

1960 - 2005 : ANNUAL DATA
(TIME SERIES)

. sum

Variable	Obs	Mean	Std. Dev.	Min	Max
year	46	1982.5	13.42262	1960	2005
y	46	4047.976	1791.113	1597.4	7841.2
x	46	6022.943	2479.288	2501.8	11048.6
yhat	46	4047.976	1789.635	1506.294	7675.667
uhat	46	-3.19e-07	72.74489	-151.0938	165.5325

. reg y x

Source	SS	df	MS
Model	144125684	1	144125684
Residual	238131.858	44	5412.08768
Total	144363816	45	3208084.79

Number of obs =	46
F(1, 44) =	26630.33
Prob > F =	0.0000
R-squared =	0.9984
Adj R-squared =	0.9983
Root MSE =	73.567

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
y					
x	.7218343	.0044233	163.19	0.000	.7129197 .730749
_cons	-299.5913	28.76494	-10.42	0.000	-357.5632 -241.6194

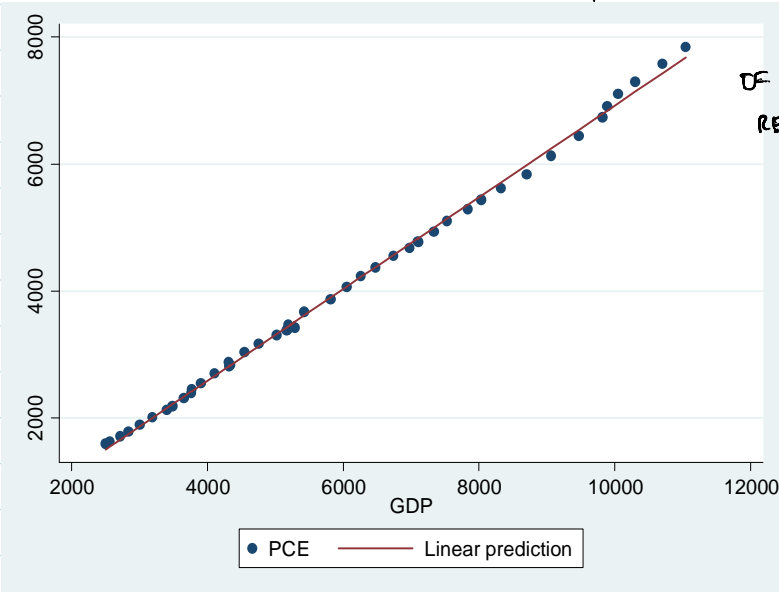
$$Y_t = -299.5913 + 0.7218 X \quad : \text{SRF}$$

$\downarrow \hat{\beta}_0$ $\downarrow \hat{\beta}_1 = \text{MPC}$

$H_0 : \beta_1 = 0$

$H_1 : \beta_1 \neq 0$

IF P-VALUE < 0.05,
REJECT $H_0 : \beta_1 = 0$.



ESS	144125684
TSS	5412.0877
F	26630.331
Correlation coefficient	0.9992
R-squared	0.9984006

TABLE 3.2 Raw Data Based on Table 2.6

Obs	Y	X	x	y	x_i^2	$y_i x_i$	X_i^2	Y_i^2	\hat{Y}_i	$\hat{u}_i = Y_i - \hat{Y}_i$	\hat{u}_i^2
1	4.4567	6	-6	-4.218	36	25.308	36	19.86217	4.165294	0.291406	0.084917
2	5.77	7	-5	-2.9047	25	14.5235	49	33.2929	4.916863	0.853137	0.727843
3	5.9787	8	-4	-2.696	16	10.784	64	35.74485	5.668432	0.310268	0.096266
4	7.3317	9	-3	-1.343	9	4.029	81	53.75382	6.420001	0.911699	0.831195
5	7.3182	10	-2	-1.3565	4	2.713	100	53.55605	7.17157	0.14663	0.0215
6	6.5844	11	-1	-2.0903	1	2.0903	121	43.35432	7.923139	-1.33874	1.792222
7	7.8182	12	0	-0.8565	0	0	144	61.12425	8.674708	-0.85651	0.733606
8	7.8351	13	1	-0.8396	1	-0.8396	169	61.38879	9.426277	-1.59118	2.531844
9	11.0223	14	2	2.3476	4	4.6952	196	121.4911	10.17785	0.844454	0.713103
10	10.6738	15	3	1.9991	9	5.9973	225	113.93	10.92941	-0.25562	0.065339
11	10.8361	16	4	2.1614	16	8.6456	256	117.4211	11.68098	-0.84488	0.713829
12	13.615	17	5	4.9403	25	24.7015	289	185.3682	12.43255	1.182447	1.398181
13	13.531	18	6	4.8563	36	29.1378	324	183.088	13.18412	0.346878	0.120324
Sum	112.7712	156	0	0	182	131.7856	2054	1083.376	112.7712	≈0	9.83017

Note:

$$x_i = X_i - \bar{X}; y_i = Y_i - \bar{Y}$$

$$\hat{\beta}_2 = \frac{\sum y_i x_i}{\sum x_i^2} = \frac{131.7856}{182.0} = 0.7240967$$

$$\hat{\beta}_1 = \bar{Y} - \hat{\beta}_2 \bar{X} = 8.674708 - 0.7240967 \times 12 = -0.01445$$

$$\hat{\sigma}^2 = \frac{\sum \hat{u}_i^2}{n-2} = \frac{9.83017}{11} = 0.893652; \hat{\sigma} = 0.945332$$

$$\text{var}(\hat{\beta}_2) = \frac{\hat{\sigma}^2}{\sum x_i^2} = \frac{0.893652}{182.0} = 0.004910; \text{se}(\hat{\beta}_2) = \sqrt{0.00490} = 0.070072$$

$$r^2 = 1 - \frac{\sum \hat{u}_i^2}{\sum (Y_i - \bar{Y})^2} = 1 - \frac{9.83017}{105.1188} = 0.9065$$

$$r = \sqrt{r^2} = 0.9521$$

$$\text{var}(\hat{\beta}_1) = \frac{\sum x_i^2}{n \sum x_i^2} = \frac{2054}{13(182)} = 0.868132;$$

$$\text{se}(\hat{\beta}_1) = \sqrt{0.868132} = 0.9317359$$