A link between measures of Gross National Product, and measures of corruption

Abstract

This paper establishes a link between a countries economic performance as measured by Gross National Product (GNP) and a compound measure of Transparency, Corruption Perceptions Index (CPI), and (TI 2002).

CPI is a measurement that should provide an indication as to a countries reputation in the eyes of investors and traders for openess and information disclosure in government and non governmental organisations, in relation to corruption, bribery and extra non-justifiable payments.

Corruption involes the behaviour of public officials either elected or appointed, by which they unlawfully enrich themselves or those close to them. This is probably the case of the disparate performance of developing countries, where some are experiencing economic growth while others are falling behind. (Helman 2000).

There has been comment in the press about the relationship between corrupt practices, and a countries economic performance. (Anon 2001), (Lobe 2001) and (Perlez 2002).

This evidence is presented as a countries ability to attract trade and investment, which should be possible to measure by examining it's economic performance.

This paper does not attempt to analyse the accuracy of this evidence, it instead shows an empirical link between measures of GNP and CPI, which along with the anecdotal evidence support the view that a countries economic performance is indeed tied to it's reputation for corruption and transparency.

Introduction

This paper collects data from the World Bank and Transparency International into a form that can be analysed easily by suitable well understood statistical methods such as Ordinary Least Squares (OLS). These are then presented as a set of tables and figures which show a distinct link between measures of GDP as defined by the World Development Bank (World Development Bank 2002 a, c) divided by measures of population. (World Development Bank 2002 b).

Data and Methodology

The data used in this paper is pesented in full as a Table 1 presented in the appendix along with the resultant OLS graphs Figures 1 and 2. ANOVA, correlation and regression statistics are presented in tables 2 and 3) (Walpole et al 1998, Chapter 11)

The provides definitions of the measures of GDP Gross Domestic Product and GDP (PPP) Gross Domestic Product adjusted for Purchasing Power Parity are avaiable from the internet, and from the references (op cit). The definition of CPI is

"CPI 2002 Score relates to perceptions of the degree of corruption as seen by business people and risk analysts, and ranges between 10 (highly clean) and 0 (highly corrupt)"

It is derived from a series of survey sources that have a variety of questions relating to corruption, bribary and transparency within the countries listed. A country is only listed if there are a set of survey's, and there is longditudinal data over several years. (TPI 2002).

There are some gaps in the World Bank Data, where the World Bank has had to interperate the figures of certain countries. These are identified in Table 1 along with the interpretation used by the World Bank.

A date of September 2002 was chosen as the base calender date, where all figures used were adjusted to that date, or as near to it in that calendar year. The data is as complete as possible using the given sources. The data provided is enough to give a good indication as to the applicabiity of comparing CPI against measures of economic performance. Some 101 economies (countries) are available in the TPI report, and these are compared against the same economies data from the World Bank

Table 1 is therefore a combination of the Transparency Internationals report, countries 101 in total, and comparitive figures from the World Bank. The Table is placed in order of CPI, so as to test the regression on this measure of corruption. Colums 1 and 2 are the economies (countries) and the CPI score respectively

The raw GDP in column 3 in Millions of US dollars alongside the population in millions. From which the GDP per Capita is calculated (column 4). Another measure of GDP was also available from the same source which measures Purcasing Power Parity. (PPP), and is in column 6. This divided by Population gives GDP(PPP)/ Capita in column 7.

The data was then subjected to OLS analysis, and the reults of GDP/Capita and GDP(PPP) / Capita are shown in tables 2 and 3 respectively. The graphs of the analysis are agin shown in the appendix as figures 1 and 2 respectively.

Results

Figure 1 shows the calculated GDP/Capita plotted against CPI as defined above. Although there is a general scattering of points around the 'best fit'line there is a degree of correlation as determined and shown in table 2, in the appendix
The R Squared value of 0.72 (rounded to two decimal places) is indicative of a good correlation between CPI index and GDP per capita, the ANOVA statistics provide a predicted straight line, which is shown in figure 1 for comparison purposes.

Figure 1
Regression line (Predicted Y), GDP / Capita (Y) against CPI Index

Similarly Figure 2 shows GDP(PPP) per Capita against CPI. Again the figure for R Squared of 0.78 (adjusted to two decimal places) is a good indication of correlation between CPI and GDP(PPP) per Capita. The full ANOVA statistics are shown in Table 3 in the appendix. Figure 2 also shows the predicted line for comparison.

Figure 2
Regression line (Predicted Y), GDP(PPP) / Capita (Y) against CPI Index

In both cases there is a good correlation between the measures of both types of GDP and the CPI index. In percentage terms 72% and 78% respectively of GDP / Capita and GDP(PPP) / Capita can be explained by a linear relationship.

