RELATIONSHIP BETWEEN CORRUPTION LEVEL CHANGES AND ECONOMIC GROWTH IN THE WORLD AND EUROPE

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Abstract

The present article reviews part of a research paper on regional differences in evaluating economic growth and the various aspects that influence it.

In this publication, the relationship between changes in corruption level and economic growth is analyzed, paying close regard to all countries of the world and taking Europe separately as a region with relatively consistent economic and social development levels. The author analyzes the average values and changes in gross domestic product (GDP) per capita based on purchasing-power-parity valuation (in US dollars) for 1998 – 2005 and the corruption perception index (CPI) of 1998 – 2007.

When looking at data from all countries of the world and European countries, no interrelation can be observed between changes in CPI and GDP per capita. These values fluctuate independently of each other. The obtained results give rise to doubt whether CPI is a suitable indicator for determining the corruption level. The author concludes that assertions of negative (or positive) influence that corruption is said to have on GDP increase should be taken very critically.

Key words: corruption perception index, gross domestic product (GDP) per capita, linear regression.

Introduction

In previous 15 years, as seen in scientific studies, understanding of the influence that corruption has on economic growth has witnessed a revolution of a kind.

Mauro (1995) discovered that corruption has a significant negative influence on the amount of investment. Many researchers (Pellegrini & Gerlagh, 2006; Desta, 2006 and others) have assumed that negative influence of corruption on investment automatically produces a negative influence of corruption on economic growth. Drury et al. (2006) have proclaimed that corruption has a negative influence on economic growth, if all other factors are held constant.

However, as early as 2001, Getz and Volkema (2001) indicated that research on the influence of corruption on economic growth has produced controversial results, demonstrating both a positive and a negative influence on economic growth.

Revina’s (2005) research on the influence of corruption produced quite peculiar results. Influence of corruption on economic growth had a determinative coefficient of only 0.17. However, if in the regression of economic growth investment, education, openness and political stability are included, while the corruption indicator is excluded, the determinative coefficient is 0.62 (Revina, 2005); and the greatest influence on growth is that of education (determinative coefficient being 0.69) (Revina, 2005).

Inconsistency of the above results promoted the formation of the research hypothesis, namely, that changes (specifically, reduction) in corruption levels have a positive correlation with economic growth, and invited to test this hypothesis by means of a quantitative analysis.

The present article reviews part of a research paper on regional differences in evaluating economic growth and its influence by various aspects.

In this publication, the relationship between changes in corruption level and economic growth is analyzed, paying close regard to all countries of the world and taking Europe separately as a region with relatively consistent economic and social development levels.

Aim of the present paper is to analyze relationship between corruption level and economic growth and possible impact to each other. The following objectives were defined in order to meet the aim of the paper:

1. To evaluate the relations of annual changes of corruption level and annual changes of GDP per capita with different years data sets.
2. To evaluate relation between long term corruption level and indicator of economic development GDP per capita.
Materials and methods

Before carrying out the research, quantitative data that would reflect changes in corruption levels, as well as data on economic growth levels had to be selected.

For quantitative analysis of the data set, the corruption perception index (CPI) created by Transparency International was selected. The main reason for selecting CPI data was an extensive availability of data for 1998 – 2007 (Corruption Perceptions Index, 2007). Moreover, as pointed out by Doug et al., (2006), CPI is the most widely cited corruption indicator. CPI has been widely used in scientific research when analyzing the influence of corruption on various spheres (Grigorescu, 2006; Khondker, 2006; Pellegrini & Gerlagh, 2006; Shen & Williamson, 2005).

In research where territorial development level must be assessed, the determinative indicator GDP growth rate per capita was used by Echevarría & Iza, (2006); Maasoumi et al., (2007); Hasler et al., (2006). Hence for this research annual changes in gross domestic product (GDP) per capita, based on purchasing-power-parity (PPP) valuation, were selected as an indicator, using International Monetary Fund World Economic and Financial Surveys obtained from the World Economic Outlook Database (World Economic Outlook Database, 2007), Gross domestic product (GDP) per capita: annual changes based on purchasing-power-parity (PPP) valuation.

