How did the housing market respond to Covid-19 and the lock-down?

Evidence from day-by-day sales and bid-by-bid auction

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Background

At early stages of the pandemic, two camps emerged:

1. Those that thought the government would kill the economy through lock-down
2. Those that thought the virus itself was the biggest threat to the economy

We concentrate on lock-down verus virus-effects on the Norwegian housing market

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The questions we are interested in!

1. How was the Norwegian housing market affected by the spread of the virus and the lock-down on March 12?
2. How important were changes in sentiment versus policy interventions?
3. Did buyers and sellers change their behavior before, during, and after lock-down?
4. What happened after the partial re-opening?

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We do not try to answer why the housing market have gone crazy over the past few months

Why do we think this is important?

1. Separate underlying drivers of the economic downturn
2. If new lock-down during Covid-19 or future pandemics, important to understand how to balance medical results versus economic outcomes
3. Large stakes in the housing market, with deep interactions with the macroeconomy and financial stability
4. Timeline in Norway similar to other countries

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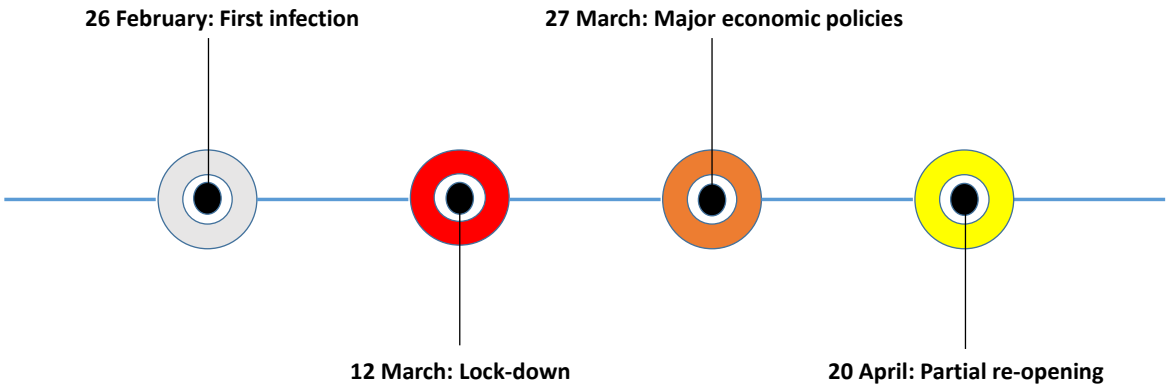
Timeline of events



Timeline of Norwegian major Covid-19 events in Norway

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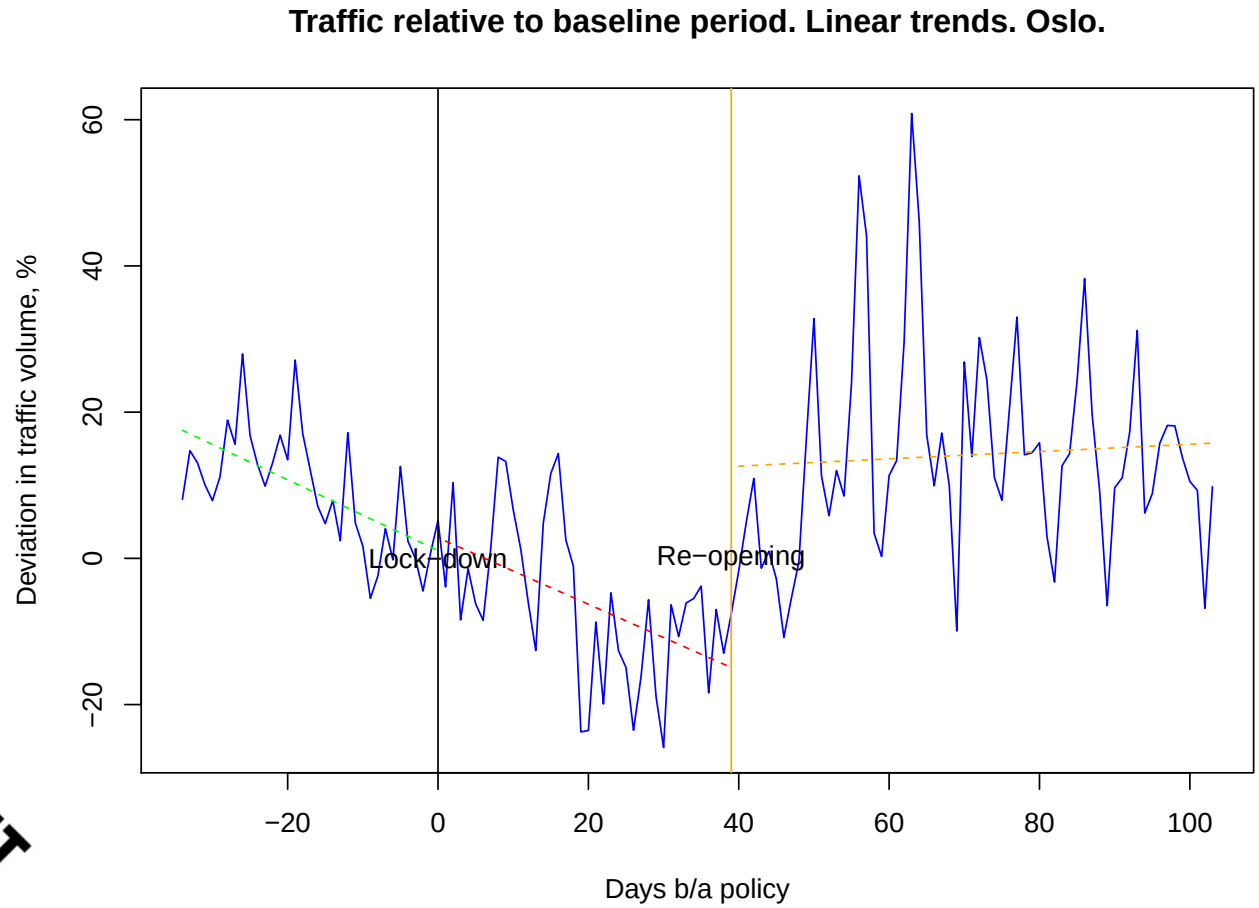
Traffic relative to median traffic the same day pre Covid-19