The economies at the lower end of the CPI index, and low GDP per Capita and GDP (PPP) per Capita have an international reputation for corruption, mis management and lack of transparency (Lobe op cit)

Also they display in action or an in ability to tackle multiple economic problems associated with corruption bribary and lack of transparency (Arif 2002).

They also display difficulty in increasing GDP by percentages that are normally associated with developing countries and are subject to major economic and non economic shocks (Dhume 2002)

Similary evidence suggests that there is a decrease in external investment and multinationals moving to a more open and transparent regime (Shari 2002).

These individual examples of economies are backed by the summary comments of Peter Eigen given at the release of the TPI report for 2002 (TPI op cit).

"Political elites and their cronies continue to take kickbacks at every oportunity. Hand in glove with corrupt business people, they are trapping whole nations in poverty and hampering sustainable development. Corruption is percieved to be dangerously high in poor parts of the world, but also in many countries whose firms invest in developing nations."

There has been some empirical research undertaken recently to examine the consequences and causes of corruption, which includes the effects on GDP.

The difficulty is that the studies indicate that it is difficult to identify any causality from the examination of a spectrum of variables and corruption directly.(Lambsdorff, 1999) However, there has been fruitful work on the relationship between GDP per head and corruption. This paper extends this earlier work to examine GDP per Capita (head) and GDP (PPP) per Capita against a collective measure of corruption (CPI). It shows that

there is a correlation. (Marginaly stronger in the case of GDP(PPP) per Capita.) without the resort to dummy variables as reported in Lambsdorff. (Lambsdorf op Cit.).

Also the data used in this paper extends the number of economies (countries) studied to nearer 100. This improves the significance of the regression, and the correlation by comparison with other results using similar cross country data.

Conclusion

The CPI index is a useful indicator of economic performance of an individual country. However, it cannot be used exclusively of its own, as many countries have similar scores. If the CPI index is used in addition to another measure of Economic performance such as GDP per Capita and GDP (PPP) per Capita then it can illustrate along with other evidence the individual countries economic performance against others.

As a performance indicator CPI is useful for assessing the general likelihood of performance, and hence the 'attractiveness' of a particular economy or otherwise for trade and investment.

Therefore it is recommended as an empirical measure for the assessment of performance, coupled with additional measures such as GDP per Capita and GDP (PPP) per Capita.

Further work suggests itself from this analysis of CPI and GDP. The relationships between trading and economic blocks such as the European Union and Organisation for Economic Development (OECD), South East Asia could be considered if suitable data were available.

The data needs to be examined for multivarience if any, and possible other measures of economic performance such as ability to attract investment.

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Appendix

Table 1

Country	CPI	GDP USD Millions	Population Millions	GDP/Capita	GDP (PPP) USD Millions	GDP(PPP)/Capita
Finland	9.7	121987	5.2	23459	132845	25547
Denmark	9.5	162817	5.3	30720	151636	28611
New Zealand	9.5	48277	3.8	12704	79770	20992
Iceland	9.4	7542	*	*	8726	*
Singapore	9.3	92252	4	23063	93846	23462
Sweden	9.3	210108	8.9	23608	222130	24958
Canada	9.0	677178	30.8	21986	887364	28811
Netherlands	9.0	374976	15.9	23583	420716	26460
United Kingdom	8.7	1406310	59.7	23556	1462912	24504
Australia	8.6	368571	19.2	19196	514757	26810
Norway	8.5	165458	4.5	36768	138869	30860
Switzerland	8.5	247362	7.2	34356	213284	29623
Hong Kong	8.2	162642	6.8	23918	170964	25142
Austria	7.8	188742	8.1	23301	223562	27600
USA	7.7	10171400	281.6	36120	9906927	35181
Chile	7.5	63545	15.2	4181	150171	9880
Germany	7.3	1873854	82.2	22796	2113640	25713
Israel	7.3	110386	6.2	17804	125487	20240
Belgium	7.1	227618	10.3	22099	286745	27839

