Quorum

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Of Butterfly Wings, Earthquakes and Market Movements –*An interview with Richard Edwards of HED Capital – Part 1*

I believe it was in January 2000 when I first met Richard Edwards. It was a cold and wet evening in London and I was introduced to this remarkable person by a mutual friend. As the bell to the flat rang, my friend said "I'm going to introduce you a friend of mine, but I do have to warn you he seems to me a bit eccentric. I also have to admit that I have no idea what he does or talks about most of the time, but I think you will like him. He is very entertaining." With that brief introduction into my world bounded one of the more exceptional people I have ever met.

Richard made an entrance into the living room that would have made Douglas Fairbanks proud. Surveying the empty room as though it was full of important people he quickly sorted through those of little interest until he came to me. With a mischievous twinkle in his intelligent eyes and a smile, he looked at me, then at my friend, and while thrusting his hand out to shake mine said, "So I finally meet the American!" Turning back to me, smiling broadly, he said in his best John Wayne voice, "Howdy, Pilgrim!"

The first meeting with Richard was to talk about Quorum's approach to executive search. We laughed a lot, talked high-brow strategy, and Richard gave me intelligent and thoughtful observations and advice. Our second meeting was over dinner, and now it was my turn. "So Richard, what do you do?"

"Well" he responded, "I am working on an application of nonlinear mathematics to financial markets." At this he paused to see if my eyes glazed over with either ignorance or boredom. "Oh!" I responded, "Chaos theory! Really, tell me more." Over the last eight years, Richard has been patiently educating me on the application of new science to the study of markets.

Richard read Law and Mathematics at Trinity College, Cambridge. He began life as a trader, trading commodities and what ever else struck his eclectic fancy. At one point in his career he was the number one commodity trading advisor in the world. He has lived and worked in London and Kuwait. He is married to a terrific woman and has two children, who repeatedly prove the aphorism, "The leaf does not fall far from the tree."

Before we begin this interview, I have a few comments. First, some of the ideas Richard talks about are complex and somewhat counterintuitive. To the extent possible, I will try to either give a much abbreviated summary of the idea or refer to a good source. Second, I am a lay person when it comes to mathematics and how markets behave, so I am going to ask questions and interrupt Richard when he uses a term or explains an idea that I do not understand. Third, I hope everyone will find Richard entertaining as well as interesting.

Quorum:
Hello Richard, it is a pleasure as usual. How has it been living in a Chinese curse? Could things in the markets get more interesting?

Richard:
They certainly could—as we say in nonlinear land, "An avalanche never knows how big it's going to get!"

Quorum:
How did HED Capital come about?

Richard:
It started as a vehicle to spread the word about our mathematical discoveries and to make some money.

Quorum:
So can you briefly describe what HED does?

Richard:
We work in the area of cause and effect. This was thought to be a simple matter until a few years ago but now we see that interaction between events and their consequences can have unexpected results. Basically, we study complex systems and develop a predictive model for how they might behave. In our case, many of the complex systems we study are financial markets.

Quorum:
Now I need to stop you for a moment. Cause and effect, complex systems, unexpected results, interaction, complexity; to a lay person this sounds like Chaos Theory.

> The study of complex systems is bringing new vitality to many areas of science where a more typical reductionist strategy has fallen short. "Complex system" is therefore often used as a broad term encompassing a research approach to problems in many diverse disciplines including neurosciences, social sciences, meteorology, chemistry, physics, computer science, psychology, artificial life, evolutionary computation, economics, earthquake prediction, molecular biology and inquiries into the nature of living cells themselves.
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> Complexity theory is rooted in Chaos Theory, which in turn has its origins more than a century ago in the work of the French mathematician Henri Poincaré. Chaos is sometimes viewed as extremely complicated information, rather than as an absence of order. The point is that chaos remains deterministic. With perfect knowledge of the initial conditions and of the context of an action, the course of this action can be predicted in chaos theory. (Wikipedia, "*Complex System*")
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> For a very good summary of Chaos, the reader should click on the following link: http://en.wikipedia.org/wiki/Chaos_theory . This is too long to be included here, but we do recommend reading this page. It also provides technical references that will be of interest to the more technically minded. In particular, the work of Benoît Mandelbrot has been particularly important to understanding the workings of financial markets.

