# MASTERING HURST CYCLE ANALYSIS

## A MODERN TREATMENT OF HURST'S ORIGINAL SYSTEM OF MARKET ANALYSIS.

CHRISTOPHER GRAFTON

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# Mastering Hurst Cycle Analysis

A modern treatment of Hurst's original system of financial market analysis

By Christopher Grafton, CMT

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Set in Sabon and RotisSansSerif

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七転び八起き

Nana korobi, ya oki

“Fall down seven times – get up eight.”

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## Praise for *Mastering Hurst Cycle Analysis*

"This book is highly recommended for any market analyst or trader who wishes to add cycles to their analytical toolbox. This is a clear and concise introduction."

**– Bill Sarubbi, Fund Manager, Cycles Research Investments LLC, Vienna**

"Cycles are one of the most underutilised, and yet most rewarding, sources of information available to an analyst or investor. If it is possible to anticipate a reversal, and track it in real time, then eager investors should want to know about it. Until relatively recently, cycles have not been properly understood, so there has been a dearth of practical knowledge. This gap is now being filled by dedicated researchers such as Chris Grafton. His book brings together the ideas of one of the pioneers of cycle analysis – the engineer, J.M. Hurst – and presents them in an easily understandable and very useable form. Once mastered, the techniques explored in the book should be a source of significantly enhanced market understanding and very profitable investment."

**– Tony Plummer, Author, *Forecasting Financial Markets*, Director, Helmsman Economics Ltd**

"I really like this book. It takes the excellent original idea of Hurst and brings it right up-to-date in the modern computer era. It explains cycles and harmonics and shows how to construct Valid Trend Lines and Lines of Future Demarcation. It does not pretend that this subject is easy, but does explain it with very clear charts and writing. The work shows the relationship to Elliott Waves and RSI oscillations. There are some clear worked examples and ideas of how to put on and manage a trade. Most investors will find it a useful addition to their knowledge. Well done Chris Grafton."

**– Robin Griffiths, Technical Strategist, Cazenove Capital Management**

"Through clear, straightforward explanations of the tools and up-to-date market illustrations, Grafton makes Hurst cycle analysis accessible to today's trader. Readers gain not only a thorough understanding of cycles but also the skills to begin implementing cyclic analysis immediately."

**– Julie Dahlquist, Ph.D., CMT, Editor of the** *Journal of Technical Analysis* **and co-author of** *Technical Analysis: The Complete Resource for Financial Market Technicians*

"J.M. Hurst's Cyclic Principles are perhaps the most powerful yet misunderstood concepts about the workings of financial markets in the history of financial trading. Published in the 1970s, Hurst's work has survived into the 21st century because it is so powerful and effective, but the application of his principles and the practice of his trading methodology have been shrouded in a cloak of arcane mystery. Christopher Grafton has done a great service to the 21st century trader by thoroughly presenting Hurst's work in a format that replaces the pencil, eraser and chart pad with a computer. Armed with the tools that Grafton includes in the book (and an understanding of how to apply them) the reader will be well placed to start honing their analytical skills and putting this powerful theory to profitable use."

**– David Hickson, creator of Sentient Trader – Hurst Trading System (www.sentienttrader.com)**

# About the author

Christopher Grafton is currently Director, Principal Analyst and Systems Developer at Vectisma Ltd., an independent market analysis firm focusing on Japanese equities with a global macro overlay, based in England. Previously, he has held positions on the sell side at several investment banks in London and Tokyo and also worked as an analyst and trader for a London-based hedge fund specialising in Japanese equities. Christopher speaks fluent Japanese, is a member of the Market Technicians Association, is a successful systems designer, programmer and trader, and holds the Chartered Market Technician designation.

# Acknowledgments and thanks

My editors at Harriman House, Stephen Eckett and Craig Pearce; Physics postgrads at Imperial College and University College London: Paolo Barletta, Shaun Thomas, Chris Willis, Alastair Dunn, Alexey Lyapin, James Burnett, Marten Tolk, as well as Jessica Chan at the Royal College of Music for their academic insights; Tim Grafton, for website and various technical input; Jeremy Du Plessis, Head of Technical Analysis, Updata Plc., for technical support and for allowing the use of Updata charts throughout; Corey Sheres, TradeStation, for technical support; John Ehlers, MESA Software for guidance on spectral analysis techniques; Mark Cotton at 7G Trading Tools (**www.7GTradingTools.com**) for translation into TradeStation Easy Language; Andrew Cardwell, President, Cardwell RSI Edge LLC, for advice on RSI; Jeffrey Kennedy, Chief Commodities Analyst, Elliott Wave International, for advice on Elliott Wave theory; Robert Prechter, President, Elliott Wave International, for allowing the reproduction of Elliott Wave figures; Tony Plummer, Helmsman Economics Ltd., for sharing his insights and for reviewing the work; Bill Sarubbi for advice on the causes of cycles and for reviewing the work; Julie Dahlquist, Ph.D., CMT, senior lecturer, Department of Finance, at the University of Texas at San Antonio College of Business, for reviewing the work; Robin Griffiths, Technical Strategist, Cazenove Capital Management, for reviewing the work; David Hickson, creator of Sentient Trader, for reviewing the work; Giles Sarson, North Square Blue Oak, for feedback; David Linton, CFTe, MSTA Chief Executive, Updata, for creating the best technical analysis platform on the market; David Donovan, for his valuable advice and coding support in the Updata programming language; James Ferguson, Chief Strategist, Arbuthnot Securities, for his fundamental take on the markets; Rob Roy, President Cain Brothers Asset Management, for general support and encouragement; Brent Smith, Redburn Partners, for technical input; Malcolm Pryor, for pointing me towards Harriman House; Christina, for artistic input; and finally Dako, Ollie, Charlie, Jilly, Annie, Lottie and Pete for their support and forbearance.

# Introduction

## Overview

My experience in financial markets has been gained on the sell side broking Japanese equities for investment banks in both London and Tokyo; and on the buy side as an analyst and trader for an equity long-short fund.

My interest in market analysis drew me towards the Market Technicians Association in New York and I hold their CMT designation. I am also currently preparing a thesis for the International Federation of Technical Analysts' Master of Financial Technical Analysis (MFTA).

My knowledge of Hurst cycle analysis comes principally from studying Hurst's original material. J.M. Hurst was an American aerospace engineer in the 1960s who applied his understanding of mathematics, computing and engineering to market cycles. The workshop-style course he produced in the early 1970s described in detail the practical application of his cyclic principles to real trading. Apparently only 250 copies of the course were ever produced and after a few years of private seminars, Hurst seems to have simply vanished.

Twenty-five years later Traders Press[1] republished Hurst's original work. However, because Hurst's course was written before personal computers were widely available the content is rather difficult for the modern market technician to implement. It is also hard work. Having said that, the course is pretty much essential reading for any serious student of market cycles.

The purpose of this book is to get you to the stage where you can perform cyclic analysis on any freely traded financial instrument quickly and effectively on your own system. Do not expect to find it easy to begin with, because it is not. In a short time however you will find that the pieces start falling together, you get the knack and the skills become second nature.

Eventually you will not remember why it seemed so hard to start with.

Hurst cycle analysis is part art, part detective work and part science, and once you have mastered it you will benefit from the outstanding results it is capable of producing. And, what is more, you will begin to see the markets in a completely new light.

The code for all of the indicators used in this book is provided in two programming languages in the appendices. More may be added in the future if there is demand.

## How this book is structured

### Chapter 1 – The Properties of Cycles

This chapter explains the basic physics of cycles and examines Hurst's principles. We look at the way cycles combine in the market, how they relate to one another harmonically, why they tend to synchronise at certain times and how there tends to be a more or less uniform set of cycles operating throughout the price history of all freely-traded financial instruments.

### Chapter 2 – Basic Tools I: Valid Trend Lines

In this chapter we examine the concept of trend and look at traditional ways of drawing trend lines. We then consider a more robust definition of trend and look at the concept of the *Valid Trend Line*. We will go on to learn how Valid Trend Lines are constructed, why they are a more objective measure of trend and how they are used to uncover cycles in the market.

### Chapter 3 – Basic Tools II: Displaced Cycles – The FLD

Here we follow on from the last chapter with a brand new tool: the *Future Line of Demarcation* or *FLD*. We will look at how this indicator is put together and then learn to use it to identify past and future reversals, project prices and reveal underlying trend.

### Chapter 4 – Isolating Market Cycles I

In this chapter we get to the core element of Hurst's system: phasing analysis. We will look at how cycles are isolated in weekly market data and introduce the concepts of *cycle envelopes* and the *phasing model*.

### Chapter 5 – Isolating Market Cycles II

Here we will continue the lesson on phasing analysis, but on the daily chart. We will consider the role of *spectral analysis*, a mathematical tool used to help uncover the dominant cycle. We will also look at the concept of *peak translation* and examine how it can be used to help uncover trend.

### Chapter 6 – Selection, Set Up And Entry

In this chapter we will start applying what we have learnt so far to actual trading. The concept of *relative volatility* will be introduced and we will look at ways to screen long lists of securities to make them a more manageable length. We will look at ways to scan charts quickly and then move on to the setting up and entering of trading positions. The concept of risk within the context of Hurst's techniques will also be covered and you will be shown how to set stops and target prices.

### Chapter 7 – Managing Open Positions

In this chapter we will look at how to manage trades using cyclic principles. You will learn why a good entry can make the trade easier to manage as well as how to control risk. We will also consider how to exit positions.

### Chapter 8 – RSI And Elliott Wave

Here we will consider how to combine RSI and Elliott Wave to improve results in Hurst cycle analysis. We will explore the subject of momentum, and some advanced RSI techniques will be introduced and applied to cycles. We will also see how the Elliott Wave principle applies to cycle work and note some of the similarities.

### Conclusion

A summary of the material covered in the book.

### Appendices

Diagrams of Elliott Wave Patterns and code for the Hurst indicators in the Updata and TradeStation programming languages.

## Endnote

[1] **www.traderspress.com**

# 1 THE PROPERTIES OF CYCLES

## Introduction

There are recurring cycles in financial markets[2] which share common characteristics. Although cycles in the real world are rarely uniform, they can always be defined in terms of fundamental quantities. Understanding these physical properties helps us to identify and interpret market cycles. Because Hurst was an engineer by training, he drew heavily on the principles of physics to develop his system of cycles-based market analysis.

The three basic quantities of cycles are *amplitude*, *period* and *phase*. These describe the size and the timing of a cycle. There tends to be a proportional relationship between the length of a cycle and its amplitude. Simply put, the longer the time between adjacent lows of a cycle, the further it tends to rise and fall. Also, when the phase of a cycle is known, we can say how far along its path it is at any given time. We can use this value to say when a cycle will reverse, or we can use it compare the progress of one cycle to that of another.

In this chapter we will cover the basic physics of cycles. This might seem somewhat removed from the markets, but a sound understanding of the nature of cycles is essential if you are to become a skilful cycles analyst.

*

Hurst observed that market action is a composite of multiple cycles. Once you have understood the elements of individual cycles, you need then to grasp how they combine with one another. Casual observers of market cycles sometimes complain that as soon as a cycle has been identified it vanishes, inverts or seems to morph into something else. These apparent inconsistencies can be accounted for by the interaction of a multiplicity of different cycles of varying magnitudes. You will be shown not only how cycles build upon one another, but also how the underlying trend, which itself is just a straightened out section of much longer cycles, can distort the picture.

