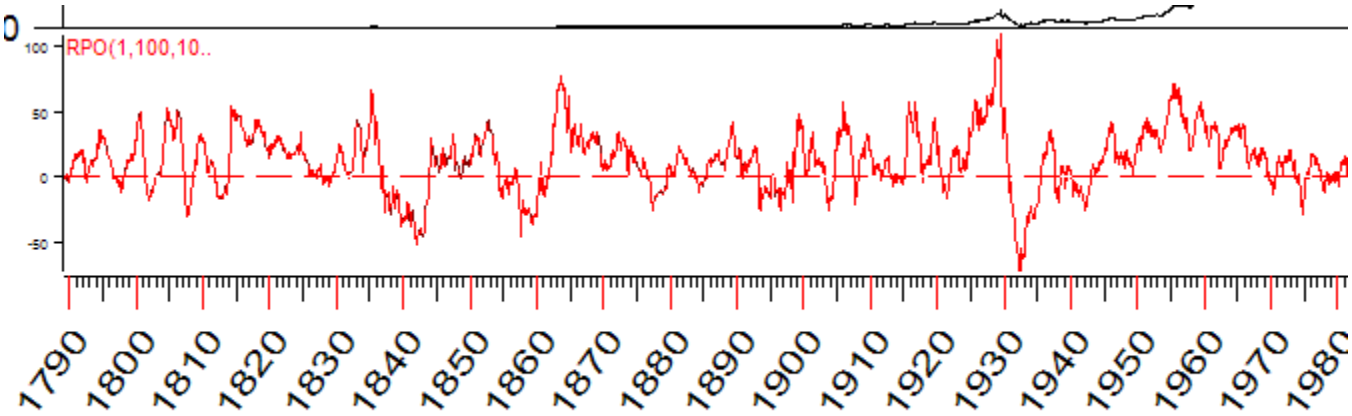
Dow Jones: a cyclic analysis in the context of 200 years of its history

In this article I would like to demonstrate the application of classical harmonic analysis to long-term forecasts.

To conduct this research, Dow Jones Industrial Index from 1789 is used. These are monthly data. The data were developed by the Foundation for the Study of Cycles. Bill Meridian obtained it in 1988 and has maintained it since that time. To eliminate the trend, the relative price oscillator with the period of 100 months is used. This is how it looks like for the last 219 years:



The process of cyclic analysis consists of these major steps:

1) The normalization of original data - that is already done as we use the oscillator for our calculations (I tried several oscillators with different periods);

2) The identification of the most powerful cycles - the best way to do that is by application of spectrum analysis;

3) The generation of the projection line based on these cycles;

