

**A STUDY OF COVID-19 RECESSION ON THE
HOUSING PRICES IN JOHOR BAHRU**

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UNIVERSITI TUNKU ABDUL RAHMAN

**A STUDY OF COVID-19 RECESSION ON THE
HOUSING PRICES IN JOHOR BAHRU**

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**A project report submitted in partial fulfilment of the
requirements for the award of Master of
Mathematics**

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April 2022

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

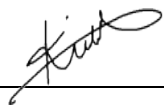
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ABSTRACT

This study adopts data visualization techniques to investigate the impact of the COVID-19 recession on the housing market in Johor Bahru, Malaysia. This study employs data from the period January 2018 – November 2021. Based on the findings, a huge recession on housing market in Johor Bahru was observed. The transaction volume during pandemic is decreasing over time as well as the total transacted price for residential property. Some macroeconomic indicators possess relationship with the housing market in Johor Bahru. Exchange rates and interest rates are positively related with property market while inflation rates and unemployment rates are possessing negative relationship on it. Moreover, buyers have slightly more interest on landed or low-rise buildings in Johor Bahru during pandemic.

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LIST OF ABBREVIATIONS

BNM	Bank Negara Malaysia
BOP	Bottom of pyramid
COVID-19	Coronavirus disease 2019
DOSM	Department of Statistics Malaysia
GDP	Gross domestic products
MCO	Movement control order
psf	Per square feet
REER	Real effective exchange rate
RM	Ringgit Malaysia
RM/sf	Ringgit Malaysia per one square feet
RM/USD	Ringgit Malaysia per one United States Dollar
Semi-D	Semi-detached house
TOP	Top of pyramid
USD	United States Dollar
VAR	Vector autoregression

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

The COVID-19 pandemic is driving the global economy into recession and many countries, including Malaysia, are implementing stimulus packages to avoid a cascade of bankruptcies and emerging market debt defaults. Johor Bahru is the capital of Johor state and situated in the southern end of Peninsular Malaysia. With a population of 802,489, Johor Bahru is the fifth largest city in Malaysia (Worldometer, 2020). Johor Bahru holds a great proportion on Johor's economy as it generates nearly 70% of the entire state's economic output (Department of Statistics Malaysia, 2017). Due to its proximity to Singapore, Malaysia residents seek better employment opportunity in Johor Bahru and thus the city does benefits from internal migration both from outside or within Johor (Lim and Ng, 2020).

#	City Name	Population
1	Kota Bharu	1,459,994
2	Kuala Lumpur	1,453,975
3	Klang	879,867
4	Kampung Baru Subang	833,571
5	Johor Bahru	802,489
...

Source: Worldometer

Table 1.1 Largest Cities in Malaysia as of 2020.

As COVID-19 was first landed in Malaysia since 2020, Malaysia government had put in efforts to control and reduce the transmission of this disease. However, the rules and regulations implemented by the government did not slow down the transmission effectively. Consequently, Malaysia citizens were forced to comply with new regulations hence restrictions on economy exist. Most regions, including Johor Bahru, are impacted by the new regulations implemented.

As a result of the pandemic, Malaysia and Singapore governments had decided to close their country border and cross-country travels were restricted. This action influenced Johor Bahru economics as Johor Bahru residents rely on income from Singapore citizens and Malaysian employed in Singapore. Moreover, businesses were not allowed to operate during the lockdown period. This even worsen Johor Bahru's economy. This study examines the effect of economy recession on housing market during pandemic.

1.2 Importance of the Study

In Malaysia, the most valuable single asset of majority households is a residential property or a house. Malaysia households continue to take house ownership as a family aspiration and the housing price fluctuation is a concern of households or investors. Households are concerning their affordability to obtain a house. Although the government had announced various policy to ensure residents are able to own a house, the weak economic performance and increasing housing price before COVID-19 pandemic is still an issue.

The advancement in computer science allows researchers collect and transform data into an easier understanding pattern. Data visualization is techniques of gathering numeric data and perform them into graphic or arts that allows user to understand the data without complicate calculations. During this process, the data is reinterpreted according to the creator's need and creative (Wands, 2006). Researchers can explore the hidden meanings or relationship between different datasets applying data visualization techniques.

1.3 Problem Statement

Obviously, pandemic changed our lifestyle. New rules and regulations set by the government hit the economy especially the lockdown periods that businesses are not allowed to operate. As the firms are recording low revenue, many small firms could not sustain during the pandemic and went bankrupt or lay off workers to reduce losses. Therefore, the unemployment rate rose in the early period of pandemic or in 2020. Without a doubt, majority unemployed are facing financial issues and even employed are having reduction for their income. Lots of statistics

and studies tell us that Malaysia is suffering an economic recession during COVID-19 pandemic. I.e., Malaysia's GDP shrinks 5.6% in 2020 which is the worst performance since 1998 Asian financial crisis.

Housing sector plays an important role in Malaysia's economy as it sustains the growth of economy and provide job opportunities. As suggested by Allen-Coghlan et al. (2020), there might have significant implications for the housing market while the number of people who can and will work from home are expected to increase in future. However, the economic recession during pandemic leads to weak performance in macroeconomic indicators and thus might have negative impact on housing sector. I.e., construction activities were banned during lockdown period. Numerous research are carried out to study the relationship between housing sector and macroeconomic indicators. Wong and Aralas (2019) concluded that a joint long run relationship between housing prices and macroeconomic variables clearly exists. For example, there is a strong connection between the housing market and the mortgage loan policy set by banks. They stated that exchange rate and interest rate have negative impacts on Malaysian housing price. This was agreed by Abelson et al. (2005) and Asal (2018). Asal (2018) suggested a weak exchange rate relative to foreign countries might attract foreign investors to purchase domestic residential property because of cheaper price.

The economic recession does not occur in Malaysia only, but also in many foreign countries during COVID-19 pandemic. Kang and Liu (2014) and Shukor et al. (2016) studied the effect of economic recession or financial crisis on housing market that happened in the past few decades. Kang and Liu (2016) suggested that country with larger financial market is more affected in crisis. Top of pyramid (TOP) consumers are likely to invest great proportion of their assets in financial instruments and receive more risks during crisis than bottom of pyramid (BOP) consumers. Only TOP consumers can afford to make a purchase when the price of real estate is high hence the price will drop significantly if less consumer can afford to purchase property during financial crisis. Shukor et al. (2016) mentioned

that the Malaysia housing price was hit by financial crisis such as Asian financial crisis (1997-1998) and global financial crisis (2007-2008). As a result of Asian financial crisis, Malaysian house price index decreased by 18.78%.

1.4 Aim and Objectives

The objectives of this study are to:

- Construct an interactive dashboard to visualize the housing prices trend in Johor Bahru before and during COVID-19 pandemic (2018-2021); and
- Compare the housing prices trend with Malaysia's macroeconomic indicators; and
- Compare the units sold and median price of different property types for each town in Johor Bahru.

1.5 Scope and Limitation of the Study

The range of this study is focusing on the housing market in Johor Bahru during the sampling period (January 2018 – November 2021). Some data entry errors are found during this study could affect the accuracy and effectiveness of this study. Human errors are frequently found when we check the validation of data. I.e., housing data are manually updated by the company staff and there is a chance for staff to enter a wrong data. E.g., a terrace house with land area of 4,000 square feet is sold at RM 350,000 but the staff entered data 40,001 square feet and this invalid data was uploaded to data warehouse without checking. We need to identify these errors and apply data cleansing before generating any results or conclusion to avoid inaccuracy in this study. Another limitation of this study is the data collection is delayed and time consuming. The transactions are not updated to the company website or data warehouse on daily basis hence we could only get the data few months later thus lengthen our data collection period.

1.6 Contribution of the Study

This study is looking forward to providing users a clear overview of residential property market in Johor Bahru during COVID-19 pandemic. This could help the users or investors to make investment decision in Johor Bahru's property market. The construction companies are hoped to extract information on Johor Bahru's property market with the assist of this study before making business decision in Johor Bahru. The prosperity of a property market not only depends on the economic situation but also taking consideration of the market saturation. If it is over-saturated for housing market in Johor Bahru, households tend to acquire houses outside Johor Bahru and the businesses are advised to do so.

1.7 Outline of the Report

CHAPTER 2

Literature Review

2.1 Introduction

House is always a popular topic in Malaysia and even the foreign countries. Youngsters are always planning to own a house, for household or investment purpose. House is a rigid need for most people. They need shelter, a place for rest or establish a family. An interesting idea is that the housing price is closely related to macroeconomic indicators. Many people believe that when the country perform well in economy, the cost of owning a house is affordable. Below are some statements that discussing the macroeconomic variables and housing.

2.2 Literature Review

2.2.1 Data Visualization

Ward et al. (2015) defined visualization as the presentation of information using graphic or image. Images have been used as an instrument for presenting before formal writing. Visualization is the use of computer-supported, visual representation of data (Sadiku et al., 2016). Data was generated every day and there is a need to display such amounts of data in an easily understandable way. A single graph can contain plenty information and provide decision support to users. However, visualizations have limitation. Visualizations are usually static and just used for presentation rather than exploration (Theus, 2002).

There are a lot of reasons to show the importance of data visualization. The most appropriate reason is that human are visual beings. Human use visual as key senses to understand information. As the overflow of data is devastating, visualization is the cornerstone to explore and understand these data. In virtually any domain, visualization could be, and is becoming an efficient tool to support in analysis and decision-making.

As the desktop computer nowadays become more advanced and data visualization tools are within easy reach, the interactive data visualizations are more familiar in data analysis. The interactive statistical data visualizations able

to beyond the limits of static graphs. The selection and identification of data is the main task in interactive data visualizations. The goals and patterns affect the outcome of interactive data visualizations. In an interactive visualization, users can inquire the display hence direct interact with the application display without using menus.

2.2.2 Gross Domestic Products (GDP)

The economic growth in a country is usually defined as an increase in the goods and services within a given period, usually a year. The essence of economic growth is the increase in Gross Domestic Product (GDP). The national income statistics had a lot of practical uses such as describe the government fiscal and monetary policies, influence corporate investment plans and assess economic development strategies (England, 1998).