Source: Norwegian Public Roads Administration's Traffic Data API (144 registration points)



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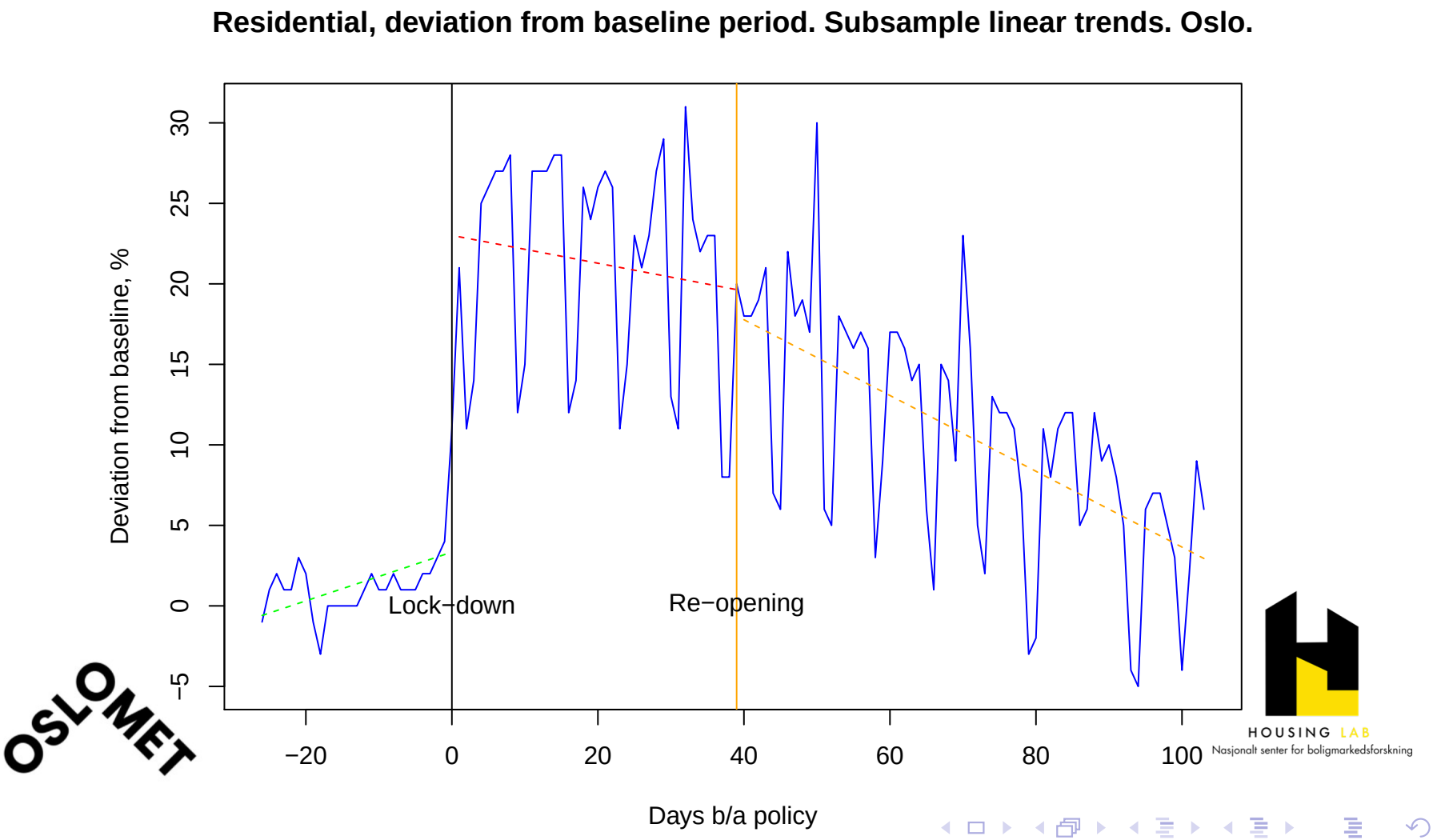
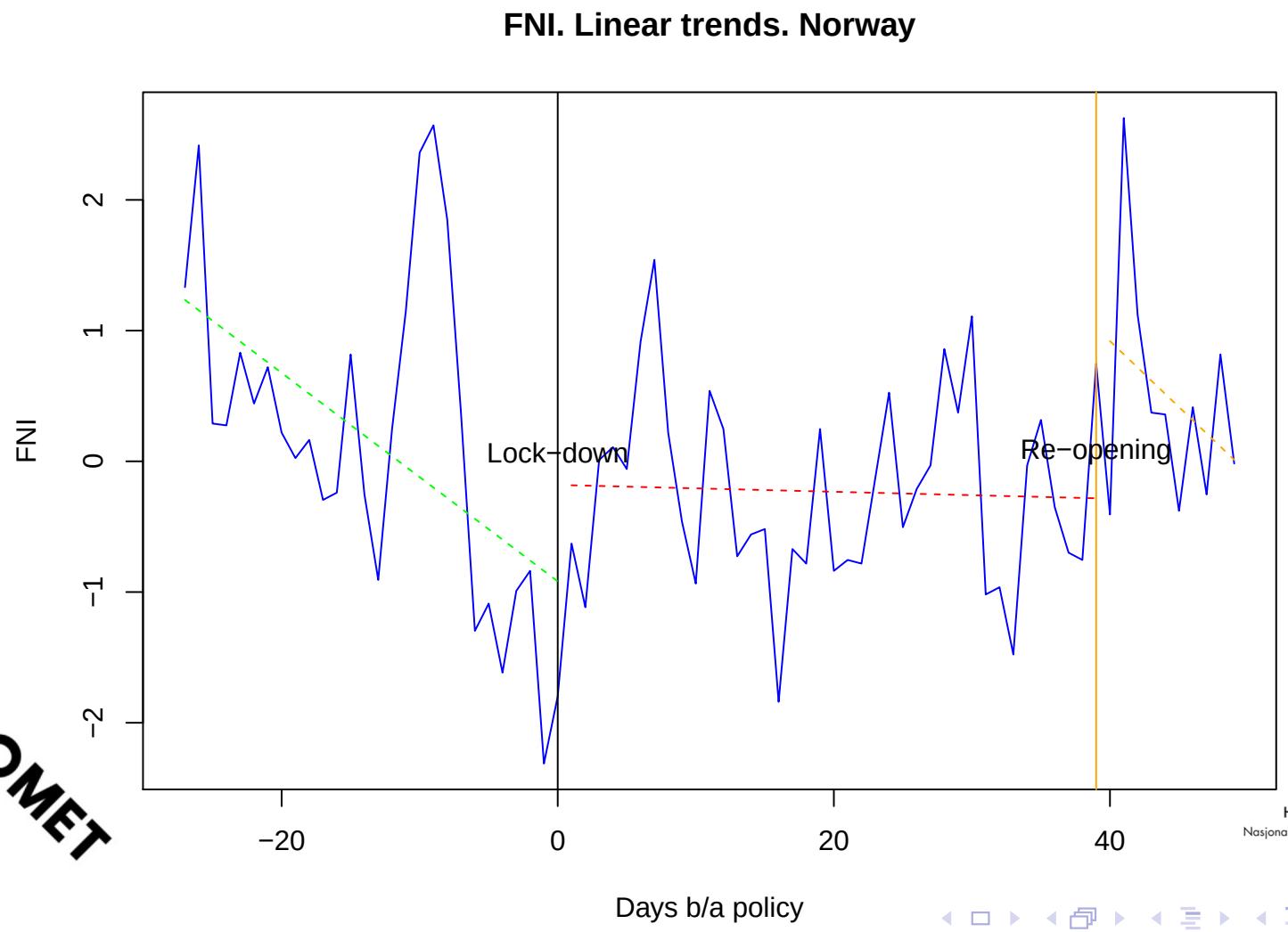
Tendency to stay at home relative to median pre Covid-19

