

2,021

Users can drag the line on the “Select Period” slider to choose the time-period that they are interested in. After selecting the time-period that they are interested in, the Ridge plot will transform to show the relevant distribution for private property prices by property type against type of sales. The data table below will also transform to show the total number of units sold, median unit price, median transacted price, median unit size for each property type in the selected time-frame.

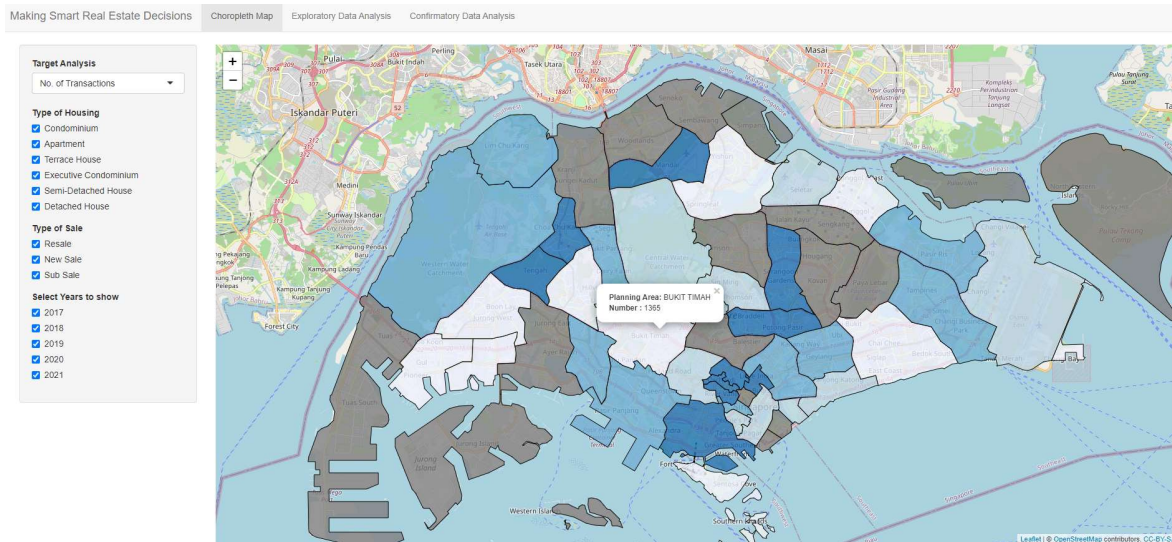
### 3. Choropleth Map



Our choropleth map is designed to show the distribution of various types of values across the various planning areas of Singapore. Users will be able to determine the value that they are wanting to see as well as filter for specific types of property, types of sale and the year. With this, they will be able to see how the distribution changes with various input changes.

For example, if we were to compare the number of condominium sales between 2020 and 2021, we would be able to see that Geylang and Clementi had a visible increase in transactions whereas the western water catchment planning area saw fewer transactions.

