FROM EXTERNAL DEBT TO ECONOMIC GROWTH … AND BACK

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Abstract

This paper is meant to trace the relationship existing between external debt and economic growth for 109 countries spread all over the world. We have resorted for this study to cross-sectional data, the economic modelling being simultaneously made for a three-year period. After having constructed four models and after having estimated them by econometric techniques, we have selected the most appropriate of them, which is in fact the version to be build upon within future personal studies. The results indicated as optimum the model including GDP in logarithm as endogenous variable and total external debt in logarithm and development level dummy as exogenous variables. The analysis revealed a positive relationship between external debt and economic growth, indicating that the threshold above which the indebting influence on the economic performance should become negative has not been reached yet. The coefficients obtained within the estimations performed, construed as elasticities, show that, while GDP is inelastic in relation with debt, the latter has a supra-unitary elasticity, therefore its modification being ampler than the GDP one.

Keywords: *economic growth, external debt, impact factors, estimates, economic modelling*

1. Introduction

This study, based on an analysis made on 109 countries, for a three year period, that is 2006, 2007 and 2008, with annual data, is meant to reveal several important issues on the economic growth phenomenon and to analyse some of its main influencing factors.

According to the economic theory, economic growth represents the increase of the real GDP from a period to another one and reflects the living standard and well being of a society. This is the reason why it is highly important to identify the key elements with major impact on economic growth and to determine the type of relationships established with each and every single such item, so as to provide accurate arguments for a ground development of a nation. The said factors cover a large range, comprising, among others, without limitation, investments, unemployment rate, budgetary deficit, exports, imports, governmental expenses, external debt or population increase. Given their significant number, we have decided to take them separately and to further render our analysis increasingly complex in subsequent studies.

Therefore, we have started, by resorting to only one item, save for GDP, meaning external debt, taken consecutively as exogenous and endogenous variable. Subsequently, we have separately added two dummies, one relating to the geographical layout and the other one to the level of development of the analysed countries. After having taken into account various facets of the issue, as seen hereinafter, the following equations have been subject to econometric estimations:

$$\log_{gdp} = \alpha + \beta * \log_{dat} + \varepsilon$$
$$\log_{dat} = \alpha + \beta * \log_{gdp} + \varepsilon$$
$$\log_{gdp} = \gamma + \delta * \log_{dat} + \theta * d_1 + \varepsilon$$
$$\log_{gdp} = \gamma + \delta * \log_{dat} + \theta * d_2 + \varepsilon$$

The relationship between the economic growth and the external debt of a country is, basically, negative, considering the opportunity cost relating to the money exit out of the country due to the debt service, this rendering non-achieved potential investments. Yet, there is an inflexion point in this

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relationship graphic, an optimum level up to which the external debt has a positive influence on economic growth by the increase of the investments funds acquired as result of the external credit contracting. In this case, it is important to see whether the investment yield is sufficient to cover the long-run debt service rate, so that the leverage should not reverse once the reimbursements begins. In order to achieve a positive impact of the external debt on growth, an efficient and comprehensive debt strategy is absolutely necessary.

In view of rendering this paper as clear as possible, we have decided to structure it into six sections, as follows: Introduction in section 1 (the current section), a brief Literature Review which appears in section 2, followed by the description of Data in section 3, the presentation of the Methodology and Empirical Results in section 4, Conclusions in section 5 and, finally, Suggestions for Further Research in section 6.

2. Literature review

The external debt – economic growth relationship has been lately focused on by many economists interested in discovering the type of correlation existing between such variables. Savvides (1992) resorted to a TSLDV method, applied on cross-sectional time series for 43 less developed countries, over a six year-period (1980-1986), in order to render the negative connection between these two variables. In his opinion, the obligation of a country to pay its foreign debt seriously affects its economic performance, as a large part of its output increase should be directed towards its debt service and creditors, the debt overhang acting as a marginal tax rate on that country and lowering its investment returns, while negatively impacting on its domestic capital formation.