Data on changes in percent in GDP per capita (in US dollars) are available in the database of IMF; these data were not altered. Changes in CPI were calculated according to the formula

\[ C_{(\%)} = \frac{(C_2 - C_1)}{C_1} \times 100 \]

where

- \( C_{(\%)} \) - changes in CPI, percent per base year
- \( C_1 \) - CPI in previous year
- \( C_2 \) - CPI in base year

To inquire into the relationship between CPI and GDP per capita, average data for the respective period (1998 – 2007 for CPI and 1998 – 2005 for GDP per capita) were used, calculations carried out by the formula

\[ G_v = \frac{\sum G_n}{n} \]

where

- \( G_v \) - average GDP per capita in time period \( n \)
- \( G_n \) - GDP per capita in a specific year
- \( n \) – number of observations included in calculations of the average value

Average CPI was calculated by the same method replacing GDP per capita with CPI.

The data set to undergo correlation and regression analysis between change in percent in CPI and change in percent in GDP per capita was formed by grouping changes in pairs. Changes of \( C \) in \( n \) years were verified, subjecting them to a regression and correlation analysis with GDP changes in the respective year (n), as well as in years (n-1), (n-2), (n-3) and years (n+1), (n+2), (n+3).

The author believes that, in the case of CPI and GDP, certain statistical indications are to be observed that reflect events or phenomena for which it is hard to distinguish between causes and effects. Krastiņš (2003) suggests that, in such cases, dependent and independent variables should be selected according to their qualitative attributes. When examining changes in percent for one year, changes in GDP per capita in the year in question were taken to be the variable indication, but changes in CPI in the year in question – as the resultant indication. In other cases, earlier data in terms of time (e.g., year \( n \)) were taken as the variable indication, while later data (e.g., year \( n+1, n+2 \) etc.) – as the resultant indication. Following the standard used by Frolova (2005), the zero hypothesis – namely, that the resultant indication is not influenced by the factorial indication of the regression – was tested for regression models, checking whether zero was included in the credibility interval of the regression coefficient. If zero appeared in the credibility interval of the respective coefficients of the regression variables in the regression equation, the factor in question was excluded from the equation.

In data matching, heed was paid to the fact that the CPI data timeline is irregular. In 1998, data on 86 countries and territories were available, in 2001 – on 92, but in 2007 – on 181 countries and territories (Corruption Perceptions Index, 2007). For GDP per capita, however, a full data timeline is available for almost all countries with only minor exceptions – such as data on Afghanistan during the Talib rule, etc. (World Economic Outlook Database, 2007). This means that in the data analysis, only those years could be included for which both CPI and GDP were available. This in turn means that for each data set there was a different number of observations.
Results and discussion

Data on all world countries

Taking CPI changes of the respective year as the variable indication, and GDP per capita changes after three years – as the resultant indication, 442 observations were made. The determinative coefficient was 0.0001. The regression coefficient, in turn, was -0.00438. The lower and upper limits of the regression coefficient were -0.0389 and 0.0301 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking CPI changes of the respective year as the variable indication, and GDP per capita changes after two years – as the resultant indication, 572 observations were made. The determinative coefficient was 0.0003. The regression coefficient, in turn, was 0.0060. The lower and upper limits of the regression coefficient were -0.0248 and 0.0368 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking CPI changes of the respective year as the variable indication, and GDP per capita changes after one year – as the resultant indication, 715 observations were made. The determinative coefficient was 0.0007. The regression coefficient, in turn, was 0.0099. The lower and upper limits of the regression coefficient were -0.0182 and 0.0380 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking GDP per capita changes of the respective year as the variable indication, and CPI changes in the respective year – as the resultant indication, 867 observations were made. The determinative coefficient was 0.0015. The regression coefficient, in turn, was 0.0972. The lower and upper limits of the regression coefficient were -0.0713 and 0.2658 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking GDP per capita changes of the prior years as the variable indication, and CPI changes in the respective year – as the resultant indication, 1026 observations were made (Fig. 1). The determinative coefficient was 0.0032. The regression coefficient, in turn, was 0.1345. The lower and upper limits of the regression coefficient were -0.0108 and 0.2797 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero. Figure 1 shows that data are distributed almost symmetrically in relation to the axes of the graph, which indicates that their position resembles that of a random dispersion.

