Reader guide to using the HED analysis

Introduction

At HED we work in the area of cause and effect, where the influence of feedback is important. The past affects the present in both obvious and subtle ways and behaviour is altered by it. The effect on markets is our main concern, where price movements affect the behaviour of the people in the market.

Residential real estate booms are an example. Demand makes prices rise, as we would expect, but any rise in price also makes potential buyers anxious. They see that the market has moved and is still moving up and away and this pushes them to act with greater urgency - to buy more quickly before prices get even higher. Sellers retreat as they too raise their expectations and this combination makes the price go up even more. This is how trends can become self-sustaining in which prices can push far beyond any level that might be 'fair value' – past any equilibrium where the market could 'clear' as proposed in classical economics.

Eventually more houses will be built but this apparent extra demand can take prices higher for many years. Much later on, a crash may happen as gloom turns to panic and falling prices push sellers into a 'fire sale' while buyers step aside. Both on the way up and on the way down, positive feedback is at work, as the continued trend in price reinforces the behaviour of the participants.

In other circumstances, rising demand will be met by a quicker increase in supply but there is usually still some lag and this causes cycles. In the hotel business, when a busy city becomes short of rooms and occupancy and room rates both increase then many hoteliers will notice this at the same time and seek permission to build. After the few years needed to complete the new hotels, a glut ensues and room rates fall back again. This is negative feedback and it leads to cyclicality and self-limiting behaviour - price ranges, in other words. In this case the link between price movement and behaviour is not an exaggeration in the mood of the crowd but the natural time lag between cause and effect.

This explains the 'tower crane' indicator that often marks the top of a building boom in commercial property - a frenzy of new building sparked by high demand and prices. The peak of new construction usually marks a temporary top that leads to a pause or a dip and then renewed growth until the next one - just another peak in a cycle. These rhythmic ups and downs affect many markets for the same reason - the lag between cause and effect. We show other examples from commodities to the so-called business cycle in the videos on our website

Often we cannot see the underlying mechanism that links effect back to cause but the signs are clear - patterns that repeat, a tendency to cyclicality and self-sustaining trends, both up and down. Feedback is the principal reason why markets are not random and the study of it is part of the evolving field of behavioural finance. This provides better explanations than traditional economics and offers a chance to predict. We have identified two ways to make use of this way of thinking to anticipate what may happen next:

THE BASICS

Measuring mood.

We measure the feedback-driven shifts in the mood of the market. From this we can see when mood has reached such a fever pitch that prices can rise no further. This moment of exhaustion usually comes at a time of great enthusiasm for the market – there will be newspaper and magazine articles proclaiming that a new higher level of prices is here to stay and maybe declaring a whole new paradigm. This will all be wrong but it will be hard to detect that amongst all the shouting. The same happens in bear markets when despair reaches its maximum after price declines, near or exactly at a low point. Mood extremes can be of optimism or pessimism but a third condition also exists – that of doubt and overall disagreement.

Analysing cycles caused by lags and nature.

Lags between cause and effect are the most common causes of cycles, as in the hotel example above but they can also come from the rhythms of nature, like the seasons or the tides. Whatever their cause, there are always plenty of cycles in active operation or in temporary suspension. These all interact together to make more cycles, so the outcome is very complex. We break down this complexity to identify what current underlying cycles are active and project this forward to see when important highs and lows should occur.

THE TECHNIQUES

Mood measurement

We know that mood is affected by the direction of price but also by its type of movement - prices that rise and fall in a jagged uptrend don't bring as much excitement as those that rise smoothly and steeply so we use a measure of both trend and smoothness called Hurst, to see how eager or despondent the crowd has become. We do this at many time frames to capture the mood of all participant groups, from day traders to pension funds.

There is almost never 100% agreement in the market. Any sustained trend gets pushed along by positive feedback and believers will mainly outnumber sceptics as the trend persists. The prevailing mood also shifts periodically from one to the other as the trend either continues or as prices dip during reactions. When the trend is well established the feedback loops that kept it going start to tighten and this shows up in our analysis as a quickening rhythm in these mood shifts. Predominantly high Hurst numbers become interspersed with intervals when lower numbers occur and this alternation speeds up as the end of the trend approaches. When the shifts are almost continuous, we get a signal called an extension.