#### 3.1 Target Analysis



### Target Analysis

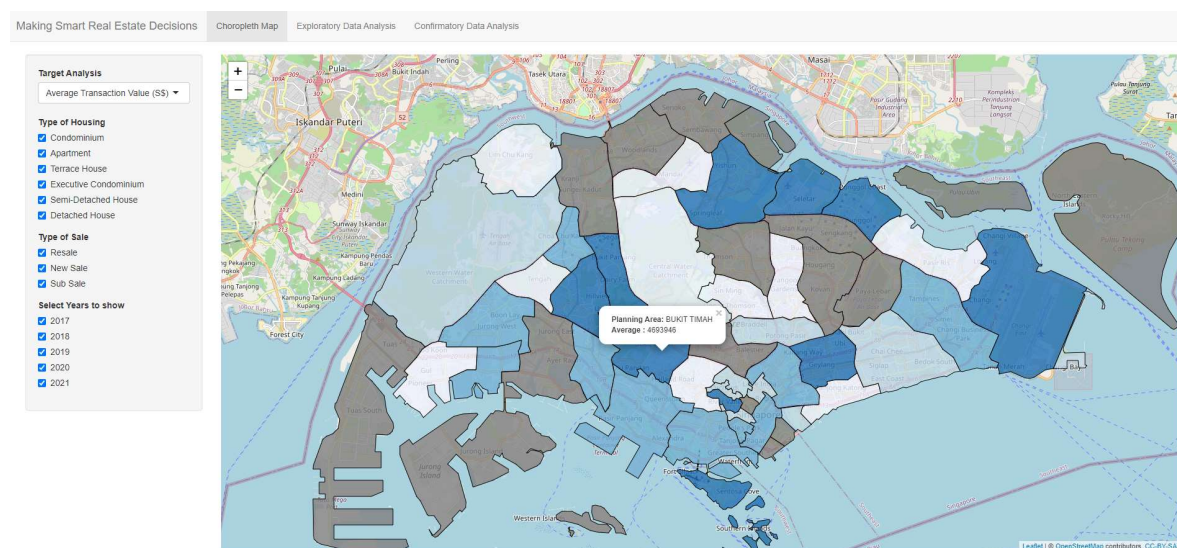
No. of Transactions

No. of Transactions

Average Transaction Value (\$\$)

Median Transaction Value (\$\$)

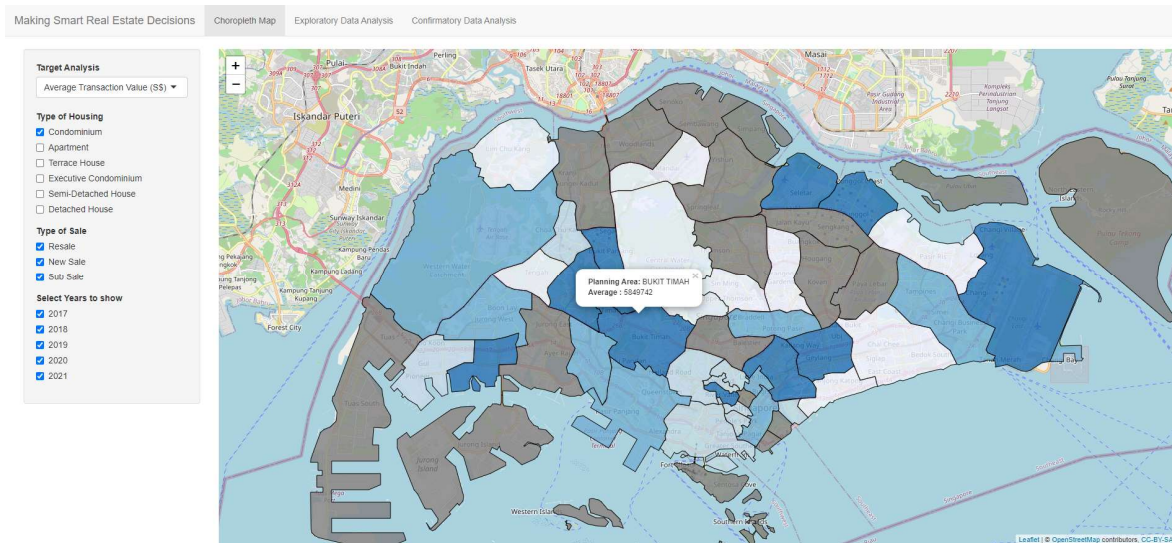
By default, users will see “Number of transactions” as the overall target analysis. By clicking on a particular planning area, users can view the total number of transactions in that planning area. By clicking on the “Target Analysis” dropdown, users can choose between “Number of transactions, Average Transaction Value and Median Transaction Value” as the target analysis.



Upon changing the target analysis and clicking on the planning area they are interested in, users will then be able to see the new values, in this case the “Average Transaction Value” in that planning area.