Richard:
I think the current term for the use of this approach in markets is "Econophysics," but that's just the latest coinage. All these nonlinear areas are dots in a line that we are still trying to connect: Chaos, complexity, critical state and a forgotten one too—catastrophe theory. They are all in the same area—where cause and effect are disproportionate, because of feedback.

In other words, effects feed back into causes and this two-way interplay results in loops that go round and round and can spiral off in some unexpected direction. This makes difficulties for economists, politicians and almost everyone who makes a living from having opinions.

Quorum:
Does that include traders?

Richard:
Especially traders, which is why I got interested in this stuff in the first place.

Quorum:
Are there differences between these areas of exploration?

Richard:
Some, but the common ground is more important—it's the strange behavior that stems from feedback and its action in so many different dynamic systems that makes it interesting. The mathematics and its applications have advanced significantly since Lorenz's famous butterfly.

Quorum:
Lorenz's butterfly?

Richard:
Edward Lorenz was a meteorologist who first discovered the idea that large events, like weather can be remarkably sensitive to very small changes in initial conditions. I'm not sure where the term "butterfly effect" came from - the idea is that a butterfly flapping its wings in, say, Honduras can cause a hurricane in the Gulf of Mexico. Small cause, big effect—that's what people mean by "nonlinear"; it's the disproportionate size of the two.

Quorum:
I have heard of that. *Butterfly Effect* was a movie title too.

The term "butterfly effect" itself is related to the work of Edward Lorenz, based in Chaos Theory and sensitive dependence on initial conditions. The idea that one butterfly could have a far-reaching ripple effect on subsequent events seems first to have appeared in a 1952 short story by Ray Bradbury about time travel, although Lorenz made popular the term. In 1961, Lorenz was using a numerical computer model to rerun a weather prediction, when, as a shortcut on a number in the sequence, he entered the decimal .506 instead of entering the full .506127 the computer would hold. The result was a completely different weather scenario. Lorenz published his findings in a 1963 paper for the New York Academy of Sciences noting that "One meteorologist remarked that if the theory were correct, one flap of a seagull's wings could change the course of weather forever." Later speeches and papers by Lorenz used the more poetic butterfly. According to Lorenz, upon failing to provide a title for a talk he was to present at the 139th meeting of the American Association for the Advancement of Science in 1972, Philip Merilees concocted, "*Does the flap of a butterfly's wings in Brazil set off a tornado in Texas*" as a title. (Wikipedia, http://en.wikipedia.org/wiki/Butterfly_effect)

Nonlinear generally refers to a situation that has a disproportionate cause and effect. In science and mathematics, nonlinearity can refer to a system whose behavior is not expressible as a linear function of its descriptors

Generally, nonlinear problems are difficult (if possible) to solve and are much less understandable than linear problems. Even if not exactly solvable, the outcome of a linear problem is rather predictable, while the outcome of a nonlinear is inherently not.

Nonlinear problems are of interest to physicists and mathematicians because most physical systems are inherently nonlinear in nature. Physical examples of linear systems are *not* very common. Nonlinear equations are difficult to solve and give rise to interesting phenomena such as chaos. The weather is famously nonlinear, where simple changes in one part of the system produce complex effects throughout. (Wikipedia, *Nonlinearity*)

Richard:
So was "Chaos theory" but the film hasn't got much to do with nonlinearity. I'm waiting for a summer blockbuster called *Strange Attractor*, another of our bits of poetic jargon.

Quorum:
You're too late—straight to video sci-fi from about five years back.