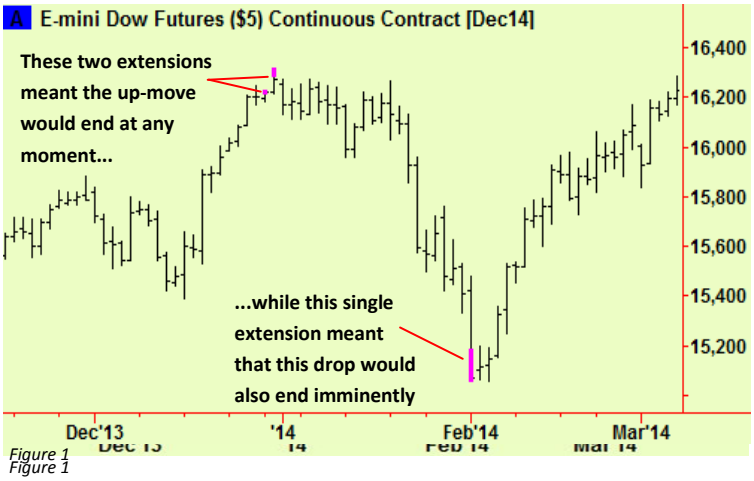

Figure 1

Extensions – these are shown as a pink tip on the bar of the period concerned:

An extension signal means the end of the current trend is imminent. This may also mean the start of another trend in the opposite direction but that is more often the case at the end of downtrends, as in this example from Dow futures in 2013/2014. The bottom extension led to a sharp rebound as the market recovered all its losses. The top extensions coincided with the end of the up-move and prices fell only after three choppy weeks, after a 'top' had formed.

Mood is also important when there is no consensus and instead doubt prevails, because that is when new trends start. We measure this using the same tools but now we look for generally low Hurst numbers with a sprinkling of high ones for contrast, with the same quickening rhythm in the different time frames. When this rhythm has become very fast, disagreement is at the maximum and a compression signal is the result.

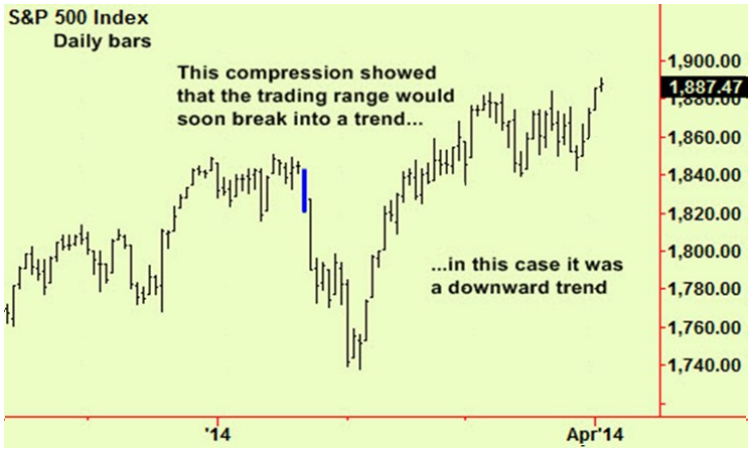

Figure 2

Compressions – these are shown in blue, covering the entire bar of the period concerned:

A compression signal means disagreement and uncertainty is at a very high level and a new trend is likely to start at any moment. There is no way to predict which way that trend will go, only that there will probably be an increase in the range of price movement.

These first two charts in figures 1&2, both show periods of market activity from late 2013 into 2014. Using data from different instruments can result in slightly different signals - there was no compression in the Dow chart and no extensions in the S&P. By looking at both (and at many others) we were able to identify, predict and capture all the main ups and downs in this period.

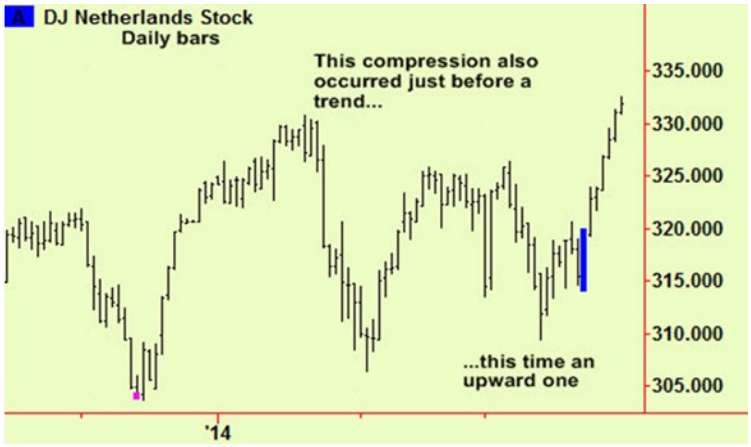

Figure 3

Compressions may also lead to up-moves, as in this Dutch example:

This compression example from Holland broke upwards, and a strong new uptrend developed immediately. Compressions often lead to trends like this but sometimes there is just an increase in range without any defined direction. We usually cannot tell which way a compression will break, so we generally wait for the break and then follow it. There are also other ways to use compressions as described below.

