

What we do at HED

The study of non-linearity, which includes chaos, and complexity, began in the 1960s, when a few researchers saw that interactions *within* systems were just as important as the systems themselves. Causes make effects of course, but life is repetitive and often the result of an action can have an influence on what happens next. Think of a slap in the face – it stings but it also causes anger, which can lead to retaliation and an escalation of more and more slaps. Feedback like this happens in chains or loops and causes strange and complex outcomes.

In the words of the Nobel Prize winner, Murray Gell-Mann in 1995: “Much of the effective complexity of the Universe lies in the interaction of a few simple basic laws”.

We now know that feedback exists in the development of weather, ocean currents, patterns in the spread of animal populations and disease and in all behavioural areas including economics and financial markets. These systems are ‘complex’ in the scientific meaning of the word because cause and effect are subtle here and their repeated interactions produce results that are not obvious. Feedback chains and loops lead to self-reinforcing or self-limiting behaviour and repetitive similarities keep appearing.

Feedback leaves these distinctive traces wherever it occurs and in markets these take the form of price patterns that repeat, especially at different time frames; the erratic emergence of cycles; trends that are unduly persistent or conversely, prices that seem ‘stuck’ in a range. All these behaviours are common, meaning that feedback is ever-present in markets although the effects vary in magnitude from being dominant to merely incidental.

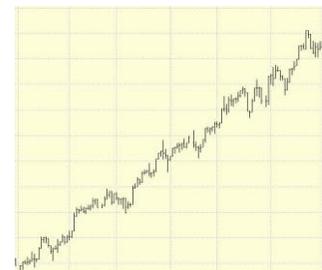
Technical analysis tries to identify these trends, ranges and shapes, much as botany started by looking at the shapes of plants. We go deeper, measuring the conditions that lead to these behaviours.

Simple causes and effects interact.....



To make complex outcomes that are not very predictable

leading to persistent trends...



...trading ranges



and familiar shapes -



(All examples taken from S&P500 price behaviour)

Much of the time, market price activity is highly disorderly as it traces out these complex chaotic paths and this makes it look random. This has led to the academic theory of 'random walk' that says that prices are no more predictable than the fall of a roulette ball. Most traders disagree with this of course, feeling that there is a big difference between trading and gambling.

Random walk still has its enthusiasts however, and it is true that a lot of the time market price action does seem to be aimless wandering. This random-looking activity changes when feedback gets involved however, producing those tell-tale traces of trends, ranges and repetitive shapes that occur too often for mere chance to explain. Extreme cases of trends that are completely sustained by their own momentum are of course asset bubbles, which are becoming more common. Real estate is currently thought to be in 'mid-bubble' in several countries. There is an urge to buy now to avoid paying more tomorrow.

Richard Edwards and Kris Kaufman have worked for 20 years on ways to use non-linear mathematics to examine the ebb and flow of feedback in the life of the market. There are two sorts of feedback involved – the positive kind that leads to self-reinforcing trends (partly identified by George Soros' 'reflexivity') and the negative kind that causes self-limiting price development, usually producing cycles too.

The effects of self-limiting feedback can be seen when two or more causes interact. Think of the link between predator and prey where the two populations limit each other: more prey means the population of predators can grow; more predators then reduce the population of prey that can then support only a smaller number of predators. Two linked cycles then develop where the populations chase each other up and down. Neither cycle can be explained without the other.

Market movements aren't entirely random, but they often look as though they are



YES I KNOW I TOLD YOU THE HOUSE WAS IN YOUR PRICE RANGE AND THIS MORNING IT WAS!

Real Estate price trends are often self-sustaining leading to long booms and spectacular busts



Two linked causes often combine to make self-limiting effects that also make cycles

Cycles dominate economics and financial markets where they also exist because of feedback. The business cycle in the US occurs because of the interaction between the economy, and the Federal Reserve. The economy has critical mass, so it has the natural tendency to gain strength. As it grows, the Fed raises rates to squeeze out some excess vigour, which brings on a 'stall'. The Fed then eases, which restarts the process again. The result is a series of over-corrections, like the path of a novice driver on an icy road. Alan Greenspan didn't abolish the cycle of course; he was just a slightly better driver whose skill led him to incautious speed. Extraneous events affect this process far less than commentators maintain - this dynamic relationship is paramount.

