Canada's Housing Market: Where Are We Heading?

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2022-04-21

Introduction

As COVID-19 spread in the early 2020, it quickly became a public health crisis and further led to an economic crisis. The Government of Canada has been successful in putting the pandemic under control through implementing various public health measures, as well as stabilizing the economy through stimulus programs. However, at the year of 2022, millions of people who don't own a house realizes that, the home price has risen to a point that it is far more unaffordable. The Map and the Scatterplot of the Canada House Price Summary interactive visuals on the website shows the average home price at the year of 2022, as well as the percentage of growth of home price from January 2020 to January 2022. Not only the average home price is at an all-time record, the average home price has increased by 46.5% in Canada in the past two years. For large cities such as Toronto and Vancouver, the average home price has broken through $1 million.

To start with, there are two important things for readers to recognize. First, the house price growth over the pandemic is extremely uncommon. Figure 1 shows the comparison of the average annual house price growth rate between the COVID-19 period (after January 2020) and the pre-COVID period (before January 2020). For almost all the cities, the average annual house price growth rate is a lot higher for the COVID-19 period. Second, the growth rate is unsustainable, since the earnings growth is not matching up. Therefore, it would be worth to understand the following questions whether you are a home buyer or an investor:

1. What has happened in the COVID-19 pandemic that leads to such high house price growth?
2. Where are we heading? What can we expect about the house price for the next few years?

We will be utilizing house market, financial market, and macroeconomic related datasets obtains from Statistics Canada to answer the research questions listed above. In the following sections, we will provide background on the datasets we use, and how we cleaned and wrangled the data. We will also explain the methods we used and the results we obtained to analyze our research questions.

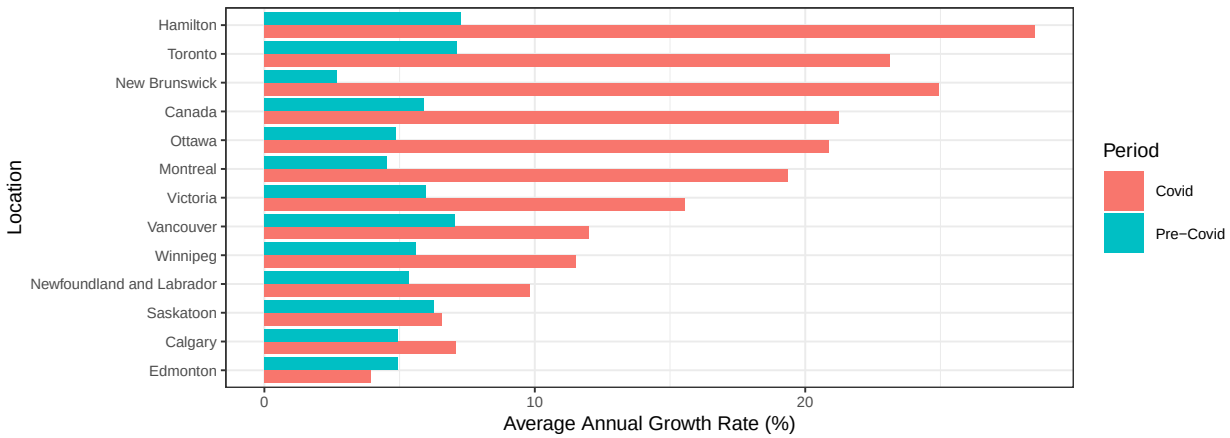

Figure 1: Average House Price Growth Rate by Location and Period

Methods

Data Set and Data Wrangling

In this section, we will introduce the datasets we used for this study, how and where the data were acquired, how we cleaned and wrangled the data, and what tools we used for data exploration.

1. Multiple Listing Service House Price Index The Multiple Listing Service House Price Index dataset provides information of average home price and price index for various different types of real estates (Ex. Townhouse, apartment, etc) at different time point. The dataset includes such information for numerous cities, as well as Canada on an aggregate level.

