

1

BASIC FIBONACCI PRINCIPLES

“Let your imagination soar.” This phrase, this invitation, started the earlier book, *Fibonacci Applications and Strategies for Traders*. And once again, we do not hesitate to introduce readers to the fascination of the findings of Leonardo Di Pisa, commonly known as Fibonacci, by publishing this renewed appeal to creativity and imagination.

Eight years have passed since *Fibonacci Applications and Strategies for Traders* was published. The market environment has changed a great deal. What has remained unchanged, however, is the beauty of nature. Think of all the wonders of nature in our world: oceans, trees, flowers, plant life, animals, and microorganisms.

Also think of the achievements of humans in natural sciences, nuclear theory, medicine, computer technology, radio, and television. And finally, think of the trend moves in world markets. It may surprise you to learn that all of these have one underlying pattern in common: the Fibonacci summation series.

The Fibonacci summation series, the baseline of our pattern-oriented market analysis, is presented in this first chapter. After the meaning of this sequence of numbers has become clear, we take a quick look at the types of phenomena and achievements in human

2 • BASIC FIBONACCI PRINCIPLES

behavior that can be analyzed using the Fibonacci summation series. We then point out the conclusions drawn by engineer and trader Ralph Nelson Elliott. We look at the generalizations he made to provide analysts today with a nonstringent framework that can be used for the sake of profitable trading in global markets.

Chapter 1 is designed as a recap of *Fibonacci Applications and Strategies for Traders*. Readers who are familiar with the details of Fibonacci and Elliott in this first chapter may want to proceed to the overview of what is new in this book, on page 22.

THE FIBONACCI SUMMATION SERIES

Fibonacci (1170–1240) lived and worked as a merchant and mathematician in Pisa, Italy. He was one of the most illustrious European scientists of his time. Among his greatest achievements was the introduction of Arabic numerals to supersede the Roman figures.

He developed the Fibonacci summation series, which runs as

$$1 - 1 - 2 - 3 - 5 - 8 - 13 - 21 - 34 - 55 - 89 - 144 - . . .$$

or, in mathematical terms,

$$a_{n+1} = a_{n-1} + a_n \text{ with } a_1 = a_2 = 1$$

The mathematical series tends asymptotically (that is, approaching slower and slower) toward a constant ratio.

However, this ratio is irrational; it has a never-ending, unpredictable sequence of decimal values stringing after it. It can never be expressed exactly. If each number, as part of the series, is divided by its preceding value (e.g., $13 \div 8$ or $21 \div 13$), the operation results in a ratio that oscillates around the irrational figure $1.61803398875 . . .$, being higher than the ratio one time, and lower the next. The precise ratio will never, into eternity (not even with the most powerful computers developed in our age), be known to the last digit. For the sake of brevity, we will refer to the Fibonacci ratio as 1.618 and ask readers to keep the margin of error in mind.

This ratio had begun to gather special names even before another medieval mathematician, Luca Pacioli (1445–1514), named it “the divine proportion.” Among its contemporary names are “golden section” and “golden mean.” Johannes Kepler (1571–1630), a German astronomer,

THE FIBONACCI SUMMATION SERIES • 3

called the Fibonacci ratio one of the jewels in geometry. Algebraically, it is generally designated by the Greek letter PHI (ϕ), with

$$\phi \approx 1.618$$

or, in a different mathematical form

$$\phi = \frac{1}{2}(\sqrt{5} + 1) \approx 1.618$$

And it is not only PHI that is interesting to scientists (and traders, as we shall see). If we divide any number of the Fibonacci summation series by the number that follows it in the series (e.g., $8 \div 13$ or $13 \div 21$), we find that the series asymptotically gets closer to the ratio PHI' with

$$\phi' \approx 0.618$$

being simply the reciprocal value to PHI with

$$\phi' = 1 \div \phi = 1 \div 1.618 \approx 0.618$$

or, in another form,

$$\phi' = \frac{1}{2}(\sqrt{5} - 1) \approx 0.618$$

This is a very unusual and remarkable phenomenon—and a useful one when it comes to designing trading tools, as we will learn in the course of the analysis. Because the original ratio PHI is irrational, the reciprocal value PHI' to the ratio PHI necessarily turns out to be an irrational figure as well, which means that we again have to consider a slight margin of error when calculating 0.618 in an approximated, shortened way.

From here on, we analytically exploit PHI and PHI' and move ahead by slightly reformulating the Fibonacci summation series so that the following PHI series is the result:

$$0.618 - 1.000 - 1.618 - 2.618 - 4.236 - 6.854 - 11.090 - 17.944 - \dots$$

In mathematical terms, it is written as

$$a_{n+1} = a_{n-1} + a_n \text{ with } a_1 = 0.618, a_2 = 1$$

4 • BASIC FIBONACCI PRINCIPLES

In this case, we do not find an asymptotical process with a ratio because, in dividing each number of the PHI series by its preceding value (e.g., $4.236 \div 2.618$ or $6.854 \div 4.236$), the operation results in the approximated ratio $\text{PHI} = 1.618$. Running the division in the opposite direction—that is, dividing each number of the PHI series by the value that follows (e.g., $2.618 \div 4.236$ or $4.236 \div 6.854$)—results in the reciprocal value to the constant PHI, introduced earlier as $\text{PHI}' = 0.618$. Before progressing further through the text, it is important that readers fully understand how the PHI series has been derived from the underlying Fibonacci summation series.

We have discovered a series of plain figures, applied to science by Fibonacci. We must take another quick detour before we can utilize the Fibonacci summation series as the basis for the development of trading tools. We must first consider what relevance the Fibonacci summation series has for nature around us. It will then be only a small step to conclusions that lead us directly to the relevance of the Fibonacci summation series for the movement of international markets, whether in currencies or commodities, stocks or derivatives.

We recognize the dampened swings of the quotients around the value of 1.618 (or 0.618, respectively) in Fibonacci's series by either higher or lower numbers in the Elliott wave principle, which was popularized by Ralph Nelson Elliott as the rule of alternation. And we present the trading tools that we developed for exploration of the magic of PHI to the largest extent possible. Humans subconsciously seek the divine proportion, which is nothing but a constant and timeless striving to create a comfortable standard of living.

THE FIBONACCI RATIO

For us—and, hopefully, for our readers as well—it remains remarkable how many constant values can be calculated using Fibonacci's sequence, and how the individual figures that form the sequence recur in so many variations. However, it cannot be stressed strongly enough that this is not just a numbers game; it is the most important mathematical representation of natural phenomena ever discovered. The following illustrations depict some interesting applications of this mathematical sequence.

We have subdivided our observations into two sections. First, we deal briefly with the Fibonacci ratio and its presence in natural

phenomena and in architecture. Then we briefly describe how mathematics, physics, and astronomy make use of the Fibonacci ratio.

The Fibonacci Ratio in Nature

To appreciate the great relevance of the Fibonacci ratio as a natural constant, one need only look at the beauty of nature that surrounds us. The development of plants in nature is a perfect example of the general relevance of the Fibonacci ratio and the underlying Fibonacci summation series. Fibonacci numbers can be found in the number of axils on the stem of every growing plant, as well as in the number of petals.

We can easily figure out member numbers of the Fibonacci summation series in plant life (so-called *golden numbers*) if we count the petals of certain common flowers—for example, the iris with 3 petals, the primrose with 5 petals, the ragwort with 13 petals, the daisy with 34 petals, and the Michaelmas daisy with 55 (and 89) petals. We must question: Is this pattern accidental or have we identified a particular natural law?

An ideal example is found in the stems and flowers of the sneezewort (Figure 1.1). Every new branch of sneezewort springs from the axil, and more branches grow from a new branch. Adding the old and the new branches together, a Fibonacci number is found in each horizontal plane.

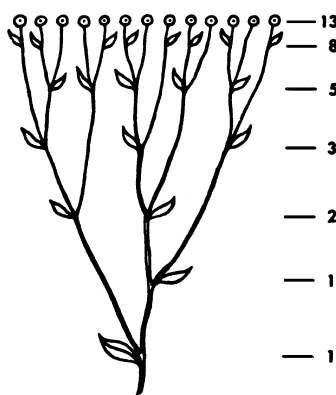


Figure 1.1 Fibonacci numbers found in the flowers of the sneezewort.

6 • BASIC FIBONACCI PRINCIPLES

When analyzing world markets and developing trading strategies, we look for structures or chart patterns that have been profitable in the past (according to historical data) and therefore shall have a probability of continued success in the future. In the Fibonacci ratio PHI, we propose to have found such a structure or general pattern.

The Fibonacci ratio PHI is an irrational figure. We will never know its exact value to the last digit. Because the error margin approximating the Fibonacci ratio PHI gets smaller as the numbers of the Fibonacci summation series become higher, we consider 8 the smallest of all the numbers of the Fibonacci summation series that can be meaningfully applied to market analysis (calculating the sample quotients of $13 \div 8 = 1.625$ and $21 \div 13 = 1.615$, compared with $\text{PHI} = 1.618$).