Richard:
I should know better than to play movie quiz with a Goldwyn. The basics are these: Once feedback sets in and the interaction between cause and effect is established we move on to what it involves—that's the road to chaotic motion. The characteristics of it are a tendency for the system (It's always a system, never a one-off.) to return towards its initial conditions (which corresponds to a market reverting to its mean) and an extreme sensitivity to those conditions.

There is a lot of this around in the physical world and some of it is useful as an illustration of what we mean. Some of it is merely interesting—think about watching smoke rise from a match. At first it is gently rising in a line then it begins to vary from its path until suddenly it is moving "chaotically." Any system that contains these conditions is referred to as dynamic or complex. This smoke example is one and so are earthquakes, weather or, of course, financial markets. This complexity makes it difficult to predict the system's behavior past a certain period of time and it's all because of the interaction between cause and effect.

Causes have effects; in turn effects feed back into causes and this two-way interplay results in complexity, which is nonlinear, meaning the effect can be a very different size from the cause. Things also change all the time. Why are financial markets so prone to bubbles compared with a few decades ago? Why does the population of lemmings occasionally take a dive?

It's not that lemmings willfully dive off cliffs (they don't) or that financial markets are inherently unhinged (although the players sometimes are). It is the existence of feedback. Feedback causes

> Feedback is a process whereby some proportion of the output signal of a system is passed (fed back) to the input. This is often used to control the dynamic behavior of the system. Examples of feedback can be found in most complex systems, such as engineering, architecture, economics, thermodynamics, and biology.
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> Systems which include feedback are prone to hunting, which is oscillation of output resulting from improperly tuned inputs of first positive then negative feedback. Audio feedback typifies this form of oscillation.
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> Bipolar feedback, which can either increase or decrease output, is present in many natural and human systems. Feedback is usually bipolar—that is, positive and negative—in natural environments, which, in their diversity, furnish synergic and antagonistic responses to the output of any system.
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> A system prone to hunting (oscillating) is the stock market, which has both positive and negative feedback mechanisms. This is due to cognitive and emotional factors belonging to the field of behavioral finance. For example, when stocks are rising (a bull market), the belief that further rises are probable gives investors an incentive to buy (positive feedback, see also stock market bubble); but the increased price of the shares, and the knowledge that there must be a peak after which the market will fall, ends up deterring buyers (negative feedback). Once the market begins to fall regularly (a bear market), some investors may expect further losing days and refrain from buying (positive feedback), but others may buy because stocks become more and more of a bargain (negative feedback).
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> George Soros used the word "reflexivity" to describe feedback in the financial markets and developed an investment theory based on this principle. (Wikipedia, Feedback)

strange cyclical loops that force repetitive behavior patterns that are never exactly the same. In the mass of humanity it can cause social and economic trends to go on and on.

Quorum:
So how do you make sense of this?

Richard:
This is the world of virtuous (and vicious) circles caused by positive (and negative) feedback. The outcome of one person's action can influence the next person's behavior and so on, leading crowds to behave differently from the individuals that comprise them. Simply put, these complex systems have a tendency to, among other things, move in cycles, which are caused by these feedback loops. These cycles and some other patterns are recognizable. We can model such systems, their cycles and the other recurrent results of feedback, assuming there is enough data and the data is accurate.

Quorum:
So how do you apply this to financial markets?

Richard:
We have discovered two distinct ways to measure and predict price behavior. First, we examine the cycles that feedback can produce and how these cycles interact. Second, we study price movement across many time frames, measuring the behavior of market participants.

Based on our study of cycles, we have the tools to understand internal market dynamic and when markets will change, or "turn."

Quorum:
Hold on, I need to back you up. When you talk about cycles, what do you mean?

Richard:
Just the normal meaning of the word—it's not jargon. We mean by it the tendency for the price of a stock, say, to shuttle back and forth with regular intervals between the ups and downs—a rhythm to its dance if you like.

