BHP UNIVERSALITY HYPOTHESIS VERIFICATION FOR BET-FI INDEX OF BUCHAREST STOCK EXCHANGE

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Abstract:
In this paper we show the assumption of BHP universality BET-FI index from BVB (Bucharest Exchange Stock) on the assumption of universality issued paper [4] on the Dow Jones index composition (DJIA30) and Standard & Poors 100 (S & P100) by Gonçalves and Pinto. BHP (S. T. Bramwell, P. C. W. Holdsworth, J. F. Pinton) distribution is a non-parametric probability distribution from GHT (Gumbel-Fisher-Tippett) distributions classes discovered from a magnetization problem. Universality of this distribution was shown in electricity, hidrology, stocks. This paper extend results from [9]-[10] recently submitted in spirit of [4] using some software tools developped.

Key words: HP distribution, universality hypothesis, BET-FI, BVB.

JEL Classification: C02, C12, C16.

INTRODUCTION

We will define α-daily fluctuation of an index and we present the universality conjecture of 2/3-daily. Based on link beetween Uniform distribution of [0,1] and BHP distribution we can test statistical hypothesis based on conjecture. We used as application data captured from BVB.

1. α-DAILY FLUCTUATION OF AN INDEX

In [4], *Gonçalves and Pinto* have proposed a new way to check the *universality hypothesis* about stock indexes. They were tested in [4] hypothesis on the component indices Dow Jones (DJIA30) and Standard & Poors 100 (S & P100) on the New York Stock Exchange. We present the construction of Gonçalves and Pinto: Let I an index from a Stock Exchange with composition

$$COMP(I) = \{s_1, s_2, ..., s_n\}$$

where $s_1, s_2, ..., s_n$ are n traded symbols. Let denote P(I,t) *closing value on day t of index I* and P(s,t) *closing value on day t of symbol s*. For a symbol or an index s, we denote *daily return on day t* as:

$$R(s,t) = (P(s,t) - P(s,t-1)) / P(s,t-1)$$

or alternative, we can use for daily return formula:

$$R(s,t) = \ln P(s,t) – \ln P(s,t-1).$$

For each day t define *mean of index at closing the day t* as:

$$m(I,t) = [\ P^a(s_1,t) + P^a(s_2,t) + ... + P^a(s_n,t)\ ] / n,$$

and *dispersion of the day t*:

$$s(I,t) = \{\ [\ P^{2a}(s_1,t) + P^{2a}(s_2,t) + ... + P^{2a}(s_n,t)\ ] / n - m^2(I, t)\ \}^{1/2}.$$

With these notations define the *α-daily fluctuation of the index I* as:

$$df(I,t) = (P^a(I,t) - m(I,t)) / s(I,t).$$

2. BHP DISTRIBUTION

S. T. Bramwell, P. C. W. Holdsworth, J. F. Pinton introduced (v. [1]) a new non-parametric distribution (called BHP) after studying some magnetization prob lems in 2D. Probability density function of distribution is:

$$p(x)=\int_{-\infty}^{\infty}\frac{dx}{2\pi}\sqrt{\frac{1}{2N^2}\sum_{k=1}^{N-1}\frac{1}{\lambda_k^2}}\exp\{ix\mu\sqrt{\frac{1}{2N^2}\sum_{k=1}^{N-1}\frac{1}{\lambda_k^2}}-\sum_{k=1}^{N-1}[\frac{ix}{2N\lambda_k}-\frac{i}{2}arctg\frac{x}{N\lambda_k}+\frac{1}{4}\ln(1+\frac{x^2}{N^2\lambda_k^2})]\}$$

where λ_k are eigenvalues of adiacency matrix of some specific graphs (v. [2]). *C. Pennetta, E. Alfinito, L. Reggiani* re-discover (v. [6]-[8]) this distribution at one specific electrical rezistivity problem. Structural, a BHP distribution is a particular *Gumbel distribution* (v. [3]) - named sometime *Fischer-Tippett distribution* (v. [11]). Probability density function (pdf) of BHP can be aproximated (v. [1]) with:

$$f_{BHP}(x) = K * \exp\{a * [t - \exp(t)]\}$$

where parameters are (v. [1], [8]):

t = b * (y - s)
a = π / 2
b = 0.936
s = 0.374
K = 2.15

In [2] suggested values are:

t = b * (y - s)
a = 1.5806801
b = 0.9339355
s = 0.3731792
K = 2.1602858

In [6], [7] suggested values are:

t = b * (y - s)
a = π / 2
b = 0.936 ± 0.002
s = 0.374 ± 0.001
K = 2.15 ± 0.01

BHP pdf and normal distribution's pdf in lognormal scale can be seen bellow (chart was generated via a *Visual Basic for Application* program in Microsoft Excel):

