# Good news for all of you - JMA's algorihm revealed!

Some time ago I've read the article "The secret of Mark Jurik's indicators revealed?" by Alexander Smirnov and others from the Russian magazine 'Spekulant'. I was thinking it was a joke because real JMA have nothing common with described in the article.
So, I have spent long time (months) for studying of this algorithm to be the real one.
And finally we have clear and understandable description of this famous trading tool.

I classify JMA as **triple adaptive filter with unique Jurik smoothing and dynamic factor**.

**The Jurik smoothing includes 3 stages:**

**1st stage** - preliminary smoothing by adaptive EMA:

MA1 = (1-alpha)*Price + alpha*MA1[1];

**2nd stage** - one more preliminary smoothing by Kalman filter:

Det0 = (Price - MA1)*(1-beta) + beta*Det0[1];
MA2 = MA1 + PR*Det0;

**3rd stage** - final smoothing by unique Jurik adaptive filter:

Det1 = (MA2 - JMA[1]) * (1-alpha)^2 + alpha^2 * Det1[1];
JMA = JMA[1] + Det1;

where:
- Price - Price Series
- alpha - dynamic factor(will be described below)
- beta - periodic ratio = 0.45*(Length-1)/(0.45*(Length-1)+2)
- PR - Phase Ratio: PR = Phase/100 + 1.5 (if Phase < -100 then PR=0.5, if Phase > 100 then PR=2.5).

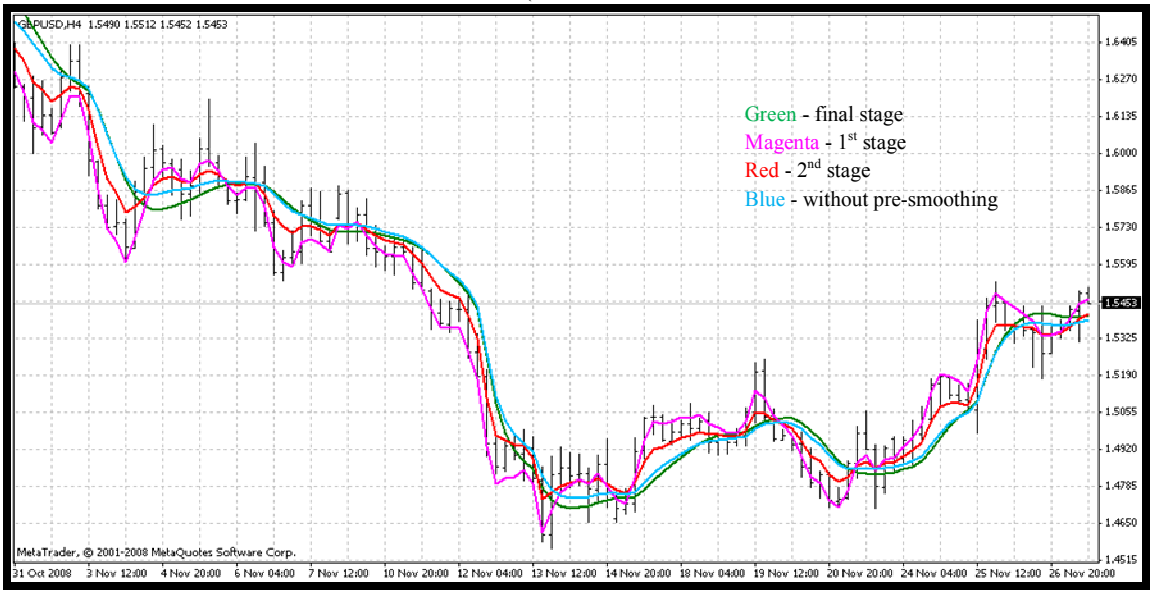


Figure 1. Sample chart with all stages of Jurik Smoothing.

You can see results (Figure 1) of each stage by means of attached indicator JurikFilter_v2, changing FilterMode:
0 - final stage(JMA)
1 - 1st stage
2 - 2nd stage
3 - only final(without preliminary) smoothing.

**The Dynamic Factor is periodic factor (beta) raised to a power (pow):**

alpha = beta ^ Pow,

where:
- pow = rVolty ^ pow1
- rVolty - relative price volatility
- pow1 - power of relative volatility with following formula:

pow1 = len1 - 2 (if pow1 < 0.5 then pow1 = 0.5),

where len1 - additional periodic factor:

len1 = Log(SquareRoot(len))/Log(2.0) + 2 (if len1 < 0 then len1 = 0).

Thus you can see that the **Dynamic factor** is based on the **relative price volatility** giving the required adaptability for this kind of the price filter.