A negative influence of foreign debt on growth is also rendered by Elbadawi et al.(1996) whose analysis is based on cross-section regressions for 99 developing countries spanning SSA, Latin America, Asia and Middle East. They underline the indirect effect of external debt on a country's economic performance, via the impact of the former on the public sector expenditures. While the financial standing becomes increasingly precarious, governments assist to the diminishing of their resources and, subsuquently, to the cutoff of their public expenditures, thus leading to a desrease in GDP.

Clements et al. (2003) made appeal to both fixed effects and system GMM, based on data for 55 low-income countries classified as eligible for the IMF's Poverty Reduction and Growth Facilitiy, for the period 1970–1999. Their study is directed towards the analysis of the channels via which external debt affects growth in those countries. The authors indicate that a significant decrease of the external debt of heavily indebted poor countries would directly increase per capita income growth with about 1% per year and indirectly contribute to economic growth by their effects on public investments.

Patillo et al. (2002, 2004) examined the relationship between the total external debt and the GDP growth rate for 61 developing countries, for the period 1969-1998. They found out a backward bending growth curve with a debt-growth positive relationship at low levels of national debt and negative relationship at high levels. This shows us that the effects of debt-overhang are likely to occur only after a certain threshold has been reached.

Schclarek (2004) used panel data for 59 developing countries and 24 industrial countries, with data averaged over each of the seven 5-year periods between 1970 and 2002 (1970-74; 1975-80; etc.), applying the GMM dynamic panel econometric method. The study revealed a negative and significant relationship between total external debt and economic growth for developing countries. After having divided the total external debt into public and private external debt, a negative relationship has resulted between public external debt and growth, and no significant relationship as for private external debt.

Hameed et al. (2008) studied the long-run and short-run relationships between external debt and economic growth for Pakistan, by resorting to annual data for the period 1970-2003. They

identified that the debt service ratio tends to adversely affect GDP and therefore the economic growth rate in the long-run, which, in turn, diminishes the country's capacity to service its debt. Also, the estimated error correction term indicated a significant long-run causal relationship among the said variables. As a whole, the results evidenced both a short-run and long-run causal relationship running from debt service to GDP.

An impressive analysis is made by Reinhart and Rogoff (2010) who selected 44 countries over around 200 years, collecting about 3,700 yearly observations. They found out that the relationship between government debt and real GDP growth is weak for debt-GDP ratios below a threshold of 90% of GDP, while, above 90%, median growth rates fall by 1%, and average growth falls considerably more. As regards the emerging markets, there are lower thresholds for public and private external debt: when external debt reaches 60% of GDP, annual growth decreases by about 2%; for higher levels, growth rates are roughly cut in half.

3. Data

In order to study the above mentioned phenomenon, we have selected the data described below:

- The economic performance (log_{gdp}) - expressed by GDP at PPP in USD, annual series taken over from UNO database.
- The indebting (log_{dat}) - represented by the credits contracted by the authorities and economic agents from the banks reporting to IRB, corrected by the implicit index for passing to PPP standard, for comparability. These data have been annualised (given that the external debt series is quarterly) and they have been taken from UNO and IMF databases.
- For the third model, a dummy variable (d1) has been defined, as follows:

  d1 = 2, if the country is located in Europe

  d1 = 1, if the country is located in North America or Asia

  d1 = 0, if the country is located on another continent
- For the forth model, a dummy variable (d2) has been defined, as follows:

  d2=0, if the country is less developed

  d2=2, if the country is developed.

Such classification has been made according to the data collected from the World Bank official site.