At different times and on different continents, people have attempted to successfully incorporate the ratio PHI into their work as a law of perfect proportion. Not only were the Egyptian pyramids built according to the Fibonacci ratio PHI (as described in detail in *Fibonacci Applications and Strategies for Traders*), but the same phenomenon can be found in the Mexican pyramids.

It is conceivable that the Egyptian and the Mexican pyramids were built in approximately the same historical era by people of common origins. Figure 1.2a and Figure 1.2b illustrate the importance of the incorporated Fibonacci proportion PHI.

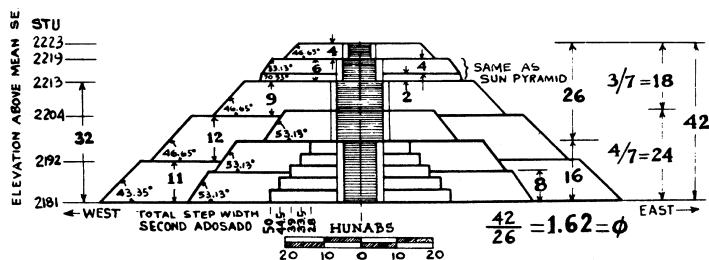


Figure 1.2a Number PHI = 1.618 incorporated in the Mexican pyramid. Source: *Mysteries of the Mexican Pyramid*, by Peter Thomkins (New York: Harper & Row, 1976), pp. 246, 247. Reprinted with permission.

THE FIBONACCI RATIO • 7

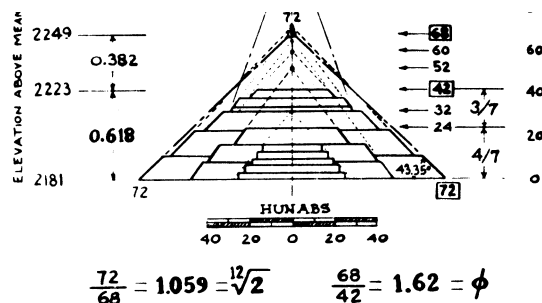


Figure 1.2b Number PHI = 1.618 incorporated in the Mexican pyramid.
 Source: *Mysteries of the Mexican Pyramid*, by Peter Thomkins (New York: Harper & Row, 1976), pp. 246, 247. Reprinted with permission.

A cross-section of the pyramid shows a structure shaped as a staircase. There are 16 steps in the first set, 42 steps in the second, and another 68 steps in the third. These numbers are based on the Fibonacci ratio 1.618 in the following way:

$$16 \times 1.618 = 26$$

$$16 + 26 = 42$$

$$26 \times 1.618 = 42$$

$$26 + 42 = 68$$

$$42 \times 1.618 = 68$$

Here we find (although not at first glance) Fibonacci's ratio PHI in a macrostructure familiar to all of us. Our task is to transfer this approach from nature and the human environment to the sphere of chart and market analysis. In our market environment, we must ask whether and where we can detect PHI as purely and exploitably as in natural plant life and manmade pyramids.

The Fibonacci Ratio in Geometry

The existence of the Fibonacci ratio PHI in geometry is also very well known. However, a workable way for investors to apply this ratio, as a geometric tool, to commodity price moves using PHI-spirals and

8 • BASIC FIBONACCI PRINCIPLES

PHI-ellipses has not yet been published. It takes a programmer's knowledge and the power of computers to apply the PHI-spiral and the PHI-ellipse as analytic tools.

Because computer power is easily accessible today, the obstacle is not the hardware, but rather some missing knowledge and the lack of appropriate software.

The fully operational software package that accompanies this book allows every interested reader/investor to trace the examples shown and to generate similar signals in real-time trading.

PHI-spiral and PHI-ellipse consist of unusual properties that are in accordance with Fibonacci's ratio PHI in two dimensions: price and time. It is very likely that the integration of PHI-spirals and PHI-ellipses will elevate the interpretation and the use of the Fibonacci ratio to a much higher level. Up to now, Fibonacci's PHI has been generally accepted as a tool for the measurement of corrections and extensions of price swings. Forecasts of time have seldom been integrated because they did not seem to be as reliable as the price analysis, but, by including PHI-spirals and PHI-ellipses into a geometric analysis, both parts—price and time analyses—can be combined accurately.

To gain a better understanding of how Fibonacci's PHI is geometrically incorporated into PHI-spirals and PHI-ellipses, we begin by describing the golden section of a line and of a rectangle, and their respective relations to PHI.

A Greek mathematician, Euclid of Megara (450–370 B.C.), was the first scientist to write about the golden section and thereby focused on the analysis of a straight line (Figure 1.3).

The line AB of length L is divided into two segments by point C. Let the length of AC and CB be a and b, respectively. If C is a point

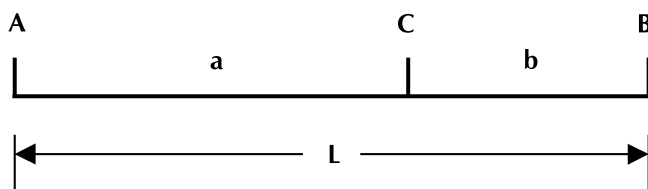


Figure 1.3 Golden section of a line. Source: FAM Research, 2000.

THE FIBONACCI RATIO • 9

such that the quotient $L \div a$ equals $a \div b$, then C is the golden section of AB. The ratio $L \div a$ or $a \div b$ is called the golden ratio.

In other words, point C divides the line AB into two parts in such a way that the ratios of those parts are 1.618 and 0.618; two figures we easily recognize from our analysis of the Fibonacci summation series as Fibonacci's PHI and its reciprocal value PHI'.

Moving from one cradle of science to another—from ancient Europe to ancient Africa, or from ancient Greece to ancient Egypt—we learn that in the Great Pyramid of Gizeh, the rectangular floor of the king's chamber also illustrates the golden section.

The golden section of a rectangle can best be demonstrated by starting with a square, a geometrical formation that served as the foundation for the Pyramid of Gizeh. This square can then be transformed into a golden rectangle as has been done schematically in Figure 1.4.

Side AB of the square ABCD in Figure 1.4 is bisected. With the center E and the radius EC, an arc of a circle is drawn, cutting the extension of AB at F. Line FG is drawn perpendicular to AF, meeting the extension of DC at G. AFGD is the golden rectangle. According to the formal definition, the geometrical representation of the golden section in a rectangle means that a rectangle of this form is 1.618 times longer than it is wide. Again, Fibonacci's ratio PHI appears, this time in the proportions of the golden rectangle.

Keeping in mind the representation of the Fibonacci ratio PHI in one-dimensional (line) and two-dimensional (rectangle) geometry, we can proceed to more complex geometrical objects that bring us closer

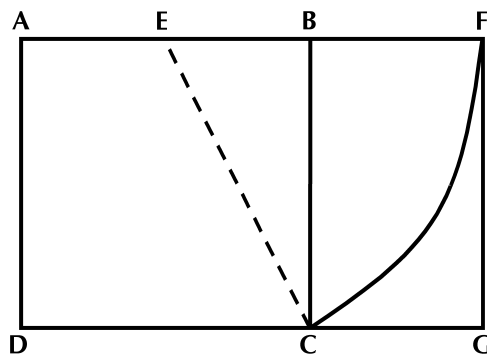


Figure 1.4 Golden section of a rectangle. Source: FAM Research, 2000.

10 • BASIC FIBONACCI PRINCIPLES

to the tools we want to apply to analyze stock and commodity markets with regard to time and price.

The only mathematical curve that follows the pattern of natural growth is the spiral, expressed in natural phenomena such as *Spira mirabilis*, or the nautilus shell. The PHI-spiral has been called the most beautiful of mathematical curves. This type of spiral occurs frequently in the natural world. The Fibonacci summation series and the golden section, introduced above as its geometrical equivalent, are very well associated with this remarkable curve.

Figure 1.5 shows a radiograph of the shell of the chambered nautilus. The successive chambers of the nautilus are built on the framework of a PHI-spiral. As the shell grows, the size of the chambers increases, but their shape remains unaltered.

To demonstrate the geometry of the PHI-spiral, it is best to use a golden rectangle as the basis for geometrical analysis. This is done schematically in Figure 1.6.