The dataset is provided as an excel file. Each sheets contains information for one city. We used the package `readxl` to read the sheets that correspond to the cities that we are interested into different dataset objects, and then we used the package `tidyverse` to concat the dataset objects into one and filtered the years of our interest.

Moreover, we added latitude and longitude by each locations in the dataframe, calculated the annual growth rate, and created a variable indicating if the time point is pre-covid or during covid.

The dataset was used to created the map and Figure 1 above with packages `leaflet` and `ggplot2`.

2. Canada Mortgage and Housing Corporation, Absorptions and Unabsorbed Inventory, Newly Completed Dwellings The Canada Mortgage and Housing Corporation, Absorptions and Unabsorbed Inventory, Newly Completed Dwellings datasets contains information of the number of absorbed complete dwelling units (newly completed units) and the number of unabsorbed inventory (second-hand housing) by different geographical regions such as Toronto, Ottawa, and Census metropolitan areas.

Table 1. Summary of Key Variables - Absorptions and Unabsorbed Inventory

Variable	Description	Variable.Type	Missing.Values
Reference Date	Time point recorded (monthly)	Date	0
Geography	Geographical Location	Character	0
Completed Dwelling Units	Absorptions or Unabsorbed Inventory	Character	0
Type of Dwelling Unit	Type of house (Ex. Single detached, Semi-detached	Character	0
Number of Units	Number of units listed for sale	Integer	0

We filtered the geographical location to be looking only at the census metropolitan areas. Since there is a great amount of seasonality in the number of units listed, for simplicity, we take the average of the number for each year. We extract the year information from reference date, and utilized the `tidyverse` package to obtain the mean number of units listed by year, completed dwelling units, and type of dwelling units.

3. Mortgages in Arrears Follow the link to the website, we wanted to scrape the table "Mortgages in arrears (delinquent for 90 or more days) continued downward trend across all lender types". The table contains information about mortgage in arrears across different lender types from 2020 Q1 to 2021 Q1. We used the packages `rvest` and `xml2` to scrape the table below.

	Chartered banks	Credit unions	Other non-bank Lenders	MIEs
2020 Q1	0.24%	0.16%	0.22%	1.04%
2020 Q2	0.26%	0.18%	0.29%	1.05%
2020 Q3	0.25%	0.16%	0.29%	1.02%
2020 Q4	0.23%	0.15%	0.27%	0.97%
2021 Q1	0.20%	0.13%	0.25%	0.88%

The problem with this table is that the dataset is not tidy. We utilized the `tidyr` package to convert the dataset into a tidy format, as shown below.

Mortgage Lenders	Quarter	Arrears
Chartered banks	2020 Q1	0.24
Chartered banks	2020 Q2	0.26
Chartered banks	2020 Q3	0.25
Chartered banks	2020 Q4	0.23
Chartered banks	2021 Q1	0.20
Credit unions	2020 Q1	0.16
Credit unions	2020 Q2	0.18
Credit unions	2020 Q3	0.16
Credit unions	2020 Q4	0.15
Credit unions	2021 Q1	0.13

4. Financial Market Statistics The Financial Market Statistics dataset provides information about various financial market rates such as bank rate, interest rates, government bond yields, treasury bills, etc, on a weekly basis. For this analysis, we will only be looking at the Government of Canada marketable bond yields. We utilized the `tidyverse` package and regular expression to filter the datapoints of our interest. Table 2 shows the summary of key variables of the dataset.

Table 2. Summary of Key Variables - Financial Markets

Variable	Description	Variable.Type	Missing.Values
Reference Date	Time point recorded (weekly)	Date	0
Duration of Bond	Bond Maturity in Years	Character	0
Yields	Yield of the bond	Double	0

As a part of data exploration, we plotted the yields of the bonds that have different maturity over time, from 1980 to 2022 in Figure 2. We observe that there is an overall decreasing trend of bond yields. This caused by various factors, In the 1990s, inflation decline, which leads to increase in demand of government bonds, that further drives up the bond price and decreases bond yields. In the 2000s, investors and central bank has increases purchases of government bonds as it was an emerging market, and more recently, yields continue to drop due to quantitative easing and monetary policies.

