Problems with Mr Illarionov's Methodology

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For commentary see Notes Pages

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Thursday, Dec. 18, 2003. Page 1

Illarionov Makes His Case On Kyoto

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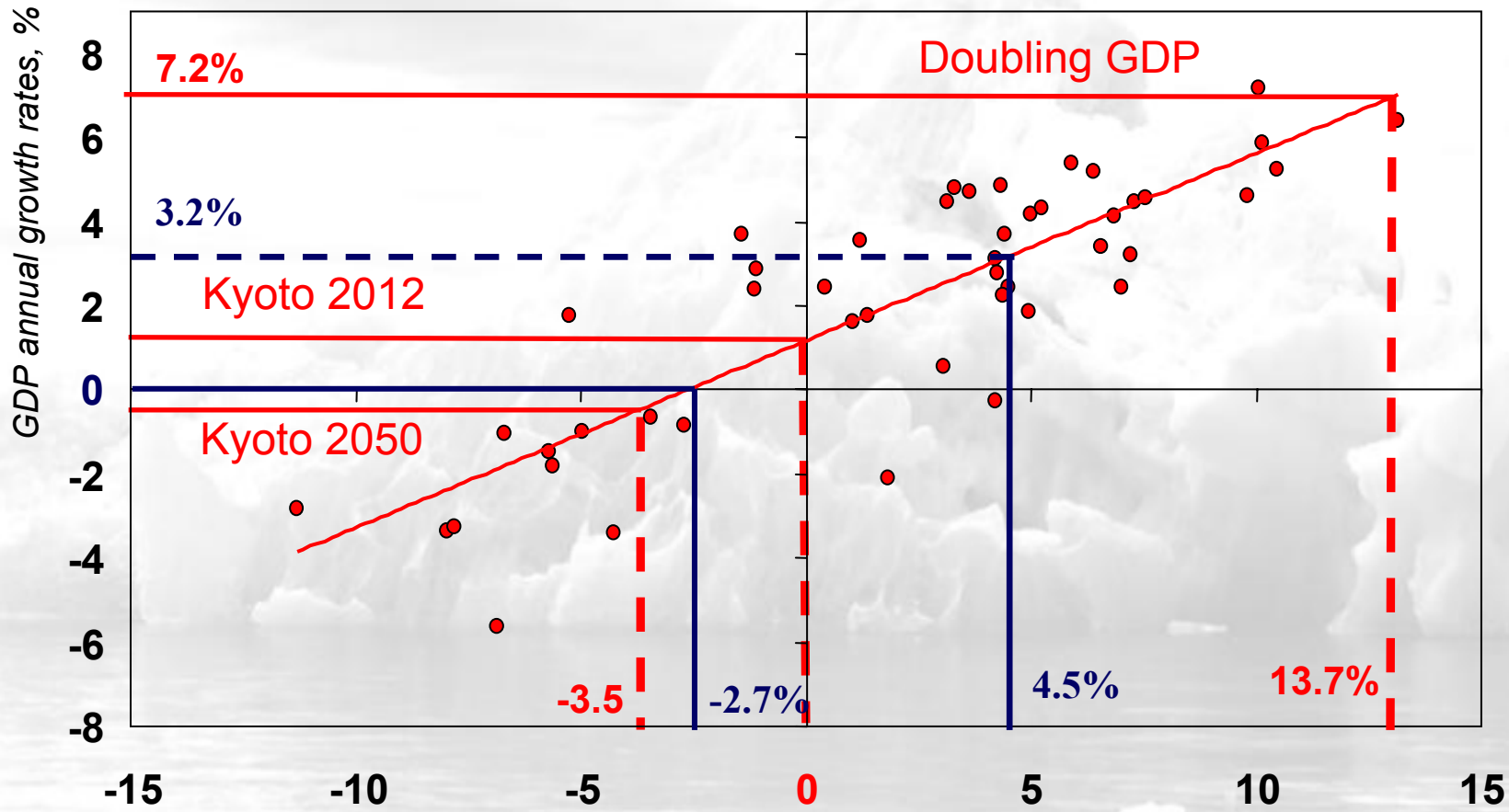
Illarionov argued that ***GDP growth and carbon dioxide emissions are fundamentally linked***, and that Moscow's targeted economic expansion will soon put Russia above the greenhouse emission limits set by Kyoto.

"In those countries we analyzed, ***each percent of GDP growth is accompanied by an increase of carbon dioxide emissions by 2 percent***," he said.

The Kyoto Protocol incompatible with economic growth. CO2 emissions are associated with economic growth in the mid-income countries (47 countries),1960-2000

Trend Line: $y = 0.44\,x + 1.17$ $R^2 = 0.71$

Trend Elasticity = 1 : 0.44 = 2.3 ('2.3% CO_2 growth per 1% GDP growth')



Zero GDP growth = 72% CO_2 reduction by 2050!