### 3.1.1 Filter by Housing

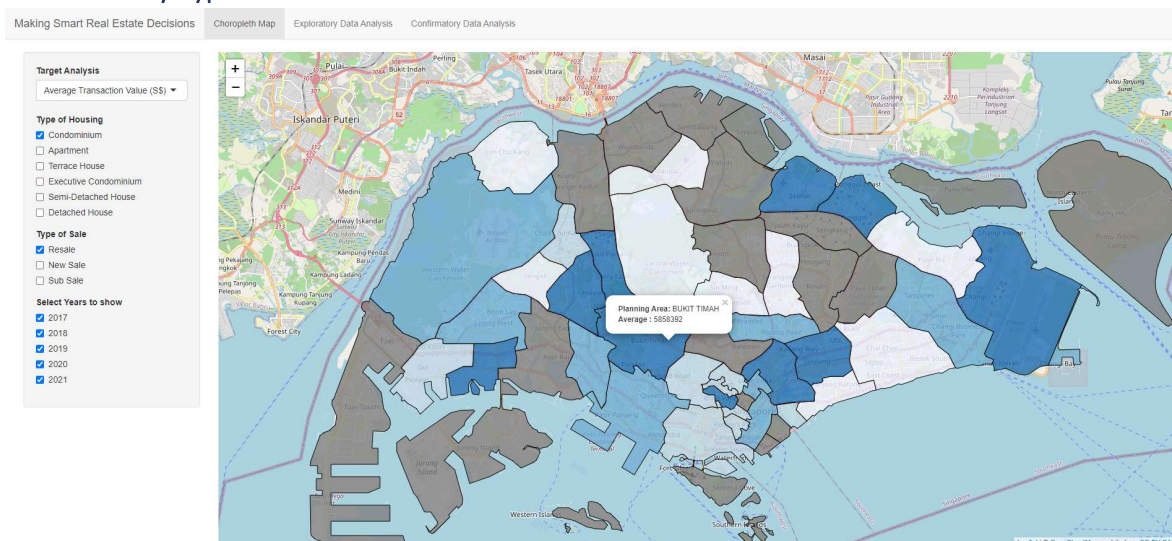


**Type of Housing**

- ☒ Condominium
- ☐ Apartment
- ☐ Terrace House
- ☒ Executive Condominium
- ☐ Semi-Detached House
- ☒ Detached House

Users can select the type of housing they are interested in by ticking the checkboxes. Users can choose amongst “Apartment, Condominium, Executive Condominium, Terrace House, Semi-Detached House and Detached Houses.” Users can tick multiple checkboxes if they are interested in more than one property type.

### 3.1.2 Filter by Type of Sale



**Type of Sale**

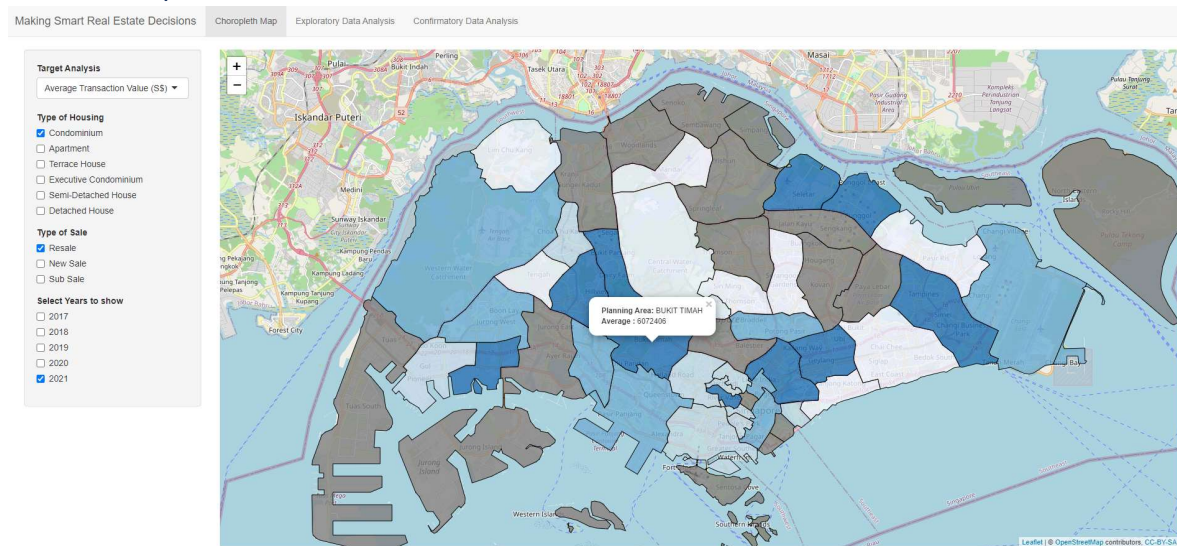
☒ Resale

☐ New Sale

☐ Sub Sale

Users can select the type of sale they are interested in by ticking the checkboxes. Users can choose amongst “Resale, New Sale and Sub Sale.” Users can tick multiple checkboxes if they are interested in more than one type of sale.