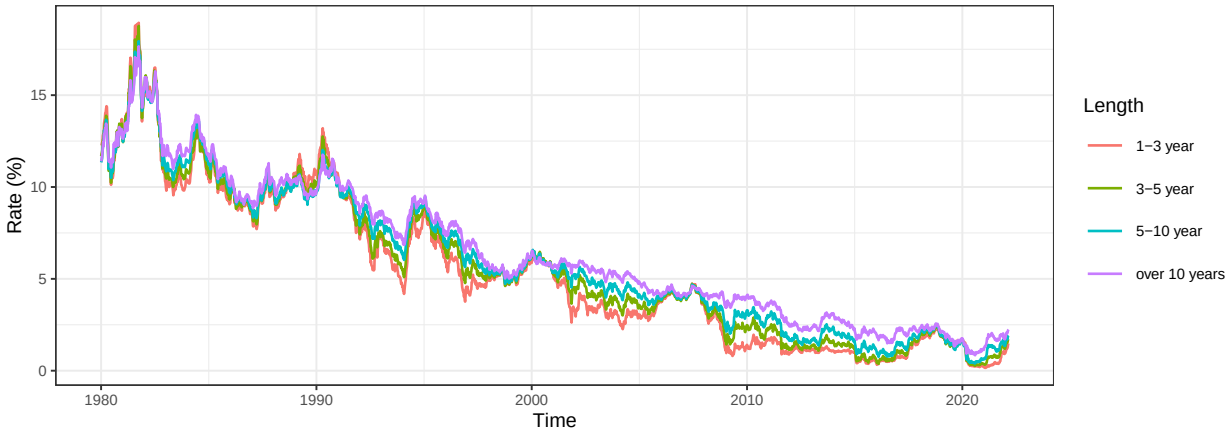

Figure 2: Government of Canada Marketable Bonds Average Yield

5. Chartered Bank Assets and Liabilities and Monetary Aggregates The Chartered Bank Assets and Liabilities and Monetary Aggregates dataset provides information of the assets, liabilities and the money circulating in the Canadian economy (monetary aggregates). When the central bank purchases long-term securities, which is known as quantitative easing, the money supply increases and hence there is more monetary aggregates. On the other hand, during quantitative tightening, monetary aggregate decreases. For the analysis, we will be looking into monetary aggregates since 2000, specifically M2, M2+, and M2++, to understand how the money supply has changed during the COVID-19 pandemic period, and further understand how the liquidity has changed.

Table 3 shows the key variables from the dataset that we will be using for our study. We cleaned the data by utilizing the `tidyverse` and regular expression to filter data points that are after year 2000, and the measurement of monetary aggregates are M2, M2+, M2++.

Table 3. Summary of Key Variables - Monetary Aggregates

Variable	Description	Variable.Type	Missing.Values
Reference Date	Time point recorded (monthly)	Date	0
Monetary Aggregates	Measurement of Monetary Aggregates (M2, M2+, M2++)	Character	0
Value	Total value of Monetary Aggregates	Double	0

6. Consumer Price Index The Consumer Price Index (CPI) reflects the consumer prices that the Canadian is experiencing. The dataset provides the value of CPI of each time points for different product groups, recorded on a monthly basis. CPI is used to measure inflation, which can affects the demand of investing in real estate. Table 4 shows the key variables in the dataset. Note that in the analysis, we only pick a few significant products and products groups to include in our study.

