Assignment 5

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1 1

1.1 a

The computed values are

$$100 \times \frac{2}{196} = 1.0204\%$$
$$100 \times (\ln(198) - \ln(196)) = 1.0152\%$$

1.2 b

First value:

$$100 \times \frac{205 - 196}{196} = 4.5918\%$$
$$100 \times (\ln(205) - \ln(196)) = 4.4895\%$$

Second value:

$$100 \times \frac{250 - 196}{196} = 27.551\%$$
$$100 \times (\ln(250) - \ln(196)) = 24.335\%$$

Third value:

$$100 \times \frac{500 - 195}{196} = 155.1\%$$
$$100 \times (\ln(500) - \ln(196)) = 93.649\%$$

1.3 c

The approximation is very close when the change is small, by Taylor's theorem. However, when the percentage change increases the approximation deteriorates in performance.

2 2

2.1 a

The value of -0.44 means that compared to non-females, women are expected to have smaller earnings, and this dependent variable will change by $100 \times \hat{\beta}_1 = 100 \times -0.44 = 44$ %.

Technically, the interpretation is $\%\Delta y = 100 \times (\exp(\hat{\beta}_1 - 1) = 100 \times (\exp(-0.44) - 1)$, so the dependent variable of earnings/compensation for women is expected to decrease by -35.5964%.

The SER is the standard error of the residual terms. This value means that the standard error of earnings was around 2.65 log-scaled units.

The female top executives do earn less, because the t-statistic is $-0.44/0.05 = -8.8$, and this magnitude beats the critical values at the traditional significance levels. Hence the null can be rejected that the coefficient on female is non-negative. However, we must be careful of omitted variable bias.

However, there may or may not be gender discrimination. Because there are other variables that are not controlled for, and therefore we get omitted variable bias because the regressors left out are now included in the erorror term, and this breaks the condition of exogeneity, stating that $\mathbb{E}[u_i|X] = 0$. In addition, to meet the criteria for discrimination, there will be two workers, different only gender but have the same levels and values for the other regressors, are paid different wages. Hence, there is a need to control for characteristics of the workers that may affect their productivity. If these characteristics are systematically different between men and women, then they may be responsible for the difference in mean wages.

2.2 b

The coefficient on market value means that ceteris paribus, an increase of 1% in market value will be expected to be associated with an increase in compensation earnings of 0.37%.

The coefficient on female decreased in magnitude, because of the omitted variable bias. There are two sources of omitted variable bias: the pairwise correlation between the originally omitted variable (market value logged) and the other regressor (female), and the partial effect of market value on earnings. It is apparent that one of the variables is highly statistically significant.

2.3 c

Large firms are less likely to have female executives because of the direction of change on the coefficient estimated on female, which was intuitively argued since the direction of change on coefficients is not exactly known when there are more than 2 regressors involved in a regression. However, the intuition is that if the return regressor was ignored due to not being statistically significant, then female is negatively correlated with log of market value.

$$\hat{\beta}_1 + \tilde{\delta}_1 \hat{\beta}_2 \approx \tilde{\beta}_1$$

Here, the interesting quantity of the rough calculation is the sign of $\tilde{\delta}_1$, which captures the pairwise correlation between size of firms and having female executives. The term on the right hand side is the simple regression coefficient estimate on female, while the left hand $\hat{\beta}$'s are from the multiple regression model. It can be shown that the sign on $\tilde{\delta}_1$ is negative:

$$\tilde{\delta}_1(0.37) \approx \tilde{\beta}_1 - \hat{\beta}_1 = -0.44 + 0.28 = -0.16$$

$$\implies \tilde{\delta}_1 \approx \frac{-0.16}{0.37} < 0$$