CYCLE analysis

What cycles are

Cycles in price can originate from natural rhythms, such as the time of orbit of the earth around the sun or the breeding seasons of livestock, but most such natural cycles have little market effect. Grain is mostly not cheaper at harvest time even if tomatoes and apples are, as markets that have futures contracts or their equivalent tend to 'smooth out' any obvious cyclical effects so little advantage can be gained. There are some identifiable seasonal effects on intra-commodity price spreads but even these tend to be 'arbitraged away' over time. Other cycles stem from lags between cause and effect, as in the hotel building example in the Introduction, or from interaction between 'core' cycles. These last two are common, and have different characteristics – cycles from lags are not as regular as say, the tides and interactions between cycles lead to yet more cycles that may appear then subside for a while. The result in most markets is a very complex set of cycles – too many to be immediately useful. We condense matters to make sense of it.

What we do

First we identify all the cycles that are present in the price history of a market - there are usually many - then break down that complex muddle into a few underlying cycles that are currently active and interacting to make the rest. We then re-combine them, projecting forward to see when they will occur in the future. These dates mark moments when important highs and lows are likely to occur.

We do this for a large variety of markets in commodities, currencies, bonds and equity indices and then look across the results to see where those turns are due, paying particular attention to days when turns in related markets coincide or 'cluster'. Clusters of turns are a particularly good guide to when price highs or lows will happen. The bigger the cluster, the more important the high or low tends to be. The main method we use is described on Page 8. We use a slightly different method to examine the very long-term Dow industrial average series and the Dow bond index and consider these more significant than any other single turns.

Uncertainty

There is an important uncertainty that remains as we cannot tell in advance if a turn will mark a high or low point – this is a consequence of the inputs that we use and the type of calculation that we do. As the date approaches, this uncertainty falls away and we can usually see what is coming. If markets are rising, the turn will mark a high point. If they are falling, it will be a low. If there is no clear prior trend we have to wait for the turn date to recede into the past to see what has occurred.

How we use the results

We publish these dates in advance roughly once every six weeks in our regular editions, titled 'upcoming turns'. Equity turn clusters are scored grade 1, 2 or 3 depending on the number of turns in each cluster and their geographic reach. A cluster that has elements from the US, Europe and Asia in considerable numbers will score 1 whereas one with fewer components or that is restricted to only one geographic zone will score 2 or 3. Turns in other assets classes are not graded as there are too few instruments linked to say, the price of copper or the €/¥ exchange rate, unlike the multiple stock market instruments that we can follow.

	Upcoming turn clusters								
Date and grade*	22-23 April	28th April	30th April	2nd May	8/9th May	13th May	19th May	29th May	6th June
Equities	2			2 *	2	2	3 (US only)		1
Bonds					✓	✓	✓	✓	✓
Currencies			✓		✓				✓
Energy		✓			✓		✓	Nat Gas	
Other commodities		✓		✓	✓		✓		Grains

*Equity turn clusters are graded 1 (high) - 3 (low)

* includes a small Dow long-term series turn

Figure 4

Interpretation and notable features of Extensions, Compressions and Cycle turns

Because **Extensions** mark the end of trends, the end of one trend might also mark the start of the next one but it is quite rare for markets to flip from an uptrend into a downtrend - there is usually an interval in which a 'top' forms, as in figure 5 below. It is much more common for a downtrend to end abruptly and the next uptrend to start immediately in a 'spike bottom', as mentioned earlier. Accordingly we have different expectations of bottom and top extensions - top extensions are more likely to mean 'no more up and maybe down later' while bottom extensions are more likely to mean 'no more down and now reverse to up':

