Investment based on Merrill Lynch Investment Cycle

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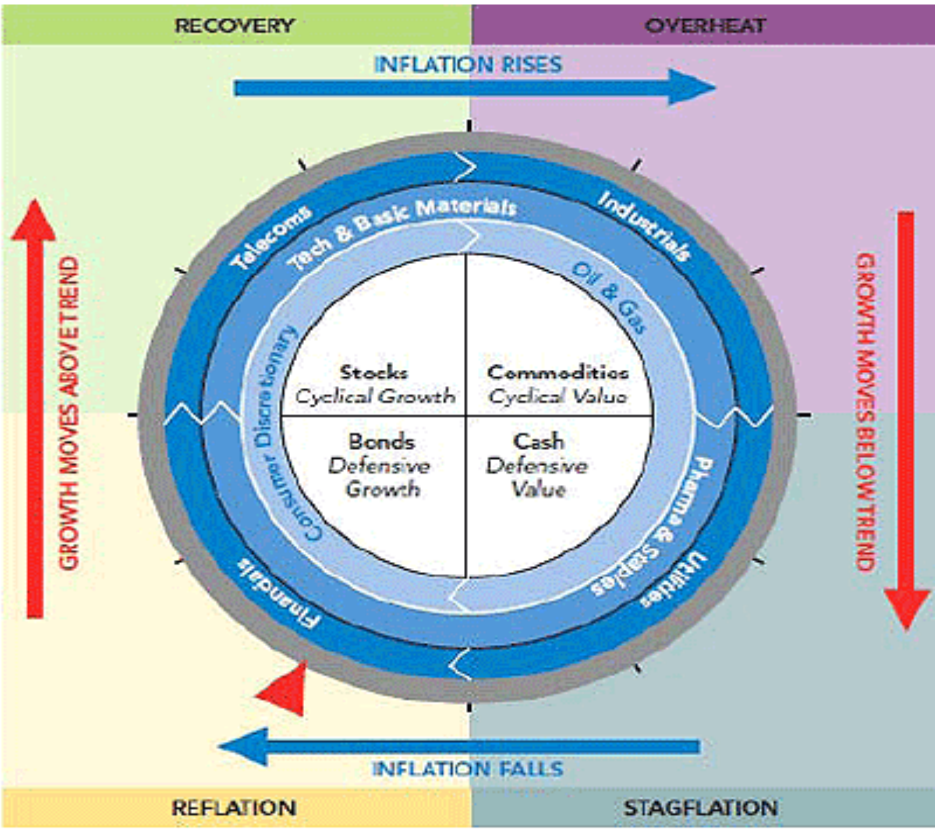
First Draft

Introduction

Trevor Greetham, a former Asset Allocation Director at Fidelity, developed the "Investment Clock" concept while at Merrill Lynch. As one of the most popular portfolio management theories, it intuitively relates assets rotation to economic cycle can be represented in a investment clock as following



Investment clock hinges on cycle investing, where it is believed that different asset class will outperform one another depending on the economic condition or cycle. The economic cycle is divided into four stages.

- Stagflation – Growth has slowed and inflation remains high = Cash is king!
- Reflation – Interest rates lowered = bond price increase (due to inverse relationship)

- Recovery – Growth period = stocks!
- Overheat – Growth has peaked and Inflation high = commodities!

The major deficiency of this approach is to identify and predict the stages of macro-cycle as if we want to use this clock, it's essential to identify the stage of the cycle that we are in currently, and then position appropriately with the asset class for the next stage. In this paper, I would discuss two approaches to identify the stages of economic cycle—Tracer Diagram.

Approach I:

Tracer Diagram

This approach is taken from Statistics Netherland Business Cycle Tracer, a system which acts as a coincident indicator of Dutch business cycle. It uses a set of economic indicators and defines the business cycles by deviations of the economy from its potential. The set of indicators I choose are:

- Consumer Sentiment
- Personal Consumption Expenditures: Durable Goods
- Exports of goods and services
- Gross Domestic Product (GDP)
- Personal consumption expenditures: Services: Household consumption expenditures
- Industrial Production Index
- Multiple Jobholders

- Unemployment Level-People who Completed Temporary Jobs (inverted)
- Unemployment Rate (inverted)
- 10-Year Treasury Constant Maturity Rate (inverted)

For this paper I only discuss the data after 1999 because some of the indicators don't have data prior to 1990s.