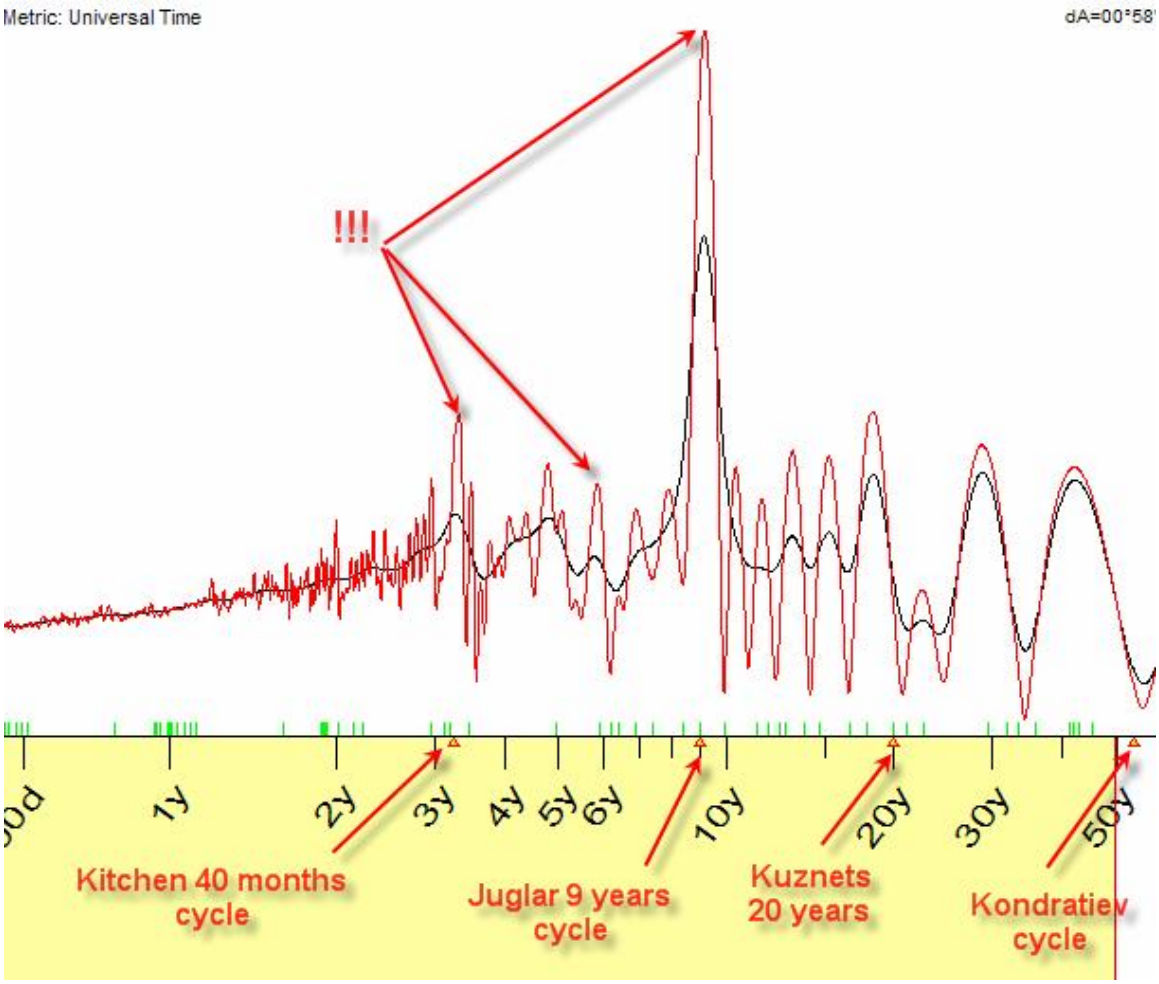
4) A verification of the forecasting ability of this model;

5) A final forecast with the use of all available price history.

Let us follow these steps.

