



B.E. International Program

Faculty of Economics, Thammasat University



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EE425 Econometrics 1

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Homework #2

1. Suppose the equation of an indifference curve between 2 goods (X and Y) is

$$X_i Y_i = \beta_1 + \beta_2 X_i + u_i$$

where u_i represents random disturbance.

How would you estimate the parameters of this model? Apply the above model to the following data and calculate the marginal rate of substitution of Y for X at the mean value.

Consumption of X	Consumption of Y
1	4
2	3.5
3	2.8
4	1.9
5	0.8

2. The purchasing power parity (PPP) holds that a unit of currency should be able to buy the same bundle of goods in all countries. The proponents of the PPP argue that, in the long run, currencies tend to move toward their PPP.

Consider the following regression model by using McDonald's Big Mac as a representative bundle as given in the table.

$$Y_i = \beta_1 + \beta_2 X_i + u_i$$

where Y = actual exchange rate

X = implied PPP of the dollar

If the PPP holds, β_1 should be zero and β_2 equals 1. Test the PPP hypothesis and offer your explanation.

Table: The Big Mac Index

Country	Big Mac Price		Implied PPP† of the Dollar	Actual \$ exchange rate - July 25th	Percent over or under valued against dollars
	Local Currency	In Dollars*			
United States	\$4.07	\$4.07	-	-	-
Argentina	Peso 20.0	\$4.84	4.92	4.13	19
Australia	A\$4.56	\$4.94	1.12	0.92	22
Brazil	Real 9.50	\$6.16	2.34	1.54	52
Canada	C\$4.73	\$5.00	1.16	0.95	23
Chile	Peso 1,850	\$4.00	455	463	-2
China	Yuan 14.7	\$2.27	3.60	6.45	-44
Colombia	Peso 8,400	\$4.74	2,066	1771	17
Czech Republic	Koruna 69.3	\$4.07	17.1	17.0	nil
Denmark	DK 28.5	\$5.48	7.01	5.20	35
Egypt	Pound 14.1	\$2.36	3.47	5.96	-42
Euro Area	€3.44	\$4.93	1.18	1.43	21
Hong Kong	HK\$15.1	\$1.94	3.71	7.79	-52
Hungary	Forint 760	\$4.04	187	188	-1
India	Rupee 84.0	\$1.89	20.7	44.4	-53
Indonesia	Rupiah 22,534	\$2.64	5,543	8,523	-35
Israel	Shekel 15.9	\$4.67	3.91	3.40	15
Japan	¥320	\$4.08	78.7	78.4	nil
Malaysia	Ringgit 7.20	\$2.42	1.77	2.97	-40
Mexico	Peso 32.0	\$2.74	7.87	11.7	-33
New Zealand	NZ\$5.10	\$4.41	1.25	1.16	9
Norway	Kroner 45.0	\$8.31	11.1	5.41	104
Pakistan	Rupee 205	\$2.38	50.5	86.3	-42
Peru	Sol 10.0	\$3.65	2.46	2.74	-10
Philippines	Peso 118	\$2.78	29.0	42.4	-32
Poland	Zloty 8.63	\$3.09	2.12	2.80	-24
Russia	Rouble 75.0	\$2.70	18.5	27.8	-34
Saudi Arabia	Riyal 10.0	\$2.67	2.46	3.75	-34
Singapore	S\$4.41	\$3.65	1.08	1.21	-10
South Africa	Rand 19.45	\$2.87	4.78	6.77	-29
South Korea	Won 3,700	\$3.50	910	1,056	-14
Sweden	SKr 48.4	\$7.64	11.9	6.34	88
Switzerland	SFr 6.50	\$8.06	1.60	0.81	98
Taiwan	NT\$75.0	\$2.60	18.5	28.8	-36
Thailand	Baht 70.0	\$2.35	17.2	29.8	-42
Turkey	Lira 6.50	\$3.77	1.60	1.72	-7

* At current exchange rates

† Purchasing-power parity; local currency price divided by price in the United States

Sources: *The Economist*, July 2011.

3. Table below gives data for Thailand's GDP and private consumption (C) at 1988 prices during 1988-2009. Run the following regression models.

$$(i) Y_t = \alpha_1 + \alpha_2 X_t + u_t$$

$$(ii) Y_t = \beta X_t + u_t$$

- Explain the economic meaning of the two models.
- Based on your econometric knowledge, which equation would you choose to explain the consumption function? Why?
- Calculate the mean and standard deviation of Y and X. Estimate the following regression.

$$Y_t^* = \alpha_1 + \alpha_2 X_t^* + u_t$$

where Y_t^* and X_t^* are **standardized variables**. Interpret the estimated result.