Red components based on: A. Illarionov, THE KYOTO PROTOCOL AND RUSSIA: WHAT IS TO BE DONE? National Press Club, Washington, DC, January 30, 2004, © Institute of Economic Analysis http://www.iea.ru/

- ‘Elasticity’ here is used in the sense of ‘CO2 growth/GDP growth’. The trend elasticity of 2.3 thus corresponds to Illarionov’s idea that ‘each percent of GDP growth is accompanied by an increase of carbon dioxide emissions by 2 percent’

[1][a] Doubling GDP in ten years requires an average annual GDP growth of 7.2%.[b]

[2-3] It is unclear why the Kyoto target is equated with an average annual emission growth of 0%, for this is clearly not true [maybe there was a misinterpretation of the Russian Kyoto target of 0% below 1990 levels]. In 2001, Russian emission stood at 1.6GtCO2, the Kyoto target is 2.4GtCO2. The real permissible average emissions growth till 2010 is thus ln(2.4/1.6)/9 = 4.5%. So even if Illarionov’s argument was sound, the permitted average annual GDP growth would be 3.2% and not 1.2%.

[4] Illarionov assumes a 2050 ‘Kyoto target’ of 74% below 1990 levels, which would require an average annual reduction in CO2 growth of 3.4% during the period between 2010 and 2050. The important point here is that the inclusion of this 2050 example illustrates that Illarionov does see his methodology suited for long-term projections.

[5] According to Illarionov’s method, all that would be needed by these ‘mid-income’ countries to resolve their long-term emission problem is to keep their GDP from growing (i.e. maintain GDP growth = 0%), for this implies –according to Illarionov – an annual emissions growth of -2.7%, which in 2050 (after 46 years) would leave them 72% below present levels![c] This conclusion might raise alarm bells about the validity of the Illarionov arguments in some minds, for they are certainly extraordinary.

Footnote (a): Numbers in square brackets refer to elements of the Power Point slide animation (‘mouse-clicks’)

Footnote (b): Text in red refers to Illarionov’s own views

Footnote (c): That is 81% below 1990 levels in the case of Russia.

Methodological Requirements

There are two fundamental methodological requirements which need to be satisfied in order to apply the sort of 'Trend Elasticity' projection method used by Mr Illarionov:

I. There has to be a justifiable expectation that the correlation (the 'trend') continues to exist during the projection horizon.

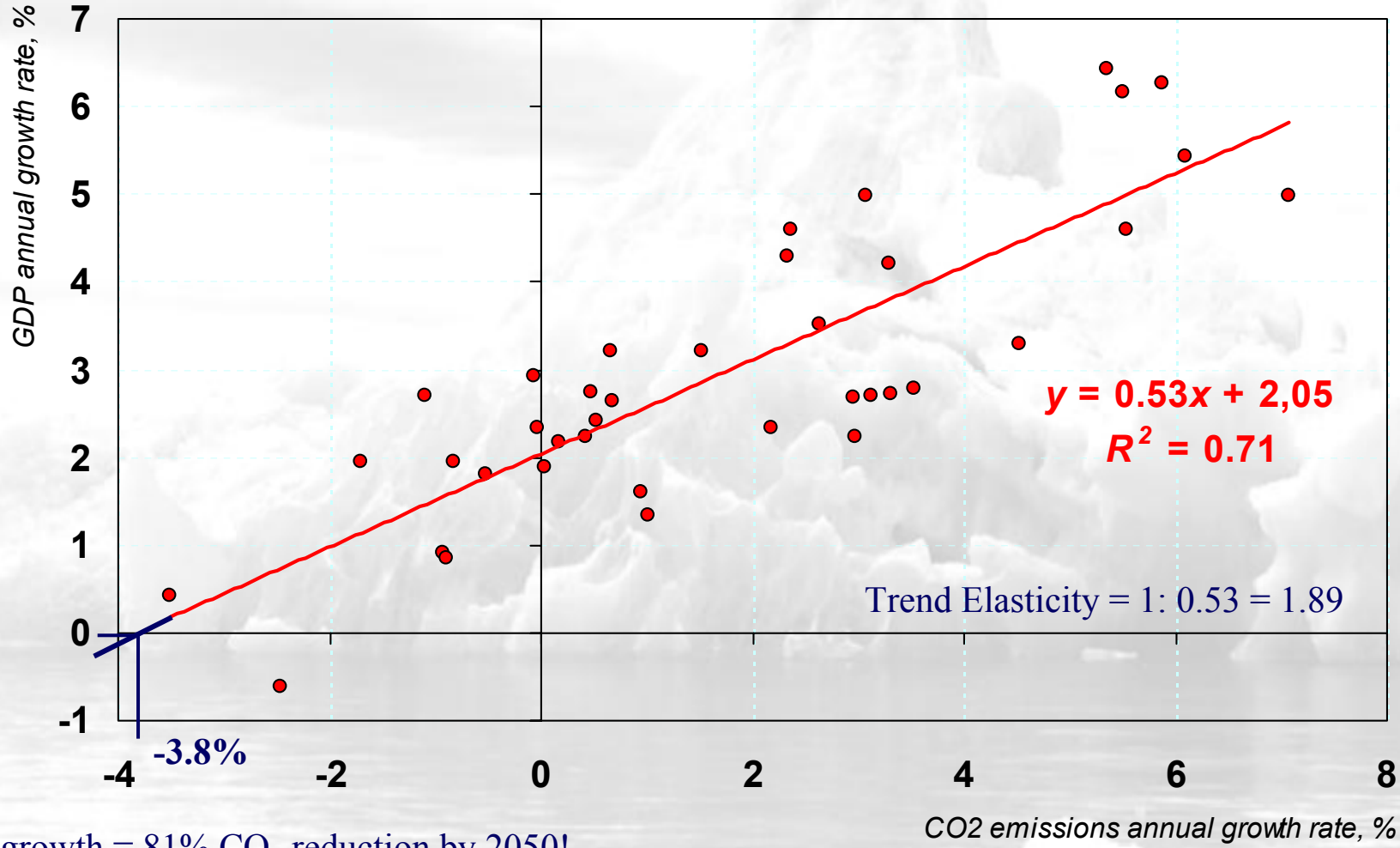
II. There has to be a justifiable expectation of how the correlation will evolve during the projection horizon.