We use the mathematics to sift through the data and analyze the important highs and lows that a market has made, examining the times when they occur, looking for cyclical repetition. We give each high point a value by looking back beyond each one to the previous high that it surpassed and measure the time interval between the two. This length of this time interval is the "score" that we give to the high point in question. We do the same for low points. Next, we identify any tendency towards cyclical repetition in the timing of these highs and lows and list their periods.

Quorum:
Are there many different kinds of cycles in a given market? If there are, how are they different?

Richard:
Yes, if we have a long-enough data record we expect to find many different cycles of various periods and strengths. We know from other areas of study that these separate cycles will be the result of a much smaller number of basic cycles that interact in ways that we can understand. Nonlinear analysis of this process allows us to extract those "core" cycles and then extrapolate what will happen next.

Quorum:
Could you expand on that a little bit?

Richard:
Sure, it can get a bit technical, however. Feedback creates cycles in many systems because there is a tendency for two or more interacting causes to affect one another. Think about the predator/prey relationship between, say, big cats and antelope. You are a female cheetah and you've met the cat of your dreams. You settle down and have a litter of cubs. There are plenty of antelope to eat so your litter grows up with plenty of food and they all go on to breed cubs of their own. After a while, your descendents eat so many antelope that their population starts to shrink. This makes food scarce, so fewer cheetah cubs make it to adulthood and their population starts to shrink too. This takes the pressure off the antelope—they can breed their way up to strength again. And so it goes on. There is a cyclical fluctuation in the numbers of both predator and prey that can only be explained by looking at them together, not alone.

Cycles always work like this. There may be a few basic cycles that start like the antelope and cheetah but these will spawn others—ups and downs in the number of antelope will affect other things too that maybe don't eat them but depend on them for existence—parasites or vegetation say. These too will fluctuate and may also interact with each other. Eventually, a hoard of cycles co-exists, all begun by the original predator/prey interaction.

Quorum:
So how do you make sense of this complicated situation, how do you study these cycles?

Richard:
The mathematics of this interaction is clearer nowadays than it used to be. We deconstruct the situation using a "divide and conquer" algorithm (called a Walsh-Hadamard transform, for the technically-minded) to find the underlying cycles, which usually breed many others. For example, there are 17 different cycles in the Dow with periods of less than a year, but far fewer core cycles that combine to make all the others.

> Once again we can refer the reader to Wikipedia. The following link is very informative: http://en.wikipedia.org/wiki/Walsh-Hadamard_Transform .
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> For the more technically minded, click on the hyperlink to *Fourier transforms* for further details.

Finally, we project how all these cycles will interact in the future to find the dates when new highs and lows are most likely to happen. We can project these dates for many weeks into the future with *considerable precision*.

Quorum:
So is this a more scientifically robust form of technical analysis?

Richard:
What is important here is not the mechanics, which are based on fairly complex maths, but the result. We are not technical analysts like chartists, or Dow Theorists. We look at the underlying complex market dynamics that lead to the shapes and trends that technicians can only observe. It's like the difference between Alchemy in the 17th century and chemistry in the 19th. Alchemists described things and guessed (often wildly) what was going on, then chemists found ways to explain the real situation. One developed out of the other, however. So in that respect we don't dismiss technical analysis; it's just that we can explain why some patterns repeat, rather than just noting that they do.

We have some ability to predict these events and their timing into the future, based on an understanding of the underlying causes of the crowd behavior that drives markets most of the time. Cycles are part of that.

Quorum:
So your work gives you the ability to predict when in the future the cycles will converge in a way that causes a change in the market. And you can predict when the change will occur with "considerable precision."

Richard:
Yes, exactly.

Quorum:
The phrase "considerable precision" is making me uncomfortable. Do you mean that you can predict with absolute accuracy, or do you mean that the probability of your being right is accurate within a margin of error?

