Channels & Cycles:

A Tribute to J.M. Hurst

by
Brian J. Millard

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Channels & Cycles

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llard is one of England's
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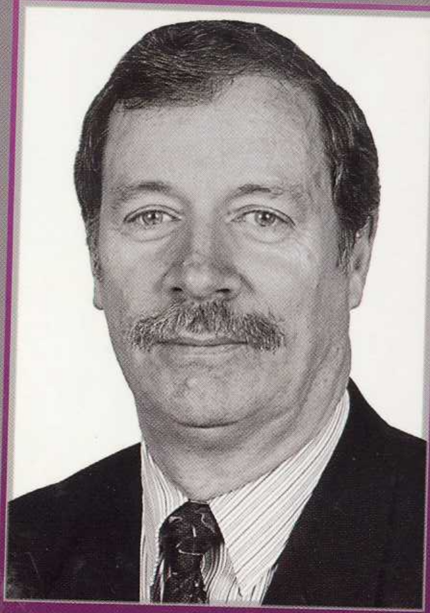

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by

Brian J. Millard

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Publishers Comments

For many years I have heard how valuable the work of J M Hurst has proven to those interested in the use of cycles in the pursuit of market profits. Many **Traders Press** customers have advised me how valuable any material would prove to them that would shed any additional light on the work of Hurst. It is with great pride that we present the work of Brian Millard, ***Channels and Cycles,*** which clarifies the original work of Hurst as well as updating it and bringing it forward to the present time. Millard, like other market technicians such as Jim Tillman and Peter Eliades, found the work of Hurst of such seminal importance in influencing his approach to market analysis that it became the cornerstone of his methodology.

It is hoped that this work will prove valuable to the members of the investment community who are interested in the application of cycles and the work of Hurst.

It should also be noted that **Traders Press** has recently reprinted the full-fledged training course on cycles authored by J M Hurst. This extensive course, which consists of 10 lessons encompassing nearly 1,600 pages (including hundreds of 11 x 17 foldout charts) and 11 audio tapes, is the most comprehensive and practical material available anywhere for those interested in understanding how to use cycles to their benefit in investing and trading. It shows how to actually apply Hurst's methods to actual trading situations, including actual buying and selling rules and applications. A fuller description of this course is included in the back of this book. This course is available exclusively through **Traders Press.**

Edward D Dobson, President
Traders Press, Inc.

Greenville, SC
January 7, 1999

FOREWORD BY PETER ELIADES

Before my stock market life, I had a life as a law school graduate and a professional musician-singer. The latter profession led to a vast mental storehouse of song lyrics. From the preface to his book Brian Millard echoes the sentiment I have expressed often in the past. Jimmy Web wrote a lyric that said, *Sometimes a single moment changes all the ones that follow.* How true. For me it was the discovery of J. M. Hurst's book, *The Profit Magic of Stock Transaction Timing.* When I read in Brian Millard's preface that he felt the same way, that Hurst's book was responsible for changing his life, I was drawn immediately to the promise of what Millard might be able to add to the Hurst legacy. It turns out he has offered much.

From his explanation of the importance of the concept that trends of different periodicity's are additive through his detailed explanation of the Hurst envelopes, he prepares the reader for the main course of his book, namely the basis and applications of numerical analysis as applied to the markets.

For the thousands of Hurst students worldwide and for anyone interested in the serious study of technical analysis, Brian Milliard's book *of "Channels and Cycles"* is a wonderful addition to your technical libraries.

Preface

Until 1979 my career followed the established path of university scientists and teachers the world over—writing papers, teaching students, presenting my work at conferences and visiting other workers in my field of scientific research. Then I was invited to spend a year as visiting scientist with the Food and Drug Administration in Washington, D.C., bringing my family with me.

Since I had an interest in the stock market, mainly from the scientific aspect of using digital filters to market data, I naturally paid a visit to the local library to see what was available on the subject of investment. I was astonished to find almost a whole wall of books devoted to this topic, at a time when there would have been probably none, or at best a couple of books on this subject back home in our local library in England.

Imagine my delight and pleasure when after about three months I came across J.M. Hurst's book *The Profit Magic of Stock Transaction Timing* (published by Prentice Hall). Unknown to me, Hurst had been putting into practice for years methods of analysis of market data that I had only recently begun to look at. Hurst was a mathematical analyst with an engineering background and he employed techniques familiar to me as a scientist where I frequently analyzed the noisy output of various instruments. He also, in his book, satisfied the slight reservations I had as a scientist about the predictability of the stock market by providing a great deal of evidence in support of the author's theories about cycles and channels in stock price movement.