Although at any given time there are many different cycles operating in the market, they belong to a finite set. In other words instead of there being infinite variety there appears to be a family of a relatively small number of related cycles. Interestingly we see this set of cycles not only in financial markets but also in many other diverse natural phenomena. This makes the task of isolating cycles considerably easier because, at any one time, we know roughly what we should be looking for. You will be shown the cycles that make up this nominal model as well as the results of a long-range study of two major market indices that helps illustrate the concept.

To simplify matters further, rather than being randomly distributed, cycles are related to one another. Most readers will be familiar with the idea of harmonics in music, but this also applies to market cycles. Hurst observed that longer cycles tend to be multiples of shorter cycles, usually by two. There are a few exceptions and at times this relationship is more difficult to see than at others, but the application of this principle makes identification of cycles much more straightforward.

Additionally, cycles tend to coincide at lows, making periodicity easier to determine. These principles of *nominality*, *harmonicity* and *synchronicity* are the bedrock of Hurst cycle analysis and provide a basic framework of predictability. Of course, markets are big, complicated mechanisms and they do not always conform neatly to theoretical expectations. We will also therefore need to look at how and why the model occasionally deviates from the norm.

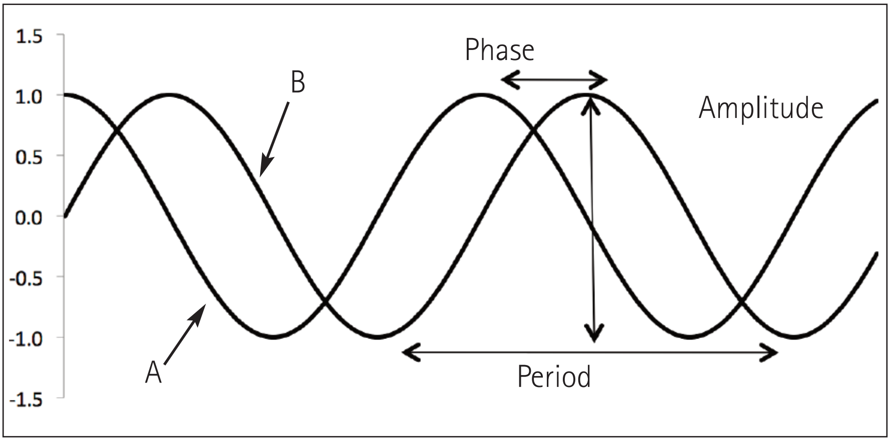
By the end of this chapter you should understand the basic properties of individual cycles; know how multiple cycles interact with one another; and be familiar with Hurst's principles of cyclicality. Once this foundation is in place you will be ready to start studying the powerful set of tools employed in Hurst cycle analysis.

# Basic Quantities

## Cycles defined

A cycle is defined in terms of amplitude, period and phase. Figure 1.1 shows two perfect sine waves with these three basic quantities labelled.

**Figure 1.1 – Sine waves showing period, amplitude and phase difference**




## Amplitude

The first property we are going to look at is amplitude, or the height of a cycle. In physics, a cycle is defined as a repeating fluctuation of an observed variable, described by a sine wave around a central value. This sounds a bit convoluted, but is very straightforward. In financial markets, the observed variable is price and the central value is the long-term average price. In other words, price tends to fluctuate rhythmically around a mean.

A full cycle describes a path through time from a trough to a peak and then back again to the level of the previous trough. In physics, amplitude is defined as the absolute difference between the central value and the peak or trough. In market analysis, however, it is the distance between these two extremes. In Figure 1.1 the amplitude is two as the values change from -1 to +1.[3]

### Velocity and acceleration

The amplitude of a cycle is a measure of its size or power. In the market it is represented by price change. All cycles, whether big and powerful or small and weak, display exactly the same characteristics: the speed of a cycle is zero at its trough and again at its peak, and it is at its maximum halfway up or halfway down.

The acceleration of the cycle, on the other hand, is greatest as it comes out of the turns and least when it is midway between peak and trough in either direction. Thus, *regardless* of amplitude, a cycle's speed is lowest at either extreme when its acceleration is highest; and conversely, a cycle's speed is highest midway along its path when its acceleration is lowest.

## Period

The time after which the pattern of a cycle starts repeating itself is the length or period of the cycle. In Figure 1.1 this is the distance between the two adjacent troughs shown. If a cycle has a period of 20 days, for example, one full revolution from low to high and back to low takes 20 days to complete. A nine-month cycle takes nine months to complete, an 18-year cycle takes 18 years to complete, and so on.

### Frequency

The frequency of a cycle is the reciprocal of the period and shows how many times it fluctuates in a given time. In physics the convention is to describe cycles in terms of frequency and the standard measurement is hertz, or one cycle per second.

In market analysis, however, we talk in terms of period. If the cycle period is short, then the frequency is high. If the cycle period is long, then the frequency is low. For a cycle with a period of 20 days, we would say that the frequency is 1/20th of a cycle per day. Thus in ten days the cycle would have completed half a full revolution. This brings us on to the final basic property of cycles: phase.

## Phase

If you imagine two cycles with the same period, but peaking at different times, then the time shift between these two cycles is the phase. Two cycles are in phase if their lows correspond. Otherwise they are out of phase.

In physics, if two cycles have a constant phase difference, then they have the same frequency and are said to be coherent. Coherence is a measure of cyclic correlation and is central to another concept that will be examined when we look at the interaction of different cycles: that of constructive and destructive interference.

If both cycles in Figure 1.1 are given a period of 20 days and Line B is offset from Line A by a quarter of a period, then the phase difference between the cycles is five days (one-quarter of 20).

If we think of Line A as being in the lead, then having topped first it is already halfway down as Line B reaches its peak. Similarly, when Line A bottoms, it is already halfway up as Line B reaches its trough.

This sort of relationship is often described in inter-market analysis when referring to the phase of the commodity market cycle in terms of the bond market cycle or when looking at sector rotation in the stock market, and so on. However, the concept of phase is also the basis for one of the most powerful tools in Hurst analysis: the *FLD* or *displaced cycle*, which will be examined in detail in chapter three.

### Phase in the market

It is possible to talk about the phase of a single cycle, providing a reference point in time is chosen. The usual way to express phase in the market, however, is in terms of time elapsed since the occurrence of a cycle trough.

For example: *prices are currently five days along a 20-day cycle* is a description of phase. This is useful information, because if we are five days along in a 20-day cycle, then – other things being equal – we know not only that the cycle is going up strongly, but also that it is another five days from a top. Alternatively, if the cycle phase is 15 days, then we know that it is five days past the top, going down strongly and another five days from the next low.

This concept is central to another key tool in Hurst's system: the *phasing model*, which will be introduced in chapter four.

## Proportionality

Hurst observed that with the exception of very long cycles, amplitude and period tend to be proportional.[4] What this means, for example, is that an 80-day cycle can be expected to have roughly twice the amplitude of a 40-day cycle; a 20-day cycle can be expected to have twice the amplitude of a 10-day cycle, and so on.

This makes sense, after all you would expect an 18-month cycle to be able to push prices up or down further than would a 20-day cycle. Thus, if you believe that a very long cycle has just bottomed, it is reasonable to assume that, other things being equal, there will be a proportionally large move out.

Of course there are times when this relationship appears to break down, for example in a long consolidation pattern, but this can be explained in terms of the action of other even longer cycles, as will be covered when we discuss the concept of *summation*.

# Visualising Period and Amplitude

## Physical models

Although physics analogies should be seen as learning tools rather than be taken too literally, using physical models can give us a better feel for market cycles. The following examples will help you picture what we have covered so far.

One intuitive way to visualise period, amplitude and proportionality is to think about dropping a bouncy ball so that it falls to the ground. The ball is released, accelerates downwards to its maximum speed and bounces off the ground. Before it reverses direction its speed is briefly zero and when it reaches the top of its bounce its speed is once again briefly zero.

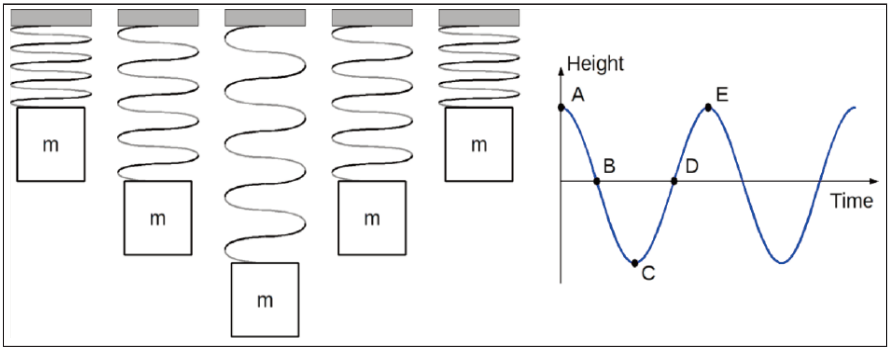
The greater the height of the drop – amplitude – the longer the time between initial bounces – period – before friction absorbs the ball's kinetic energy and brings it to rest. Drop the ball from lower down, however, and the bounces are shorter and quicker, i.e. the frequency is higher. If you were to plot the ball's path as a time series on a graph it would look very much like cyclic motion.

## Mass spring oscillator

Although the bouncing ball example helps to illustrate the proportional relationship between amplitude and period, the behaviour of a true cycle is subtly different. In the ball's case, the force of acceleration and deceleration acts either straight up or straight down, i.e. the bounce and gravity.

The acceleration of a true cycle, on the other hand, is always towards the centre of its oscillation, in other words it reverts to the mean. This can be demonstrated with a mass spring oscillator as shown in Figure 1.2.

**Figure 1.2 – Mass spring oscillator**[5]




When the load (m) attached to the spring is released it initially falls due to gravity, stretching the spring (A to B on the graph). At point B the forces acting on the load become balanced and the speed is at the maximum. The load then continues down at a slower speed as the spring's restoring force exerts itself, stops briefly (at point C), after which the evolution of its motion is reversed. At point E the load returns to the initial height finishing one cycle and starting a new one.

Assuming the rigidity of the spring is constant the mass of the load will determine the length of the period (and conversely the frequency of the swings) as well as the vertical displacement (amplitude) which will be in direct proportion.

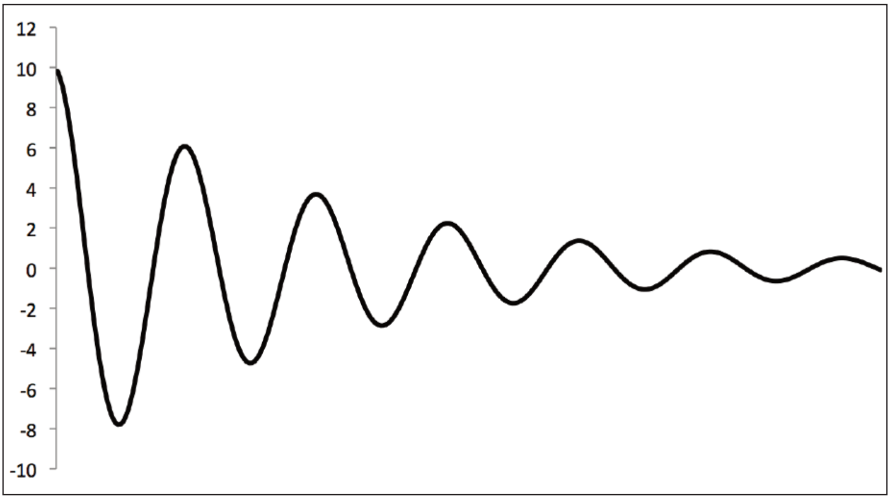
Note that at the low (point C) and high (points A and E) the speed is zero. Unlike the ball the maximum speed, as we noted earlier, is in the *middle* (points B and D) and this is the crucial point to remember when we start looking at market behaviour.

