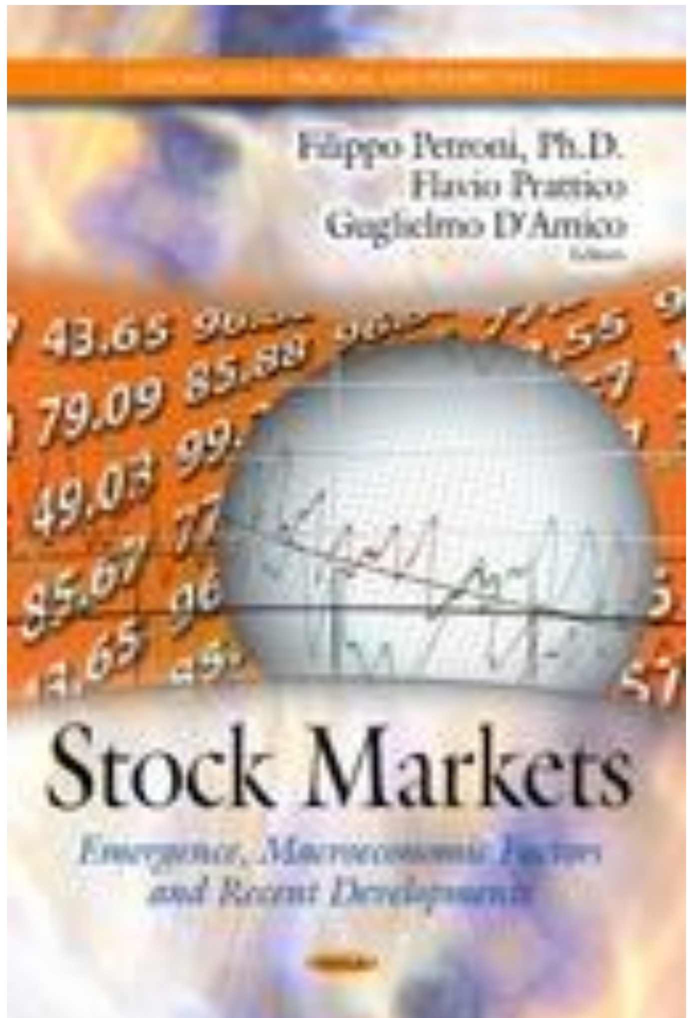
Viktor Zharkov: fibonacci numbers in p-adic theory of stock market



Fractals, Multifractals & p-adic

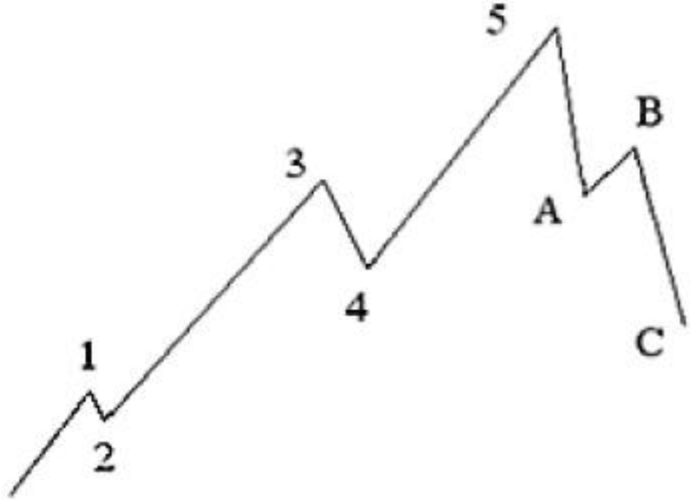
- Two approach
- 1) Mandelbrot (Global description of fractal)
- 2) p-adic (Vladimirov, Steklov Mathematical Institute), Local description,
- Good for traders.

Wavelets & p-adic

- P-adic as bases of Wavelets
- Work of S. Kozyrev (Steklov Mathematical Institute)
- Eigenfunction of gradient as Haar wavelets.

Elliott wave theory

VERY PRACTICAL APPROACH BUT UNKNOWN MATHEMATICAL BASES



P-adic mathematics

A new look at the price dynamics
Prices are described by P-adic numbes!

All know the fields of real numbers: 0.314…, 2.35:

$$10^{\nu}\sum_{n=0}^{\infty} b_n \left(\frac{1}{10}\right)^n$$

Why these numbers are bad? Answer: Heavy tails !