The formula for **relative price volatility** is

rVolty = Volty/AvgVolty
(if rVolty > len1^(1/pow1) then rVolty = len1^(1/pow1), if rVolty < 1 then rVolty = 1),

where:
- Volty - price volatility based on calculation of so-called **Jurik Bands** (VisualMode = 1).
- AvgVolty - average volatility for which Jurik use difficult enough algorithm of calculation:

AvgVolty = Average(vSum,AvgLen),

where:
- vSum - incremental sum of (Volty - Volty[10])/10;
- AvgLen - period of average (Jurik use 65).

In my version of Jurik Filter I use simple average instead of Jurik's complex averaging.

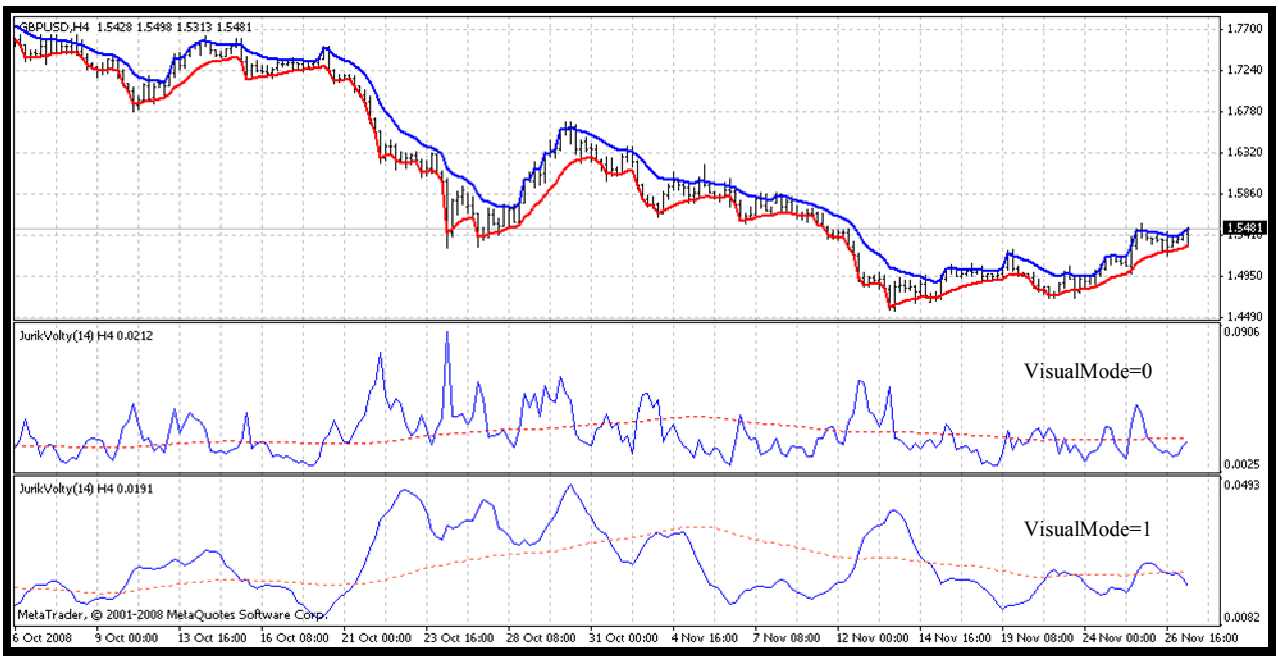


Figure 2. Sample Chart with Jurik Bands and Jurik Volatility.

Moreover, with attached indicator JurikVolty_v1(Figure 2) you can see values for Volty (VisualMode=0), vSum (VisualMode=1) and AvgVolty(red dotted line).

The formula for price volatility is

Volty = max between Abs(del1) and Abs(del2), if Abs(del1) = Abs(del2) then Volty = 0,

where:
- del1 - distance between price and upper band del1 = Price - UpperBand
- del2 - distance between price and lower band del2 = Price - LowerBand

The **Jurik Bands** are different from any known price bands such as Bollinger, Keltner, Donchian, Fractal and so on:

if del1 > 0 then UpperBand = Price else UpperBand = Price - Kv*del1
if del2 < 0 then LowerBand = Price else LowerBand = Price - Kv*del2,

where:
- Kv - volatility's factor Kv = bet ^ SquareRoot(pow2).

It's easy to see that these bands can be a basis for **trend following indicator** like Wilder's Parabolic.

So, you can see we practically don't have obscure places in the algorithm of Jurik Moving Average(JMA).

Thanks for attention,
Igor

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