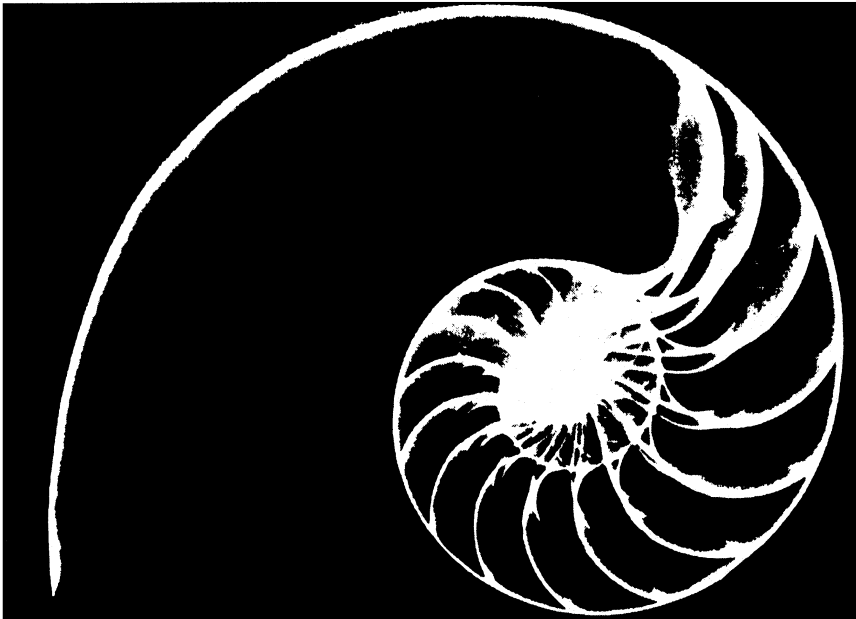


Figure 1.5 The PHI-spiral represented in the nautilus shell. *Source: The Divine Proportion*, by H. E. Huntley (New York: Dover, 1970), p. iv. Reprinted with permission.

THE FIBONACCI RATIO • 11

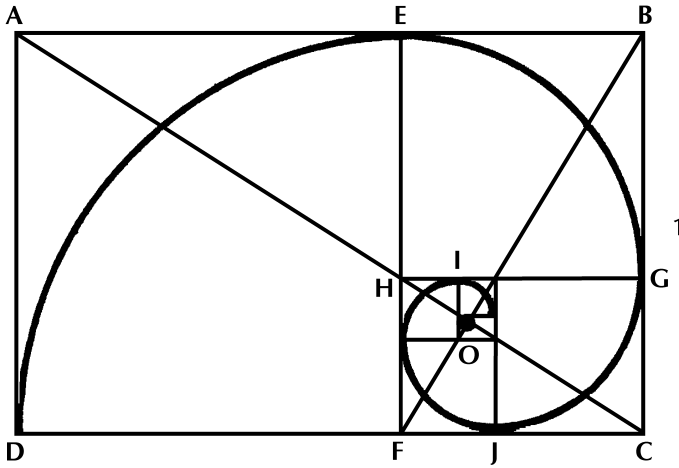


Figure 1.6 Geometry of the PHI-spiral. *Source: FAM Research, 2000.*

The quotient of the length and height of rectangle ABCD in Figure 1.6 can be calculated, as we learned previously, by $AB \div BC = \text{PHI} \div 1 = 1.618$. Through point E, also called the golden cut of AB, line EF is drawn perpendicular to AB, cutting the square AEFD from the rectangle. The remaining rectangle EBCF is a golden rectangle. If the square EBGH is isolated, the then remaining figure, HGCF, is also a golden rectangle. This process can be repeated indefinitely until the limiting rectangle O is so small that it is indistinguishable from a point.

The limiting point O is called the pole of the equal angle spiral, which passes through the golden cuts D, E, G, J, and so on. The sides of the rectangle are nearly, but not completely, tangential to the curve.

The relation of the PHI-spiral to the Fibonacci series is evident from Figure 1.6 because the PHI-spiral passes diagonally through opposite corners of successive squares, such as DE, EG, GJ, and so on. The lengths of the sides of these squares form a Fibonacci series. If the smallest square has a side of length d , the adjacent square must also have a side of length d . The next square has a side of length $2d$ (twice as long as d), the next of $3d$ (three times the length of d), forming the series $1d, 2d, 3d, 5d, 8d, 13d, \dots$ which is exactly

12 • BASIC FIBONACCI PRINCIPLES

the well-known Fibonacci sequence: 1–1–2–3–5–8–13– and so on, indefinitely.

The spiral is without a terminal point. While growing outward (or inward) indefinitely, its shape remains unchanged. Two segments of the spiral are identical in shape, but they differ in size by exactly the factor PHI. All those spirals whose rate of growth is an element of the PHI series 0.618–1.000–1.618–2.618–4.236–6.854–11.090– and so on, shall be referred to as PHI-spirals in the context of this book.

The PHI-spiral is the link between the Fibonacci summation series, the resulting Fibonacci ratio PHI, and the magic of nature that we enjoy all around us.

In addition to the PHI-spiral, other important geometric curves can be found in nature. Those most significant to civilization include the horizon of the ocean, the meteor track, the parabola of a waterfall, the arc the sun travels, the crescent moon, and, finally, the flight of a bird. Many of these natural curves can be geometrically modeled using ellipses.

An ellipse is the mathematical expression of an oval. Each ellipse can be precisely designated by only a few characteristics (Figure 1.7).

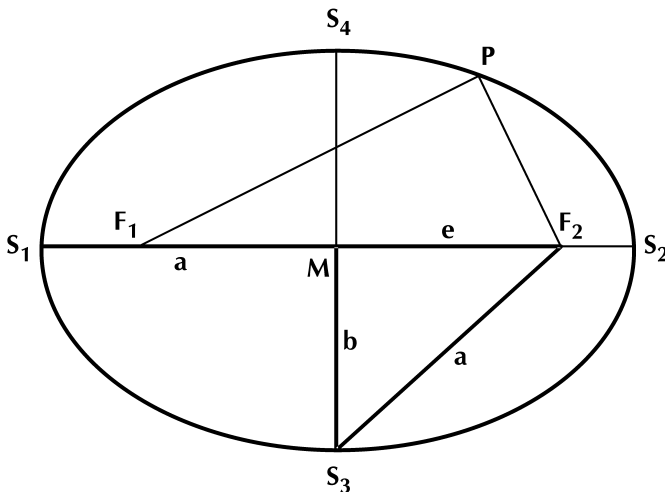


Figure 1.7 Geometry of the PHI-ellipse. Source: FAM Research, 2000.

THE FIBONACCI RATIO • 13

S_1S_2 in Figure 1.7 represents the length of the major axis of the ellipse. S_3S_4 is the length of the minor axis of the ellipse. The ellipse is now determined by the equation

$$F_1P + F_2P = S_1S_2 = 2a$$

Of interest to us, in the context of Fibonacci analysis, is the ratio of the major axis and minor axis of the ellipse, in mathematical terms

$$S_1S_2 \div S_3S_4 = 2a \div 2b = a \div b$$

An ellipse is turned into a PHI-ellipse in all those cases where the ratio of the major axis to the minor axis of the ellipse is a member number of the PHI series 0.618–1.000–1.618–2.618–4.236–6.854– and so on. A circle is a special type of PHI-ellipse, with $a = b$ and a ratio of $a \div b = 1$.

What makes PHI-ellipses preferable to all other possible ellipses (those with ratios of major axes divided by minor axes other than numbers of the PHI series) is the fact that empirical research has shown that people find approximations of PHI-ellipses significantly more visually satisfying.

When participants in a research project were confronted with different shapes of ellipses and were asked for their levels of comfort, a sample empirical study returned the results shown in Table 1.1.

Table 1.1 Preferences for PHI-Ellipses

Ratio Major Axis \div Minor Axis $a \div b$	Percentage of Preference
1.000	1.2
1.205	0.6
1.250	8.3
1.333	14.7
1.493	42.4
1.618	16.7
1.754	13.1
2.000	1.6

Source: The Divine Proportion, by H. E. Huntley (New York: Dover, 1970) p. 65. Reprinted with permission.

14 • BASIC FIBONACCI PRINCIPLES

Three observers out of four favored ellipses shaped with axes whose ratios were either the PHI-ellipse (1.618) or so close an approximation to the PHI-ellipse as to be almost indistinguishable from it.

With this optimistic outlook, we can proceed to the second main part of our theoretical introduction of basic Fibonacci tools.

What conclusions can be drawn from our discussions so far? And what sort of conclusions did Elliott draw to integrate the Fibonacci summation series and Fibonacci's PHI with the forces that move international markets?

THE ELLIOTT WAVE PRINCIPLE

Ralph Nelson Elliott (1871–1948) began his career as an engineer, not a professional market analyst. Having recovered from a serious illness in the 1930s, he turned his interest to the analysis of stock prices, focusing on the Dow Jones Index.

After a number of remarkably successful forecasts, in 1939 Elliott published a series of major articles in *Financial World* magazine. In these articles, he first presented the contention that the Dow Jones Index moved in rhythms.

Elliott's market theory was based on the fact that every phenomenon on our planet moves in the same patterns as the tides: low tide follows high tide, reaction follows action. Time does not affect this scheme because the structure of the market in its entirety remains constant.

In this section, we briefly review and analyze Elliott's concepts. However, it is important that we address his ideas, because they explain the fundamental concepts that we have used in our analysis of the Fibonacci tools. We will not go into great detail here; most of the facts have been discussed extensively in *Fibonacci Applications and Strategies for Traders*.

Our attention will focus on the main sectors of Elliott's work, which have long-lasting value. Even if we do not agree with some of Elliott's findings, he must be admired for his ideas. We know how difficult it was to create new concepts for market analysis without the technical support that is available today. When we began to study Elliott's work, back in 1977, it was a tremendous struggle to get the

THE ELLIOTT WAVE PRINCIPLE • 15

data needed for an in-depth analysis. How much more difficult it must have been for Elliott in those years when he started his work! The computer technology available today gives us the ability to test and analyze quickly, but it is still necessary to have Elliott's ideas handy in order to begin.