This set consists of indicators that represent the major aspects of the economy including confidence indicators, consumption, trade, labor markets and confidence. Each indicator has a minimum correlation of ± 0.5 with the reference GDP-cycle.

Deviation from long-term trend is identified as the cyclical component of an indicator and can be useful in identifying the current economic stage.

To determine the trend, we use Christiano-Fitzgerald filter to filter out the data.

To explain Christiano-Fitzgerald filter, we first introduce Baxter-King filter.

Baxter-King filter

Baxter and King (1999) introduced a band-pass filter which is an approximation of the ideal filter for series which are integrated of order one or two and contain a deterministic trend. For an ideal filter, an infinite series is required. Baxter and King construct a filter which is optimal for series of the form:

$$y_t = y_{t-1} + \varepsilon_t - \theta \varepsilon_{t-1},$$

where θ <1 and ε_t 's i.d.d.. [Christiano en Fitzgerald (1999)]. Here, optimal is defined as minimal expected quadratic deviation between the ideal filter and the approximation for a finite series.

The Baxter-King filter is actually based on combining two low-pass filters. It is the difference between a low-pass filter with as boundary the upper frequency of the band and a low-pass filter with the lower frequency as boundary. The Baxter-King band-pass filter is symmetrical and uses the following weights:

$$w_k = \begin{cases} \dfrac{\sin(\frac{2\pi k}{p_l}) - \sin(\frac{2\pi k}{p_u})}{\pi k} - \dfrac{C}{1+2K} & \text{for} \quad 1 \le k \le K \\ \dfrac{2}{p_l} - \dfrac{2}{p_u} - \dfrac{C}{1+2K} & \text{for} \quad k = 0, \end{cases}$$

where

$$C = \frac{2}{p_l} - \frac{2}{p_u} + 2\sum_{k=1}^{K}\left(\sin(\frac{2\pi k}{p_l}) - \sin(\frac{2\pi k}{p_u})\right),$$

with pl and pu the lower and upper boundary for the wavelength in months or quarters. For example, the band-pass filter for cycles between 2 and 10 years uses pl =24 en pu =120 for monthly data. Baxter and King recommend K =12 for quarterly data and K =36 for monthly data. This means that the filter uses data from three years in the past and three years into the future when determining the cycle for a certain month.

By construction, this filter runs into trouble at the last K observations. For a monthly series, it takes 36 months until the filter is able to compute a value. For practical purposes, such a lag is of course unacceptable. Two solutions have been proposed in the literature; extrapolation of the original series into the future and an adaptation of the weighting scheme. Extrapolation requires a statistical model to estimate the expected future observations. This can be done using a procedure similar to the one for the Henderson trend cycle in the Census X12 [e.g. Vollebregt (2002) and Doherty (2001)].

Christiano-Fitzgerald filter

Christiano and Fitzgerald (1999) propose a band-pass filter similar to the Baxter-King filter. However, they assume the time series to be a random walk:

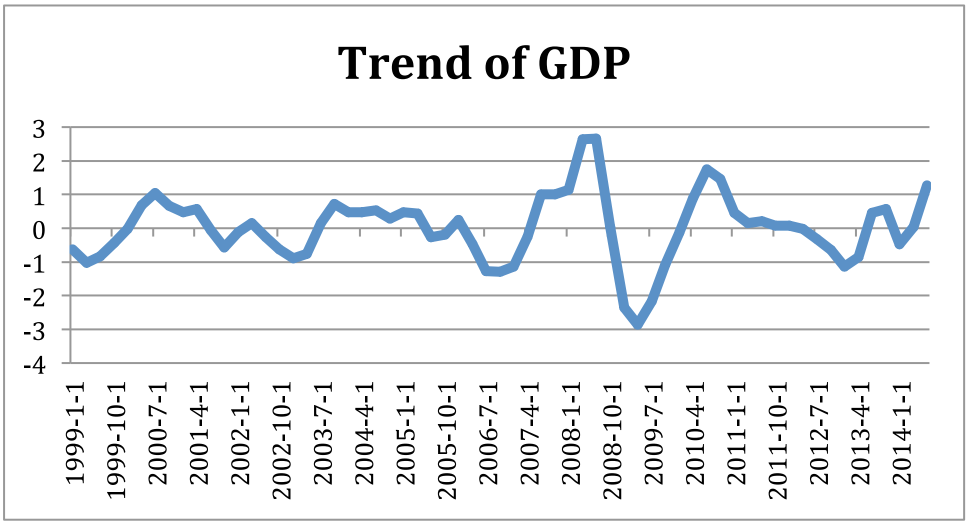
Where the ε_t are again i.d.d. Under these assumptions, the Christiano-Fitzgeraldfilter minimizes the expected squared deviations from the ideal weights. Their solution for the end value problem encountered by the Baxter-King filter is to use an asymmetrical weighting scheme, where the final observation receives the weights of all the missing (future) observations.

