

A Method in the Madness: Complexity and the Elliott Wave Principle.

I can calculate the motions of the heavenly bodies, but not the madness of people.

-- Sir Isaac Newton

The Western mindset is the epitome of linearity, an outgrowth of the Greek philosophies of ancient times. Concepts such as logic, rationality, and causality were delineated by intellectuals such as *Aristotle*, giving impetus to the scientific method. While the linear framework has been a boon for the progress of scientific knowledge, this paradigm has fallen by the wayside in light of recent scientific developments.

This article briefly explores the worldviews that have dominated the scientific and philosophical traditions over the past 500 years. It reviews the recent advent of *complexity science*, which holds the promise of a new epoch. While modern science may be coming to grips with the implications of *complexity*, its ramifications are far from permeating the remainder of Western society. A case in point is financial markets where the linear paradigm continues to be the method of choice. Most investors and even experts for that matter, persist on looking for a specific smoking gun to explain market developments, unaware that a valid explanation is likely to violate Ockham's razor, the principle that posits simple explanations are preferable to intricate arguments.

Complexity science may also provide the Elliott Wave Principle with a strong theoretical footing. This method of technical analysis, considered by its proponents to be technical analysis in its purest form, purports to finding a method in the madness that we call the stock market. In the context of *complexity*, it allows the investor to identify potential tipping points, where inconsequential exogenous developments can trigger a sudden change in behaviour.

Mechanism, Chance, Chaos and Complexity

The *mechanistic worldview* held sway as the predominant paradigm in scientific and philosophical circles during the seventeenth and eighteenth centuries. Following the advent of Newtonian physics, the universe was perceived in the same light as a machine, a linear system unfolding with clockwork precision. Every event was preceded by a sufficient and proportional cause. Such continuity lent itself to prediction by approximation through calculus. A corollary of the mechanical universe was the concept of determinism, where future states are predestined outcomes, fixed by the current state. The French mathematician *Pierre-Simon Laplace* articulated the implications of this thesis in a thought experiment now known as Laplace's demon. He argued that if an entity could fathom the initial conditions of a system in conjunction with the laws of nature, and they possessed an infinite capacity for calculation, they could predict the future as well as the past. A Laplacean deterministic universe however precludes the existence of chance. Probabilities were merely a measure of our ignorance rather than a property of the underlying system. Chance was not content with living in exile however and would soon experience metempsychosis.

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The *chance worldview* became the ruling scientific ideology in the twentieth century. While developments in biology and astronomy were contributing factors, the main catalyst was the advent of quantum mechanics. The birth of this discipline is generally accepted to have taken place on December 14, 1900 following *Max Planck's* presentation to the German Physical Society. Quantum mechanics represented a break with the classical physics of *Isaac's Newton's* era, which could not provide an accurate account of the atomic and sub-atomic world. At this microscopic level, chance was an ever-present phenomenon which omniscience could not eliminate. Identical experiments could generate different results, shattering the link between cause and effect. Another key facet of quantum mechanics was *Werner Heisenberg's* uncertainty principle, which posits the impossibility of measuring certain pairs of physical properties, such as the position and momentum of a particle, to infinite precision. The existence of practical limitations on our capacity to ascertain the current state of the system ruled out any possibility of emulating Laplace's demon. While quantum mechanics initially attracted the ire of some of our greatest intellectuals such as *Albert Einstein*, empirical work nevertheless affirmed the theory. While our comprehension of chance had progressed in the wake of quantum mechanics, it would experience another phase change in the context of chaos theory.