Source: Google residential data



Changes in Financial News Index (FNI)

Source: CAMP/BI and Retriever



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What we observe

1. Changes in FNI before March 12 (expectations)
2. People did as they were told after March 12 (policy)
3. Increased mobility following the partial re-opening on April 20

   We are interested in separating voluntary behavioral changes from policy

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How do we attack this?

Study different housing market indicators on a daily basis before, during, and after lock-down

1. We estimate market values for all houses that are sold using a hedonic model. **Aim:** Study price developments relative to counterfactual developments
2. Look at transaction volumes
3. Changes in seller and bidder behavior studied through auction logs from DNB Eiendom
4. Look at association between sell-predicted spreads , the Norwegian stock exchange, and FNI

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Summary of main findings

Both expectations and policy mattered:

1. **Expectations:** House prices on downward trend before lock-down (3.7 percent lower than hedonic between March 6 and March 12)
2. **Policy:** Lock-down had additional effect on house prices (7.3 lower than counterfactual between March 13 and March 19)

Voluntary behavior changes are evident in auction-data:

1. Sellers are more impatient and less confident
2. Bidders are more aggressive
3. Drop in sentiment (FNI) is associated with lower house prices relative to counterfactual without Covid-19 and lock-down

The re-opening lead to a reversal of the effects

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Related literature

- **Housing, epidemics, and pandemics:** Wong (2008), Del Giudice et al. (2020), and D'Lima et al. (2020),
- **Economic consequences of Covid-19:** Eichenbaum et al. (2020), Alvarez et al. (2020), Atkeson (2020), Baker et al. (2020), Caballero and Simsek (2020), Guerrieri et al. (2020), Stock (2020), Barro et al. (2020), Correia et al. (2020), Hassan et al. (2020), Moser and Yared (2020), Coibion et al. (2020), Ramelli and Wagner (2020), Huang et al. (2020), Nicola et al. (2020), and Brodeur et al. (2020)