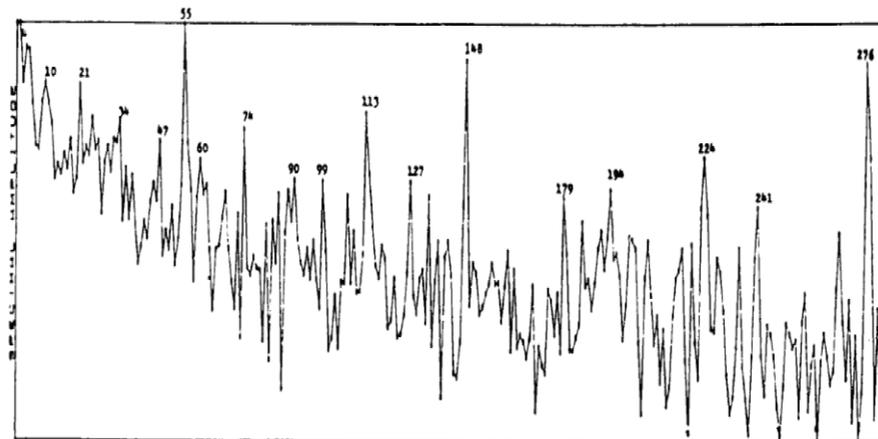
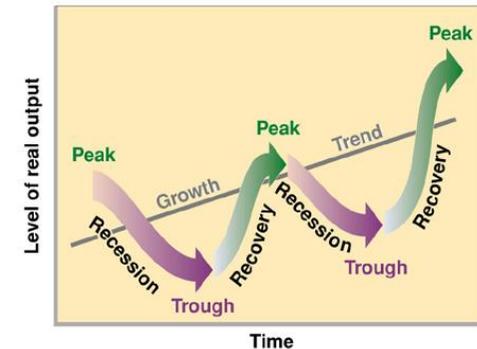
Methods

We use two principal methods to make sense of this.

First, we look at the way that cycles form and interact, using science from complexity studies and from the sound laboratory. We know that there are many cycles operating in any market - there are seventeen separate cycles of different periods in the 100-year Dow history shown here, for example. Sometimes a cycle will dominate, sometimes they all subside. We now know that this complex, muddled outcome is the result of a few underlying cycles combining to make others, according to understood rules. Just as two musical notes combine to make a harmonic third, two market cycles will combine to make others, each of which will also combine and so on.

We examine a market's price history, deconstruct the cyclical part to identify these core cycles and then re-combine them to see when in the future there will be a significant turn day. We have been able to identify most of the important high and low turning points in the US and other stock markets since 2000 - see the last page for a chart.

Business cycles also stem from two interacting forces – the economy and the Fed.



Spectrum of 100 years of daily DJIA prices

Market cycles proliferate, but modern science helps to simplify the complex interactions

Second, we look at the ways in which feedback causes persistent market price trends to develop. All financial markets are prone to self-sustaining trends that sometimes tip over into the extreme condition of a full-grown bubble. We use a measure of trend persistence that was developed in the 1950's by a dam engineer to deal with trends in flood water levels - the Hurst exponent. This is sometimes used as a gauge of smoothness (by Thomson Reuters Lipper, among others) but it is also good for measuring the persistence of a trend. We take a novel approach....

The underlying idea is an old one – there cannot be a continued price move in the face of a consensus among traders. We use Hurst exponents to measure this with great precision. Simply put, if traders with short, medium and long-term time frames are all agreed, there is no fresh impetus to keep that trend moving. Traders are highly influenced by price movements, whatever they may say to the contrary, so the state of trend reveals trader attitudes. If Hurst measures of trend at all time frames are uniformly high, that reveals a consensus and that trend will end almost immediately. We examine over a hundred different time periods to see if agreement is widespread.

This is more than a good trick for measuring sentiment however. We have taken a technique from seismology which detects the rhythm of small pre-shocks as they quicken on the way to a bigger quake. When looking through Hurst spectacles, we see a similar picture - a series of small market swerves that precedes an end to the major trend. Once these little feedback - led cycles tighten up to a critical degree in a mature trend, we can detect this. We call the resultant signals 'extensions' and they are marked in lilac on this chart of GAP.

