COVID-19 and Housing Market Effects from an Icelandic context

- Lockdown measurement’s impact on property sales

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COVID-19 och bostadsmarknadseffekterna från ett isländskt perspektiv

COVID-19 and housing market effects from an Icelandic context

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Abstract

The global emergency declared by the World Health Organization in early 2020 due to the outbreak of SARS-CoV-2 would later develop into a pandemic that has since affected global markets at large. Though its affects have been varied in nature and magnitude, housing markets in many countries have seen a boom since the initial outbreak. This paper seeks to assess how COVID-19, and the domestic measures implemented as a result of it, have impacted the housing market in the capital region of Iceland. It focuses particularly on how two central variables have been affected: sale price and transacted volume. In pursuit of a deeper understanding, two hypotheses have been formulated:

1. Sale prices increased due to restrictions because of COVID-19.
2. Transaction volumes increased due to restrictions because of COVID-19.

Using data from the Housing and Construction Authority of Iceland, Húsnæðis- og mannvirkjastofnun, regression analysis was conducted through two different models. The data set contained 30 991 apartment and single-family house transactions that occurred between January 2017 and April 2021. The models also considers the Central Bank of Iceland's interest rate.

Although both sales prices and transaction volumes have increased in Iceland over the course of the pandemic, no documented support for either of the hypotheses was established through the analysis. Thus, no distinct correlation was proven by the study in regard to the relationship between the increases and the government implemented restrictions and measures. It is unknown and cannot be assumed nor concluded whether this outcome occurred due to insufficient data or the absence of a clear positive or negative relation between the two factors. The overarching issue is likely the difficulty that exists in isolating and examining one sole factor, such as restrictions, from other influential and interdependent factors, and the underlying disregard this harbours for synergetic relationships that elicit complex market changes.

Sammanfattning

I början av 2020 kom Världshälsoorganisationen att tillkännage coronavirusets utbrott som en global nödsituation. Viruset kom sedan att utvecklas till en pandemi och kom att påverka många globala marknader. Bostadsmarknaden har sett en kraftig uppgång i många länder efter den initiala epidemin. Denna uppsats syftar till att undersöka effekterna av COVID-19, och efterföljande åtgärder som togs, på bostadsmarknaden i huvudstadsregionen i Island. Särskilt tittar studien på hur två variabler påverkades; försäljningspris och transaktionsvolym. För att finna svar formulerades två hypoteser;

1. Försäljningspriserna ökade under COVID-19 då restriktioner existerade.
2. Transaktionsvolymen ökade under COVID-19 då restriktioner existerade.

Med data från Bostads- och byggmyndigheten i Island, *Húsnæðis- og mannvirkjastofnun*, utfördes regressionsanalys utifrån två modeller framtagna. Ursprungsdatan innehöll 30 991 transaktioner, innehållandes både lägenheter och småhus, mellan Januari 2017 och April 2021. Modellerna tar även hänsyn till den isländska centralbankens styrränta.

Fastän försäljningspriser och transaktionsvolymen har ökat i Island under pandemin, hittades inget support för någon av hypoteserna i analysen. Därmed kan inget tydligt samband mellan ökningarna och regeringens implementerade restriktioner dras. Huruvida detta beror på otillräcklig data eller om det faktiskt inte finns en tydlig positiv eller negativ relation mellan dessa två kan inte fastställas. Den huvudsakliga problematiken grundar sig troligtvis i svårigheten i att isolera och enbart studera en faktor, såsom restriktioner, särskilt från andra påverkande faktorer, liksom att ignorera synergier som finns mellan dessa.

Acknowledgement

This thesis completes my Master of Science in Engineering, Surveying and Land Management, at the Division of Real Estate Science, Lund University, Sweden. Writing this paper has been both interesting and challenging, and I am grateful for the experience and now feel ready for life outside of school.

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Elsa Frisk

Stockholm, December 14th 2021

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1 Introduction

1.1 Background

At the beginning of 2020, a new respiratory disease was identified. The virus, commonly known as COVID-19, was declared a global emergency on January 30th by the World Health Organization (WHO) (Sohrabi, 2020) and later developed into a pandemic (World Health Organization, 2020). Governments have since then taken action to "flatten the curve" (Burkert & Loeb, 2020) by implementing restrictions/encouragements for businesses and households to limit human interactions and decelerate the spread of COVID-19 (Ritchie et al., 2021). Subsequently, the effects from the pandemic and the government imposed regulations could be seen on several markets; consumption decreased (Eurostat, 2021a; Horvath et al., 2021), unemployment increased (Eurostat, 2021b; Martin et al., 2020) and volatility in equity returns fluctuated (Uddin et al., 2021; Ramelli & Wagner, 2020).

The housing market has not been immune to the global economic disruption. The pandemic and government imposed restrictions have, to varying degrees, made the selling of residential property difficult or impossible. Concrete examples of restrictions affecting the sales are travel restrictions (both nationally and internationally), limiting allowed number of people in gathering and implementing stay-at-home orders (DW, 2020). Early studies from the pandemic showed decrease in both frequency and sales prices, with a correlation to shut down and re-opening periods (D'Lima, 2020; Jovanović-Milenković et al. 2020). However, looking at the development shortly after the initial outbreak period, real estate markets have seen a significant increase in both sales and prices due to multiple different factors such as; increased demand, low mortgage rates, stamp duty holidays (a time period where buyers don't have to pay stamp duty when purchasing property) and accidental savings (i.e. without actively choosing, restrictions have led to households spending less compared to before to the pandemic) (BBC News, 2021; Baynes et al., 2021; Manhertz, 2021).

Whereas most studies on the subject of residential housing markets during COVID-19 today have been conducted on larger economies (e.g. the US and China), this thesis addresses a smaller one, Iceland. Iceland has overall so far had few cases during the pandemic compared to other countries, with a few periods where the number of cases was seen as relatively high (Roser et al., 2020). Several reasons that have been used to explain the outcome with the low overall rate of infection is; international travel quarantine, screening and tracking the virus among the general public as well as Iceland being a diminutive country relative to other countries (both for land area and population) (Scudellari, 2020; Worldometer, n.d.b; Worldmeter, 2021).

This thesis examines how the housing market of Iceland reacted to governmental restrictions introduced during the start and development of the pandemic. Iceland is an interesting case study for several reasons. First, due to it being a smaller economy, it has a history of larger fluctuations on the housing market. Thus, there might be reason

to expect a more pronounced outcome from a study of the market there. Secondly, with being geographically isolated, certain spill over effects from neighbouring countries that could be seen in other countries, would less likely be having the same effect in this case.

The data originates from Húsnæðisog mannvirkjastofnun (HMS), and contains housing transactions from the Capital region between January 1st 2017 to April 30th 2021. A regression analysis is used to analyse and draw conclusions.

1.2 Aim & Research question

This study aims to look closer at the housing market in Iceland during the past year of the COVID-19 pandemic, to address any changes to both the number of sales as well as the sales prices, depending on different levels of restrictive measurements imposed by the government.

There are two clear questions to be answered:
1. How, if at all, did the pandemic and governmental responses imposed by the government impact sale prices? And;
2. How, if at all, did the pandemic and governmental responses imposed by the government impact market volumes?

1.3 Limitations

The data originates from and analyses the Great Reykjavik region, where most of the population lives (63 % of inhabitants on January 1st 2021) and where most transactions occur (Statistics Iceland, 2021b).

The main focus time frame for this work is between January 2017 to May 2021. The governmental restrictions included in this paper have been selected for the purpose of this paper.

1.4 Disposition

The disposition follows as:

2. Iceland Background
Chapter 2 describes the residential market before the pandemic (2.1), the chronologic COVID-19 timeline and the government response (2.2), and the residential market during the pandemic (2.3).

3. Theoretical basis & hypotheses
This chapter provides a literature overview from pandemics/epidemics in the past as well as the current, theoretical concepts and models from economic theories relevant for this paper and the hypotheses for the research questions.

4. Data
Chapter 4 describes the data and variables used in the analysis as well as the descriptive statistics.

5. Methodology
Chapter 5 presents the research methods and the mathematical framework used for answering the hypotheses.

6. Results & Analysis
The empirical findings are presented in chapter 6.

7. Discussion & Conclusion
Chapter 7 provides discussion and conclusions.

1.5 Definitions

COVID-19 – Previously known as the "coronavirus disease 2019", caused by the virus called "SARS-CoV-2". Sometimes referred simply to "coronavirus" in this paper.

Sales price – The final price when a property is transacted.