If I had any criticism of the book at all, it was simply that the average investor, picking it up and quickly scanning through its pages, would perhaps feel that it was too mathematically orientated, and replace it on the shelf, because it contained terms such as *Fourier Analysis*, *modulated side-bands*, etc. The investor would then be missing an important contribution to the subject of technical analysis. However, a reader who took the trouble to study the book in depth would grasp that Hurst's' work was based on five main concepts. These were:

1. Maximum profits are obtained from shorter trades
2. Some 23% of price motion is based on cyclic movements in nature
3. These cycles are additive
4. The cycles can be seen clearly if envelopes are constructed around the price movement
5. The ideal buying point is when several such cyclic components are reaching their low points

Now, some 20 years later, Hurst's pioneering work is as valid as ever, and his concepts form a solid foundation for profitable investment. To my regret, I never had the opportunity of meeting Hurst, but I can truly say that he was responsible for changing my life, because once I returned to England I used his basic principles as a starting point for my own line of research into price movements. This soon became my full time occupation.

Of course, I have the advantage over Hurst of state-of the-art computers and vast amounts of price data from markets all around the world on stocks, commodities, currencies and futures. However, these markets all have one thing in common—the methods described in this book apply to all of them, as will be seen by the examples used to illustrate the various chapters.

In this book I have employed the general principle of putting forward a concept and then applying it to artificial data before using it on real market data. The reason for this is quite simple—predictive techniques must be shown to work with totally predictable data, i.e. artificial data, so that the accuracy of the predictions can be checked. It is only then that these same techniques can be applied to less predictable market data.

A great deal of space has also been taken by a full discussion of moving averages and their properties. Moving averages are not only simple to calculate, they are also extremely powerful tools, but unfortunately the majority of investors have no idea of how to harness this power. It is to be hoped that the treatment given here will enable readers to avoid the mistakes made by using them incorrectly.

Finally, although the majority of investors have access to computers and programs to carry out various calculations and plot charts, computers are not absolutely essential for channel analysis, and the investor with only a pencil, paper and calculator can still achieve a great improvement in performance.

Brian J. Millard
Bramhall
Cheshire
England

CHAPTER 1

Money Management and Other Disciplines

Since the stock market is subject to a certain amount of random, *i.e.* unpredictable, movement, it is impossible to be correct in all of your investment decisions. Because of this fact, it is imperative that certain basic rules are followed in order to prevent the incorrect decisions that you will inevitably make having a disproportionate effect on your capital base. In other words, the aim should be to reduce the overall risk to your portfolio.

INVESTMENT RISK

There are many forms of investment risk, but as far as we are concerned we can reduce these to three. There is the overall market risk, there is the risk attached to a particular sector of the market, for example oil stocks, and there is the risk attached to an individual stock. Although the concept of risk can be addressed mathematically, we can avoid this approach by taking the view that the risk is reflected by the performance of these three components. Taking the very simplest way of looking at things, when the market has become overbought and is due for a reversal, then the market risk is high. When a sector has become overbought and is due for reversal following a rise, then the sector risk is high. Finally, the same argument applies to the individual stock, making the individual stock risk high.

Later in this book we will see how to determine the most probable direction of the trend in stock price, sector and market. This will give us some idea of the risks attached to each of the three components. There is an interplay between them that can be crystallized by the '80:20 rule.' Research on the UK stock market has shown that in a normal falling market, 80% of the component stocks of that market will also fall, and the same rule applies to sectors of the market. In a severely falling market this percentage can rise to 100% or very near 100%. Thus it is imperative that the investor is aware of the probable market and sector direction when invested in a stock. **It is taking an unacceptable risk to invest in a stock if the market direction is down or about to turn down and its market sector is also in the same situation.** Conversely of course, the overall risk is lowest when the market, market sector, and stock have just begun to rise.

Quite clearly, the way to reduce each of these risks to zero is to exit the market if the market risk is high, exit the sector if the sector risk is high, and exit the individual stock if the individual stock risk is high. However, the partially random behavior of the stock market means that each of these risks can increase dramatically and so quickly that it is impossible to take immediate action. Because of this potential for disaster we must have another way of reducing the overall risk. This is achieved by diversification.

