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Appendix 1. Result from e-view software

LS // Dependent Variable is LOG(IMR)
Date: 03/25/98 Time: 22:20
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.257618	0.731309	1.719681	0.0886
LOG(IMR(-22))	0.487680	0.091141	5.350815	0.0000
LOG(LS)	-1.112403	0.334682	-3.323761	0.0012
LOG(LS(-22))	1.093040	0.332342	3.288899	0.0014
LOG(POV)	0.011089	0.050786	0.218348	0.8276
LOG(POV(-22))	0.038018	0.046533	0.817010	0.4159
LOG(EDUC)	-0.213240	0.092580	-2.303310	0.0233
LOG(EDUC(-22))	0.221529	0.098132	2.257463	0.0262
LOG(EXPEND)	0.008206	0.155677	0.052713	0.9581
LOG(EXPEND(-22))	0.234216	0.113300	2.067222	0.0413

R-squared	0.498095	Mean dependent var	3.864083
Adjusted R-squared	0.452923	S.D. dependent var	0.314519
S.E. of regression	0.232633	Akaike info criterion	-2.830079
Sum squared resid	5.411809	Schwarz criterion	-2.584581
Log likelihood	9.571101	F-statistic	11.02675
Durbin-Watson stat	2.052179	Prob(F-statistic)	0.000000

Appendix 2. Result from e-view software

LS // Dependent Variable is LOG(U5MR)
Date: 03/25/98 Time: 22:27
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.997214	0.824692	3.634344	0.0004
LOG(U5MR(-22))	0.106617	0.064606	1.650257	0.1020
LOG(LS)	-1.067871	0.335782	-3.180252	0.0020
LOG(LS(-22))	1.055073	0.333169	3.166779	0.0020
LOG(POV)	0.584937	0.050760	11.52358	0.0000
LOG(POV(-22))	-0.206371	0.046785	-4.411051	0.0005
LOG(EDUC)	-0.399646	0.090861	-4.398422	0.0000
LOG(EDUC(-22))	0.404838	0.094218	4.296805	0.0000
LOG(EXPEND)	-0.157761	0.161064	-0.979492	0.3297
LOG(EXPEND(-22))	0.419674	0.137547	3.051132	0.0029

R-squared	0.386667	Mean dependent var	4.222763
Adjusted R-squared	0.331467	S.D. dependent var	0.286649
S.E. of regression	0.234376	Akaike info criterion	-2.815153
Sum squared resid	5.493191	Schwarz criterion	-2.569655
Log likelihood	8.750171	F-statistic	7.004836
Durbin-Watson stat	1.985983	Prob(F-statistic)	0.000000

Appendix 3. Result from e-view software

LS // Dependent Variable is LOG(LIFE)
Date: 03/27/98 Time: 21:17
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.888049	0.205107	4.329697	0.0000
LOG(LIFE(-22))	0.763634	0.049353	15.47296	0.0000
LOG(LS)	0.070321	0.025612	2.745627	0.0484
LOG(LS(-22))	0.036319	0.025529	1.422656	0.0949
LOG(POV)	-0.046731	0.003899	-11.98538	0.0000
LOG(POV(-22))	-0.025012	0.003621	-6.907484	0.0000
LOG(EDUC)	0.029363	0.006725	4.366010	0.0000
LOG(EDUC(-22))	-0.030725	0.007004	-4.386657	0.0000
LOG(EXPEND)	0.004348	0.011920	0.364743	0.7161
LOG(EXPEND(-22))	0.010305	0.008477	1.215600	0.2270

R-squared	0.778303	Mean dependent var	4.161915
Adjusted R-squared	0.758351	S.D. dependent var	0.036324
S.E. of regression	0.017856	Akaike info criterion	-7.964314
Sum squared resid	0.031884	Schwarz criterion	-7.718816
Log likelihood	291.9540	F-statistic	39.00740
Durbin-Watson stat	1.854496	Prob(F-statistic)	0.000000

Appendix 4. Result from e-view software

LS // Dependent Variable is LOG(MMR)
Date: 03/25/98 Time: 22:25
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.101368	2.869979	1.080624	0.2825
LOG(MMR(-22))	0.306320	0.098217	3.118822	0.0024
LOG(LS)	-0.813994	1.365398	-0.596159	0.5524
LOG(LS(-22))	0.742735	1.357768	0.547027	0.5856
LOG(POV)	0.080679	0.206616	0.390477	0.6970
LOG(POV(-22))	0.103271	0.192368	0.536838	0.5926
LOG(EDUC)	-0.119140	0.363092	-0.328127	0.7435
LOG(EDUC(-22))	0.400124	0.376055	1.064003	0.2899
LOG(EXPEND)	-0.741231	0.647226	-1.145243	0.2548
LOG(EXPEND(-22))	-0.120129	0.460604	-0.260807	0.7948