Extensions mark the ends of self-sustaining moves that have developed and been driven by positive feedback.



Trends end at extensions – and sometimes new ones begin

The reverse situation occurs when negative feedback predominates in a market. A trading range may form in which prices chase up and down and show some short-term cyclical character. The feedback often then becomes more intense and the loops start to tighten, leading to a potentially explosive situation from which prices may suddenly 'break'. In this condition of disagreement and uncertainty among traders, we expect to see low Hurst measures of trend (because there is no trend) but the same tell-tale increasing rhythm in their progress. Once we find it, a 'compression' signal is generated. An example is shown here from 3M Corp and this is a typical result. The compression forms and suddenly a new price move begins. The trend in this case lasted only three days, ending with an extension.

Occasionally, compressions will cause an increase in the size of range, rather than a new trend. Statistical analysis of tens of thousands of compressions shows that markets have a range $2\frac{1}{2}$ times larger after a compression than beforehand. This has obvious implications for option trading and for any other volatility risk.

If extensions are our equivalent of oscillators, but with much greater precision, compressions are similar to another common market form - range breaks. We don't rely on just the shape of the price action however; we examine what goes on under the surface of all the price 'froth' to see deeper currents. This gives us a crucial edge in timing.

Markets do more than start trends and end them of course. Each of the various kinds of market action corresponds to points on a spectrum of Hurst exponents. We have identified the following categories of price behaviour: ranging, bias to ranging, random walk, bias to trend, strong trend and of course the two extreme conditions mentioned here that lead to compressions and extensions - each has its Hurst equivalent. Our researches continue into ways to measure and use each of these additional conditions to capture profits.