GDP is one of the indicators in macroeconomics used by researchers to display economic conditions (MacLennan and Pyrcce, 1996). Qing (2010) indicates the high demand on housings boost housing market and speed up the recovery of GDP growth rate as housing investment is part of the GDP. Ong (2013) states that GDP is one of the three macroeconomic variables that found to have a positive relationship with housing price in Malaysia. This was supported by Wheeler and Chowdhury's (1993) statement that the GDP has a close connection with the macroeconomic activities in housing market. However, the studies conducted by Trofimov et al. (2018), Wong and Aralas (2019) and Pillaiyan (2015) indicated the GDP possesses a negative relationship with housing market. Trofimov explained that the continuous high economic growth will have excessive constructions and leads to an oversupply of houses hence drives down the housing price. With more sophisticated consumer preferences, Xu and Tang (2014) explained there shall be a downward pressure on demand side when the income growth could not catch up with property prices, thus lowering housing prices.

2.2.3 Exchange Rates

Supported by Australia real estate data, Abelson et al. (2005) stated that the exchange rate is an important variable on housing price in Australia as it can influence foreign investors' interest. Asal (2018) reveals there might be an improvement in a country's competitiveness due to a weak nominal exchange rate relative to foreign countries. As in Sweden, there is an increasing demand for housing from non-residents hence positively affect the housing price due to weak nominal exchange rate. He argues that the real effective exchange rate (REER) is an important indicator for countries rely on foreign investment in the economy.

By incorporating the real estate data into the Dornbusch (1976) model, the yielding of housing prices and exchange rates in the short run are depending on the price elasticity of foreign housing demand as well as the degree of international capital mobility (Tai et al., 2017). In particular, the exchange rates will be overshoot in a short run if a country's international capital is less mobile and the housing price might fall if the foreign demand for housing is price-elastic. In the long run, a continue rising in housing demand by foreign buyers may cause the rise in housing price and exchange rate to appreciate.

2.2.4 Inflation Rates

The increase in housing prices lead to a growth in households' net value as well as the households' consumption expenses and thus stimulates the aggregate housing demands (Demary, 2009). The stimulus on housing demand causes increasing inflationary pressure thus the central bank will probably tighten their monetary policy to slow the domestic currency from inflation.

By means of VAR model that consist of inflation-adjusted housing prices, Tsatsaronis and Zhu (2004) reveal inflation as the key driver of real housing prices among macroeconomic variables such as growth rate of GDP, consumer price inflation (CPI) rate, real short-term interest rate, etc. From their findings, the household income has a low explanatory power to the housing prices. Demary

(2009) could not find evidence that the rise in housing prices due to inflation. He explains this scenario occurs because there is an increase in housing demand when people try to hedge the inflation rate when inflationary pressures rise.

2.2.5 Interest Rates

Interest rate is an important factor in driving housing prices. The banks tend to increase interest rate for mortgage or housing loan when inflationary pressure was high (Korkmaz, 2019). Demary (2009) said if the central bank is raising the federal funds rate to tighten monetary policy, the money market rates will go up and thus transmit to mortgage market rates. The high mortgage rates thereby increase the cost of housing finance and pull the demand for housing as well as housing prices.

The real rate of interest viewed by the potential buyers is the core mechanism affecting the changes in housing price levels (Harris, 1989). He mentioned that as the nominal interest rate is relatively slow to reflect changes in expectations for housing prices, the real rate of interest varies over time and the ebb as well as flow of interest rates able to reflect the market price levels in a faster manner. The real rates will be low, or even negative, when the housing prices are expected to rise. Conversely, the real rates will be high when housing prices start dropping.

2.2.6 Unemployment Rates

The unemployment rate is frequently referred to as a lagging economic indicator. It is often the unemployment rate starts declining sometime after the other broad measures of economic activities have showed positive growth (Levine, 2012). Levine indicated the labor hoarding scenario was happening and thus the unemployment rate does not drop substantially when economy start recover after a recession end. Labor hoarding occurs when firms may have underutilized workers on their payrolls because costs were needed for laying off workers when the market demand drops and rehiring workers when the market demand rises. Initially, employers are able to increase output without hiring more workers by increase the productivity of current workers.

Ni et al. (2011) examined the relation between interest rate and unemployment rate along with house market index in US after the global economic crisis in 2008. They construct a VAR model with variables such as housing market index, unemployment rate, consumer confidence index, etc. In their result, they found that unemployment rate has a positive relationship with house market index and 11.7% of the changes in house market index could be explained by unemployment rate.

2.3 Summary

The above papers are discussing the uses of data visualization techniques and the effect of macroeconomic variables on the housing market. The authors may have different opinions for the impact of macroeconomic indicators on housing market. As an example, Wheeler and Chowdhury (1993) and Ong (2013) believe GDP has a positive effect on housing market but Trofimov (2019), Wong and Aralas (2019) and Pillaiyan (2015) argued that excessive economic growth will cause oversupply of houses thus drags down the price. We are examining these statements with real Johor Bahru's housing data based on the findings of this study.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

Secondary data of macroeconomic indicators (GDP, exchange rate, inflation rate, interest rate and unemployment rate) and the Johor Bahru housing prices used in this study are in monthly basis that cover the time period from January 2018 till November 2021, before and during COVID-19 pandemic, except for GDP which is in quarterly basis. The macroeconomic indicators were collected from Department of Statistics Malaysia (DOSM), Bank Negara Malaysia (BNM), Trading Economics and Khazanah Research Institute. The housing data used in this study was downloaded from IVPS Malaysia Database (<http://database.ivpsmalaysia.com/>).

3.2 Dashboard Development Process in Excel

In this study, we will demonstrate the use of Excel for data cleansing and graph sketching of housing prices data and macroeconomic indicators. We will use pivot tables to regroup and reorganize data.

The first step is to extract the residential property data from the dataset. We only extract residential property data for non-Malay buyers as Malay buyers will have extra benefits on housing price due to the government's policy. A total of 19,677 rows of data was then extracted and saved in Excel. Next, we apply data cleansing on the raw data. Any possible errors detected in the data will be reviewed and revised before taking any action. If that particular data was identified as an error, either transaction price, property's land area and/or land price (per square feet) will be amended as the mean value of other valid data for the same property type in same year. The sensitive data such as buyer's name and address are removed to protect buyer's privacy.

	A	B	C	D	E	F	G
1	Date	Scheme	Type	Type2	Floor Above	Transacted Price (RM)	Land Area (sf)
14438	1/3/20	TMN NUSA PERINTIS I	PANGSAPURI	APARTMENT	16	360000.00	990
14439	1/3/20	TMN NUSA BAYU	RUMAH TERES - TENGAH	TERRACE HOUSE	2	530000.00	1200
14440	2/3/20	BDR BARU SERI ALAM	RUMAH PANGSA/FLAT KOS RENDAH	APARTMENT	5	115660.09	656
14441	2/3/20	TMN TAMPOI UTAMA	KONDOMINIUM	CONDOMINIUM	4	125000.00	1180
14442	2/3/20	TMN DESA CEMERLANG	RUMAH PANGSA/FLAT KOS RENDAH	APARTMENT	5	90000.00	581
14443	2/3/20	TMN UNGKU TUN AMINAH	RUMAH TERES - TENGAH	TERRACE HOUSE	1	390000.00	1539
14444	2/3/20	TMN UNGKU TUN AMINAH	RUMAH TERES - TENGAH	TERRACE HOUSE	1	400000.00	1539
14445	2/3/20	TMN SUTERA	RUMAH TERES - TENGAH	TERRACE HOUSE	1	500000.00	1894
14446	2/3/20	TMN PUTERI WANGSA	RUMAH TERES - TENGAH	TERRACE HOUSE	2	450000.00	1979
14447	2/3/20	TMN PERLING	RUMAH PANGSA/FLAT KOS RENDAH	APARTMENT	4	115000.00	550
14448	2/3/20	TMN PUTERI WANGSA	RUMAH TERES - TENGAH	TERRACE HOUSE	1	400000.00	1540
14449	2/3/20	TMN ISTIMEWA	RUMAH SESEBUAH-REKA BENTUK PEMAJU	DESIGNED HOUSE	1	365000.00	5219
14450	2/3/20	TMN PERLI	RUMAH TERES - TENGAH	TERRACE HOUSE	2	420000.00	1620

Figure 3.1 Snapshot of raw data after data cleansing and regrouping.

The raw data is then regrouped according to property type. E.g., the side terrace house and the middle terrace house were regrouped as terrace house. The new property type is stored in the column “Type 2”.

We examined the number of units sold and median housing price for different property types as well as different period in each town. This was done by using pivot table and Data Analysis plug-in in Excel. An excel table was constructed to display the result.

The objective of this study is creating an interactive dashboard that allow users to visualize and understand the housing market from different perspectives. The three perspectives used in this study are transacted price, transaction volume, and the average land price (psf). Moreover, we highlighted the lockdown periods in our graphs to provide users a better understanding for COVID-19 recession on housing market. A statistics list is created in the dashboard for each perspective to allow users view the difference on yearly data. Map charts are created using scatter plot to display the housing data for all towns in Johor Bahru. Combo charts are generated to show the relationship between housing data and macroeconomics variables. The results shown in the dashboard are controlled by using control macro or slicers.

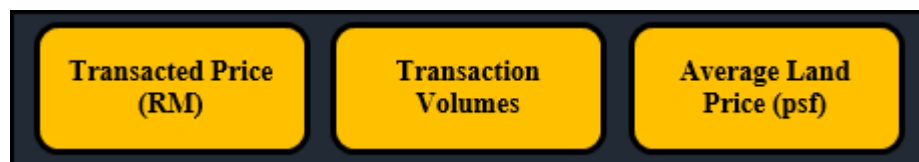


Figure 3.2 Example of control cells – I.



Figure 3.3 Example of control cells – II.

```

(General)
display_sales
Sub display_sales()
With ActiveSheet
    .Shapes("rm").Visible = True
    .Shapes("unit_rm").Visible = True
    .Shapes("frame").Visible = True
    .Shapes("sales").Visible = True
    .Shapes("units").Visible = False
    .Shapes("land").Visible = False
    .Shapes("line_sales").Visible = True
    .Shapes("line_units").Visible = False
    .Shapes("line_land").Visible = False
End Sub

```

Figure 3.4 Control macro - VBA Excel Code.

Lastly, the buyers' preference on high-rise building (apartment and condominium) is illustrated in the dashboard. The buyers' preference on high building is analyzed from three perspectives, which are average housing price, total transaction volume and average land price (psf) on different floor level. Graphs are constructed for each perspective and is located at the bottom of the dashboard.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Median Price

This section discusses the median price of different property types over sampling period. 7 types of residential property are included in this study, which are apartment, bungalow, cluster house, condominium (condo), designed house, semi-detached house (Semi-D), shophouse, terrace house and townhouse. Table 4.1 shows the quantity units sold and median prices of properties. The findings in this section provided us some useful ideas when creating an interactive dashboard for this project.