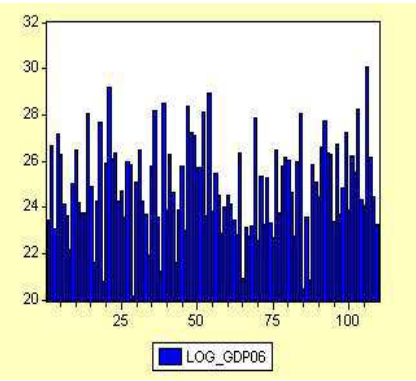
The data correspond to the years 2006, 2007 and 2008 and refer to the economic standing of 109 countries. Within the estimations performed, the series have been used in logarithm, so as to attenuate the size-related differences between the values of the variables for the selected countries.

4. Methodology and Empirical Results

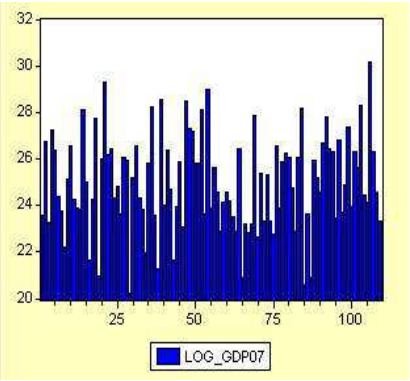
4.1. Data Descriptive Analysis

The graphic representation of the gross domestic product and of the external debt reveals the major differences between the analysed countries, even if these have been partly compensated by the logarithmic transformation performed. As for GDP, the differences indicate the distance separating the well developed countries from the poor ones.

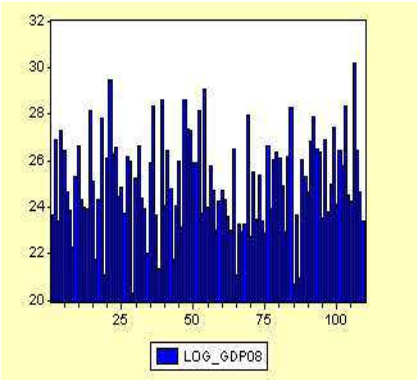
2006



2007

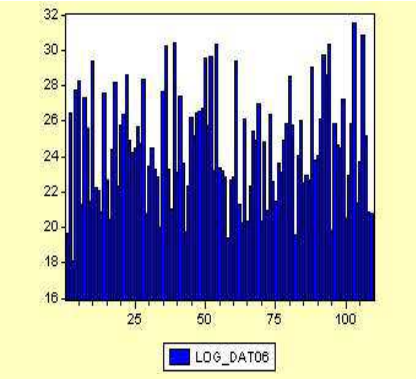


2008

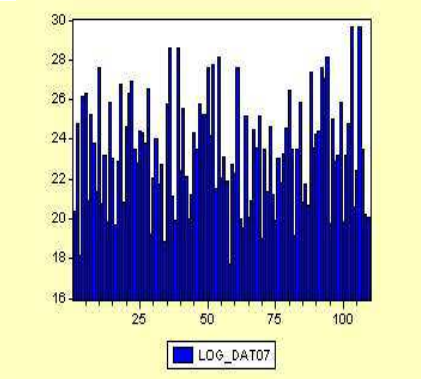


Such significant differences are also obvious in the case of the external debt series and look like remaining quite unchanged for the whole analysed period. We specify that this series is adjusted with the implicit index for passing to PPP standard and it comprises both external public debt and external private debt.