## Shock absorbers

We can take this idea a step further. Think of the suspension in a car travelling down a road and hitting a bump. The size of the bump determines the initial amplitude and the car spring will continue to oscillate as the car travels along.

Unlike a laboratory mass spring oscillator, these oscillations will be damped by the shock absorbers and will decay as shown in Figure 1.3, like a pendulum in syrup. On the other hand, if the energy lost to friction is replaced, for example more bumps of the right size and in the right spots on the road, then plotting the motion of the end point on the spring as the car drives along will replicate the same sine wave we saw in Figure 1.1.

**Figure 1.3 – Damped oscillation**[6]




# How Cycles Combine

Now that you have a better feel for the characteristics of individual cycles it is time to look at the behaviour of multiple cycles. Hurst's insight was that the market is a composite of numerous cycles of varying magnitude interacting with each other. Each cycle is separate and yet they combine in a specific way to create price patterns and the overall shape of market action.

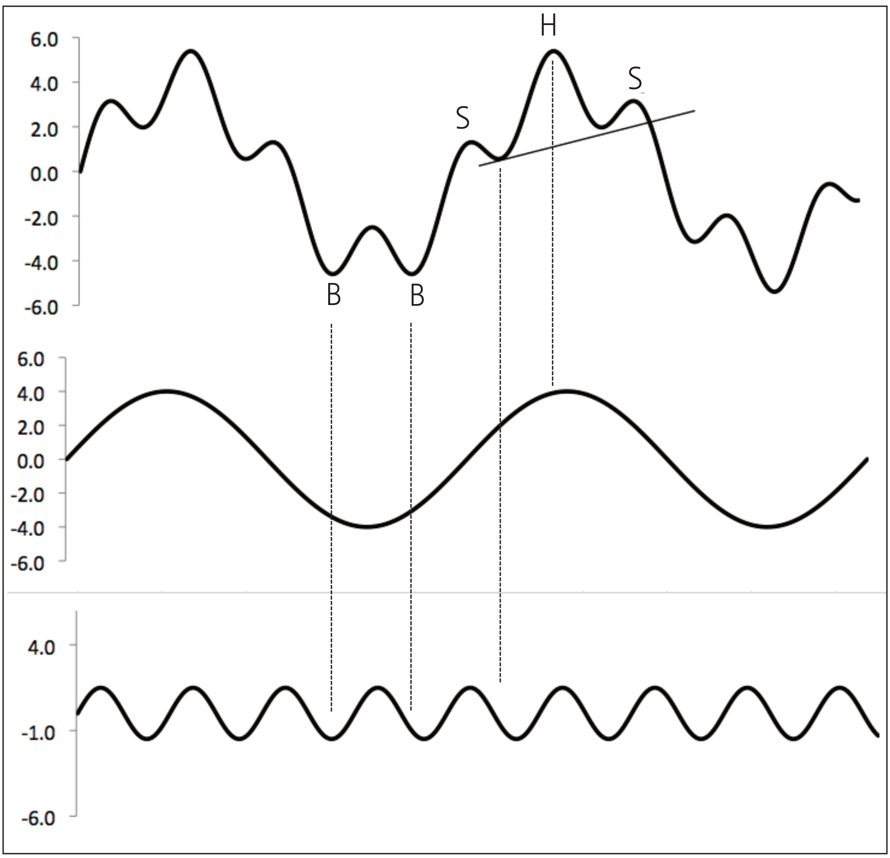
The way cycles combine is by simple addition: the value of a short cycle at any given time is summed with that of a long cycle, which in turn is summed with an even longer cycle, and so on to the upper limit. What we perceive as price movement is simply all of these cycles added together. In physics this is known as superposition. Hurst referred to it as the *Principle of Summation*.

## Summation

Let us say that the two sine waves in the middle and lower charts of Figure 1.4 are an 18-month (78 week) and an 18-week cycle respectively. The value of each of these cycles at each point in time is summed to create the composite curve at the top.

Two price patterns in the composite should immediately be obvious: a Head and Shoulders top and a Double Bottom.

**Figure 1.4 – Head and Shoulders Top and Double Bottom Composite (78 week plus 18 week)**



## Creating a composite cycle

The patterns that show up in the composite are just the result of the two cycles interacting in the following manner:

- Starting in the middle of the chart, the 18-week cycle runs up along the advancing leg of the 18-month cycle. The second trough of the 18-week cycle occurs halfway along the 18-month cycle's up-leg and temporarily pulls it down to create the left shoulder. This is an example of so-called destructive interference.
- The peaks of both cycles then superimpose to create the head, which is an example of constructive interference. The 18-week cycle then runs down the decline of the 18-month cycle with the third peak of the shorter cycle pulling the longer cycle down to form the right shoulder.
- Notice also how the composite cycle seems to lengthen in the decline and how the middle section is the steepest and longest. Note also during this stage that the second crest of the 18-week cycle does not overlap the first trough of the 18-week cycle. These are features of a five-wave decline that should instantly be recognisable as an impulse wave to students of Elliott Wave.

As for the double bottom, the sharp lows are the 18-week cycle superimposing on to the 18-month trough – another example of constructive interference – and the intervening peak that defines the double bottom is the 18-week cycle showing through the composite cycle – which again is destructive interference.

Table 1.1 gives the values of each cycle at each point in time and illustrates how the composite is derived. For example, the first bottom (B) in the composite has a value of -5, which is the sum of -1 (18 week) and -4 (18M). The left shoulder (S), has a value of +1, the sum of +1 and 0; the Head (H) has a value of +5, the sum of +4 and +1. Notice that the trend component in this example is zero, i.e. it has no impact on the shape of the composite.

**Table 1.1 – Data extract for composite cycle**

| X-axis | 78W | 18W | Trend | Sum |
|---|---|---|---|---|
| | A | B | C | (A+B+C) |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.50 | 0.16 | 0.26 | 0.00 | 0.42 |
| 1.00 | 0.32 | 0.51 | 0.00 | 0.83 |
| 1.50 | 0.48 | 0.75 | 0.00 | 1.23 |
| 2.00 | 0.64 | 0.96 | 0.00 | 1.61 |
| 2.50 | 0.80 | 1.15 | 0.00 | 1.95 |
| 3.00 | 0.96 | 1.30 | 0.00 | 2.26 |
| 3.50 | 1.11 | 1.41 | 0.00 | 2.52 |
| 4.00 | 1.27 | 1.48 | 0.00 | 2.74 |
| 4.50 | 1.42 | 1.50 | 0.00 | 2.92 |
| 5.00 | 1.57 | 1.48 | 0.00 | 3.05 |

## Complex composites

Obviously the market is more complicated than this: firstly, there are many more possible components; and secondly market cycles are not perfect sine waves. Nevertheless, the process is the same.

Figure 1.5 shows a composite curve not dissimilar to what you might see in actual market data. This has been created by adding together four perfect sine waves. Let us say that these component sine waves have periods of 156, 78, 18 and nine days and that their respective amplitudes are in proportion, as shown in Figure 1.6.

**Figure 1.5 – Complex composite consisting of four component cycles (156, 78, 18, 9)**

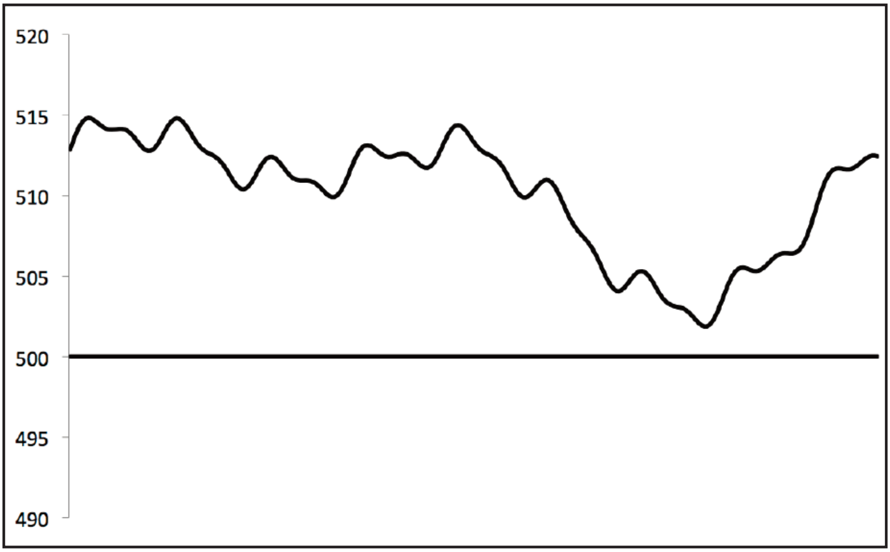
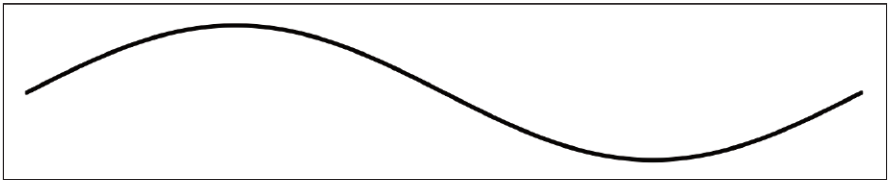
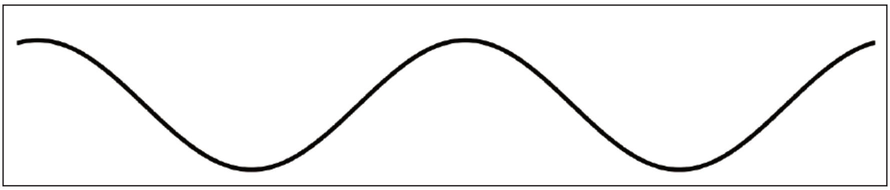


**Figure 1.6 – Individual components of the complex composite wave in Figure 1.5**

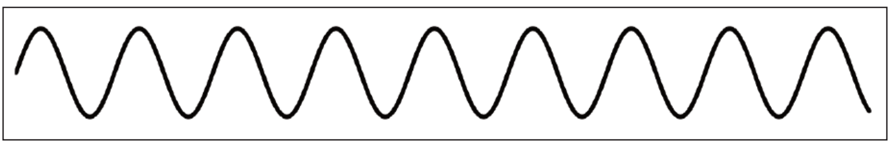
**156-day cycle**



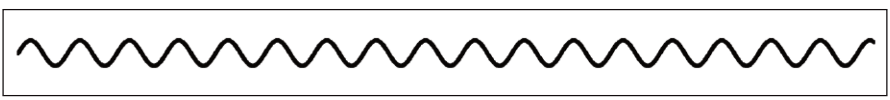
**78-day cycle**



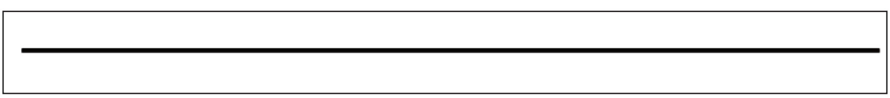
**18-day cycle**



**Nine-day cycle**



**Underlying trend (composite of all cycles longer than 156 days)**



Again you can see how the value of each cycle at each point in time is simply added together to create the composite. Table 1.2 shows the detail of the first four time units. The final column is the sum of each cycle value and this has been added to a constant (K) of 510 to enhance visibility.