- Because Illianorov's 'mid income countries'case – as well as his second example involving 'low income countries'[a] – are using trends established over the total range of (readily) available data, it is impossible to carry out some of the key temporal variations on the basis of which such expectations could be formed. However, his third analysis concerning 'developed countries' is based on the much shorter 'trend-period' of 1991 – 2000, which does allow for the sort of dynamic variations needed to form these expectetions.

Footnote (a): For which he establishes a trend described by $y = 0{,}48x + 1{,}22$ ($R2 = 0.66$)

The Kyoto Protocol is incompatible with wealth accumulation.

CO_2 emission are associated with economic growth in developed economies, too (38 countries), 1991-2000



Zero GDP growth = 81% CO_2 reduction by 2050!

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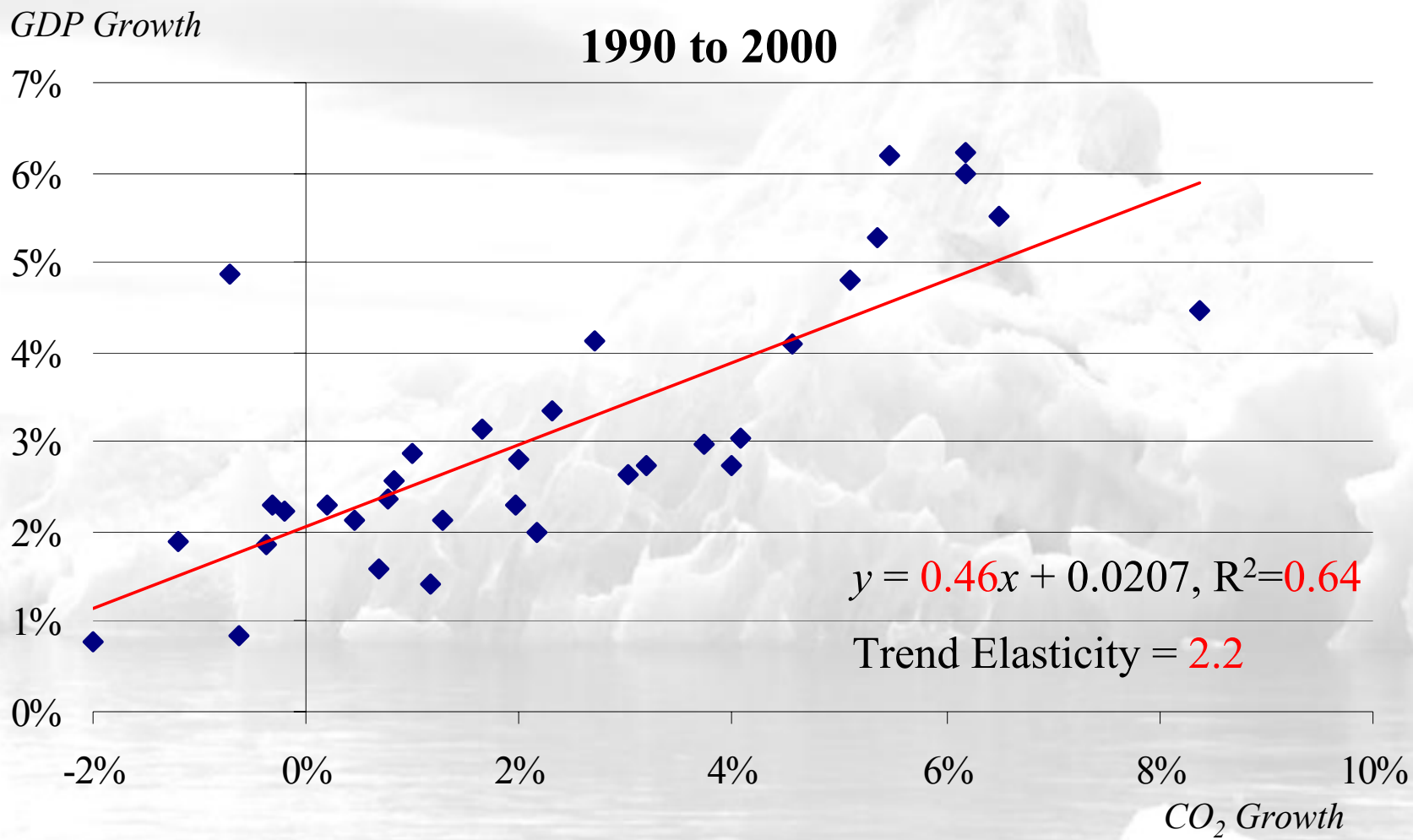
- **Illarionov's list of developed countries** (Countries in red font not included in the following analysis due to a lack of data):

