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Updated report on Kamloops's housing market

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1 Report

This report provides an interesting update on the recently published study [2] by us on the rapid increase in housing prices in Kamloops, British Columbia (BC). While our previous study found one threshold effect (also called breakpoint) in housing prices, using a new (also expanded) dataset we found two threshold effects for price increase in Kamloops. Please note that a threshold effect shows either a significant increase or decrease in the rate at which prices change over time. We used monthly average home prices that are the average of all types of houses such as detached and semidetached, townhouses, and condos form January 2010 to October 2021 for a total of 141 months.

We found that the implementation of an additional property transfer tax for foreign buyers in Vancouver, BC had an initial threshold effect in the housing prices in Kamloops. This is consistent with our findings in the previous study [2].

However, with the expanded dataset we found that the Kamloops housing market had experienced another threshold effect in April 2020 in the form of an even more rapid increase in housing prices. We think that this is probably due to multiple causes such as Covid-19 issues, buyers' migration from larger to smaller cities, low mortgage interest rates and investors' speculation purchases. The updated research includes data for 15 additional months into the Covid-19 period beyond the cut-off time of July 2020 in the previous study. The housing market in Kamloops is sky rocketing ever since BC introduced Bill 28, with rapid growth in home prices quantifying 484.48% higher than before the second threshold in April, 2020 and 7115.71% higher than before the first threshold in August 2015 (Table 1).

It can be seen from the plot below that the two breakpoints occurred in August 2015 and April 2020 with the slope becoming very steep ever since (Figure 1).

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2 Updated data from Kamloops, BC

We collect data of monthly average home prices from Kamloops, BC from January 2010 to October 2021 for a total of 141 months from the monthly statistical report of the Canadian Real Estate Association (CREA) (`https://creastats.crea.ca/en-CA/`). In this collection of data, the monthly average home prices are the average of all types of houses such as detached and semidetached, townhouses, and condos.

3 Model

Let Y and x be the average monthly home price and the linear trend variable, in month, respectively. We define our model as:

$$Y_t = \theta_0 + \theta_1 x_t + \theta_2 (x_t - \theta_4) I(x_t - \theta_4) + \theta_3 (x_t - \theta_5) I(t - \theta_5) + \epsilon_t,$$

where θ_4 and θ_5 are the first and second breakpoints, respectively, and

$$I(x_t - \theta_j) = \begin{cases} 1 \text{ for } x_t \geq \theta_j \\ 0 \text{ for } x_t < \theta_j, \end{cases}$$

for $j \in \{4, 5\}$. In this formulation, θ_1, $\theta_1 + \theta_2$ and $\theta_1 + \theta_2 + \theta_3$ are the slopes in the first, second and third segments of the model demarcated by the thresholds θ_4 and θ_5, respectively. The model is estimated using the R package `segmented` by Muggeo (2021) [1].

4 Results

Table 1 shows the 95% confidence intervals for breakpoints θ_4 and θ_5 which occurred in months of 68 (August 2015) and 124 (April 2020) with 95% confidence intervals ranging from 50.17 to 65.82 and from 122 to 162, respectively. (Please note that the months 1 and 141 refer to January 2010 and October 2021, respectively.) In the first segment of the model (from January 2010 to August 2015), the slope θ_1 is 333.09 with 95% confidence interval ranging from 166.68 to 499.51: The average price increase per month is \$333.09. In the second segment of the model (from August 2015 to April 2020), the slope $\theta_1 + \theta_2$ is 1953.40 with 95% confidence interval ranging from 1741.30 to 2165.50: The average price increase per month is \$1953.40. In the third segment of the model (from April 2020 to October 2021), the slope $\theta_1 + \theta_2 + \theta_3$ is 9463.90 with 95% confidence interval ranging from 8159.70 to 10768.00: The average price increase per month is \$9463.90. The price increases in the first, second and third segments are significantly different from each other as the confidence intervals are highly non-overlapping.

Figure 4 shows the expected home price plotted against linear trend in time (in month) for Kamloops housing market data highlighting two breakpoints in red along the horizontal axis with 95% confidence intervals. The breakpoints occurred in August 2015 and April 2020 and the slopes are very steeply increasing ever since.

Table 1 Estimates and 95% confidence intervals for breakpoints and slopes for the updated data (from January 2010 to October 2021) from Kamloops, British Columbia.

Names	Parameter	Median	95% confidence interval	
			Lower Limit	Upper Limit
Breakpoints	θ_4	67.28	61.42	73.15
	θ_5	124.00	122.00	126.00
Slopes	θ_1	333.09	166.68	499.51
	$\theta_1 + \theta_2$	1953.40	1741.30	2165.50
	$\theta_1 + \theta_2 + \theta_3$	9463.90	8159.70	10768.00

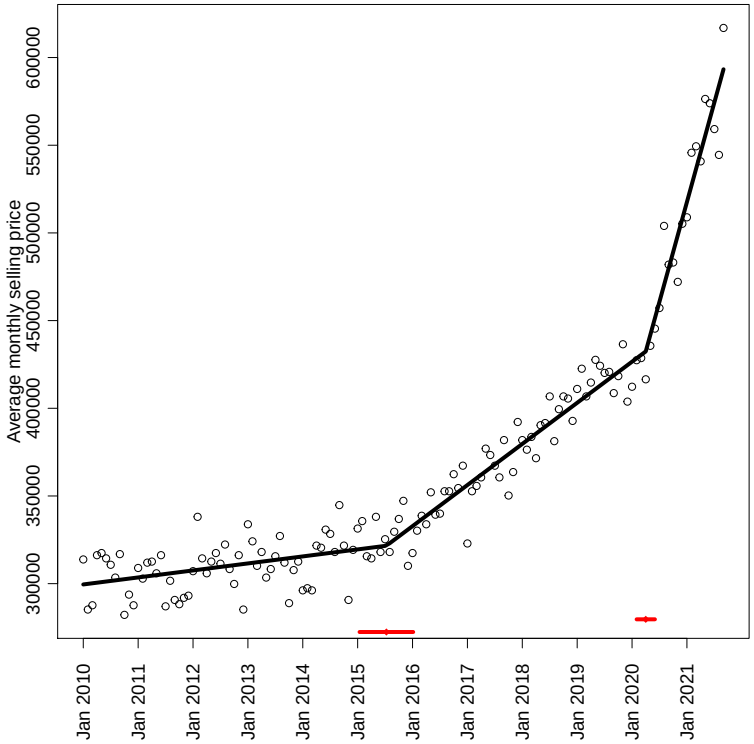

Fig. 1 Fitted piece-wise linear regression model to the updated data from Kamloops, BC with 95% confidence intervals for the breakpoints shown in red along the horizontal axis.

Acknowledgements

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References

1. Muggeo, V.M.R.: segmented: Regression Models with Break-Points / Change-Points Estimation (2021). R package version 1.3-4

2. Tomal, J.H., Rahman, H.: A bayesian piecewise linear model for the detection of breakpoints in housing prices. Metron **79**(3), 361–381 (2021). DOI https://doi.org/10.1007/s40300-021-00223-8