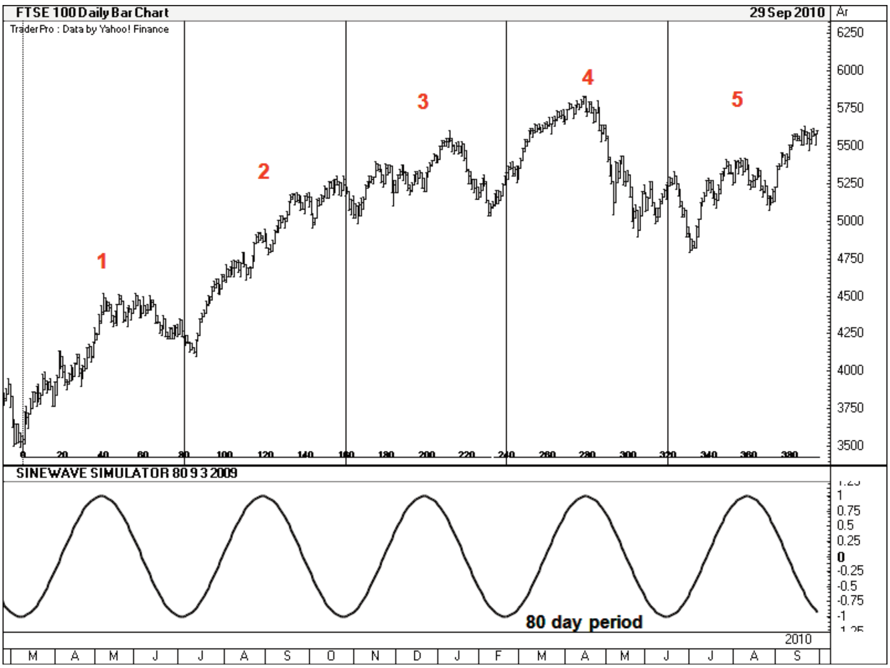
**Table 1.2 – Data for composite cycle in Figure 1.5 – first four time units**

| X-axis | 156D | 78D | 18D | 9D | Trend | Sum+K |
|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 2.88 | 0.00 | 0.00 | 0 | 512.9 |
| 0.50 | 0.08 | 2.91 | 0.17 | 0.17 | 0 | 513.3 |
| 1.00 | 0.16 | 2.94 | 0.34 | 0.32 | 0 | 513.8 |
| 1.50 | 0.24 | 2.96 | 0.50 | 0.43 | 0 | 514.1 |
| 2.00 | 0.32 | 2.98 | 0.64 | 0.49 | 0 | 514.4 |

## The effect of underlying trend

Figure 1.7 shows the FTSE 100 Index daily bar chart from March 2009 to September 2010. The sine wave with a period of 80 days shown in the lower window looks to be a pretty close approximation to the cycles in the price data.

**Figure 1.7 – 80-day cycle in the FTSE 100 (Source: Yahoo)**




Despite the uniformity of the dominant cycle running through the FTSE 100 here, each numbered cycle looks slightly different. The second low of the first cycle is much higher than the first. The second cycle hardly looks like a cycle at all. The fourth shows a longer period and a lower second trough, and so on.

The reason for this distortion is the presence of underlying trend or, more correctly, the action of the sum of all longer cycles.

In stage one the underlying trend has just turned up, causing the second higher low; in stage two the trend is now firmly up obscuring the fluctuation of the cycle; and finally in stage four the trend has turned down, causing the cycle to extend and form a second lower low.

## Swamped cycles

Figure 1.8 shows the same composite we were just studying (Figure 1.5) but this time a 5° trend has been added. All that has been done here is to add a set of values that plots a diagonal line across the chart. The value of each cycle is then added to the value of this new line at each point in time. The fluctuations seem to be muted.

**Figure 1.8 – Composite with 5° trend added**

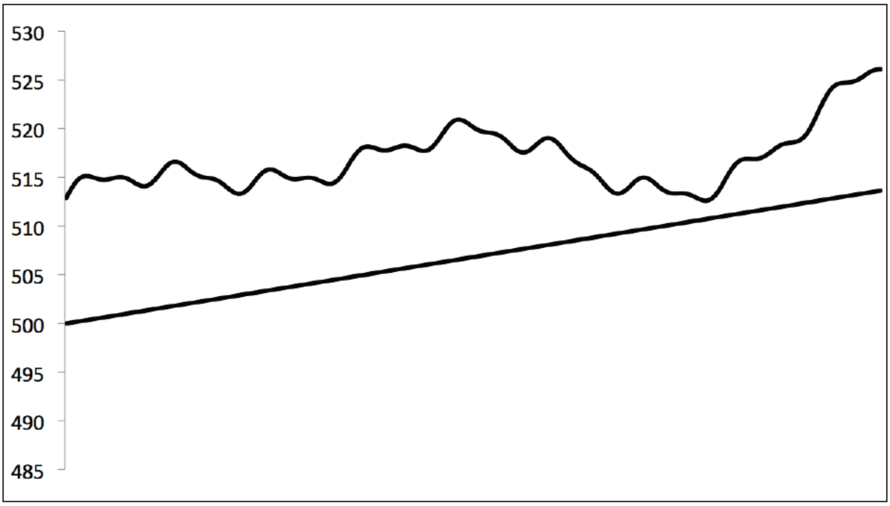
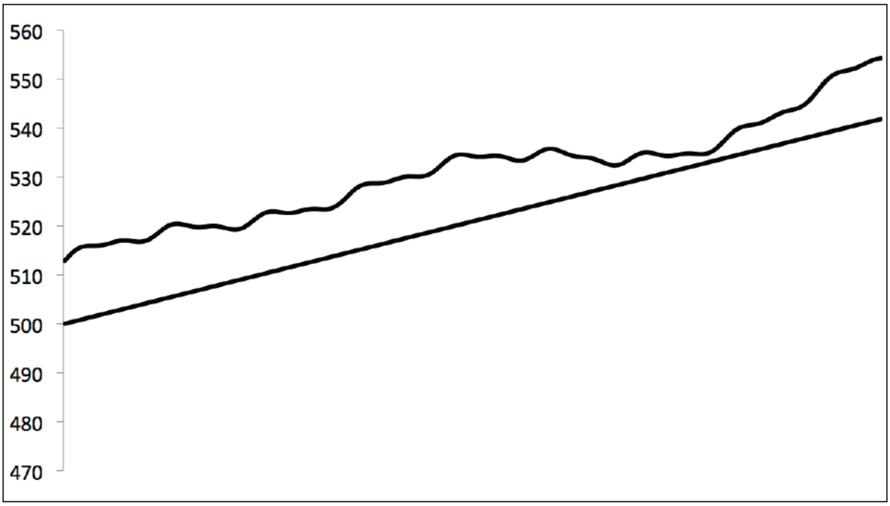



Figure 1.9 shows the same composite, but this time a 15° trend has been added. This time the cycles' fluctuations are much less apparent. The cycles are still there, it is just that they have been swamped by the underlying trend.

The stronger the trend component the more pronounced is this effect. This is one of the reasons some market observers are suspicious of cycles and bemoan the fact that they seem to come and go.

**Figure 1.9 – Composite with 15° trend added**




# Properties of Market Cycles

## Hurst's principles

Hurst observed that market cycles, and indeed cycles in many other naturally occurring phenomena, are governed by a set of core principles which all fall under the broader heading of the *Principle of Cyclicality*. These principles are as follows:

1. *Harmonicity*: cycles typically tend to be related to one another by multiples of two, although in certain cases by a multiple of three.
2. *Synchronicity*: cycle lows tend to converge: in other words the trough of a long cycle will coincide with the trough of all shorter component cycles. Although, apart from commodities, this is not the case for cycle peaks, which tend to be more dispersed.
3. *Nominality*: there is one more or less uniform set of cycles from very long to very short.
4. *Variation*: deviation from the norm is to be expected: cycle periods and amplitudes vary over time.
5. *Commonality*: these principles are applicable to cycles in all markets across the entire price history.

It is worth remembering here that although Hurst used the word *principle* he did not mean *physical law*, like the law of gravity or the law of thermodynamics, but rather *strong tendency*. Occasionally the influence of strong fundamental factors or price shocks will temporarily distort the picture. This is to be expected: forecasting the market is not an exact science.

## 1. Harmonicity

We have seen that price action is a composite curve of a multiplicity of different cycles. Adding sine waves together on a spreadsheet and generating a composite curve is easily done. Pulling that composite apart again and identifying the components is less easy. Extracting cyclic information from market data is harder still.

The main purpose of Hurst cycle analysis and the subject of this book is how to extract cycles from market data and form conclusions about what path they will follow beyond the end of the data.

Isolating component cycles would be made very much more difficult were it not for the strong tendency of cycles to form harmonic relationships.

### Harmonics example

A useful way to conceptualise waves (cycles) in market action is to imagine you are sitting on a beach near a busy fishing port. You watch three types of vessel going past at regular intervals – a cargo ship, a ferry and a trawler – with the wash from each of these breaking on to your beach as waves.

- Every 54 minutes a cargo ship passes and produces a big wave.
- Every 18 minutes a ferry passes and produces a lesser wave.
- Every nine minutes the trawler passes and produces a much smaller wave.
- The cargo ship is three times the size of the ferry and the ferry is twice the size of the trawler.
- The wash created is proportional to the size of the boat, there is a 3:2:1 harmonic relationship and the waves are synchronised.

You could represent these three waves graphically as in Figure 1.10. Notice that there are two full revolutions of the short cycle (red) to one revolution of the mid-cycle (blue) and there are three full revolutions of the mid-cycle to one of the long cycle (black). The cycles are harmonically related and the pattern produced is pleasing to the eye.

**Figure 1.10 – Set of harmonic and synchronised proportional waves (54, 18 and 9 unit periods)**

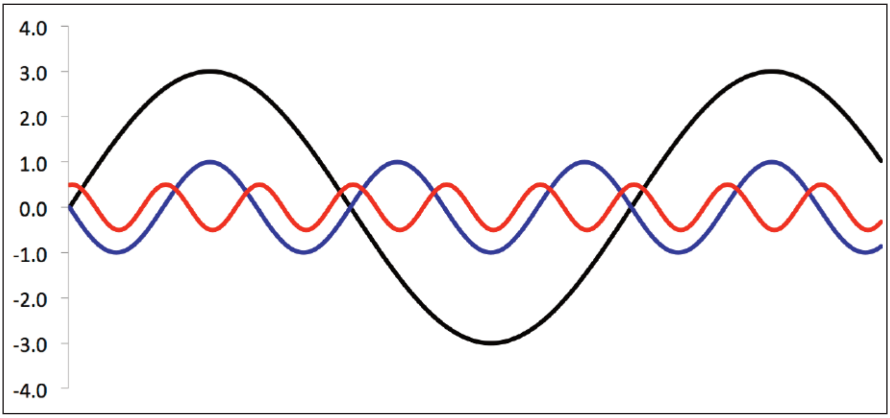
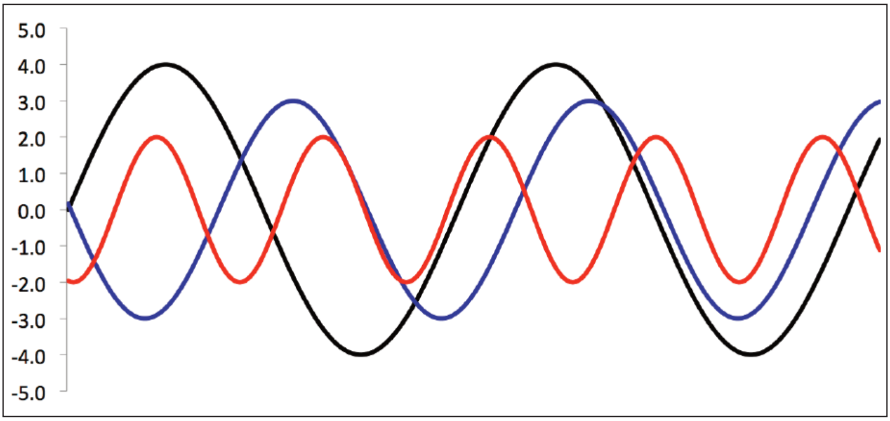



Figure 1.11 on the other hand shows three cycles lacking harmonicity. This is a much more confused and seemingly random picture and were market cycles arranged in this way we would have a hard job extracting useful information. Fortunately, however, they are not.