Argentina	Finland	Malta	Switzerland
Australia	France	Mauritius	Taiwan
Austria	Greece	Netherlands	Trinidad and Tobago
Bahamas	Hong Kong	New Zealand	United Arab Emirates
Belgium	Hungary	Oman	United Kingdom
Canada	Iceland	Portugal	United States
Chile	Israel	Slovak Rep	Uruguay [*sic*!]
Cyprus	Italy	Slovenia	Venezuela [*sic*!]
Czech Rep	Japan	Spain	
Denmark	Korea,	Sweden	

- R^2 = The square of the *Pearson product moment correlation coefficient*, R, a dimensionless index that ranges from -1.0 ('perfect negative correlation'), 0 ('absolutely no correlation') to 1.0 ('perfect positive correlation') and reflects the extent of a linear relationship between two data sets.

[1-2] Note, incidentally, that economic stagnation (zero annual GDP growth) corresponds to an average annual emissions growth of -3.8%, which would lead these developed countries to 81% below present emission levels in 2050. In short, Illarionov's method suggest also for rich countries that all that needs to be done to overcome the emission problem is to keep GDP at present levels! In short, according to Illarionov's method, there is really no need for rich countries to worry about the consequences of the most draconian emission reduction requirements, as long as they are happy with the level of riches they already have. An interesting conclusion indeed!

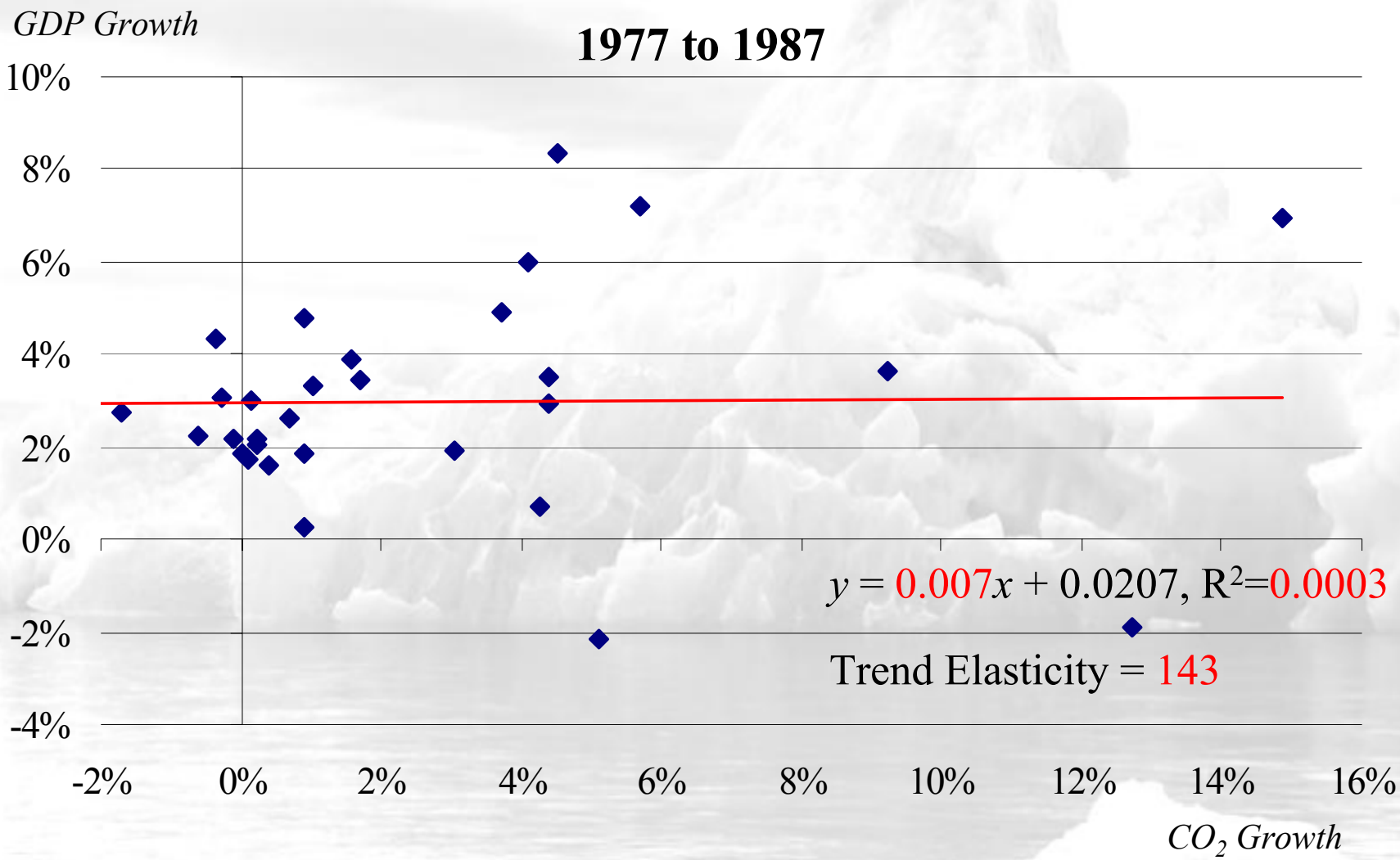
Mr Illarionov's 'Developed Country' Case Revisited