Richard:
Yes, that does need clarification. Our work on cycles now provides us with the ability to predict changes in the direction of the markets, weeks and months in advance of the date of the change. What we can say is that the market will change direction or condition on a given date, plus or minus a day or so. It may happen exactly on the day, or a day or so early or late. I am speaking in terms of probability of outcome. However, our accuracy is generally good. We also calculate turns using weekly-scale data which are a little less accurate, say plus or minus two to three days (occasionally even plus or minus a week), but these are of longer lasting significance.

Quorum:
Ok, so now that we know when a "change" will occur, we can all go margin our accounts, at least those who still have one, to the hilt.

Richard:
There is a catch.

Quorum:
There usually is.

Richard:
It's a catch but not a bad one. As I said before, we can project these dates for many weeks into the future with considerable precision but this accuracy comes at a price.

Quorum:
Are you about to tell me that I am buying lunch?

Richard:
No. But feel free to invite me for dinner.

Our work tells us that at a future date there will be a change in the direction of the market. Since we do not yet know what the direction of the market will be coming into that date, we cannot tell you what the change in direction will be on that date. All we can say is that the main cycles will interact at that future point so there will be a change in direction. It is only when we get near to the date that we can we see what that directional change is likely to mean. If we see that the market is in a strong up trend as the moment approaches then the probability quickly starts to grow that it is about to make a high point and then fall. Similarly, if it's falling into a turn date it should then make a low.

Quorum:
So you can tell me that a change will occur, but not the direction of the change. To know the new direction requires data about the direction of the market just prior to the change.

Richard:
Correct. But if you are positioned in a market, trying to "run a profit" and you know that in two weeks time a change is going to happen, it gives you a huge advantage from a trading perspective.

Quorum:
If I understand you correctly, the work you have done gives you the ability to look at a given market and predict when, at some date in the future, the internal dynamics of that market will

change. At the moment you take your view, you may not be able to predict the future direction, but you can predict with a high probability of accuracy that a change will occur. On the other hand, if you do have a well-defined trend coming into the turn, then you can predict the subsequent direction. Is that right?

Richard:
Yes.

Quorum:
And all this is based on the application of nonlinear mathematics to the historic data of the stock market.

Richard:
Yes. Stock markets are very rich in historical data going back a long time.

Quorum:
Does your work apply only to the stock markets?

Richard:
No. It applies to all auction markets such as; bonds, commodities, metals, currencies, carbon; any market that has sufficient price data. By "auction" I mean where the price is made in a free environment without, for example, government interference; it won't work in "managed" markets, and there are still plenty of those around the world.

Quorum:
So much for a random walk down Wall Street!

Richard:
Actually, the prevalence of random price movement is very important to our work. It's fundamental to our second predictor of market behavior.

Quorum:
Please explain.

Richard:
Markets seem to trade randomly a lot of the time; so much so that some business schools still teach that all movement is random. By

> The random walk hypothesis is a financial theory stating that stock market prices evolve according to a random walk and thus the prices of the stock market cannot be predicted. It has been described as 'jibing' with the efficient market hypothesis. Economists have historically accepted the random walk hypothesis. They have run several tests and continue to believe that stock prices are completely random because of the efficiency of the market.
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> The term was popularized Burton G. Malkiel, an economist professor at Princeton University and writer of *A Random Walk Down Wall Street*. Malkiel performed a test where his students were given a hypothetical stock that was initially worth fifty dollars. The closing stock price for each day was determined by a coin flip. If the result was heads, the price would close a half point higher. But if the result was tails, it would close a half point lower. Thus, each time, the price had a fifty-fifty chance of closing higher or lower than the previous day. Cycles or trends were determined from the tests. Malkiel then took the results in a chart and graph form to a chartist, a person who "seeks to predict future movements by seeking to interpret past patterns on the assumption that "history tends to repeat itself." The chartist told Malkiel that they needed to immediately buy the stock. When Malkiel told him it was based purely on flipping a coin, the chartist was very unhappy. Malkiel argued that this indicates that the market and stocks could be just as random as flipping a coin. (Wikipedia, *Random Walk*)

most measures, prices mimic randomness *most of the time but not **all** the time*. Good traders know this, so we had a long think about it. The two things that poke a hole in the idea of perpetually random price movement are trends and ranges. In a random walk, like a series of coin flips, you would expect to see some of both, but there are simply too many in real conditions. What seems to make markets slip into these two more predictable conditions is when the trading crowd gets emotionally involved; typically in bull markets but at other times too.