**Figure 1.11 – Non-harmonic and non-synchronised waves (lacking proportionality for emphasis)**



## Market harmonics

### Multiples of two

The periods of market cycles, and indeed many other naturally occurring cycles, are typically related to one another by a factor of two. Any given cycle tends to be half as long as its closest longer neighbour and twice as long as its closest shorter neighbour. Thus, if you have identified an 80-day cycle, you can expect it to break down into two 40-day cycles. If you are looking at a 40-day cycle, you should be looking for two 20-day cycles, and so on.

Going the other way, if you have found a 20-week cycle in the data, you should be looking for another 20-week cycle to make up a 40-week cycle. If you are looking at a 40-week cycle expect it to be the first half of an 80-week cycle, and so on. Naturally, this makes the job of searching for cycles much more straightforward. If you have found one, you should be able to find the others.

### Multiples of three

Hurst identified two exceptions to this: the 54-month cycle breaks down into three 18-month cycles and the 54-year cycle (sometimes called the Kondratieff wave) breaks down into three 18-year cycles. Why this should be so is uncertain.

It should be noted that certain respected analysts have identified three as the base harmonic rather than two[7], and this may well be a suitable area for further research. In our experience, however, using the relationship of two as the base gets the required results more often than not.

Sometimes market cycles are difficult to read and a cycle other than the 54 month will seem to break down into three harmonics rather than the usual two. It is not unheard of, but it is the exception. If you do come across this, you will often find a way to make a harmonic of two work without too much con tortion. This sounds a bit *shoot from the hip*, but it will become clear when we look at isolating market cycles in chapters four and five.

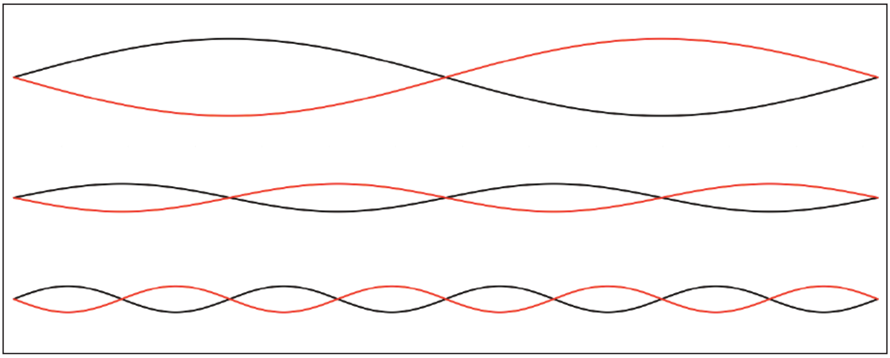
## Harmonics in music

A rough analogy for market harmonicity can be made with music. Figure 1.12 is a graphical representation of the frequency of a vibrating string showing the second, fourth and eighth harmonics.

When an instrument produces a note, the fundamental pitch is accompanied by a series made up of harmonics (or overtones). The relative intensity of these harmonics determines the timbre of each note, that is to say the characteristic piano or violin sound.

Harmonic series exist because when a string (or column of air) vibrates, it does so by vibrating at several frequencies simultaneously – each resulting in a harmonic. Like the markets, these frequencies only occur at integer multiples of the fundamental frequency and that is why all harmonic series follow the same pattern, irrespective of the fundamental pitch.[8] The difference between these harmonics and those of cycles, of course, is that it is the nodes that coincide here rather than the troughs.

**Figure 1.12 – Vibrating string showing even harmonic levels**



## 2. Synchronicity

Cycle troughs tend to converge giving them a sharp appearance. If cycles have a harmonic relationship then their troughs will have to coincide periodically, which goes some way to explaining it. On the other hand, peaks tend to be non-synchronous and more dispersed, giving them a more rounded appearance. This is the reason for the convention of measuring cycle period from low to low.

Figure 1.13 shows three harmonic and synchronised sine waves. The diamonds in the lower part of the diagram represent the location of the troughs and the triangles in the upper part represent the location of the peaks. As you can see, the distribution of the diamonds is more uniform.

Although the market consists of a much larger set of cycles and the picture is more complex, we see the same thing. Figure 1.14 shows a monthly bar chart of the FTSE 100 between 1984 and 2010. Apart from two apparent anomalies in 1987 and 1994, the tops are rounded and the bottoms are sharp.

**Figure 1.13 – Harmonic waves in phase showing synchronisation of troughs and dispersion of peaks**

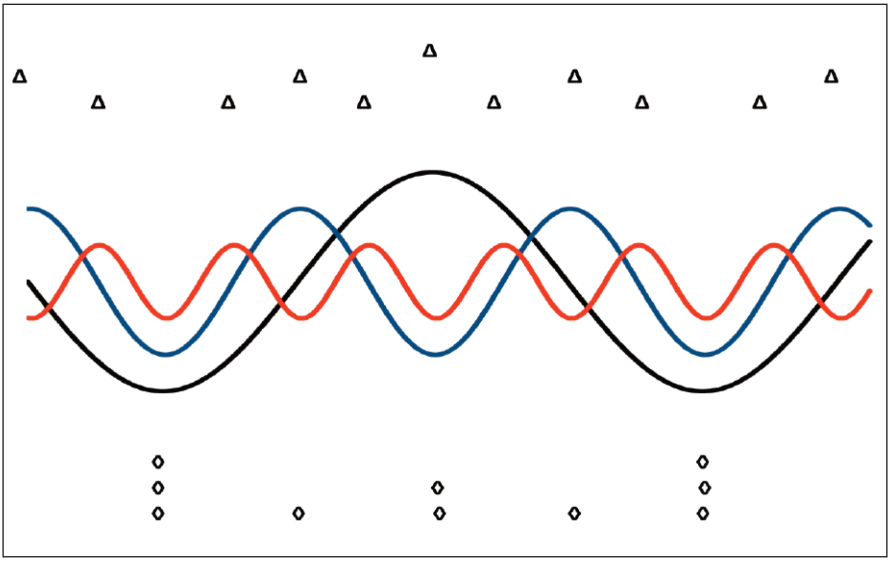
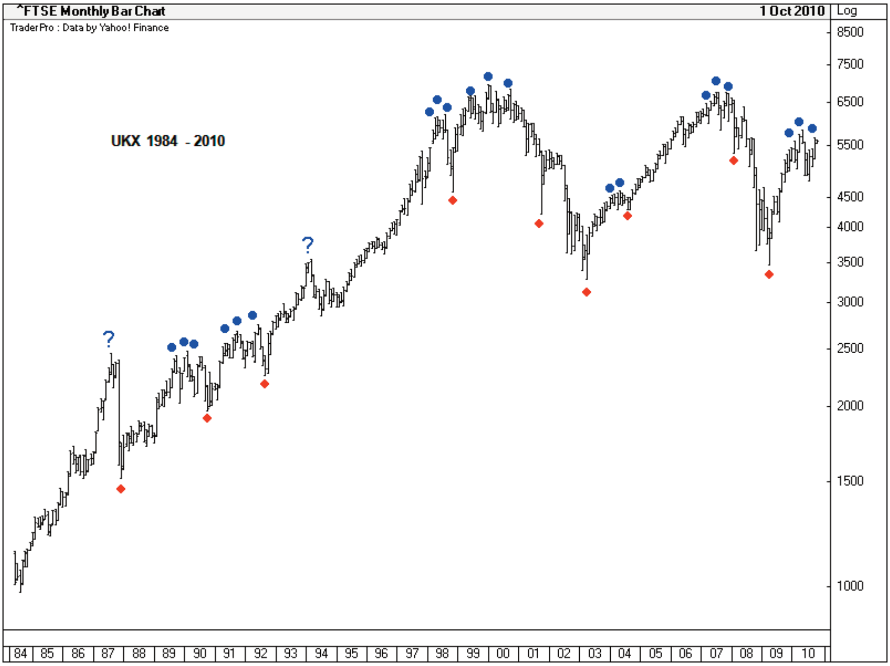


**Figure 1.14 – FTSE 100 showing tendency for sharp bottoms and rounded tops (Data: Yahoo)**



### Implications

Synchronicity means that the troughs of longer waves will coincide with the troughs of all of their shorter harmonic neighbours. For example, the time location of an 80-week low will be the same as that of a 40-week low, a 20-week low, a ten-week low, and so on down.

What it does not mean, however, is that a short cycle low also implies the presence of a longer cycle low. This makes sense of course, because in any time series short cycles will be more numerous than long cycles and mathematically not every short cycle trough can correspond to that of a longer cycle.

The usefulness of the phenomenon of synchronicity to cycle analysis should be apparent. Once a long cycle period trough has been identified, we have immediately identified the time location of all shorter cycle troughs. This will all become a lot clearer when we start looking at actual techniques later in the book.

### Behavioural explanation

The reason often given for rounded tops and sharp bottoms in markets is as follows: hope dissipates slowly whereas fear, being a more powerful motivator, reaches a crescendo faster.[9]

Most traders will be familiar with the feeling of wanting to hold out for a bit more profit, believing that the market has further to go up and getting more excited as trading profits grow. At the same time, new buyers attracted to higher prices continue to probe higher until gradually the weight of sell orders from more thoughtful traders makes itself felt. Eventually demand is exhausted and the emphasis shifts from the bid to the offer. Positive sentiment takes time to unwind.

On the other hand, once the herd stampedes, it is a brave soul who ignores the call. Traders at all time-frames up to the longest cycle in the approaching trough hurry to unload their positions until they are sold out. Because this happens fast, time on the chart seems to compress and the move into the low appears sharp and steep.

Fear in equal or even greater measure is also present on the other side of the lows as short sellers at all time-frames up to the longest cycle in the trough rush to cover their positions. This again has the effect of compressing time on the chart adding to the sharp appearance of the trough.

## Cyclic motion

### Cycles transporting energy

Before moving on to discuss the principles of *nominality* and *variation*, it is worth spending a moment thinking about the actual motion of cycles in markets.

A modern physicist might say something like *there are no things, only waves*. What is meant by this is that what we take for granted as solid matter is actually a complex web of electromagnetic waves or cycles. Thus, the chair you are sitting on is made of waves; this book is made of waves; and so on. This all sounds a bit far removed from the practicalities of everyday life, but it does lead to another important property of cycles.

Waves are not things in their own right – they simply transport energy through things.[10] When you flick the end of a skipping rope the transverse wave that runs along its length is only displacing the rope vertically, it is not actually moving it forward. Similarly, ocean swell is the energy of wind and tide rotating the sea upwards at a given point and then moving on, rather than the sea pouring from one place to another.

Thus wave energy in each case is transferred from point to adjacent point creating the illusion of forward movement. In the same way a film creates the impression of continuity, but is in fact just a series of separate images constantly remade.

### Cycle energy in the market

Applying this analogy to market cycles forces the question, what medium is the wave energy passing through? The obvious answer is that it moves through prices, but more accurately it moves through the mood of the market participants.