HCA – The Housing and Construction Authority of Iceland, or in Icelandic the *Húsnæðis- og mannvirkjastofnun*

Apartment – Residential property in an apartment building, i.e. house with three or more apartments or semi-detached house with two apartments in one house.

Single-family home – Units not included in the term apartment; single-family detached houses, townhouses, et cetera.

2 Iceland background

This chapter describes the structural foundations of Iceland when it comes to the past and current housing market and management of COVID-19. It also further explains the country's COVID-19 response that may have affected the housing market.

2.1 The housing market before COVID-19

Icelandic housing and financial stability has fluctuated over the years. In the years around 1980, inflation soared to an all-time high and led to indexation of all housing loans (Sveinsson, 2000). Prior to the indexation of loans, the inflation led to an increase in the share of home ownership, as this protected against the inflation (Ministry of Social Affairs, 2004). The indexed loan has since then made up a majority of all mortgages in Iceland (Mallett, 2013). Throughout the 1990s and up until 2007, the financial market of Iceland was having a prime time. During these years, cost of capital decreased due to privatization of banks and their rapid expansion into international markets. A state-owned mortgage lender – The Housing Financing Fund (HFF) – formatted the mortgage rules and offered a loan-to-value (LTV) ratio of 90 % in 2004. However, competitiveness between banks led to some banks offering 100 % loans. Subsequently, demand and pricing for housing increased. The share of home ownership in Iceland has remained high since the 1980s. Homeownership was around 80 % from 1995 until 2007, with a decrease after the financial crises. In 2018 the home ownership was approximately 74 % (Tulip, 2007; Elíasson & Skúlason, 2016; Helgason & Kopsch, 2020; Eurostat, 2021c).

Despite fluctuations, Iceland's residential market has seen a consistent rise in the last decade since the global financial crisis in 2008 (Statistics Iceland, 2021). Iceland was one of the country’s worst hit by the crisis, which could be seen through; depreciation of the country's currency (Icelandic Krona, ISK), high inflation, an increase in household debts, and the collapse of the three major banks of Iceland in October 2008 (Central Bank of Iceland, 2018). While the crisis put Iceland's economy in a tough financial position, this led to reformations within the financial sector and made traveling to Iceland more affordable. In 2010 the volcano Eyjafjallajökull erupted and caused big air traffic disruptions all over Europe, causing Iceland to be brought up in international media. Adding to the media attention, a promotional campaign called “Inspired by Iceland” helped Iceland market itself as safe and attractive for tourists. The following years saw an increase in tourism (see figure 1), which helped the country in its recovery (Sæþórsdóttir et al., 2020). Since the crisis Iceland has seen itself become more reliant on tourism in its economy; in 2009 it accounted for 3.5% of GDP, 2016-2019 that figure was approximately 8%) (Statistics Iceland, n.d.).

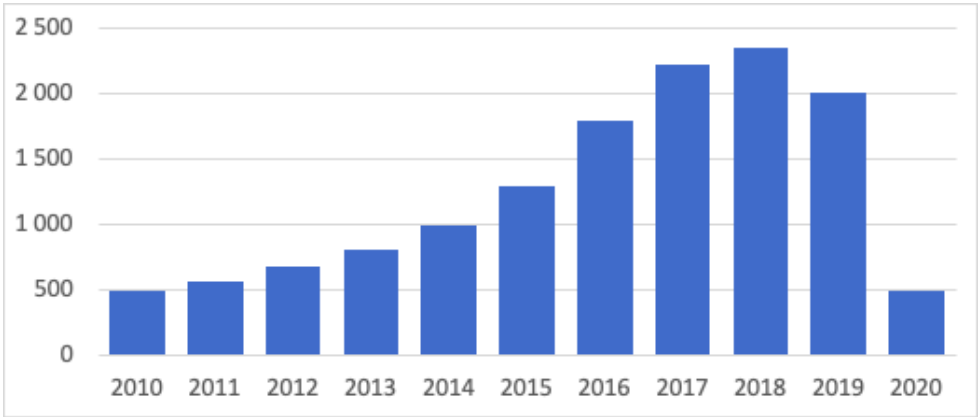

Figure 1: The number of international visitors to Iceland, in 1000s. Source: Icelandic Tourist Board; Statistics Iceland.

In 2019, tourism saw a decrease for the first time since 2008 (see figure 1). The same year the Central Bank of Iceland decided to lower the interest rates – which had been stable at approximately 4-9 percent since 2010 – to an interest of about 3 percent. Unemployment remained stable between 2016-2019 at around 3-4 percent (Statistics Iceland, 2021). The housing market price increase had slowed at this time, but the transaction volumes remained stable (Statistics Iceland, National Registry of Iceland & Central Bank of Iceland, 2021; National Registry of Iceland & Central Bank of Iceland 2021).

Despite a slowing in population growth, Iceland has seen a consistent increase in completed buildings, as well as an overall increase in dwellings under construction in recent years (see figure 2). Another growing infrastructure is the fibre-optic network. Connectivity and speed experiences by users has increased in the past decade through reforms guided by the Electronic Communication Plan (2011-2022). Current fibre distribution is approximately 80 %, which puts Iceland in the top amongst European countries (OECD, 2021).

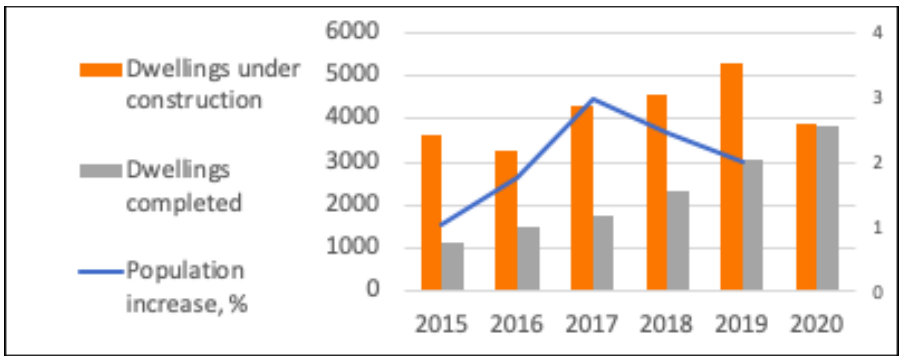

Figure 2: The number of dwellings completed and under construction each year together with the population growth between 2015-2020. Source: Statistics Iceland

2.2 Covid-19 timeline & Government response

The first case of COVID-19 in Iceland was recorded on February 28th (Hilmarsdóttir, 2020). The Icelandic government declared an emergency alert level – the highest national danger level – on March 6th 2020. Government measurements imposed early on included isolation of those infected, quarantine for people exposed to the virus or international travellers arriving from certain designated risk areas, and limiting the number of attendees at gatherings. For long periods of time, the restrictions on gatherings were set at maximum 20 or 50 people (see figure 10). (The Directorate of Health and The Department of Civil Protection and Emergency Management, 2021). Iceland has had relatively few corona cases and spikes in contagion compared to a majority of all nations, (see figure 3 for a comparison with a few) (Worldometer, n.d.a).

The first recommendation for quarantine in Iceland was established on January 27th, 2020, before WHO had declared a state of emergency or Iceland had its first case. Shortly after, the country designated risk areas where people traveling from certain countries or areas into the country were obliged to quarantine for 14 days. This lasted until March 19th, when all countries were designated as risk areas. The restrictions implemented took legal effect on March 27st, which meant that from then onwards the public authorities could collect fines and handle cases on legal grounds (The Directorate of Health and The Department of Civil Protection and Emergency Management, 2021).

As time progressed, Iceland recorded few COVID-19 cases between early April and early September of 2020. During this time, larger crowds were allowed again and society opened up more. The quarantine rules were developed and alternatives to the long 14-day quarantine were provided; two negative Covid tests at five-day intervals were given as an option. Later, this was changed into a seven day quarantine, with a Covid test as the final test (The Directorate of Health and The Department of Civil Protection and Emergency Management, 2021).

