Obtaining P-values from the t-table

In the following examples assume that you determined the type of test (upper, lower, 2-tail), have found the value of the test statistic, and the the degrees of freedom, based on this information, what is the P-value:

- 1. $t_0 = 0.5, df = 20$
 - (a) uppertail: $P value = P(t > t_0) = P(t > 0.5)$

From the table the only reference point is $t_{0.1} = 1.325$ (look it up). Sketching this shows:



As you can see from the diagram, the P - value > 0.1

- (b) lowertail: $P value = P(t < t_0) = P(t < 0.5)$. Therefore the P-value is the area to the left of $t_0 = 0.5$, which is more than half of the area under the curve and it is P value > 0.5.
- (c) 2-tail: $P value = 2(P > |t_0|) = 2P(t > 0.5)$. This is two times the P-value found for the uppertail test. Multiply what you have found for the uppertail test by 2, and get P - value > 0.2

2. $t_0 = 2.5, df = 20$

(a) uppertail: $P - value = P(t > t_0) = P(t > 2.5)$

From the table we can now use two reference points $t_{0.025} = 2.086$ and $t_{0.01} = 2.528$ (look it up) (2.5 falls between those two numbers). Sketching this shows:



As you can see from the diagram, the 0.01 < P - value < 0.025

- (b) lowertail: $P value = P(t < t_0) = P(t < 2.5)$. Therefore the P-value is the area to the left of $t_0 = 2.5$, which is more than half of the area under the curve and it is P value > 0.5
- (c) 2-tail: $P value = 2(P > |t_0|) = 2P(t > 2.5)$. This is two times the P-value found for the uppertail test. Multiply what you have found for the uppertail test by 2, and get 0.02 < P value < 0.05.
- 3. $t_0 = 4.5, df = 20$
 - (a) uppertail: $P value = P(t > t_0) = P(t > 4.5)$ From the table we can use one reference point $t_{0.005} = 2.845$ (look it up). Sketching

From the table we can use one reference point $t_{0.005} = 2.845$ (look it up). Sketching this shows:



As you can see from the diagram, the P - value < 0.005

- (b) lowertail: $P value = P(t < t_0) = P(t < 4.5)$. Therefore the P-value is the area to the left of $t_0 = 4.5$, which is more than half of the area under the curve and it is P value > 0.5
- (c) 2-tail: $P value = 2(P > |t_0|) = 2P(t > 4.5)$. This is two times the P-value found for the uppertail test. Multiply what you have found for the uppertail test by 2, and get P value < 0.01.

4. $t_0 = -0.5, df = 20$

- (a) uppertail: $P value = P(t > t_0) = P(t > -0.5)$. Negative values are not listed in the table, so we use symmetry, P(t > -0.5) = P(t < 0.5), which we argued in 1.(b) is greater than 0.5. P value > 0.5.
- (b) lowertail: $P value = P(t < t_0) = P(t < -0.5) = P(t > 0.5)$, which results in P value > 0.1 (see 1.(a)).
- (c) 2-tail: $P value = 2(P > |t_0|) = 2P(t > 0.5)$. This is two times the P-value found for the lowertail test. Multiply what you have found for the lowertail test by 2, and get P value > 0.2.

5. $t_0 = -2.5, df = 20$

- (a) uppertail: $P value = P(t > t_0) = P(t > -2.5) = P(t < 2.5)$ (symmetry), which we argued in 2.(b) is greater than 0.5. P value > 0.5.
- (b) lowertail: $P value = P(t < t_0) = P(t < -2.5) = P(t > 2.5)$ (symmetry), which results in 0.01 < P value < 0.025 (see 2.(a)).

- (c) 2-tail: $P value = 2(P > |t_0|) = 2P(t > 2.5)$. This is two times the P-value found for the lowertail test. Multiply what you have found for the lowertail test by 2, and get 0.02 < P value < 0.05.
- 6. $t_0 = -4.5, df = 20$
 - (a) uppertail: $P value = P(t > t_0) = P(t > -4.5) = P(t < 4.5)$ (symmetry), which we argued in 3.(b) is greater than 0.5, P value > 0.5.
 - (b) lowertail: $P value = P(t < t_0) = P(t < -4.5) = P(t > 4.5)$ (symmetry). According to 3.(a), we get P - value < 0.005.
 - (c) 2-tail: $P value = 2(P > |t_0|) = 2P(t > 4.5)$. This is two times the P-value found for the lowertail test. Multiply what you have found for the lowertail test by 2, and get P value < 0.01.