HOW TO SUSTAIN ECONOMIC PERFORMANCE? ECONOMIC GROWTH AND ITS IMPACT FACTORS

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Abstract

This paper intends to render several important factors of impact on economic growth and to describe the particular types of relationships of the latter with each one of its influencing elements. In order to correctly determine such issue, we have resorted to three carefully selected models that have been estimated and compared so as to identify the most adequate and representative regression. For this purpose we have performed an analysis based on cross-section annual data for 105 countries spread all over the world. After having tested and rejected certain exogenous variables initially considered, such as imports or exports, we have finally retained the external debt and foreign direct investments as explanatory items of the dependent variable. The results revealed that both of them positively affect the gross domestic product of the analysed countries, this one being inelastic in relation to the exogenous variables considered. Even if the relationship between the economic growth and the external debt of a country is usually negative, as the money exit out of the country due to the debt service causes non-achieved potential investments, yet, there is an inflexion point 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, this being the case reflected by our study. As for the relationship existing between foreign direct investments and GDP, the economic theory confirms that FDI and economic growth are directly correlated, the former contributing to technical progress, production increase and, finally, to the improvement of the living standard.

Keywords: *economic growth, external debt, FDI, causal relationship, economic modelling*

1. Introduction

The present study based on cross-section annual data for 105 countries all over the world is destined to render various essential issues on the economic growth phenomenon and to provide a sound analysis of several important influencing factors of it.

As reflected by the economic theory, economic growth means the increase of the real GDP from a period to another one and indicates the living standard and well being of a society. Considering this, the identification of the key factors significantly impacting on economic growth and the decryption of their related relationships becomes essential is proposing and adopting the best possible economic policies. These influencing elements cover a large range, comprising, among others, without limitation, investment, unemployment rate, budgetary deficit, exports, imports, governmental expenses, external debt or population increase. Given their variety, we have undertaken to introduce them separately into models and to further render our analysis increasingly complex.

Therefore, we have started our study, by resorting to only one explanatory variable, meaning external debt. Later on, after having calibrated the model, we have introduced other exogenous items: foreign direct investments, exports and imports. After having considered several issues described hereinafter, we have finally selected for estimations the equations below:

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$\log_{gdp08} = \alpha + \beta_1 * \log_{dat08} + \varepsilon$
$\log_{gdp08} = \alpha + \beta_1 * \log_{dat08} + \beta_2 * \log_{inv08} + \varepsilon$
$\log_{gdp08} = \alpha + \beta_1 * \log_{dat08} + \beta_2 * \log_{inv08} + \beta_3 * \log_{exp08} + \varepsilon$

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, 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 respect of foreign direct investment, these ones are usually deemed to be one of the major catalysts to economic growth, therefore the relationship between such variables being positive. Yet, the benefits obtained via FDI do not accrue automatically and evenly across countries. The characteristics of host country economy and industry largely affect the FDI impact on growth in developing economies. FDI has a favorable influence on economic performance as it reduces the gap between the existing production level and a steady state production border and besides, it comes with built-in advanced technologies and last hour knowledge from more developed countries. But, if the target country doesn't have a high absorption capacity so as to take advantage from what powerful nations provide, all such advantages might vanish.

The debates regarding the export - economic growth relationship have mainly revealed a positive connection between these two items, as exports can help the country to harmonize with the world economy and to reduce the impact of external shocks on the domestic economy. Also, exports help domestic production in achieving a high level of economies of scale.

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 analysis of the relationship existing between economic growth and its various influencing factors represents one of the main topics of interest approached by economists all over the world.

The relationship between the total external debt and the GDP growth rate is carefully examined by Patillo et al. (2002, 2004). They analysed 61 developing countries, for the period 1969-1998 and discovered a backward bending growth curve with a debt-growth positive relationship at low levels of national debt and negative relationship at high levels, thus indicating us that the debt-overhang effects might occur only after having reached a certain threshold. Clements et al. (2003) resorted to the generalised method of moments with fixed effects econometric technique, applied on data for 55 low-income countries, over the period 1970–1999, in order to render the channels through which economic growth is affected by external debt in the analysed countries. They evidenced that a high decrease in external debt for heavily indebted poor countries might determine an increase per capita income growth and might contribute to economic growth by their effects on public investments. The analysis of Hameed et al. (2008) was directed towards the long-run and short-run relationships between external debt and economic growth. In this respect, they made appeal to annual data collected for Pakistan during 1970-2003. The debt service ratio proved to have a negative

impact on GDP translated into a decrease of the economic growth rate in the long-run, with adverse consequences as for the capacity of the country to service its debt. Also, the estimated error correction term indicated a significant long-run causal relationship among the said variables. Reinhart and Rogoff (2010) used in their study 3,700 yearly observations for 44 countries covering about 200 years and drew the conclusion 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.