2006



2007



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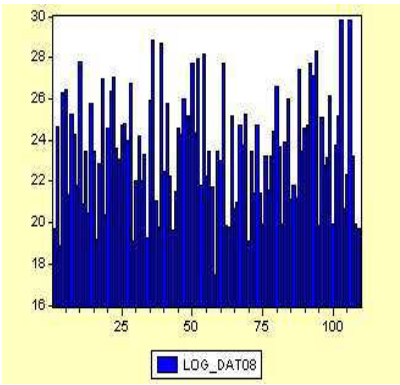
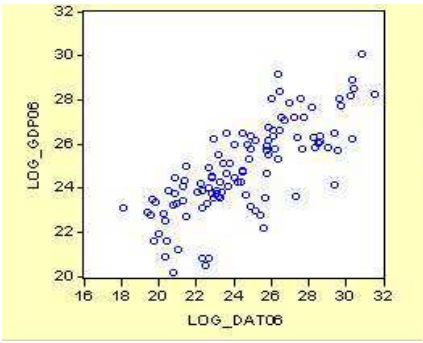
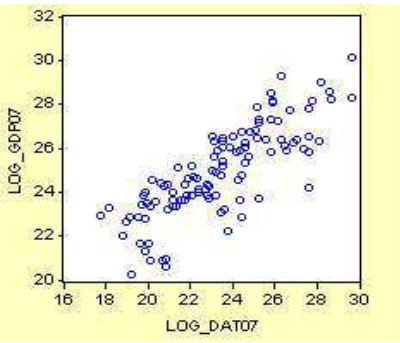


The dot plot graphic indicates a quite significant dispersing of values, but it also reveals a certain trend, a positive, stochastic relationship between the two data series to be tested by OLS method.

2006



2007



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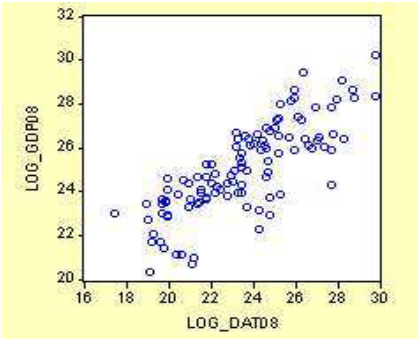

The descriptive analysis of the two variables is separately rendered, for each of them, in Table 1.1 below:

Table 1.1 Statistic data

DEBT	2006	2007	2008	GDP	2006	2007	2008
Mean	24.55952	23.40943	23.54578	**Mean**	24.88958	24.96721	25.05848
Median	24.43337	23.46045	23.45824	**Median**	24.66615	24.75479	24.87544
Max	31.55636	29.63298	29.79000	**Max**	30.09061	30.14872	30.21124
Min	18.07819	17.72692	17.49275	**Min**	20.16988	20.23551	20.30623
Std.dev	3.097767	2.753593	2.773542	**Std.dev**	2.051020	2.051408	2.046549
Skewness	0.223488	0.172115	0.131958	**Skewness**	0.046065	0.034324	0.030269
Kurtosis	2.264114	2.289877	2.287765	**Kurtosis**	2.675430	2.680631	2.678163
Jarque-Bera	3.366811	2.828412	2.620225	**Jarque-Bera**	0.516995	0.484637	0.487066
Probability	0.185740	0.243119	0.269790	**Probability**	0.772211	0.784806	0.783854

By analysing the results obtained for the external debt, we can see that the mean increases over the three-year period, but the values remain sensitively equal. Also, the difference between the series minimum and maximum strengthens the previous statements as for the rather divergent levels between the debts of the countries considered in this study.

An interesting issue is that, in 2006, the standard deviation suddenly decreases from about 2.7 to 1.7, thus indicating a tendency of the sizes of observations to come closer to one another. The values of the skewness and kurtosis indicators have values close to the ones specific to the normal distribution.

Considering that the probability of Jarque-Bera test exceeds 5%, the null hypothesis cannot be rejected, therefore the external debt following a normal distribution. As skewness is more than zero, a slightly right deviation distribution is revealed, but its value decreases each year, thus dissipating such deviation.

As for GDP, the same increase of the mean and a significant distance between the series minimum and maximum is noticed. The standard deviation is lesser than in the previous case and it maintains all over the analysed period.

A compared to the external debt, GDP presents a positive value skewness much closer to zero, indicating an imperceptible deviation to right of the distribution graphic. The Jarque-Bera test confirms in this case too the normal distribution of the analysed series and the kurtosis values directs each year towards the normal value of 3.