Data Sources:
GDP: IMF *The World Economic Outlook* (WEO) Database April 2003; 1970-2000; Local currency, fixed prices
CO_2: CDIAC; Total Emissions (excluding land-use).

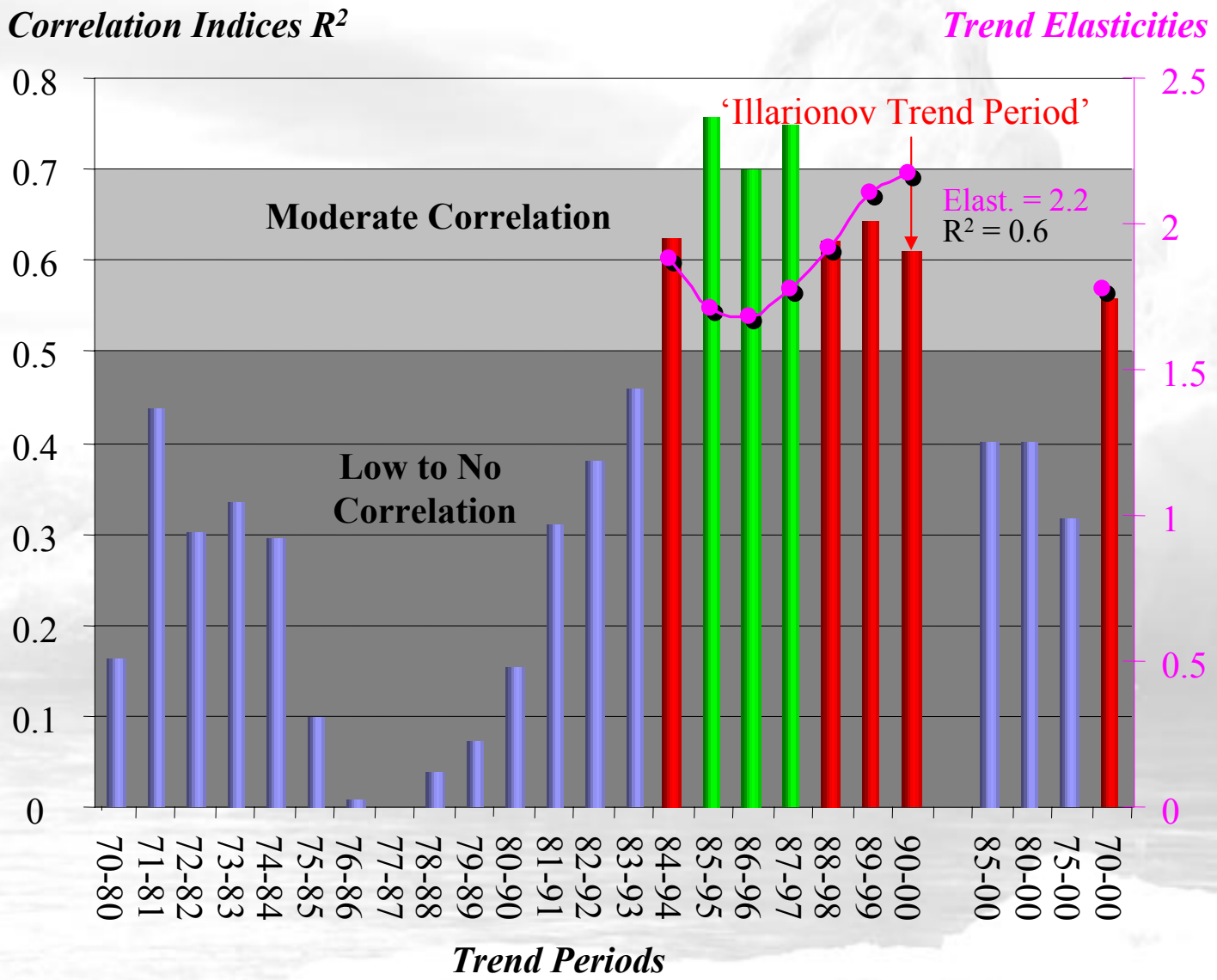
- Not knowing Illarionov's data sources, the following discussion is based on IMF and CDIAC data for his 'developed countries' and a 10-year trend period. The correlation turns out to be slightly weaker than the one he established, with somewhat stronger trend elasticity of 2.17. However, for the present methodological examination, these differences can be ignored.
- How could one form some sort of justifiable expectations concerning the trend evolution for the next ten or even fifty years? Probably the only way is to consider the historic evolution of the correlation during the period for which there are data, in this case 1970 – 2000.
- There are two ways in which such temporal variations can be carried out: The first one is to move the 10-year trend period into the past, i.e. to analyse the correlation not only for the period of 1990–2000, but also for 1989–1999, 1988-1998, ….. and 1970-1980.