$$
\begin{array}{lll}
For & t=1 & w=(\frac{1}{2}B_0, B_1, \ldots, B_{T-2}, -\frac{1}{2}B_0-\sum_{k=1}^{T-2}B_k) \\
For & t=2 & w=(-\frac{1}{2}B_0, B_0, B_1, \ldots, B_{T-3}, -\frac{1}{2}B_0-\sum_{k=1}^{T-3}B_k) \\
For & 3\le t\le T-2 & w=(-\frac{1}{2}B_0-\sum_{k=1}^{t-2}B_k, B_{t-2}, \ldots, B_1, B_0, B_1, \ldots, B_{T-t-1}, -\frac{1}{2}B_0-\sum_{k=1}^{T-t-1}B_k) \\
For & t=T-1 & w=(-\frac{1}{2}B_0-\sum_{k=1}^{T-3}B_k, B_{T-3}, \ldots, B_1, B_0, -\frac{1}{2}B_0) \\
For & t=T & w=(-\frac{1}{2}B_0-\sum_{k=1}^{T-2}B_k, B_{T-2}, \ldots, B_1, \frac{1}{2}B_0),
\end{array}
$$

where $B_0=\frac{2}{p_l}-\frac{2}{p_u}$ en $B_k=\frac{\sin(\frac{2\pi k}{p_l})-\sin(\frac{2\pi k}{p_u})}{\pi k}$ and p_l and p_u as in the Baxter-King filter.

Low-pass and high-pass filters can be constructed by taking, $p_u=\infty$ or $p_l=2$ respectively.

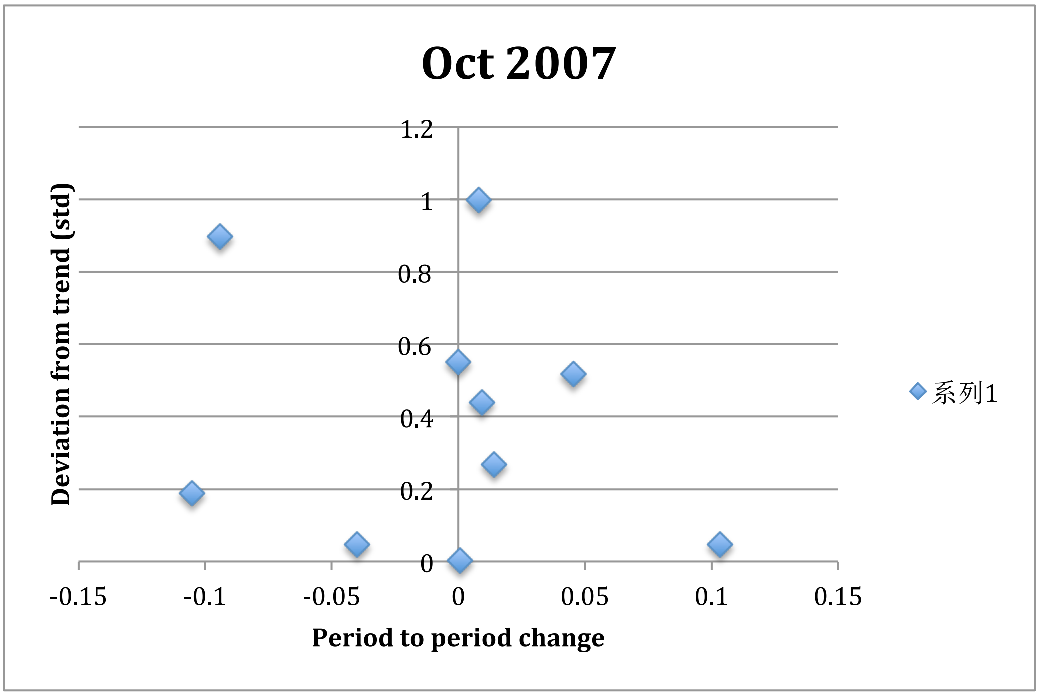
After filtering all the data through Christiano-Fitzgerald filter (code attached below), I standardized the cyclical deviation from the trend for each indicator. As an example, the deviation from the trend for GDP is shown below.