Quorum:
How so?

Richard:
Enthusiasm and despair (greed and fear) are the engines for this and if the crowd falls prey to either one then a trend will set in. At that point, prices will go up more than they "should" in the case of positive emotion or down more in the case of gloom.

Quorum:
Someone once said that trading stocks is like having a bipolar spouse—you never know which mood extreme to expect next.

Richard:
Yes, that's it. And it's hardly an original observation, but we have been able to make something different from it. The mood of a market is notoriously hard to measure so we study a useful correlation. Market views are closely linked to recent price trend. The link between the most recent market move and what people think (and importantly *feel*) is very clear. There are many more bulls in a rising market and more bears when it's dropping. This is plainly sensible for most of the time but it also has a feedback element to it. If I need to sell and the market is clearly falling then I will hurry. If several people do the same thing, the market will fall faster, which will trigger yet more selling and so on. This happens in reverse in bull markets, especially in those turbo-charged bull markets that we have seen—bubbles. You have to buy today because it will be more expensive tomorrow, which keeps the ball rolling.

Quorum:
What do you mean when you use the word "trend?" I have a feeling that there are a few nuances to your use of that word.

Richard:
Yes indeed. The nature of markets is that the price action is ragged. At any given moment you can't tell what the trend is unless you specify a time frame. The Dow might have just gone up 200 points in a morning but that doesn't mean the trend is up—it's just up that morning. The trend over several days may be downward within an uptrend that covers a couple of weeks within a larger down trend that has lasted a few months and so on. If you are a day-trader, your concern is with that morning up trend. If you are a hedge fund you might look forward a couple of months

and if you are a pension fund then you think in terms of decades. Each has their own idea of trend based on their investment time horizon. In short, there is no single market trend at all!

Quorum:
I sense a point coming.

Richard:
Yes, an important and counter-intuitive point. The mood of the crowd is affected by the trend and that goes for each group of traders. The short-termers will be swayed by the short-term trend and the long-termers by the trend over months. That makes trend a proxy for mood at all time frames.

The important and counter-intuitive point is that when the trends for all the important individual time frames are up, we can deduce that anyone who matters is bullish, everyone is a buyer, and so it's time to step away from the market; the market's about to run out of buyers.

Quorum:
So you evaluate the internal conditions of the market for each of these time frames and evaluate the tendencies or trends in each time frame?

Richard:
Yes. We do exactly that, using a subtle measure of trend called a "Hurst exponent." This dates back to the sixties, like so much of the original work on these surprising effects, and was originally developed by a water engineer (Hurst himself) to measure the persistence of flood levels. It's good for any trend actually, so we've picked it up.

Quorum:
Couldn't you just use a simple measure like a sloped line?

Richard:
We could, but these Hurst measures capture more than just the immediate trend; they also go some way to measuring its persistence. Safe to say it's a superior method. We look back at the recent price history of the market (and the not-so-recent) and calculate hundreds of these Hurst measures, aiming to get an overall picture of all the trends that exist in that market. We go from just a few days out to many months, measuring all those trends. If we find a certain consistency in the

