

3주차 3차시 : 단순회귀분석(가설검정)

1. 가설검정

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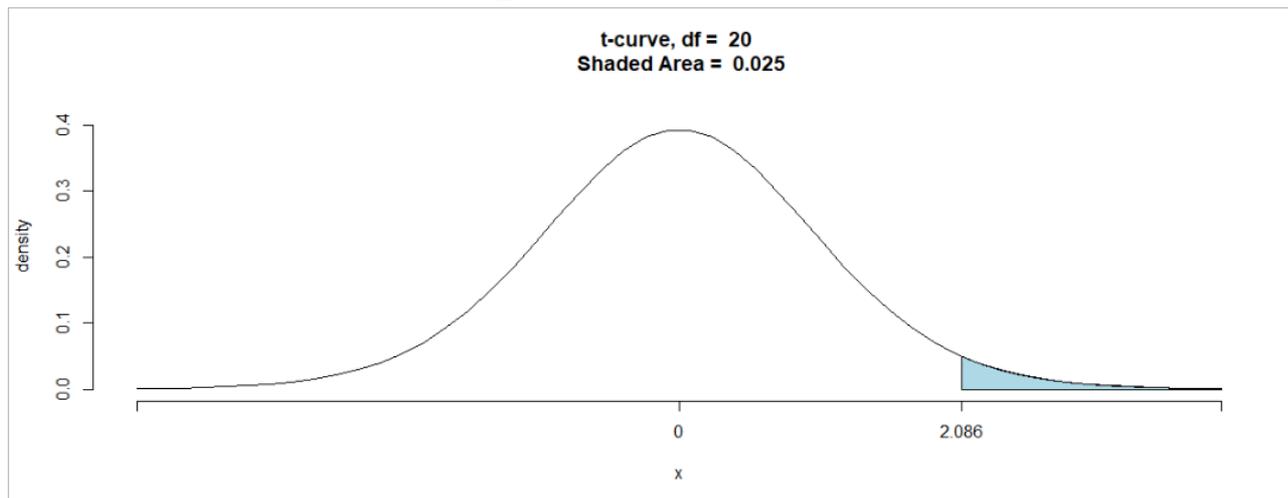
- 경제적 유의성(economical significance) : 이론적으로 독립변수가 종속변수에 영향을 주는 것
- 통계적 유의성(statistical significance) : 실증분석 결과 독립변수가 종속변수에 영향을 주는 것

(회귀모형) $Y_i = \beta_0 + \beta_1 X_i + u_i$

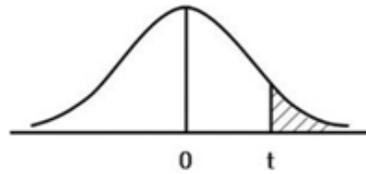
(가설) $H_0: \beta_1 = 0 \quad H_1: \beta_1 \neq 0$

(검정통계량) $t = \frac{\hat{\beta}_1 - \beta_1}{\sqrt{\text{var}(\hat{\beta}_1)}} = \frac{\hat{\beta}_1 - \beta_1}{\text{se}(\hat{\beta}_1)} \sim t_{n-2}$

(신뢰구간) $\hat{\beta}_1 \pm t_{(n-2, \frac{\alpha}{2})} \text{se}(\hat{\beta}_1)$



〈표 2〉 t-분포표



자유도 \ P	0,1	0,05	0,025	0,01	0,005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.923
3	0.1638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.103
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.816
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

(예제-계속)

$$\hat{\sigma}_u^2 = \frac{4.4}{3} = 1.4667$$

$$\text{var}(\hat{\beta}_1) = \hat{\sigma}_u^2 \frac{1}{\sum_{i=1}^n (x_i - \bar{x})^2} = (1.4667) \left(\frac{1}{10}\right) = 0.14667$$

(추정회귀식) $\hat{Y}_i = 0.4 + 1.4X_i$
(1.62) (0.383)

(가설) $H_0: \beta_1 = 0 \quad H_1: \beta_1 \neq 0$

(홍보지 지출액이 연간매출액에 영향을 주지 않는다)

(검정통계량) $t = \frac{1.4 - 0}{0.383} = 3.655 \sim t_3$

(95% 신뢰구간) $\hat{\beta}_1 \pm t_{(n-2, \frac{\alpha}{2})} \text{se}(\hat{\beta}_1) = 1.4 \pm 3.182(0.383) = [0.181, 2.618]$

```
> (t<-beta1/sqrt(vbeta1))
[1] 3.655631
> (pt(t,3))
[1] 0.9823236
>
> (tc<-qt(p=0.025, df=3, lower.tail=F))
[1] 3.182446
>
> (b1hat_lb<-b1hat-(tc)*sqrt(vbeta1))
[1] 0.1812159
> (b1hat_ub<-b1hat+(tc)*sqrt(vbeta1))
[1] 2.618784
>
```