The development of *chaos theory* had startling implications for physicists, philosophers and playwrights alike. The term *chaos* is often employed in a lay context to refer to a state of randomness or extreme disorder. From the perspective of applied mathematics however, the term refers to the qualitative study of unstable aperiodic behaviour in deterministic non-linear dynamical systems" (Stephen Kellert 1993, *In the wake of chaos: Unpredictable order in dynamical systems*, p. 2). Essentially, chaos theory deals with those systems that appear random to the naked eye, but are in fact deterministic in the Laplacean sense. The perceived randomness is attributable to the non-linearity of the system, which reveals itself as a disproportionate relationship between cause and effect. This concept has been referred to as sensitive dependence on initial conditions, where relatively minor variations in the initial conditions can have a significant impact on future states of the system. The media have provided their own interpretation of this concept with recourse to a colourful illustration: a seemingly innocuous event, such as a butterfly flapping its wings, causing a significant weather disturbance on the other side of the world. While this populist definition is an example of journalistic hyperbole at its finest, it nevertheless serves to underscore the difficulty of forecasting chaotic systems, where discontinuity, rather than the continuity of the mechanical world, is omnipresent. Without an infinite capacity for measurement, seers can be forgiven for accepting the line offered by physicist *Joseph Ford* who quipped: "chaos is merely a synonym for randomness." As our progression of knowledge with respect to chaos evolved, it became apparent that *chaos* was merely a subset of a much larger field called complexity.

The *complexity worldview* is likely to become the dominant scientific paradigm during the twenty-first century. *Complexity* arises when "an increasing number of independent variables are interacting in interdependent and unpredictable ways" (Andrew Ilachinski 2001, *Cellular Automata: A Discrete Universe*, p. xxvii). Essentially, random interactions between a significant number of variables on a local scale generates an evident structure on a global scale. Such an outcome is attributable to the non-linearity of the system, a trait shared by chaotic systems. Unlike chaos however, where determinism gives rise to randomness, complexity involves order arising out of randomness (Mitchel Resnick 1994, *Turtles, Termites, and Traffic Jams. Explorations in Massively Parallel Microworlds*, p. 14). Examples of complexity include our immune systems, the brain, neighbourhoods, asset markets and the global economy.

Complexity science studies a particular class of complexity, exhibited by complex adaptive systems. These complex systems are distinguishable by their ability to adapt or evolve in the face of an ever-changing environment as a means of survival. This capacity to learn arises because the system is not fixed in either an orderly stable state or a disorderly chaotic state. The ability to move between order and chaos permits the incessant transmission and processing of information between the different variables, facilitated by the presence of positive and negative feedback loops within the system. The result is a global intelligence that transcends the capabilities of the local components.

Equity Markets as Complex Adaptive Systems

The stock market is an excellent example of a complex adaptive system. It represents the collective outcome of millions of individuals, buying and selling on their own volition, influenced by numerous feedback loops within the system that amplify or dampen the existing mindset. The evolution of stock prices, the behaviour of friends and acquaintances, fundamental analysis, the state of the economy, monetary policy, and the opinion of experts are only a few of the plethora of variables that interact in unobvious, albeit significant ways, exerting influence over the individual on both the conscious and subconscious level. While no lead partner or instructor is present, the myriad of transactions reflecting the decisions made by individuals, combine in such a manner as to create a well choreographed dance routine at the global level.

A predisposition to herding or collective behaviour has been well documented in the field of Behavioural Finance. The social psychologist *Solomon Asch* conducted a number of studies during the 1950's seeking to gauge the impact of peer pressure on individual decision making. In one particular experiment, the individual conformed to the group approximately one-third of the time, even though the group had intentionally selected a solution that was obviously incorrect. The conformist was usually aware of the fact that the answer was incorrect, yet they did not want to face the potential for ridicule by selecting the correct answer. In those other instances, the conformist was of the view that the group had selected the correct answer, perhaps reflecting the view that the group is likely to be better informed. In the context of equity markets where uncertainty reigns and answers are not so forthcoming in a timely manner, mob mentality can overcome the inhibitions of even the most conservative of investors, resulting in a collectivist behaviour that bears little resemblance to the outcome that would have otherwise prevailed. As a result of herding tendencies, a reductionist approach to forecasting equity markets becomes impotent.

The sway of collective behaviour should not be underestimated. According to the econophysicist *Didier Sornette*, quantitative studies reveal that two-thirds of significant stock market declines are endogenous in origin (Didier Sornette 2003, *Why Stock Markets Crash: Critical Events in Complex Financial Systems*). As the stock market evolves, it will come across many critical junctures or tipping points where demand and supply are closely aligned. Given the equilibration of these two opposing forces, the slightest disturbance can be sufficient to trigger a significant change in the behaviour of the system, referred to as the point of bifurcation in *complexity theory*. Positive feedback loops will reinforce the new trend, temporarily underwriting its sustainability until the next tipping point is reached. While exogenous factors will always be present, they merely lend a helping hand in perturbing a system that was already located at the edge of a precipice. A linear reductionist framework completely overlooks this possibility however.