Mr Illarionov's 'Developed Country' Case Revisited



- Interestingly, for the present case, the pattern for the period 1977 – 1988 exhibits no correlation whatsoever ($R^2 = 0.0003$)

Mr Illarionov's 'Developed Country' Case Revisited



[1] Illarionov is basing his analysis on one period for which he determined average annual growth data which he then tests with a linear regression. The key numerical parameter estimated through this procedure is the slope of the regression, the 'trend elasticity. The correlation obtained for this trend period is moderate, with a trend elasticity of somewhat over 2.

[2] Shifting the trend period backwards in time, the correlation improves, in some cases to deliver 'good' correlations (R^2 >0.7)

[3] However, going further into the past we find that two thirds (14 out of 21) of the 10-year patterns have a correlation index of less than 0.5 which is difficult to describe as a significant correlation at all.

[4] A similar picture emerges if the second type of temporal variation is applied, in which the initial year of the trend period is varied, i.e. 1990–2000, 1985–2000, … 1970–2000.

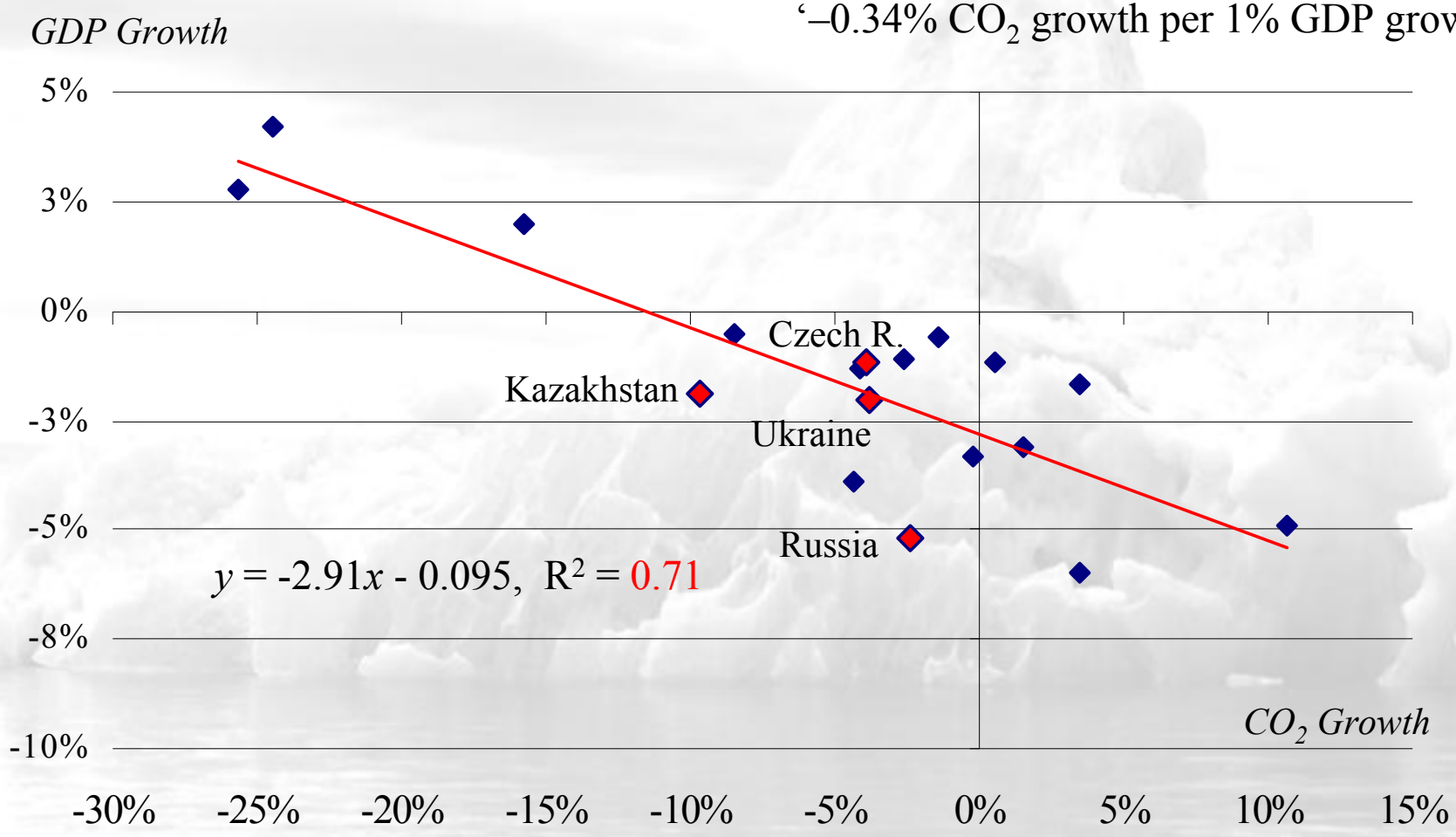
- Note that the issue here is the *existence* of a significant correlation (of a linear trend) and not the evolution of the trend parameters (in this case the 'trend elasticities'),
- What sort of expectation concerning future periods could be justified on the basis of this picture? It is by no means clear whether *any* expectations could be justified on the basis of the available historical data, particularly for longer-term projection horizons (beyond a couple of years). In the absence of a much more detailed methodological analysis, the pattern of correlation coefficients, if anything, would seem to suggest that the trend used by Illarionov is going to disappear during the next ten years.