Based on the findings, we found terrace house is the most favorable property in Johor Bahru. Out of 19,677 units sold, 11,841 of them are terrace house. The sales of terrace houses are focusing in Plentong, Pulai and Tebrau. The terrace houses sold in Tebrau have the highest median price, followed by Pulai, Bandar Johor Bahru and Plentong. The terrace houses in Jelutong and Tanjung Kupang have lower median price compared to other towns. As observed, the number of terrace houses sold in each town keep falling over years.

From table 4.1, we could indicate townhouse is less preferred or lack of building project in Johor Bahru. 190 townhouses are sold within the sampling period. We may assume there is no building project completion in Jelutong, Tebrau, Tanjung Kupang and Sungai Tiram as there is no sales record for townhouse in these 3 areas. Property developer should launch new projects for townhouse in Johor Bahru as it might be welcomed by young/ first-time buyers due to its low price.

Bungalow and designed house are the most expensive residential property in Johor Bahru. The highest median price observed for bungalow is RM 1.53 million in Bandar Johor Bahru while RM 2.95 million for designed house in Pulai during 2021. The number of units sold and median price for both types of property

are relatively constant compared to other property because of the rich buyers get less impact during the pandemic.

Items	Median Price																							
	Bandar Johor Bahru				Jelutong				Plentong				Pulai				Tebrau				Tanjung Kupang			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
Total Units Sold	436	334	232	110	66	57	22	2	2066	1648	1096	570	2903	2535	1590	746	1877	1577	1119	632	5	13	38	2
Apartment Sold	183	123	94	30	0	0	0	0	409	348	253	100	604	511	338	100	301	263	180	81	4	12	37	1
Median Price (RM '000)	365	365	360	362.5	0	0	0	0	280	270	260	285	260	280	280	288.9	290	255	260	260	375	150	150	350
Bungalow Sold	9	16	11	13	0	0	1	0	315	24	15	13	32	10	10	11	28	13	6	7	0	0	0	0
Median Price ('000)	1000	935.2	1500	1533.3	0	0	120	0	312.2	1563	1050	1038.7	1448	1990.5	585	1121	450	190	553.9	1918.4	0	0	0	0
Cluster House Sold	0	0	0	0	0	0	0	0	23	11	12	2	164	133	106	59	136	98	69	56	0	0	0	0
Median Price ('000)	0	0	0	0	0	0	0	0	685	650	680	715	1000	950	784	868.8	960	885	888	979.9	0	0	0	0
Condo Sold	68	68	35	14	0	0	0	0	119	124	61	24	46	51	37	11	23	29	14	2	0	0	0	0
Median Price ('000)	402.5	435.5	440	440	0	0	0	0	370	415	410	450	330	330	330	350	280	300	338	362.5	0	0	0	0
Designed House Sold	37	34	24	13	3	0	0	0	19	11	11	13	23	17	28	17	28	18	25	3	0	1	0	0
Median Price ('000)	1300	1000	1203.2	1020	450	0	0	0	1700	1750	1186	1750	2250	2850	2700	2950	500	600.3	450	1250	0	2010	0	0
Semi-D Sold	40	19	22	10	0	0	0	0	130	159	88	52	105	93	62	42	83	73	49	59	0	0	0	0
Median Price ('000)	817.5	720	780	675	0	0	0	0	800	460	805	815	1000.4	1140	950	965	970	900	1118	1200	0	0	0	0
Shophouse Sold	0	0	0	0	0	0	0	0	13	13	12	6	25	19	10	2	4	4	0	0	0	0	0	0
Median Price ('000)	0	0	0	0	0	0	0	0	130	130	127.5	132.5	160	156	185	167.5	124	195	0	0	0	0	0	0
Terrace House Sold	98	74	44	30	63	57	21	2	1024	941	635	356	1841	1632	972	495	1274	1079	776	424	1	0	1	1
Median Price ('000)	490	495	472.5	499	320	350	370	317.5	400	438	425	450	490	510	520	500	500	540	530	560.3	280	0	300	350
Town House Sold	1	0	2	0	0	0	0	0	9	17	9	4	63	49	27	9	0	0	0	0	0	0	0	0
Median Price ('000)	460	0	492.5	0	0	0	0	0	350	300	300	229	350	350	340	400	0	0	0	0	0	0	0	0

Table 4.1 Median price of properties in Johor Bahru.

Before the onset of COVID-19 pandemic, the number of apartments and condominiums sold are quite constant. The number of units sold start to drop during pandemic but the median price keeps rising. We need further investigation before we can conclude that the buyers are keener on landed properties than high-rise building during pandemic in Johor Bahru as the median price of high-rise buildings remain and there is also significant decline on sales of landed properties. This topic will be discussed in Section 4.6 below.

4.2 Overview of Dashboard

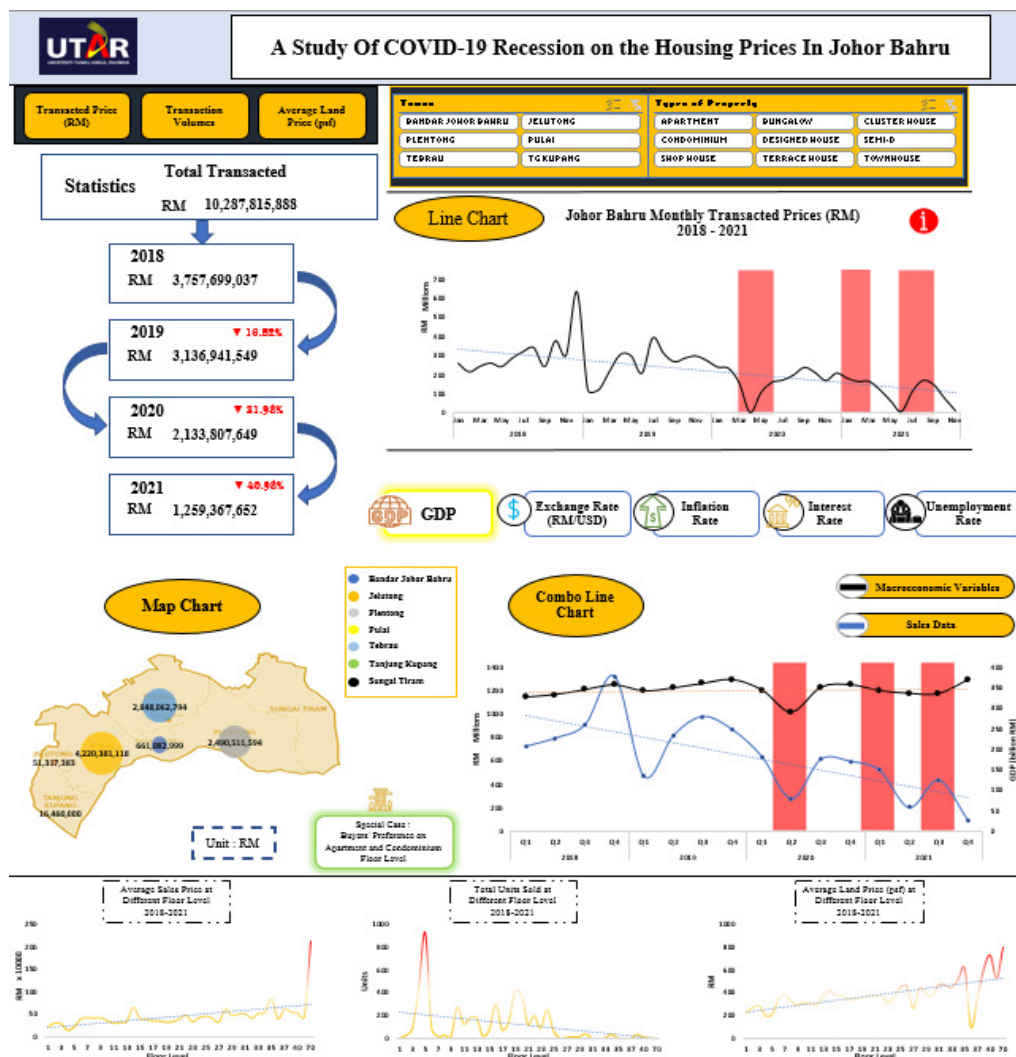


Figure 4.1 Overview of interactive dashboard for housing data in Johor Bahru.

Figure 4.1 shows the outcome of this study and overview of the interactive dashboard. There are 5 sections in this interactive dashboard to help user visualize and understand the housing price data in Johor Bahru over 4 years, which are the overall along with yearly statistics, a basic line chart, a map chart, combo charts that comparing the housing price data to different macroeconomic indicators, and lastly three line graphs showing buyer's preference on apartment and condo. The result is controlled and changed by slicers as well as buttons inside this dashboard.

4.3 Transacted Price

Figure 4.2 shows the monthly transacted price trend for residential property in Johor Bahru over 4 years. Over the sampling period, Johor Bahru recorded a total transacted price of more than RM 10.29 billion for residential property. 2018 has the highest sales over the sampling period with RM 3.75 billion and the yearly sales is declining over time. RM 3.13 billion in 2019, RM 2.13 billion in 2020 and 2021 with lowest sales record, RM 1.26 billion. The trend line existing in the line chart suggests a declining in transacted price over time.

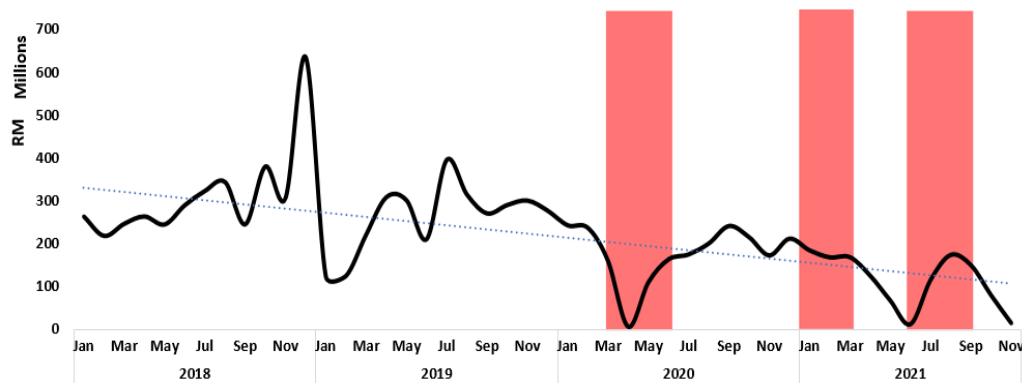


Figure 4.2 Development of housing transacted price over sampling period.