R-squared	0.190683	Mean dependent var	2.654770
Adjusted R-squared	0.117844	S.D. dependent var	1.020555
S.E. of regression	0.958537	Akaike info criterion	0.001814
Sum squared resid	91.87937	Schwarz criterion	0.247313
Log likelihood	-146.1830	F-statistic	2.617878
Durbin-Watson stat	2.130280	Prob(F-statistic)	0.009276

Appendix 5. Result from e-view software

LS // Dependent Variable is LOG(CDR)
Date: 03/25/98 Time: 22:37
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.202622	0.355263	-0.570344	0.5697
LOG(CDR(-22))	0.607900	0.068220	8.910928	0.0000
LOG(LS)	-0.429512	0.170447	-2.519917	0.0133
LOG(LS(-22))	0.433735	0.170218	2.548113	0.0124
LOG(POV)	0.022430	0.026250	0.854490	0.3949
LOG(POV(-22))	0.032290	0.023891	1.351562	0.1796
LOG(EDUC)	0.081967	0.045426	1.804420	0.0742
LOG(EDUC(-22))	-0.072556	0.048088	-1.508837	0.1345
LOG(EXPEND)	0.172651	0.079351	2.175797	0.0319
LOG(EXPEND(-22))	0.039266	0.060706	0.646829	0.5192

R-squared	0.668597	Mean dependent var	1.925378
Adjusted R-squared	0.638770	S.D. dependent var	0.197613
S.E. of regression	0.118770	Akaike info criterion	-4.174628
Sum squared resid	1.410627	Schwarz criterion	-3.929129
Log likelihood	83.52128	F-statistic	22.41635
Durbin-Watson stat	2.088613	Prob(F-statistic)	0.000000

Appendix 6. Result from e-view software

LS // Dependent Variable is LOG(CBR)
Date: 03/25/98 Time: 22:33
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.338867	0.293099	1.156154	0.2504
LOG(CBR(-22))	0.646730	0.055220	11.71189	0.0000
LOG(LS)	0.478383	0.139339	3.433232	0.0009
LOG(LS(-22))	-0.454989	0.138742	-3.279396	0.0014
LOG(POV)	0.341921	0.081123	4.214847	0.0007
LOG(POV(-22))	0.411956	0.079741	5.166175	0.0001
LOG(EDUC)	0.106621	0.038249	2.787550	0.0054
LOG(EDUC(-22))	-0.102823	0.040284	-2.552453	0.0021
LOG(EXPEND)	0.025820	0.066010	0.391153	0.6965
LOG(EXPEND(-22))	0.083319	0.050185	1.660238	0.1000

R-squared	0.755613	Mean dependent var	3.199258
Adjusted R-squared	0.733618	S.D. dependent var	0.189255
S.E. of regression	0.097679	Akaike info criterion	-4.565639
Sum squared resid	0.954109	Schwarz criterion	-4.320141
Log likelihood	105.0269	F-statistic	34.35415
Durbin-Watson stat	1.624443	Prob(F-statistic)	0.000000

Appendix 7. Result from e-view software

LS // Dependent Variable is LOG(LS)
Date: 03/25/98 Time: 22:41
Sample(adjusted): 23 132
Included observations: 110 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.575123	0.206967	-2.778815	0.0065
LOG(LS(-22))	0.987763	0.007316	135.0066	0.0000
LOG(IMR)	-0.070782	0.043434	-1.629653	0.1063
LOG(MMR)	-0.001991	0.007173	-0.277594	0.7819
LOG(U5MR)	-0.032188	0.045812	-0.702607	0.4839
LOG(LIFE)	-0.233109	0.120917	-1.927843	0.0912
LOG(CDR)	-0.056172	0.044767	-1.254772	0.2124
LOG(CBR)	0.152382	0.044087	3.456404	0.0008

R-squared	0.855425	Mean dependent var	2.422377
Adjusted R-squared	0.848770	S.D. dependent var	1.039142
S.E. of regression	0.072661	Akaike info criterion	-5.173954
Sum squared resid	0.538521	Schwarz criterion	-4.977556
Log likelihood	106.4843	F-statistic	1022.416
Durbin-Watson stat	1.676647	Prob(F-statistic)	0.000000