Taking GDP per capita changes of two prior years as the variable indication, and CPI changes in the respective year – as the resultant indication, 1026 observations were made. The determinative coefficient was 0.0013. The regression coefficient, in turn, was 0.0818. The lower and upper limits of the regression coefficient were -0.0588 and 0.2224 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking GDP per capita changes of three prior years as the variable indication, and CPI changes in the respective year – as the resultant indication, 1026 observations were made. The determinative coefficient was 0.0001. The regression coefficient, in turn, was 0.0237. The lower and upper limits of the regression coefficient were -0.1163 and 0.1636 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.
Observing data for all countries in the world, no interrelationship can be spotted between changes in CPI and changes in GDP per capita. It must be concluded that these indicators fluctuate independently of each other. Using the determinative coefficient as a criterion, the best results appear in the connection between GDP per capita changes in the year before and CPI changes in the year in question. However, the determinative coefficient was only 0.0032, and GDP changes would explain only 0.32% of all dispersion of CPI changes (Fig. 1). In this case also, the zero hypothesis that there is no regression cannot be rejected.

When tracing this lack of interrelationship between all countries of the world, a legitimate question may arise – that is, are the results similar when analyzing data from different regions? Moreover, Sah (2007) has reached a conclusion that corruption indicators are better used for comparing countries of the same region, but less effective when comparing countries from different regions. To test this hypothesis, data on European countries were separated from the data set on the world countries, and subjected to the same regression analysis as data on all countries in the world.

Data on European countries
Taking CPI changes of the respective year as the variable indication, and GDP per capita changes after two years – as the resultant indication, 197 observations were made. The determinative coefficient was 0.0168. The regression coefficient, in turn, was 0.0405. The lower and upper limits of the regression coefficient were -0.0032 and 0.0843 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking CPI changes of the respective year as the variable indication, and GDP per capita changes after one year – as the resultant indication, 235 observations were made. The determinative coefficient was less than 0.0000. The regression coefficient, in turn, was -0.0020. The lower and upper limits of the regression coefficient were -0.0428 and 0.0389 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.
Taking GDP per capita changes of the respective year as the variable indication, and CPI changes in the respective year – as the resultant indication, 273 observations were made. The determinative coefficient was less than 0.0000. The regression coefficient, in turn, was -0.0013. The lower and upper limits of the regression coefficient were -0.3680 and 0.3654 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking GDP per capita changes of the year before as the variable indication, and CPI changes in the respective year – as the resultant indication, 311 observations were made. The determinative coefficient was 0.0017. The regression coefficient, in turn, was 0.1201. The lower and upper limits of the regression coefficient were -0.2093 and 0.4494 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero. Taking GDP per capita changes of two prior years as the variable indication, and CPI changes in the respective year – as the resultant indication, 311 observations were made. The determinative coefficient was 0.0085. The regression coefficient, in turn, was 0.2382. The lower and upper limits of the regression coefficient were -0.0490 and 0.5254 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking GDP per capita changes of three prior years as the variable indication, and CPI changes in the respective year – as the resultant indication, 311 observations were made. The determinative coefficient was 0.0002. The regression coefficient, in turn, was 0.0002. The lower and upper limits of the regression coefficient were -0.0002 and 0.0002 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

Taking GDP per capita changes of the year as the variable indication, and CPI changes in the respective year – as the resultant indication, 273 observations were made. The determinative coefficient was less than 0.0000. The regression coefficient, in turn, was -0.0013. The lower and upper limits of the regression coefficient were -0.3680 and 0.3654 respectively, which indicates that the zero hypothesis cannot be rejected, as the regression coefficient with a probability of 95% does not differ from zero.

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Observing data for European countries, no interrelationship can be spotted between changes in CPI and changes in GDP per capita. It must be concluded that these indicators fluctuate independently of each other. Taking the determinative coefficient as a criterion, the result, when evaluating connectedness between GDP per capita changes and CPI changes in the respective year or the year before or after, is less than 0.002. The data are distributed almost symmetrically in relation to the axes of the graph, which indicates that their position resembles that of a random dispersion.

However, when looking at the average values in
European countries of average GDP per capita of a decade, and average CPI of a decade, a surprising similarity is observable in the spatial placement of these indicators. GDP per capita and synchronically CPI are high in the Nord and the West part of Europe and low in the East Europe. Regression analysis of these indicators (Fig. 2) also shows a high connectedness between the two. The interconnection is almost functional.

Looking at gross domestic product per capita, based on purchasing-power-parity valuation (in US dollars) for 1998 – 2005, as the variable indication, and the average values of corruption perception index in European countries between 1998 – 2007, in the respective year as the resultant indication, 38 observations were made. The determinative coefficient was 0.7259. In turn, the regression coefficient was 0.000165. The upper and lower limits of the regression coefficient were 0.00013 and 0.00020, respectively, which indicates that the zero hypothesis can be rejected, as the regression coefficient differs from zero with a very high probability.