The majority of finance journalists, market commentators, economists, stock analysts and investors continue to employ a linear framework to decipher equity markets. They insist on reducing market behaviour to specific developments to account for the past. When looking towards the future, they will compartmentalise the system, taking into account only those components they deem important, while ignoring the remaining components. Moreover, the concept of continuity embedded in the linear framework, will insist on proportionality between effects and their causes. As a result of this approach, most market participants will pay little heed to developments they deem as inconsequential in the grand scheme of things. *Complexity science* however reveals the fallacy of this approach. Insignificant events can be the trigger for a major catastrophe, if the market is positioned at a tipping point. Even if an inconsequential development does not lead to an imminent change in behaviour, it may still combine with other inconsequential developments in the future, through the amplification of positive feedback loops, to trigger a catastrophe in the right circumstances.

Complexity and the Elliott Wave Principle

The prescience of complex adaptive systems involves a holistic framework of looking through lower-level randomness to ascertain the bigger picture. Such an approach is facilitated by the concept of self-similarity. An object is said to be self-similar if it appears as an approximate replica of itself under magnification, a characteristic commonly referred to as scale invariance. Fractals are a special type of self similar object, composed of extremely irregular or fragmented shapes. Clouds, mountains, lightning bolts, and coastlines are examples of fractals found in nature. They are also evident in financial time series.

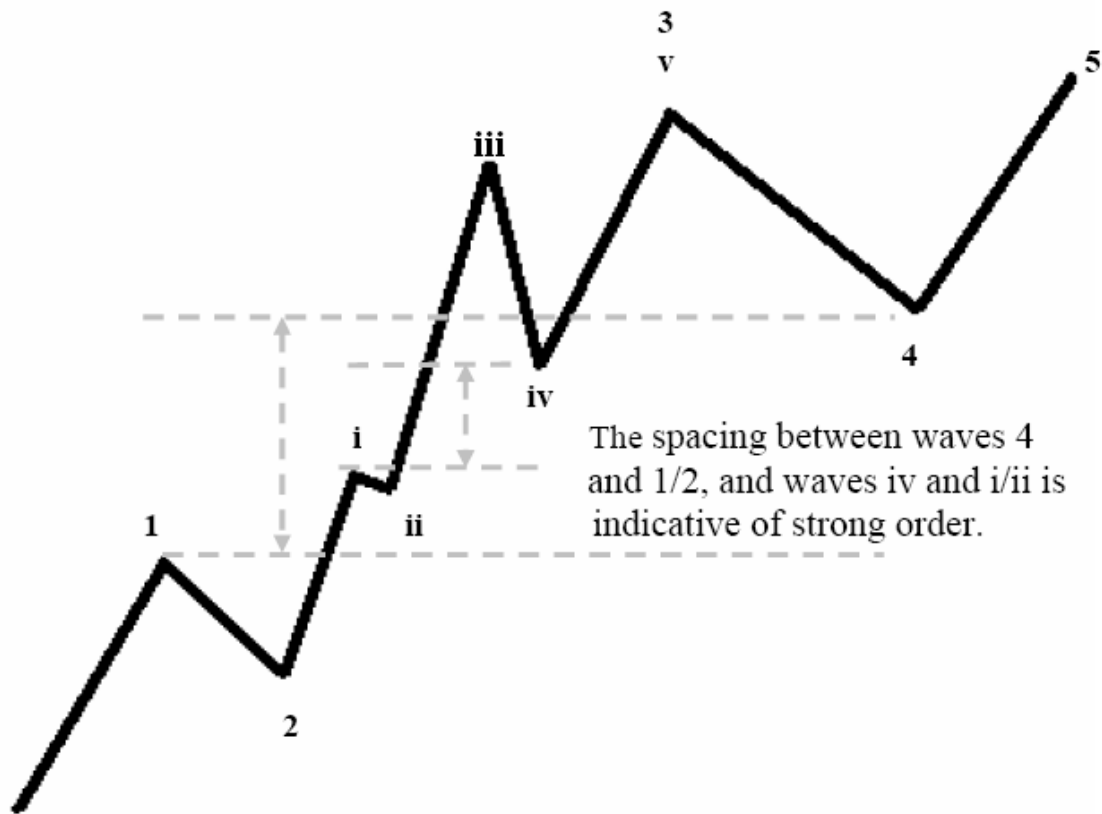
The self similar nature of the market was the cornerstone of the Elliott Wave Principle, enunciated by an accountant, *Ralph Elliott*, in the 1930s. While he never coined the term fractal, he nevertheless asserted that oscillations in public opinion between optimism and pessimism gave rise to specific price patterns, which could be combined to generate larger price patterns of a self-similar nature. As a result, he concluded that the collective mood of market participants could be quantified, and in turn, used to predict the seemingly random fluctuations of the market.