The idea emerging from most of the studies regarding the influence of FDI on economic growth is that the developing countries should provide a supportive business environment and should have reached a minimum level of economic development before they can capture the FDI growth-enhancing effects. Alfaro et al. (2003) revealed, by using cross-section data between 1975-1995 for various OECD and non-OECD countries, that FDI causes economic growth only if the the target countries benefit from well developed financial markets. Countries should be interested not only in attracting FDI but also in improving their local conditions, as in this way, on one hand many foreign companies could be attracted and, on the other hand, the host economies would have the possibility to optimize their foreign investment-related benefits. Kinoshita and Lu (2006) carried out an empirical study based on a reduced form approach, in their panel data analysis for 42-non OECD countries. For them, infrastructure seems to be the one of the key elements in providing FDI efficiency. The central result is that FDI does not represent an economic growth driver by itself. The host country should undertake infrastructure investment before attracting FDI so as to maximize the incidence of technology spillovers from FDI. Lee, Chang (2009) applied panel cointegration techniques and panel error correction models for 37 countries for the period 1970-2002, based on annual data in order to explore directions of causality among FDI, financial development, and economic growth and revealed a strong long-run relationship. Besides, the financial development indicators proved to have a larger effect on economic growth than FDI. Overall, the findings underscored the potential gains associated with FDI when coupled with financial development in an increasingly global economy.

The export-economic growth correlation has been also approached by various authors. Jordaan (2007) focused on the causality relationship between exports and GDP of Namibia over the period 1970 – 2005, resorting for this purpose to Granger causality and cointegration analysis and concluded that exports influence GDP and GDP per capita and that the export-led growth strategy based on incentives has a positive influence on growth. Ullah et al. (2009) discovered a positive relationship between exports and economic performance when resorting to VEC models for time series from1970 to 2008 for Pakistan. The results indicated that there is uni-directional causality between economic growth, exports and imports. Besides, Granger causality through VEC is checked by means of F-value of the model and t-value of the error correction term, partly reconciling the traditional Granger causality test.

3. Data

In order to achieve our research, we have selected the following data series:

The gross domestic product in 2008 (gdp08) - expressed by GDP at PPP in USD, annual series taken over from the UNO database.

The external debt in 2008 (dat08) - represented by the credits contracted by authorities and by the 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.

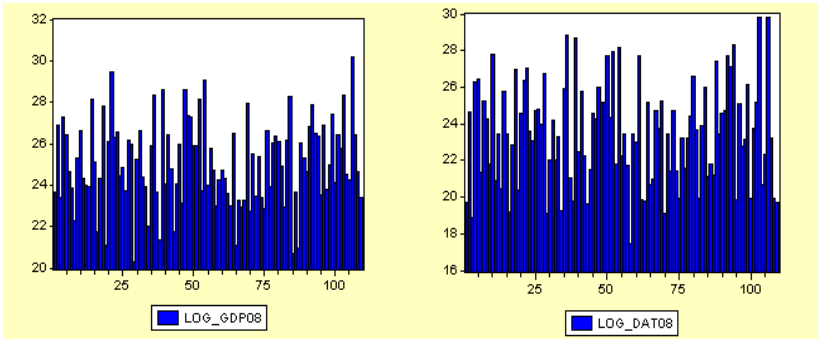
The foreign direct investments (I08), exports (EXP08) and imports (IMP08) in 2008 - computed based on the series of their percentage expression in GDP. These are annual series taken over from the UNO database.

The data correspond to the year 2008 and refer to the economic standing of 105 countries. This study is a continuation of the previously presented simple regression model.