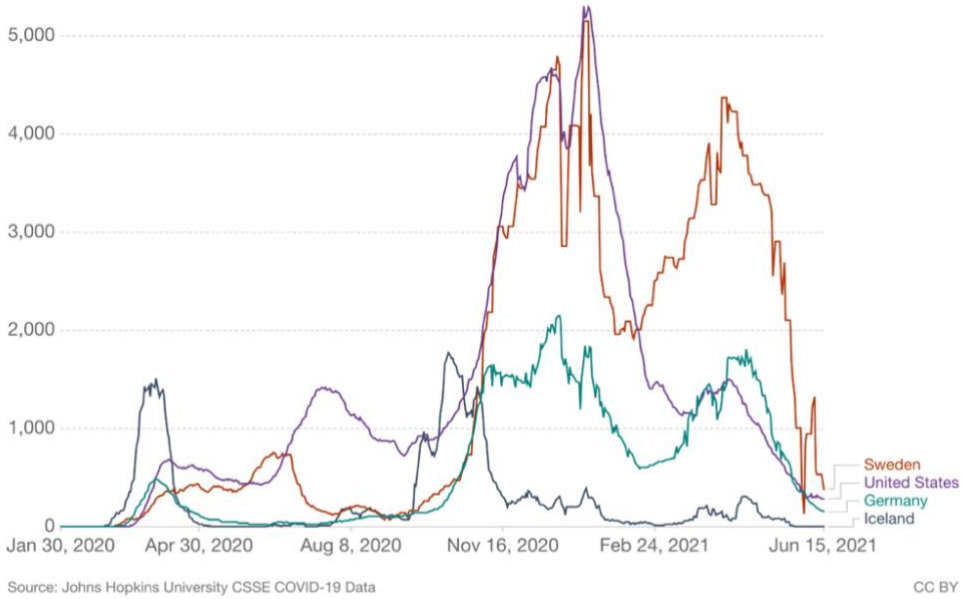

Figure 3. Weekly confirmed COVID-19 cases per million people comparing Iceland to other countries. Weekly cases refer to the cumulative number of confirmed cases over the previous week. Source: John Hopkins University CSSE COVID-19 Data (Roser et al., 2020).

At the end of September 2020, Iceland got a new surge of cases. Subsequently, between September 18th and September 27th, all bars and restaurants were closed and the government tightened allowable crowds. Between 5th of October to 9th of December, limitations oscillated between 10 to 20 for public gatherings, all leisure and cultural activities were prohibited and masks required. Vaccination against COVID-19 starts on December 29th 2020 (The Directorate of Health and The Department of Civil Protection and Emergency Management, 2021). During 2021 one relatively small surge in cases was seen in the early spring (see figure 3 and 10), which prompted stricter regulations on gatherings and banning unnecessary international travel. However, travel bans are not applicable to people living in Iceland or people with certificates showing a full vaccination completion and/or that they have had the coronavirus and are no longer infectious. As of August 2021, the capital region has fully vaccinated 68 % of its residents (see figure 4).

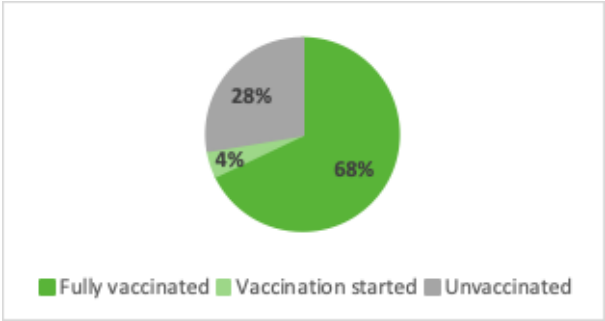

Figure 4: Percentage of people vaccinated in the Capital region. Source: covid.is

2.3 The housing market during COVID-19

Overall during COVID-19, the housing market has seen an increase in sales prices and number of transactions (see figure 5 and 9). Although the stock market initially dramatically declined, tourism numbers dipped about 75 % in 2020 (see again, figure 1) and unemployment increased to about 8 % until today (the biggest group affected being 16-24 years old), there has been an upwards trend following the initial outbreak (Bloomberg, 2021). Some explanations for this could be the lowered interest rate, a lowered supply and accidental savings due to restraints on spending on certain goods during closings of restaurants et cetera. There could also be a pent up demand due to the slowdown of the transactions in the beginning of the pandemic (see figure 9) (HCA, 2021b).

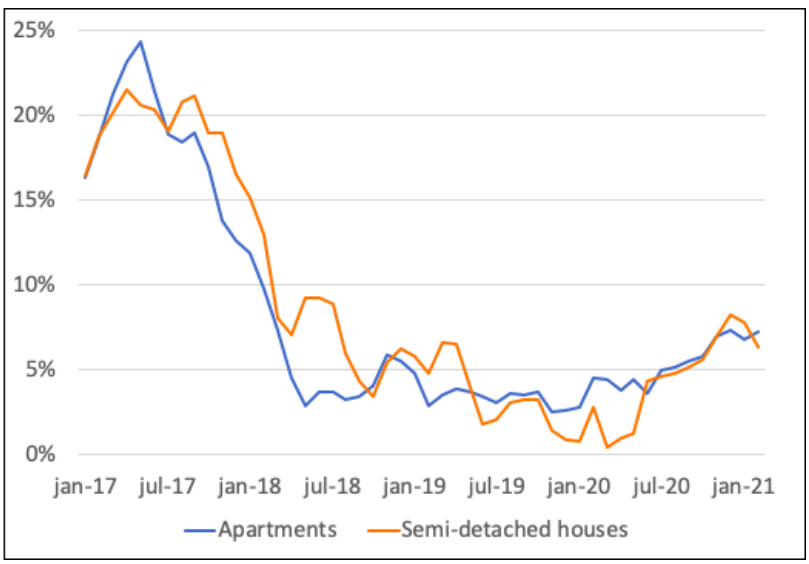

Figure 5: Housing price index in capital area, % changes in weighted average price per square meter. Source: National Registry of Iceland, Central Bank of Iceland 2021.

The Central Bank of Iceland lowered the key interest rate from 3 to 1 % between February to May of 2020, and then lowered it further to 0.75 % (see figure 6). Since then the key interest rate was increased for the first time since the outbreak in May 2021, to 1 % (Statistics Iceland, 2021; Central Bank of Iceland, n.d.). The effect of a lowered main interest rate on mortgage loans are low rates for both indexed and non-indexed loans. This has lowered the threshold for low-income earners and young people to enter the housing market. The increase in first time buyers have been significant during the pandemic, with approximately 30 % of all purchase agreements in the capital region coming from first time buyers. Subsequently, the share of households owning their own homes increased from 70,8 % at the start of early 2020 to 73,1 % later in the year. The share of households who rented their homes decreased from 16,6 % to 12,9 % during the same period (HCA, 2021c).

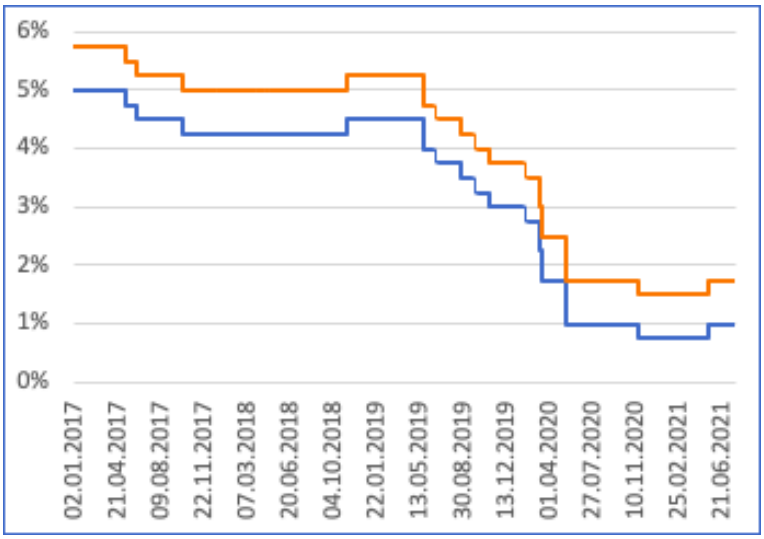

Figure 6: In blue; the Central Bank's main interest rate over time, %. In red; the 7-day mortgage rate. Source: Central Bank of Iceland, n.d.

Consequently, new loans have been increasing (see figure 7 and 8) and banks' proportion of housing loans of their total assets have increased. The share of housing loans of the banks' total assets went from 25 to 30 percent during 2020, with significant growth in the proportion of non-indexed loans (Helgason et al., 2021; HCA, 2021a). The Central Bank of Iceland decided in June 2021 that the LTV-ratio for consumer mortgages would be lowered from 85 to 80 %, whilst the LTV ratio for first-time buyers remained at 90 % (Central Bank of Iceland, 2021a).