Table 4. Summary of Key Variables - CPI

Variable	Description	Variable.Type	Missing.Values
Reference Date	Time point recorded (monthly)	Date	0
Products and Products Groups	Consumer good and services	Character	0
Value	CPI	Double	0

As a part of data exploration, Figure 3 displays the historical CPI since the year 2000. We observe that overall, CPI growths on a steady trend. Steady inflation is healthy to our economy, since it stimulates consumption. However, we observe that in the beginning of 2021, the inflation surges. We will investigate how inflation has a relationship with house price in the following sections.

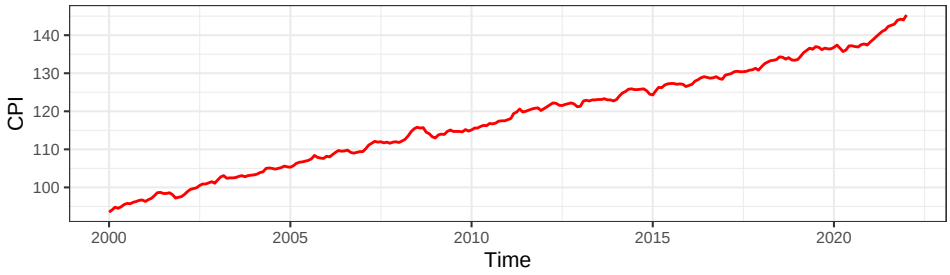

Figure 3: Historical CPI

Preliminary Results

As we have showcases the datasets we use and how we cleaned and wrangled the data, we are now ready to analyze the questions of interest:

1. What has happened in the COVID-19 pandemic that leads to such high home price growth?
2. Where are we getting? What can we expect about the home price for the next few years?

During the Covid Period, What Happened and Why?

Figure 4 shows the average house price growth rate for each year in Canada since 2005. We observe that between year 2021 and 2022, the house price growth has been significantly high. We want to look back on what happened during the COVID-19 period, and what caused the home price grew up significantly. And then base on the causes the drive up the home price, we can make inferences on the home price for the next few years.

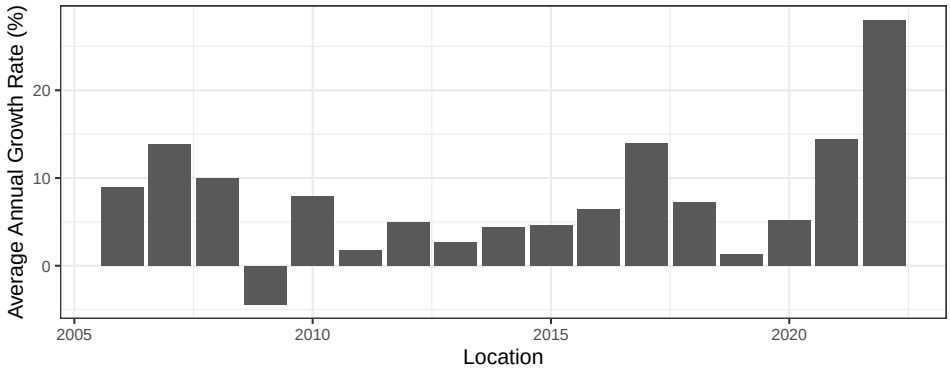

Figure 4: House Price Growth Rate in Canada

There is one important concept that this analysis will be solely based on. House as a good that producers wish to sell and consuers with to buy, its price is decided by supply and demand. By the law of supply and demand, quantity supplied and prices of goods has an inverse relationship, and quantity demanded and prices of goods has a positive relationship. We will explain what leads to such high home price growth during the COVID-19 pandemic by looking through the lense of supply and demand of the Canadian housing market.

Housing Supply

The housing supply mainly consists of two important components: 1. Number of Completed Dwelling Units 2. Unabsorbed Inventory (second-hand housing)

Figure 5 shows the number of completed dwelling units in Census Metropolitan Areas. We observe that starting 2004, the number of completed dwelling units starts to decrease, and achieves the minimum point at the year of 2019. After 2019, it starts to increase. Therefore, this supply components have increased during the COVID-19 pandemic and hence has no effect on the surge of home price.