### 3.1.3 Filter by Years



**Select Years to show**

☐ 2017

☐ 2018

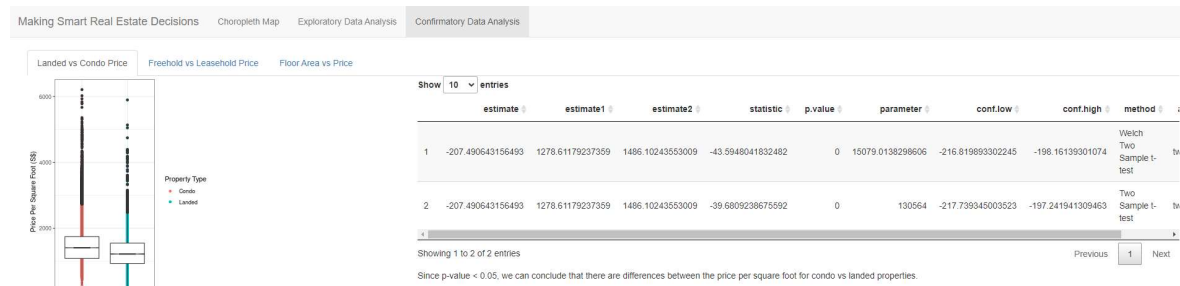
☐ 2019

☐ 2020

☒ 2021

Users can select the time-period they are interested in by ticking the checkboxes. Users can choose amongst “2017, 2018, 2019, 2020 and 2021.” Users can tick multiple checkboxes if they are interested in more than year of transaction data.

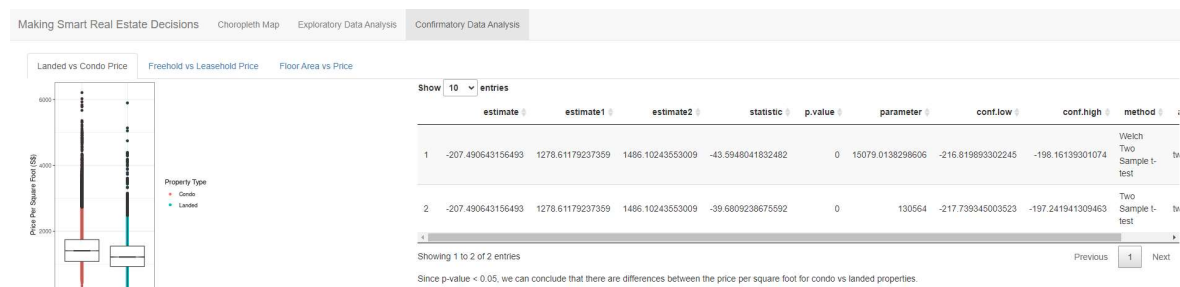
## 4. Confirmatory Data Analysis



We conducted 3 tests with our data sets to find out the following:

- Whether there was a difference in price between Landed and Non-Landed properties.
- Whether there was a different in price between freehold and tenured properties.
- Whether there was a correlation between the floor number and property prices.

### 4.1 Landed vs Condo Price



Users can view a boxplot of price per square foot for each property type. We have filtered “Condominium, Apartment and Executive Condominium” as Condo and “Terrace House, Semi-Detached House and Detached Houses” as Landed before performing our analysis.

Show 10 entries

	estimate	estimate1	estimate2	statistic	p.value	parameter	conf.low	conf.high	method
1	-207.490643156493	1278.61179237359	1486.10243553009	-43.5948041832482	0	15079.0138298606	-216.819893302245	-198.16139301074	Welch Two Sample t-test
2	-207.490643156493	1278.61179237359	1486.10243553009	-39.6809238675592	0	130564	-217.739345003523	-197.241941309463	Two Sample t-test

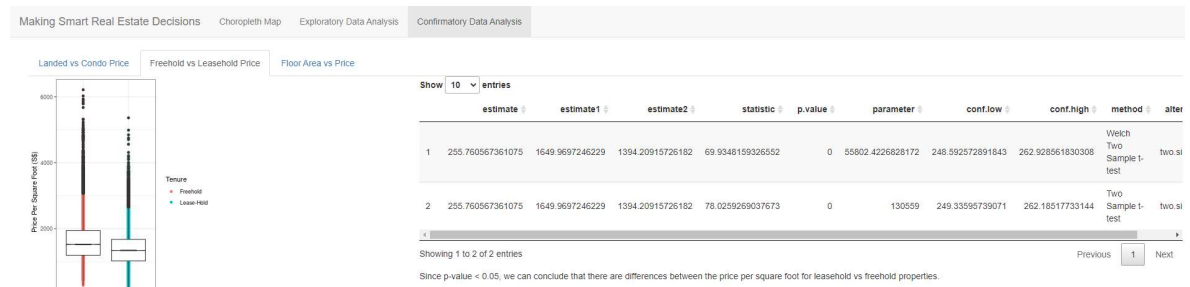
Showing 1 to 2 of 2 entries

Since p-value < 0.05, we can conclude that there are differences between the price per square foot for condo vs landed properties.