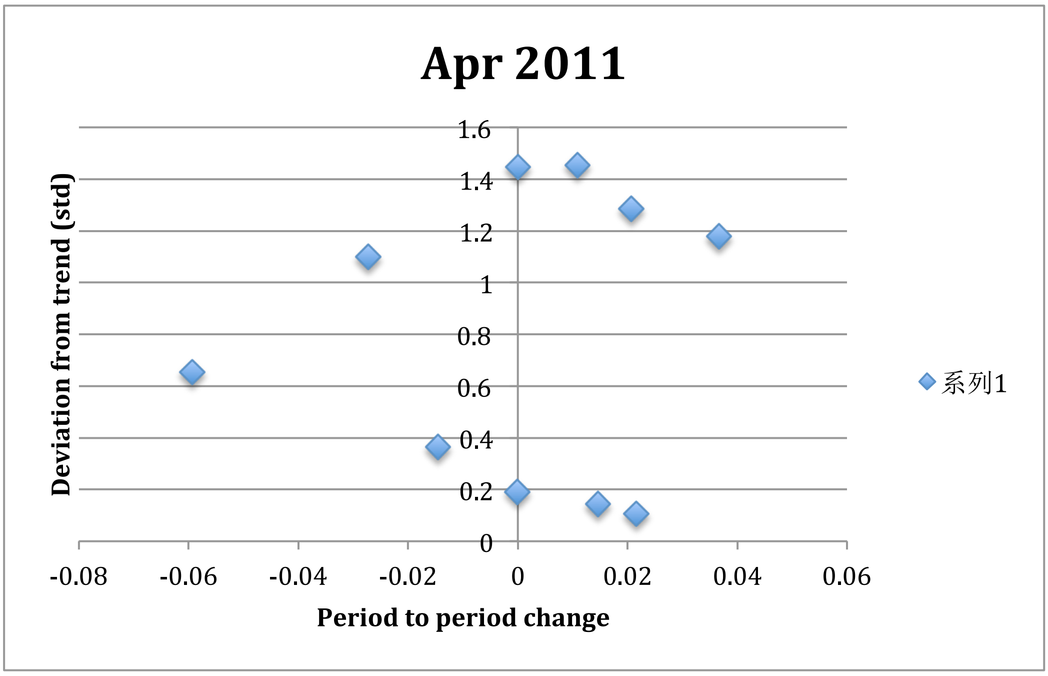
From the graph we can see that it reaches a peak around Dec 2007 and a trough around June 2009 and so on , corresponding to the troughs and peaks reported by the National Bureau of Economic Research.

But how to predict the turning points with the given data? We use Traser Diagram, with deviation from the trend as y axis and period-on-period change as x-axis.

Boom is characterized by sustained increase in economic indicators, which requires nearly all the indicators above the trend, as shown in the figures below

