15.17

The data file $liquor$ contains observations on annual expenditure on liquor ($LIQUOR$) and annual income ($INCOME$) (both in thousands of dollars) for 40 randomly selected households for three consecutive years.

a. Create the first–differenced observations on $LIQUOR$ and $INCOME$. Call these new variables $LIQUORD$ and $INCOMED$. Using OLS regress $LIQUORD$ and $INCOMED$ without a constant term. Construct a 95% interval estimate of the coefficient.

Ans.

$\widehat{LIQUORD}_{it} = 0.02975 \cdot INCOMED_{it}$

INCOMED 變數的係數在 95% 信賴區間內的估計為 [−0.02841457, 0.08790818]。

信賴區間涵蓋了 0，我們沒有足夠證據拒絕 $H_0: \beta = 0$ （收入變化不影響酒類支出）。

```
Call:
lm(formula = LIQUORD ~ 0 + INCOMED, data = liquor5_diff)

Residuals:
    Min      1Q  Median      3Q     Max
-3.6852 -0.9196 -0.0323  0.9027  3.3620

Coefficients:
        Estimate Std. Error t value Pr(>|t|)
INCOMED  0.02975    0.02922   1.018    0.312

Residual standard error: 1.417 on 79 degrees of freedom
Multiple R-squared:  0.01295,   Adjusted R-squared:  0.0004544
F-statistic: 1.036 on 1 and 79 DF,  p-value: 0.3118
```

```
> # 95% 信賴區間
> confint(ols_diff, level = 0.95)
                2.5 %     97.5 %
INCOMED -0.02841457 0.08790818
```