Appendix 8. Real and Nominal GDP at 1993 prices /billion Togrog/

Years	Nominal GDP	Real GDP
1981	7.4	132.2
1982	8.2	144.3
1983	8.8	153.1
1984	9.0	162.9
1985	9.4	172.7
1986	9.3	186.2
1987	9.7	195.0
1988	10.3	205.4
1989	10.7	214.0
1990	10.5	208.6
1991	18.9	189.3
1992	47.3	171.4
1993	166.2	166.2
1994	283.2	170.0
1995	429.2	180.8
1996	532.8	185.6

Appendix 9. GDP per capita at 1993 prices /thousand Togrog/

Years	GDP per capita	Years	GDP per capita
1981	78.6	1989	104.7
1982	83.7	1990	99.6
1983	86.6	1991	88.1
1984	90.0	1992	78.3
1985	93.2	1993	75.0
1986	98.0	1994	75.6
1987	100.0	1995	79.3
1988	102.9	1996	80.1

Appendix 10. GDP and agricultural production, at 1993 prices /billion Togrog/

Years	GDP	Gross agricultural product	Livestock	Crops
1985	172.7	80.4	64.0	16.4
1988	205.4	92.0	72.0	20.0
1989	214.0	113.5	79.1	34.4
1990	208.6	109.3	79.3	29.9
1991	189.3	101.2	78.9	22.3
1992	171.4	95.2	77.1	18.1
1993	166.2	91.1	69.9	21.3
1994	170.0	96.3	80.0	16.3
1995	180.8	102.8	87.8	15.0
1996	185.6	104.8	92.3	12.5

Appendix 11. Livestock per capita by provinces, 1996

Provinces	Livestock per capita	Provinces	Livestock per capita
Arhangai	17	Suhbaatar	18
Bayan-Olgii	15	Selenge	5
Bayanhongor	25	Tuv	17
Bulgan	19	Uvs	17
Govi-Altai	28	Hovd	21
Dornogovi	19	Hovsgol	16
Dornod	7	Hentii	15
Dundgovi	35	Darhan-Uul	2
Zavhan	23	Ulaanbaatar	0.5
Uvurhangai	22	Orhon	2
Umnugovi	29	Govisumber	9

Appendix 12. Food calorie per capita, 1980-1996

Years	1980	1985	1990	1991	1992	1993	1994	1995	1996
Food calorie	2397	2612	2538	2407	1980	1963	2103	2277	2278

Appendix 13. Percentage of the population under official poverty line by provinces, 1996

Provinces	Percentage of the population under official poverty line	Provinces	Percentage of the population under official poverty line
Arhangai	28.5	Suhbaatar	14.2
Bayan-Olgii	20.6	Selenge	12.3
Bayanhongor	30.0	Tuv	18.9
Bulgan	22.2	Uvs	18.2
Govi-Altai	19.5	Hovd	25.6
Dornogovi	12.4	Hovsgol	35.2
Dornod	25.9	Hentii	16.3
Dundgovi	9.4	Darhan-Uul	15.0
Zavhan	21.1	Ulaanbaatar	12.7
Uvurhangai	31.0	Orhon	8.8
Umnugovi	41.9	Govisumber	38.2

Appendix 14. Percentage of the population under official poverty line, 1991-1996

Years	1991	1992	1993	1994	1995	1996
Percentage of the population	14.5	17.7	17.8	20.2	15.6	19.2

Appendix 15. Eighth-years secondary school graduates as a percentage of total population, 1985-1996

Years	As a percentage of total population	Years	As a percentage of total population
1985	2.05	1991	1.91
1986	2.12	1992	1.72
1987	2.08	1993	1.51
1988	2.13	1994	1.51
1989	2.13	1995	1.69
1990	2.10	1996	1.77

Appendix 16. Government health expenditure as a percentage of GDP and total government expenditure

Years	As a percentage of GDP	As a percentage of total government expenditure
1980	4.8	8.1
1985	4.5	7.6
1986	5.2	8.1
1987	5.2	7.8
1988	5.1	7.7
1989	5.1	7.8
1990	5.3	8.1
1991	5.9	12.4
1992	4.1	15.7
1993	3.8	10.3
1994	4.1	11.5
1995	3.7	10.7
1996	3.7	11.5

Appendix 17. Total and per capita government expenditure on health at 1993 prices, 1980-1996

Years	Total government expenditure on health /million Togrog/	Per capita government expenditure on health /Togrog/
1980	58.5	34.8
1985	79.5	41.8
1986	97.9	50.2
1987	100.7	50.4
1988	104.1	50.9
1989	110.1	52.5
1990	110.1	51.2
1991	57.9	26.5
1992	39.7	17.9
1993	16.9	7.5
1994	69.7	30.6
1995	71.3	30.8
1996	73.7	31.3