Identifying the most influential cycles

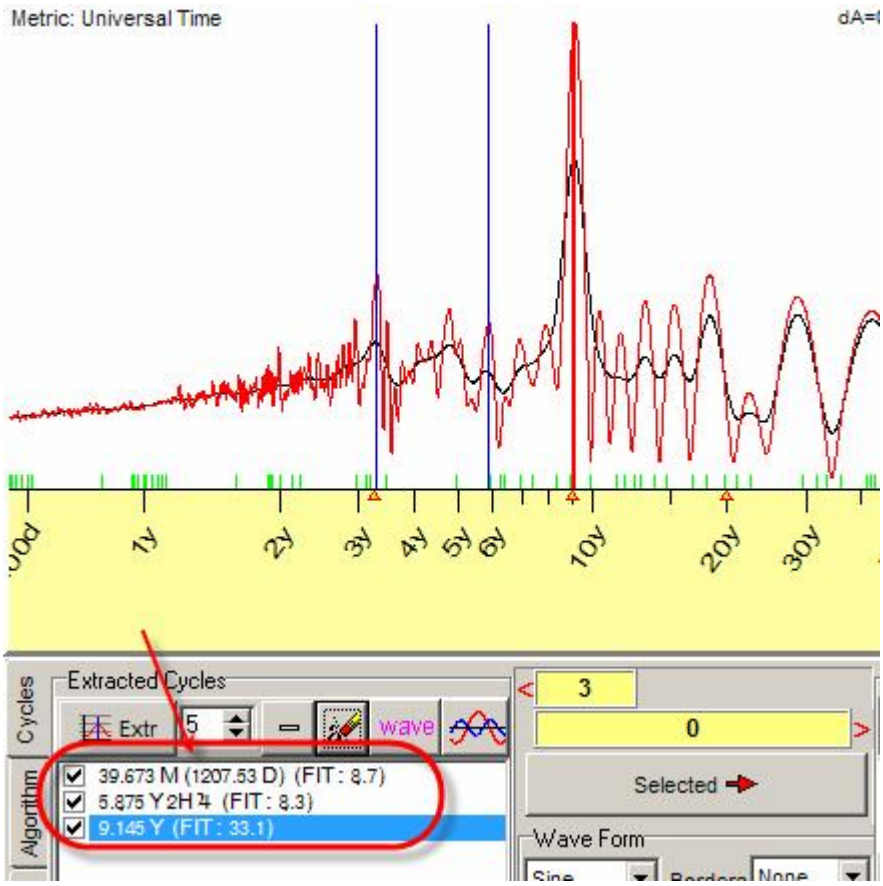
The spectrogram for DJIA (to be exact, for its oscillator with the period of 100 months) is shown here:



Here the X-axis shows the period of cycles while Y-axis means the force of these cycles. The famous economical cycles - Kitchen, Juglar, Kuznets and Kondratiev's cycles - are marked by small yellow marks.

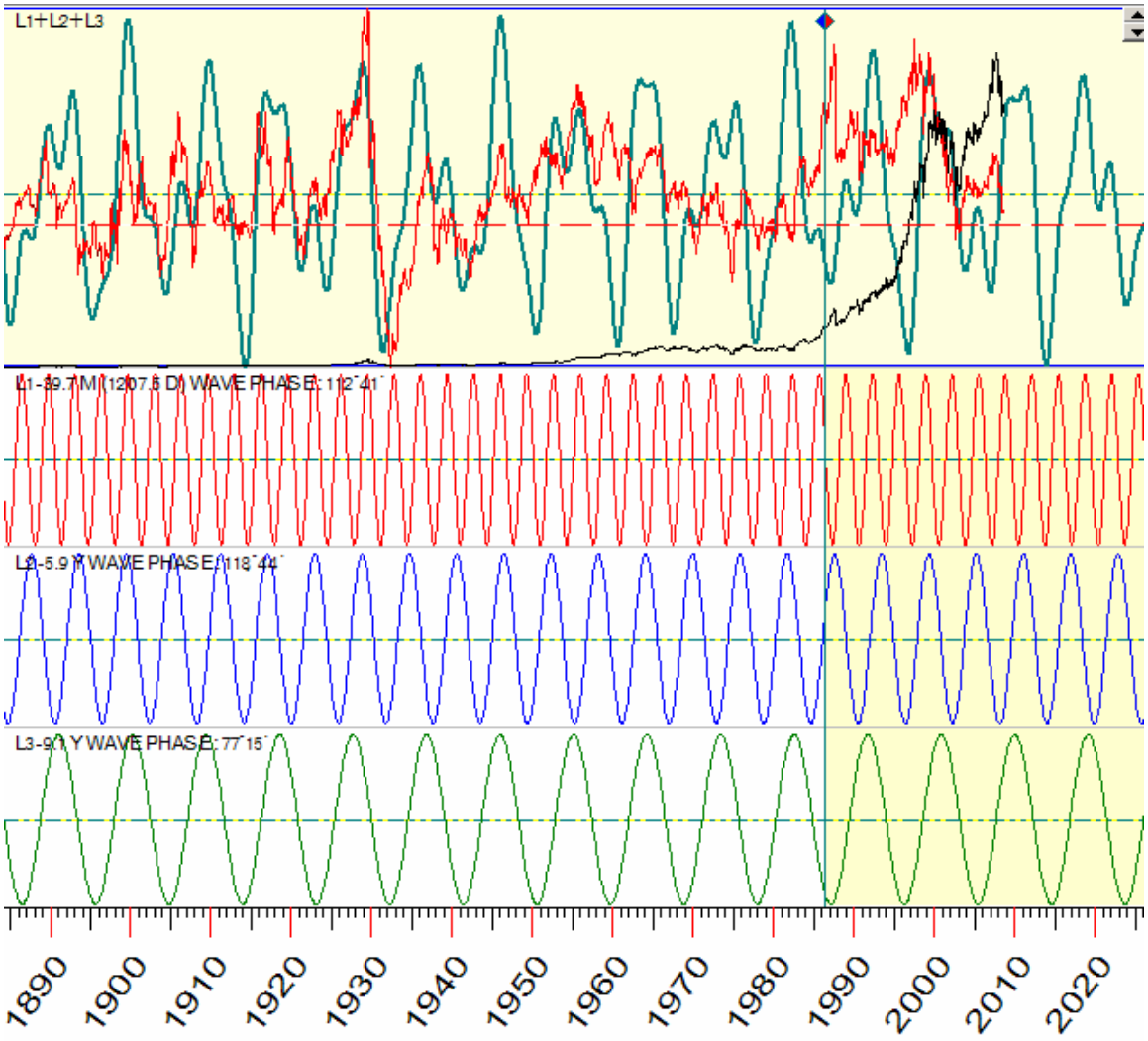
As you see, the spectral analysis definitely shows us the importance of two cycles, Kitchen and Juglar's – the peaks of the diagram confirm this fact. Also I choose 5.9 years cycle.

