Multifractality in Transition Economies

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Abstract

A comparable statistical analysis for the currency exchange rates of the countries with Transition economies has been made. Self-criticality has been demonstrated and studied. Non-linear effect for self-criticality indexes has been demonstrated. All effects are essentially nonlinear and differ from ones in the advanced economies.

Summary

As we demonstarted, the scaling properties of the currency exchange rates for the countries with transition economies are similar to those observed in other parts of the world.

There are a lot of differencies in qualitative behaviour among these four groups of countries. The interpretation is not straightforward and a lot of things still need to be understood.

The main conclusions can be itemized as follows (see Summary Table III):

1) Scaling behaviour over three four decades does exsist. There are two different scaling regions. First one corresponds to the short– and mid–term correlations (up to the $2.5-3$ monthes) $0 < logN < 4$, second one corresponds to the long–term correlations $4 < logN < 6.5$. The origin of crossover near $logN \sim 3-4$ still needs to be understood.

2) The function ξ_q is strongly non-linear for all transition economies as well as for selected developed countries. We can see that exponents ξ_q for $q = 1$ and $q = 2$ are strongly different from TSMT values in transition economies. There are two different slopes of curve $\xi_q(q)$. Both of these parts are almost linear, but have different coefficients. Crossover area is in the vicinity of $q \sim 1.0-2.0$. This also needs to be understood.

3) Growth rate (5) also exhibits scaling behaviour with $\mu \sim 0.0$ for advanced economies, $\mu \sim 0.2$ for Baltics and part of the Central and Eastern Europe countries and $\mu \sim 0.4$ for Russia, Ukraine Bulgaria and Romania Long–term data (μ for $n < 500$) giving almost the same results as short– and mid–term (μ for $n < 100$).

4) $P_n(0)$ distribution has been calculated for returns $(Z_n(t))$ as well as for logarithms of returns $(L_n(t))$. Last one looks more robust. The center of distribution $P_n(0)$ demonstrates scaling behaviour $\sim n^{-1/\alpha}$ in a vide range over N $(0 < logN < 4.5)$ where advanced economies have $\alpha \sim 1.50$, Baltics and

CEE countries have $\alpha \sim 1.25$, and CIS countries (Russia and Ukraine) have $\alpha \sim 1.00$.

5) Autocorrelation coefficients (7) always become zero. This gives us an arguments toward an evidence for the existence of a low–dimensional deterministic chaos, but further investigations needed.

6) Power spectra have scaling with different $\gamma(n)$ dependencies. Roughly, $-4 < \gamma < -1$, which corresponds to the negative values of Hurst exponent in the range $-2.5 < H < -1$. Asymptotically, for large n (greater than 2 years), γ is close to the value for Classical Brownian motion ($\gamma \sim 2$, $H \sim 0.5$). For short–term returns ($n = 1$) spectra are almost flat and corresponds the gaussian white noise. The origin of this $\gamma(n)$ dependency is unclear.