When analyzing European countries, a very high correlation can be observed between the average values of gross domestic product per capita, based on purchasing-power-parity valuation (in US dollars) for 1998 – 2005, and the corruption perception index in European countries for 1998 – 2007.

In political debates within Latvia it is often claimed that, in order to attain a certain goal, the value of another parameter must be influenced. Rather paradoxically, it was stated that a smaller level of corruption is cause for greater economic growth (one of Latvian political leaders and member of Latvian parliament, Aigars Štokenbergs in an interview to the daily newspaper “Diena”, (Štokenbergs et al., 2008)) or that a successful combating of corruption will result in a decrease in inflation (keynote announcement of Latvian political leaders and members of Latvian parliament Sandra Kalniete and Einars Repše before the parliamentary election (Repše & Kalniete, 2006)).

Problems often arise in Latvia when it is attempted to materialize political ideas dictated by the political situation through a specific economic policy.

In this sense, results obtained in this paper are an attempt to test by statistically measurable methods exactly how great the chances are of improving the quantitative indicators of one phenomenon – growth – by influencing the quantitative indicators of another – corruption.

In this sense, the obtained results are practically useful for creating a scientifically grounded system of measures that would stimulate economic growth.

The obtained results are controversial; a tight, almost functional connectedness is observable between the average values of GDP per capita and CPI, along with a total lack of connection between annual changes in these values, either synchronously or with an offset of one, two or three years.

Such results can possibly be interpreted by the methodological deficiencies of CPI.

Here it must be stressed that, according to Sajo (2003), corruption perception indexes are good for stirring up public interest, but the dynamics of these indexes depend on the political diary and create a sort of a competition between countries. One of the strongest points against over-reliance on CPI is that in many countries corruption of a high level is not taken notice of, and this creates a deformed perception of what corruption is (Sajo, 2003). It has been stressed that there is a methodical problem in adapting indexes by different agencies, because, ideally, the indexes of the same methodology and the same dimension should be used (Knack, 2007). Hwang et al. (2005), in turn, point out that the perception of corruption is too closely connected with the satisfaction of the people with government policies, hence the index can reflect the level of satisfaction or dissatisfaction with the government. Seligson (2006) criticized perception-type indicators from a different aspect, stating that corruption perception indexes are of a national level, but do not reveal problems of individual corruption. Moreover, Dreher et al. (2007) have concluded that perception-based indicators are not good in evaluating the actual corruption level of a country.

It is impossible to come to a practically unequivocal conclusion on the interrelationship between corruption and economic growth only from the obtained results. It is highly possible that, due to its methodological deficiencies, CPI cannot be used as an indicator, measuring the prevalence of corruption, that in the long term this indicator reflects the satisfaction level of the population with the economical situation in the country and that this would explain the almost functional interconnection between CPI and GDP per capita in Europe. Obviously, satisfaction with economical and general living conditions is higher in richer countries (Nordic and Central Europe) and lower – in poorer countries of Europe (Baltic, Balkans and former USSR area). Meanwhile, changes in short-term CPI and GDP depend on completely different factors.

Practically, there exist two probabilities. One is that CPI cannot be used as an indicator of corruption levels. The other suggests that statements asserting a positive or a negative influence of corruption on GDP growth should be taken very critically, and the argument stands that changes in corruption do not influence GDP per capita changes in any way.

To obtain more specific conclusions, similar quantitative research should be carried out, using other corruption indicators.
Conclusions

1. Observing data for all world countries, no interrelationship can be spotted between changes in CPI and changes in GDP per capita. These indicators fluctuate independently of each other.

2. Using the determinative coefficient as a criterion, the closest connection appears between GDP per capita changes in the year before and CPI changes in the year in question, with a determinative coefficient of 0.0032.

3. Observing data for European countries, no interrelationship can be spotted between changes in CPI and changes in GDP per capita. These indicators fluctuate independently of each other.

4. When analyzing European countries, a very high correlation can be observed between the average values of gross domestic product per capita, based on purchasing-power-parity valuation (in US dollars) for 1998 – 2005, and the corruption perception index in European countries for 1998 – 2007. The obtained results give rise to doubt whether CPI is a suitable indicator for determining the corruption level. Statements proclaiming a negative (or positive) influence of corruption on GDP growth should be taken very critically.

References