> Harold Edwin Hurst (1880-1978) was a British hydrologist. Hurst's (1951) study on measuring the long-term storage capacity of reservoirs documented the presence of long-range dependence in hydrology. Much of Hurst's research was motivated by his empirical observations of the Nile.
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> The Hurst exponent, which has been used in other fields, such as finance and cardiology, was named after him. In fractal geometry, the generalized Hurst exponent, named "H" by in honor of both Harold Edwin Hurst (1880-1978) and Ludwig Otto Hölder (1859-1937), is referred to as the "index of dependence," and is the relative tendency of a time series to either strongly regress to the mean or "cluster" in a direction.
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> A self-similar phenomenon behaves the same when viewed at different degrees of magnification, or different scales on a dimension (space or time). Self-similar processes can be described using heavy-tailed distributions, also known as long-tailed distributions. Self-similar processes are said to exhibit long-range dependency.
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> In fractal geometry, the generalized Hurst exponent, named H by Benoît Mandelbrot, is referred to as the "index of dependence," and is the relative tendency of a time series to either strongly regress to the mean or "cluster" in a direction. (Wikipedia, *Hurst and long-range dependence*)

numbers, we can tell that there is an embedded trend. And when those numbers tip over into a critical condition, that trend is about to end. Usually right then and there.

Quorum:
Like the match smoke changing from one form to another?

Richard:
Exactly like the smoke. When a strong market trend comes to an end, it's quite rare for it to turn straight around and head back in the opposite direction, (although it does sometimes happen.) It's much more common for it to churn around for a while—just like the smoke starts whirling after a straight-line updraft.

Quorum:
And all this comes from measuring mood?

Richard:
Yes, and it doesn't end there. It's not only the sentiment of the market crowd that gets more enthusiastic as prices rise, but includes most conventional kinds of market analysis, which are also influenced by rising prices and become progressively more bullish. This is another form of feedback that leads to positive reinforcement and so the kind of self-sustaining behavior which is reflected in price trends that just keep on going. It's notoriously hard to find many bears at the top of a bull market—almost everyone has become a convert to the cause of rising prices. Likewise there are few bulls at a market bottom.

So this feedback-led process whereby higher prices cause more buying leads to extremely over-valued bull markets rather than some kind of elusive price equilibrium that economic theory requires.

The same logic applies in reverse. Falling prices compel views to become progressively more bearish so leading to a gloomy spiral of falling prices, increasing pessimism—and yet more falls. It is a common trap for the unwary. In the current banking crisis, the process has even been formalized by the mark-to-market accounting rules of the moment—falling asset prices compel corporate failure once they start sliding past a critical point.

Quorum:
So how does your way of looking at the world help?

Richard:
When market mood runs hot, as in the later stages of a major bull market or in one of the many price bubbles we have seen recently, trends become self-sustaining. This effect creates and sustains further rises in price and so the whole process keeps rolling forward. This "persistent" trend is one that keeps going beyond the expectation that it might pause or reverse. This is much more common than most people think and can lead to the even more extreme condition of a

"bubble," which inflates and inflates until it bursts. (There are no "soft landings" after burst bubbles). Housing prices, stock prices, commodity prices, and energy prices have all been recent examples—each of these bubbles has now burst and we are seeing greed on the way up replaced by fear on the way down.

As I said, the mood that prevails in these circumstances is heavily conditioned by price rises and drops. The trading crowd becomes "caught up" in the excitement of each new surge in price.

To digress for a moment, the time frame of each trader/investor that we spoke of just now needs a little more exploration. Pension funds, for example, enter the market rarely but in large size. Day traders are individually small but they are numerous and trade often. Each has their perspective on the price movement that is occurring and we try to capture every view of the market.

Using Hurst exponents as the measure of trend we calculate lots of them for every interesting time-frame. Effectively, we build a landscape of Hurst exponents and look for shifting patterns within it as a clue to upcoming changes of behaviour.

Quorum:
So Hurst is the key?

Richard:
Hurst has become a staple in the analysis of feedback-driven systems such as markets and one well-known fund monitor uses a simple version to rank the performance of hedge funds. However, we go further than that. We have discovered that there are telltale signs of impending change in a market that show up best if we look at it through Hurst spectacles—the crowd starts to stir before the stampede begins. Using some tools that we have borrowed from the study of earthquakes (famously unpredictable but getting less so), we now know how to detect these signs and this helps in identifying critical moments.