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Data

1. Transaction data from Eiendomsverdi, January 1, 2010 - April 30, 2020
2. Auction data from DNB Eiendom, January 1 - April 30, 2020
3. FNI from CAMP and Retriever
4. Mobility and traffic data from Google and Norwegian Public Roads Administration

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Transaction data

- Transaction level data for (almost) **all arms-length housing transactions** in Oslo between January 2010 and April 2020 (Source: Eiendomsverdi AS)
- **Unit specific data:**
  - ID $\Rightarrow$ can follow repeat sales
  - 7 digits GPS coordinates, size, type, # of bedrooms, construction year, $+ + +$
- **Transaction specific data:**
  - Ask price, sales price, time-on-market, **exact date of accepted bid**

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Summary statistics

	Min	25	Median	Mean	75	Max
Size	16	50	65	73.6	84	353
Sell price	747,000	2,505,399	3,326,171	3,943,824	4,588,297	19,070,656
Sell/size	12,671	41,828	53,546	56,319	68,660	136,190
No. obs.			192,106			
Perc. apt.			89.1			
Perc. det.			3.8			

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Check for balances: Pre versus post lock-down

	Pre Lockdown		Post Lockdown	
Variable	Mean	Std.	Mean	Std.
Size	74.5	34.8	70.4	34.0
Sell price	5,256,464	2,436,155	4,815,018	2,242,502
Ask price	5,120,188	2,388,980	4,817,731	2,320,044
Sell/size	73,487	19,096	71,959	18,666
No. obs.	733		513	
Perc. Apartment	89.6		92.0	
Perc. Detached	3.3		2.3	

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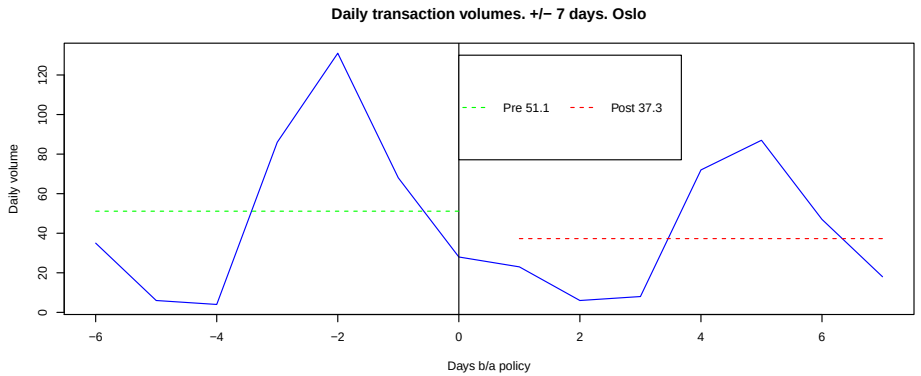
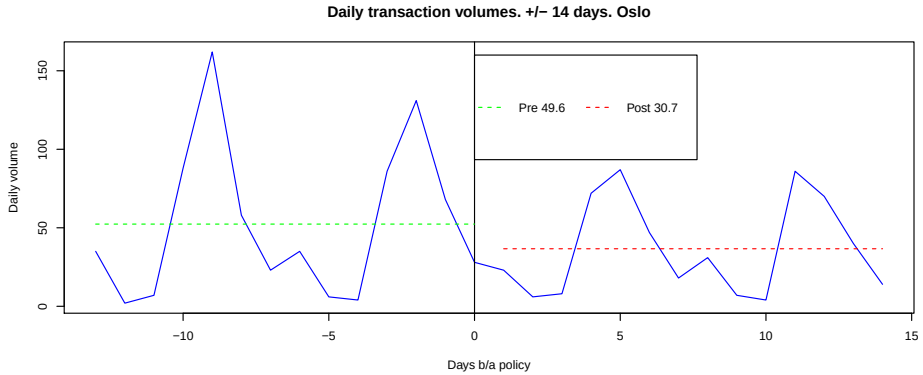
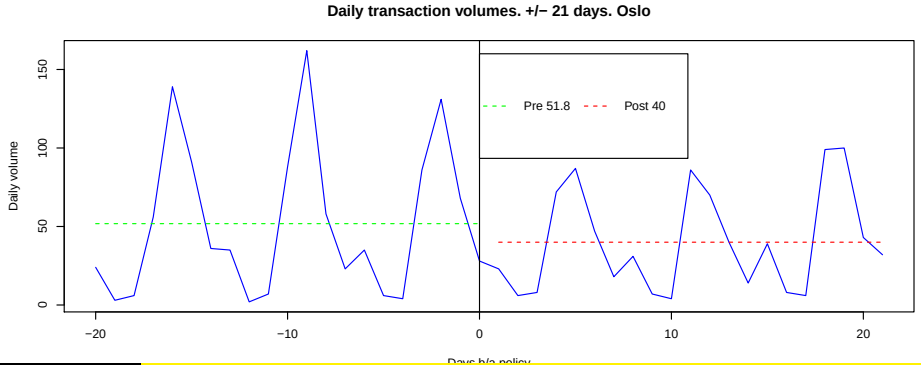
Number of transactions







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Auction data

- Auction data for **all units sold by DNB-Eiendom** between Jan. 2020 and April 2020
- **Unit specific data:**
  - (Mostly the) Same as in transaction data
- **Transaction specific data:**
  - Same as in transaction data
- **Auction specific data:**
  - All bids in all auctions, counter bid (by seller), bidder id, realtor id, realtor office, bid received time (at minute), bid expiry time (at minute), date of hiring realtor, date ready for sale, etc.