When you have heavy tails, you're dealing with a p-adic numbers!

$$x = p^{\nu}\sum_{n=0}^{\infty} a_n p^n$$

P is prime number (the base of p-adic fields)

Comparison of p-adic function and real data

Main procedure: Mapping: $a_n \to (a_n)^D$ D is fractal dimension

Real Data

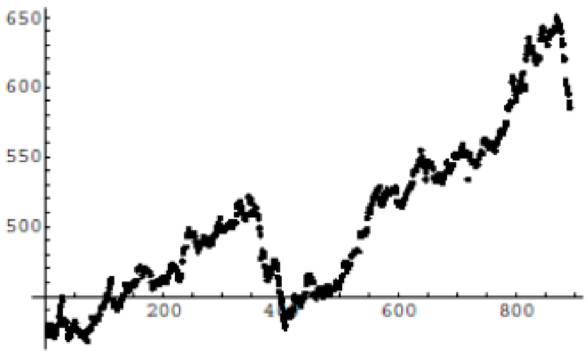


Fig 2. *Russian stock Index*

Mapping of P-adic straight line

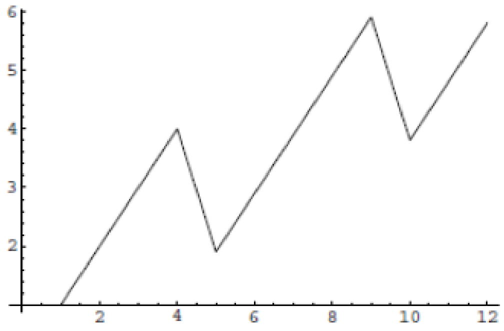


Fig.3. *Subcritical wave (First Level of Fractal) for D>1, p=3*

Two type of p-adic function (Elliott waves): subcritical and supercritical

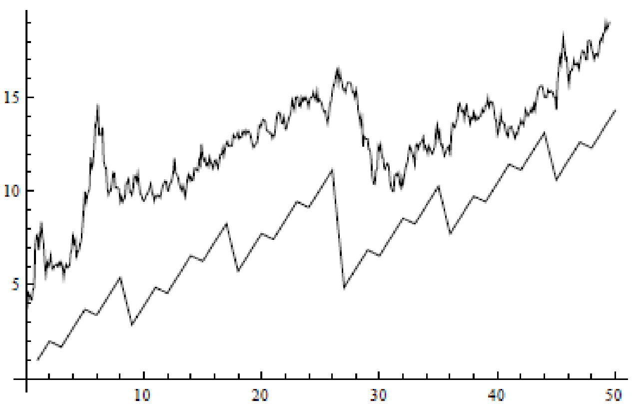


Fig 4. *Subcritical wave (Third Level of Fractal)for D>1, p=3 The second curve shows the real data*.

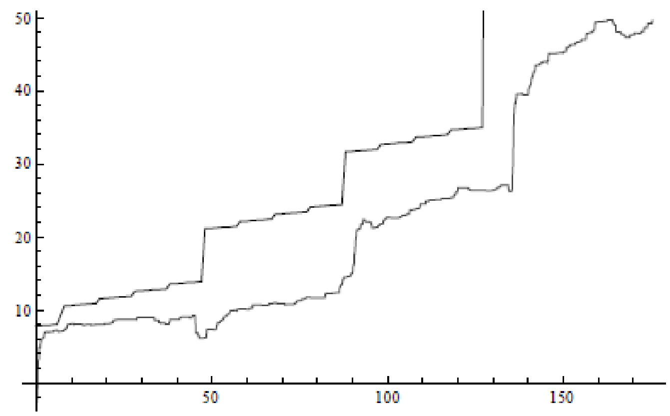
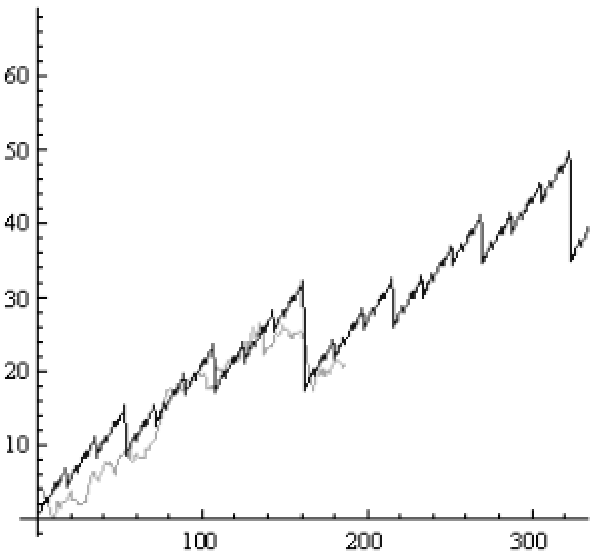
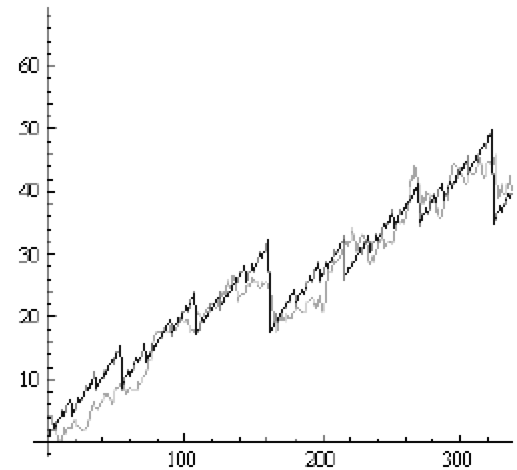