Regarding the second component of supply, number of Unabsorbed Inventory (second-hand housing), Figure 6 shows that the inventory decreases significantly during the COVID-19 period, almost at the historical low point. This is because that as home price starts to go up, second-hand house sellers tends to be reluctant to sell, as they expect that the price will continue to go up and hence earns more profit in the future. The supply side of housing market, to sum up, it has decreased significantly.

Housing Demand

COVID-19 starts as a public health crisis, and then further led to an economic crisis. GDP shocked, and the unemployment rate rised. Initially, there were worries that this will lead to a rise of mortgage default rate, which could possibly lead to a collapse of house price. However, the government have prevented the economic crisis to continue by implementing various stimulus program. The housing market has returned to an optimisitc state. Figure 7 shows mortage in arrears by lenders. We observe that although the mortgage in

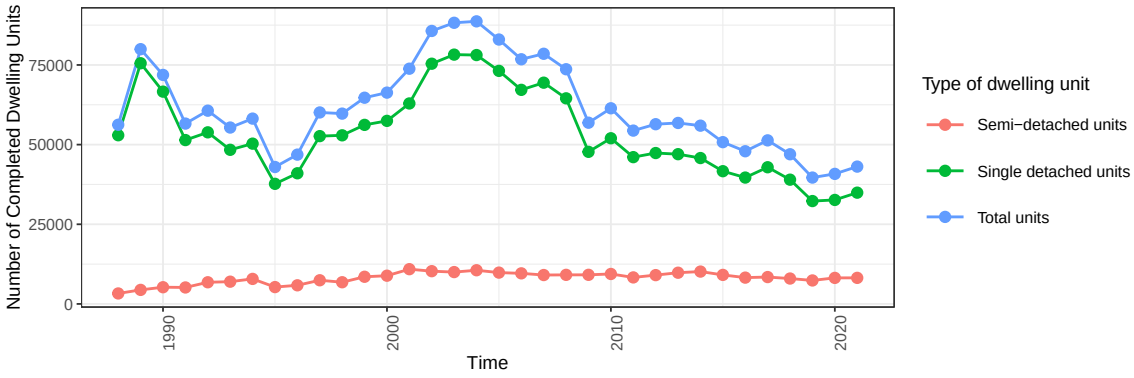

Figure 5: Completions by Dwelling Type in Census Metropolitan Areas

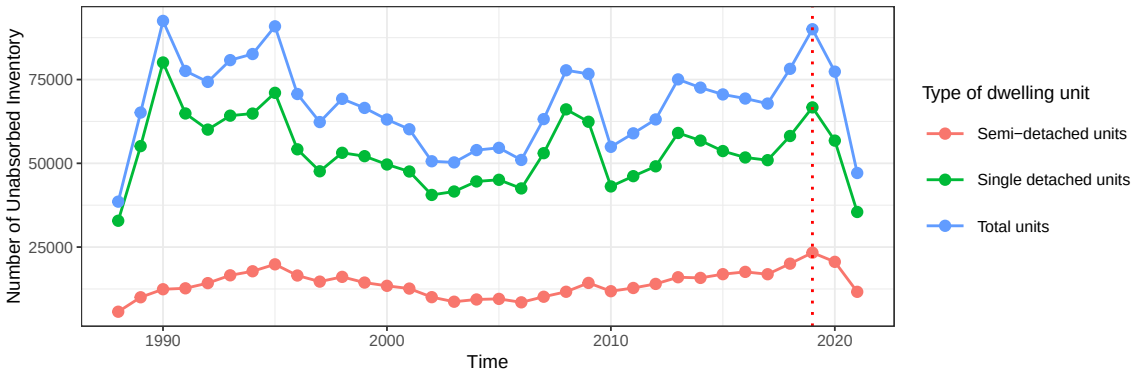

Figure 6: Unabsorbed Inventory in Census Metropolitan Areas

arrears increases from 2020 Q1 to 2020 Q2, it has started to decrease after that. The major source of this is nothing else, but quantitative easing.