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Bidding data pre versus post lock-down

	Pre lock-down		Post lock-down	
Variable	Mean	Std.	Mean	Std.
No. bidders	2.47	1.48	2.30	1.47
No. bids	7.75	6.79	7.70	6.57
No. bids per bidder	3.10	1.73	3.33	1.78
Dist. sell price vs. rejected bid	2.49	2.48	0.78	1.36
Perc. with op. bid $<$ 90% ask price	17.92		27.14	
No. obs.	106		70	
No. obs.*	16		8	

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Estimating counterfactual house prices I

Hedonic model:

$$P_{h,t} = \alpha + \sum_k \beta_k X_{k,h} + \sum_R \theta_R D_{R,h,t} + \epsilon_{h,t},$$

in which:

- P is the sales price
- X is a vector of attributes: size, unit type, ownership form, number of befrooms, $+ + +$, as well as 3-digit zip-codes
- D is a vector of time dummies: year, calendar month, Easter, winter break

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Estimating counterfactual house prices II

- Use data between January 2, 2010, and February 14, 2020, to estimate parameters in hedonic specification
- Construct predicted values for all units sold thereafter (keeping all parameters constant)
- Calculate the percentage deviation between sell prices and predicted values
- Follow daily averages in the spread in 1,2, and 3 week windows around March 12

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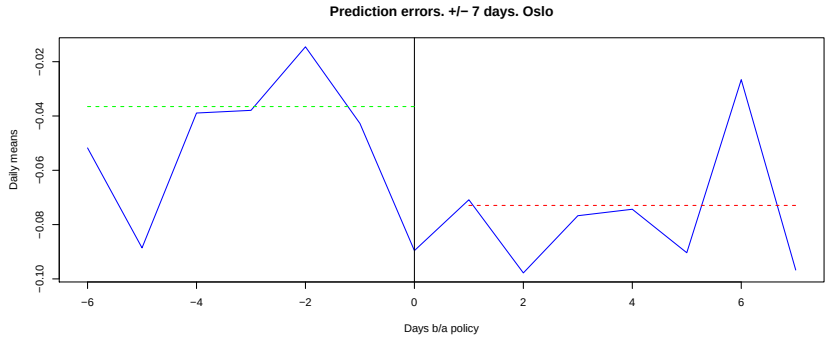
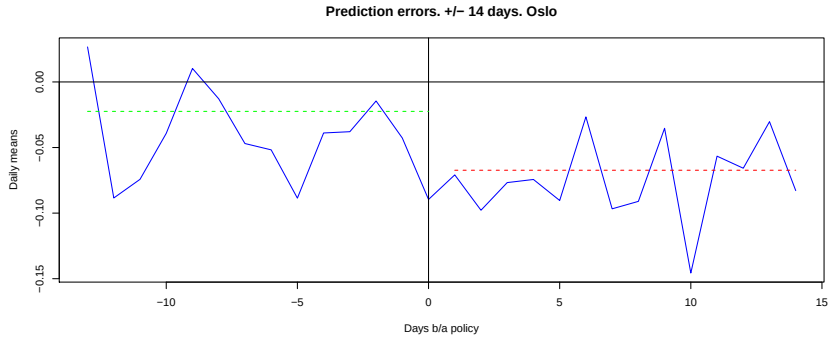
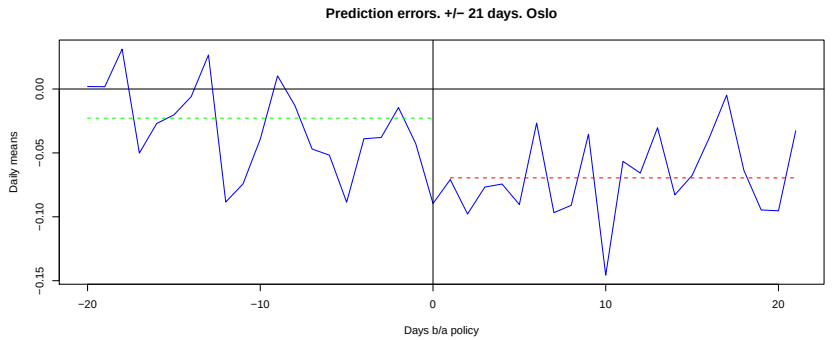
%-spread between sell price and predicted price







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Price and volume changes

Var	Per.1	Cut-off	Per. 2	$Mean_1$	$Mean_2$
Volumes	- 7 days	Mar. 12	+ 7 days	51.1	37.3
Volumes	- 14 days	Mar. 12	+ 14 days	52.4	36.6
Volumes	- 21 days	Mar. 12	+ 21 days	51.8	40.0
Prices	- 7 days	Mar. 12	+ 7 days	-0.037	-0.073
Prices	- 14 days	Mar. 12	+ 14 days	-0.022	-0.067
Prices	- 21 days	Mar. 12	+ 21 days	-0.023	-0.070