Elliott wrote: "Nature's law embraces the most important of all elements, timing. Nature's law is not a system, or a method of playing the market, but it is a phenomenon which appears to mark the progress of all human activities. Its application to forecasting is revolutionary."*

Elliott based his discoveries on nature's law. He noted: "This law behind the market can only be discovered when the market is viewed in its proper light and then is analyzed from this approach. Simply put, the stock market is a creation of man and therefore reflects human idiosyncrasy" (p. 40).

The chance to forecast price moves using Elliott's principles motivated legions of analysts to work day and night. We will focus on the ability to forecast, and try to answer whether it is possible.

Elliott was very specific when he introduced his concept of waves. He said: "All human activities have three distinctive features, pattern, time and ratio, all of which observe the Fibonacci summation series" (p. 48).

Once the waves are interpreted, that knowledge may be applied to any movement because the same rules apply to the prices of stocks, bonds, grains, and other commodities.

The most important of the three factors mentioned is pattern. A pattern is always in progress, forming over and over again. Usually, but not invariably, one can visualize in advance the appropriate type of pattern. Elliott describes this market cycle as ". . . divided primarily into 'bull market' and 'bear market'" (p. 48).

A bull market can be divided into five "major waves," and a bear market, into three major waves. The major waves 1, 3, and 5 of the bull market are subdivided into five "intermediate waves" each. Then

* *The Complete Writings of R. N. Elliott with Practical Application from J. R. Hill*, by J. R. Hill, Commodity Research Institute, NC, 1979 (subsequent references will cite Elliott), p. 84.

16 • BASIC FIBONACCI PRINCIPLES

waves 1, 3, and 5 of each intermediate wave are subdivided into five “minor waves” (Figure 1.8).

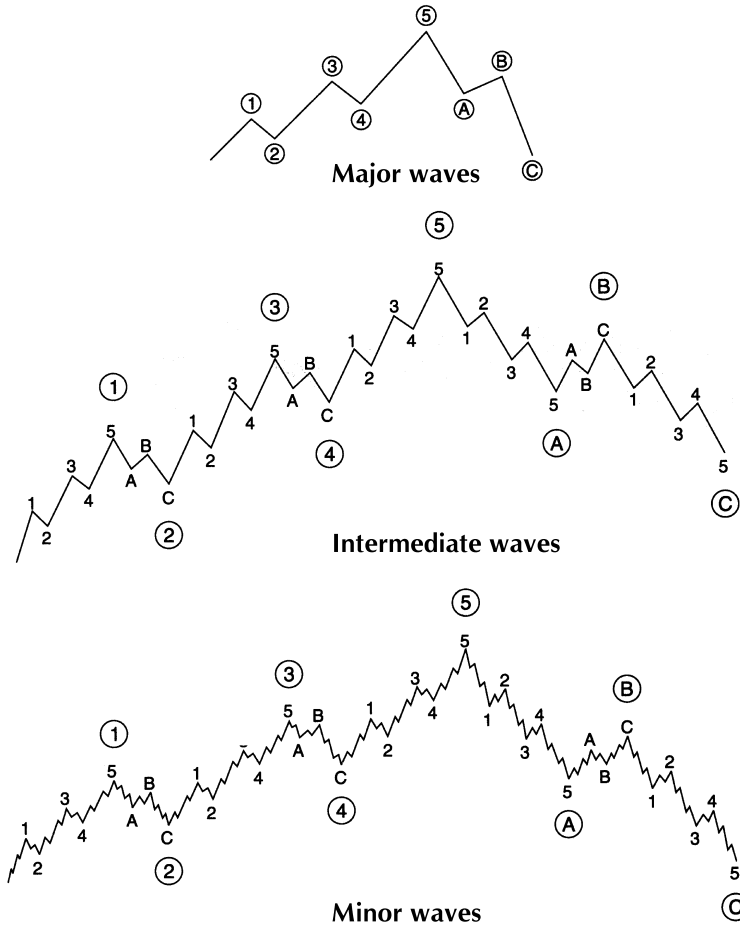


Figure 1.8 Elliott’s “perfect” stock market cycle. Source: *Fibonacci Applications and Strategies for Traders*, by Robert Fischer (New York: Wiley, 1993), p. 13. Reprinted with permission.

The problem with this general market concept is that, most of the time, there are no regular 5-wave swings. The regular 5-wave swing is only the exception to a rule that Elliott tried to fine-tune via a sophisticated variation to the concept.

THE ELLIOTT WAVE PRINCIPLE • 17

Elliott introduced a series of market patterns that apply to almost every situation in market development. If the market rhythm is regular, wave 2 will not retrace to the beginning of wave 1, and wave 4 will not correct lower than the top of wave 1 (Figure 1.9). In cases where it still does, the wave count must be adjusted.

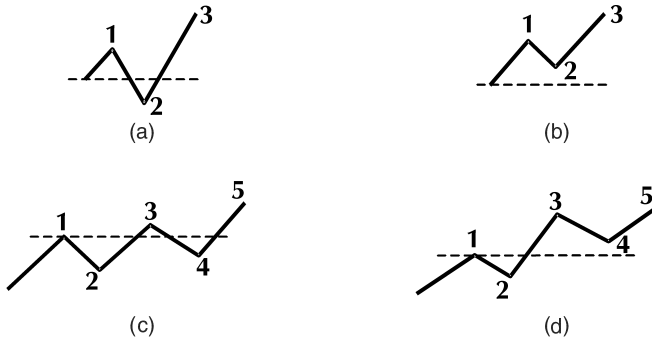


Figure 1.9 Counting is (a) erroneous in a 3-wave upmove; (b) correct in a 3-wave upmove; (c) erroneous in a 5-wave upmove; (d) correct in a 5-wave upmove. *Source: Fibonacci Applications and Strategies for Traders, by Robert Fischer (New York: Wiley, 1993), p. 14. Reprinted with permission.*

Each of the two corrective waves 2 and 4 can be subdivided into three waves of a smaller degree. Corrective waves 2 and 4 alternate in pattern. Elliott called this the *rule of alternation*. If wave 2 is simple, wave 4 will be complex, and vice versa (Figure 1.10). Complex in this respect is another term to describe the fact that wave 2 (or wave 4) consists of subwaves and does not go straight as the simple waves do.

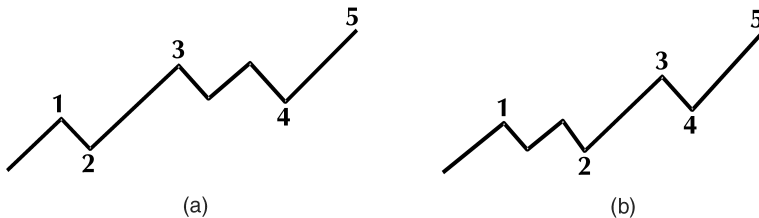


Figure 1.10 Simple waves and complex waves (a) in wave 4; (b) in wave 2. *Source: Fibonacci Applications and Strategies for Traders, by Robert Fischer (New York: Wiley, 1993), p. 14. Reprinted with permission.*

18 • BASIC FIBONACCI PRINCIPLES

Given his remarkable observation that simple and complex waves alternate, and his formulation of this as a rule for market development, Elliott linked nature's law to human behavior and thus to investors' behavior.

In natural phenomena such as sunflowers, pinecones, and pineapples, there are spirals that alternate by first turning clockwise and then counterclockwise. This alternation is seen as an equivalent of the alternation of simple and complex constellations in the corrective waves 2 and 4.

In addition to corrections as integral parts of any market move, Elliott analyzed extensions as reinforcements of trends to either side of the market, be they uptrends or downtrends. "Extensions may appear in any one of the three impulse waves, wave 1, 3, or 5, but never in more than one" (p. 55).

Combinations of impulse waves and extensions in the first, third, and fifth wave of a market uptrend are demonstrated in Figure 1.11. The three wave extensions shown can be reversed for impulse waves and extensions in downtrends.

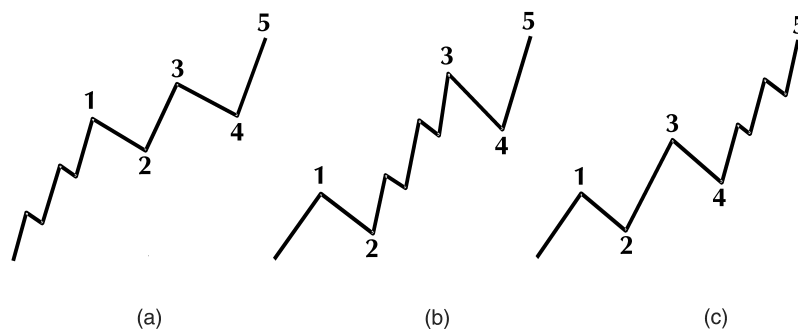


Figure 1.11 (a) First wave extension in an uptrend; (b) third wave extension in an uptrend; (c) fifth wave extension in an uptrend. *Source: Fibonacci Applications and Strategies for Traders*, by Robert Fischer (New York: Wiley, 1993), p. 17. Reprinted with permission.

