

FORK 1002 Statistics
Exercise Set 3: Solutions

1. (a) 2.489, 3.316 and 5.390
 (b) About 2.074, about 2.579 and about 3.767.¹
 (c) 1.853, 2.223 and 3.036
 (d) 0.10 (or 10%)
 (e) 0.01 (or 1%)
 (f) Less than 0.01 (or less than 1%)
2. (a) $Salesprice_i = B_0 + B_1m2_i + B_3Debt_i + u_i$
 (b) $Salesprice_i = B_1m2_i + B_3Debt_i + u_i$
 (c) $Salesprice_i = B_0 + B_1m2_i + Debt_i + u_i$ (or alternatively $Salesprice_i - Debt_i = B_0 + B_1m2_i + u_i$)
 (d) $Salesprice_i = B_0 + u_i$
3. (a) Contained, because it can be obtained by means of the restrictions $B_0 = 0, B_2 = 0, B_3 = 0$
 (b) Contained, since it can be obtained by means of the restriction $B_3 = -1$
 (c) Not contained, because it includes a variable (*Yearofconstruction*) that is not contained in the model of the previous exercise
 (d) Not contained, because the left-hand side variable cannot be obtained by means of restrictions
4. (a) b_1 : If the size of the house or apartment increases by 1 square meter, then the salesprice increases on average by 28 550 kroner, assuming that the other variables are held constant. b_2 : A house or apartment with 1 room more increases on average the salesprice by 41 400 kroner, assuming that the other explanatory variables are held constant. b_3 : If the debt increases by 1000 kroner, then this reduces the salesprice on average by 1200, assuming that the other variables are held constant
 (b) $H_0 : B_2 = 0, H_1 : B_2 \neq 0$. t -test: Critical value $t_{0,05}(16) = 1.746$ and the test-value is $t = 41.40/112.96 = 0.3576$. Conclusion: H_0 is not rejected. F -test: Critical value is $F_{0.10}(1, 16) = 3.05$ and the test-value is $F = \frac{(0.8296-0.8282)/1}{(1-0.8296)/(20-4)} = 0.1315$. Conclusion: H_0 is not rejected.

¹Here the critical values are obtained by rounding the numerator degree of freedom (Df_1) downwards towards the next Df_1 that appears in the table. Other conventions may be used by others.

- (c) $H_0 : B_2 = 0$ and $B_3 = -1$, H_1 : One or both equalities in H_0 do not hold. F -test: Critical value is $F_{0.05}(2, 16) = 3.63$. The restrictions $B_2 = 0$ and $B_3 = -1$ are imposed in model (3). We have to use the test expression in term of RSS (rather than R^2), since the left-hand side variable in model (3) is not equal to the left-hand side variable in model (1). That is, $F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} = \frac{(1068704 - 1006064)/2}{1006064/(20-4)} = 0.4981$. Conclusion: H_0 is not rejected. Interpretation with respect to B_3 : The result of the test does not reject the hypothesis that 1000 Norwegian kroner in more debt reduces the salesprice with the same amount (that is, with 1000 kroner).
- (d) $H_0 : B_1 = 0, B_2 = 0, B_3 = 0$, H_1 : One or more of the equalities in H_0 do not hold. F -test: Critical value $F_{0.05}(3, 16) = 3.24$ and $F = \frac{(0.8296-0)/3}{(1-0.8296)/(20-4)} = 25.97$. Conclusion: H_0 is rejected, one or more of the equalities in H_0 are wrong.