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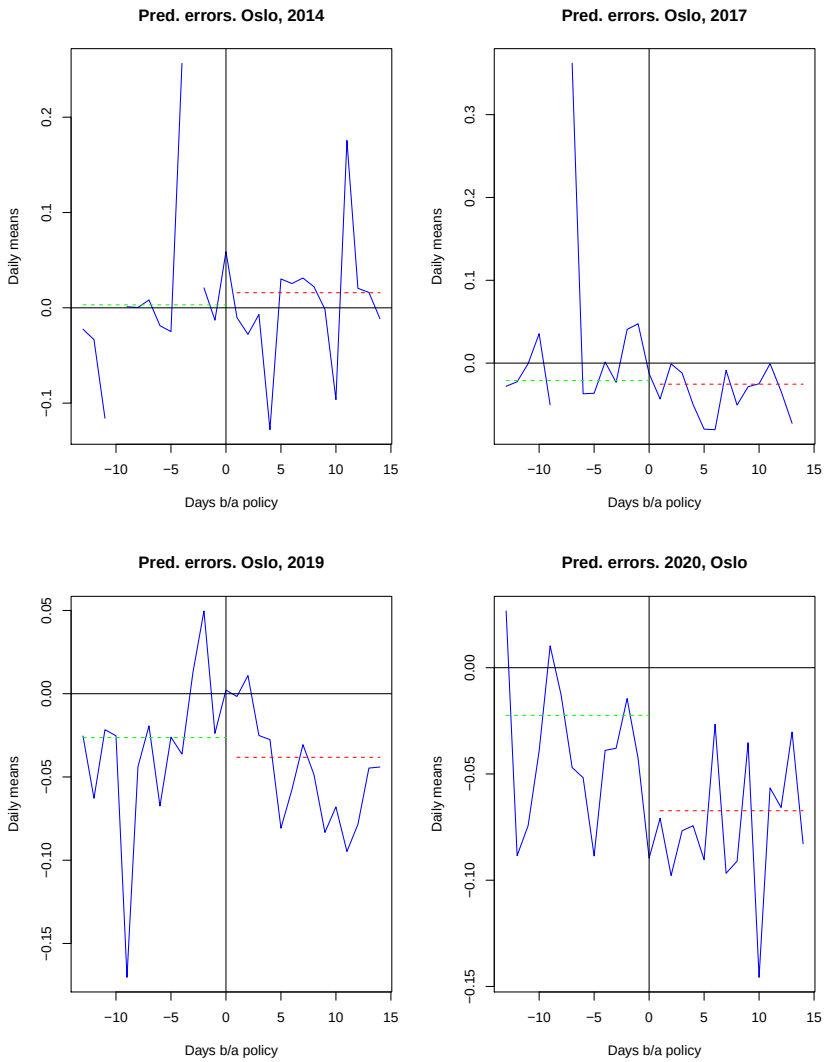
Placebo for previous, non-Easter, years



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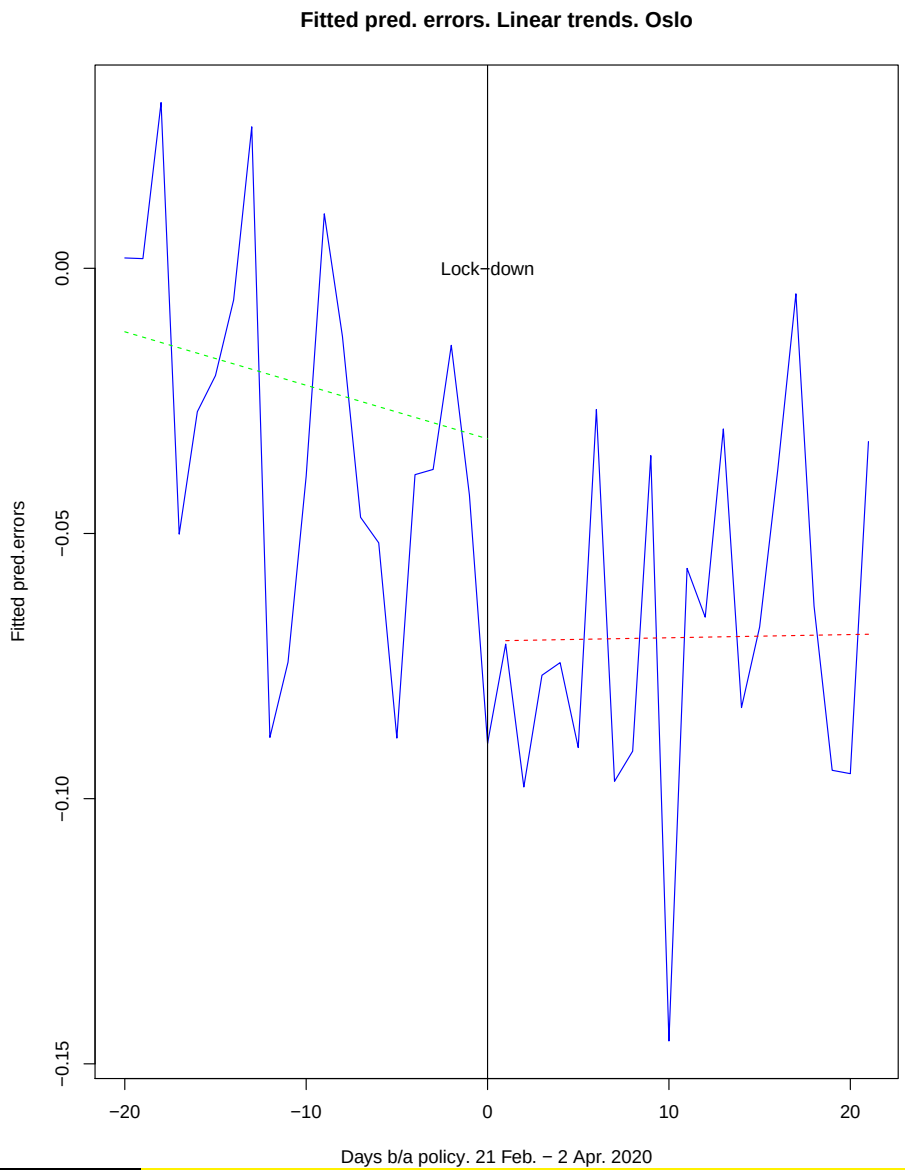
Clear downward trend before lock-down