Fig 5. Supercritcal wave (third Level of Fractal) for D<1, p=3
This type of wave is not presented in the Elliott theory.

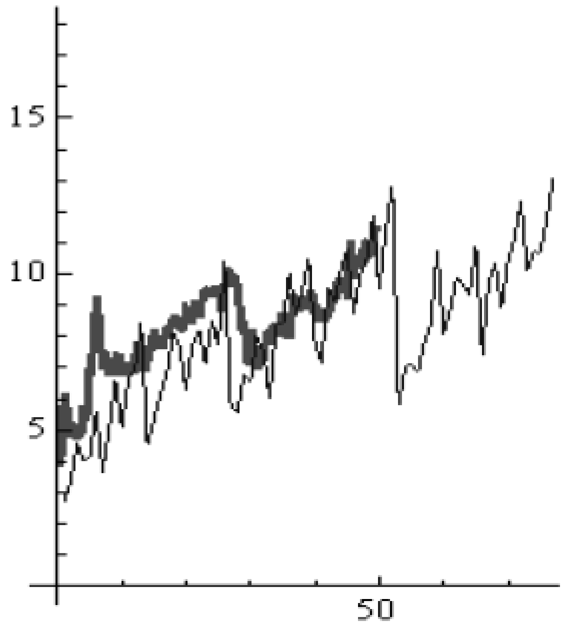
P-adic interpolation and extrapolation as Forecast procedure