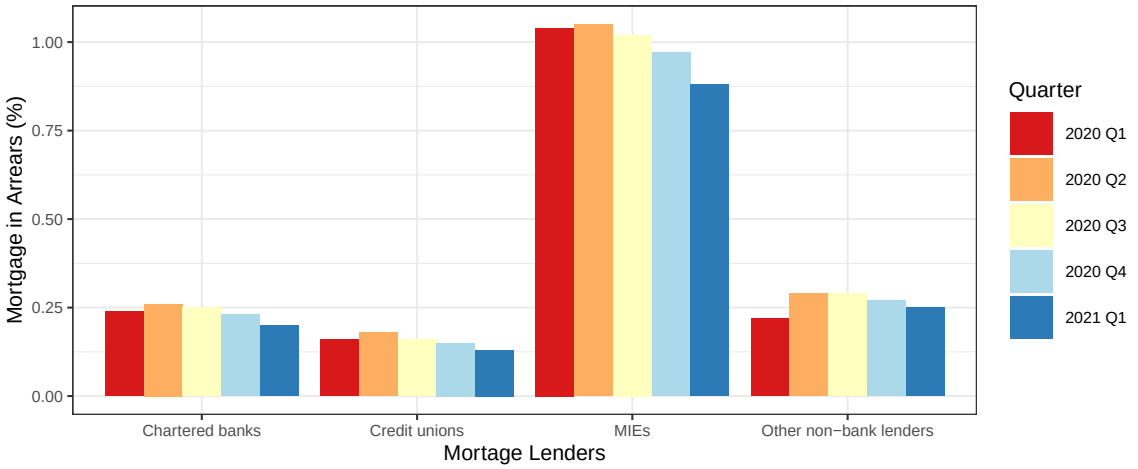

Figure 7: Mortgage in Arrears by Lenders and Quarters

Quantitative easing happens when the central bank purchases government bonds, so that money can be injected into the economy, and the government and utilize the money for stimulus programs and benefits. Quantitative easing causes three major consequences that causes the rise of demand in the house market:

1. Increase of government bond price, which decreases bond yields. As a result, the opportunity cost of mortgage decreases, which leads to higher demands. Figure 8 shows the distribution government bond yield of different maturity since 2015, we observe that the yield dropped significantly in the beginning of pandemic.