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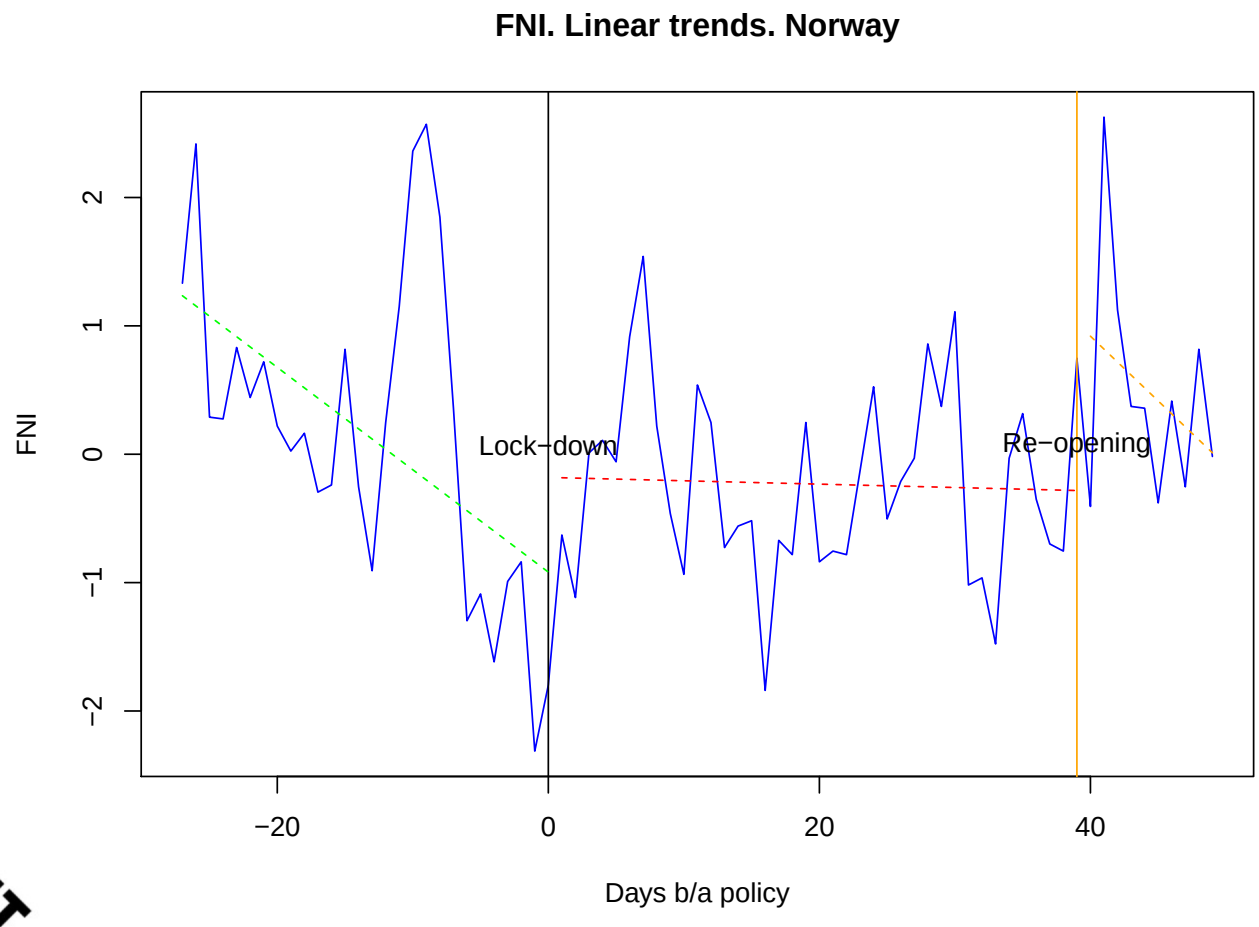
Consistent with the drop in FNI

Source: CAMP/BI and Retriever



$$Pred.\ Error_t = a + b(\Delta FNI_t\ \ Index) + c\Delta(Stock\ \ Exch.\ \ Index_t) + \epsilon_t$$

Variable	Estimated coef.	St. err.	P-value
Diff. Sentiment	0.174	0.072	0.018
Diff. Oslo stock exchange	-0.0003	0.0003	0.24
No. obs.		77	
Root mean sq. err.		0.043	
Adj. R^2		0.0524	

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Behavioral changes in the auction-data

1. **Extensive margin:** Number of bidders and number of bids
2. **Intensive margin:** Seller and bidder behavior
   a. *Seller confidence:* Percentage difference between sell price and highest rejected bid
   b. *Aggressive bidding:* Share of auctions where the opening bid is lower than 90% of the ask price

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Seller and bidder behavior pre and post lock-down

	Pre lock-down		Post lock-down	
Variable	Mean	Std.	Mean	Std.
No. bidders	2.47	1.48	2.3	1.47
No. bids	7.75	6.79	7.7	6.57
Dist. sell price vs. rejected bid	2.49	2.48	.78	1.36
Perc. with op. bid $<$ 90 perc. of ask price	17.92		27.14	
No. obs.	106		70	
No. obs.*	16		8	

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Behavior changed before lock-down!