## The medium of mood

### Traders' emotions

The ostensible driver of prices, supply and demand, is a different concept in freely traded financial markets than it is in, say, a market for bread or shoes. We buy (or short sell) in the markets planning to reverse the trade at some point in the future so that we can make money. In other words we hope for a positive outcome.

Alternatively, we sell a long position (or cover a short) because we have made money and we fear being stuck with something we cannot sell on at a favourable price. In other words we fear a negative outcome. In normal circumstances, this emotional content is largely absent (when purchasing bread for example).

It is the emotions of individual traders that persuade them to either buy, sell or stay out of the market. Of course traders do not live in isolation; they are members of society and as such they are subject to the overall mood of society. Even though price marks the progress of a cycle, the medium through which cyclic energy is transmitted is social mood.

### History repeats

We know that mood changes over time. The 54-year Kondratieff cycle is sometimes thought to be the time it takes for one generation to forget the lessons learnt by the previous generation: how much different do you think social mood was after the Depression compared to at the top of tech bubble? How different was the mood of the times in the early 1960s to that of the 1980s, or the mood in March 2009 to the mood in January 2011? These long-term cyclical swings do not come out of nowhere – they build step by step and these steps are cyclical in nature.

This process of cyclical change is repeated at every time frame right down to the daily level. The emotions on a trading desk over the course of an afternoon are no different to those over twenty days or twenty weeks. The Dutch trader buying and selling tulips in 1637 will have had a lot in common with a hedge fund manager trading asset-backed securities in 2006.

People's motivations remain the same, and the patterns caused by cyclic action we see in the price charts of the nineteenth century are broadly the same as they are now and, no doubt, as they will be in years to come.

## 3. Nominality

Rather than there being an infinite number of different individual cycles in the price history, there appears to be a specific set. These share the characteristics of cycles described so far and yet they are separate. Hurst called this *nominality* or the *Nominal Model*.

- The longest cycle catalogued in the model is 54 years, the next shorter cycle is 18 years and the shortest at this degree of magnitude is nine years. For the purposes of Hurst cycle analysis, these are treated as very long-term trends.

- At the monthly level, a nine-year cycle divides into two 54-month cycles, which further divide into three 18-month cycles (usually labelled 80 weeks), which further divide into two nine-month cycles.
- The nine-month cycle is the equivalent to a 40-week cycle, which consists of two 20-week cycles, which subdivide further into two ten-week cycles.
- The ten-week cycle is labelled as an 80-day cycle on the daily chart and this breaks down into separate 40-day, 20-day and ten-day cycles.
- Naturally, cycles also exist longer than 54 years and shorter than ten days.

Table 1.3 is a summary of the Nominal Model in calendar days and trading days.

**Table 1.3 – Simplified Nominal Model showing calendar days and trading days**[11]

**Calendar days**

| Years | Months | Weeks | Days |
|---|---|---|---|
| 54 | | | |
| 18 | | | |
| 9 | | | |
| | 54 | | |
| | 18 | 80 (560D) | |
| | 9 | 40 (280D) | |
| | | 20 (140D) | |
| | | 10 (70D) | 80 |
| | | | 40 |
| | | | 20 |
| | | | 10 |

**Trading days**

| Years | Months | Weeks | Days |
|---|---|---|---|
| 54 | | | |
| 18 | | | |
| 9 | | | |
| | 54 | | |
| | 18 | 80 (392D) | |
| | 9 | 40 (196D) | |
| | | 20 (98D) | |
| | | 10 (49D) | 56 |
| | | | 28 |
| | | | 14 |
| | | | 7 |

## Calendar time and trading time

Cycles run in calendar time rather than in trading time. This seems counter intuitive and why it should be so is a good area for further research. We will consider some possible reasons in the last chapter when we discuss the causes of cycles, but for now it is probably best just to accept it.

Hurst's Nominal Model is accordingly based on calendar time and not trading time, which presents a slight problem for anyone using a trading platform set up only to show trading days, which of course means pretty much everyone. The following conversion therefore needs to be made at the daily level:

- There are roughly 250 trading days in a 365-day calendar year. To convert calendar days to trading days, therefore, multiply by 0.7 (250/365).

- Conversely, to convert trading days into calendar days, divide by 0.7 (multiply by 1.42).
- Thus, the nominal 80-day cycle is 80 x 0.7, or 56 trading days.
- The nominal 40-day cycle is 40 x 0.7, or 28 trading days.
- The nominal 20-day cycle is 20 x 0.7, or 14 trading days, and so on.

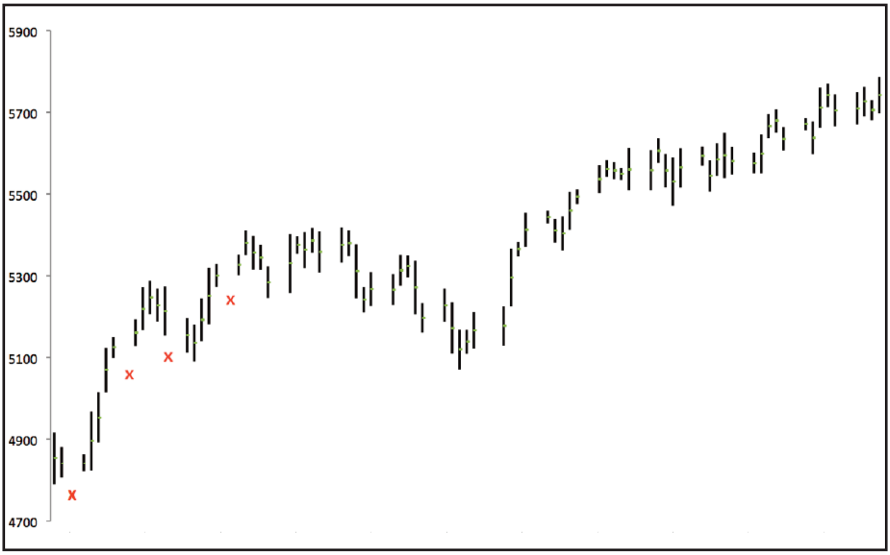
These numbers should be familiar to most technicians as the basis for the popular 55-day moving average; the 26-day standard setting for MACD; and the 14-day default settings for RSI, DMI and Stochastics.

### Time gaps

Hurst's original daily charts showed time gaps for weekends and holidays, which means that there is some distortion when these are omitted and the bars are continuous. Obviously, because there are no week-long gaps in trading, this problem does not present itself on weekly charts. The problem on the intraday level is acute, however, which is why you will need a modified trading platform to perform Hurst analysis at this time frame. David Hickson's Sentient Trader – a superb automated Hurst cycles analysis system – does just this.[12]

Figure 1.15 shows an example of the FTSE 100 with the first four gaps marked with X.[13]

**Figure 1.15 – FTSE 100 bar chart 1 July to 21 October 2010, with gaps for non-trading days**



## Alternative cycles

Arguably there are alternative cycle durations which recur in market price history: for example the ten-year decennial cycle; the four-year US Presidential cycle; the business cycle; seasonal cycles; the lunar cycle; and so on. These are all expressions of the Nominal Model and for clarity it is probably best to stick to Hurst's original nomenclature.

A cursory examination of two stock indices, the Dow Jones Industrial Average (DJIA) and the Japanese Topix, will show that Hurst's Nominal Model appears to be a fairly accurate representation of what is actually happening.

For the sake of brevity, we will only be considering the long cycles from 54 months to 54 years. However, as above, so below; the subdivisions continue all the way down to the shortest cycles. You will be exposed to numerous examples of shorter cycles over the course of the rest of the book.

## Nominality in the DJIA and Topix

The charts that follow (Figures 1.16 to 1.23) are an attempt to isolate the long cycles of the Nominal Model in the DJIA from 1900 to 2010 as well as in Topix from 1949 to 2010. The technique used is a rough and ready version of Hurst's method of extracting cycles in market data; *phasing analysis*. This will be covered in detail in chapters four and five.

The rows of coloured diamonds in the lower part of each chart correspond to the approximate time location of troughs in the component cycles (54Y, 18Y, 9Y and 54M): the convention being, as you have learnt, to measure cycle periods between cycle lows rather than peaks.

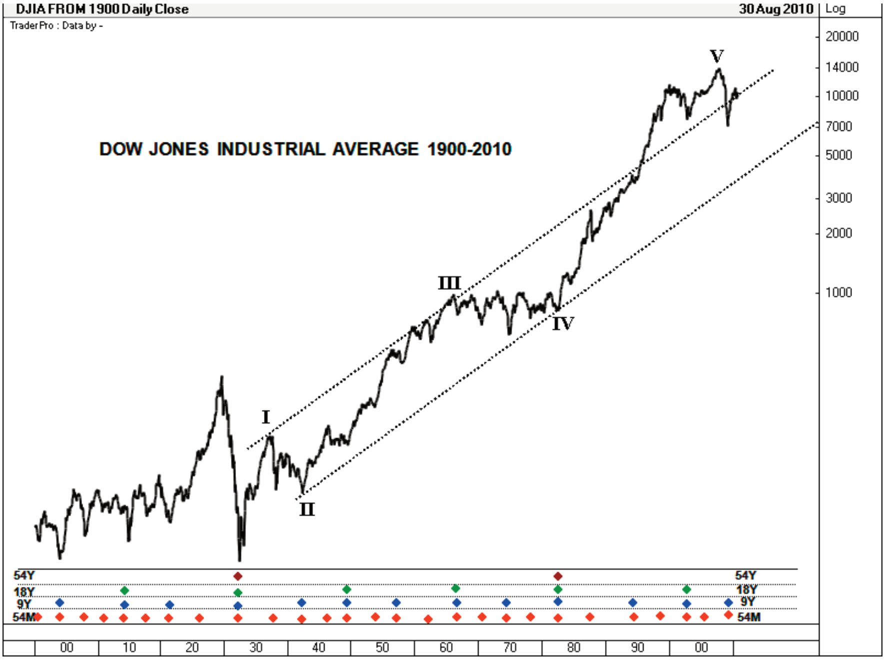
Thus, the top row displays time locations of the nominal 54-year cycle troughs; the second row displays the nominal 18-year cycle troughs; the third row displays the nine-year cycle; and the fourth row shows the troughs of the 54-month cycle.

## The Dow Jones Industrial Average: 1900 – 2010

### Overview

Figure 1.16 shows the broad sweep of prices in the DJIA over the 20th century and the first decade of the 21st century. The charts that follow will break the period into shorter sections. This is not intended to be the last word, and some analysts may disagree with the interpretation, but the purpose here is to illustrate the concept of nominality. Glance through the charts and check the results tabulated at the end.

**Figure 1.16 – Dow Jones Industrial Average 1900-2010 (Data courtesy of www.wrenresearch.com.au)**




For experts in economic cycles, it might look like liberties are being taken with the 54-year Kondratieff cycle (or K-Wave) placement in 1982. Kondratieff, a Russian economist, who first proposed this cycle, suggested that 1896 was the last low in the 19th century, which would make 1950 the following low. Since this puts the low right in the middle of one of the strongest rallies this century, it is a difficult case to make.