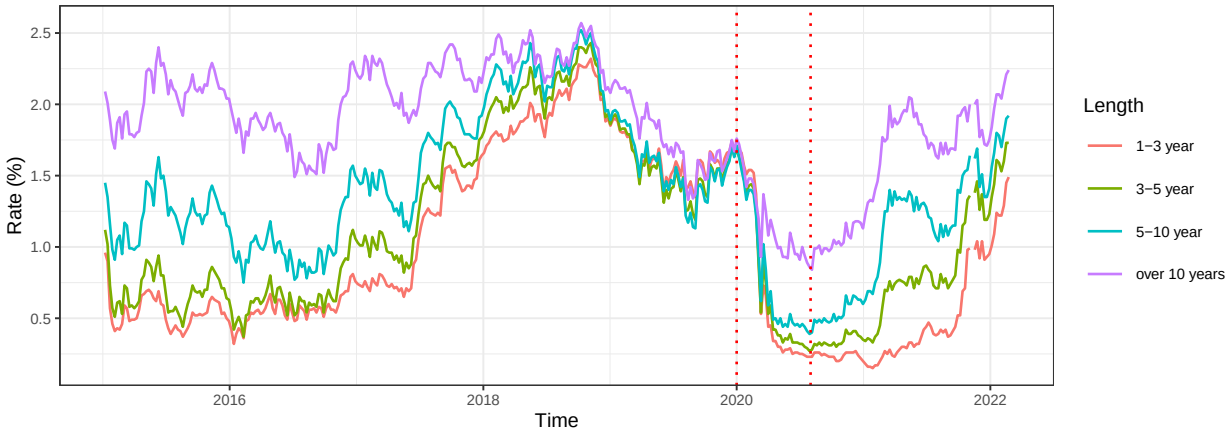

Figure 8: Government of Canada Marketable Bonds Average Yield

2. Increase of money supply and hence there is more monetary aggregates. More money in circulation implies that there is more money for the banks to lend and hence the cost of mortgage decreases. Figure 9 shows the log of monetary aggregates by time. We observe that since the COVID-19 pandemic, the growth rate of monetary aggregates has increased significantly. Another interesting observation is that, the growth of monetary aggregates during COVID-19 pandemic is larger than during financial crisis, as shown in Table 5. This is bacause that COVID-19 pandemic is an economic crisis, we need more money in circulation to expand economic activities, whereas the financial crisis was a debt crisis, the importance is to unfreeze the debt market and regain confidence.

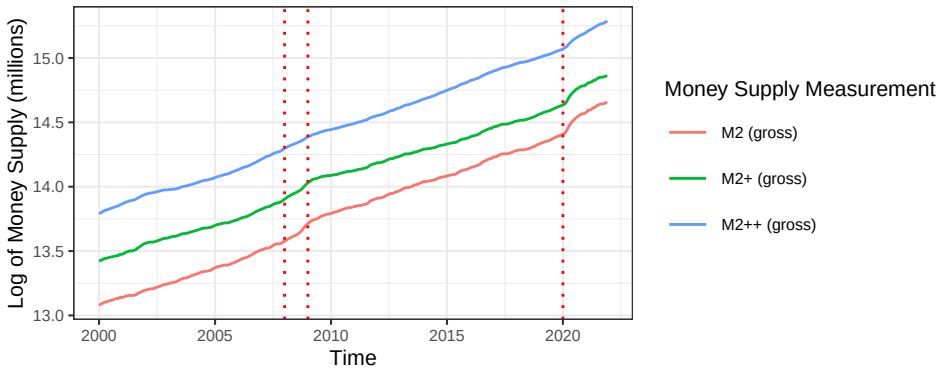

Figure 9: Money Supply By Time

Table 5. Money Supply Growth Comparison Between Financial Crisis and Covid-19 Pandemic

Measurement	COVID.19.Pandemic	Financial.Crisis
M2	20.8%	17.0%
M2+	19.0%	16.0%
M2++	16%	10.7%

3. Rise of inflation. Real estate is known to be an investment product that performs well in high-inflation environments, which leads to a higher demand. CPI has raised significantly since 2021, and the trend continues. In fact, inflation in the year of 2021 was 5.14%, and a huge growth for all product groups, as shown in table 6.

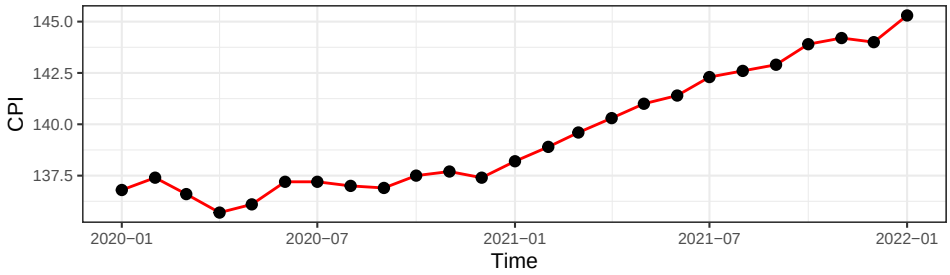

Figure 10: CPI during COVID-19 Pandemic

Table 6. CPI Growth of 2020 and 2021 by Category

Category	Year_2020	Year_2021
All-items	1.02%	5.14%
Food	0.98%	5.74%
Shelter	1.37%	6.20%
Clothing and footwear	-4.07%	1.63%
Health and personal care	1.32%	2.92%
Energy	-2.71%	23.14%
Services	1.87%	3.41%