Appendix 18. Composition of health expenditure by category, 1980-1996 /percentage/

Years	Salary	Drug	Food	Others
1980	43.3	13.9	13.9	28.9
1985	43.0	15.8	13.4	27.8
1987	42.0	15.2	12.6	30.2
1989	41.7	15.8	11.7	30.7
1991	45.7	12.6	9.5	32.2
1992	35.4	14.6	11.1	38.9
1993	21.6	11.6	8.2	58.6
1994	28.0	20.1	6.7	45.2
1995	30.8	16.7	7.0	45.5
1996	25.8	13.7	6.4	54.1

Appendix 19. Infant, child and maternal mortality rates, 1975-1997

Years	Maternal mortality /per 100,000 births/	Infant mortality /per 1,000 live births/	Underfive mortality /per 1,000 live births/
1975	130	75	
1980	200	78.9	
1985	150	75.9	
1990	120	64.4	
1991	130	62.1	93.2
1992	200	59.8	86.6
1993	240	57.4	83.7
1994	210	46.0	67.8
1995	190	44.4	62.0
1996	170	40.0	56.0
1997	140	40.2	55.5

Appendix 20. Crude birth and death rates, 1970-1995

Years	Crude birth rate	Crude death rate
1970	40.2	12.2
1975	39.9	10.0
1980	38.9	10.2
1985	38.1	10.0
1990	35.6	7.9
1991	32.9	8.1
1992	28.9	7.9
1993	22.9	7.5
1994	24.1	6.9
1995	23.6	7.0

Appendix 21. Evaluating the results of regression analysis

In order to evaluate regression results we should answer the question how "good" is the fitted model? We need some criteria with which to answer to this question.

First, are the signs of the estimated coefficients in accordance with theoretical or prior expectations? The relationship should be not only expected sign according to the priori expectations, but also statistically significant. On the other hand the p value of the estimated t value should be small for selected level of significance. The comments apply about the intercept coefficient.

Second, we use R^2 as a measure of goodness of fit in the multiple regression model. It is defined as below

$$R^2 = \frac{RSS}{TSS} = \frac{\Sigma(Y_i - Y)^2}{\Sigma(Y_i - Y)^2} = 1 - \frac{\Sigma\varepsilon^2_i}{\Sigma(Y_i - Y)^2}$$

R^2 measures the proportion of the variation in Y which is explained by the multiple regression equation. It is often used as a goodness of fit statistic and to compare the validity of regression results under alternative specifications of the independent variables in the model. However, there are several problem with the use of R^2. One of this is that it is sensitive to the number of independent variables included in the regression model. It means that the addition of more independent variables to the regression eqaution can raise R^2. To avoid this problem we adjust the R^2 in degrees of freedom.

$$R^2 = 1 - (1 - R^2)\frac{N - 1}{N - k}$$

Therefore, the use of R^2 eliminates at least some of the incentive for researchers to include numerous variables in a model without much thought about why they should appear.

Third, the F-statistic used in the multiple regression model to test significance of the R^2 statistic. The F-statistic with k-1 and N-k degree of freedom allows us to test the joint hypothesis that none of the explanatory variables helps to explain the variation of Y about its mean. It can be shown that

$$F_{k-1, N-k} = \frac{R^2}{1 - R^2}\;\frac{N - k}{k - 1}$$

When the null hypothesis is not true, F statistic has a high value. In fact, it is possible for the R^2 to be significant at a given level. But in this case F-statistic is likely to reject null hypothesis whether or not the model explains the structure under study.

In last, multicolleanarity is the problem which often face in the multiple regression analysis. Because, many of the explanatory variables are highly collinear is a fact of life.

One of the assumptions of the multiple regression model is that there is no exact linear relationship between any of the explanatory variables in the model. If such a linear relationship does exist, it means the independent variables are collinear. Multicolleanarity arises when two or more variables are highly (but not perfectly) correlated with each other. It is said to exist if the following condition is satisfied:

$$\lambda_1 X_1 + \lambda_2 X_2 + \ldots\ldots + \lambda_2 X_k + v_i = 0$$

When multicollinearity exists the interpretation of coefficients will be quite difficult. The regression coefficient of the first of the two highly correlated variables is interpreted to measure the change in Y due to a change in the variable in question, other things being equal. But the presence of multicollinearity implies that there will be very little data in the sample to give one confidence about such an interpretation. It is likely to change predictably. In order to detect multicollinearity is to examine the standard errors of the coefficients. If several coefficients have high standard errors and dropping one or more variables from the equation lowers the standard errors of the remaining variables, multicollinearity will usually be problem.

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