If all the available capital is placed in one stock, then all three component risks will apply. If the capital is placed in a number of stocks, and these stocks are all in the same market sector, then the risk attached to an individual stock is diluted by a factor which is proportional to the number of stocks. Although the risk is reduced, the total holding is still subject to the market risk and the market sector risk. It is obvious that spreading one's holdings across a number of market sectors can reduce the overall risk even further. An item of bad news that would affect a complete sector would then have a reduced effect on the total holdings.

The ideal would be to invest in individual sectors and individual stocks

with very little correlation to each other. By this we mean that many factors that can affect one sector or stock will then either have no effect or indeed the opposite effect on other sectors or stocks.

Opinions vary as to how many stocks an investor should diversify into, but the number should obviously be large enough to reduce significantly the overall risk to the portfolio from the various component risks. The greater the number of stocks, the smaller is the effect on the whole portfolio of an individual losing stock. On the other hand, a large number of stocks will cause the portfolio to behave more and more like the market itself, and the effect of making some good investment decisions will become diluted. Since we are going to show in this book how investors can easily outperform the market itself, then we need to concentrate our efforts on just a handful of stocks. This will also have the advantage of making it much less tiresome to continue to monitor and manage the portfolio. The experience of this author and many others is that a portfolio consisting of eight stocks is the ideal. Such a portfolio is fairly robust towards the occasional loser, but will allow the outstanding winner to make a large contribution to the overall value.

FULL INVESTMENT

The portfolio of eight stocks that make up the ideal diversification represents the maximum position when all the available capital has been invested. In practice, this position is rarely attained, since the investor will be trading fairly constantly over a period of time. The risk to the portfolio will be minimized when the capital is evenly divided between the eight stocks, *i.e.* each represents one eighth of the total value.

KEEP IN BALANCE

As time moves on, individual stocks will make individual gains, with the occasional losses, so that the value of each one will cease to be exactly one eighth of the total. The investor should try to keep the portfolio in rough balance if possible. Retaining a cash reserve can only do this.

Thus, if one holding, once liquidated because a selling signal has been given, represents a large proportion of the total capital, then it would be inappropriate to re-invest the whole of the proceeds into the next stock. It would be better to use an amount representing roughly one eighth of the total portfolio and cash value, and keep the rest in this cash reserve. This reserve can then be used to top up the selling proceeds from an under-performing stock whose representation has fallen below the one-eighth level so that the next investment will restore the balance.

Of course, if the first stock to be sold were an under-performing one, then the proceeds would not be enough when re-invested to buy a holding that would amount to one eighth of the whole. In such a case, it is best to wait until one or two other stocks have been sold so that the increased amount of cash will make it easier to balance the whole portfolio.

It is important to realize that one should not spend too much time and effort trying to maintain more than a rough balance of one eighth of the total for any one stock. Avoid at all costs the temptation to sell a stock simply to maintain this balance. **A stock should only be sold when its price movement dictates that it is time to sell.**

STAY DISCIPLINED

Besides this question of money management, there are a number of other rules that the investor should obey in order to stay disciplined. The greatest barrier to success in the stock market is *investor psychology*. This manifests itself in two ways. In the first, the investor ignores the selling signal generated by a stock because the feeling is that the downturn in price is simply a temporary aberration in the long upward trend, which will be resumed tomorrow, next week, or the week after that. In the second, the investor is subject to impulse buying. A stock becomes attractive for a variety of reasons, and the investor rushes in to buy, totally ignoring the fact that a buying signal has not been given by any of the methods developed in this book. Sometimes one of the reasons for buying is because

advice has been given by a friend, a broker, or simply by a press comment. It is perfectly in order to listen to such advice, but it is vital that the stock being pushed is checked by these well proven methods before it is bought.

The methods in this book have stood the test of time in various markets throughout the world. They move the balance of probabilities in favor of the investor. Over the short term of just a few transactions, the investor might find that results might not be favorable, but over a larger number of transactions the investor comes out ahead. For this reason it is essential that the investor follow the methods without question, does not stay inactive when action is required, and does not give in to the urge to take action when inactivity is called for. If the investor does not do this, the balance of probabilities will move the wrong way, and may not just have the effect of reducing the profit made, but could cause serious losses over the long term.

CHAPTER 2

The Importance of the Trading Interval

A surprising number of investors still hold the view that the best strategy is to buy and hold. They can point to the substantial profits that would have been accumulated by an investment in most stocks if they had been held for say five years. This gain would have occurred over any five-year period for most stocks, irrespective of when it started in the last fifteen years, even including the eve of the 1987-market crash. This, in retrospect, is now viewed as just a blip in the market's long upward trend, as can be seen from the chart of some twenty years of the weekly closing values of the Dow Jones Index in Figure 2.1.