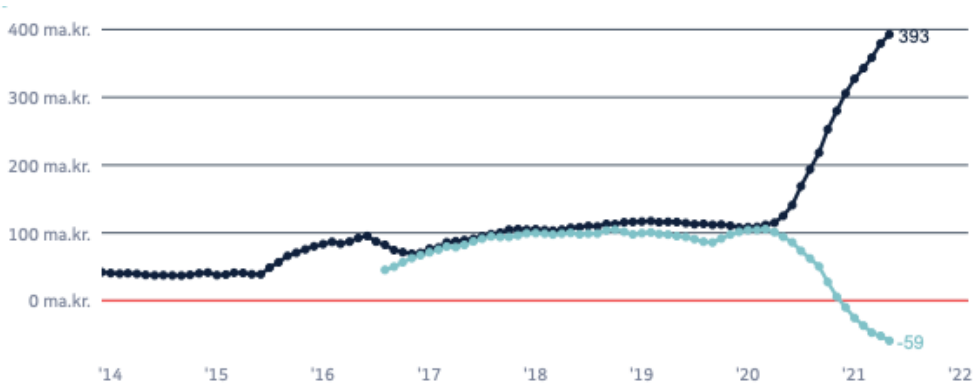

Figure 7: New net loans - accumulated over 12 months. In black; banks. In blue; from pension funds. Source: Housing and Construction Authority, *2021b.*

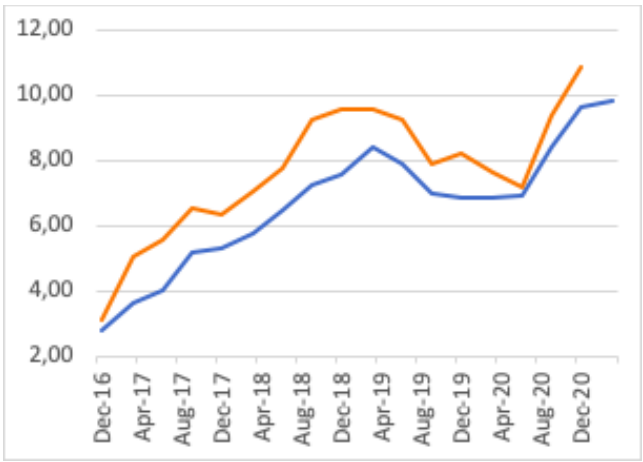

Figure 8: Credit-growth in the private non-financial sector, y-o-y, % growth. Blue; households. Orange; mortgage.

Since the start of the summer of 2020, supply of apartments has fallen sharply. In May 2020, the supply was about 4,000 apartments on the market, and in March 2021, the same number was 2,200 apartments. The largest reduction took place in the metropolitan area, where the supply went from 2,200 apartments to 940 in the same time span, the lowest number recorded for the capital region. The increase in purchase frequency is presented in a publication on economic indications from the Central Bank of Iceland. Both supply of both old and new apartments have decreased sharply in the last year. The supply of new apartments was 74% lower in March 2021 than in May 2020. Time on market (TOM) also decreased and was in May of 2021 at a minimum of 38 days in the capital region. The normal average TOM is about 90 days (HCA, 2021a; HCA, 2021b).

Furthermore, the low supply has led to sales prices increasing, peaking in May 2021 where more than 30 % of all dwelling sales exceeded list price. The capital area saw the highest proportion for single-family homes, where 42.7 % of transacted properties sold above list price. The data shows that the proportion of houses exceeding market value was different in different price categories. It was highest in the higher price category between 45-75 million ISK, and lowest for house prices at 35 million ISK or lower (HCA, 2021b). The annual price increase between January 2020 and January 2021 was at around 8 % in the greater Reykjavik area, with the increase being more noticeable in detached dwellings than in multi-family residential. In contrast, leasing prices have generally declined since the start of the pandemic (HCA, 2021a).

3 Theoretical basis & hypotheses

This chapter presents hypotheses for the two research questions, with supporting theoretical framework and assumptions.

3.1 Effects of the pandemic on prices

Past pandemics' effect on prices
Studies on previous pandemics and epidemics have been relatively uncommon as they have not occurred to such an extent in modern times. A study of the cholera epidemic that took place during nineteenth-century London shows that house prices fell due to the pandemic and remained significantly lower 10 years after the epidemic than the surrounding area. This effect on house prices persisted over the following 160 years. However, this was concluded to be mainly due to the loss of income that occurred and led to friction in the rental market (Ambru et al., 2020).

A more recent study examines how the Severe Acute Respiratory Syndrome (SARS) outbreak in Hong Kong in 2003 affected the housing market. Hong Kong handled the outbreak in a few ways, such as government imposed quarantine measures to slow the spread, and companies encouraged employers to work from home (Crampton, 2003). The paper analysed the relationship between the level of disease and real estate prices and sales. The risk of SARS was measured based on infection rate, news reports and government announcements of infection. The average prices fell between 1-3 percent when the property was directly affected by the disease, and 1.6 percent for all properties in the area. The relatively low figure corresponded to the expected outcome based on psychology and behavioural economics. The lack of price overreaction among the transaction volume was said to be due to the nature of the housing market, with higher transaction costs, credit constraints and loss aversion (Wong, 2008).

COVID-19 and housing
D'Lima et al. (2020) presented an early study of the impact of COVID-19 on the housing market in the USA, using transaction data between the 1st of January 2020 to the 20th of June 2020. The study analysed states who did impose and didn't impose state-wide shutdown orders, and concluded that whilst there was evidence for a significant decrease in the transaction volume, a noticeable aggregate price effect wasn't evident. However, looking at the contagion rate in states which had shutdown orders in effect; a unit increase in the contagion rate showed a decrease in prices by on average 5.1 % (D'Lima et al. 2020). Wang (2021) looked closer at a few states in the USA with different economic characteristics and restrictions in a similar type of study and similarly found no clear indication that house prices were affected by restrictions. On another note, Wang's study suggests that a higher dependency on the service industry might be related to a higher market vulnerability (Wang, 2021).

D'Lima et al. (2020) discusses that the change in transaction volume could be explained by sellers considering the uncertainty on the market, choosing not to list their homes.

Larger properties were most illiquid in states with shutdown orders. Another possible explanation is that the many frictions - created by increases in contagion as well as shutdown orders in the matching process - further complicates the search and bidding processes (D'Lima et al. 2020). Similar shifts can also be seen on housing markets in China, Great Britain, Italy and Serbia during the start of the pandemic (Jovanović-Milenković et al. 2020).

Del Guidice et al. (2020) studied the housing prices in Campania Region in Italy in the early days of the pandemic. The housing price decrease is calculated to 4.16 % in the short-run after the outbreak, whilst a decrease of 6.49 % is predicted to last until the beginning of 2021. The authors mention multiple factors from COVID-19 that affect the housing market, e.g. closing of whole neighbourhoods or cities, health concerns and general economic decline. Moreover, the home sale decline is partially acknowledged to be likely caused by changes in income and uncertainty (Del Guidice et al. 2020).

However, with early studies showing decreases in price due to the COVID-19 outbreak and developing in the world, the general effect on prices seen today in many parts of the world is an increase. The countries of the EU, USA and Australia all show significant increase in housing prices in the times of the pandemic (Eurostat, 2021d; Anenberg & Ringo, 2021; Reserve Bank of Australia 2021). Furthermore, many of these countries also decreased their interest rate at early stages of the outbreak (Cantú, 2021). Anenberg & Kung (2017) challenges previous empirical findings which attributes the effect of interest rates on housing prices as only moderate, meaning that these studies use reduced-form correlations of interest rates with house prices that could be worth questioning. With their model, buyer willingness to pay for the typical home in response to an interest rate change is estimated by more than twice as much as average home sale prices (Anenberg & Kung, 2017).

Additionally, Coibon et al. (2021) and Layser et al. (2021) look at economic uncertainty following the pandemic and how it could impact the housing market. Coibion et al. analyzes household spending during COVID-19 and concludes a reduction in household spending (Coibion et al., 2021). Layser et al. (2021) looks at the public health tools used to reduce the spread of COVID-19 and argues that social distancing is in itself a threat to the housing market stability. The authors explain that social distancing leads to people remaining more at home, which causes businesses to close and unemployment numbers to increase. Unemployment leads to inability to pay rent or a mortgage, which then causes an increase in homelessness (Layser et al. 2021). Imposing a shutdown order can also affect households' possibility of visiting a house showing. In her study, Rosane Hungria-Gunnelin (2013) discusses the presumption that more visitors at a house showing leads to more bidders which is concluded to play a significant role for the final sales price (Hungria-Gunnelin, 2013). Thus, there are several ways the governmental restrictions could impact the sale prices negatively.

Hu et al. (2021) opposes this in their study that analyses the impact of COVID-19 cases and government restrictions on housing prices. They find that while the confirmed number of cases has a negative relation to prices, government measures have an insignificant effect on housing returns (Hu et al., 2021).