Four significant changes on housing transacted price are observed from the graph. The first change is between November 2018 and January 2019. A sudden

rise in December 2018 and followed by a large drop in January 2019. A total transaction of RM 635 million was made in December 2018 and is about 2 times higher than previous month (RM 306 million in November 2018). The sales record is then dropped to RM 123 million in January 2019 and is 80.5 % lower than in December 2018.

The next three major changes are observed during the pandemic period (2020 and 2021). A huge drop is observed in April 2020 which is the following month after the first total lockdown, movement control order (MCO), implemented in Malaysia (started since 18th March 2020). With RM 159 million sales in March, April 2020 only recorded a total sale of RM 6.33 million, only 4% sales compare to last month. The sales is then back to normal level in May 2020.

There are no significant changes observed during the following partial lockdown and second fully lockdown period (known as Recovery MCO and MCO 2.0 respectively). The monthly transacted price is showing a slow but stable declining trend during this period. As an effect of MCO 3.0, the total transacted price starts to drop critically on April 2021, about 25% decline compared to previous month, and reaches the lowest point on June with a total transacted price of RM 12.1 million. The housing sales starts to recover in July 2021 but turns down again in September and no sign of recovery until November 2021.

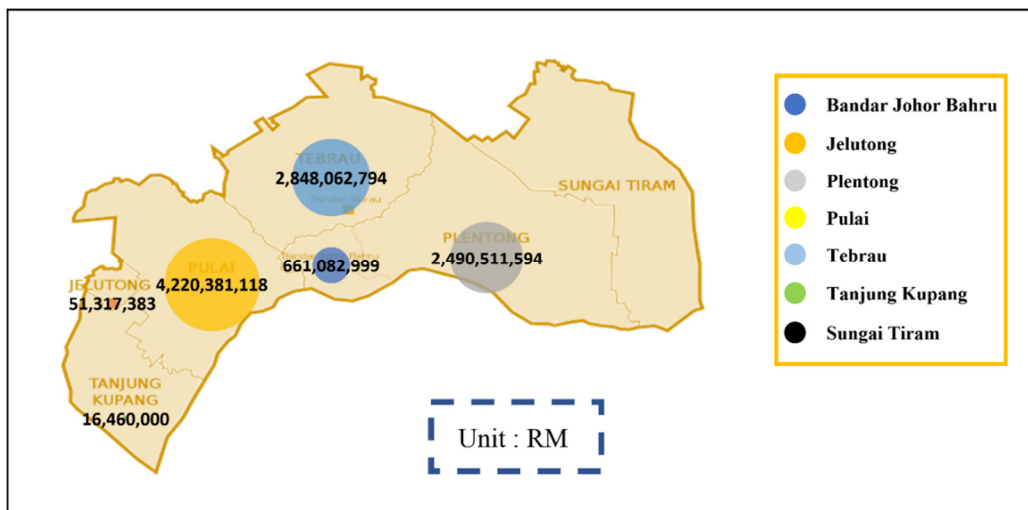


Figure 4.3 Total transacted price in each town over sampling period.

Figure 4.3 presented the total transacted price in each town over the 4 years sampling period. The size of the bubbles inside the map chart are varying according to the sales records in different town. The bigger the bubble, the greater the total transacted price. With highest number of units sold (7,774 out of 19,676), Pulai recorded the highest transacted price of RM 4.22 billion, or 41% of total housing sales in whole Johor Bahru, among the towns. The town with lowest sales is Tanjung Kupang with 4 years sales of RM 16.46 million or Sungai Tiram which has no record for transaction of residential property within the sampling period. Based on the data, we found that 81 data was collected from Sungai Tiram but all of them are commercial property, industry and farmland thus not included in our findings.

The sub-sections below comparing the transacted price with macroeconomic indicators (GDP, exchange rate, interest rate, inflation rate and unemployment rate).

4.3.1 Transacted price with GDP

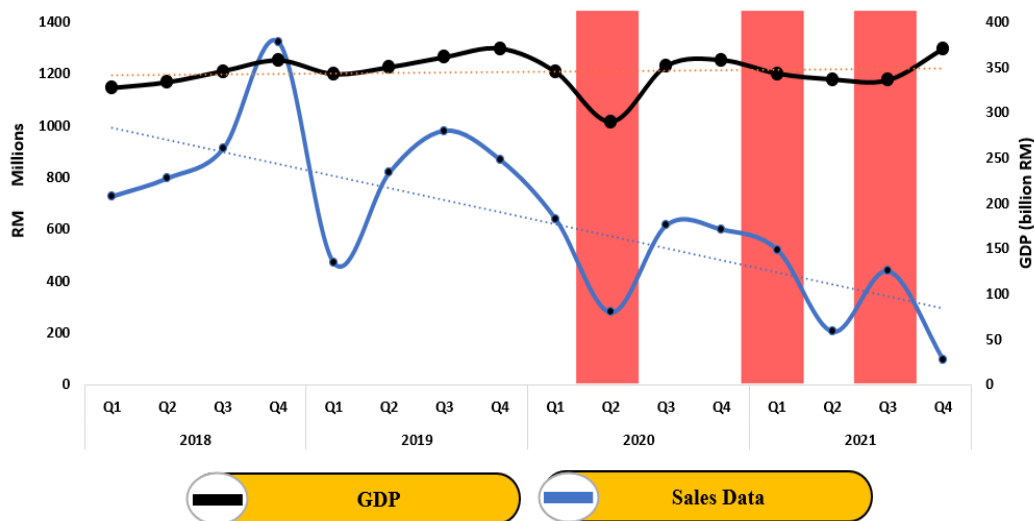


Figure 4.4 Transacted price vs. GDP.

The combo line chart above shows the trends of quarterly transacted housing price and Malaysia GDP (at constant 2015 prices). Through visualization, we can

conclude that the transaction price of residential property has a positive relationship with Malaysia GDP. It is observed the GDP goes up along with the sales price because sales from housing is a portion of Malaysia's GDP. The trend in sales price is basically same as in GDP, with different magnitude, except for third and fourth quarter in 2021. As the transaction data for December 2021 is not included in our findings, the total transacted price for fourth quarter 2021 might be misleading and further completion is required before any conclusion can be made for the quarter.

4.3.2 Transacted Price with Exchange Rate (RM/USD)

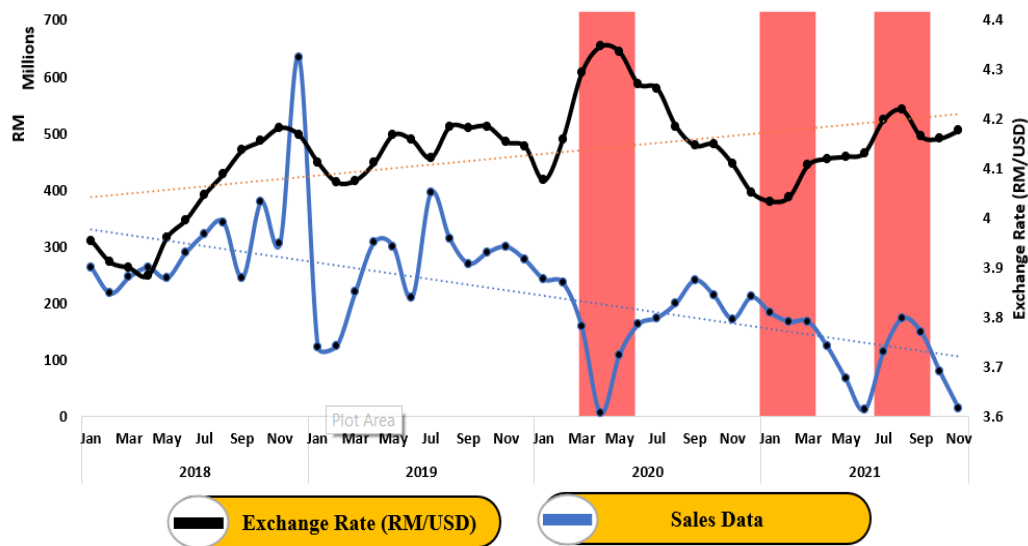


Figure 4.5 Transacted price vs. exchange rate (RM/USD).

Figure 4.5 shows the trends of monthly housing transacted price and the exchange rate (RM/USD). Before the pandemic (2018 – Feb 2020), the housing price has a positive relationship with the exchange rate, but the graph shows there is a negative relationship between housing price and exchange rate during the pandemic (starting March 2020). This scenario does contradict with statements in section 2.2.3 above which indicates a weak nominal currency relative to foreign currency will attract foreign investors. This might be due to border closure and difficulties to travel interstate in Malaysia during pandemic. Because of

restrictions on travelling and information gathering, foreign investors may lose interest to invest in Johor Bahru's property market.

4.3.3 Transacted Price with Inflation Rate



Figure 4.6 Transacted price vs. inflation rate.

Figure 4.6 shows the comparison on monthly transacted price and inflation rate. The trend lines suggest that the inflation rate is negatively related to the sales data in Johor Bahru over the sampling period. However, through visualization, the total transacted price is positively correlated with the inflation rate from 2018 - 2020. In 2021, we could observe a distinct negative relationship between total transacted price and inflation rate. This scenario happens as the government start offering vaccination against COVID-19 and loosen restriction for vaccinated people. Moreover, the government is committed in helping citizens who are in needs as numerous of policies and programs had been introduced to cater their needs. Nevertheless, these actions did not able to recover the damage of economic recession but showing Malaysia is in a weak economic position thus inflation rates rose critically.