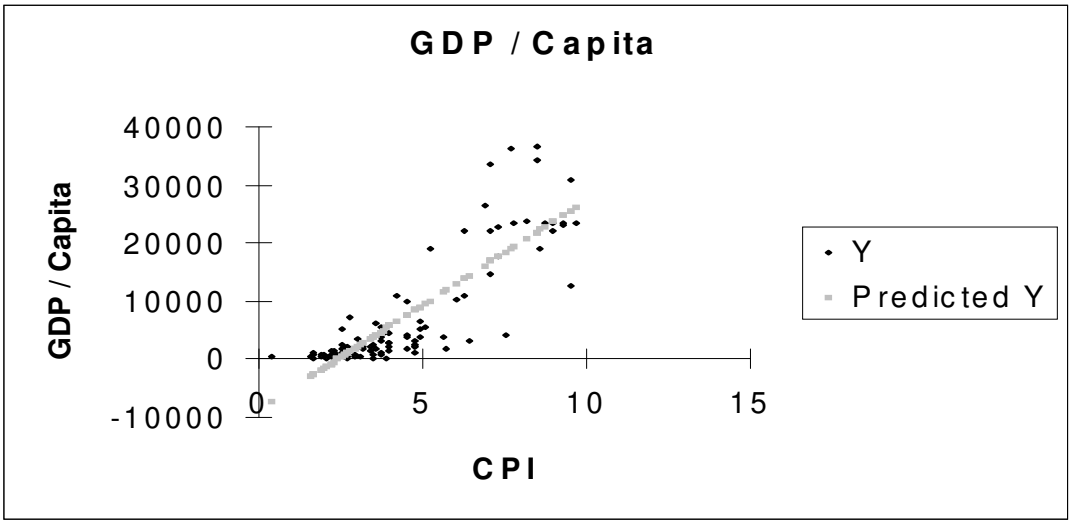
Japan	7.1	4245191	126.9	33453	3444459	27143
Spain	7.1	577539	39.5	14621	804785	20374
Ireland	6.9	101185	3.8	26628	123178	32415
Botswana	6.4	5142	1.6	3214	13239	8274
France	6.3	1302793	58.9	22119	1483497	25187
Portugal	6.3	108479	10	10848	179765	17977
Slovenia	6.0	20522	2	10261	36268	18134
Namibia (3)	5.7	3168	1.8	1760	11917	6621
Estonia	5.6	5281	1.4	3772	14062	10044
Taiwan	5.6	75100	*	*	*	*
Italy	5.2	1090910	57.7	18907	1413976	24506
Uruguay	5.1	18429	3.3	5585	29497	8938
Hungary	4.9	52361	10	5236	131839	13184
Malaysia	4.9	87540	23.3	3757	200445	8603
Trinidad & Tobago	4.9	8412	1.3	6471	13120	10092
Belarus	4.8	12070	10	1207	80527	8053
Lithuania	4.8	11834	3.7	3198	27082	7319
South Africa (3)	4.8	113274	42.8	2647	413610	9664
Tunisia	4.8	20035	9.6	2087	65489	6822
Costa Rica	4.5	16156	3.8	4252	32994	8683
Jordan	4.5	8829	4.9	1802	20526	4189
Mauritius	4.5	4500	1.2	3750	12458	10382
South Korea	4.5	477555	47.3	10096	864697	18281
Greece	4.2	116347	10.6	10976	184878	17441
Brazil	4.0	502509	170.4	2949	1338915	7857
Bulgaria	4.0	12714	8.2	1550	50222	6125
Jamaica	4.0	7784	2.6	2994	10380	3992
Peru	4.0	54047	25.7	2103	125149	4870
Poland	4.0	174597	38.7	4512	360513	9316
Ghana (3)	3.9	5301	19.3	275	40487	2098
Croatia	3.8	19821	4.4	4505	36860	8377
Czech Republic	3.7	56424	10.3	5478	152786	14834
Latvia	3.7	7549	2.4	3145	18142	7559
Morocco	3.7	33733	28.7	1175	110489	3850
Slovak Republic	3.7	20522	5.4	3800	63478	11755
Sri Lanka	3.7	16346	19.4	843	71405	3681
Colombia	3.6	83432	42.3	1972	266916	6310
Mexico	3.6	617817	98	6304	891692	9099
China	3.5	1159017	1262.5	918	5505714	4361
Dominican Rep.	3.5	21211	8.4	2525	52713	6275
Ethiopia	3.5	6366	64.3	99	47171	734
Egypt	3.4	97545	64	1524	244425	3819
El Salvador	3.4	13963	6.3	2216	29456	4676
Thailand	3.2	114760	60.7	1891	405987	6688
Turkey	3.2	147627	65.3	2261	444798	6812
Senegal	3.1	4620	9.5	486	15462	1628
Panama (1)	3.0	10200	2.9	3517	17362	5987
Malawi (2)	2.9	9198	10.3	893	6642	645
Uzbekistan	2.9	11270	24.8	454	63148	2546