Here are the most important cycles: 40 months, 5.9 years and 9.1 years:



Projection line – all cycles together

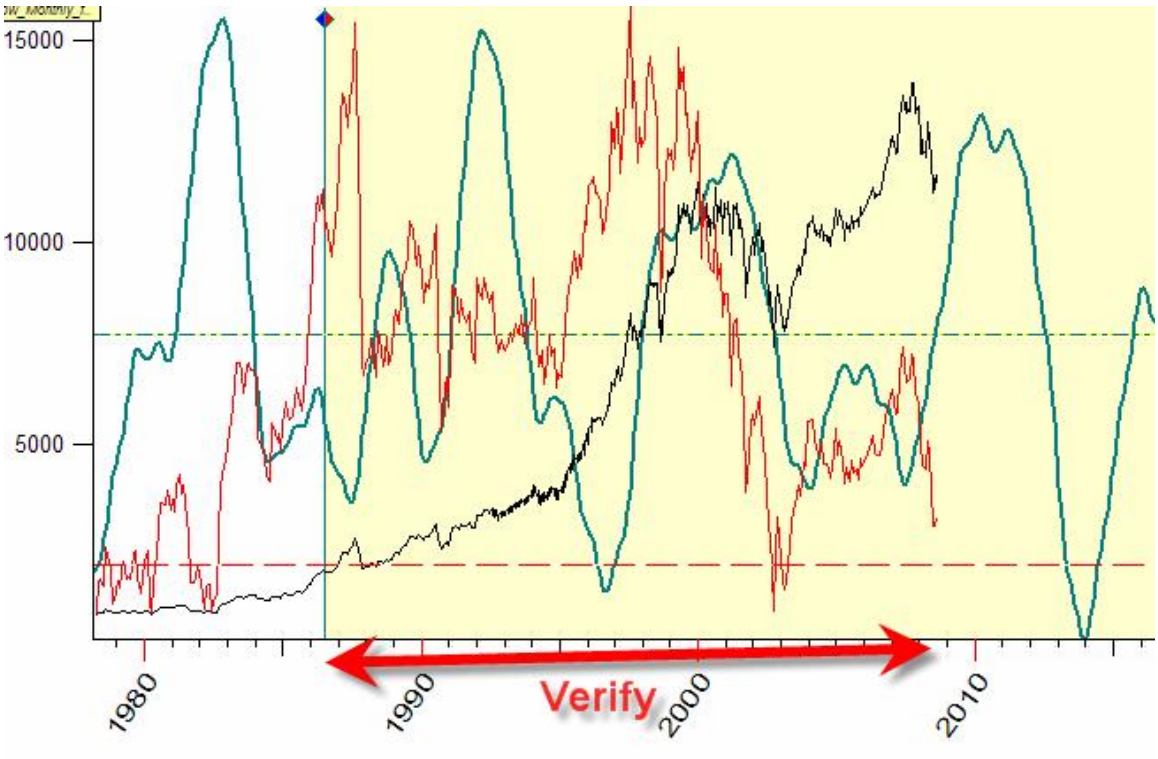
This diagram shows how these three cycles work in time:



Here the red curve is for Kitchen's cycle, the blue one is for 5.9-year cycle, while the green curve represents Juglar's cycle. The teal diagram on the top is the superposition of these three cycles.

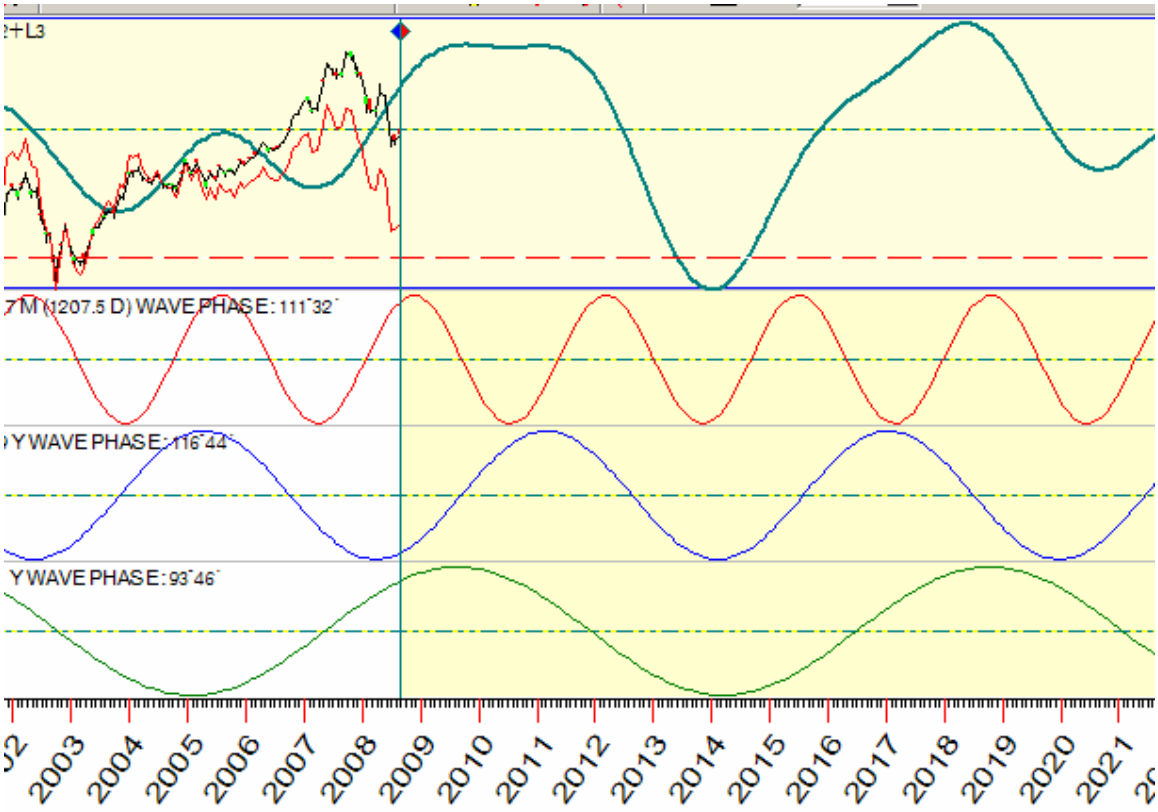
Verification

I did not use the price history after 1986 year in calculations. It is an "untouched" price history which allows us to figure out how this technology works for real forecast:



It is not ideal of course, though it worth a try.

Below you can see a final forecast based on these three models, for all available price history:

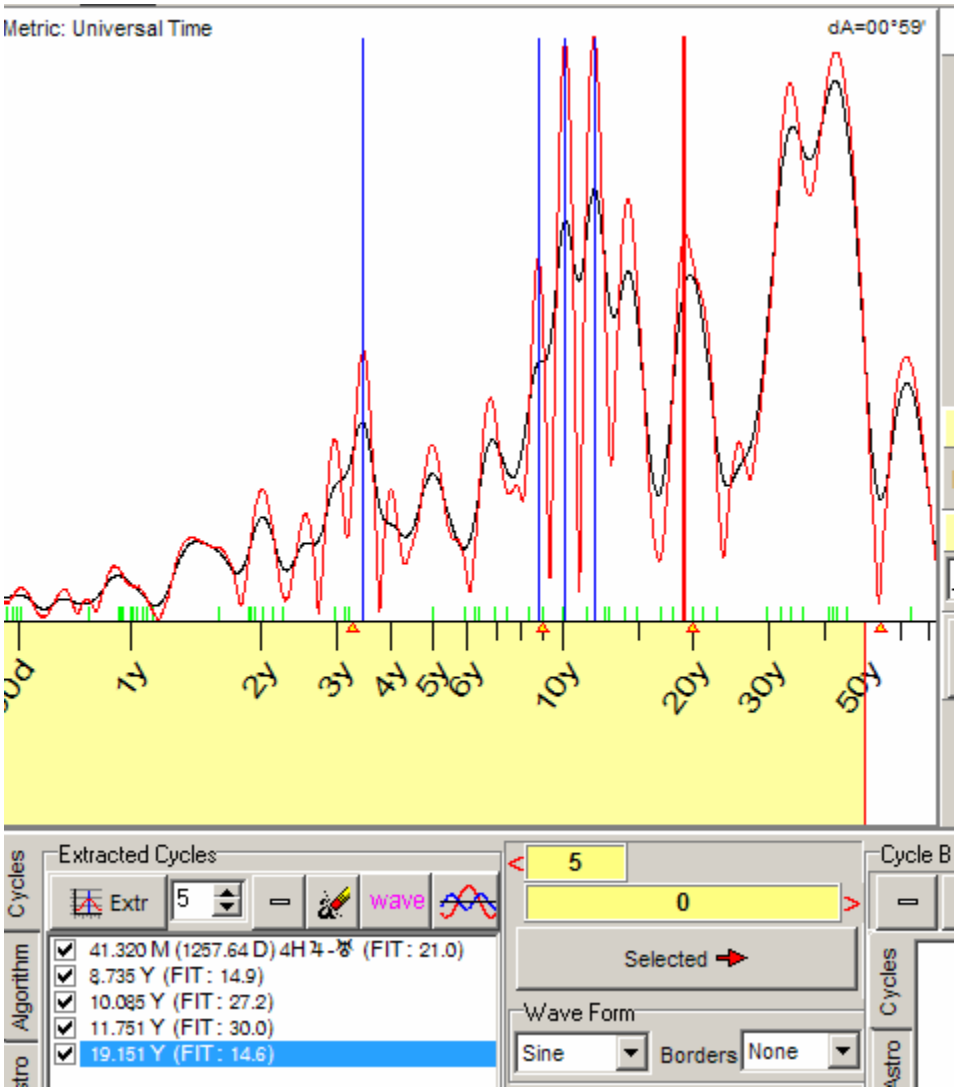


Multiframe Model

We have considered in the previous example the forecast based on classical spectral analysis. We assumed there that all analyzed cycles worked in the same manner for the last two hundred years. This is definitely not true, the stock marked changes with time as its economic gears are changed.