[5] Yet even for those trend periods with moderate to good correlations where we can justifiably speak of a 'trend elasticity' we find that –contrary to Illarionov assumption– these elasticities are by no means time independent. They fluctuate significantly even over short time periods. So even if Illarionov's correlation does not disappear, his purely static method is likely to be flawed even for short-term projections.

Correlations: Spurious or Not Spurious?

"Green Trend" Countries? (18)

Trend Elasticity: -0.34
'–0.34% CO_2 growth per 1% GDP growth'



7.2% GDP p.a. growth (i.e. doubling of GDP) over 10 years = 45% reduction of emissions

- It is not self-evident even if a correlation is 'good' (R^2 >0.7) that it is 'real', (corresponds to some causal relationship) and not spurious, particularly if the underlying pool of data itself is completely uncorrelated, as indicated in the Appendix slide. The correlation established here is based on a selective choice of data alone and is unlikely to represent a real relationship. Indeed, the 'reality' of this type of correlation can only be established though a detailed analysis of the similarities and dissimilarities of the economic activities in the countries in question.

List of countries (all data for 1998)

Czech R.	Japan	Panama	Ukraine
Ethiopia	Kazakhstan	Papua N.G.	UAE
Fiji	Macau	Peru	Zimbabwe
Gabon	New Zealand	Philippines	
Guyana	Palau	Russian	

Conclusions

Mr Illarionov's arguments are fundamentally flawed.

(I) They are based on the unjustified assumption that certain current correlations ('trends') will continue to exist during his chosen 10 to 50 year projection horizons.

(II) Even if he were justified in this assumption, his second assumption that these correlations are constant over time is not justified.