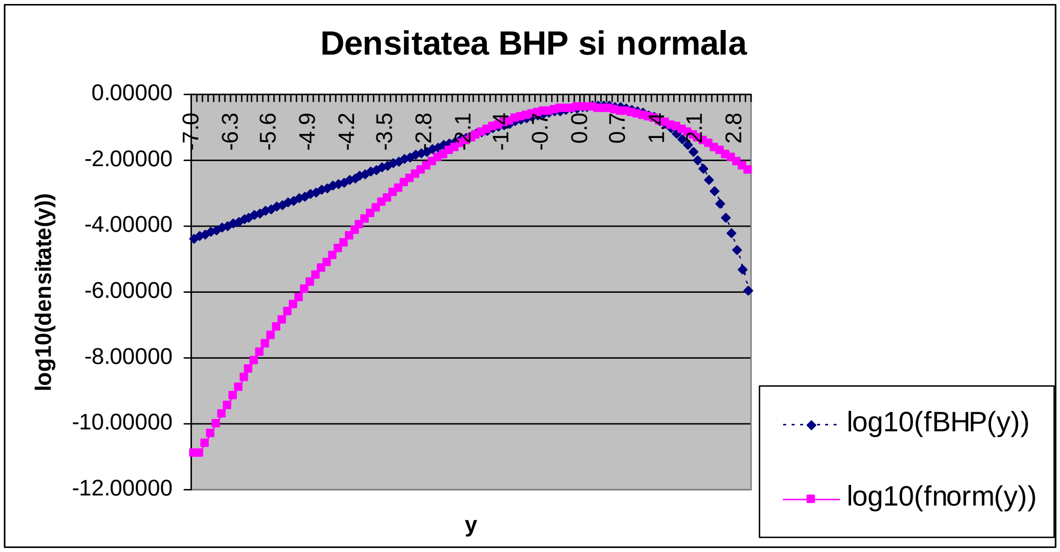

Figure no. 1 BHP pdf and normal distribution's pdf in lognormal scale

3. HYPOTHESIS OF 2/3-DAILY FLUCTUATION

Based on notations can issue the following conjecture (reviewed in [4] for the U.S. stock market indices remember where):

Conjecture (of BHP universality): For a = 2/3, the series $(df(I,t))_{t>0}$ verifies the BHP distribution.

Note: The type of $P(.,t)^{2/3}$ are called in [4] as *Cubic Root of the Daily Return Squared* (abbreviated CRDRS).

4. CONJECTURE VERIFICATION ON BET-FI FROM BVB

We try to check conjecture with the following values of the Bucharest Stock Exchange (see [9]), where trading Romanian regional Financial Investment Companies (SIF Moldova, SIF Muntenia, SIF Transilvania, SIF Oltenia, SIF Banat-Crisana) and is computed daily BET-FI index. Composition of BET-FI index is:

COMP(BET-FI) = {SIF1, SIF2, SIF3, SIF4, SIF5}.

We will resume the procedure as in the case presented by Gonçalves and Pinto about *Wall Street*, namely:

a = 2 / 3
I = BET-FI
n = 5
s1 = SIF1
s2 = SIF2
s3 = SIF3
s4 = SIF4
s5 = SIF5.

First we will capture data from [12] (we choose 2nd semester of 2008) with a Vi sual Basic for Application scripts. All the elements were also calculated necessary to assess the daily fluctuation df. A chronogram of df can be view bellow:

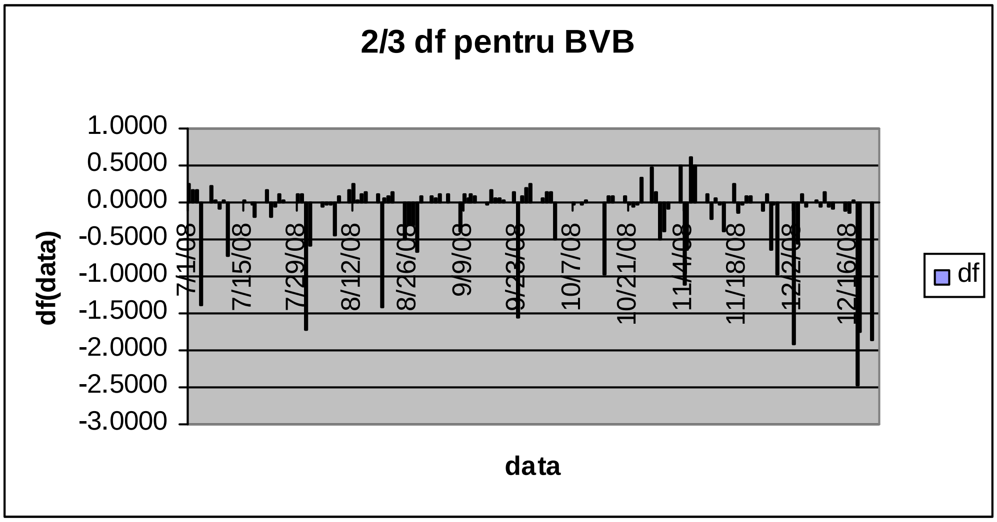

Figure no. 2 A chronogram of df

From df series we build a new series z by:

$$z_i = s - \ln(-\ln(df_i)) / b$$

where parameters b and s are specific of BHP distribution:

b = 0,936 ± 0,002
s = 0,374 ± 0,001

Testing universality of df are reduced at testing uniformity on (0, 1) for z. A simple histogram for df (see next figure) shows that we have not uniformity, agglomeration benefits in an area value of 0.5:

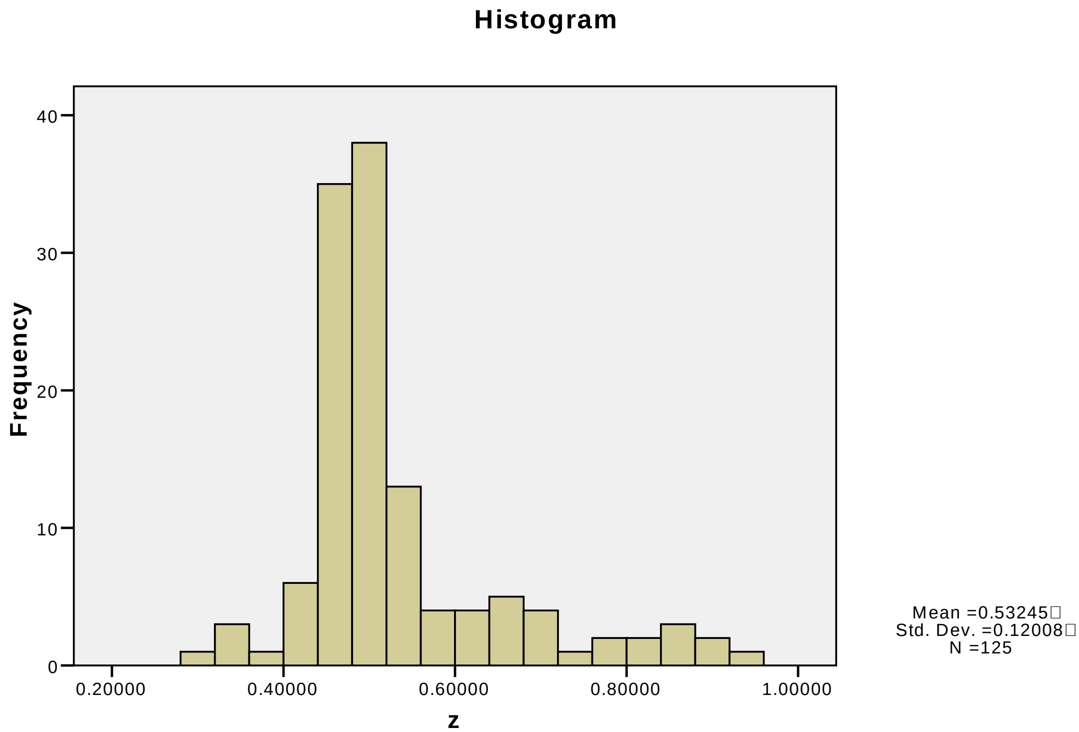

Figure no. 3 A simple histogram for df

This can not be certified unless a statistical test is applied. Applying Kolmogorov -Smirnov test for uniform distribution using SPSS 15.0 obtain a low de gree of significance, which convince us that the uniform distribution for z is rejected, i.e. the assumption of universality is rejected for df:

One-Sample Kolmogorov-Smirnov Test

			z
N			125
Uniform Parameters(a,b)	Minimum		.29356
	Maximum		.93461
Most Extreme Differences	Absolute		.377
	Positive		.377
	Negative		-.151
Kolmogorov-Smirnov Z			4.216
Asymp. Sig. (2-tailed)			.000
Monte Carlo Sig. (2-tailed)	Sig.		.000(c)
	95% Confidence Interval	Lower Bound	.000
		Upper Bound	.000

a Test distribution is Unif orm.
b Calculated from data.
c Based on 10000 sampled tables with starting seed 299883525.

5. CONCLUSIONS. FURTHER WORKS

In our opinion, check the assumption of universality 2/3 -fluctuation of BET-FI index was not conclusive, and we can not confirm or reject conjecture. Explanation can be based on:

a) the accuracy of density function estimates for BHP (an approximation was used GFT) and distribution function, defined as full from -7 (below this value the area under the graph is negligible) amount approximated Darboux-Newton, with the rule division 0.1;

b) use df for a relatively short range (approximately 120 days of trading at BVB in semester II of 2008, unlike the cited paper that used a series of thousands of days).

Several directions of development of ideas are listed below:

1) recalculation of density function of BHP distribution using numerical methods and methods like Monte Carlo;

2) finding a suitable statistical test for BHP distribution and implementation of the software;

3) verifying the hypothesis of universality for all stock indices on the BVB to define the period of their life;

4) approaches the quality of universality, that of forcing the parameter (I have seen it is fixed, a = 2/3, as the paper cited).

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