At this point, we refrain from giving readers advice on all possible options given in Elliott's publications so that we can model the basic structure of market moves based on impulse waves, corrections, and extensions.

The purpose of this quick review is to show the essence of Elliott's ideas and follow them as they became more intricate. In their

THE ELLIOTT WAVE PRINCIPLE • 19

most complex stages, it is almost impossible, even for very experienced Elliott followers, to apply all of Elliott's wave pattern rules to real-time trading.

Elliott himself admitted: "Corrections in bull and bear swings are more difficult to learn" (p. 48). The problem is that the complex nature of the wave structure does not leave room for forecasts of future price moves in advance. The schemes and structures look perfect in retrospect. The multitude of rules and situations described by Elliott can be used to fit any price pattern after the fact. But that is not good enough for real-time trading.

To conclude our remarks on Elliott, we give a summary of those segments of Elliott's findings that can be exploited in order to devise trading concepts and trading tools that are easy to apply, and that relate to what we have stated about Fibonacci's PHI as the constant for natural growth.

Elliott's principles of markets steadily moving in a wave rhythm are brilliantly conceived. The principles work perfectly in regular markets and give stunning results when looking back at the charts.

The most significant problem is that market swings are irregular. This makes it difficult to give definitive answers to questions such as:

- Is the point at which we start our wave count part of an impulse wave or part of a corrective wave?
- Will there be a fifth wave?
- Is the correction flat or is it zigzag?
- Will there be an extension in wave 1, 3, or 5?

Elliott specifically wrote, regarding this point: "The Principle has been carefully tested and used successfully by subscribers in forecasting market movements" (p. 107). And: "Hereafter letters will be issued on completion of a wave and not await the entire cycle. In this matter, students may learn how to do their own forecasting and at no expense. The phenomenon and its practical application become increasingly interesting because the market continually unfolds new examples to which may be applied unchanging rules" (p. 137).

Our own work with Elliott's concepts, done from many different angles over 20 years, does not support the contention that the wave structure has forecasting ability. The wave structure is too complex,

20 • BASIC FIBONACCI PRINCIPLES

especially in the corrective waves. The rule of alternation is extremely helpful, but this abstract scheme does not tell us, for example, whether to expect:

- A correction of three waves,
- A double sideways correction, or
- A triple sideways movement.

It is even more unlikely that any 5-wave pattern can be forecast. The integration of extensions in wave 1, wave 3, or wave 5 complicates the problem further. The beauty of working with the Elliott concept is not the wave count. We can only agree when J. R. Hill reveals in his practical application: “The concept presented is extremely useful but has literally driven men ‘up the wall’ as they try to fit chart patterns to exactness in conformity with the Elliott wave” (p. 33).

Elliott focuses on pattern recognition. His whole work is streamlined to forecast future price moves based on existing patterns, but he does not appear to have succeeded in this area.

Elliott expressed uncertainty about the wave count himself, when he wrote in different newsletters: “The five weeks’ sideways movement was devoid of pattern, a feature never before noted” (p. 167).

Elsewhere he wrote: “The pattern of the movement across the bottom is so exceedingly rare that no mention thereof appears in the Treatises. The details baffle any count” (p. 165).

Yet again: “The time element [meaning the Fibonacci summation series] as an independent device, however, continues to be baffling when attempts are made to apply any known rule of sequence to trend duration” (p. 180).

And last: “The time element is based on the Fibonacci summation series but has its limitations and can be used only as an adjunct of the wave principle” (p. 186).

Elliott did not realize that it is not the wave count that is important, but Fibonacci’s PHI. The Fibonacci ratio represents nature’s law and human behavior. It is no more and no less than Fibonacci’s PHI that we try to measure in the observation of market swings. While the Fibonacci summation series and the Fibonacci ratio PHI are constant, the wave count is confusing.

Elliott tried to forecast a price move from point B to point C based on market patterns (Figure 1.12). We consider this impossible,

THE ELLIOTT WAVE PRINCIPLE • 21

and Elliott himself has never given a rule that showed he was able to do it mechanically.

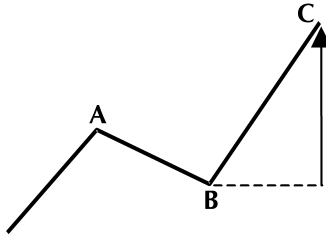


Figure 1.12 Forecasting a price move from point B to point C is not possible. *Source: Fibonacci Applications and Strategies for Traders*, by Robert Fischer (New York: Wiley, 1993), p. 23. Reprinted with permission.

By studying Elliott's publications more carefully, a rule with forecasting value can still be identified. "A cyclical pattern or measurement of mass psychology is five waves upward and three waves downward, a total of eight waves. These patterns have forecasting value: when five waves upward have been completed, three waves down will follow, and vice versa" (p. 112). We could not agree more with this statement. Figure 1.13 visualizes Elliott's latter findings.

Most likely, Elliott did not realize that his strategy had taken a complete shift. Elliott's latest statement takes an opposite strategy, compared to the approach shown in Figure 1.12. Instead of trying to

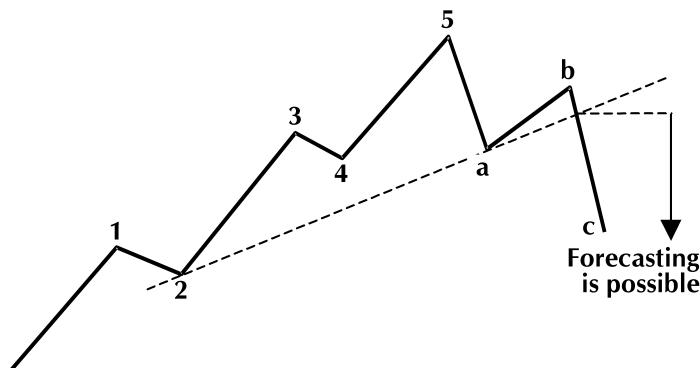


Figure 1.13 Forecasting a price move after the end of a 5-wave cycle is possible. *Source: Fibonacci Applications and Strategies for Traders*, by Robert Fischer (New York: Wiley, 1993), p. 23. Reprinted with permission.

22 • BASIC FIBONACCI PRINCIPLES

forecast a price move from point B to point C, he waits, according to Figure 1.13, until the very end of the 5-wave move, because three waves in the opposite direction are to be expected.

We totally accept Elliott's approach here and will reinforce the idea with additional rules in later sections. Numbers 5 and 3 are valid in the Fibonacci summation series and therefore cannot mislead us in our analysis.

We will also introduce other investment strategies closely related to the Fibonacci ratio. We will cover corrections and extensions as Elliott did, but will do so differently, always with our focus on Fibonacci's ratio PHI and its representation in the instruments we analyze.

Elliott never worked with a geometric approach. We, however, have developed computerized PHI-spirals and PHI-ellipses ready for application to analysis. We strongly believe that this is the solution to the problem of combining price and time in an integral analysis approach. This goes far beyond what we initiated with our first book some eight years ago.

Using our Fibonacci trading tools, as well as our WINPHI computer program, our analyses in the forthcoming chapters will concentrate mainly on daily price bar charts.

All tools presented have been tested thoroughly and are ready to be used on the commodity and stock markets. Research shows that intraday data can also be used, but under different parameters. More historical tests are needed on a tick or intraday bar basis before definite rules can be set for real-time application of Fibonacci-related geometrical tools.

SUMMARY: GEOMETRICAL FIBONACCI TOOLS

Investigation into the Fibonacci summation series and Elliott's analysis of markets moving in regular waves has led us to six general tools that can be applied, almost without limit, to market data series, whether cash currencies, futures, index products, stocks, or mutual funds are involved.

The six tools are: (1) The Fibonacci summation series itself, (2) Fibonacci time goals, (3) corrections and extensions in relation to the Fibonacci ratio, (4) PHI-channels, (5) PHI-spirals, and (6) PHI-ellipses.

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 23

All six of these trading tools are described in this section, to give readers an overview of the functioning and the functionality of the geometrical instruments in any detailed analysis and application of the tools to market data.

The Fibonacci Summation Series

It might seem astonishing at first, but the Fibonacci summation series can easily be turned into a tool for market analysis that works in a stable and reliable manner.

We recapitulate the Fibonacci summation series as:

$$1 - 1 - 2 - 3 - 5 - 8 - 13 - 21 - 34 - 55 - 89 - 144 - \dots$$

The quotients of each number in the Fibonacci series, divided by the preceding number, asymptotically gets closer to the value $\text{PHI} = 1.618$ (which we call the Fibonacci ratio).

If we combine the findings of Fibonacci with those of Elliott, we can count out Elliott's theoretical waves—five plus three plus five plus three plus five, for a total of 21 major waves, a number of the Fibonacci summation series.

If each 5-wave move in an uptrend is broken down into five plus three plus five plus three plus five smaller or intermediate waves (a total of 21 waves), and if each of the resulting waves is broken down into five plus three plus five (or a total of 13) small waves, we end up with a total of 89 waves, a number that we again recognize as part of the Fibonacci summation series.