One study that looks into correlation between shifts in location demand for housing during the coronavirus pandemic is Liu & Su (2021), who finds that neighbourhoods with high population density have decreased in popularity after the coronavirus outbreak in the USA. They also conclude evidence for a persistent decline in demand for housing in dense areas that could remain in the future. On one hand, this downward shift of people's demand is explained by telework-compatible jobs which lowers the need for living close to work combined with a decrease in utility of easy access to consumption amenities. On the other hand, the authors suggest another incentive for this shift is a growing health concern about living in locations with higher density (Liu & Su, 2021). The same trend with household preferences shifting towards less dense areas is seen in Spain (Alves & San Juan, 2021).

Summarized, research on the housing market during the coronavirus varies in their findings. First, studies from previous epidemics as well as the current one might point at the contagion rate in a certain area as the most impactful factor to the housing prices. D'Lima did not find evidence for an effect on price in states with shutdowns without taking into account contagion. Since Iceland has remained a low contagion rate for most of the time since the first case, and have not had major lockdowns compared to the US or Italy, this would indicate a less major impact on the housing market. Second, the interest rates have been falling and remaining low, which has lowered mortgage rates and led to an incentive to loan money for housing. Many households might have also been accidentally saving money through not being able to travel internationally or go to restaurants or bars. Thirdly, many factors point towards a shift in demand for housing that has changed during the pandemic. Some of these factors are working from home and overall spending more time at home. Finally, the supply has been decreasing during the pandemic, which all combined leads to the following hypotheses.

Hypothesis 1:

Sale prices increased due to restrictions because of COVID-19.

3.2 Effects of the pandemic on transaction volumes

Early studies in the relationship between volume and uncertainty in the equity market suggest that there is a positive relationship between trading volumes and an asymmetry in belief and information. However, George et al. (1994) points out that these studies left out transaction costs that exist in specialist markets, examines how these costs affect the relationship, and finds that there may instead be a negative relationship between these two. Their model predicts heavy volume as reaction to events that

resolve uncertainty, since that decreases informational asymmetries and beliefs (George et al., 1994).

Stein (1995) explores the relationship of prices and trading volume in the housing market, considering the effects of down-payments in the USA. The paper shows the historically close correlation between sales prices and trading volume, which is further concluded by Clayton et al. (2008). One important conclusion that Stein mentions is that market volatility may be due to the initial distribution of debt levels, which means that cities where a majority of homeowners have high LTV may mean that the market is more prone to a crash in house prices. This can occur if transaction volumes are high during a period when prices are rising. Furthermore, the study mentions that "starter" houses, only bought by first-time buyers, are less sensitive to fundamental changes than "repeat" houses, houses that are only bought by buyers who already own a house. (Stein, 1995).

Another study by Clayton et al. (2008) analysed data from 114 metropolitan areas in the USA between 1990-2002 to determine whether and how exogenous shocks cause co-movements of price and volume. The authors conclude that both prices and volumes are affected by the state of the mortgage, labour and the stock market. These effects differ, with trading volume-caused components of price and volume being negatively correlated in markets with low supply elasticity, and positively correlated in markets with high supply elasticity. Thus, trading volume does not appear to influence future prices if supply can adjust easily. Mortgage rates have a significant effect on the housing market depending on the level and trend, with low sale prices and trading volumes when the rate is high and when it’s falling. Buyers will probably feel more financially optimistic with low mortgage rates, and potential buyers could possibly delay their home purchase if they predict mortgage rates to fall (Clayton et al., 2008).

Government restrictions have also affected international tourism, which has been a prominent attribute to the increase in house prices in recent years. In their paper, Elíasson & Ragnarsson (2018), studies the effects of Airbnb in the Icelandic housing market, and confirms this by estimating growth from Airbnb to 15 % of the total increase in real house prices during 2014-2017. In 2017, around 10 % of all residential housing was listed on Airbnb. With international borders shut and other countries restricting travel for a longer period of time, the owners could rethink having unused properties listed, and these homes could become part of the housing supply to saturate the market demand. As mentioned in chapter 2, the Icelandic housing market has seen a decrease in the supply (even with increasing numbers of completed dwellings in recent years), and the possible Airbnb additional supply does not seem to have satiated the market. Figure 10 shows the drastic increase in purchase agreements during the coronavirus pandemic.

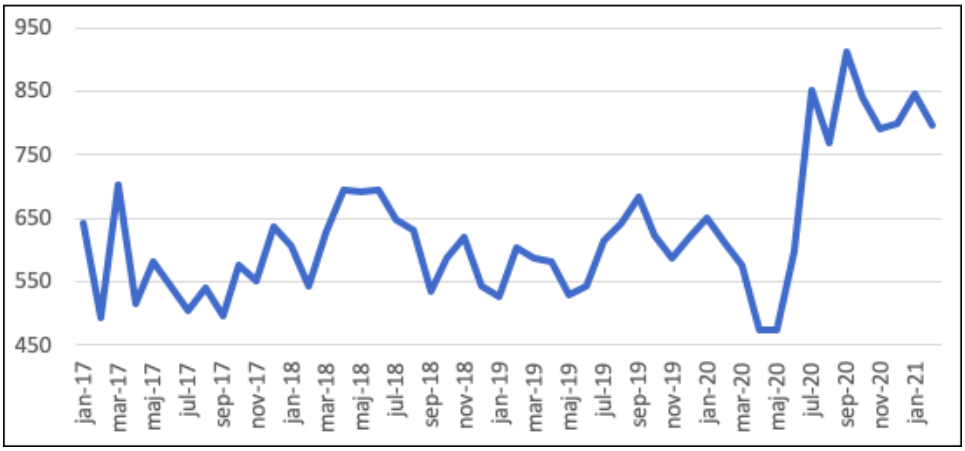

Figure 9: Number of purchase agreements in the Capital Region. Source: Statistics Iceland, National Registry of Iceland & Central Bank of Iceland.

Summarized, in this theoretical area varying results from studies brought up can be seen. Based on the findings about a strong relationship between housing prices and volume, with the support from statistical numbers from Iceland showing an increase in transacted volume (figure 9), the second hypothesis is formulated;

Hypothesis 2:

Transaction volumes increased due to restrictions because of COVID-19.

4 Data

In this chapter the data and variables used for the analysis is presented and described. The descriptive statistics of variables is also summarized.

4.1 Variables

The data consists of housing transactions taking place in the Capital Region of Iceland, and is acquired from the HCA platform from 1st of January 2017, through 30th of April, 2021. Additionally, information about the national restrictions and COVID data are obtained from Our World in Data and the Icelandic COVID-19 information platform, covid.is, operated by The Directorate of Health and The Department of Civil Protection and Emergency Management.

30 991 transactions were examined through regression analysis using the statistical software STATA. Some observations had to be removed before analysing due to variables missing, to keep the data as representable as possible; without outliers or seemingly non-trustworthy values. Transactions of properties with a sale price below 1 million ISK or above 300 million ISK or an area below 10 square meters or above 400 square meters were removed from the sample. The remaining number or transactions after this selection was 30 632. 25 878 were related to apartment purchases and 4 754 came from semi-detached units purchases. Variables included in the data set can be seen in Table 1.

Table 1: Data variables

Property characteristics	*1. Size (square meters)* *2. Number of rooms* *3. Floor level* *4. Housing type (apartment, townhouse)* *5. Construction year* *6. Property ID*
Location characteristics	*6. Assessment area* *7. Postal code* *8. Street*
Price-related variables	*9. Sales price (ISK)*
Time-related variables	*10. Date of sale*

Out of the variables stated in the table 1 above; square meters, number or rooms, housing type, construction year, assessment area and date of sale were used in the regression model as independent variables. Assessment area was used to create dummy

variables for the variable *location*. Together with square meters, number of rooms, housing type and the age of the building, these variables are determinants to describe the price and with which a higher degree of explanation (R squared) for the regression models can be assumed.

Dummy variables other than location were the time variables, used by converting date of sale. The variables construction year and date of sale was used to create the variable *age*, explaining the building's age. Apart from this, dummy variables for the COVID-19 restrictions were created, which is further explained below.

4.2 Variables explained

Location
The location of a property is considered the most important factor for the property's value. It is often even said that the three most decisive factors for a property's value are location, location and location. This expression aims at looking at the implications of different aspects of locations, for example what the location is within a city, in relation to transports and communications, and what commercial and social services are in place (SFF, 2018).

Size
A foundational condition for a reliable valuation is the area. With a bigger residential area, there is more room for different functions within the same unit. Therefore, this should have a positive effect on the price (SFF, 2018).

