Answer on Question #60734 – Math – Statistics and Probability

Question

You have been asked to compare two neighbourhoods in the west end of Montreal by a real estate agency. The agency wants to know if a difference exists in the selling price of houses on Westminster street (Montreal West), as compared to Beaconsfield street (NDG). You take a sample of houses sold on both streets over the past 10 years, adjust the inflation and monetary rate so as to equalize the dollar, and tabulate your results. Is there enough evidence to prove that the selling price for the houses on the two streets is significantly different? Please conduct a complete hypothesis test at the 99% confidence level and calculate the p-value. (Hint: Can we assume that the variances are equal?)

Street	n	x	s
Westminster	16	125,950	2400
Beaconsfield	24	128,800	3700

Solution

$\mu_w = 125950, \ s_w = 2400, \ n_w = 16;$
$\mu_b = 128800, \ s_b = 3700, \ n_b = 24.$

Null hypothesis H_0: $\mu_w = \mu_b$.
Alternative hypothesis H_a: $\mu_w \neq \mu_b$.

Test statistic $t = \dfrac{\mu_w - \mu_d}{\sqrt{\dfrac{s_w^2}{n_w} + \dfrac{s_d^2}{n_d}}} = \dfrac{125950 - 128800}{\sqrt{\dfrac{2400^2}{16} + 3700^2/24}} = -2.95$

Degrees of freedom $df = \dfrac{\left(\dfrac{s_w^2}{n_w} + \dfrac{s_d^2}{n_d}\right)^2}{\dfrac{s_w^4}{n_w^2(n_w-1)} + \dfrac{s_d^4}{n_d^2(n_d-1)}} = \dfrac{\left(\dfrac{2400^2}{16} + \dfrac{3700^2}{24}\right)^2}{\dfrac{2400^4}{16^2 * 15} + \dfrac{3700^4}{24^2 * 23}} = 37$

For $t = -2.95, \ df = 37$, in two $-$ tailed test $p = 0.0055 < \alpha = 0.01$.
Therefore, we should reject the null hypothesis and conclude that there is a significant difference in selling prices between Westminster and Beaconsfield.