4.2. Parameter Estimation

As mentioned in Introduction, we have started our study by analysing the relationship between GDP and external debt, taken successively as endogenous and exogenous variables. We have subsequently added two separate dummies, thus constructing four models to be estimated. The estimation results are rendered in brief in the tables below.

Table 1.2

$\log_{gdp} = \alpha + \beta * \log_{dat} + \varepsilon$ $\log_{dat} = \alpha + \beta * \log_{gdp} + \varepsilon$

Modelul 1	**2006**	**2007**	**2008**	**Modelul 2**	**2006**	**2007**	**2008**
Coeficient β	**0.504418***	**0.601439***	**0.588830***	**Coeficient β**	**1.150663***	**1.083645***	**1.081471***
Coeficient α	**12.50132**	**10.88788**	**11.19402**	**Coeficient α**	**-4.080010**	**-3.646159**	**-3.554232**
R-squared	0.580415	0.651746	0.636802	**R-squared**	0.580415	0.651746	0.636802
Adj R-squared	0.576494	0.648491	0.633408	**Adj R-squared**	0.576494	0.648491	0.633408
F-statistic	148.0141	200.2467	187.6053	**F-statistic**	148.0141	200.2467	187.6053
Prob F-statistic	0.0000	0.000000	0.000000	Prob F-statistic	0.0000	0.000000	0.000000
Akaike	3.433542	3.247588	3.284860	**Akaike**	4.258231	3.836349	3.892800
Schwartz	3.482925	3.296971	3.334243	**Schwartz**	4.307613	3.885732	3.942183
Durbin-Watson	2.024481	2.035982	1.987568	**Durbin-Watson**	1.985802	2.069626	1.992531

According to Table 1.2., in models 1 and 2, the independent variables are econometrically significant, the t-test having a computed value exceeding the critical one for a significance threshold of 5% for 109-2 observations. As for model 2, the intercept is significant for a significance threshold of maximum 10% in 2006 and 2008.

F statistics renders also high values, evidencing the correct specification of the said models and an adequate selection of the considered factors.

The determination ratio R^2 shows that the variance of the dependent variable is explained in a proportion of 63% by the selected explanatory variable. By comparing the two models, the adjusted R^2 is identical, as expected, but the Akaike and Schwartz tests have a lower value for the first model, indicating it as qualitatively superior.

As regards the error autocorrelation, the DW test values are located within the interval (d_2, 4-d_2), evidencing no autocorrelation for the two analysed models.

The obtained coefficients have quite similar values across the tree-year period. Considering that the used variables are in logarithm, they shall be construed as elasticities. Therefore, we could state, by interpreting the estimation results for Model 1 that GDP is inelastic in relation with the external debt, more exactly, if the external debt increases by 1%, GDP increases by only 0.58% in 2006, for instance. Model 2 indicates the elasticity of the external debt in relation with GDP, the coefficient exceeding the 1 value for the entire analysed period. The relationship would reverse once the β coefficient reaches the maximum value (t statistics value), the leverage becoming negative.

Table 1.3

$\log_{gdp} = \gamma + \delta * \log_{dat} + \theta * d_1 + \varepsilon$ $\log_{dat} = \gamma + \delta * \log_{gdp} + \theta * d_2 + \varepsilon$