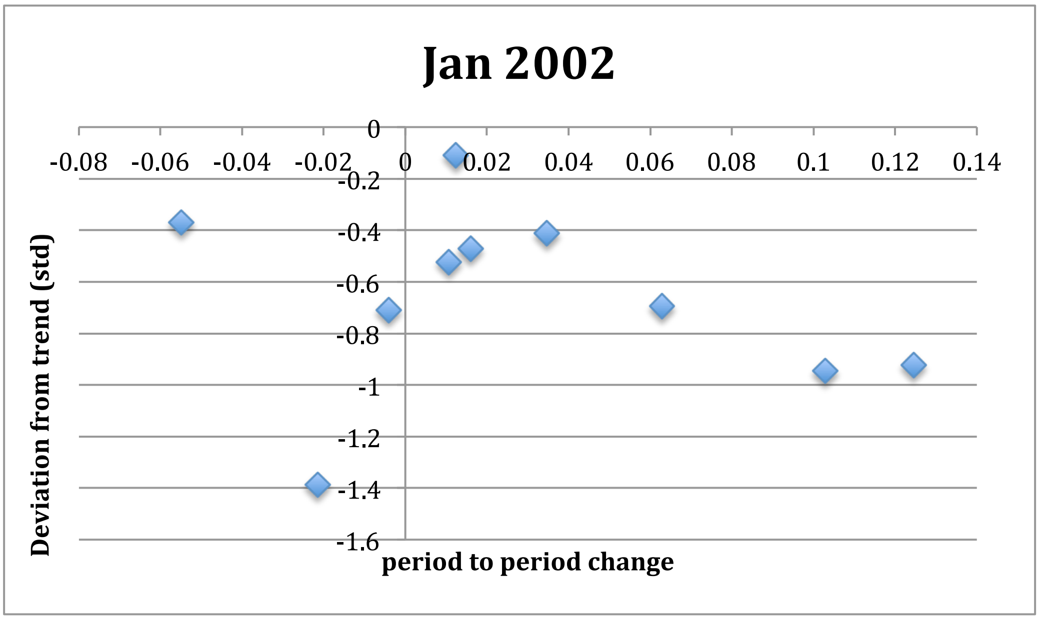


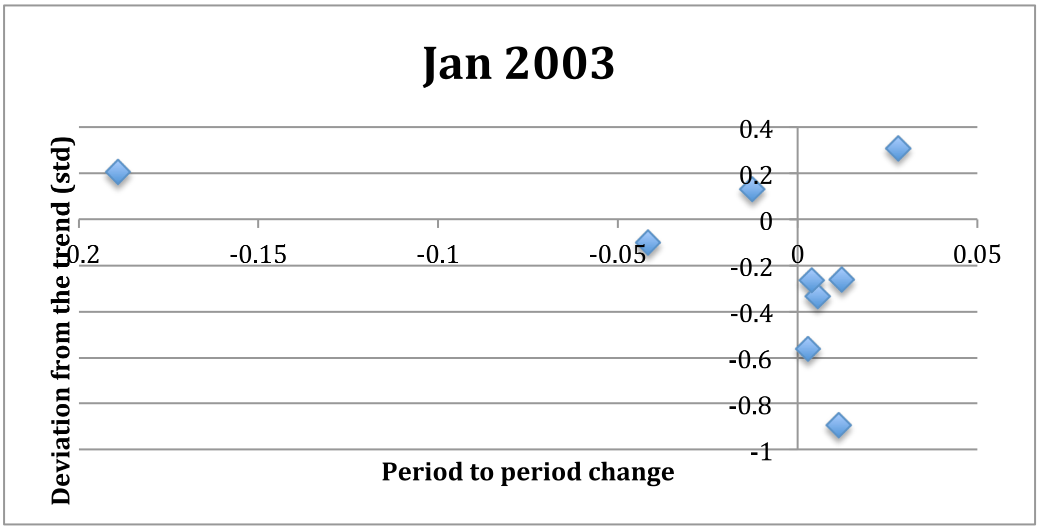
Oct 2007
Deviation from trend (std)
1.2
1
0.8
0.6
0.4
0.2
0
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
Period to period change
系列1