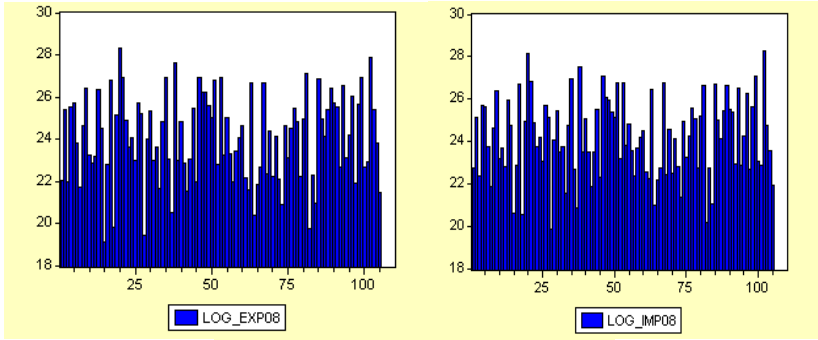
4. Methodology and Empirical Results

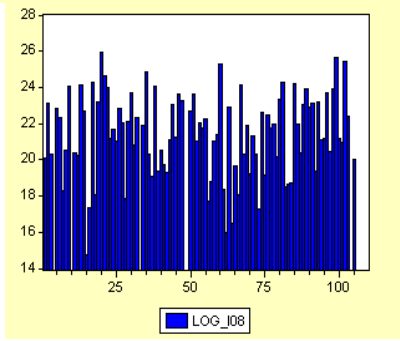
4.1. Data Descriptive Analysis

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. Such significant differences are also obvious in the case of the external debt series. 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.



We have also rendered below the graphs specific to the three series in logarithm added to our previous analysis:





As noticed, the size differences preserve in this case too, but their amplitude is less significant for imports and exports. The foreign direct investment series also contains negative values, so that, by the logarithmic transformation, they have been turned to 0.

Correlation Matrix

	GDP08	DAT08	I08	EXP08	IMP08
GDP08	1.000000	0.717154	0.640893	0.791651	0.903491
DAT08	0.717154	1.000000	0.628806	0.529327	0.657320
I08	0.640893	0.628806	1.000000	0.794587	0.791705
EXP08	0.791651	0.529327	0.794587	1.000000	0.963921
IMP08	0.903491	0.657320	0.791705	0.963921	1.000000

According to the matrix of correlation coefficients, the import series is positively correlated to the export one, with a correlation coefficient very close to 1 value. Therefore, in order to avoid this phenomenon, we have decided to exclude the data series relating to imports from our analysis. Even if it has a higher correlation coefficient in relation to GDP than the export series, exports are theoretically deemed to have a superior influence on economic growth.

As for the other correlation coefficients, the estimations of the models by pairs have indicated that, the other variables being retained, no multi-collinearity phenomenon should occur.

4.2. Parameter Estimation by OLS

Model 1:

$\log_{gdp08} = \alpha + \beta_1 * \log_{dat08} + \varepsilon$

Comments based on model 1:

- The probability of F statistics and that of parameters α and β1 is 0%. Therefore, the parameters are significantly different from zero, and the eternal debt variable is correctly introduced in the model.

- F statistics = 215.7692 is higher than F with (P-1,T-P) freedom degrees and 5% significance level, whose critical value obtained from the specific table is F(2-1,105-2) = 3.936. This confirms the correct definition of the model (the explicative variable – external debt – is fit for explaining the behaviour of the GDP variable).

- The t-statistics value – computed for the parameter estimators – exceeds the one rendered for t critical value with (T-P) freedom degrees and a significance level of 5%; t (105-2)=1.645. It results that the external debt variable is relevant within the model.

- The adjusted R-squared is 67.37%, this meaning that our explanatory variable explains 67.37% of GDP variance.

The Durbin Watson (DW) statistics indicates a value of 2.235523, belonging to the interval (d2,4-d2)=(1.72 ; 4-1.72), meaning that the error series in uncorrelated. (d2 is extracted from the table considering k=2 parameters and T=105 data).

In order to improve this simple regression model, we have decided to add one more variable: foreign direct investments.

Model 2:

$\log_{gdp08} = \alpha + \beta_1 * \log_{dat08} + \beta_2 * \log_{i08} + \varepsilon$

Comments made based on model 2:

- The probability of F statistics and that of parameters α, β1 and β2 is 0%. Therefore, the parameters are significantly different from zero, and the explanatory variables are correctly introduced in the model.

- F statistics = 172.4927 is higher than F with (P-1,T-P) freedom degrees and 5% prag de significance level, whose critical value obtained from the specific table is F(3-1,105-3)=3.087. This confirms the correct definition of the model (at least one of the two explanatory variables – external debt or foreign direct investments is fit for explaining the behaviour of the GDP variable).

- The t-statistics values – computed for each estimator of the two parameters exceed the one rendered for t critical value with (T-P) freedom degrees and a significance level of 5%; t (105-3)=1.645. It results that both explanatory variables used are relevant within the model.