Trends begin with compressions – end with extensions

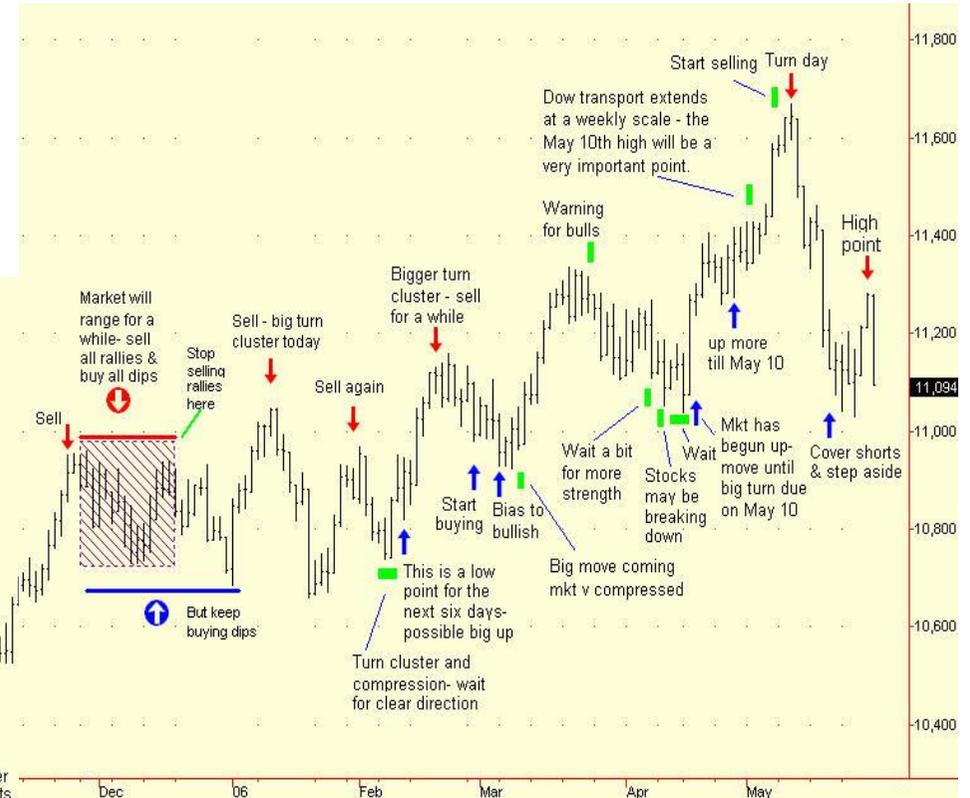
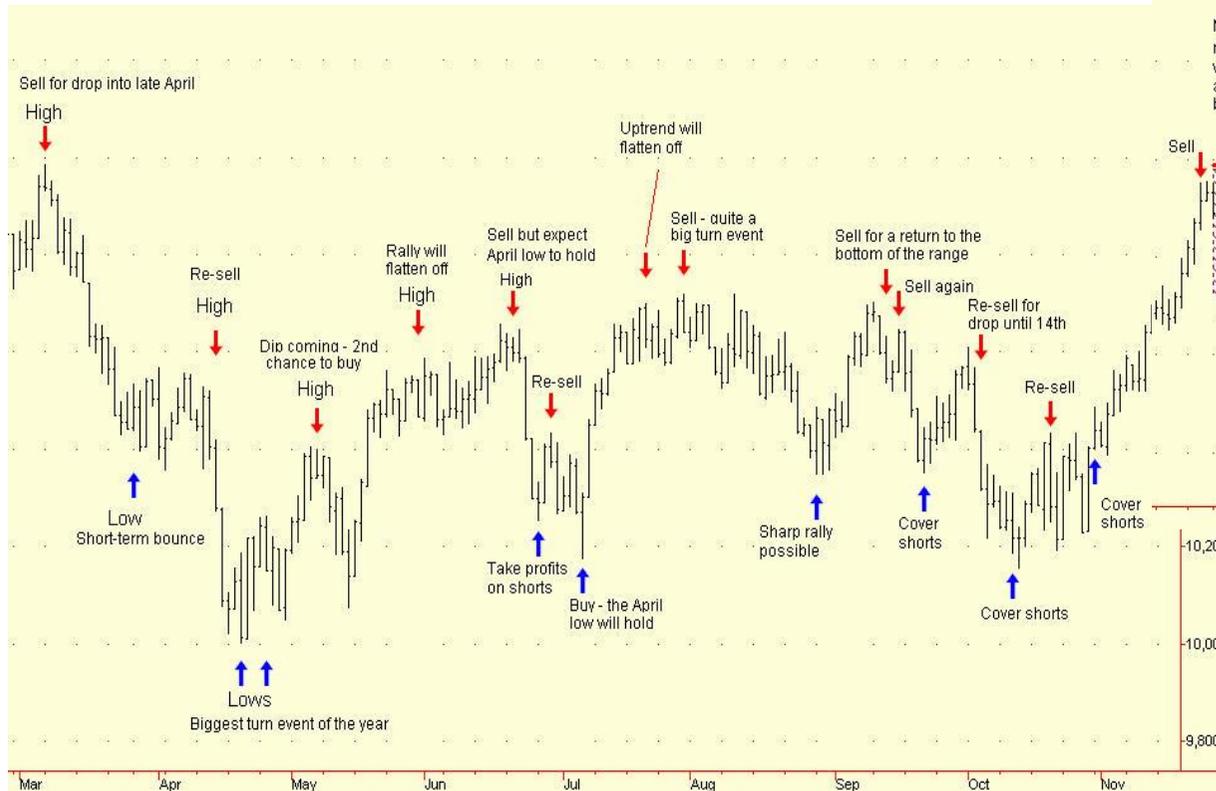
The HED publications HEDlines and AlphaMail combine all these techniques to provide a running commentary, to make forecasts of various markets and generate trades.

We use these publications as a showcase for our methods, and also supply it as a paid service. Our commercial activity is to find ways for hedge funds and proprietary traders to use our methods to manage money.

We advise several trading accounts directly and are launching a fund that we will manage.