Ralph Elliott made a clear distinction between the behaviour of a legitimate fast moving market, which he labelled as impulsive, and a reaction against the prevailing trend, which he labelled as corrective.

Impulse waves produce a significant change in the price level. A distinctive feature is minimal or no overlapping, depicting a strong level of conviction about the outlook. They contain five segments labelled numerically (waves 1-2-3-4-5). Three of the five waves (waves 1, 3 and 5) will unfold strongly in the direction of the prevailing trend. Two intervening phases (waves 2 and 4) will unfold predominantly against the prevailing trend.

An example of an impulse wave is presented below in Figure 1. Its wave structure is delineated 5-3-5-3-5, reflecting the structure of its constituent waves. Waves 1, 3 and 5 may subdivide into their own set of 5 waves, while waves 2 and 4 may also subdivide, usually into 3 waves. For the sake of clarity, I have shown only wave 3 subdividing, denoted (i-ii-iii-iv-v).

Figure 1: An Impulse Wave (5-3-5-3-5)



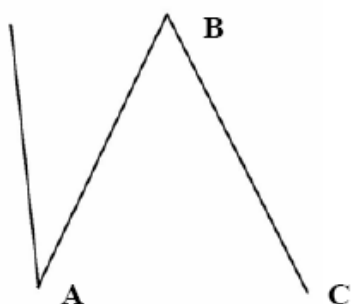
Corrective waves are reactions against the prevailing trend that produce little net movement on balance. Overlapping is a common feature although it is not a strict prerequisite. Corrections are an outgrowth of indecision or ambiguity with respect to the future. They are labelled alphabetically (A-B-C etc). Corrective waves constitute waves 2 and 4 of an impulse wave.

According to the Classical school (the term I use to denote the body of knowledge that remains predominantly consistent with the original teachings of *Ralph Elliott*), corrections can contain either three or five segments. In addition to these orthodox patterns, the Neowave school (the body of knowledge enunciated by Glenn Neely, representing a significant break with the original teachings of *Ralph Elliott*) has also identified corrective structures containing seven and nine segments.

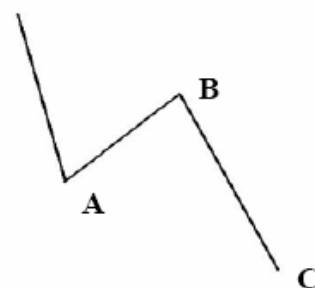
Figure 2 below presents a complete list of simple corrective outcomes, including their wave structure. Complex corrective structures (which are outside the scope of this article) occur when two or three simple corrective structures combine together.