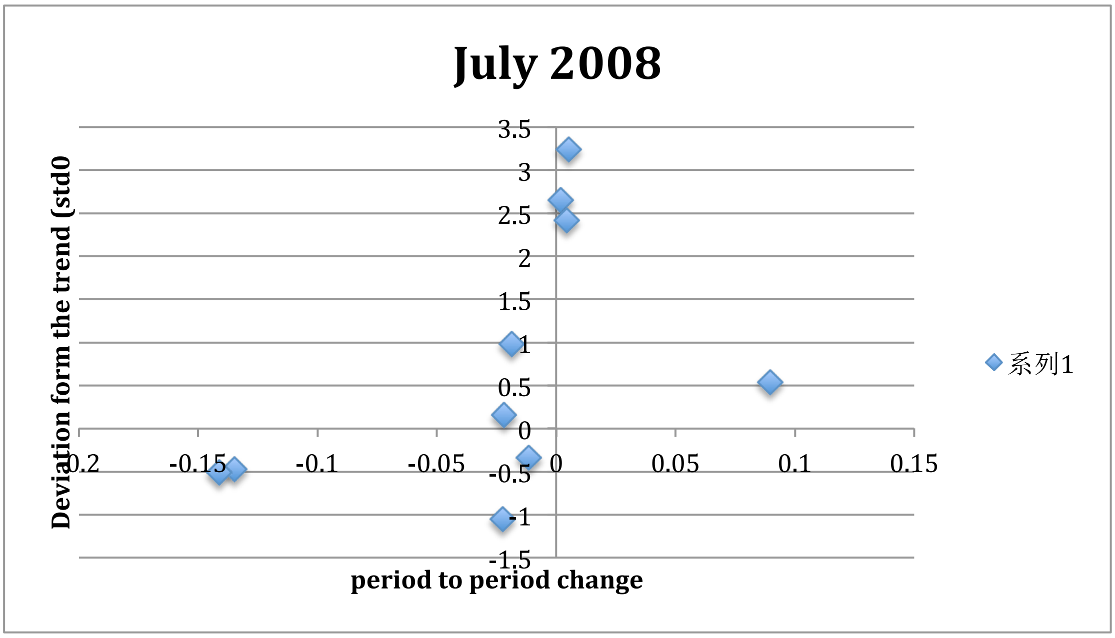
Apr 2011
Deviation from trend (std)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
Period to period change
系列1

Recessions, sharp contractions after overheating, are characterized by most indicators below the trend.(shown by the figure below)

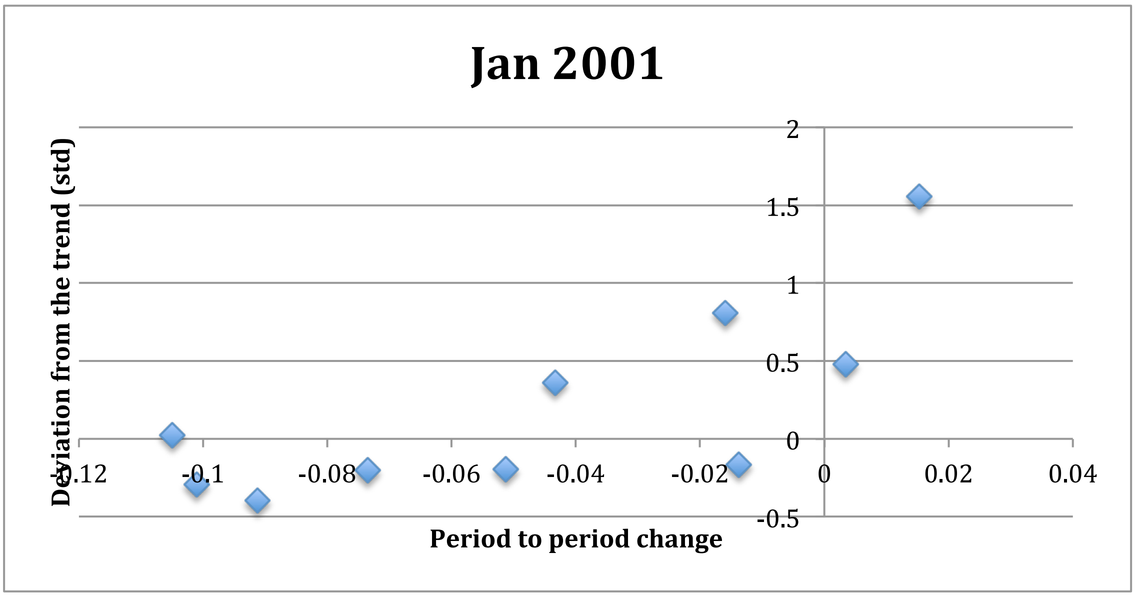




Recovery, increasing business activity at the end of recession, can be characterized by transitions of some indicators from below the trend to above the trend and have positive period to period change.



Overheat, occurs after the boom when the economy is unable to keep pace with growing aggregate demand, can be characterized by some of the indicators changing from above the trend to below the trend with negative period to period change. Jan 2001 is the one I found.