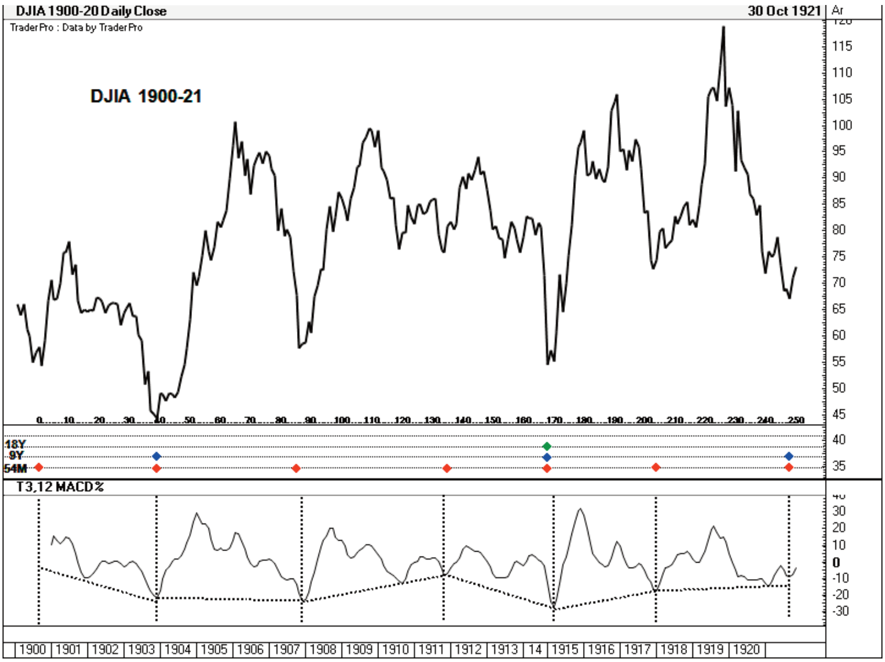
If any year is to be a contender for a Kondratieff low, then surely 1932 would be it. This would make 1878 the previous low, the beginning of the railway age. If we take a shortened cycle of 50 years from 1932, then 1982 was the most recent K-Wave trough. This corresponds to the start of a major bull market, the last in fact of the 20th century, which culminated in the tech bubble of 2000.

One could argue therefore that if the current K-Wave is also running short at 50 years, then it topped in 2007. Assuming that even longer cycles underlying the K-Wave are not advancing then, as of 2010, we are three years into a multi-decade decline.

## DJIA: 1900–1921

Figure 1.17 shows the DJIA from 1900 to 1921. Three clear 54M cycles (red diamonds) are apparent although the first cycle is shortened. Although it is not needed in this chart, the data has been detrended and the output is shown in the lower window. Detrending is simply a method of extracting underlying trend from the data so that the cycles show up more clearly. In this case it is a percentage-based moving average convergence-divergence (MACD) line set at three and 12 years. We will talk a little more about the concept of detrending in chapter four.

**Figure 1.17 – DJIA 1900–1921 (Data courtesy of www.wrenresearch.com.au)**



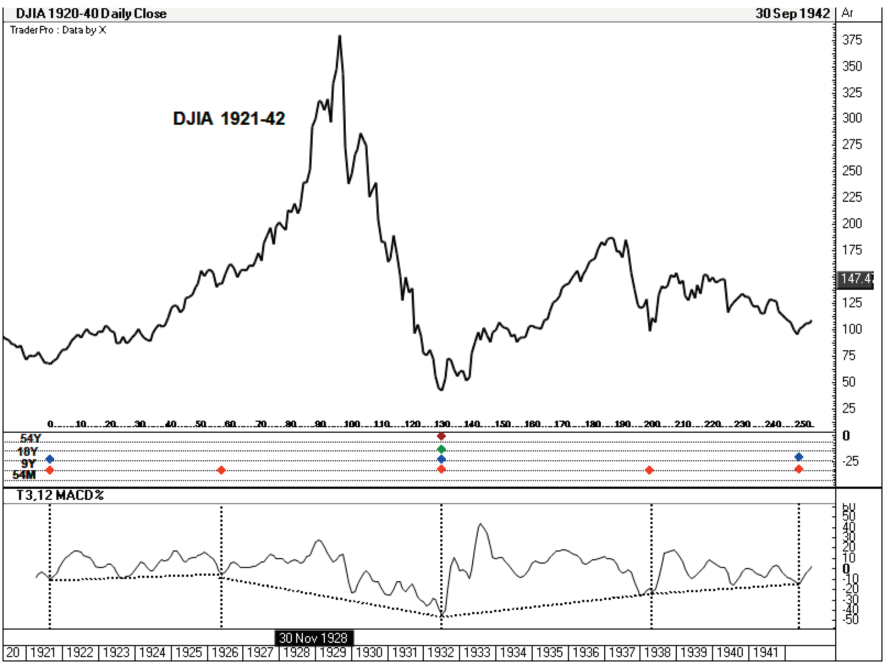
### DJIA: 1921–1942

Figure 1.18 shows the Dow between 1921 and 1942 – notice that it is quite difficult to isolate cyclic movement in the sharp rally into the 1929 top. Picking out the cycles period by period is often straightforward but at other times some artistic licence is needed. That is just the nature of cycle research and we more or less have to live with it.

That said, the tools that will be introduced in later lessons will show that this element of subjectivity turns out to be less important than it at first seems. The detrending tool helps pick out the cycles in this period.

Here we see a clear 54M cycle (red diamond) emerging from the 1932 K-Wave low.

**Figure 1.18 – DJIA 1921–1942 (Data courtesy of www.wrenresearch.com.au)**

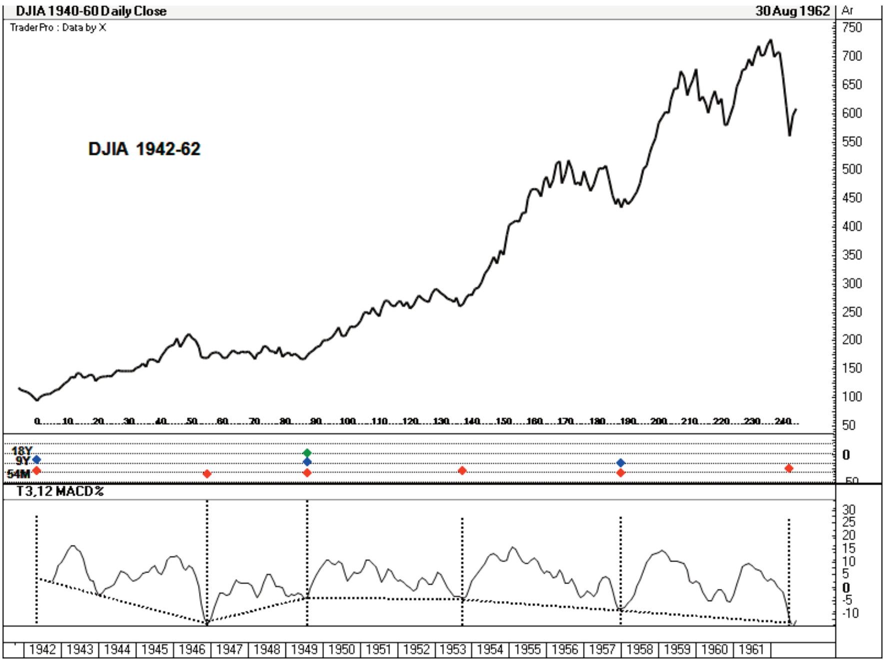


## DJIA: 1942–1962

Figure 1.19 shows the DJIA from 1942 to 1962. Although the last three cycles are regular and quite clear, at first glance the 18-year low between grids 80 and 90 (in 1949) does not seem like much of a trough and the previous cycle is more or less non-existent.

This 20-year period represents the strongest bull market of the last century, both technically and in terms of fundamentals. This is an example of cycles being obscured by the interaction of other cycles and underlying trend.

**Figure 1.19 – DJIA 1942–1962 (Data courtesy of www.wrenresearch.com.au)**

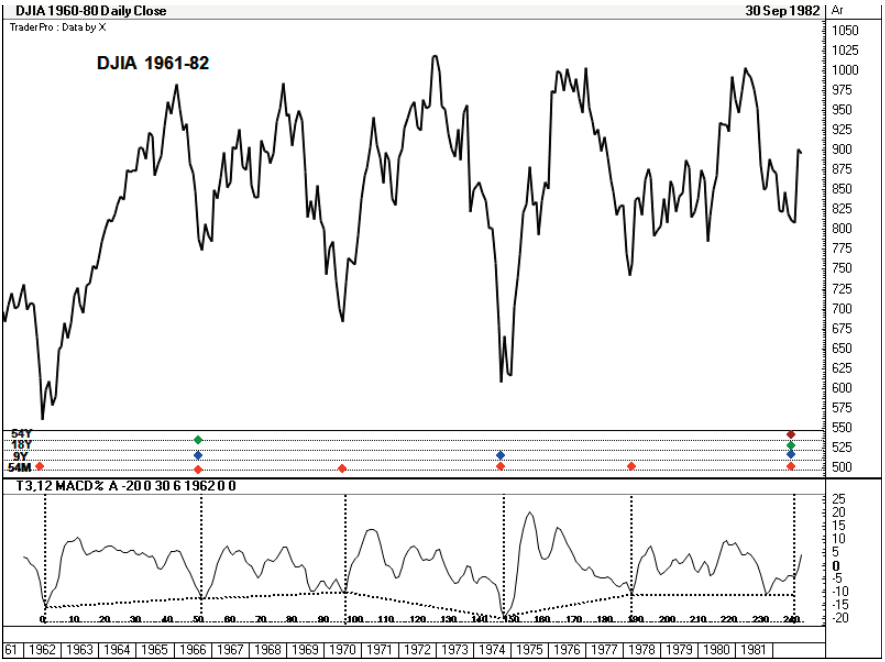


### DJIA: 1961–1982

The period from 1962 to 1982 shown in Figure 1.20 can be viewed as a transition period between the long bull market of the previous 19 years and the final rally of the next 18 years into 2000.

The cycles show up clearly and regularly as the underlying long trend shifts sideways, performing much the same job as a flag or a pennant.[14]

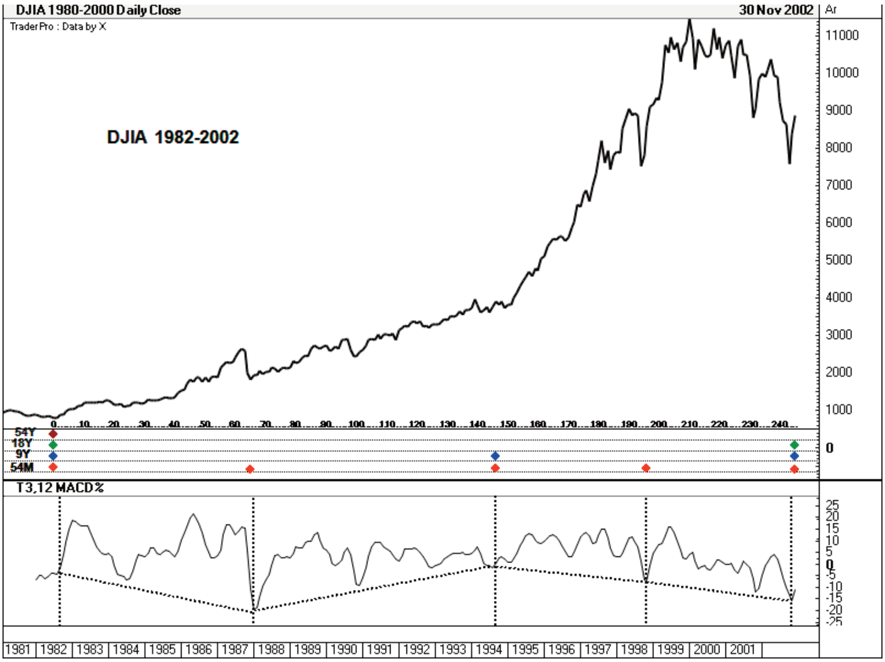
**Figure 1.20 – DJIA 1962–1982 (Data courtesy of www.wrenresearch.com.au)**



**DJIA: 1982–2002**

Figure 1.21 shows the last push up from 1982 into 2000 and the first reaction decline into 2002. Once again the cycles are obscured by the strong underlying trend and some judgment is called for on a chart of this length. The detail would be considerably clearer at lower time frames.