4.3.4 Transacted Price with Interest Rate

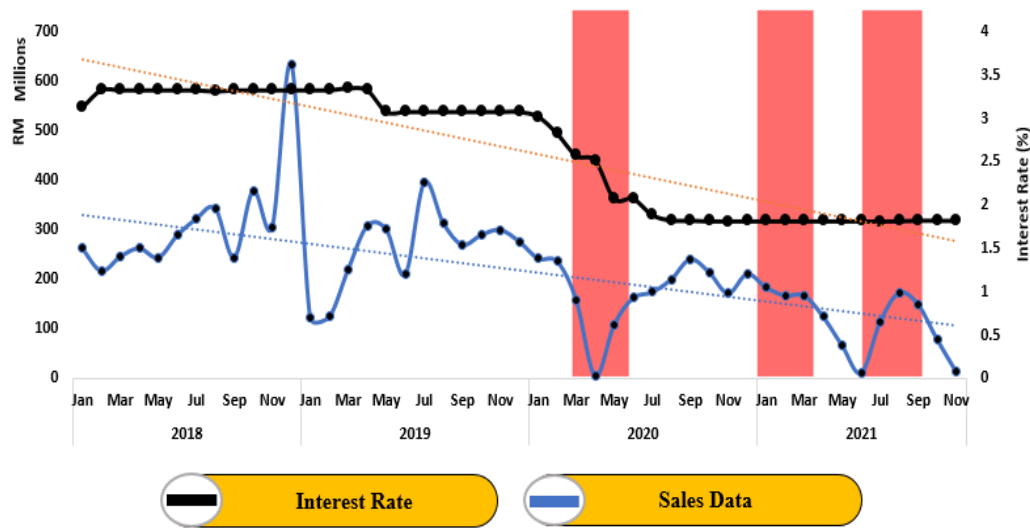


Figure 4.7 Transacted price vs. interest rate.

Figure 4.7 illustrates the relationship between transacted price and the bank's interest rate. A change in bank interest rate will affect the cost of repayment by borrowers as well as households' interest to apply for housing loan. A lower bank interest rate should attract households or investor to invest in housing properties but the result in the above figure does not agree with this statement. Both housing sales and the bank interest rate are declining over the period. This might be due to the long last weak economic performance in Malaysia and the banks are forced to lower their interest rate to attract more borrowers.

4.3.5 Transacted Price with Unemployment Rate

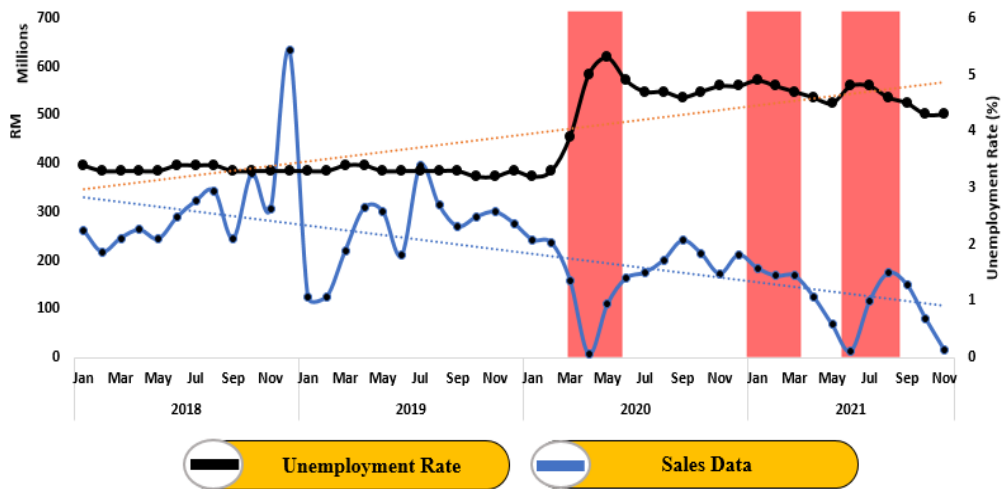


Figure 4.8 Transacted price vs. unemployment rate.

Figure 4.8 illustrates the relationship between transacted price and unemployment rate. Through visualization, it is observed that the Malaysia's unemployment rate is almost constant at 3.3% before the COVID-19 pandemic while the total transacted price trend is fluctuating. Entering year 2020, the unemployment rate rises to 5.3% and remain above 4.3% as the pandemic causes a significant impact on the Malaysian economy. Meanwhile, the housing sales drops critically and thus there exists a negative relationship between transacted price and unemployment rate. Investors may not be willing to invest in house market if the unemployment rate is high.

4.4 Transaction Volume

As the transaction volume is closely related to transacted price, we expect this section exhibits similar result as in Section 4.3. As the results observed are highly like section 4.3, no interpretation of result is needed for this section.

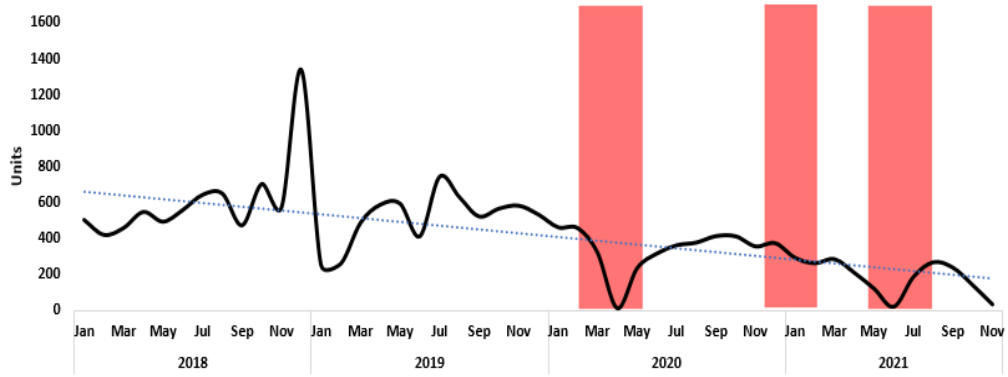


Figure 4.9 Development of transaction volume over sampling period.

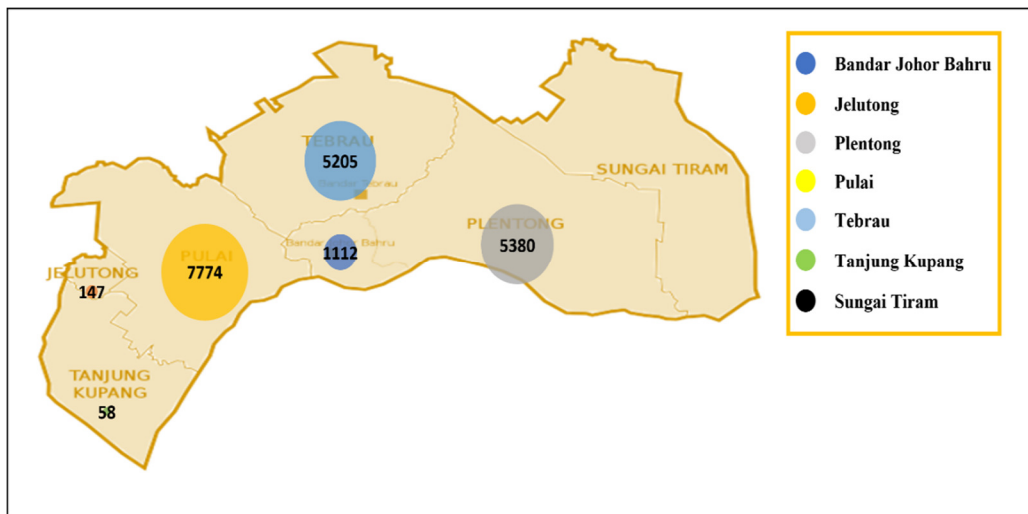


Figure 4.10 Transaction volume in each town over sampling period.

4.4.1 Transaction Volume with GDP



Figure 4.11 Transaction volume sold vs. GDP.

4.4.2 Transaction Volume with Exchange Rate

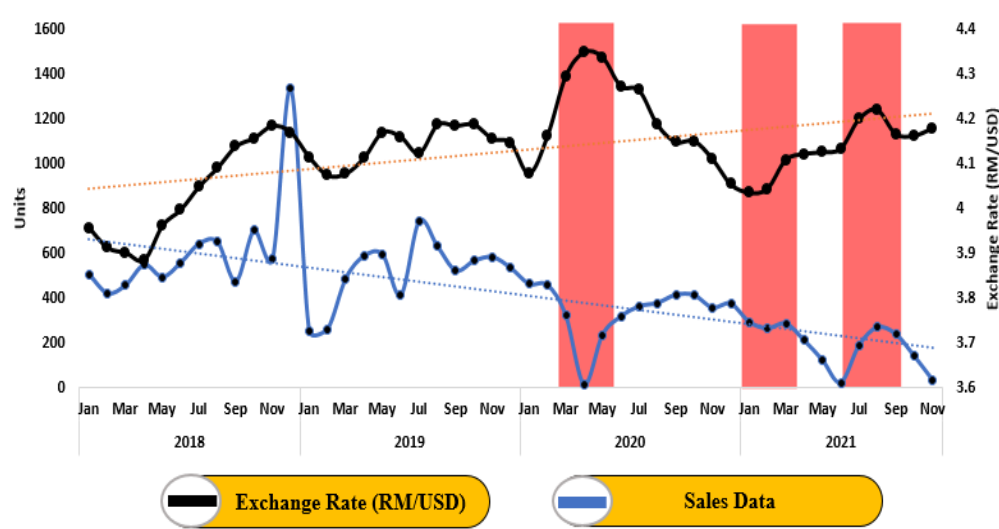


Figure 4.12 Transaction volume vs. exchange rate.

4.4.3 Transaction Volume with Inflation Rate

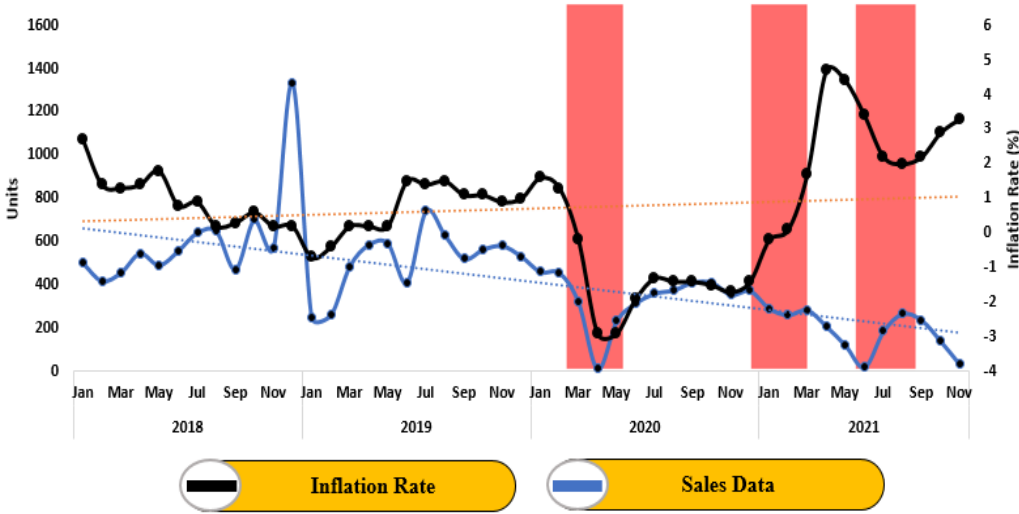


Figure 4.13 Transaction volume vs. inflation rate.