Modelul 3	**2006**	**2007**	**2008**	**Modelul 4**	**2006**	**2007**	**2008**
Coeficient δ	**0.500752***	**0.621105***	**0.619299***	**Coeficient δ**	**0.581558***	**0.692501***	**0.700211***
Coeficient θ	**0.045621**	**-0.168338**	**-0.239868**	**Coeficient θ**	**-0.404404***	**-0.437195***	**-0.515113***
Coeficient γ	**12.54991***	**10.58040***	**10.69447***	**Coeficient γ**	**11.05943**	**9.245491***	**9.148010***
R-squared	0.580756	0.656104	0.645411	**R-squared**	0.605520	0.681993	0.677046
Adj R-squared	0.572846	0.649616	0.638720	**Adj R-squared**	0.598077	0.675993	0.670953
F-statistic	73.41808	101.1165	96.46866	**F-statistic**	81.35402	113.6630	111.1103
Prob F-statistic	0.0000	0.000000	0.000000	Prob F-statistic	0.0000	0.000000	0.000000
Akaike	3.451078	3.253342	3.279222	**Akaike**	3.390194	3.175077	3.185770
Schwartz	3.525152	3.327416	3.353295	**Schwartz**	3.464268	3.249150	3.259844
Durbin-Watson	2.018820	2.046178	2.003555	**Durbin-Watson**	2.026908	2.099867	2.075932

Concerning models 3 and 4 from Table 1.3., we have tried to identify the influence of the geographical layout of the analysed countries on their economic performance (for model 3) and the influence of their development level on their future economic growth (for model 4).

The dummy variable proved to be insignificant in model 3, for a significance threshold of maximum 10%; therefore we could draw the conclusion that the geographical layout does not clearly determine the economic growth of the countries in the analysed period.

In model 4, the dummy variable is significant for a significance level of at most 5% for the entire period. The sign of this coefficient is negative and sub-unitary, signalling a reverse relationship between GDP and the level of development of the countries.

By comparing this model to model 1, the first one looks like more adequate, this affirmation being strengthened by the value of the adjusted R^2 and by the Akaike and Schwartz tests.

F-test validates the model and DW test shows the absence of error autocorrelation, therefore our previous statement being reinforced. The debt coefficient remains close to the values registered for model 1, meaning positive and sub-unitary, suggesting a highly similar relationship between the two variables.

5. Conclusions

The positive relationship between external debt and GDP revealed by this study may have one of the following two explanations:

- Considering the major differences between the values of the analysed series, the negative leverage effect obtained for some of them has been compensated the positive effect of the other ones, so that, as a whole, a positive relationship emerged for the two variables of interest;
- At the world level, in average, the threshold above which the indebting influence on the economic performance should become negative has not been reached yet.

By comparing our results to those obtained by the authors of the articles considered as basic bibliographic sources, we could state that this study has revealed the same trend as that reached by Patillo et al. (2002, 2004), with the mention that the latter found a debt coefficient much closer to the inflexion value above which the leverage on GDP becomes negative.

The d1 dummy variable, dividing the countries depending on their geographical layout, proved to be insignificant, the same result being also obtained by Alfaro (2003) in his study on the influence of investments on economic growth.

Our analysis indicated that the d2 dummy variable has a strong influence on the economic growth, it being in compliance with the economic theory, according to which, as a country develops, its economic growth lowers, because the economic increase function is concave, therefore evidencing decreasing returns. On the other hand, a country in progress will develop more rapidly, as it has not reached yet the flattening level of the economic growth curve, according to Solow-Swan model.

The coefficients obtained within the estimations may be interpreted as elasticities and indicate that, while GDP is inelastic in relation with debt, the latter has a supra-unitary elasticity, so that the conclusion may be drawn that its modification is ampler than the GDP one.

Such result could be explained by stating that, if an increase of the debt determined a quicker increase of GDP, then many countries would indebt themselves until the maximum limit so as to obtain economic growth, and the debt service would be always covered by it.

The debt elasticity in relation with GDP is supra-unitary and it is confirmed for the developing and emerging countries, with significant economic growths, but highly indebted in order to reach a superior development standard, especially considering that their governments are involved in expensive development projects.

6. Suggestions for further research

In order to continue the economic growth analysis, we propose to render the model more complex, by adding, as explanatory variables, series relating to foreign direct investments, exports and imports. Such estimation results will be rendered in a future study. Also, a panel data approach could offer a larger perspective on this issue. As concerns methodology, a fixed versus random effects generalised method of moment would be an interesting alternative to the already used econometric estimation techniques.

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