Variable	-2 weeks	-1 week	+1 week	+2 weeks
No. bidders	2.36	2.55	2.38	2.23
No. bids	7.30	8.10	7.47	7.91
Dist. sell price vs highest rejected bid	3.03	1.59	0.96	0.60
Opening bid $<$ 90 % ask price	13.04	21.67	18.18	35.14
No. obs.	46	60	33	37
No. obs.*	10	6	4	4

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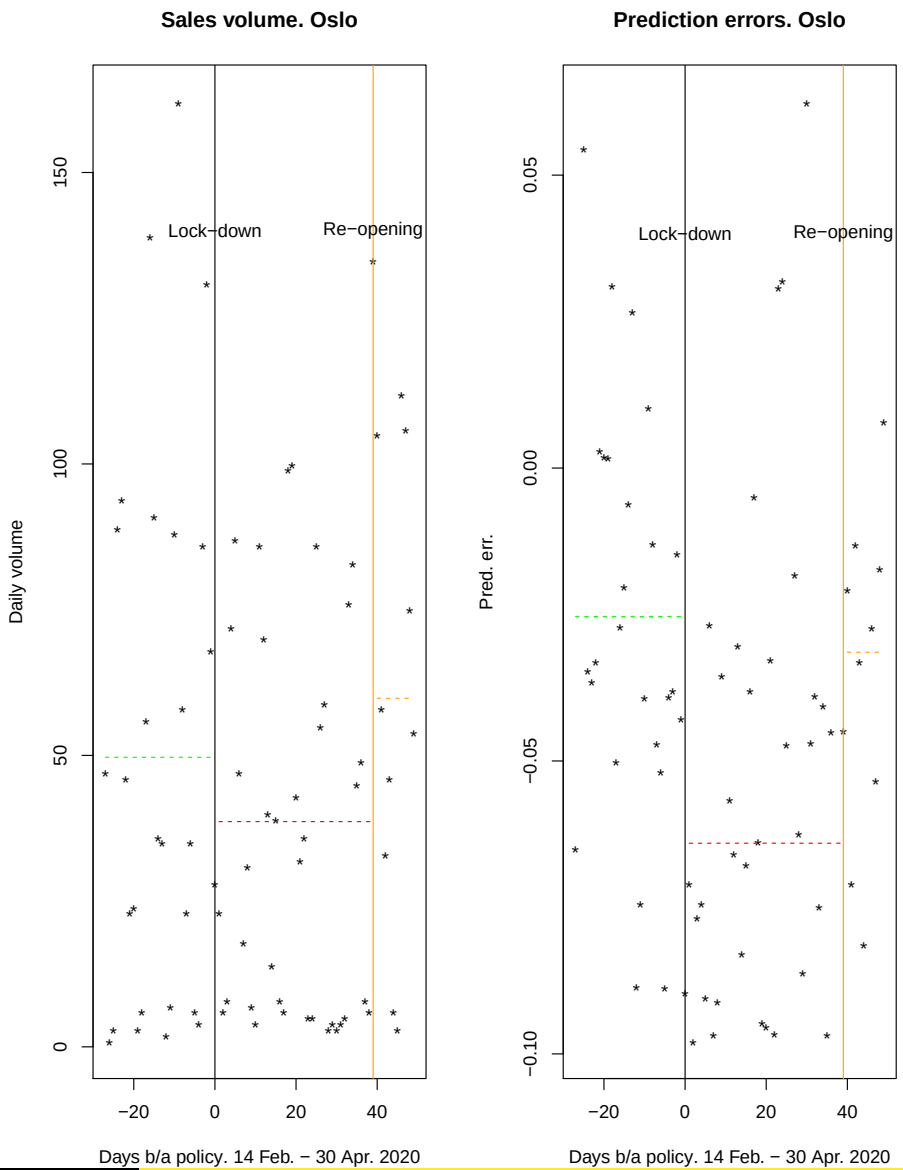
Re-opening

Prices and volumes after re-opening



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Seller and bidder behavior after re-opening

	Pre April 20		Post April 20	
Variable	Mean	Std.	Mean	Std.
No. bidders	2.34	1.23	2.53	1.7
No. bids	7.83	5.86	7.57	5.84
Dist. sell price vs. rejected bid	2.11	4.23	5.06	3.23
Perc. with op. bid $<$ 90 perc. of ask price	35.29		21.49	
No. obs.	119		121	
No. obs.*	13		8	

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Cautionary notes

Effects pre lock-down and just after not obfuscated by other policies, but later on more tenuous:

1. Spreading news about Covid-19
2. Spreading cases from Covid-19
3. The lock-down
4. Monetary policy changes (brought to zero)
5. Fiscal policy changes (support packages)

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Conclusion

- Half of the fall in house prices took place before lock-down
  - Relates to changing expectations
  - No change in number of bidders or number of bids (extensive margin)
  - Sellers become less confident and bidders more aggressive (intensive margin)
- Effects on prices reversed after re-opening, and:
  - Sentiment improving
  - Sellers become more confident and bidders less aggressive

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