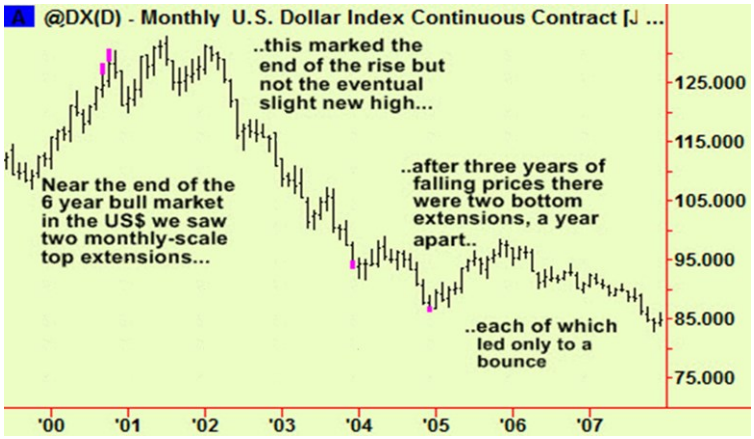

Figure 5

The top extensions near the start of this chart signalled the end of the uptrend but we had no expectation that the dollar would immediately fall. Instead it was likely that a 'top' would start to form - the extensions would mark the 'beginning of the end'. At this point we should exit all longs and start trading from the short side, but also trade back-and-forth while building a core short position. When the price drops and bottom extensions form, we expect immediate rallies. Extensions can mark the absolute end of trends, as in the end of the $ index bull market in figure 5 above but can also mark the end of interim 'legs' in the trend as the two bottom extensions in the same chart show - each preceded just a bounce. Signals using data from longer-term periods (weekly or monthly) have longer-term significance but the 'active shelf-life' is always about 15-17 periods. We look across all time frames to devise both strategic and tactical views.

Compressions can also act in several different ways.

A **new trend** often starts with a compression or multiple compressions. A little later there is a tendency for prices to return to the price level of the compression before the trend then resumes. It is useful when prices return to the level where a compression has occurred, as a new position can be taken with greater confidence – we already know the direction of the trend as shown by the break of the compression. In this case it was downward, so selling a rally back up to the price level of those compressions was a lower-risk trade. The trend then remained downward with imminent reactions signalled by extensions, as usual.

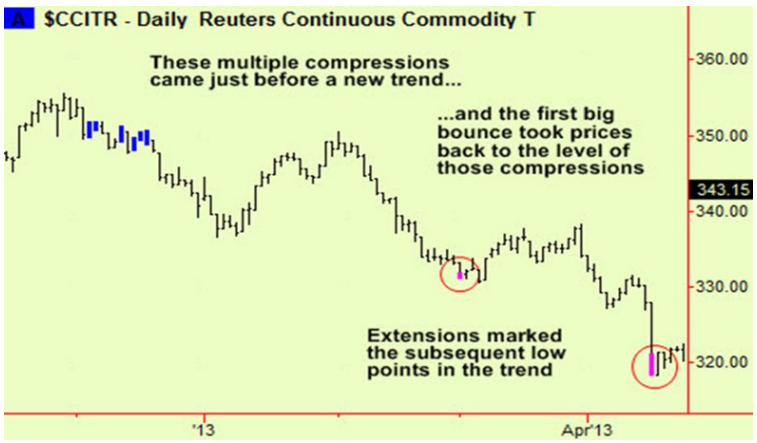

Figure 6

Any 'return movement' to the compression may be after some time has passed, as in Figure 6 above or it may be fleeting and come much sooner, as in these other examples in Figure 7 from the same commodity index: These 'return movements' to compressions do not always happen – they did not in the S&P and Dutch stock market examples in Figures 2&3. When they do, it can be very soon after the compression breaks or shortly after as both seen here OR after quite some time has passed as in Figure 6 above. In all cases the compression level acts as a 'barrier' to the price which may approach it but will have difficulty going through it. After this pair of compressions in figure 7 broke down, there was a fleeting rally on the third day after the break which was small but still gave a chance to sell a rally with the full knowledge that a break down had already occurred. In the later example in this chart there was a rally that peaked on the fifth day after the break which again gave a clear opportunity to sell at prices in the area of the compression, with the certain knowledge that a break down had occurred so a downtrend had begun.

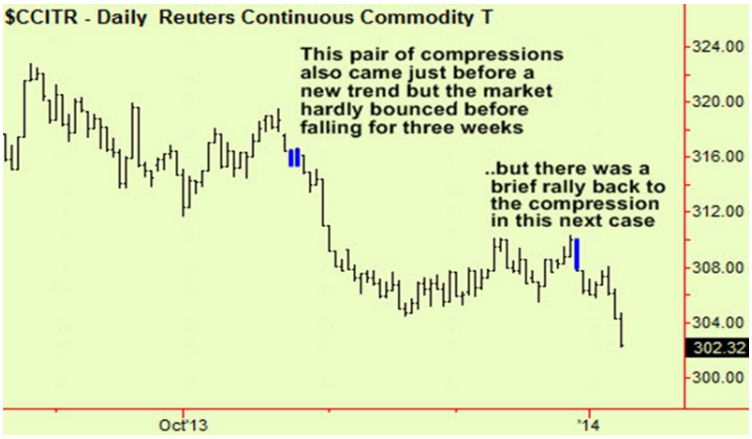

Figure 7

Return movements can also happen after an upward break from a compression:

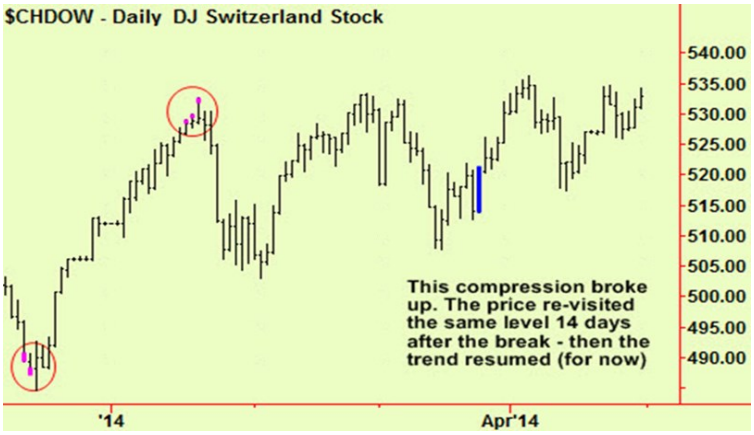

Figure 8

After a compression breaks upward, the trend is then clearly up. A return movement may take the price back down to the area of the compression, offering a second chance to buy. If there is a return movement the area of the compression will act as price support.

See also how extensions can mark major highs and lows, but do not always appear. We look at multiple markets to get as many signals as we can – even one may be enough. There is no way to predict whether a return movement will occur or when, so the best preparation is to know what to do if one does happen - assume the trend has begun when the break of a compression occurs and take advantage of the return to the compressed price area to take a low-risk position pointing in the same direction as that trend. Protective stops may then be placed a little beyond the other side of the compression. The reason for the existence of return movements is covered later in 'Attractors'.

Volatility increase and repeat compressions

Sometimes a compression does not break into a trend. There are two other possibilities:

- Volatility simply increases on both sides of the compression. This can be dangerous as the increased volatility will start with an apparent break of the compression which then 'fails' to continue, instead pushing back through the other side of the compression:

Here a compression formed in Spyders which broke upward. The price trended up a little before a dip started then the price fell back to, and soon through the compressed area. This would have been very difficult to trade profitably and yet there is still some pattern here. The price rose above the compression by a little over 3 points and then moved below it by almost exactly the same amount. This is typical and is part of the 'Attractor' aspect of compressions.

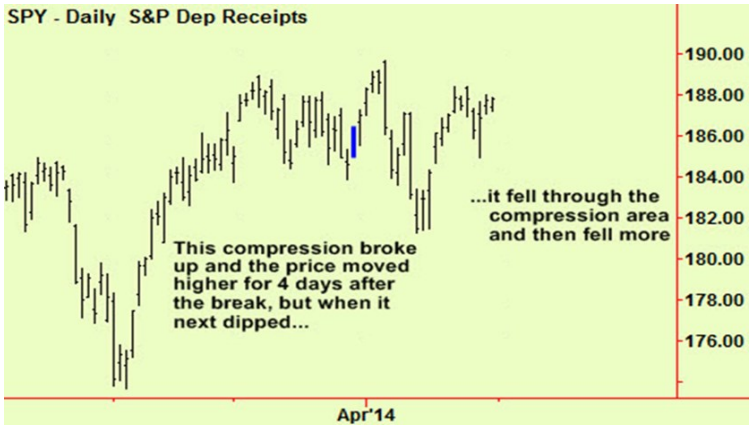

Figure 9

- Multiple compressions can occur, as shown in the early part of the first commodity index chart in Figure 6 and this daily DAX chart below in Figure 10. Markets do sometimes get 'stuck' for longer periods of time when caught between conflicting forces and this is when we can see multiple compressions. Such multiple compressions will eventually break into a new trend but there is the risk of some short-term 'false breaks' before that happens with the risk of 'whipsaw' trading losses. In circumstances like these, compression signals will usually also appear at weekly or even monthly scales before a 'real' break occurs, so we scan these time frames constantly to reduce the risk of getting caught in short-term trading ranges.