- The adjusted R-squared is 77.77%, this meaning that the three explanatory variables explain 77.77% of GDP variance.

The Durbin Watson (DW) statistics indicates a value of 2.242166, belonging to the interval (d2,4-d2)=(1.74 ; 4-1.74), meaning that the error series in uncorrelated. (d2 is extracted from the table considering k=3 parameters and T=105 data).

Subsequently, we have introduced a new explanatory variable in 2008, in order to render our model more complex.

Model 3:

$\log_{gdp08} = \alpha + \beta_1 * \log_{dat08} + \beta_2 * \log_{i08} + \beta_3 * \log_{exp08} + \varepsilon$

Comments based on model 3:

- Ads notices in Table 2.1, the variables $\log_{dat08}$ and $\log_{i08}$ are incorrectly introduced in the model, having probabilities 68.08%, respectively 17.53%.

- The probability of F statistics and that of parameter β3 is 0%; the probability of the intercept parameter is 3.03%, still it belongs to the interval 0-5%. Therefore, only β3 and α parameters significantly differ from zero, this meaning that just the exports explanatory variable is correctly introduced in the model.

- F statistics = 384.9854 is higher than F with (P-1, T-P) freedom degrees and 5% prag de significance level, whose critical value obtained from the specific table is F(4-1,105-4) = 2.696. This confirms the correct definition of the model (at least one of the three explanatory variables – external debt, foreign direct investments or exports is fit for explaining the behaviour of the GDP variable).

- The t-statistics values – computed for each estimator of the first two parameters are lower than the one rendered for t critical value with (T-P) freedom degrees and a significance level of 5%; t (105-4)=1,645. It results that the first two explanatory variables used are not relevant within the model. The t-statistics for the third parameter (13.308) exceeds the related critical value.

- The obtained adjusted R-squared is indeed higher than in previous models (92.16%), this meaning that the three explanatory variables explain 92.16% of GDP variance.

The Durbin Watson (DW) statistics indicates a value of 1.737297; this value do not belong any more to the interval (d2,4-d2)=(1.76 ; 4-1.76), meaning that the error series in auto-correlated. (d2 is extracted from the table considering k=4 parameters and T=105 data).

Table 2.1.

Indicators	**Model 1**	**Model 2**	**Model 3**	**Model TSLS**
Coeficient β1	**0.610929**	**0.330684**	**0.016963**	**0.409588**
Coeficient β2	**-**	**0.460119**	**-0.078361**	**0.493743**
Coeficient β3	**-**	**-**	**1.027295**	**-**
t-statistic β1	14.68909	5.832822	0.412661	2.596898
t-statistic β2	-	6.718064	-1.365715	2.655667
t-statistic β3	-	-	13.30821	-
Prob1	0.0000	0.0000	0.6808	0.0109
Prob2	-	0.0000	0.1753	0.0093
Prob3	-	-	0.0000	-
Coeficient α	**10.71861**	**7.390172**	**1.577747**	**4.824524**
t-statistic α	10.95133	7.708104	2.198428	4.425868
Prob	0.0000	0.0000	0.0303	0.0000
R-squared	**0.676882**	**0.782306**	**0.923997**	**0.764195**
Adjusted R-squared	**0.673745**	**0.777770**	**0.921597**	**0.759282**
F-statistic	**215.7692**	**172.4927**	**384.9854**	**186.0950**
Prob F-statistic	0.0000	0.0000	0.0000	0.0000
Akaike	**3.196818**	**2.836981**	**1.804859**	**-**
Schwartz	**3.247370**	**2.915621**	1.909713	-
Durbin-Watson	**2.235523**	**2.242166**	**1.737297**	**2.150270**

By analysing the table with centralized results for the three analysed models, we see that the third model cannot be considered due to the probabilities of the parameters β1 and β2 that exceed 5%. By comparing the first and the second model, we notice that the second one has a superior R-squared. In conclusion, model 2 is selected as the most appropriate of them.

4.3. Selected model parameter estimation by TSLS

As our analysis has started with data series at a given moment in time, delayed variables (t-1, t-2) would not have been an option for being used as instrumental variables. If we have used as instrumental variables exactly the explanatory ones: $\log_{dat08}$ and $\log_{i08}$, the same results as by means of OLS would have been obtained.

By using dat08 and i08 as instrumental variables, the results are close to those obtained by resorting to OLS, but the probabilities of the parameters β2 and β3 are 1.1%, respectively 4.55%. After several trials, we have decided to use as instrumental variables dat08, i08 and $\log_{exp08}$, for which the probabilities of parameters are: 1.09% for β1 and 0.93% for β3.