Number of rooms
In the same way that a larger home can facilitate a larger variety of functions, the number of rooms in a home provides a similar effect. Thus, the variable coefficient for the number of rooms is anticipated to be positive.

Housing type
The housing type is linked to different types of functions that satisfy different demands. Thus, this can be a factor that differs in its coefficient depending on whether the housing type is for example an apartment or a townhouse.

Dummies
From the transaction data, the geographical location variable *assessment area* is used to create dummy variables. A total of 81 location dummies were created (location). Additionally, five dummies were created based on the date of sales for each year, ranging from 2017-2021. Furthermore, another two dummies were created based on the age of the building. This was done by subtracting the construction age from the date of sales (age) and then raising it to the power of 2 (age2).

COVID- 19 restrictions

The effect of the different restrictions on housing sales and prices are the variables of interest for both hypotheses. To analyse COVID-19's effects on prices and transactions, two different scenarios of restrictions were chosen to look at. The first one is moderate restrictions, *Restriction1*, which is defined as when limitations on gatherings of people are set to 50 people or less. The second scenario looked at is substantial restrictions, *Restriction2*, which is defined as when limitations on gatherings of people are set to 20 people or less. These levels of restrictions were tested in the regression model using dummy variables that described which level of restrictions that were implemented at different times. For a graphic overview of the timeline, see figure 10.

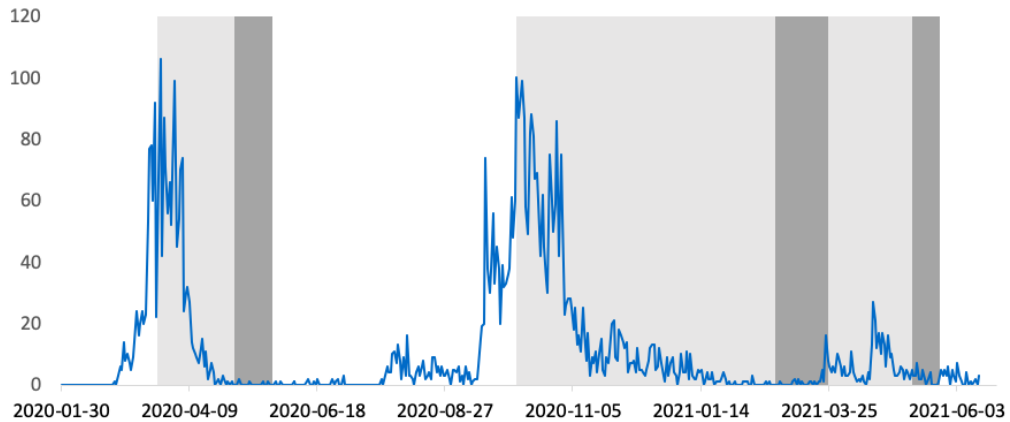

Figure 10: Total daily coronavirus cases in Iceland and the different levels of restrictions imposed related to the pandemic. Light grey represents the moderate restrictions, Restriction1, where gatherings were restricted with a limit of 20 people. Dark grey represents the substantial regulations, Restriction2, where gatherings were restricted with a limit of 50 people. Where there is no colour, over 50 people were allowed in gatherings. Source: www.covid.is; Hafstað, 2020.

Interest rate

Since the interest rate affects the possibility of taking out a mortgage, it's put into the regression model. The interest rate has been decreasing in Iceland since the start of COVID-19, and is expected to affect prices as well as transactions.

4.3 Descriptive statistics

Tables 2 and 3 show descriptive statistics of the variables included in STATA calculations. They show the mean, standard deviation and the maximum and minimum values of the time period before and after the first registered case of COVID-19 in Iceland. The standard deviations are large for all variables, which is to be expected with a wide range of values in the data.

Table 2: Descriptive statistics of variables before the initial case of COVID-19 in Iceland.

Variable	Mean	St. deviation	Min	Max	No. of Observations
PT (ISK)	49 600 000	19 600 000	2 500 000	260 000 000	20 651
Pa (ISK)	44 500 000	14 700 000	2 500 000	260 000 000	17 286
Pt (ISK)	70 400 000	15 300 000	15 000 000	132 000 000	1 551
Sq. meters	109.841	47.325	13.8	349.8	20 651
No of rooms	3.672	1.509	1	25	20 651
Interest rate	4.178	0.568	2.75	5	20 651

The average property from the data sample has 3 rooms and a size of 109 m2. An insignificant decrease in size and number of rooms is seen after compared to before the start of COVID-19 (see table 3). However, there are some changes to point out.

Table 3: Descriptive statistics of variables after the initial case of COVID-19 in Iceland.

Variable	Mean	St. deviation	Min	Max	No. of Observations
PT (ISK)	55 900 000	22 600 000	1 500 000	300 000 000	10 007
Pa (ISK)	50 700 000	17 000 000	5 000 000	265 000 000	8 615
Pt (ISK)	79 700 000	19 100 000	2 050 000	169 000 000	646
Sq. meters	107.953	46.346	21.9	348.4	10 007
No of rooms	3.606	1.487	1	14	10 007
Interest rate	1.020	0.408	0.75	2.75	10 007

First, the average sale price has increased since the start of COVID-19, from approximately 50 000 000 ISK to 56 000 000 ISK. Looking at apartments and semi-detached houses separately, there is a 14 % increase in prices for apartments and 13 % increase in price for apartments after the introduction of coronavirus in Iceland. This suggests that the first hypothesis, "*Sale prices increased due to restrictions because of COVID-19"* is correct.

Second, the average interest rate has significantly declined when comparing before and during the coronavirus pandemic. From the previous theoretical chapter, the research seems to be in line with the data in this case, since prices have gone up whilst interest rates have been falling.

Third, the number of houses being transacted before the outbreak of COVID-19 is substantially less than after, when acknowledging the different time frames. About 21 000 houses were transacted between the start of January 2017 to the 27th of February 2020, or ca 38 months. That is to compare with 10 000 transactions being done in the last 14 months, until the 30th of April 2021. This suggests that the second hypothesis, "*Transaction volumes increased due to restrictions because of COVID-19"* is correct, as a majority of the last year had COVID-19 restrictions imposed.

5 Methodology

This chapter presents the empirical quantitative method and the research models that are used in the analysis to approach the two hypotheses.

5.1 Regression analysis

Regression analysis is a regularly used statistical method utilized for explaining a relationship between a dependent variable Y and an independent variable X. The simple linear regression model can be defined as:

$$Y = \beta_0 + \beta_1 \times X + u \quad (1)$$

The intercept parameter β_0 describes where the linear function intercepts the Y-axis, in other words the value of Y when X equals 0 (see figure 11). β_1 is called the slope parameter, and explains the relationship between X and Y. If the error term, u, is fixed X has a linear effect on Y. All factors affecting Y besides X are in this model summed into u, which stands for unobserved (Wooldridge, 2006).

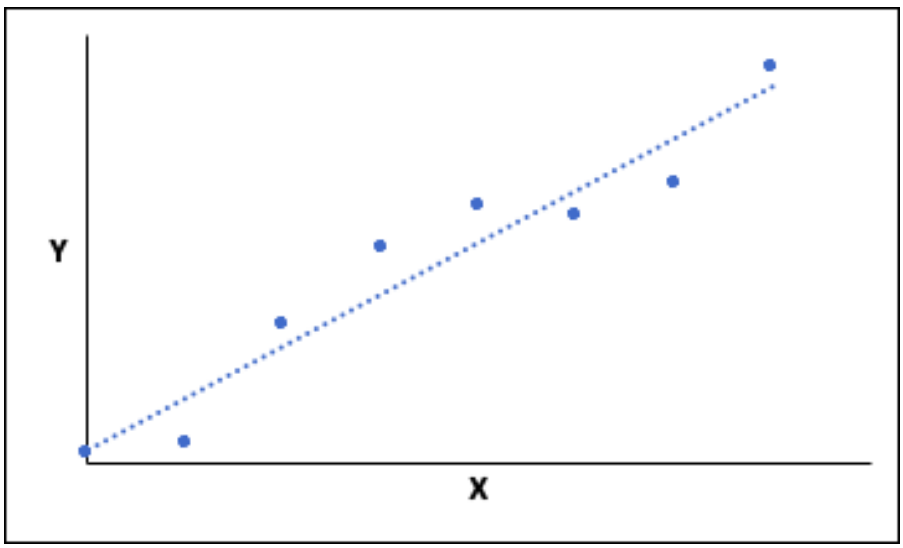

Figure 11. Linear regression.