Figure 2: Simple Corrective Patterns

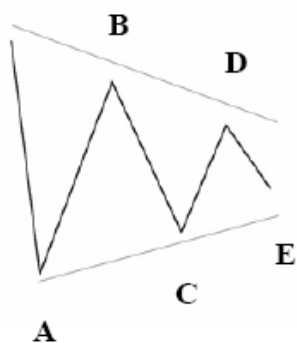
Flat
(3-3-5)



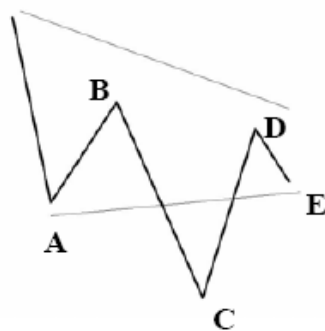
Zigzag
(5-3-5)



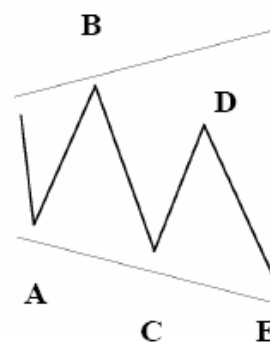
Contracting Triangle
(3-3-3-3-3)



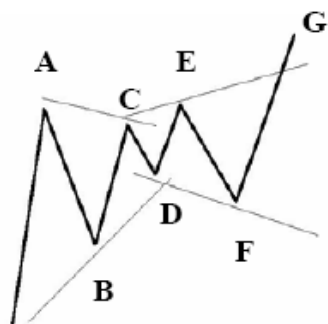
Neutral Triangle (Neowave)
(3-3-3-3-3)



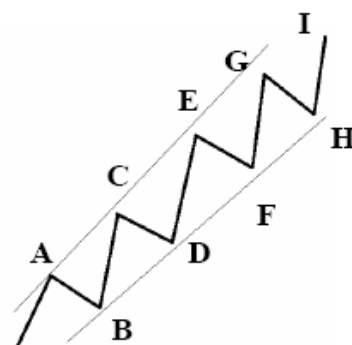
Expanding Triangle
(3-3-3-3-3)



Diametric (Neowave)
(3-3-3-3-3-3-3)



Symmetrical (Neowave)
(3-3-3-3-3-3-3-3-3)



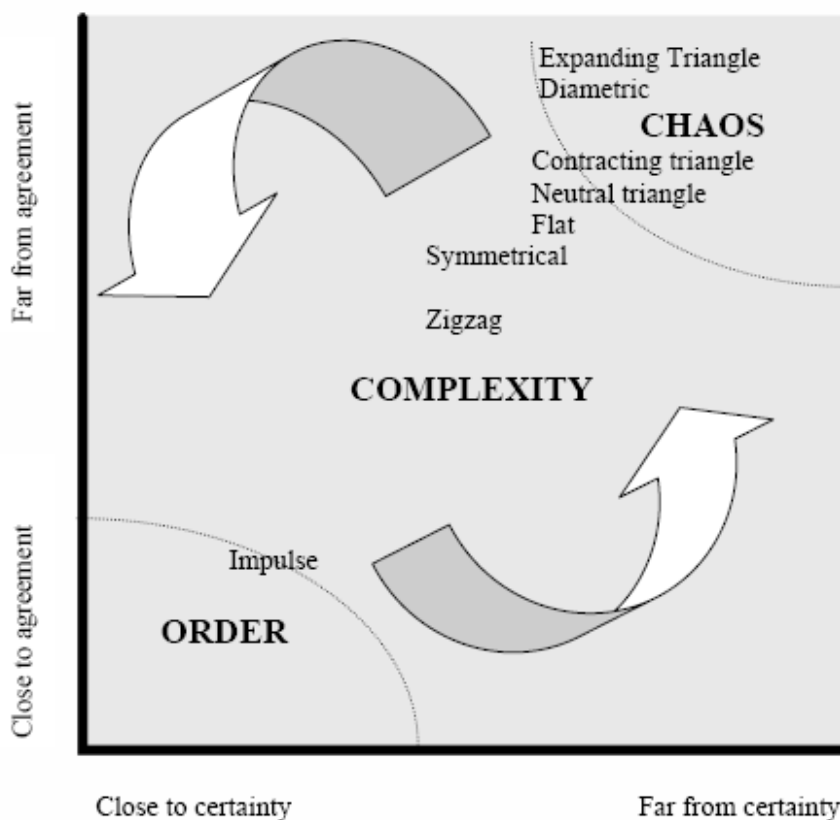
Impulse waves and corrective waves are the graphical representation of the market in its various stages of its evolution.