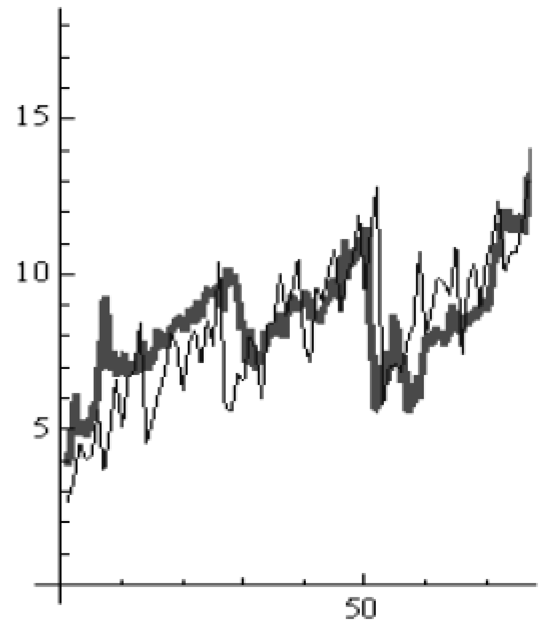




01.07.2006-01.04.2007 *IBM Year timeframe* 01.07.2006-01.07.2008

Forecast – PROGNOZ of Gazprom



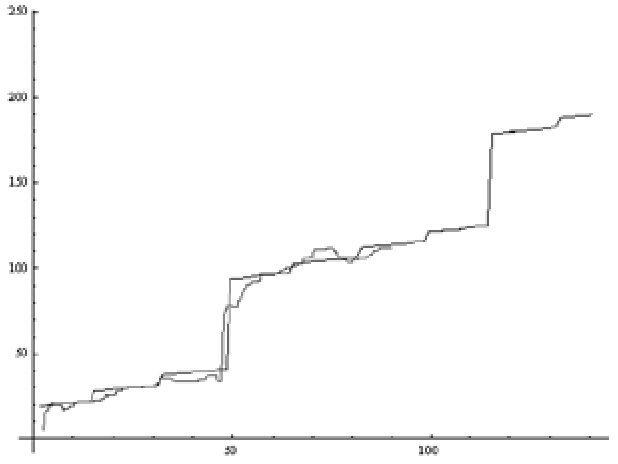


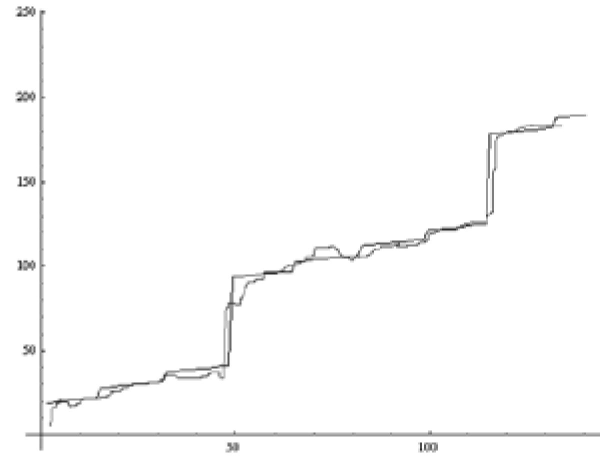
Gazprom Daily time frame

01.06.2009

01.06.2009-02.06.2009

Forecast: RTS Index





RTS index Weekly time frame

27.05.2009-30.05.2009

27.05.2009-1.06.2009

The future!

- As well as “Trend is You Friend”   P-adics are also very nice !
- P-adic Technical analysis?!

Fibonacci number from enveloping theory

Fourier basis

$$Z(q) = Trq^{L_0}$$

Statistical model

Expression for function

$$\prod_{n=2}^{\infty} L_{-n}^{s_n} \left|\Omega\right\rangle,$$

$$Z_0(q) = q^{-k} \prod_{n=2}^{\infty} \frac{1}{1-q^n}.$$

First and second order

Expansion for result

$$Z(q) = \sum^{k} f_r J^r ,$$

First order

$$J(q) = j(q) - 744 = q^{-1} + 196884q + 21493760q^2 + \ldots,$$

Second order

$$Z_4(q) = J(q)^4 - 787535J(q)^2 - 8597555039J(q) - 644481279 =$$
$$= q^{-4} + q^{-2} + q^{-1} + 2 + 81026609428q + 1604671292452452276q^2 + \ldots$$

Числонавтика !

196884 $\ln 196883 \cong 12.19.$ $4\pi \cong 12.57$

$\ln 81026609426 \cong 25.12,$ $8\pi = 25.13.$ First Order Results

$12{,}19 = 12 + 0{,}19$ $25{,}12 = 25 + 0{,}12$

Second Order Results

$12 + 19 = 31,\ \ 12 + 25 = 37,\ \ (31 + 37) / 2 = 68 / 2 = \mathbf{34}$
$12 + 12 = 24,\ \ 19 + 25 = 44,\ \ (24 + 44) / 2 = 68 / 2 = \mathbf{34}$

$(12 + 12 + 19 + 25) / 4 = 68 / 4 = 17 = \mathbf{34} / 2.$

Числа Фибоначчи выделены жирным

$12 \cong c^{31}, \quad 12 \cong c^{31}, \quad 19 \cong c^{37}, \quad 25 \cong (c^{41} + c^{40})/2.$
$c = 1{,}08366$)

$(31 + 31 + 37 + 41) / 4 = 140 / 4 = 35 = \mathbf{34} + 1.$

$19/12 = 1{,}58 \cong 1{,}618 = \Phi \cong c^6; \quad 12/19 = 0{,}631 \cong 0{,}618 = \varphi; \quad 25/12 = 2{,}08 \cong c^9;$
$12 / 25 = 0{,}48$ with $\varphi / 0{,}48 = 1{,}28 \cong c^3 = 1{,}27\ldots.$

$12 = 2 \times 6 = 9 + 3; \quad 19 = 3 \times 6 + 1 = 9 + 6 + 3 + 1; \quad 25 = 3 \times 9 - 2 = (6 \times 9)/2 - 2 = 3 + 6 + 6 + 9 + 1.$

Числа Фибоначчи !

12 = **11** + 1 = **13** – 1; Fibonacci's coefficient **2**, because $6\times2\pm1 =$ **11** and **13**;
19 = 6×3+1; Fibonacci's coefficient 3;
25 = **23** + 2 = 6×**4** – 1+2, coefficient 4 = **2** + **2** = **3** + **1.**

3 = **3**; **6** = **2**×**3** = **3**+**3**; **9** = **2**+**3**+(**2**+**2**) = **3**×**3**.

12 = **13** – 1; **19** = **21** – 2; **25** = **21** + 4 = **34** – 9,