However, many situations cannot be described as relying on just one factor. For example, housing sale prices vary depending on variables such as location, size, number of rooms, et cetera. Thus, multiple regression analysis is better at predicting the dependent variable when multiple independent variables simultaneously affect the output variable y. Introducing the multiple regression analysis model:

$$y = \beta_0 + \beta_1 \times x + \ldots + \beta_k \times x_k + u \quad (2)$$

In addition to the slope parameter, this expression includes several slope parameters that all relate to a factor – x_1, x_2 et cetera – affecting y. For instance, β_1 might relate to a specific location of a residential unit and β_2 relates to the size of the unit, et cetera. Moreover, R^2 or the *coefficient of determination*, tells what fraction of the sample variation of y that is explained by x. With properly chosen independent variables in the model, both to amount and selection, a higher R^2 can be generated (Wooldridge, 2006).

5.1.1 Hedonic pricing model

Housing is a homogenous asset with many individual attributes. For instance, housing varies in structural components, e.g. size and construction age. Apart from these house specific attributes there are many other characteristics for housing, for example the demographic components (education, average income), location-specific attributes (land use regulation, air quality, et cetera) and the timing attributes (market status). In his article, Rosen (1974) illustrates this through the equation (3), where a property is described by *n* objectively measured characteristics.

$$Property = (z_1, z_2, \dots, z_n) \quad (3)$$

The hedonic price model aims at explaining an asset's comprehensive value based on the characteristics bundle. As can be seen in the model (4), each attribute is valued separately and then added together to sum up the total value. Attributes can be valued both negatively and positively, and this can also change over time and between buyers (Rosen, 1974; Sirsman et al., 2005).

$$p(Property) = p(z_1) + p(z_2) + \dots + p(z_n) \quad (4)$$

The natural logarithm, or simply log function, is another way of expressing the dependent or independent variables in the regression model. In this case, β/100 represents the unit change in y when x increases by 1% (Wooldridge, 2006).

5.2 Methodologic approach to hypothesis 1

The hedonic pricing model is an appropriate choice for the first research question, when estimating the sales prices during the governmental restrictions during COVID-19. To test the first hypothesis, the hedonic model is used on a standard form (2), and include restrictions, interest rates, and other control variables for location and time as independent variables, as follows:

$$\ln(PT) = \beta_0 + \beta_1 Restriction1 + \beta_2 Restriction2 + \beta_3 InterestRate + \sum X_j \beta_j + \varepsilon \quad (5)$$

ln(PT) = the natural logarithm of the property's sale price at time t
β_0 = constant term

Restriction = The set of restrictions being tested
X_j = a matrix of covariates, controlling for time and location
ε = error term

In the model (5), the dependent variable is the natural logarithm of sales price. When using the natural logarithm of our dependent variable, all out independent variables become semi-elastics. This means that a unit change in an independent variable, for example size (sqm), gives a percentage increase in β of the price.

Restriction1 and Restriction2 are dummy variables that signifies if COVID-19 restrictions are put in place at the time of the sale. Restriction1 takes a value of 1 if the sale occurs during dates when there are restrictions on gatherings larger than 50 people, otherwise it's zero. Restriction2 takes a value of 1 if the sale occurs during dates when there are restrictions on gatherings larger than 20 people, otherwise it's zero. The variable InterestRate is the central bank's interest rate at the date of the transaction. $\beta 1$, $\beta 2$ and $\beta 3$ are coefficients for Restriction1, Restriction2 and InterestRate respectively. Dummy variables are used for all assessment areas and each year from the data.

The coefficients $\beta 1$ and $\beta 2$ will be positive if the restrictions had a positive effect on sales price, and vice versa be negative if the restrictions had a negative effect on sales price. Thus, the first hypothesis; "*Sale prices increased due COVID-19 restricted periods.",* should stand true if $\beta 1$ and $\beta 2$ are positive.

5.3 Methodologic approach to hypothesis 2

The regression model is used again for the second hypothesis. Now, the aim is to analyse the effect restrictions might have had on transaction volumes. The effects model studies the transactions per month for the period of January 2017 through the 30th of April. Just as the model above, the second model includes moderate and substantial restrictions as well as interest rates, as follows;

$$Transactions = \beta_0 + \beta_1 Restriction1 + \beta_2 Restriction2 + \beta_3 InterestRate + \sum X_j \beta_j + \varepsilon \quad (6)$$

Transactions = the number or transactions for each month
β0 = constant term
Restriction = The set of restrictions being tested
X_j = a matrix of covariates, controlling for time
ε = error term

The model (6) has the dependent variable as the number of transactions for each month. Compared to the natural logarithm model (5), the interpretation of a unit increase differs. Here, one unit change in an independent variable is going to show the unit change in the number of sold apartments that month. For example, a one percent

increase in interest rate is going to show the results in a unit change in the number of homes sold.

Restriction1 and Restriction2 are dummy variables that signifies if COVID-19 restrictions are put in place at the time of the sale, just as stated in the previous section. The variable InterestRate is the central bank's interest rate at the date of the transaction. $\beta 1$, $\beta 2$ and $\beta 3$ are coefficients for Restriction1, Restriction2 and InterestRate respectively. Dummy variables are used for all assessment areas and each year from the data. Dummy variables were created for each month, to be able to see if any seasonal effect in transaction volumes could be seen over the year. All months are compared to the month of January.

The coefficients $\beta 1$ and $\beta 2$ will be positive if the moderate and substantial restrictions had a positive effect on transacted volume, and vice versa be negative if the restrictions had a negative effect on transacted volume. Thus, the hypothesis; "*Transaction volumes increased due to restrictions because of COVID-19.",* should stand true if $\beta 1$ and $\beta 2$ are positive.

6 Results & Analysis

This section presents the results and analysis of the empirical findings and puts them in relation to the purpose and hypotheses of this paper, as well as to the previous chapters.

6.1 Hypothesis 1

The regression analysis conducted for the first hypothesis was estimated by 30 632 observations (25 878 apartments and 4 754 semi-detached units) and resulted in the following three tables. Table 6.1 shows the results without any restrictions implemented, table 6.2 the results from moderate restrictions and table 6.3 the results when substantial restrictions was implemented.

Table 6.1. Results of the hedonic model.

	Total		**Apartment**		**Single-family home**	
Explanatory variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
No. of rooms	.0264	0.000	.0182	0.000	.0096	0.000
Sq. meters	.0051	0.000	.0069	0.000	.0025	0.000
Interest rate	-.0243	0.000	-.0231	0.000	-.0276	0.000
Apartment	-.1029	0.000				
Single-family home	-.0112	0.026				
Constant	16.4621	0.000	16.9217	0.000	18.0137	0.000
Location dummies	Yes					
Time dummies	Yes					
R-squared	0.7844		0.7734		0.6363	

The model R-squared values are between 0.6363 and 0.7844, indicating that the independent variables used in the model explains about 63-78 % of the variations in the logarithm sale price. Almost all regression variables show significance on a 1 % level for explaining variations in sales price. Single-family homes are explained on a 5 % level of significance.

The output shows positive coefficients for the number of rooms and square meters, i.e. an increase in these two variables will have a positive influence on sale price. As an example, the number of rooms coefficient for the regression without restrictions is at .0264284, explaining that for every additional room the selling price will increase by 2.6 percent. The same coefficient for square meters is .0051, indicating that a unit increase in square meters will increase the price by 0.51 %. As expected, houses with larger areas and more rooms will be more expensive. The coefficients shows that number of rooms and square meters has a stronger positive correlation for apartments than single-family homes, indicating that the marginal utility is higher for each added sqm and room in an apartment.

Moreover, the coefficients for apartment and single-family homes show how much the type of property affects the sale price. An apartment, with coefficient -0.1030, will on average have a 10.3 % lower sale price than if the property is not an apartment. For single-family homes this percentage is 1.2 %. Thus, a single-family home is more expensive, on average, than an apartment.

Interest rate also shows a negative coefficient of -0.0243. This implies that a one unit increase in interest rate will decrease the sale price by 2.4 % on average. This negative relationship is in line with previous stated sections.

Table 6.2. Results of the hedonic model with moderate restrictions; a limit of 50 people allowed in gatherings.