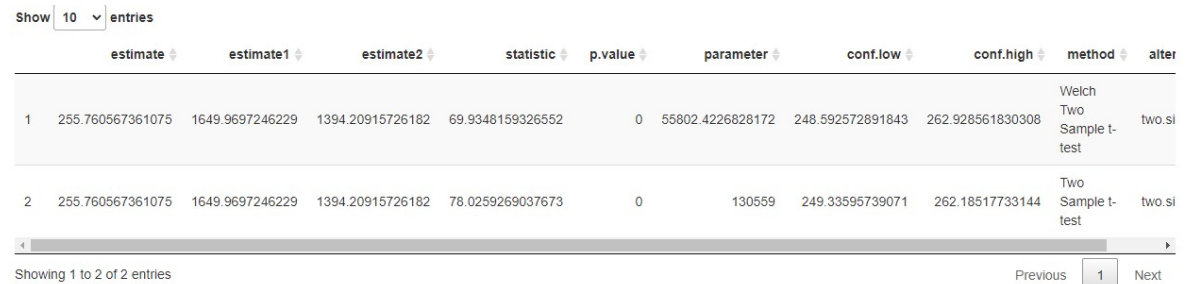
Previous 1 Next

The data table shows the two different methods of t-test we conducted to determine if we can reject the null hypothesis. And given that the p-value is less than 0.05, we can conclude that there are differences between the price per square foot for condo vs landed properties.

## 4.2 Freehold vs Leasehold Price

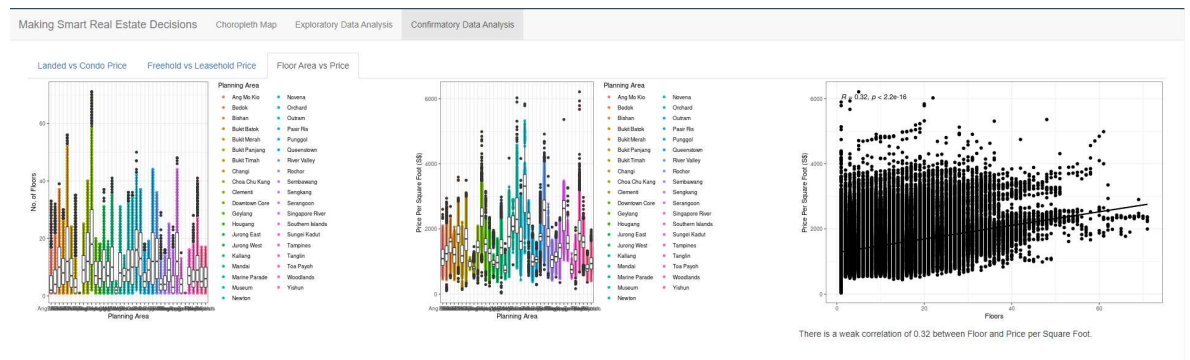


Users can view a boxplot showing the price per square foot for each tenure type. We have filtered all non-freehold tenure types into leaseholds before performing our analysis.



The data table shows the two different methods of t-test we conducted to determine if we can reject the null hypothesis. And given that the p-value is less than 0.05, we can conclude that there are differences between the price per square foot for leasehold vs freehold properties.

## 4.3 Number of Floors vs Price



The first boxplot chart on the left shows the number of floors of properties in each planning area. We can see that Clementi has the highest average number of floors while Changi has the lowest average number of floors.

The second boxplot chart in the middle shows the price per square foot of properties in each planning area. We can see that Orchard has the highest average price per square foot while Choa Chu Kang has the lowest average price per square foot.

The scatterplot chart shows the correlation between the price per square foot of properties and the number of floors of properties. With a score of 0.32, there is a weak correlation between the price per square foot and number of floors.