4.4.4 Transaction Volume with Interest Rate

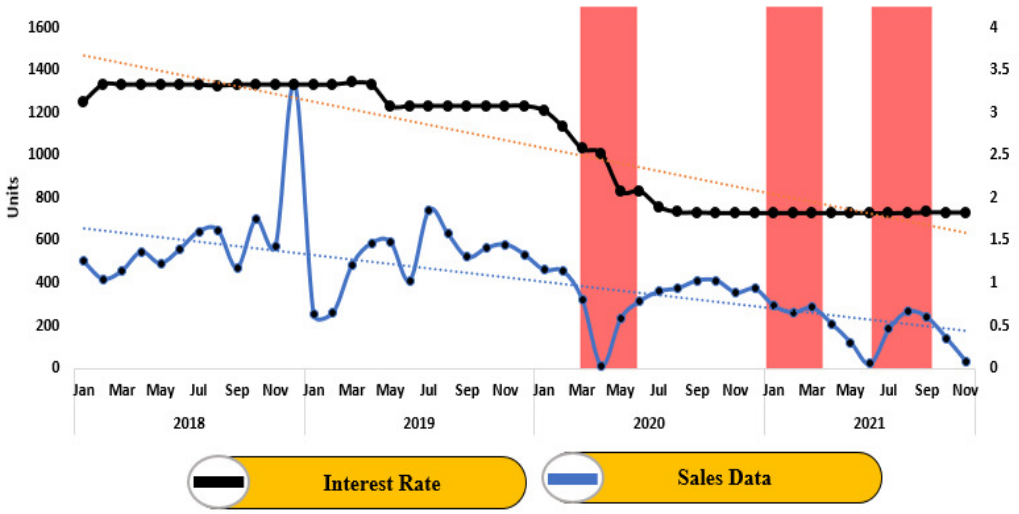


Figure 4.14 Transaction volume vs. interest rate.

4.4.5 Transaction Volume with Unemployment Rate

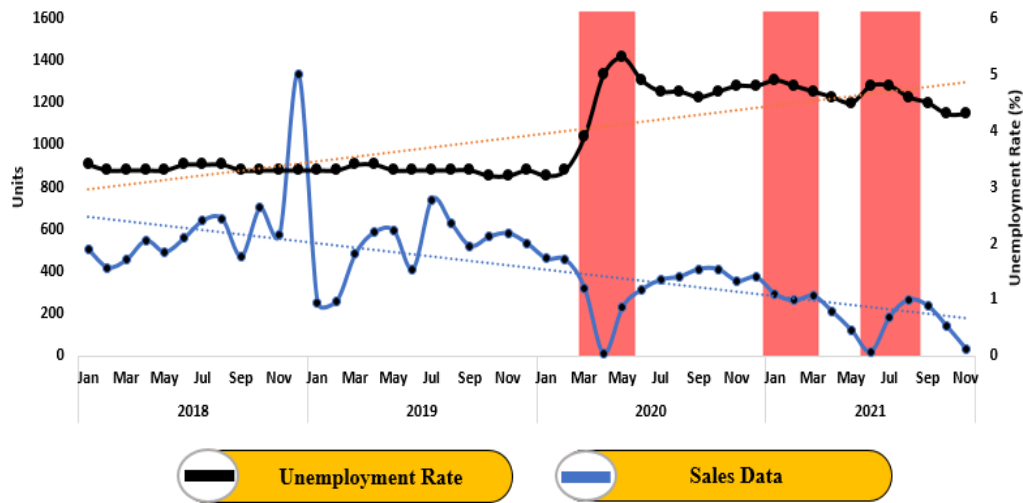


Figure 4.15 Transaction volume vs. unemployment rate.

4.5 Average Land Price (RM/SF)

Figure 4.16 shows the trend of monthly average land price (per square feet/psf) for houses in Johor Bahru over 4 years sampling period. In overall, the average land price is increasing overtime. This was agreed by the upward sloping trendline. The equation of the trendline is

$$y = 299.24 + 0.2115x$$

where

y = average land price, RM/sf

x = number of months.

It was shown that the monthly average land price is increasing at RM 0.2115 per month. Some weak fluctuations are observed from the graph and no major change is observed.

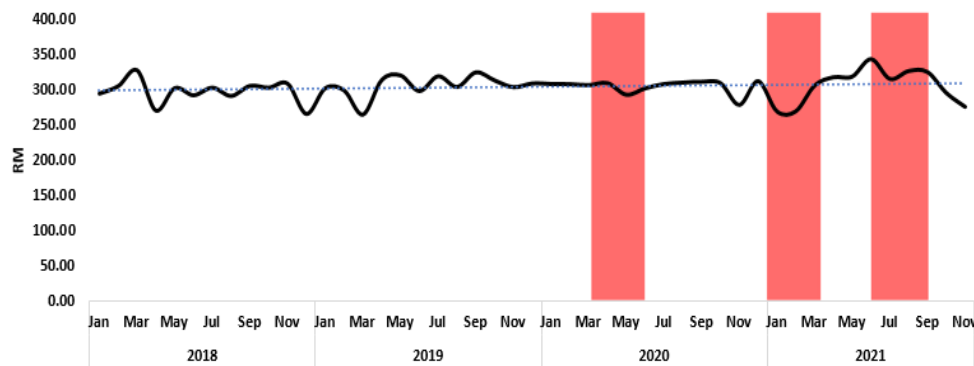


Figure 4.16 Development of average land price (psf) over sampling period.

In 2018, Johor Bahru recorded an average land price of RM 294.67 psf which is the lowest among the 4 years sampling period. The average land price rises to RM 308.36 psf, a 4.65% increment, in 2019 and is falling during pandemic. The average land price drops 0.78% and 0.69% respectively in 2020 and 2021.

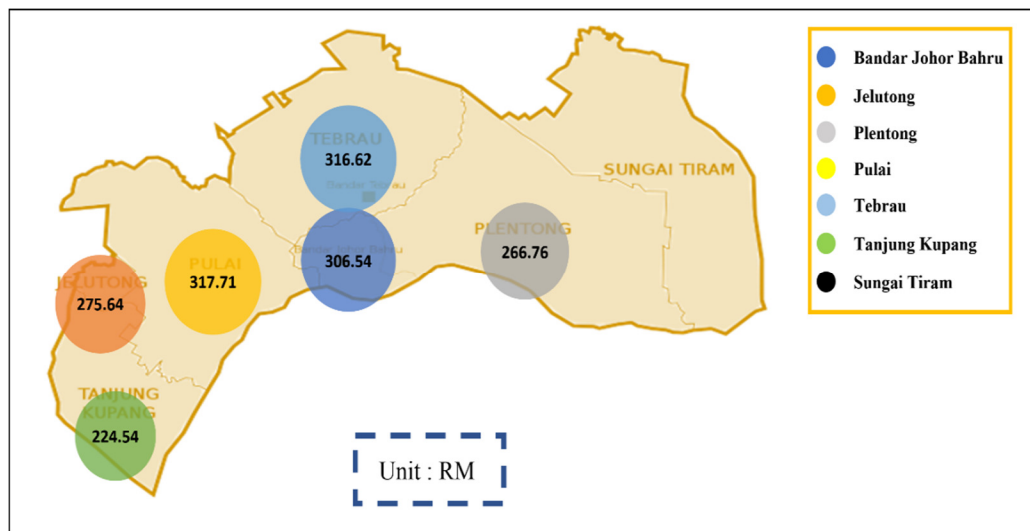


Figure 4.17 Average land price (psf) in each town over the sampling period.

The map chart above illustrates the average land price (psf) for residential properties in towns over sampling period. The map chart indicates residential properties sold in Pulai have the highest average land price (RM 317.71 psf) then followed by Tebrau (RM 316.62 psf) and Bandar Johor Bahru (RM 306.54 psf). It is not surprising as the three towns proximity to wealthy Singapore and

Malaysian workers that unable to afford high housing price in Singapore are willing to stay in these three areas and spend lesser time on road everyday. The existence of the North-South Expressway in Tebrau, Pulai and Bandar Johor Bahru also an important factor to boost the land price. Jelutong has slightly higher land price than Plentong and Tanjung Kupang has the lowest average land price over the years. Without the presence of housing data, we could not estimate the average land price for residential property in Sungai Tiram.

4.5.1 Average Land Price with GDP

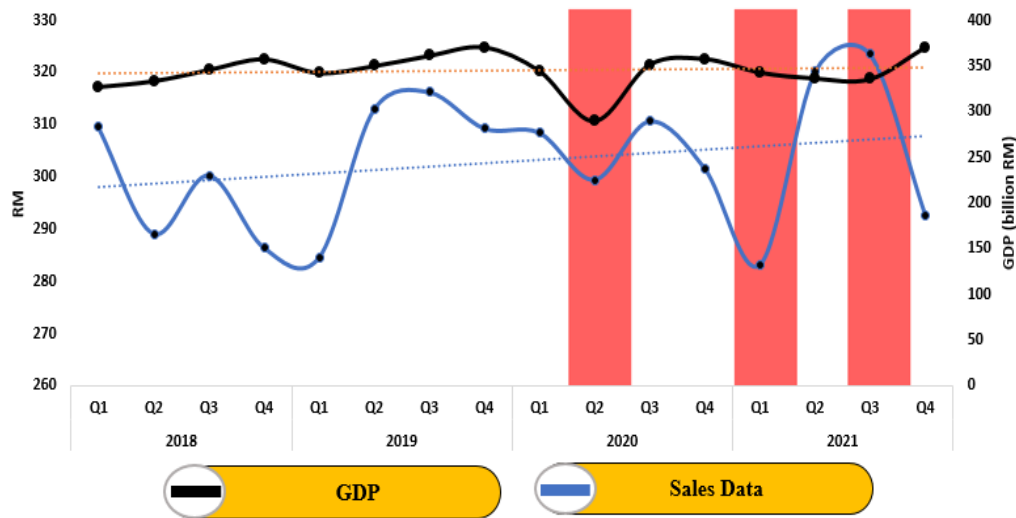


Figure 4.18 Average land price vs. GDP.

