

Model

ln(price) = 10.2082 + 0.3618 · waterfront − 0.0160 · bedrooms − 0.0153 · bathrooms + 0.1400 · sqft_living^0.3 + 0.0088 · floors + 0.1494 · view^0.5 + 0.0105 · grade^2 + 0.1187 · ln(sqft_living15)

Explanation of the Model

Before I begin explain the coefficients, I notice that $P > |t|$ for the *floors* variable is 0.155, which makes *floors* insignificant for the analysis.

- 1. The model has the sample intercept of 10.2082. If we assume that all explanatory variables are zeros, this would mean that the price would be $e^{10.2082} \approx 27,124$
- 2. 0.3618 is the coefficient for *waterfront*. *Waterfront* is a categorical variable coded as 0 or 1, a one unit difference represents switching from one category to the other. 10.2082 is then the average difference in *price* between the category for which *waterfront* = 0 (no waterfront) and the category for which *waterfront* = 1 (the house has a waterfront). So compared to ln(*price*) of the house with no waterfront, we would expect the ln(*price*) for the house with waterfront to be 0.3618 higher, on average, if we fix all other explanatory variables.
Let y_2 = price of the house with waterfront and y_1 = price of the house with no waterfront, then

ln y2 − ln y1 = 0.3618 ⇒ ln y2 / y1 = 0.3618 ⇒ y2 / y1 = e^0.3618

To understand the change in *price* in percents, if we switch from the house with no waterfront to the house with waterfront while keeping all other variables the same, will use the following formula:

100 × [(y2 − y1) / y1] = 100 × [y2 / y1 − 1] = 100 × [e^0.3618 − 1] ≈ 43.59%

Thus, switching from the house with no waterfront to the house with waterfront while keeping all other explanatory variables fixed, will increase the price by 43.59%.

- 3. −0.0160 is the coefficient for number of *bedrooms*. Let y_2 = price for the house with x_2 number of bedrooms and y_1 = price for the house with x_1 number of bedrooms, then
ln y2 − ln y1 = −0.016x2 − (−0.016x1) = −0.016(x2 − x1) ⇒ ln y2 / y1 = −0.016(x2 − x1) ⇒ y2 / y1 = e^−0.016(x2 − x1)

If we increase the number of bedrooms by 1 while keeping the other variables fixed and use percents, we will get the following

100 × [(y2 / y1) − 1] = 100 × [e^−0.016 − 1] ≈ −1.58%

Thus, increasing the number of bedrooms by 1 while keeping the other variables fixed, will decrease the price of the house by 1.58%. Which is a strange result.

- 4. The same explanation we have for −0.0153 which a coefficient for number of bathrooms. If we increase the number of bathrooms by 1 while keeping the other variables fixed, will decrease the price of the house by 1.51%. Which is a strange result.
- 5. 0.1400 is the coefficient for *sqft_living*. Let y_2 = price for the house with x_2 *sqft_living* and y_1 = price for the house with x_1 *sqft_living*, then

ln y2 − ln y1 = 0.1400x2^0.3 − 0.1400x1^0.3 ⇒ ln y2 / y1 = 0.1400 (x2^0.3 − x1^0.3) ⇒ y2 / y1 = e^0.1400(x2^0.3 − x1^0.3)

If we increase the *sqft_living* from 1000ft to 1100ft while keeping the other variables fixed, we will get the following change in price in percents:

100 × [(y2 / y1) − 1] = 100 × [e^0.1400(1100^0.3 − 1000^0.3) − 1] ≈ 3.28%

If the *sqft_living* is 1000ft and we increase it to 1100ft while keeping the other variables fixed, we will get the change in price of 3.28%. In this particular example 10% change in *sqft_living* starting from $x_1 = 1000ft$ forces 3.28% change in price.

- 6. 0.1494 is the coefficient for the *view*. The coefficient for the *view* has the same explanation as the *sqft_living*. If we increase the *view* by 1 unit from 2 to 3 while keeping the other variables fixed, we will get the following:

100 × [(y2 / y1) − 1] = 100 × [e^0.1494(3^0.5 − 2^0.5) − 1] ≈ 4.86%

In this particular example if the *view* will increase from 2 to 3, the price will increase by 4.86%.

- 7. 0.0105 is the coefficient for the *grade*. The coefficient for the *grade* has the same explanation as the *sqft_living*. If we increase the *grade* by 1 unit from 2 to 3 while keeping the other variables fixed, we will get the following:

100 × [(y2 / y1) − 1] = 100 × [e^0.0105(3^2 − 2^2) − 1] ≈ 5.39%

In this particular example if the *grade* will increase from 2 to 3 while other variables stay the same, the price will increase by 5.39%.

- 8. 0.1187 is the coefficient for the *sqft_living15*. Let y_2 = price for the house with x_2 *sqft_living15* and y_1 = price for the house with x_1 *sqft_living15*, then
ln y2 − ln y1 = 0.1187 ln x2 − 0.1187 ln x1 ⇒ ln y2 / y1 = 0.1187 ln x2 / x1 ⇒ y2 / y1 = e^0.1187 x2 / x1

The change in price in precent will be:

100 × [(y2 / y1) − 1] = 100 × [e^0.1187 x2 / x1 − 1]

If we increase the *sqft_living15* by 100 units from 1000 to 1100 while keeping the other variables fixed, we will get the following:

100 × [e^0.1187 × 1100 / 1000 − 1] ≈ 23.87%

Thus, 10% increase in *sqft_living15* will lead to 23.87% increase in *price*.