Impulse waves are a depiction of the approximation of order. They represent a near consensus with respect to the outlook. As a result of the significant imbalance between demand and supply, a significant market move will ensue.

Corrective waves, on balance, depict the participation of chaos. In the case of a non-directional corrective wave (a term I use to denote a corrective structure that involves a negligible change in the price level on balance, such as a triangle), a high level of dissonance with respect to the outlook is present. Demand and supply will be closely equilibrated so that the market is unable to gain traction in either direction. In the case of directional corrective wave (a term I use to denote corrective structures that involve a weak element of trending, such as a zigzag), the corrective structure will involve both a chaotic interval as well as an interval of order seeking behaviour. A moderate imbalance between demand and supply will arise over the lifespan of the pattern, allowing the market to stage a moderate move.

Figure 3 presents my framework for viewing impulsive and corrective price structures. Such a conceptualisation may invite disagreement with respect to where I have inserted various structures or even criticism as to the validity of the approach itself.

Figure 3: Impulsive and Corrective Structures



Source: Adapted from Ralph Stacey 1996, Complexity and Creativity in Organizations.

During chaotic episodes, investors are essentially wrestling in the dark. A significant amount of information will be exchanged between investors as they explore the various permutations open to the market. As the corrective pattern approaches its terminus, demand and supply will essentially offset each other so that the market comes to rest, finely balanced between different potential outcomes. This is depicted by the completion of a corrective structure. A slight disturbance will result in the majority of investors choosing a particular permutation. This may involve another corrective structure restarting the process again. On the other hand, the permutation may involve the commencement of an impulse wave, if public opinion is conducive to such a development. Such resolution is the point of bifurcation (the concept of bifurcation is a key concept espoused by the Post Elliott school, an approach founded by *Zoran Gayer* who modified the original theory of *Ralph Elliot* in light of Nobel chemist *Ilya Prigogine's* contributions to *chaos theory*). The bifurcation represents the onset of a significant change in the behaviour of the system.

Major market reversals, including the onset of a new bull or bear market, occur when the stock market arrives simultaneously at tipping points across many different timeframes. More often than not, it is only the short-term trend that is being decided upon when markets come to a state of rest. Every so often however, a long-term structure completes. At these major tipping points, the long-term fate of the market is predicated on the emergence of new short-term trends and the influence from positive feedback loops, reinforcing the short-term trend to such a degree that it achieves critical mass, underwriting its own sustainability over the medium to long-term.

The impact of exogenous events is greatest immediately before a long-term trend achieves critical mass. This development usually occurs during the middle stages of a price structure, when a number of various permutations exist at smaller timeframes. A move that may hold promise as a long-term trend can be cut short, if exogenous developments sway the public in the other direction. For example, both a corrective zigzag (5-3-5) and an impulse wave (5-3-5-3-5) commence in an identical fashion. For an impulse wave to emerge, it is essential the short-term trend achieves critical mass so that the market continues to move strongly in the same direction. Otherwise, the trend will terminate as a correction, and a move in the opposite direction will ensue. Once critical mass is achieved, exogenous events will have negligible or no impact on the behaviour of the system. Order will rule the day.

The concepts of order and chaos have significant implications for modern Elliott practitioners. They are perhaps most profound for the Rule of Overlap, a pertinent rule with respect to trending impulse waves (the exception to the rule is outside the scope of this article). According to Classical theory, the terminus of wave 4 should not overlap any part of wave 1. A stricter application of this rule, applied by the Neowave school, forbids any section of wave 4 from overlapping any section of wave 1 or wave 2. While this subtle variation may be interpreted as a case of semantics by the lay person, I believe this nuance is grounded in complexity theory. A disorderly corrective wave 4 should be unable to retrace to any great extent an orderly impulsive wave 3. The presence of overlap precludes strong order, the backbone of impulsive price action.

Looking forward, I believe the field of complexity science will have much to offer modern aficionados of the Elliott Wave Principle. This article is merely a stepping stone in that direction, serving as a bridge between these two related topics.

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