Comments made based on TSLS:

- All parameters have probabilities lower than 5%; therefore, the variables are correctly introduced in the model.
- As for OLS, in this case too the F and t statistics values exceed the critical ones taken from the related tables. Still, the adjusted R-squared decreases in TSLS as compared to OLS, from 77.77% to 75.93%.

4.4. Selected model autocorrelation and homoskedasticity hypotheses testing

4.4.1. Autocorrelation

The error autocorrelation has been rejected by the Durbin-Watson test for model 2 estimated by OLS. Yet, in order to strengthen this result, we have decided to use also the Breusch-Godfrey test.

The statistics BG = (T-P') * R² follows a distribution $\rightarrow \chi^2$ with P' freedom degrees and 5% significance level. It is also to be mentioned that P' represents the number of parameters contained in the model having as explained variable the resid series, obtained after having estimated model 2 (the analysed model), and as explanatory variables, the explanatory variables of model 2 completed by the delayed values of the endogenous variable:

$$\varepsilon_t = b_1 * \log_{dat08} + b_2 * \log_{i08} + a_1 * \varepsilon_{t-1} + a_2 * \varepsilon_{t-2} + a_2 * \varepsilon_{t-3}$$

In this model, we have P=3 parameters and T=105. P' is 2+3=5, so that the test statistics has the value:

$$BG = (105 - 5) * 0.22555 = 2.2555 < \chi^2_5 = 11.07$$

This statistics indicates us that we cannot reject the null hypothesis according to which the coefficients of the above-mentioned model are null, therefore model 2 presents no error autocorrelation.

4.4.2. Homoskedasticity

In order to test the error homoskedasticity, we have resorted to the White test implemented in Eviews.

The statistics W = T * R² follows a distribution χ^2 with 2*P freedom degrees, where R² is the determination ratio computed for one of the two regression models having the square of errors as explained variable and the square of the explanatory variables as explanatory variables, without cross terms, respectively with cross terms.

Without cross terms: W = 105 * 0.104471 = 10.969455 < W with 2*3 freedom degrees taken from the table = 12,592 => the null hypothesis, according to which the data are homoskedastic, is accepted.

With cross terms: W = 105 * 0.113288 = 11.89524 < W with 2*3 freedom degrees taken from the table = 12.592 => the null hypothesis, according to which the data are homoskedastic, is accepted.

In consequence, the White test reveals the absence of heteroskedasticity in model 2 estimated by OLS.

5. Conclusions

As result of our attempt to study the economic growth and its influence factors, we have created various models that have been estimated by OLS and TSLS methods, the best one being finally selected based on several criteria.

Out of the chosen series, the imports one has been eliminated due to the high level of collinearity. The trials to improve the simple regression model have lead to the selection of two important factors determining GDP: external debt and foreign direct investments, both having a positive influence on the economic performance of countries.

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.

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.

As regards the extended model, the positive relationship between GDP and external debt remains unchanged, the statement of its reversal after a critical threshold being still valid. We could also mention that the inelasticity of GDP maintains, but it has a lower value as compared to the one obtained within the simple regression model.

As for the relationship existing between foreign direct investments and GDP, the economic theory confirms that FDI and economic growth are directly correlated, the former contributing to technical progress, production increase and, finally, to the improvement of the living standard.

We can find in the economic theory cases when a negative relationship has been revealed for these two variables, but just for certain areas (for instance, the Latin America countries) and for short periods of time.

Considering that we have used logarithmic values, the values of coefficients can construed as elasticities. As regards the foreign direct investments, the elasticity coefficient is sub-unitary, this involving that GDP is inelastic in relation to foreign direct investments, increasing only by 0.33% when FDI increases by 1%.

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. Our findings are in compliance with those reacjed by the quoted authors also as regards the foreign direct investments. Still, their analysis does not comprise TSLS estimations, therefore a comparison from the perspective of this method being impossible.

6. Suggestions for further research

In view of going on with our economic growth analysis, we propose to resort to a panel data approach, therefore enlarging the perspective on the economic performance phenomenon and its

impact factors. As for the methodology, a GMM econometric estimation technique, with fixed versus random effects could be applied. The long-run relationship between variables could be also examined so as to see whether cointegration is present or not. If a cointegration relationship is revealed, the use Error Correction Models would be an interesting approach which might significantly enrich our study.

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