	Total		**Apartment**		**Single-family home**	
Explanatory variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
No. of rooms	.0264	0.000	.0182	0.000	.0096	0.000
Sq. meters	.0051	0.000	.0069	0.000	.0025	0.000
Interest rate	-.0241	0.000	-.0229	0.000	-.0277	0.000
Restriction <50	-.0171	0.002	-.0157	0.003	.0048	0.779
Apartment	-.1030	0.000				
Single-family home	-.0116	0.026				
Constant	16.4613	0.000	16.9210	0.000	18.0140	0.000

Location dummies	Yes					
Time dummies	Yes					
R-squared	0.7844		0.7735		0.6363	

R-square indicates that the degree of explanation is the same in the model with moderate restrictions as in the one without restrictions (comparing table 6.2 with 6.1). The p-values also remains the same as in the previous model, which indicated that the most of the coefficients continues to explain the variation to sale prices. Further developed, this means that the number of rooms and square meters of a unit continues to have a positive effect on the sale prices; the interest rate effects the sale price negatively when it increases; and single-family homes remains more expensive even after the moderate restrictions are introduced in the Great Reykjavik region.

However, the restriction variable does not show a significance level in line with the previous tested variables. Although apartments and total shows significance levels below 5 %, the single-family homes shows a higher p-value of 0.779 that indicates that the evidence is not strong enough to suggest an effect from the restrictions exists in the sampled data. Although it cannot be statistically concluded, an aspect to point out it that for moderate restrictions, coefficients for apartments and total are negative, showing that the restriction would have had a negative effect on sales prices for apartments and the total if the outcome would have been significant. This would have gone against the hypothesis.

Table 6.3. Results of the hedonic model with substantial restrictions; a limit of 20 people allowed in gatherings.

	Total		**Apartment**		**Single-family home**	
Explanatory variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
No. of rooms	.0264	0.000	.0182	0.000	.0096	0.000
Sq. meters	.0051	0.000	.0069	0.000	.0025	0.000
Interest rate	-.0223	0.000	-.0212	0.000	-.0253	0.000
Restriction <20	.0150	0.000	.0144	0.000	.0190	0.060
Apartment	-.1029	0.000				

Single-family home	-.0114	0.028				
Constant	16.4560	0.000	16.9130	0.000	18.0024	0.000
Location dummies	Yes					
Time dummies	Yes					
R-squared	0.7845		0.7736		0.6365	

The results from the regression analysis with substantial restrictions added (table 6.3) shows no change in R-squared, number of rooms or square meters coefficients. This shows that the model maintains the same explanation level of variations in the logarithm sale price. The number of rooms and the square meters in an apartment or a single family-home continues to have a positive relation for the sale price, which is to be expected for all of the regression analysis.

Neither does the substantial restrictions show any significant change for interest rate, apartment or single-family coefficients. The substantial set of restrictions' effect on semi-detached units show p-values 0.060, and do not either explain the variation in sale prices significantly. However, if p-values would have been on a significance level below 5 %, the positive coefficients would have indicated that the hypothesis would be supported by the analysis. Summarised, the restrictions present no significant explanation and cannot be interpreted as support for the hypothesis.

6.2 Hypothesis 2

Table 6.4 and 6.5 depict the results from the analysis based on the regression model for analysing transacted volumes, estimated by a total of 30 632 transactions. When testing hypothesis 2, the transactions during Covid-restricted months are compared to transactions from previous years from 2017 and forward. For the test of moderate and substantial restrictions' effect, the coefficients are expected to show a positive value.

The monthly/seasonal effects expected could possibly mirror the historical course of the Coronavirus pandemic, showing the effect on housing transaction volumes. Previous sections in this paper indicate that for example October of 2020 was a month when moderate restrictions were put in place whilst sale transactions volumes were substantially increased compared to previous years.

Table 6.4. Results of the regression model with a limit of 50 people allowed in gatherings.

Explanatory variable	Coefficient	p-value	St. deviation
Restriction < 50	39.35913	0.725	111.1297
Interest rate	-38.01435	0.004	12.60486
February	181.3743	0.027	78.81318
March	332.1025	0.000	82.52063
April	147.3715	0.068	78.63827
May	177.4647	0.056	90.13999
June	168.2991	0.052	83.96598
July	245.1732	0.006	83.90806
August	230.1732	0.009	83.90806
September	275.7973	0.002	83.8575
October	311.2956	0.001	83.77852
November	291.2956	0.001	83.77852
December	236.6697	0.007	83.75012
Constant	494.3752	0.000	64.45525
R-squared	0.4931		

Table 6.5. Results of the regression model with a limit of 20 people allowed in gatherings.

Explanatory variable	Coefficient	p-value	St. deviation
Restriction < 20	116.1439	0.114	71.89751
Interest rate	-24.5156	0.105	14.76829
February	170.3035	0.032	76.74501
March	352.1323	0.000	76.71181
April	115.7716	0.150	78.79144

May	194.5692	0.023	81.89868
June	180.6259	0.033	81.7024
July	258.3436	0.003	81.70614
August	243.3436	0.005	81.70614
September	289.8114	0.001	81.72031
October	297.961	0.001	81.67616
November	277.961	0.002	81.67616
December	224.1788	0.009	81.5934
Constant	435.6465	0.000	72.7045
R-squared	0.5234		

The R-squared outcome of these models are 0.4931 and 0.5234. This implies that the independent variables included in the model explains around 50 % of the outcome variable. The coefficients for both level of restrictions shows outcomes of about 40 and 116. This indicates that, if significance levels are below 5 or 1 %, we should see a number of 116 more homes transacted during the significant restrictions than when these were not put into place. The same way, we should see a number of about 40 more homes transacted during the period when moderate restrictions were implemented. However, the variables from both restrictions show levels of significance above 5 %, and are thereby not explaining the changes in transaction volume. They can therefore not be seen as support for the second hypothesis.

The interest rate shows a negative relation in line with expected outcome. Only the moderate restrictions showing significance on a 1 % level, for significant restrictions there are no statistically clear result. The coefficients indicates how many more homes were sold per month if the interest rate was lowered one percentage. For example, during the time period of moderate restrictions, 38 more homes were sold when the interest rate was lowered compared to the month of January.

The monthly variations in transacted volumes are measured against the month of January. For example, the month of March shows a coefficient of about 332 in table 6.4. This would indicate that the sale volumes were 332 times as many compared with the volumes in January. The same number for March in table 6.5 is approximately 352. The months of April, May and June are sifted because of their p-values. March and October seem to have a larger amount of transactions compared to the other months.

However, overall it cannot be ensured that these monthly changes are proven from the data analysis.

7 Conclusion & Discussion

The following chapter presents the conclusions and discusses these.

The ongoing pandemic has precipitated change for established patterns of life and many global markets. One of these markets is the Icelandic housing market, which has seen a large increase in both sale prices and transaction volumes. This study has assessed the impact that COVID-19 – and consequent response measurements – has had on the housing prices and transaction volumes in the capital region of Iceland. Two hypotheses are formulated; 1. Sale prices have increased due to restrictions because of COVID-19, and 2. Transaction volumes have increased due to restrictions because of COVID-19. However, the regression model outcome shows no significant change in either price or volume during the period studied that can be attributed to the sets of restrictions tested – the two hypotheses are rejected. This is in line with previous studies by D'Lima (2020) and Wang (2021).

Why do the restrictions not show an impact in the regression output? Whilst the analysis does not answer this, there could be several reasons for not finding a clear result that will now be discussed.

First, there are numerous error sources from the conditions of the study. One is that Iceland did not have a longer shutdown period where the restrictions could have a more conclusive effect. The restrictions put in place were also mild compared to other nation states. Another limiting factor is that the study only looked at restrictions on gatherings. If restrictions on, for example, international travel or restaurant closures were into account, a different result may have arisen. Moreover, the periods of time when restrictions were implemented were short and there might be a delayed effect. For example, sale dates in the data actually could have been agreed upon between seller and buyer before the actual contract was signed, which could affect the outcome.

Secondly, it is impossible to distinguish a factor such as a specific restriction on gatherings from the rest of the restrictions or effects following the pandemic. The factors all intertwine and effect each other and the outcome different depending on the what is implemented at each given time. Examples of factors that has a significant role for the housing prices and transactions is the supply, interest rate and specific loan conditions (such as LTV-ratio). In the case of interest rates, they may have been a consequence of the coronavirus even if governmental restrictions were not put in place, and would likely have had a similar effect on sale prices and volumes then. A more dependent relationship could be between restrictions on international travel and an added supply on the housing market as a result of a shrinking Airbnb market during lockdown periods. Consequently, this could have contributed to increase in transacted volumes on the market. Hence, the synergies between different factors' effect's on sale price and volume over time is difficult to take apart and study isolated. With more of these effects added in the model, a higher R-squared may have been achieved, but the relation between the studied factors would still be difficult to map.

Finally, even if the outcome of this study adds no answer to the questions and hypotheses asked, it provides a framework from which deeper analysis can be conducted in the future.

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