Argentina	2.8	268773	37	7264	453424	12255
Cote d'Ivoire	2.7	10411	16	651	25729	1608
Honduras	2.7	6386	6.4	998	16470	2573
India	2.7	477555	1015.9	470	2545930	2506
Russia	2.7	309951	145.6	2129	1295949	8901
Tanzania	2.7	9119	33.7	271	18765	557
Zimbabwe	2.7	9057	12.6	719	30843	2448
Pakistan	2.6	59605	138.1	432	281470	2038
Philippines	2.6	71438	75.6	945	316789	4190
Romania	2.6	39714	22.4	1773	157587	7035
Zambia	2.6	3647	10.1	361	8431	835
Albania	2.5	4114	3.4	1210	12878	3788
Guatemala	2.5	20629	11.4	1810	45339	3977
Nicaragua (2)	2.5	12571	5.1	2465	*	*
Venezuela	2.5	124948	24.2	5163	146966	6073
Georgia	2.4	3138	5	628	14250	2850
Ukraine	2.4	37588	49.5	759	207478	4191
Vietnam	2.4	32903	78.5	419	169354	2157
Kazakhstan	2.3	22635	14.9	1519	99727	6693
Bolivia	2.2	7960	8.3	959	20773	2503
Cameroon	2.2	8591	14.9	577	26925	1807
Ecuador	2.2	17982	12.6	1427	42443	3368
Haiti (3)	2.2	3771	8	471	11719	1465
Moldova	2.1	1478	4.3	344	10047	2337
Uganda (3)	2.1	5707	22.2	257	28607	1289
Azerbaijan	2.0	5692	8	712	26174	3272
Indonesia	1.9	145306	210.4	691	653533	3106
Kenya	1.9	10419	30.1	346	31719	1054
Angola (3)	1.7	9471	13.1	723	25209	1924
Madagascar	1.7	4566	15.5	295	14207	917
Paraguay (3)	1.7	6926	5.5	1259	24678	4487
Nigeria	1.6	41237	126.9	325	116619	919
Bangladesh	0.4	46652	131.1	356	21920	167

Notes

1 GDP Estimated from 2000
2 GDP Calculated from reported GDP/Capita
DP (PPP) Constructed from prediction of trend
*Not Used in Calculations because data is incomplete

Figure 1



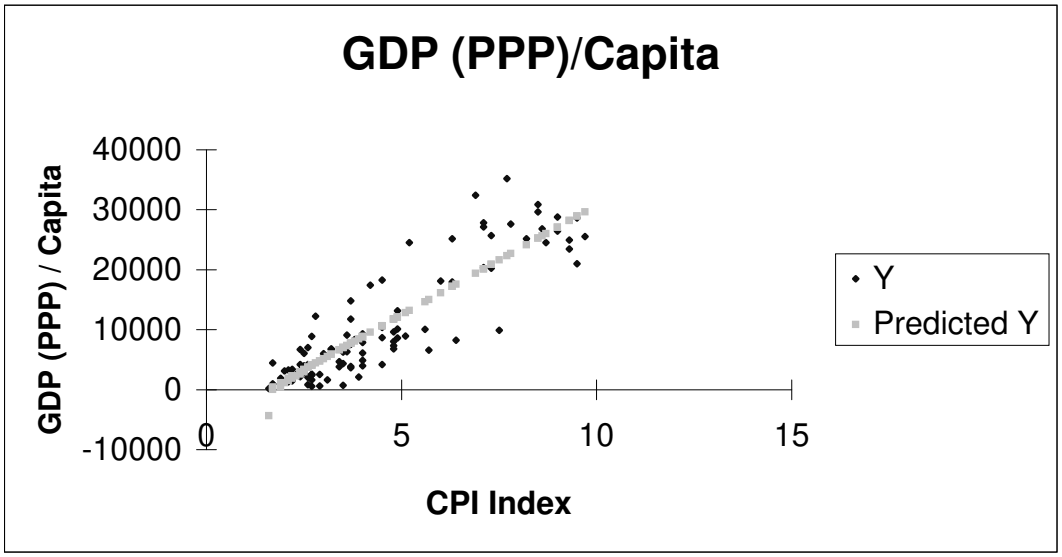


Figure 2

Table 2

Regression Statistics	
Multiple R	0.848132725
R Square	0.719329119
Adjusted R Square	0.716435605
Standard Error	5246.361067
Observations	99

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	6842556165	6842556165	248.6005	1.64001E-28
Residual	97	2669857531	27524304.45		
Total	98	9512413696			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-8642.376742	1142.776578	-7.562612769	2.25E-11	-10910.47064	-6374.28	-10910.5	-6374.28284
X Variable 1	3595.948334	228.0669918	15.76707048	1.64E-28	3143.29874	4048.598	3143.299	4048.59793

GDP / Capita against CPI

Table 3

Regression Statistics	
Multiple R	0.885569852
R Square	0.784233963
Adjusted R Square	0.7819864
Standard Error	4484.576442
Observations	98

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	7017406862	7017406862	348.92637	9.82715E-34
Residual	96	1930696883	20111425.87		
Total	97	8948103745			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-5791.974496	984.1405126	-5.885312535	5.811E-08	-7745.479467	-3838.47	-7745.4795	-3838.4695
X Variable 1	3654.830581	195.6592357	18.67957098	9.827E-34	3266.449771	4043.211	3266.44977	4043.21139

GDP (PPP) against CPI