If we go through the same process for the three corrective waves, we come up with a total of 55 waves for the corrective 3-wave move and a grand total of 144 waves for the completion of one of Elliott's market cycles.

The general application of this principle shows that a move in a particular direction continues up to a point where a time frame—part of, and consistent with, the figures of the Fibonacci summation series—is completed.

A move that extends itself beyond three days should not reverse until five days are reached. A move that exceeds five days should last a minimum of eight days. A trend of nine days should not finish before 13 days have passed, and so on.

24 • BASIC FIBONACCI PRINCIPLES

Our findings regarding the relation between Fibonacci's summation series and Elliott's wave principle can be summarized as shown in Figure 1.14.

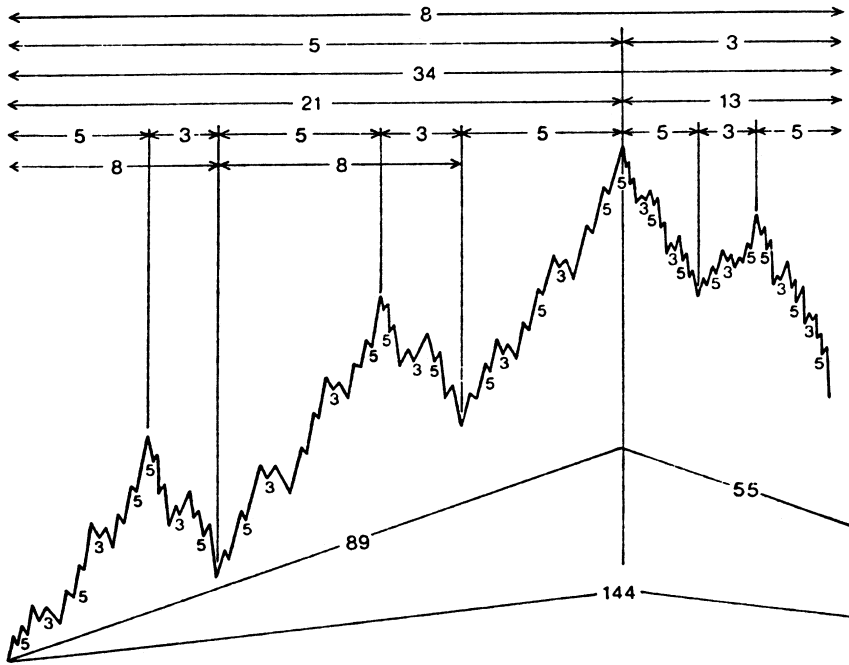


Figure 1.14 The Fibonacci summation series schematically integrated into the complete market cycle according to the Elliott wave count. *Source: Fibonacci Applications and Strategies for Traders*, by Robert Fischer (New York: Wiley, 1993), p. 20. Reprinted with permission.

This basic structure of calculating trend changes may be applied just as successfully on hourly, daily, weekly, or monthly data. But this is only an ideal type of pattern, and traders must never expect commodities, futures, stock index futures, or stocks to behave in such precise and predictable manners.

Deviations can and will occur both in time and amplitude, because individual waves and price patterns are not always likely to develop in a regular way. We also have to keep in mind that the simple application of the Fibonacci summation series is designed to forecast

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 25

the length of trend moves, but the number of bars in sideways markets remains unpredictable.

However, as we will see later on, the figures 8, 13, 21, 34, and 55 can be of very practical value when applied to work in combination with other Fibonacci tools. One simple example: While looking for the length of a standard PHI-ellipse in a product we want to trade, the easiest way to identify a major trend change is to first check for moves of the length of the Fibonacci figures 8, 13, 21, 34, or 55. This does not mean that trend changes will always occur at the precalculated points after 8, 13, 21, 34, or 55 bars, but it happens too often to be ignored.

Elliott and his followers tried to calculate major trend changes in the stock market by applying the figures from the Fibonacci summation series to weekly, monthly, and yearly data. This made sense even though the underlying time frames became very long, and turning points in historical perspective on a weekly, monthly, or yearly basis often did not materialize at all. On intraday data, we consider the figures of very little value because (1) the markets are extended sideways, and (2) the much more erratic market moves during the day, compared to those from day to day, make the use of Fibonacci figures intraday almost impossible for serious analysis. In our analysis, therefore, we concentrate on daily data and the figures 8, 13, 21, 34, and 55.

Fibonacci Time-Goal Days

The use of time-goal days as the second of our geometrical Fibonacci tools is derived from the same rationale as the Fibonacci summation series.

Time-goal days are those days in the future when a price event will occur. If we were able to anticipate a day in the future when prices would reach a prescribed target or reverse direction, it would be a step forward in market analysis. If we could find a way to forecast the market, we would be able to enter trades or exit positions at the time of the price change rather than after the fact. In addition, a concept of time-goal days would be dynamic, allowing adjustments to longer or shorter swings of the market.

Our time analysis is based on the findings of Euclid of Megara and his invention of the golden section. This was previously discussed in the representation of the Fibonacci ratio in geometry and the golden section of a line.

26 • BASIC FIBONACCI PRINCIPLES

We link nature's law, expressed in mathematical terms through the Fibonacci ratio PHI, to market swings, as is illustrated in Figure 1.15.

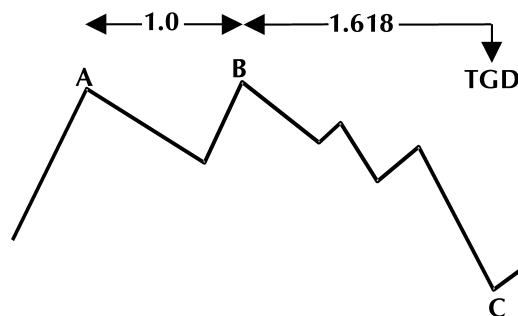


Figure 1.15 Calculation of time-goal days. Source: FAM Research, 2000.

When we know the distance from peak A to peak B in days (or whatever the time unit is), we can multiply this distance by the Fibonacci ratio PHI = 1.618 to forecast the point C that will occur on that day:

$$C = B + 1.618 \times (B - A)$$

C is called a Fibonacci time-goal day. This is the day on which the market is expected to change direction. The forecast of Fibonacci time-goal days will not indicate whether the price will be high or low on particular days. The price can be either. In Figure 1.15, we have a high-high-low formation with a low at point C, but the formation could also be a high-high-high formation indicating a reversal to the downside on the precalculated time-goal day. The time-goal day only forecasts a trend change (a simple event) at the time the goal is reached; it does not indicate the direction of the event. By applying the Fibonacci ratio, the timing of objectives can be measured on intraday, daily, weekly, or monthly charts.

The Fibonacci summation series, Fibonacci's PHI, and the notion of time-goal days as the essence of both, are tools that we use to get closer to resolving the problem of forecasting markets. It cannot be stressed enough, however, that it is difficult to wait for a time goal or to wait for a precalculated period of time (according to the Fibonacci

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 27

summation series) before finally being entitled to show trading action. Identifying a Fibonacci goal and patiently sticking to it, even when the odds are unfavorable (that is, if the market starts moving before the Fibonacci goal has been reached and one is not yet participating in the trend), are two sides of the same (golden) trading model.

Corrections and Extensions

Corrections and extensions are the third category of our geometrical Fibonacci trading tools. The most common approach to working with corrections is to relate the size of a correction to a percentage of a prior impulsive market move (Figure 1.16).

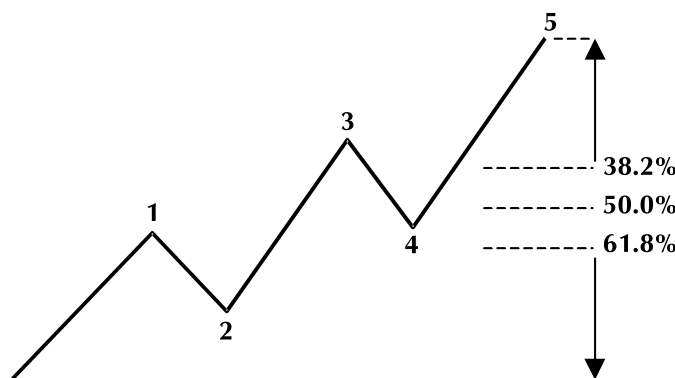


Figure 1.16 Corrections of 38.2%, 50.0%, and 61.8% after a 5-wave move. *Source: Fibonacci Applications and Strategies for Traders, by Robert Fischer (New York: Wiley, 1993), p. 52. Reprinted with permission.*

In our analysis, we are interested in the three most prominent percentage values of possible market corrections that can be directly derived from the quotients of the PHI series and the Fibonacci sequence:

- 38.2% is the result of $0.618 \div 1.618$;
- 50.0% is the transformed ratio 1.000; and
- 61.8% is the result of the immediate ratio $1.000 \div 1.618$.

