

Problem Set 7 – Answers
Econ 253

Textbook problems:

6.8 (a) An increase of one percentage point in the broad market index is associated with an increase of 1.0598 percentage points in the return to IBM stock, on average. If the broad market return is zero, the average rate of return on IBM stock is 0.7264.

(b) 47.1% of the variation in the return to IBM stock can be “explained” by variation in the broad market index.

(c) $H_0: B_2 = 1$

$H_a: B_2 > 1$

$$t = (b_2 - B_2)/s.e. (b_2) = (1.0598 - 1)/0.0728 = 0.8214.$$

We don't have t_{238} in the tables, so use t_∞ . The 5% critical value on the right tail is 1.645. The null is not rejected. We cannot conclude that this is an aggressive security.

6.11 (a) Negative; the incumbent should receive fewer votes if unemployment goes up.

(b) $H_0: B_2 = 0$

$H_a: B_2 < 0$

We have 14 data points. The critical value at 5% for t_{12} at 5% is -1.782. The null is rejected, given the t of -2.67. Thus the results support the political business cycle theory.

(d) $S.e. (b_1) = 53.10/34.10$, $S.e. (b_2) = -1.70/-2.67$.

Computer exercises:

1. . regress score miss

Source	SS	df	MS			
Model	20.5128205	1	20.5128205	Number of obs =	27	
Residual	3134.15385	25	125.366154	F(1, 25) =	0.16	
Total	3154.66667	26	121.333333	Prob > F =	0.6893	
				R-squared =	0.0065	
				Adj R-squared =	-0.0332	
				Root MSE =	11.197	

score	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
miss	-.7692308	1.901665	-0.405	0.689	-4.685784	3.147322
_cons	55.48718	2.613589	21.230	0.000	50.10439	60.86997

I regressed the score on the number of classes missed. The coefficient is negative as I expected but it is statistically insignificant. We can see that from the value of the t-statistic and comparing it to the critical values in tables or from the p-value being larger than 0.05. Hence, I conclude that I found no evidence that number of classes missed has an effect on expected score on the midterm. This is somewhat demoralizing conclusion. However, before you decide to stop going to class, you should remember that we obtained this result under some very strong assumptions. First, we are assuming that only the number of classes missed influences the score. This is quite unlikely. Score probably depends on many other variables which are leaving out and hence miss-specifying our model. In addition, we have only a small number of observations. Remember that the precision of our estimates depends on the number of observations. Therefore, it is possible that if we had more observations our estimate would be more precise - its standard error low and hence t statistic high.

2.

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regress patcap grad
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Source	SS	df	MS			
Model	15.0143943	1	15.0143943	Number of obs =	60	
Residual	68.0776321	58	1.17375228	F(1, 58) =	12.79	
Total	83.0920264	59	1.40833943	Prob > F =	0.0007	
				R-squared =	0.1807	
				Adj R-squared =	0.1666	
				Root MSE =	1.0834	

patcap	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
grad	.2370444	.0662772	3.577	0.001	.1043762	.3697126
_cons	-.4601526	.5340559	-0.862	0.392	-1.529182	.6088765

The results show that if the percentage of population with graduate degrees increased by one percentage point the number of patents per 1000 people would increase by 0.237. This means that an additional person with a graduate degree will bring in 0.0237 patents. Why?

$$\Delta \left(\frac{\# \text{patents}}{\text{pop. (in thousands)}} \right) = 0.237 \Delta \left(\frac{\# \text{graduates}}{\text{population}} 100 \right)$$

$$\Delta \# \text{patents} = 0.0237 \Delta \# \text{graduates}$$

Mechanically, the intercept shows that if there were no people in the city with graduate degrees the number of patents would be negative which is impossible. In this case the intercept has no interpretation.

(b) You cannot be confident about this conclusion. Regression analysis does not lead to inferences about causality, unless backed by economic theory. It could be that the presence of more people with graduate degrees leads to more inventive activity, but the results are also consistent with other explanations.

The causality could run the other way. For instance, it could be the case that some cities have a good business-supportive environment, which is why many dynamic firms, which engage in Research and Development, settle there. Such cities then attract people with Ph.Ds. Thus the

regression results could be also interpreted as “Cities which have firms engaging in high levels of inventive activity attract people with graduate degrees.”

3.

. regress heighth heightw

Source	SS	df	MS			
Model	124295.721	1	124295.721	Number of obs =	199	
Residual	811582.017	197	4119.70567	F(1, 197) =	30.17	
Total	935877.739	198	4726.65525	Prob > F =	0.0000	
				R-squared =	0.1328	
				Adj R-squared =	0.1284	
				Root MSE =	64.185	

heighth	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
heightw	.4012984	.0730588	5.493	0.000	.2572207	.5453761
_cons	1089.633	117.1249	9.303	0.000	858.6531	1320.612

(a) $Y_i = B_1 + B_2X_i + u_i$, where Y_i is the husband’s height in millimeters and X_i is the wife’s height in millimeters.

$H_0: B_2 = 0$

$H_a: B_2 \neq 0$

The probability of getting such a high value of “t” is almost zero (under the null), so the null is rejected at 5%.

(b) 13.28%.

(c) $H_0: B_2 = 0.5$

$H_a: B_2 > 0.5$.

Our t-statistic is $(b_2 - B_2)/s.e(b_2) = (0.401 - 0.5)/0.07 = -1.414$. The critical t-value at 5% is 1.645 (I used t with degrees of freedom infinity). The null is not rejected.