Figure 4.18 indicates the trends of quarterly average land price (psf) in Johor Bahru and GDP (in constant 2015 prices). As observed in quarterly manner, the average land price (psf) is fluctuating critically. Through visualization, we could find a positive relationship between average land price in Johor Bahru and GDP except for 2021. Both trendlines are upward sloping, thus we can conclude that the average land price in Johor Bahru has a positive relationship with GDP.

4.5.2 Average Land Price with Exchange Rate (RM/USD)

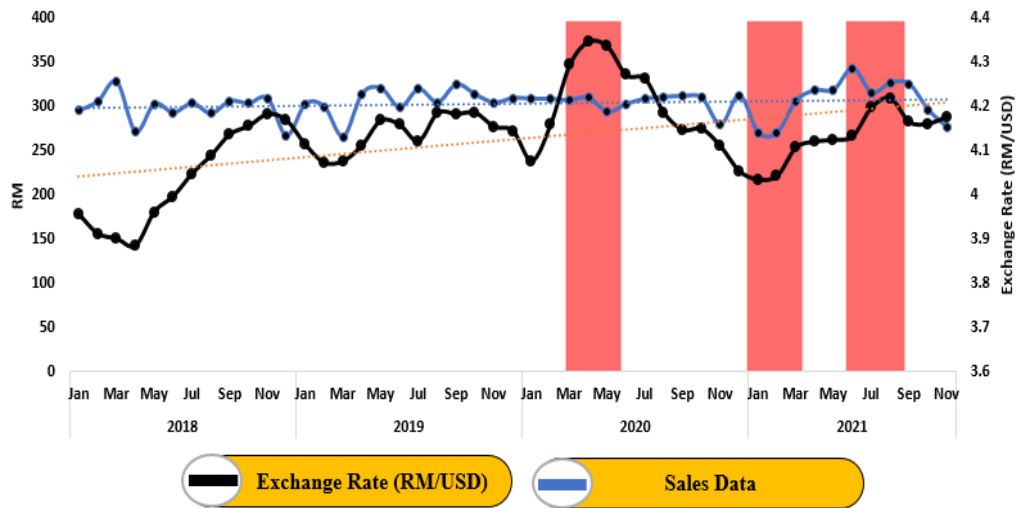


Figure 4.19 Average land price vs. exchange rate.

Figure 4.19 shows the trends of monthly average land price (psf) and exchange rate (RM/USD). The trendlines suggest a weaker nominal exchange rate relative to foreign currency does have a weak positive relationship with average land price (psf) for houses in Johor Bahru. The increment in average land price (psf) is much lesser relative to the increment in exchange rate (RM/USD) hence a weak relative is identified.

4.5.3 Average Land Price with Inflation Rate

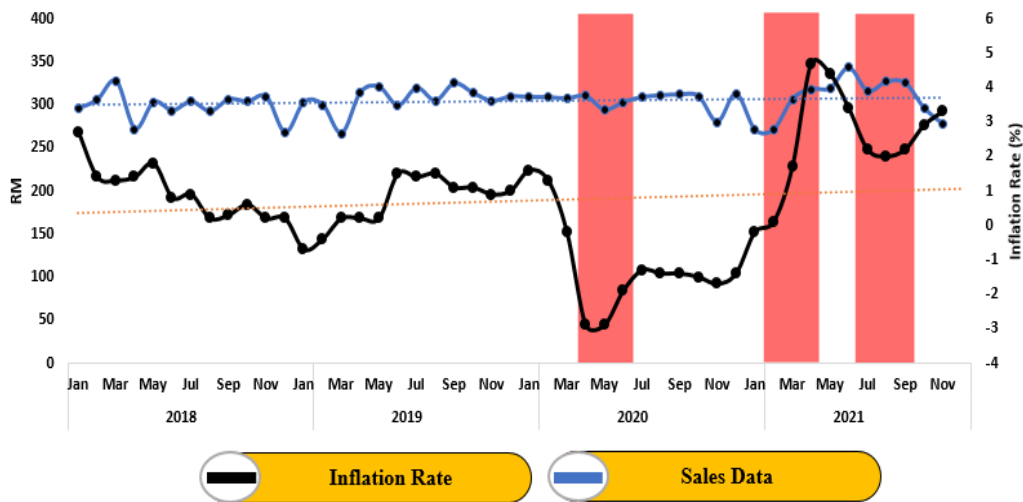


Figure 4.20 Average land price vs. inflation rate.

Figure 4.20 shows the trends of monthly average land price (psf) and inflation rate. Before pandemic, it is found that when the average land price (psf) for houses in Johor Bahru go up when the inflation rate drops. Johor Bahru residents will have more spendings on houses if the inflation goes down. However, during the pandemic, a negative inflation rate was recorded but the average land price (psf) in Johor Bahru did not increase as expected. Due to the economic recession, residents have less spendings on houses and the demand for houses decline. Only investors or TOP consumers are willing to spend on houses hence exert a downward pressure on the average land price. We did not observe any significant relationship between inflation rate and average land price in Johor Bahru during the pandemic.

4.5.4 Average Land Price with Interest Rate

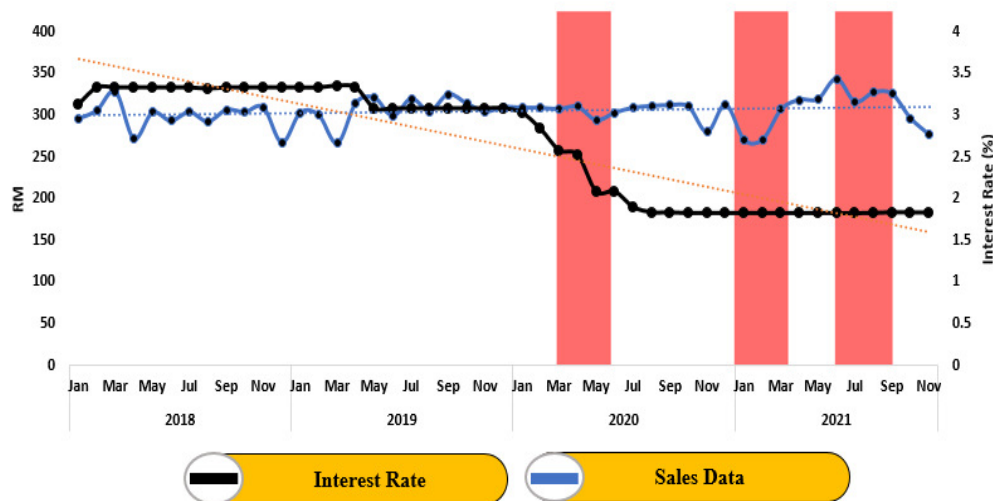


Figure 4.21 Average land price vs. interest rate.

Figure 4.21 shows the trends for average land price (psf) and interest rate. As the average land price is almost constant, the banks' interest rates are dropping over time. Through visualization, we could not reveal any connections between interest

rates and average land price in Johor Bahru hence we can conclude that there is no relationship between banks' interest rate and average land price in Johor Bahru.

4.5.5 Average Land Price with Unemployment Rate

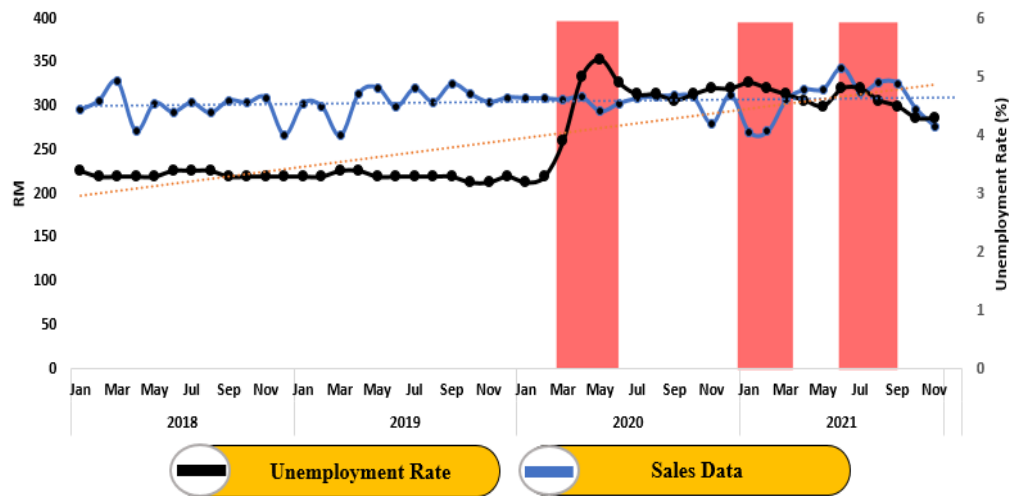


Figure 4.22 Average land price vs. unemployment rate.

Figure 4.22 shows the trends of average land price (psf) and unemployment rate. As the unemployment rates shoot up, there is no significant changes observed on average land price trend. We could assume majority are not willing to spend on houses during an economic recession but the developers are not willing to lower the housing price due to high cost. Hence residents who are intended to buy houses did not receive any discount on houses thus the housing prices and average land prices are remain constant.

4.6 Buyers' Preference on High-Rise Residential Buildings

This sub-section is discussing the buyers' preference on high-rise residential building. In the Real Estate Highlights for 1H2020, Knight Frank Malaysia predicts that the COVID-19 pandemic may have brought a shift in buyers' preference in Malaysia's residential property market. Under the pandemic, buyers may prefer landed properties or low-density developments with spacious layouts that have extra room to be converted into home office as working from home is a

new normal. Based on our findings, this prediction does realize in Johor Bahru. We found that 24.53% of the property sold before pandemic are apartments and condominiums (3,541 over 14,436) while only 22.46% property sold during pandemic are high-rise buildings (1,177 over 5,240), which is slightly lower than the proportion of high-rise buildings sold before pandemic. Since the proportion of landed properties or low-density developments sold during pandemic is higher than before pandemic, we can accept the prediction by Knight Frank Malaysia and conclude that buyers have more interest on landed properties in Johor Bahru during pandemic.

The high-rise and high-density residential buildings that available in our data are apartment and condominium. The buyers' preference will be discussed from three perspective, average housing price, total units sold and average land price (psf) at different floor level.

