Globalization limits. Does the world economy reached globalization limit?

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Recent world economy situation shows strong correlations among countries, banks, companies, etc. These correlations are symptoms of globalization of the world economy. Within this work various measures and globalization aspects are discussed. The time series analysis of the main economy indexes (Gross Domestic Product, Consumer Price Index, stock market indexes, inflation) is performed. The analysis is based on the Manhattan l_1 (Eq.1), correlation (Eq.2) and entropy (Theil index, Eq.4) distances.
The distances are defined as follows:
Let assume that A, B are time series and a_i, b_i theirs elements, than

Manhattan distance the l_1 distance is defined as:

$$d_l(A,B)(t,T) = |\langle a_i - b_i \rangle_{(t,T)}| \tag{1}$$

where the mean value is defined in the standard way $\langle a_i \rangle_{(t,T)} = \frac{1}{T}\sum_{i=t}^{t+T} a_i$ and $|\ |$ denotes absolute value.

Correlation distance the correlation distance is:

$$d_s(A,B)_{(t,T)} = \sqrt{\frac{1}{2}(1 - C_{(t,T)}(A,B))}, \tag{2}$$

where

$$C_{(t,T)}(A,B) = \frac{\langle AB \rangle_{(t,T)} - \langle A \rangle_{(t,T)} \langle B \rangle_{(t,T)}}{\sqrt{\langle A^2 \rangle_{(t,T)} - \langle A \rangle^2_{(t,T)}}\sqrt{\langle B^2 \rangle_{(t,T)} - \langle B \rangle^2_{(t,T)}}} \tag{3}$$

Entropy distance In order to calculate the entropy distance first the time series is mapped through the Theil index Eq.4,

$$Th_A(t,T) = \frac{1}{T}\sum_{i=t}^{t+T}\left(\frac{a_i}{\langle A \rangle_{(t,T)}} \ln \frac{a_i}{\langle A \rangle_{(t,T)}}\right), \tag{4}$$

then the correlation (Eq.3) or l_1 (Eq.1) distance applied so two entropy distances are considered:

entropy-Manhattan distance

$$d_le(A,B)(t,T_1,T_2) = |\langle Th_A(t,T_1) - Th_B(t,T_1) \rangle_{(t,T_2)}| \tag{5}$$

entropy-correlation distance

$$d_se(A,B)_{(t,T_1,T_2)} = \sqrt{\frac{1}{2}(1 - C_{(t,T_2)}(Th_A(t,T_1), Th_B(t,T_1)))} \tag{6}$$

In the analysis the the four distance measures are applied and results discussed: the Manhattan distance (Eq.1), correlation distance (Eq.3), entropy-Manhattan (Eq.5) and entropy-correlation (Eq.6). The distance measures are applied to the time series of the macroeconomy parameters of the most developed countries: Austria, Belgium, Canada, Denmark, Finland, France, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, U.K., U.S.A, and Germany. The analysis consists of four steps:
(i) the chosen time series are remapped using Theil index (Eq.4),
(ii) the time windows sizes are chosen and the distances between countries are calculated (the distance matrices are found), then
(iii) two network structures (Bidirectional Minimal Length Path and Locally Minimal Spanning Tree) are constructed and its statistical characteristics measured.
(iv) The evolution of the networks' statistical parameters analysed.
The results obtained by application of different time series distances are compared. The role of the time window sizes discussed and shown that the globalization process is in fact unification of the time series entropies, therefore the most appropriate measure to observe globalization process is the entropy-Manahatan distance. On the example of Euro introduction the influence of political regulations onto the entropy evolution is discussed.

Keywords
time series analysis, distance analysis, globalization, entropy