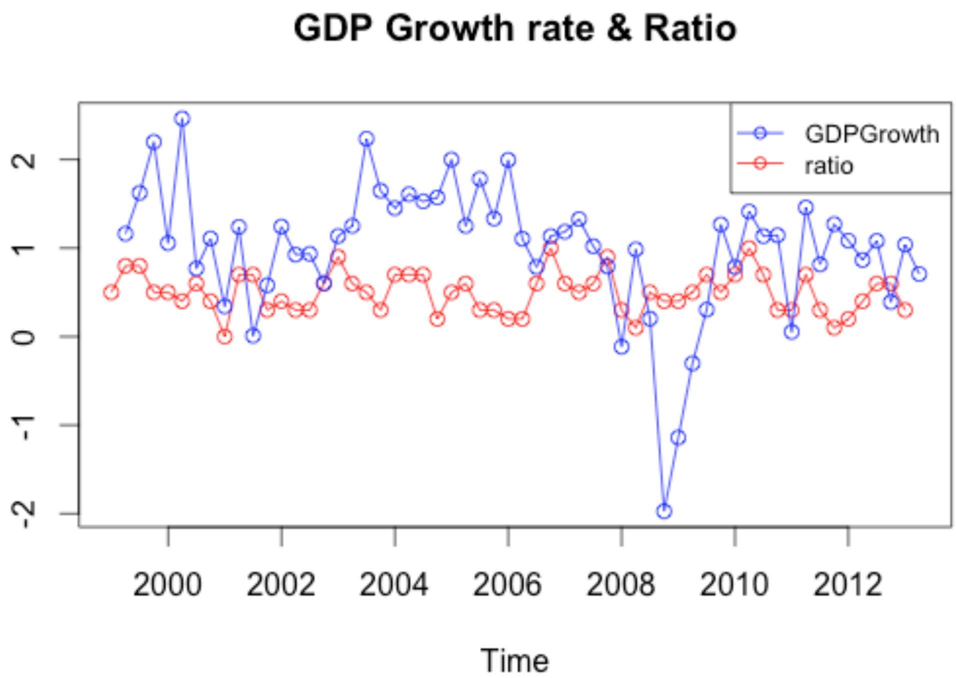


The overall data is constructed in excel as following

	Jan-00		Apr-00		Jul-00		Oct-00		Jan-01		Apr-01		Jul-01	
consumer	0.08527132	-0.0071094	-0.025	0.39159348	-0.0082418	-0.1600802	-0.023084	-0.0120172	-0.1049149	0.02362616	-0.0665259	-0.7619178	0.04524887	0.97120734
durable	0.03503803	0.23229155	-0.0327793	-0.6096614	-0.0274674	0.45497931	-0.014924	-0.179025	-0.0512864	-0.1945759	-0.0303397	-0.0752872	-0.0087616	0.48108071
export	0.02373306	-0.1689626	0.03274463	0.29832525	0.02820548	0.82381552	-0.0067698	0.98008936	-0.0159624	0.80679207	-0.0369006	0.45280883	-0.0581182	-0.2592374
GDP	0.010568098	-0.019252	0.02465357	0.6766682	0.00769583	1.04945349	0.01109352	0.66181764	0.00341854	0.48009259	0.01239996	0.5615217	0.0001034	-0.0498163
household	0.02365602	0.10806788	0.01607607	0.42561122	0.01678646	0.50242138	0.0160112	1.19149842	0.01533864	1.55818677	0.00820878	0.75997059	0.00499464	-0.2568771
industrial	0.02650102	0.08694479	0.01505146	0.04938882	0.0091102	0.47777192	-0.0042612	-0.4146724	-0.013751	-0.1673274	-0.0193185	-0.2026215	-0.0220508	0.43923085
multiple	-0.0309278	1.30425212	-0.0085569	0.18404086	-0.0503849	-0.4318627	0.0375829	-0.9878726	-0.0433239	0.36049505	0.03043801	0.78090339	-0.0264169	-0.1374096
temporary	-0.1522936	-0.2412511	0.16878981	-0.8394666	-0.0057471	0.94072744	0.04	0.35201682	-0.0912698	-0.3972296	-0.04	-0.4841533	-0.0454545	0.54415531