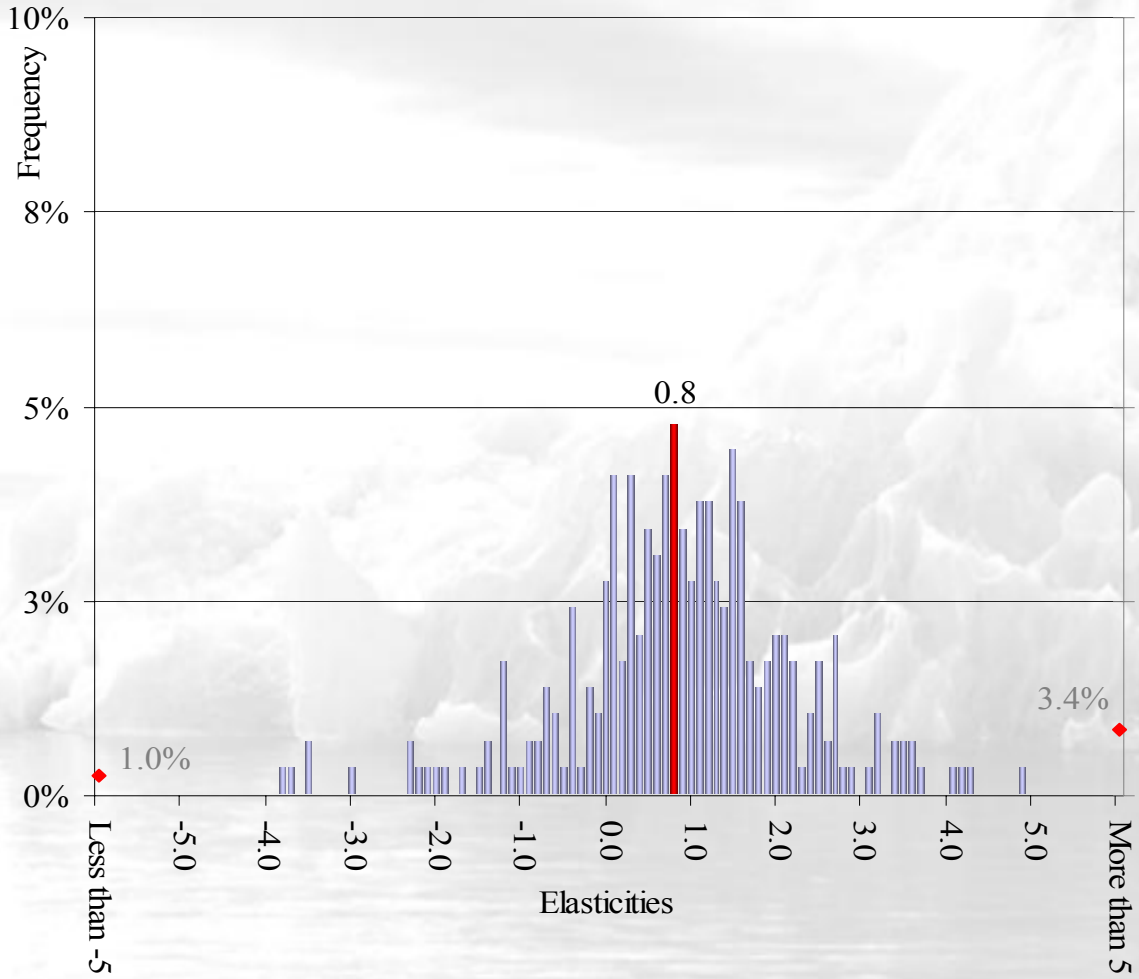
- His conclusions based on these arguments must therefore be rejected as ill-founded.
- The only reliable way to make projections about GDP or emissions (or anything else) is by way of dynamic methods such as used in economic modelling.

• Illarionov applies a purely static argument to a fundamentally dynamic problem with the inevitable misleading consequences.[a]

Footnote (a): This seems to be symptomatic for Illarionov's analyses. Tatiana Gurova, already in March 2002, characterised his convictions by 'The love of static models and structures over dynamic models that take time into account'['Illarionov and poor, poor, pitiful Russia', *Expert* #10 (317) 11 March 2002]

Statistical Appendix:

Frequency of CO_2 Elasticities: All Countries, 1980-98, GDP growth between 6% and 8% p.a.



A Frequency analysis of the elasticities which have occurred in the context of economic growth between 6% and 8% over the last twenty years reveals that half of them were below 0.8 (the median of the distribution)

The following preliminary result of a statisticel analysis of all the CO2 and GDP growth rates between 1980 and 1998 reveals no correlation at all.

Model:

$\Delta CO_2(t) = b\ \Delta GDP(t) + c + \varepsilon(t)$

Method: Pooled Least Squares

Sample: 1980 to 1998, all countries

Included observations: 19

Number of cross-sections used: 176

Total panel (unbalanced) observations: 3055

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.050723	0.017581	2.885156	0.0039
ΔGDP	0.176737	0.255180	0.692599	0.4886

R-squared	0.000157	Mean dependent var	0.055003
Adjusted R-squared	-0.000170	S.D. dependent var	0.909636
S.E. of regression	0.909713	Sum squared resid	2526.598
F-statistic	0.479693	Durbin-Watson stat	2.138577
Prob(F-statistic)	0.488614		