Measuring COVID-19 Effects in the Austrian Housing Market Using Hierarchically Structured Hedonic Models

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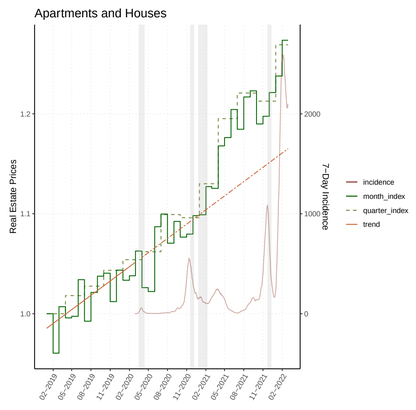
Motivation

How did the COVID-19 pandemic affect the Austrian residential real estate market?

- Expectations vs. Reality – Lessons from 2 years of COVID-19
- Expectations of market downturn at the (very) beginning of the pandemic vs. surge in house prices and sales in 2021
- Change in housing preferences? Urban vs. rural areas, importance of open space amenities

Figure 1: Price Indices



The figure shows housing price indices (monthly and quarterly variant) of the transactions data set. The indices are computed using the time-dummy variable method and normalised to the first month/quarter of 2019. The pre-pandemic trend is indicated in orange. Grey bars show strict nationwide lock-down periods, the red line shows the 7-day incidence rate.

Methodology

Hierarchically Structured Hedonic Model

- 3 levels (individual, district, federal state)
- logged price $p_{i,d,s}$ of dwelling i located in district d in federal state s regressed on a set of hedonic characteristics and COVID-measures $\mathbf{X}$
- fixed effects (conventional explanatory variables $\mathbf{X}$) and random effects on federal state/district level (random intercepts)
- accounts for large heterogeneity across location

$$\begin{aligned}\log p_{ids} &= \beta_{0ds} + \mathbf{X}_{1ids}\beta_{1ds} + \varepsilon_{0ids} \\ \beta_{0ds} &= \beta_{0s} + \mathbf{X}_{2ds}\beta_{2s} + \varepsilon_{0ds} \\ \beta_{0s} &= \beta_0 + \mathbf{X}_{3s}\beta_3 + \varepsilon_{0s}\end{aligned}$$

with $\varepsilon_{0ids} \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0ids}})$, with $\varepsilon_{0ds} \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0ds}})$ and with $\varepsilon_{0s} \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0s}})$.

This set-up collapses to the single model equation

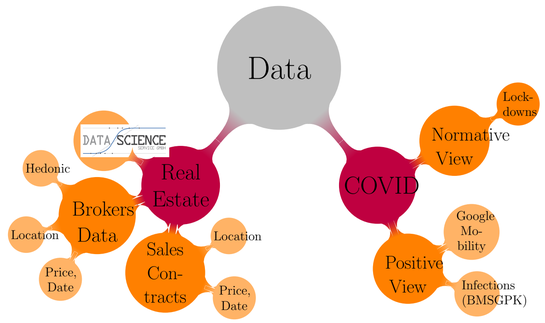
$$\log p_{ids} = \beta_0 + \mathbf{X}_{1ids}\beta_{1ds} + \mathbf{X}_{2ds}\beta_{2ds} + \mathbf{X}_{3s}\beta_{3s} + \varepsilon_i,$$

with $\varepsilon_i = \varepsilon_{0ids} + \varepsilon_{0ds} + \varepsilon_{0s}$. Per assumption, the error terms are independent and thus $\varepsilon_i \sim \mathcal{N}(0, \sigma^2_{\varepsilon_{0ids}} + \sigma^2_{\varepsilon_{0ds}} + \sigma^2_{\varepsilon_{0s}})$.

Results

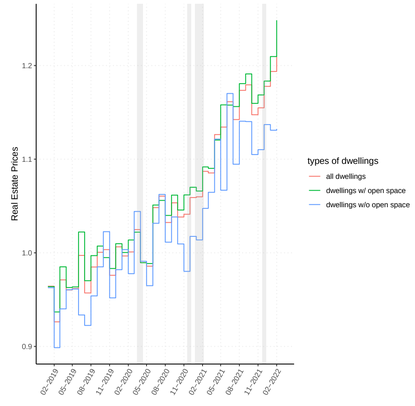
- short-term negative effects of lock-down periods on asking and realised real estate prices in Austria
- relatively stronger effect of the 1^{st} lock-down period compared to all lock-down periods
- relatively stronger effect of lock-down periods on offers compared to transactions data set
- offers data set leads transactions data set by approx. 1 month
- small negative effects of (reduced) mobility and infections rate on asking and realised housing prices
- immediate recovery and price increases above pre-Covid-19 trend level
- possible reasons: housing as safe investment, low interest rate, supply chain disruptions, price increase of raw materials and increased construction costs, changes in demand/tastes, wealth effect (money could be saved), ...
- prices of properties with open space experienced a higher increase compared to properties without open space – particularly relevant for apartments

Data



- **period** covered: **pre-COVID-19** phase (01/01/19 to 16/03/20 – start of 1^{st} lock-down) and **COVID-19** phase (16/03/20 to 28/02/22)
- hedonic data set (brokers' data): **offers** and **final purchases** are separable, coverage: approx. 25% (offers; 60,336 obs.) and 11% (final purchases; 25,719 obs.) of total market

Figure 2: Open Space



The monthly time-dummy indices compare price developments of different subgroups – all dwellings (orange) compared to dwellings with open space (green) and without open space (blue). They are normalised to the mean of the first three months after the outbreak of the pandemic (03/20 – 05/20).