28 • BASIC FIBONACCI PRINCIPLES

Forecasting the exact size of a correction is an empirical problem; investing after a correction of just 38.2% might be too early, whereas waiting for a correction of 61.8% might result in missing strong trends completely. However, no matter what sizes of corrections are taken into consideration, the PHI-related sizes are the ones to focus on in the first place.

Extensions, in contrast to corrections, are exuberant price movements. They express themselves in runaway markets, opening gaps, limit up and limit down moves, and high volatility. These situations may offer extraordinary trading potential as long as the analysis is carried out in accordance with sensible and definite rules.

Considering extensions as graphical tools for market analysis, we again make use of the Fibonacci ratio as we derived it from the Fibonacci summation series (Figure 1.17).

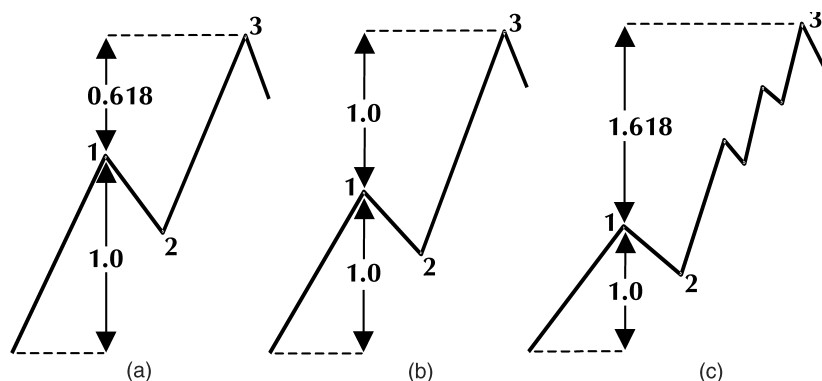


Figure 1.17 Extensions in the third wave of a trend, and the Fibonacci ratio PHI. (a) Ratio 0.618; (b) ratio 1.000; (c) ratio 1.618. *Source: Fibonacci Applications and Strategies for Traders, by Robert Fischer (New York: Wiley, 1993), p. 52. Reprinted with permission.*

The three ratios we work with in most of our analyses of extension sizes are 0.618, 1.000, and 1.618. But other elements of the PHI series, such as 2.618, 4.236, or 6.854, referred to in earlier sections, are also valid estimates for the strength of a market move once the size of the initial wave has been set to 1.000.

Strong trends can overshoot the initial wave by more than just PHI or 1.618 times the size of the initiating impulse wave. It can be

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 29

tested empirically on various sets of data (using the ratio that best serves the need of the analyst) to get the most profit out of market rallies.

Remember: If 1.618 does not seem good enough, wait until the move has extended to 2.618, and do not stop somewhere in the middle.

There is no rationale behind the Fibonacci ratio, but by applying this ratio as a scheme for analysis, we get a hold on strong major market moves that are triggered by news of political or economic events, crop or storage reports, or any situation in which emotions take control of actions. Fear or greed, fast markets or stop-loss orders make the markets move. We measure the extent of these moves in Fibonacci's ratio PHI, the Fibonacci summation series, and the member numbers of the respective PHI series.

PHI-Channels

PHI-channels, so-called Fibonacci trend channels, constitute the fourth element in our set of geometrical tools. They are generated by drawing parallel lines through tops and bottoms of price moves.

The general idea behind PHI-channels as Fibonacci-related trading tools becomes clear when we look at the abstract schematic presentation in Figure 1.18.

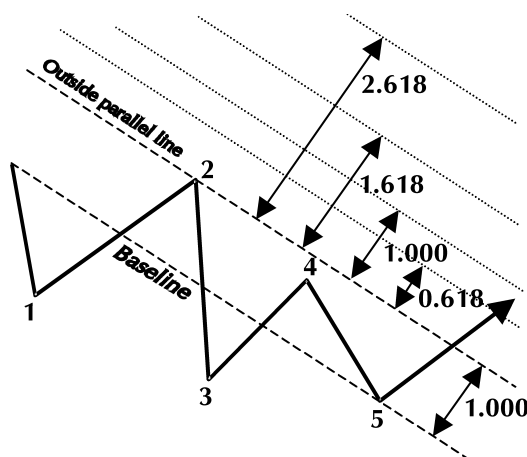


Figure 1.18 PHI-channel. Source: FAM Research, 2000.

30 • BASIC FIBONACCI PRINCIPLES

The width of the PHI-channel is calculated as the distance between the baseline and the parallel outside line. This distance is set to 1.000. Parallel lines are then drawn in PHI series distance starting at 0.618 times the size of the channel, continuing at 1.000 times, 1.618 times, 2.618 times, 4.236 times the distance, and so on. We follow the wave pattern move through the PHI-channel. As soon as wave 5 has been completed, we expect a correction opposite to the trend direction to occur.

In contrast to our findings regarding corrections aiming at the prediction of price targets, PHI-channels provide us with an extra opportunity to make assumptions about the duration of the expected correction timewise. The correction will last until either one of the lines running parallel to the trend channel is touched. Which line we should wait for is another empirical question, but regardless of which line we consider reliable (0.618, 1.000, 1.618, 2.618, or beyond), we must make sure that we wait to the very end and do not act before the Fibonacci target line has been reached.

At the point our target parallel is realized, we might not have arrived at our Fibonacci goal pricewise on the basis of our calculation of corrections. This example shows how important it is to work with multiple Fibonacci targets and to try to identify points where different Fibonacci tools result in the same forecast pricewise and/or timewise.

In our example, an optimal Fibonacci target would be triggered when a correction out of a Fibonacci trend channel hit a parallel at 0.618, 1.000, 1.618, or 2.618 times the size of the channel, and pricewise at a level where a correction of 38.2%, 50.0%, or 61.8% is just or nearly completed.

In discussions of similar examples in later sections, we prove how this kind of multiple Fibonacci analysis is possible.

PHI-Spirals

PHI-spirals, fifth on our list of Fibonacci tools, provide the optimal link between price and time analysis.

In an earlier section on the representation of Fibonacci's PHI in geometry, we introduced the PHI-spirals as perfect geometric approximations of nature's law and phenomena of natural growth in the world around us.

In simple geometrical terms, the size of a PHI-spiral is determined by the distance between the center (X) of the spiral and the starting point (A). The starting point is usually given by wave 1 or

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 31

wave 2: either a peak in uptrends or a valley in downtrends. The corresponding center of the spiral is usually set to the beginning of the respective wave. The PHI-spiral then turns either clockwise or counterclockwise around the initial line that goes from the center to the starting point.

As the PHI-spiral grows, it extends by a constant ratio with every full cycle. Returning to what we explained earlier in this chapter, all the spirals that have rates of growth corresponding to an element of the PHI series—0.618, 1.000, 1.618, 2.618, and so on—shall, in the context of this book, be referred to as PHI-spirals (Figure 1.19).

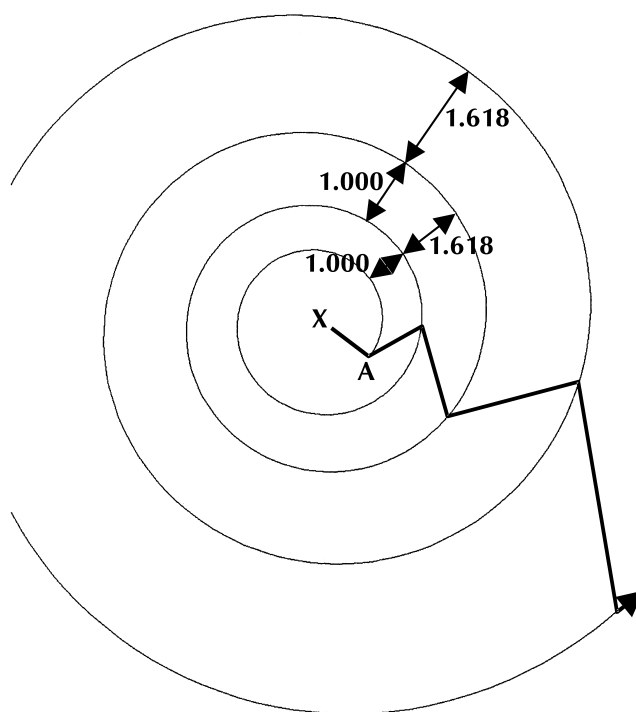


Figure 1.19 PHI-spiral. Source: FAM Research, 2000.

A growth rate of 1.618 is the one we will work with most, but all other ratios that can be generated using the PHI series are valid as well and can be tested individually with the WINPHI software package.

32 • BASIC FIBONACCI PRINCIPLES

We can now conclude that each point on a PHI-spiral manifests an optimal combination of price and time. Corrections and trend changes occur at all those prominent points where the PHI-spiral is touched on its growth path through price and time.

With PHI-spirals as Fibonacci tools, we can make the best out of the stunning symmetry in the price patterns of charts, whether on a daily, weekly, monthly, or yearly basis, and whether they represent stocks, cash currencies, commodities, or derivatives. The stronger the behavioral patterns become in extreme market conditions, the better PHI-spirals work to inform investors in advance about tops and bottoms of market moves.