Some more analysis on the deviation from the trend

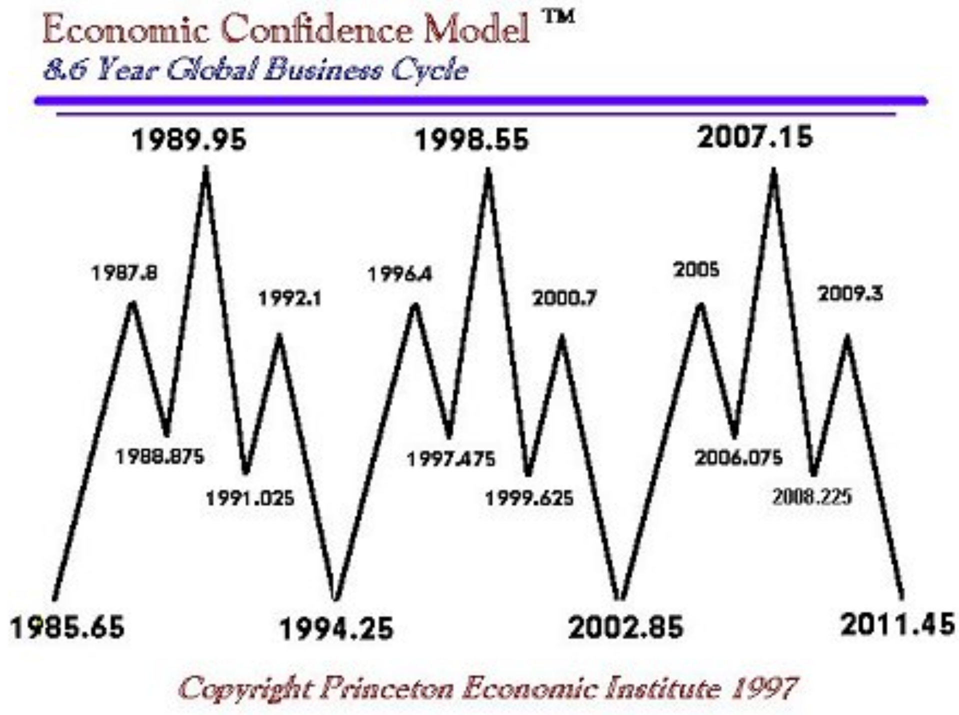
It now becomes an interesting question that what is the relationship between the ratio of number of indicators that are above the trend and the number of indicators that are below the trend and the GDP-cycle. It turns out the correlation is quite low(less than 0.1)



Approach II:

Economic Confidence Model

Martin A. Armstrong, a former chairman of Princeton Economics International Ltd, developed The Economic Confidence Model. He proposes that that economic waves occur every 8.6 years, or 3141 days, which is Pi X 1000. At the end of each cycle is a crisis after which the economic climate improves until the next 8.6 year crisis point.



He claimed that the driving force behind the business cycle is due to shifts in public confidence and can be calculated on quarter-cycle intervals of 2.15 years.

The Economic Confidence Model in 2.15-year intervals

1998.55... 07/20/98
2000.7.... 09/13/00
2002.85... 11/08/02
2005.... 01/02/05
2007.15... 02/27/07
2009.3... 04/23/09
2011.45... 06/18/11
2013.6... 08/12/13
2015.75... 10/07/15
2017.9... 12/01/17
2020.05... 01/26/20
2022.2... 03/22/22
2024.35... 05/16/24
2026.5... 07/11/26
2028.65... 09/04/28
2030.8... 10/30/30
2032.95... 12/24/32

Following his idea, we can predict that Nov 2002 and June 2011 as the troughs and Oct 2007 as the peak between 2000 and 2014, roughly corresponding to the ones I predicted using Traser Diagram.

Mean Deficiency of these two studies:

The mean deficiency of the study is that due to high inflation, the price of stocks and commodities increase dramatically from 2000 to 2006 so investing in either one would give you anormal high returns. It also makes it hard to compare the return in investing based on Merill Lynch cycle or sorely in one asset such as commodities or stocks.

Works Cited

"The Martin Armstrong Defense Fund (Armstrong Articles: The Business Cycle and the Future)." The Martin Armstrong Defense Fund (Armstrong Articles: The Business Cycle and the Future). N.p., n.d. Web. 05 Dec. 2014.

Ruth, Floris Van, Barry Schouten, and Roverto Wekker. "The Statistics Netherlands' Business Cycle Tracer. Methodological Aspects; Concept, Cycle Computation and Indicator Selection." (2005): n. pag. Web.