As a result, we conclude that the rise of home price during the COVID-19 pandemic was due to decrease in supply of inventory (listing of second-hand house), as well as increase in demand that was caused by quantitative easing. The opportunity cost of mortgage decreased as government bond yield decreases, which leads to increase of purchasing power. Increase of monetary aggregate leads to higher liquidity. The banks have more money to lend. And the rise of inflation increases the demand of real estate investment, as it performs well in high-inflation environments. As the house price rapidly grows, the second-hand house sellers are less willing to sell as they expect the price will continue to grow, which futher decreases the supply.

Where Are We Heading?

As we now know the causes that leads to such high house price growth, we are now ready to make inferences on what can we expect about the house price for the next few years, again through the lense of supply and demand.

Housing Supply Housing completions and housing under contruction will impact the number of completed dwelling units, which is an important component of housing supply. Figure 11 shows the distribution of housing completions and housing under construction since 2000, we observe that housing under construction continue to grow, hence we can expect that number of completed dwelling units to increase in the future.

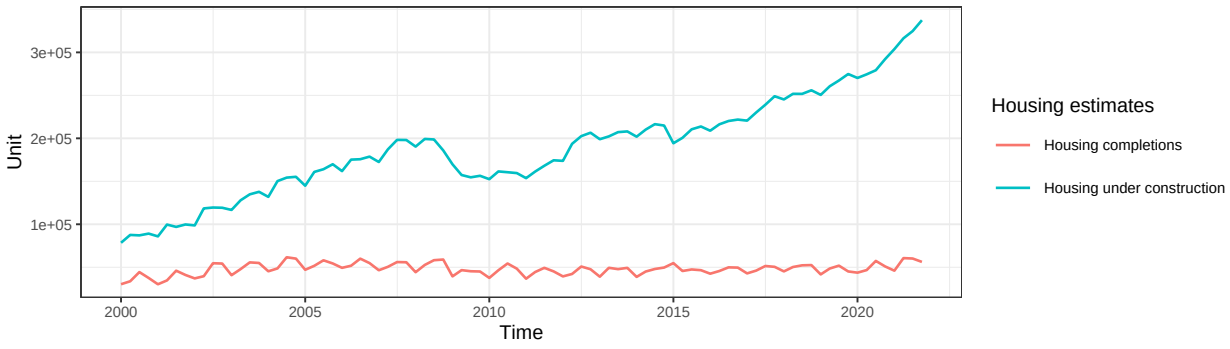

Figure 11: Housing Under Construction, and Completions

Another component of housing supply, the unabsorbed inventory (second-hand housing), as discussed before, was decreasing during the pandemic because the second-hand house sellers were less willing to sell as they expect the price will continue to grow, which futher decreases the supply. This also suggests that, once the expectation on housing price changes to that the growth does not continue, a lot of sellers will start to release the inventory, which leads to increase in supply.

Housing Demand As the central bank will be raising the interest rate, this reduces potential buyers in the market as the cost of mortgage increases. Figure 2 also shows that there is an increasing trend of bond yield, which increases the opportunity cost of mortgage and decreases purchasing power. Moreover, the central bank is ending quantitative easing and moving into the tapering phase. As a result, monetary aggregate decreases, there will be less liquidity. As a result, there will be less demand which may leads to decrease in house growth rate or even decreases in house price.

Conclusion/Summary

To summarize our findings, the rise of home price during the COVID-19 pandemic was due to decrease in supply of inventory (listing of second-hand house), as well as increase in demand that was caused by quantitative easing. As the central bank is ending quantitative easing, the expectation of that the price will continue to grow has a high possibility to change. The house growth rate is not sustainable and back to steady. As we expect both the absorbed inventory and newly completed dwelling units to increase in the future, it is possible that there will be a correction for house price. It is important to note that, house price is deeply connected to economic development and hence the house price growth is inevitable in the long run.