PHI-Ellipses

The sixth tool brings us back to the PHI-ellipse. In its geometry, it is like the PHI-spiral. This tool has been discussed in one of the earlier sections.

An ellipse is the mathematical expression of an oval. What we mainly are interested in when dealing with a Fibonacci tool is the ratio $e_x = a \div b$ of major axis a and minor axis b of the ellipse (Figure 1.20).

An ellipse is turned into a PHI-ellipse in all those cases where the ratio of the major axis, divided by the minor axis of the ellipse, is

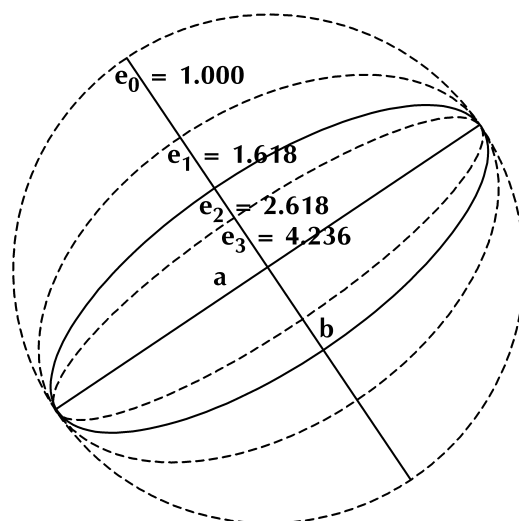


Figure 1.20 PHI-ellipses; $e_x = a \div b$. Source: *FAM Research, 2000*.

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 33

a member number of the PHI series—0.618–1.000–1.618–2.618, and so on. A circle, in this respect, is a special type of PHI-ellipse with $a = b$ (ratio $a \div b = 1$).

What makes PHI-ellipses preferable to all other possible ellipses with ratios of major axis divided by minor axis other than numbers of the PHI series is that empirical research has shown that the majority of people find approximations of PHI-ellipses significantly more visually satisfying. But when it comes to using PHI-ellipses as tools for market analysis, satisfaction is not what we first consider. We are primarily looking for ellipses that fit well to market moves and can be utilized for forecasting purposes.

From Figure 1.20, we can conclude that PHI-ellipses with increasing ratios $e_x = a \div b$ of major axis to minor axis turn very quickly into “Havana cigars”—and, in this process, lose part of their beauty. PHI-ellipses at ratios of 6.854 and above become so narrow that they can hardly be applied to charts as analytical tools. In Figure 1.21, however, we present a convincing solution that helps us with the dilemma and gives us a chance to maintain the beauty of PHI-ellipses up to ratios of at least 17.944.

To make PHI-ellipses work as tools for chart analysis, we have applied a transformation to the underlying mathematical formula that

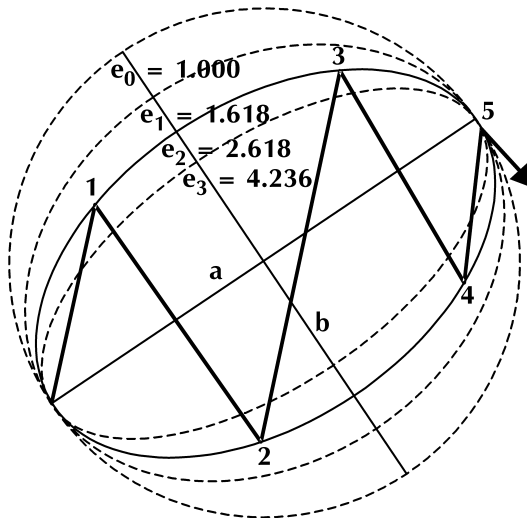


Figure 1.21 Fischer transformed PHI-ellipses; $e_x = (a \div b)^*$. Source: *FAM Research*, 2000.

34 • BASIC FIBONACCI PRINCIPLES

describes the shape of the ellipse. We still consider the ratio of major axis a to minor axis b of the ellipse, but in a different way—in mathematical terms $e_x = (a \div b)^*$.

It took us quite a while to come up with a solution to the problem of transforming PHI-ellipses for productive chart analysis and, at the same time, maintaining them as PHI-ellipses; that is, still incorporating the member numbers of the PHI series into our analysis of the ratio of the major axes and minor axes of the ellipse.

We protect our property in this case and hold the exact formula for transforming $a \div b$ into $(a \div b)^*$ proprietary, but readers will still benefit from our findings, because transformed PHI-ellipses are part of the WINPHI software on the CD-ROM and can easily be applied to charts, according to readers' preferences.

However, when we refer to the application of PHI-ellipses, keep in mind that we are referring to Fischer-transformed PHI-ellipses of the type demonstrated in Figure 1.21.

As long as we prefer a PHI-ellipse [meaning an ellipse with a ratio of major axis to minor axis $(a \div b)^*$, which is an element of the PHI series], we are free to test various ratios and ellipses on market data. The only thing we must make sure of is that once we have found an ellipse that fits well to a move (like the one at a ratio of $(a \div b)^* = 2.618$ in Figure 1.21), we do not alter it in the course of our analysis.

We will see in the upcoming chapters how this promising tool can be applied to charts and can be used to forecast market moves and targets in market developments.

Final Introductory Remarks on the WINPHI Software Package

The WINPHI software package that comes with this book allows interested investors to generate all the signals on historical data with the different Fibonacci tools (shown in examples).

All sample signals were tested, via our best efforts, by the time this book was completed early in 2001. Tests were done by hand and, of course, with the assistance of the WINPHI computer program.

Generating signals by hand can introduce the possibility of error. More important to mention, we did not test the products for demonstration purposes longer than 11 months backward on daily charts and three years backward on weekly charts. It would be too much for us to test each strategy presented in our entire historical database, which goes between 12 and 20 years backward, depending

SUMMARY: GEOMETRICAL FIBONACCI TOOLS • 35

on the product. However, interested investors have the ability to do this on sample datasets for all major products and markets included with the CD-ROM, or on their own datasets.

We do not claim that, for each example shown, we have published the very best parameters, entry rules, stop-loss rules, or profit targets. There will certainly be other combinations that are somewhat superior to what we offer, but we want to distribute inspiration rather than optimization. We therefore provide a challenge for every investor who is especially interested in one of the tools or in a special strategy.

Test runs become more valid and reliable, the longer the time span selected to test a tool or a strategy. This holds true for all the examples and strategies we have described. Parameters, like swing sizes, never work equally well in sideways market conditions and in trending markets. This factor becomes especially important when we work with extensions or corrections where percentages are calculated relative to a minimum swing size. It is possible that the relevant parameters we use change over time with longer historical test runs.

In addition, the WINPHI software is basically restricted to plotting daily data on charts in ASCII D-O-H-L-C field order. We do not offer any conversion utility; the program does not change compression rates from daily to weekly, monthly, or yearly. However, weekly, monthly, yearly, and even intraday minute or hourly bar charts can be generated, if the data to plot are already in the respective ASCII D-O-H-L-C format. Monthly ASCII data files are plotted as monthly data, weekly data files as weekly data, and so on. And if data come as intraday minute or hourly ASCII D-O-H-L-C data, the correct data compression will also be plotted on the charts. Nevertheless, our default assumption remains that daily ASCII-coded D-O-H-L-C data files are intended to be analyzed by users.

All six Fibonacci tools are based on pattern recognition. These patterns can look very different if the price scale is varied. Generally speaking, online data vendors provide software packages that, by default, always scale full screen when information is updated. Depending on new highs or new lows, price scales are adjusted accordingly.

However, a constant scale is an absolutely necessary condition for any sort of convincing pattern recognition that is intended to run over longer periods of time (sometimes 20 years or more). One year of data, scaled full screen, is usually not good enough to cover an entire market cycle of trending and sideways periods. As soon as sophisticated tools, such as the PHI-ellipse, are employed to analyze market

36 • BASIC FIBONACCI PRINCIPLES

moves in price and in time, it is vital to have the angle of the PHI-ellipse remain free of influence from small variations in scaling.

Knowing that many data vendors do not have a feature for constant scaling included with their charting devices, we designed our software so that users can opt for either full-screen scaling of the most recent data loaded or constant scaling from highest high to lowest low of the entire data series for investors who do not feel comfortable with the need to convert data from their data series.

FINAL REMARKS

Elliott and his followers did not find a solution to the problem of whether to chart data on a linear scale or on a semi-log scale. Semi-log scales might be interesting to look at, especially when weekly or monthly charts analyze price and time, or when working with corrections or extensions. We consider the discussion on linear or semi-log scaling important to professional traders. Throughout the book, all sample applications of our tools have been conducted using linear scaling. Wherever we find it necessary—for example, when describing extensions and corrections on weekly data—we discuss the subject briefly. However, we do not consider the matter worth the effort of integrating an extra feature for semi-log scaling with our WINPHI software package.

So much for technical questions, parameters, scaling, and measurement. May the following chapters be inspiring and challenging. Readers should take our findings not as final solutions to the problem of making Fibonacci's PHI tradable, but as a promising starting point to verify, modify, improve, and apply our Fibonacci tools.

Trading according to Fibonacci principles is a journey. Come join us for an exciting trip.