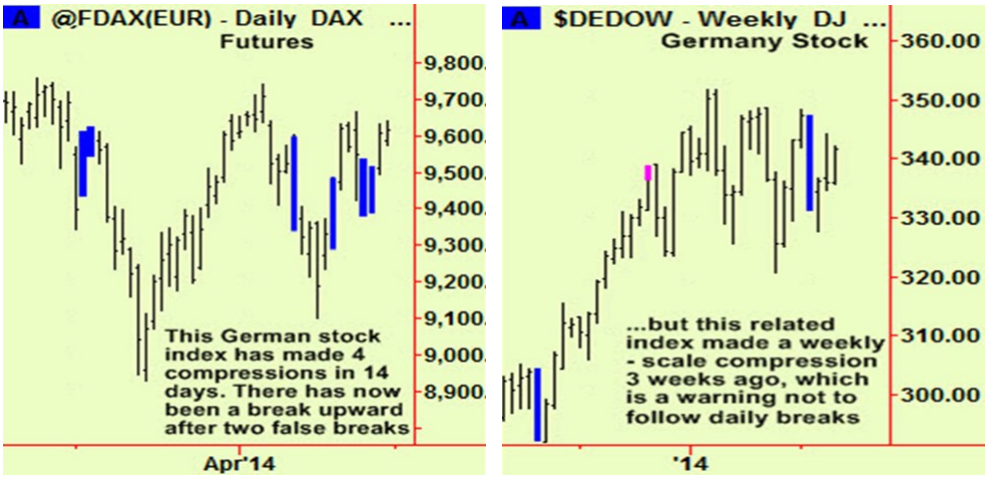

Figure 10

Several daily-scale compressions occurred in DAX futures in April 2014. Each broke in one direction then another, meaning there was a high risk of 'whipsaw' trading losses. In the early part of the same period there was also a weekly-scale compression in another German stock index and this warned that a 'real break' would not occur until this larger-scale signal also broke. This prevented us from whipsaw losses.

When compressions occur

Compressions are not the same as the simple 'range break', as defined and used by technical analysts. There are quite specific requirements for a pattern of mainly low Hurst measures to develop a quickening rhythm before a compression can happen and this makes compressions rarer than simple trading ranges that may have been going on for a while. They do occur in such circumstances but also when a range is narrowing or when a period of erratic market action has continued for a while. There are no consistent visual clues that a compression is due – the calculation is paramount. The oddest occasions are when a particularly wild trading day, week or month comes along with a wide price range and afterward we see that generated a compression signal. An example from copper futures:

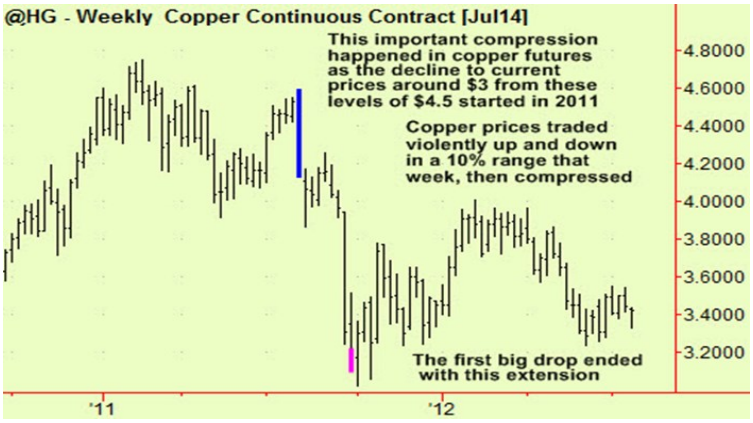

Figure 11

Despite the violence of the trading conditions in the week of this compression, the necessary conditions for the signal were only met after this 10% range.

This requires patience and the urge to resist guessing which way the compression will break – there are plenty of examples of compressions that seemed to be breaking one way that actually broke in the opposite direction by the end of the period - as did this

Stops are a vital part of trading but placing stops too close almost guarantees overall losses as small random moves will elect many of them. Placing them too far means that hitting one is expensive. Compressions act as support and resistance once a trend has started and this property can be used to place stops at the proper distance, in locations where they are unlikely to be hit. This is especially useful when a trade is in progress and a new compression appears - the stop can be moved closer to the price, protected by that compression.

Turns

Typically, turns reliably mark market price highs and lows but there is some need for interpretation as the turn date approaches in the calendar because we do not know whether to expect a high or low point. This is a consequence of the way that we recombine the component cycles extracted from the price history. Every cycle has 3 characteristics:

- Wavelength or its inverse, which is frequency
- Amplitude, or how big each wave is from bottom to top
- Phase – whether we are expecting a high or a low