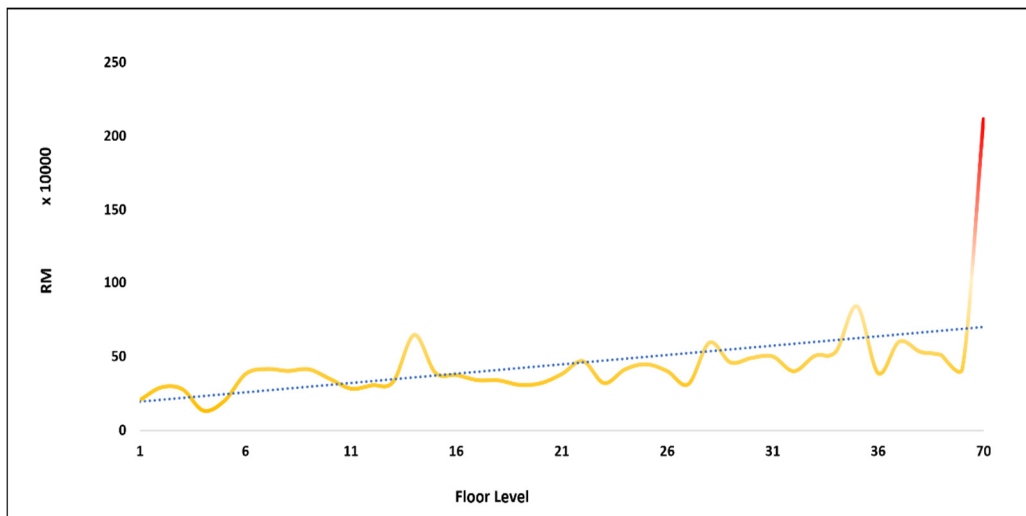


Figure 4.23 Average housing price on different floor level.

Figure 4.23 shows the average housing price on different floor level. It is observed that the average housing price is increasing over the floor level. Starting from level 1 to 42, the average housing price is slowly increasing but an enormous increase at level 70 is observed. Units sold at level 70 have a highest mean price of RM 2.12 million. The 3 units sold at level 70 are located at The Astaka, the tallest residential skyscraper in Malaysia with a total of 70 floors. As the units at

level 70 are penthouses in The Astaka, the units are having a higher price than other condominiums.

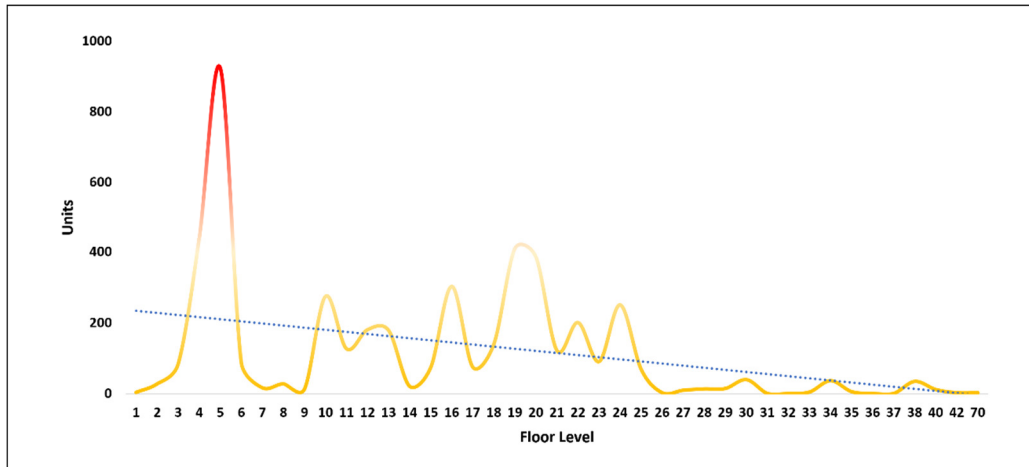


Figure 4.24 Total units sold on different floor level.

Figure 4.24 illustrates the number of apartment and condominium's units sold at different floor level. Buyers are more intended to purchase units at 4th, 5th and 6th floor which are the highest among all floor levels. Moreover, units at floor level 10, 16, 19 and 24 are welcomed by buyers. The trendline suggests the number of units sold are decreasing over floor level. The number of units sold are found to be low starting from level 26. This scenario might be due to the lack of high-rise residential buildings in Johor Bahru.

Figure 4.25 suggests an increasing on average land price (psf) over floor level. A sharp decrease at level 36 is found. More data is needed to estimate on the average land price at level 36 as there is only one data for it.

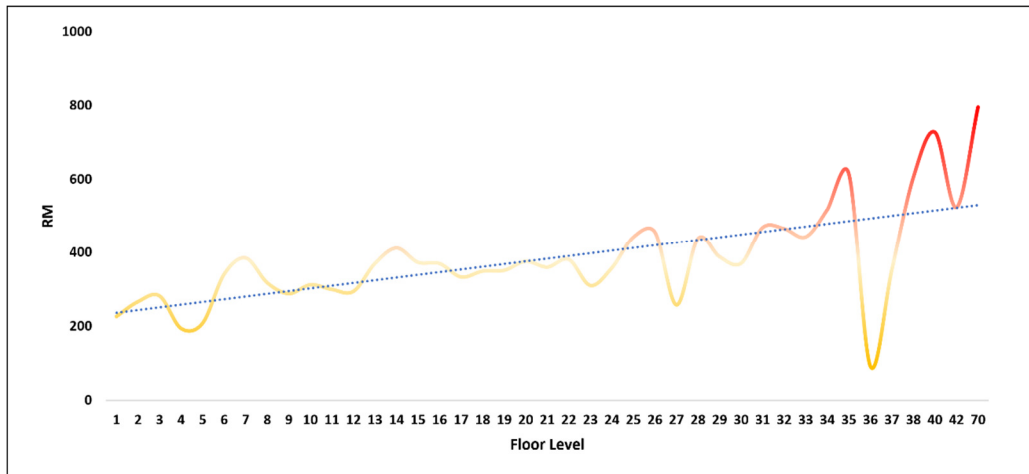


Figure 4.25 Average land price (psf) on different floor level.

In a nutshell, buyers are willing to pay more for high level units in Johor Bahru while more units are purchased at low level (4 to 6). According to the data, the number of apartments sold in Johor Bahru is higher than condominiums (3,992 and 726 respectively). More apartment's units were purchased thus quantity of units sold at low level is higher than high level condominium.

4.7 Summary

Section 4.3 - 4.5 discussed the relationship between macroeconomic variables and housing market in Johor Bahru. Based on the results, we could not indicate any relationship between GDP and housing market. There is a great slump in both transaction volume and transacted price while the GDP keep growing but the average land price (psf) rises along with the GDP.

We find significant relationship between exchange rate (RM/USD) and property market. Before the pandemic, a negative relationship between exchange rate and property market was observed. A weaker nominal exchange rate relative to US Dollar does exert an upward pressure on the residential property market. During the pandemic, as foreign investors not willing to invest in Johor Bahru, a positive relationship between exchange rate is observed. As the Ringgit Malaysia depreciated, a recession in housing market was observed.

The inflation rate exhibits a connection with housing market. We observe the housing market is positively related to inflation rate from 2018 – 2020 but a negative relationship was observed in 2021. The inflation rate does not have much influence on the land price. The interest rate proposed a positive relationship with the housing market. It was found that the high interest rate set by central bank did not lower the enthusiasm of buyers before the onset of pandemic but when the central bank set a lower interest rate for housing loan during pandemic, the Johor Bahru's property market did not show a sign of recovery. Similarly, the interest rate does not affect the land price. The unemployment rate does negatively relate to housing market. A downturn in property market when a significant rise in unemployment rate was observed during the pandemic.

Section 4.1 and 4.6 discussed the buyers' preference on high-rise building and the median price for properties in different areas. The cheapest residential property in Johor Bahru is apartment while the most expensive properties are bungalow and designed house. The housing market in Johor Bahru facing a downturn during COVID-19 pandemic.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study aims to examine and compare the performance of housing market in Johor Bahru before and during the COVID-19 pandemic. An interactive dashboard was constructed to perform data visualization techniques on housing market data. Based on the result, we have evidence to suggest the existence of relationship between some macroeconomic indicators and housing market in Johor Bahru. The exchange rate and unemployment rate possessed a negative relationship with housing market while inflation rate and interest rate are positively related to housing market before COVID-19 pandemic. During the pandemic, evidence shows the exchange rate and interest rate having positive relationship with housing market in Johor Bahru. Moreover, inflation rate and unemployment rate negatively affect the housing market.

Our findings shows that buyers are willing to spend more on high level units but the number of high-rise buildings in Johor Bahru are limited. Hence developers should have some projects on high-rise buildings in Johor Bahru. In addition, developers should take consideration of constructing more townhouse in Johor Bahru as townhouse is cheap relative to other landed property and might welcomed by low-income buyers.

5.2 Recommendation for Future Work

As Malaysia government had announced to reopen international borders with looser regulations on travellers starting 1st April 2022 thus Malaysia's economy is expected start to recover after some time. Hence this study should include the recovery period, to have a better comparison and understanding for the effect of economic recession on housing market in Johor Bahru during the COVID-19 pandemic, in future work.

Moreover, the Malay or bumiputera buyers should be included in future work as they have the largest proportion in Malaysia's population and their needs would greatly affect the trend of housing market. Due to the bumiputera's policy on housing, this study did not include bumiputera's housing data as it will affect the result of non-bumiputera's housing market performance. However, new visualization method should be taking consideration in future work such as create separate dashboard for bumiputera' housing data. This could help users to evaluate the housing market more accurate and make better investment or business decision

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APPENDIX

VBA Excel Code

Appendix A: Control Macro for Transacted Price

```
Sub display_sales()
```

```
With ActiveSheet
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```
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```
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```
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Call display_usd_sales
Call display_inflation_sales
Call display_interest_sales
Call display_unemployment_sales
Call display_gdp_sales

End With

End Sub
```

Appendix B: Control Macro for Transaction Volume

```
Sub display_units()
```

```
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```
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```
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```

```
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```
    .Shapes("units_up2").Visible = True
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Call display_interest_units
Call display_unemployment_units
Call display_gdp_units

End With

End Sub
```

Appendix C: Control Macro for Average Land Price

```
Sub display_land()
```

```
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```
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Call display_inflation_land
Call display_interest_land
Call display_unemployment_land
Call display_gdp_land

End With

End Sub
```