**Figure 1.21 – DJIA 1982–2002 (Data courtesy of www.wrenresearch.com.au)**



### DJIA: 2002–2010

Figure 1.22 shows the eight years from 2002. The 54-month low at grid 38 is obscured by underlying trend and the nine-year cycle looks to be running short at 77 months. However this is to be expected as the sharp sell-off out of 2007 compressed the cycle.

**Figures 1.22 – DJIA 2002–2010 (Data courtesy of www.wrenresearch.com.au)**

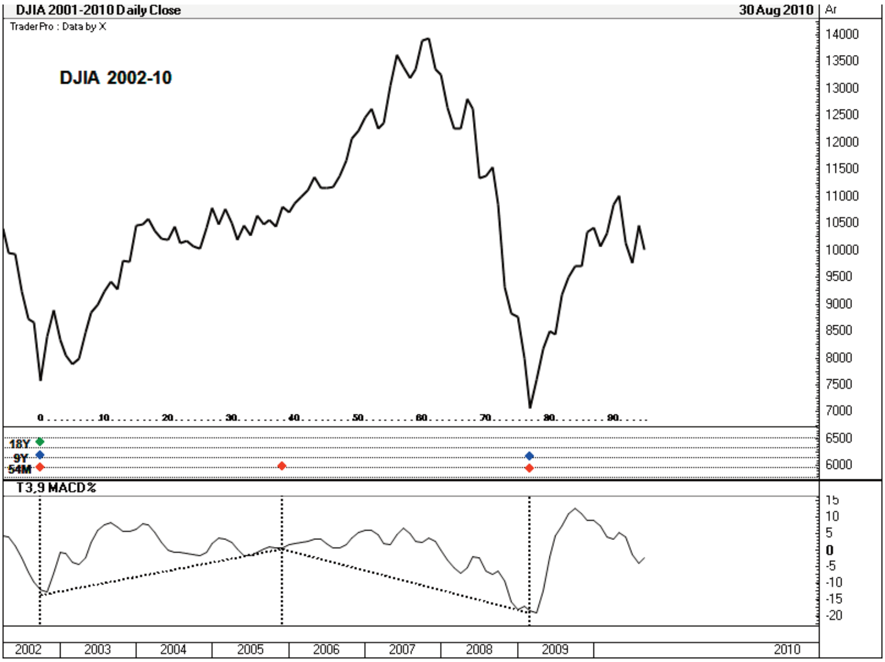


Table 1.4 shows the data in spreadsheet form. The summary results are as follows:

- Nominal 54-month cycle: average period, 52.5 months
- Nominal nine-year cycle: average period, 9.1 years
- Nominal 18-year cycle: average period, 17.1 years
- Nominal 54-year cycle: average period, 50 years

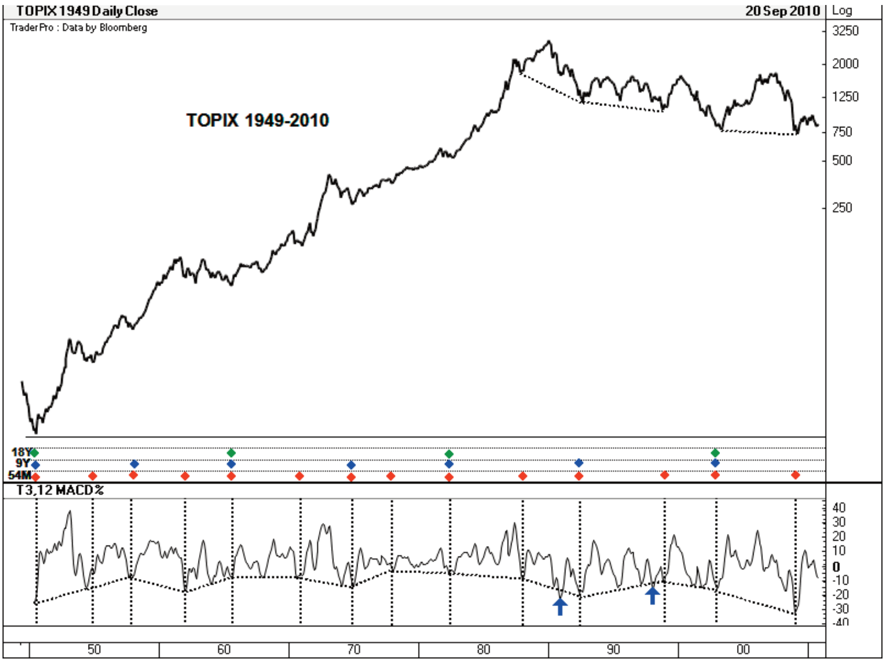
**Table 1.4 – Dow Jones Industrial Average periodicity 1903-2010**

| Month end | Close | 54M | 9Y | 18Y | 54Y |
|---|---|---|---|---|---|
| 30/11/1903 | 44.32 | 0 | | | |
| 30/09/1907 | 67.71 | 46 | 92 | 92 | |
| 30/12/1914 | 54.57 | 83 | | | |
| 30/06/1921 | 68.45 | 78 | 161 | | |
| 30/03/1926 | 140.45 | 57 | | | |
| 30/06/1932 | 42.83 | 75 | 132 | 293 | |
| 30/03/1938 | 98.94 | 69 | | | |
| 30/04/1942 | 95.34 | 49 | 118 | | |
| 30/10/1946 | 169.15 | 54 | | | |
| 30/07/1949 | 175.91 | 33 | 87 | 205 | |
| 30/08/1953 | 261.21 | 49 | | | |
| 30/12/1957 | 435.68 | 52 | 101 | | |
| 30/06/1962 | 561.27 | 54 | | | |
| 30/09/1966 | 774.21 | 51 | 105 | 206 | |
| 30/06/1970 | 683.52 | 45 | | | |
| 30/09/1974 | 607.86 | 51 | 96 | | |
| 28/02/1978 | 742.11 | 41 | | | |
| 30/07/1982 | 808.59 | 53 | 94 | 190 | 601 |
| 30/11/1987 | 1833.54 | 64 | | | |
| 30/06/1994 | 3624.95 | 79 | 143 | | |
| 30/08/1998 | 7539.06 | 50 | | | |
| 30/09/2002 | 7591.93 | 49 | 99 | 242 | |
| 30/10/2005 | 10440.07 | 37 | | | |
| 28/02/2009 | 7062.93 | 40 | 77 | | |
| Mean | | 52.5M | 9.1Y | 17.1Y | 50Y |

### Nominality in Topix: 1949–2010

Figure 1.23 shows a chart of Topix over the period 1949 to 2010, with summary results and data given in Table 1.5.

**Figure 1.23 – Tokyo Stock Exchange TOPIX Index 1949–2010 (Data: Bloomberg Finance LP)**




- Nominal 54-month cycle: average period, 54.2 months
- Nominal nine-year cycle: average period, 8.8 years
- Nominal 18-year cycle: average period, 17.6 years

**Table 1.5 – TOPIX periodicity 1949-2010**

| Month End | Close | 54M | 9Y | 18Y |
|---|---|---|---|---|
| 20/05/1950 | 10.65 | 0 | 0 | 0 |
| 20/11/1954 | 27.24 | 54 | | |
| 20/12/1957 | 44.06 | 37 | 91 | |
| 20/10/1962 | 86.23 | 58 | | |
| 20/07/1965 | 82.4 | 33 | 91 | 182 |
| 20/12/1970 | 147.69 | 65 | | |
| 20/11/1974 | 267.86 | 47 | 112 | |
| 20/10/1977 | 379.9 | 35 | | |
| 20/08/1982 | 519.11 | 58 | 93 | 205 |
| 20/10/1987 | 1793.9 | 62 | | |
| 20/08/1992 | 1163.77 | 58 | 120 | |
| 20/10/1998 | 1043.02 | 74 | | |
| 20/04/2003 | 790.72 | 54 | 128 | 248 |
| 20/02/2009 | 739.53 | 70 | | |
| Mean | | 54.2 | 8.8 | 17.6 |

## 4. Variation

From the rough analyses of the DJIA and Topix it can be seen that the actual average periods over the data samples were very close to the expected nominal values. However, you will also have noticed that there were sometimes significant excursions from the mean.

In the DJIA data for the largest sample, the 54-month cycle, the maximum period is 83 months, whereas the minimum period is only 33 months. In the Topix data the maximum period in the 54-month sample is 74 months and the minimum period is 33 months.

The Nominal Model represents long-term averages of cycle periods and it is there to guide us. It does not mean that you can expect to see exactly the nominal cycle durations roll out on cue time after time. On the face of it, this variation may seem to make the forecasting of cycles a little suspect, but in fact it is much less of a problem than it seems, as will become apparent when we look at the causes of variation and how to predict it in later chapters.

## Conclusion

Cycles in the market share the same physical quantities. Understanding basic terms like period, amplitude and phase, borrowed directly from physics, helps us to understand the nature of market cycles. We saw that price action in the market is a composite of a multiplicity of cycles (Principle of Summation) and that rather than being any old group of cycles, the market consists of a specific set of more or less uniform cycles (Principle of Nominality) and this is true for a very wide range of diverse instruments.

Long cycles tend to be of greater magnitude than short cycles and there is a proportional relationship between period and amplitude (Principle of Proportionality). It was also shown that there is a harmonic relationship of two and three between neighbouring cycles (Principle of Harmonicity) and that wherever possible troughs tend to converge (Principle of Synchronicity). However, we have also seen that the real world is not so neatly accommodated by these guidelines (Principle of Variation).

Hurst analysis is a system of tools: we do not just blindly rely on individual signals, but combine empirically derived techniques with sound underlying logic to build up evidence to forecast future cyclic action. The next chapter introduces the first basic tool in this system, the *Valid Trend Line (VTL)*.

### Endnotes

[2] For 'market' read any freely traded liquid financial market: equities, bonds, commodities, currencies, ETFs, etc.
[3] In physics the value would be 1 (0 to 1 or 0 to -1).
[4] This relationship tapers off approaching the upper limit.
[5] Diagram courtesy of Alexey Lyapin Ph.D., University College London, Department of Physics.
[6] Example courtesy of Christopher Willis Ph.D., Imperial College London, Department of Physics.
[7] Tony Plummer, *Forecasting Financial Markets* (Kogan Page, 2008).
[8] Thanks to Jessica Chan, Royal College of Music.
[9] The opposite tends to be true in commodities markets, where peaks represent fear.
[10] Although not all waves need a medium; for example, electro-magnetic radiation does not. Thanks to Alastair Dunn Ph.D., University College London (UCL).
[11] The actual periods Hurst proposed were: 77.9; 39; 19.5; 9.7; 5 weeks and 68.2; 34.1; 17; 8.5; 4.3 days. Because these are long-term averages and there is variation from the mean, the convention is to use the shorthand values of the simplified Nominal Model.

[12] See page 348 of this book and the website **www.sentienttrader.com** for more information on David Hickson's system.

[13] Also note that the original Hurst charts only show high, low and mid-price.

[14] This pattern is a sideways pause usually halfway along a fast up or down move and has the appearance of a flag flying at half-mast.