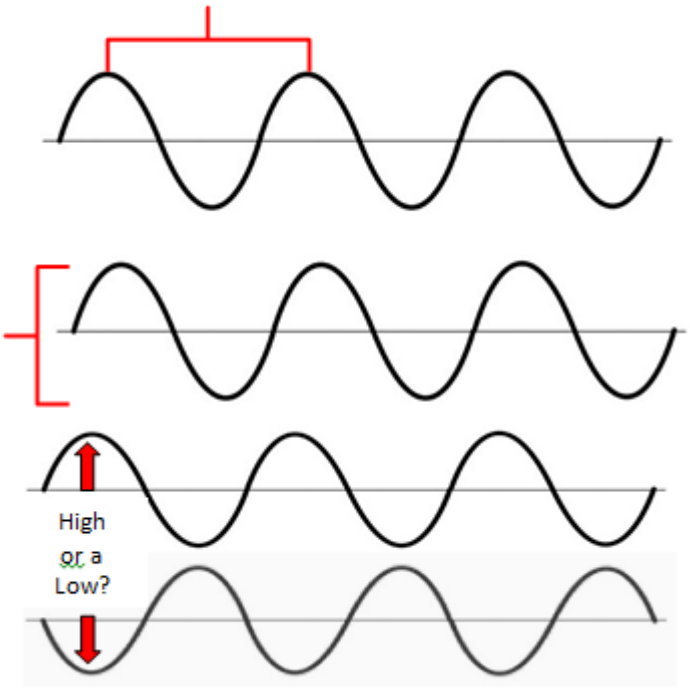

Figure 12

Previous work done by others on predicting market turns using cycles has mostly used methods based on an 18th century approach that emphasises only the wavelength. This is too rigid as each of the characteristics of a cycle can have an important effect, so we use more recent mathematics. See a note on Turns at the end.

The result is much greater accuracy of timing in our turn prediction results at the expense of certainty about phase. We cannot know in advance whether to expect a high point or a low. We deal with this by publishing turn dates in advance and waiting until the date of a turn is very near before trying to tell what it will be. Here the prior trend is all important as uptrends lead to highs and downtrends lead to lows. When there is a clear trend, interpretation is easy. When there is not, it is hard.

Swerves

There is a further complication. When markets are in trading ranges or are simply erratic, turns pick out highs and lows with good accuracy and reliability. This is useful, as these can otherwise be times of great trading risk - whipsaw is common, as described above.

When markets are in trends however, the turns don't just disappear - the 17 different cycles in the Dow with periods of less than a year are mostly still present if the market goes up all year, but they mean different things.

In a strong trend, such as the bull market in US stocks throughout 2013, an upcoming turn will often seem to mark an obvious imminent high point. Some days before the turn arrives, the market may dip without warning and the expected high point turns into a low instead. The uptrend then continues from that low point until the next turn. This is a 'swerve' and is another reason why we watch carefully as a turn date approaches, as it is easy to be wrong-footed. Swerves are very useful (after the event) as they provide extra evidence that the market is currently in a trend, possibly a strong one.

Chicanes

As stated, we look for clusters of turns in related markets and the more we find on or near the same day, the more likely it is that an important high or low will occur that day. Clusters are often spread over two or three days but when significant numbers of turns are due over a slightly longer period, the possibility arises that we may be looking at more than one event. When markets enter a highly volatile period, there may be significant high and low points separated only by a few days.

These ‘chicanes’ can be very useful when detected in advance (and dangerous when hidden) and closely-spaced turn dates are a good way to see them coming. An example from US equities: we expected large-scale turns from the longer-term Dow series on 22nd and 28th May 2013 and another on June the 5th or 6th, all with direction unknown, as usual. What happened was this:

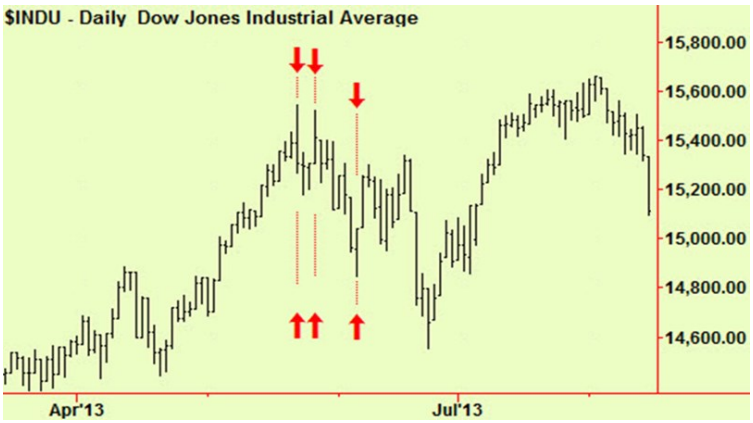

Figure 13

We expected three turns in quick succession on the dates marked with arrows joined by lines. Prices rose into the first, making an obvious high. The second also marked a high but we can only see this with hindsight as a low between these two was close to both. The third turn spanned 2 days, marking a low on its second day. Three turns in 12 trading days was too dense to use as trading triggers but closely-packed turns warn of increased volatility, which is very useful. This requires a degree of interpretation as any individual example of a chicane may also resemble a single large but diffuse turn event that simply spreads over a larger-than-average number of days. There are always some clues but they are faint and we have not found a way to improve upon the trained human eye when examining the evidence.