There is another approach. I call it Multiframe spectrum. It allows revealing dominant cycles - the cycles that work quite recently. In ten - twenty years other cycles will work on the market because other economic/stock market reality will appear.

This diagram shows what cycles are most active today (dramatic September 2008):

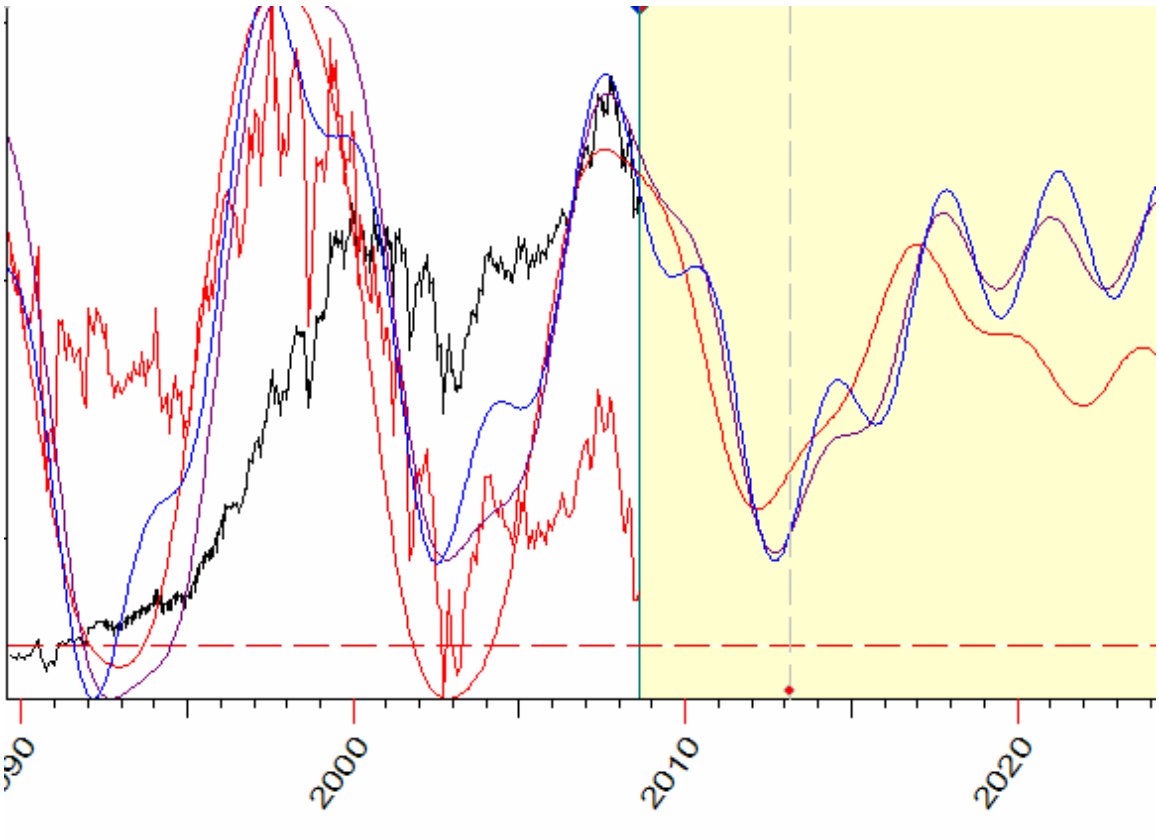


You can see here that Kitchen cycle is still active.