Quorum:
How so?

Richard:
If the trend of a market at, say the three-day point is steeply upwards it will tell us that those who follow the market closely will be getting excited. If we can tell that the three-day trend is not only steep but also "persistent" then we know that the short-term crowd's feverish mood is here to stay for a day or so. This is what we can measure with Hurst exponents. High Hurst = persistent trend. Low Hurst = mean reverting.

If we detect that the views of short-term traders and

> Persistence in Physical Sciences, as the name suggests, conveys the meaning of survival and is chiefly the characteristic of stochastic process. There has been a lot of interest in recent years on this particular nature of stochastic process. Standard result exists for a wide range of stochastic process, Random Walk, Diffusion, Surface Growth, Magnetic Systems are few to name. To quantify this meaning of survival we define a probability, which is simply the probability that the local field has not changed sign up to a point in time (t.)
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> The simplest of all stochastic models that exhibit this typical persistence behavior is the Random Walk model. (Wikipedia, *Persistence*)

those of long-term traders (and everyone else in between) are the same, we always find that this is because the market has been in a strong trend—and has been in it for a while.

Next, we look for the distinctive signs that this consensus is about to shift. The tell-tales are usually only visible through the computerized analysis of which direction all these Hurst exponents, of different time-frames, are pointing (it would take a long time to do it with a calculator) so we have this scrutiny constantly running across all the many markets that we follow.

Quorum:
And what does this show you?

Richard:
When everything is in place—the uniformity of opinion, revealed by consistently high Hurst scores at all time frames *and* we see the tempo start to change, because there are some ripples that develop in the constantly re-calculated Hurst scores, we know that change is imminent—that the trend is about to end.

Quorum:
So is this reliable?

Richard:
Yes, it is. Our work gives us the ability to measure the extremes of feedback-led market mood and how they occur at the ends and beginnings of trends. We can use these measurements to generate predictive signals about changes in market behavior. We have called these signals “extensions” and they do exactly what they say—detect when crowd behavior has pushed market price movement too far away from randomness into a more predictable state of being overstretched. There is another condition that we can spot as well, by using the same observations about crowd behavior.

When the crowd is in a state of total confusion, rather than consensus, what happens is that the market then gets squashed into narrow confines. We can measure this and generate an equivalent signal that we call a “compression” and the conditions that make compressions happen occur just before the market bursts back into life.

The prior situation I was just discussing, when there is an unusual degree of consensus, is what we call an “extension” for obvious reasons—the trend is over-stretched and vulnerable to a sharp reversal. We find that each such signal has a high probability of success and the odds are improved even more when we have several extensions at once—say, in different stock indices in different sectors or different countries.

Compressions are what we call those conditions when the market is confused about how it feels. The participants in each time frame behave in a way that moves the market sideways in narrow bands, just as the name suggests. Confusion, ambiguity, indecision abound with increasing frequency in all time frames. We measure this and watch for a change in behavior. Often this is the start of a new trend, either up or down, in the market.

Now, if we also find that one or more of these “extensions” or “compressions” coincide with our work on market cycles, and we get the other kind of signal, a “turn,” then we really sit up and take notice.

Quorum:
Ok, I think we now have a fairly good overview of what HED does and how you study markets. Before we get into “extensions” and “compressions,” let’s take a break. When we come back, perhaps you could explain how these work, share with us some real life examples of your methods in action.

Richard:
Splendid!

Watch for the next installments of our interview with Richard Edwards of HED Capital.

A Method to the Madness – an Interview with Richard Edwards of HED Capital – Part 2

Gazing into the Fractal Ball – the Conclusion of Our Interview with Richard Edwards of HED Capital – Part 3

The Conclusion of Our Interview with Richard Edwards of HED Capital will be published soon. If you would like to know when it is available, please join our mailing list.