Accuracy of turns

Turns are often accurate to the day or within one day either side of the date on which the cluster of turns is due. If the cluster spans two or three days then it is highly probable that the high or low point will happen on one of those days but there is still the possibility that it may come on a day either side of the cluster. If it comes even further away from when we expect it, we consider this a failure as the need to act on turn signals is urgent and greatly impeded by any extra uncertainty.

Even if an expected turn is hard to read as the date fails to coincide with either a high or low point, there is still some valuable information available. Waiting for a few days and looking back can reveal the true nature of events and still leave enough time to take profitable action. A large turn will have affects that last many weeks and even smaller turns are useful for a week or more. Patience is helpful.

Conclusions

Hurst-based signals

Extension and compression signals are ‘coincident’ indicators - they need constant recalculation and tell us about the current state of the market. The signals themselves only appear when strict conditions are met and those signals have considerable power. Extensions mean that the current trend is ending and compressions mean that a sharp increase in range is due - probably a new trend. We at HED also monitor the general state of Hurst measures of all the markets that we follow to see if the preconditions for signals are falling into place but keep this analysis for internal purposes. Using some or all of these signals is a good way to engage with the markets – for example buying any share that has a weekly- or monthly-scale bottom extension and selling or hedging the whole portfolio whenever there is a weekly or monthly-scale top extension in the market index produces very good returns. Adding shares that have also made upward breaks from longer-term compressions provides similar results but adds diversification while adding the third method described here of buying stocks that have returned back down to compressions adds a bit more alpha.

Turns

Predictions of upcoming turns based on cycle work are reliable on timing but leave room for doubt about direction. Using some rules derived from experience and the judgement of the HED staff reduces that doubt but there are still occasions when the date arrives and recedes into the past without certainty about the turn. Waiting a little reduces this uncertainty further, leaving only a few indeterminate turns a year. Turns can also be a useful trading method, even if used on their own - we at HED have been able to identify in advance most important highs and lows in equities and other markets in the past decade.

Combinations

The best results come from using the two techniques together. HED provides warning of upcoming turns and a running commentary about Hurst-based signals for readers to use as they wish, but we only issue 'official' firm trading recommendations when there is a coincidence of both. In order of usefulness these combinations are:

- A turn with a bottom extension (to take long positions) is the most reliable
- A turn with a return to a compression is the next best – providing a place to take long or short positions, depending on the direction of the original break
- A turn with a top extension is only the third best due to the time that is usually needed to make a 'top'. Profits from being short in a down-move may come only after that process is complete, which can be lengthy, but some back-and-forth trading can help generate profits in the meantime
- A turn with a compression that is breaking is the last. This is a powerful combination – we often say that the turn 'turbo-charges' the compression – but the possibility of false breaks and/or recompressions makes the direction subject to a greater degree of doubt. Use with care.

Results

Using this combination of coincident (Hurst-based) signals and turn predictions from cycle analysis produces the track record that we update every month.

Notes

Attractors

Markets share some of the characteristics of dynamical systems, like the flow of fluids or the population numbers in a predator vs. prey relationship. The role of negative feedback can be significant here, in the interaction between related causes and effects, so that if wolves eat all the rabbits, they too will die out as each population limits the other. Rather than simple mutual extinction, the two populations tend to chase each other up and down making two linked cycles, as shown in the shorter of our videos.

Another feature of dynamical systems is the spontaneous appearance of attractors, which lead to repeating behaviour linked to fixed points that are regularly re-visited, no matter what disturbance may occur. The best-known example is the Lorenz system of two attractors that are orbited in turn. This is the role compressions play in markets, acting alternately to repel and attract the price that forms them. Occasionally this can lead to the compression becoming the mid-point for a new trading range, as in the Spyder example in figure 9 above.

Prior generations of traders had often noticed that certain price levels seemed to act as attracting and repelling 'magnets' for the market but were baffled as to why this should be and why they should appear, vanish then return. In the 1980s this was dismissed as the kind of superstitious nonsense beloved of mystics and it became too embarrassing to mention. Now we can see that it has a sound basis in science.

Attractors are sometimes described as 'strange' if they have a fractal aspect. Markets do indeed have this feature as their tendency to make self-similar patterns extends to different time frames too – a chart of hourly prices looks similar to one of monthly prices so the correct scientific term for this aspect of compressions is the lyrical expression 'strange attractor'.

Turns

The favourite method for distilling complex cycles into simpler components has long been the Fourier transform, first conceived around AD1800. Most versions concentrate on the frequency of the cycles involved, so ignoring the other cycle characteristics. We use a Fast Walsh-Hadamard Transform in a divide-and-conquer algorithm that allows all three to contribute. The results are dramatically better.