9-year Juglar cycle gave birth to three new cycles: 8.7 years, 10 years and 11.7 years cycles. Usually this happens due to non linear interaction with some long term cycle (50-100 years cycle),

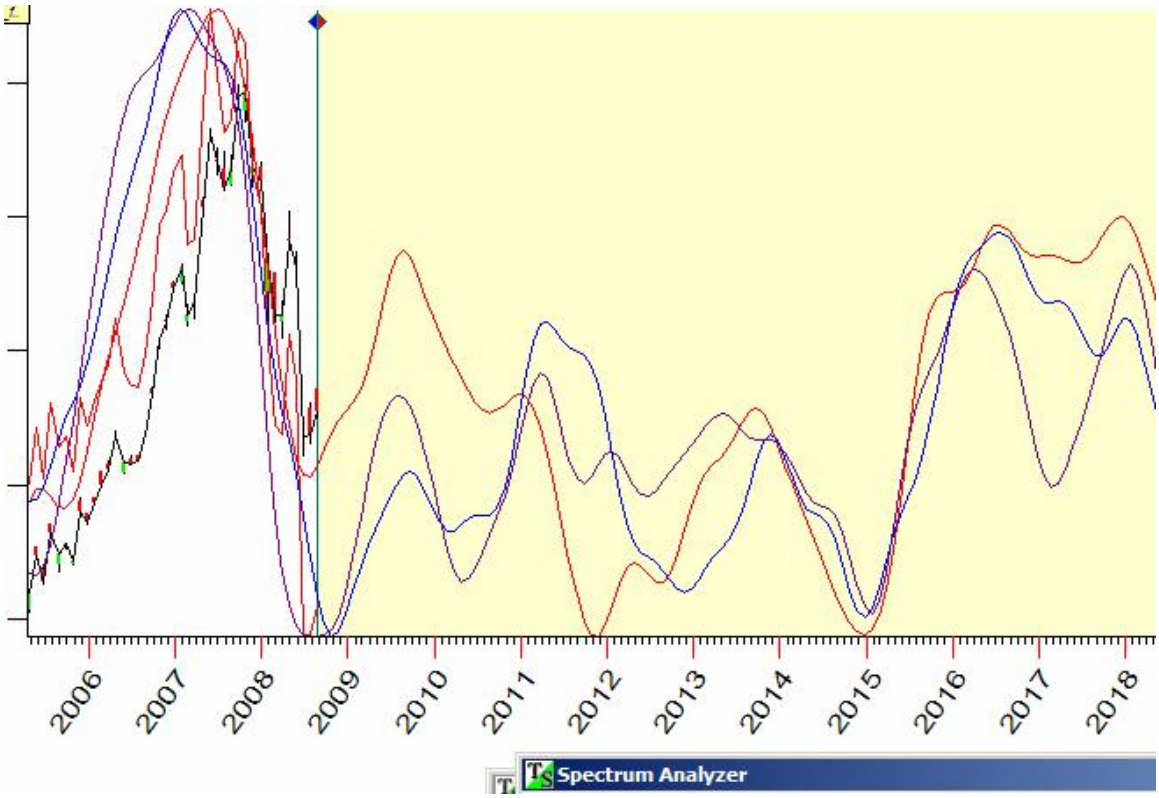
Pay attention to the fact that Kuznets cycle with 19-year period is active now. This is infrastructural investment cycle; it sends us back to 80th years, I mean Reaganomics.

This is a forecast based on these cycles:



I put 3 projection lines based on the same cycles; I have varied here some parameters to see all possible trajectories (committee technology).

This system is not stable. I have added several more overtones to the described above cycles. And see what I have got (this is more positive picture):



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Toronto, Canada