- Divide both GDP and consumption by 1,000 and estimate the model

$$Y_i^* = \alpha_1^* + \alpha_2^* X_i^* + u_i$$

where $Y_i^* = w_1 Y_i$, $w_1 = \frac{1}{1,000}$, $X_i^* = w_2 X_i$, $w_2 = \frac{1}{1,000}$

Compare the result with the original model (i) $Y_t = \alpha_1 + \alpha_2 X_t + u_t$

Data in constant 1988 prices		
Year	Real GDP	Real Consumption
1988	1,559,804	885,008
1989	1,749,952	984,184
1990	1,945,372	1,110,935
1991	2,111,862	1,171,164
1992	2,282,572	1,273,031
1993	2,470,908	1,380,205
1994	2,692,973	1,486,105
1995	2,941,736	1,601,693
1996	3,115,338	1,694,443
1997	3,072,615	1,671,178
1998	2,749,684	1,478,785
1999	2,871,980	1,542,775
2000	3,005,394	1,617,971
2001	3,073,601	1,690,644
2002	3,237,042	1,782,648
2003	3,468,166	1,898,464
2004	3,688,189	2,016,859
2005	3,858,019	2,109,339
2006	4,054,504	2,176,210
2007	4,259,026	2,214,421
2008	4,364,833	2,278,617
2009	4,263,139	2,252,698

Source: NESDB website: www.nesdb.go.th

4. **Table: Average Salary and Per Pupil Spending (dollars), 1985**

Observation	Salary	Spending	Observation	Salary	Spending
1	19,583	3346	27	22,795	3366
2	20,263	3114	28	21,570	2920
3	20,325	3554	29	22,080	2980
4	26,800	4642	30	22,250	3731
5	29,470	4669	31	20,940	2853
6	26,610	4888	32	21,800	2533
7	30,678	5710	33	22,934	2729
8	27,170	5536	34	18,443	2305
9	25,853	4168	35	19,538	2642
10	24,500	3547	36	20,460	3124
11	24,274	3159	37	21,419	2752
12	27,170	3621	38	25,160	3429
13	30,168	3782	39	22,482	3947
14	26,525	4247	40	20,969	2509
15	27,360	3982	41	27,224	5440
16	21,690	3568	42	25,892	4042
17	21,974	3155	43	22,644	3402
18	20,816	3059	44	24,640	2829
19	18,095	2967	45	22,341	2297
20	20,939	3285	46	25,610	2932
21	22,644	3914	47	26,015	3705
22	24,624	4517	48	25,788	4123
23	27,186	4349	49	29,132	3608
24	33,990	5020	50	41,480	8349
25	23,382	3594	51	25,845	3766
26	20,627	2821			

Source: National Education Association, as reported by Albuquerque Tribune Nov. 7, 1986

The above table gives cross-sectional data on average public teacher pay (annual salary in dollars) and spending on public schools per pupil (dollars) in 1985 for 50 states and the District of Columbia in the United States.

To find out if there is any relationship between teacher's salary and per pupil expenditure in public schools, the following model was suggested: $S_i = \beta_1 + \beta_2 \text{Spend}_i + u_i$, where S stands for teacher's salary and Spend stands for per pupil expenditure.

- a.) Plot the data and eyeball a regression line. (approximation by hand).
- b.) Suppose on the basis of (a) you decide to estimate the above regression model. Obtain the estimates of the parameters, their standard errors, r^2 , RSS, and ESS.
- c.) Interpret the regression. Does it make economic sense?
- d.) Establish a 95 percent confidence interval for β_2 . Would you reject the hypothesis that the true slope coefficient is 3.0?
- e.) Set up the ANOVA table to test the hypothesis that X has no influence on Y (the slope coefficient of X is zero)
- f.) Obtain the mean forecast value of Salary if per pupil spending is \$9,000. Also establish 95 percent confidence intervals for the true mean of Salary for the given spending figure.

5. Table below gives annual data on the Consumer Price Index (CPI) and the Wholesale Price Index (WPI), also called Producer Price Index (PPI), for the U.S. economy for the period 1980-2006

Table: CPI and PPI, USA 1980-2006

	CPI Total	PPI (Total Finished Goods)
1980	82.4	88.0
1981	90.9	96.1
1982	96.5	100.0
1983	99.6	101.6
1984	103.9	103.7
1985	107.6	104.7
1986	109.6	103.2
1987	113.6	105.4
1988	118.3	108.0
1989	124.0	113.6
1990	130.7	119.2
1991	136.2	121.7
1992	140.3	123.2
1993	144.5	124.7
1994	148.2	125.5
1995	152.4	127.9
1996	156.9	131.3
1997	160.5	131.8
1998	163.0	130.7
1999	166.6	133.0
2000	172.2	138.0
2001	177.1	140.7
2002	179.9	138.9
2003	184.0	143.3
2004	188.9	148.5
2005	195.3	155.7
2006	201.6	160.3

Source: Economic Report of the President. 2007.

- a.) Plot the CPI on the vertical axis and the WPI on the horizontal axis. A priori, what kind of relationship do you expect between the two indexes? Why?
- b.) Suppose you want to predict one of these indexes on the basis of the other index. Which will you use as the regressand (dependent variable) and which as the regressor (explanatory variable)? Why?
- c.) Run the regression you have decided in (b). Show the standard output. Test the hypothesis that there is a one-to-one relationship between the two indexes.