Sample of fifteen months of US stock market forecasts and comments made in HED emails to June 2006, on daily Dow chart

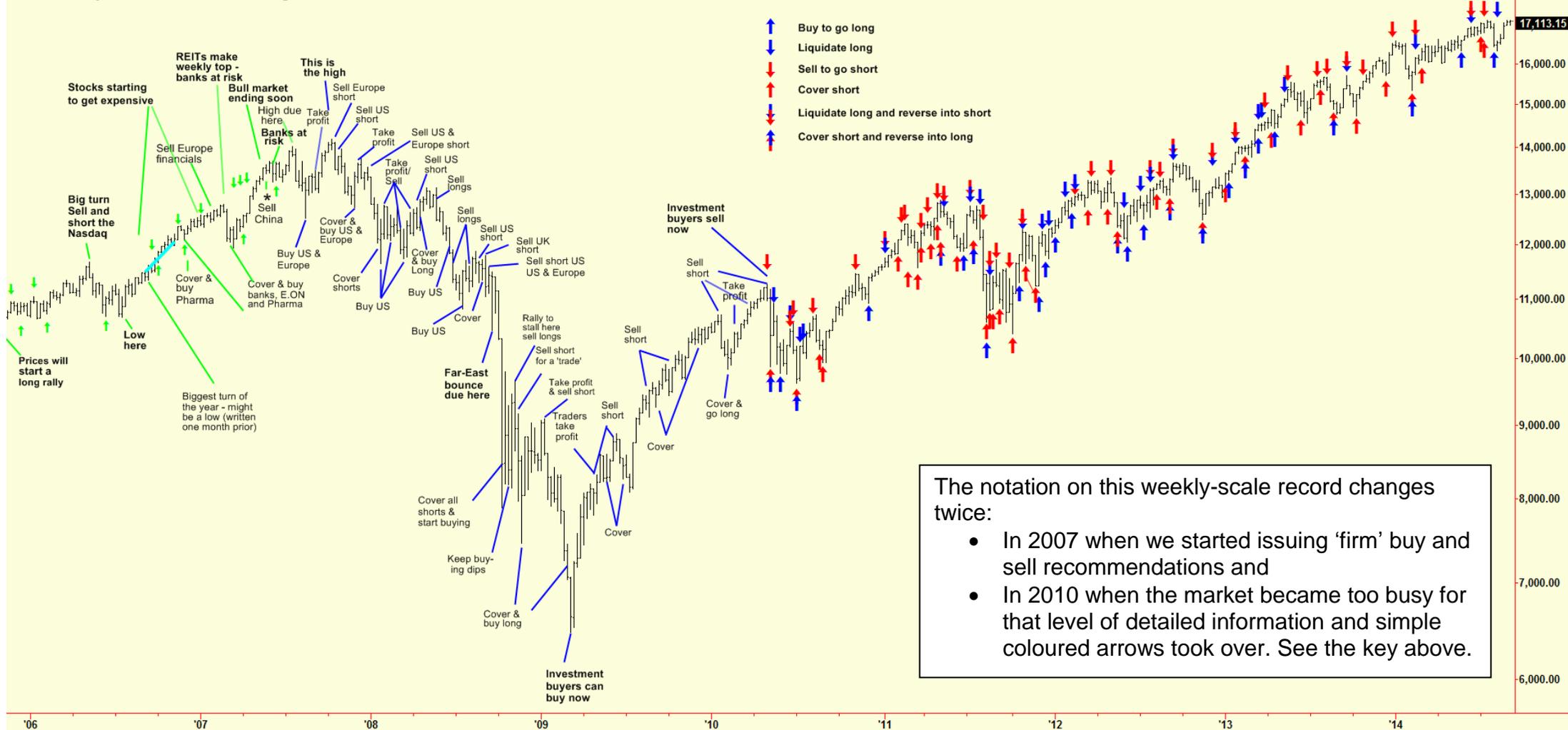
This is a chart of the daily price movement of the Dow Jones Industrials over the 15 months to June 2006. The overlaid remarks and symbols are a summary of the commentary and forecasts given in the HED Newsletter that is transmitted once or twice a week to market professionals. We also analyse other markets, including bonds, currencies, many non-US stock markets and some commodities, principally in energy and metals.



Our notation has changed a little over the period shown here. The arrows show tops and bottoms when predicted in advance or identified as they occur. Green marks show comments that prepare readers to take action. There will be further improvements and changes as time passes.

Commentary and analysis of US equities futures from end 2005. Trades from August 2007, overlaid on Dow Jones index

SINDU - Weekly Dow Jones Industrial Average



Richard Edwards
Kris Kaufman