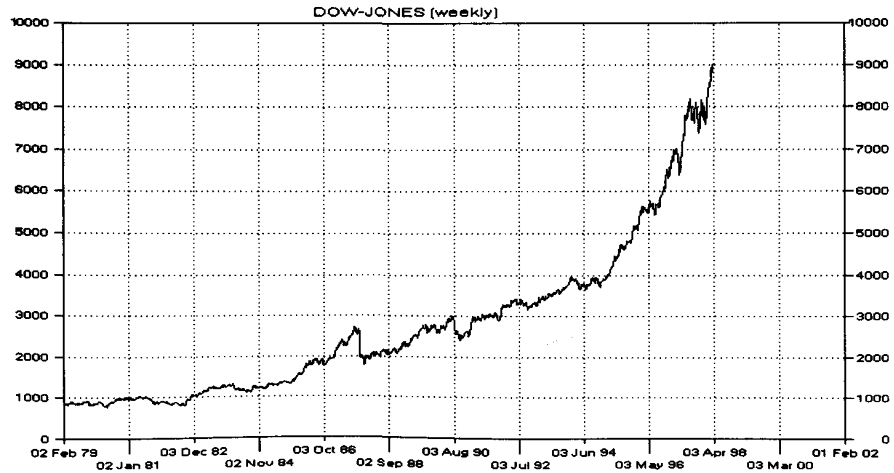

Figure 2.1. *A chart of the Dow Jones Index since February 1979.*

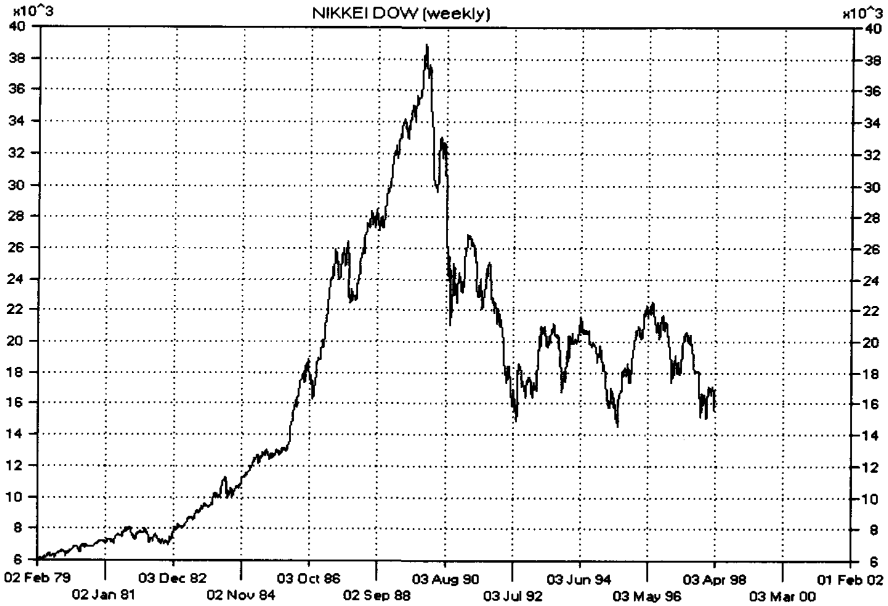

Figure 2.2. *A chart of the Nikkei-Dow Index since February 1979.*

Underpinning this strategy is the assumption that the underlying long term trend in the market will always be upwards, and that minor fluctuations in stock prices are simply temporary aberrations in the long march to substantial profit. There is of course no fundamental law of nature that says the stock market will rise indefinitely, and so a strategy based on this concept is subject to some risk. A Japanese investor will understand this only too well, as can be seen by comparing the chart of some twenty years of the closing values of the **Nikkei Dow Index** in Figure 2.2 with the chart in Figure 2.1. The **Nikkei** is now less than half of what it was in late 1989.

It is important that investors have a clear objective. The investor who stays in for the long term has the unclear though commendable objective of making profits. What is not part of the thinking is how to maximize the profit, and how to protect the accumulated profit. The factor that makes it possible to improve and protect profits from all markets, stocks, currencies and commodities alike, is that the movements in these markets are not straight line rises, but show shorter term rises and falls grafted on to the underlying long term trend. An investor who utilizes the short term rises and is not in the market during the short term falls will achieve much better results than the buy-and-hold investor. Using this approach, it is even possible to make profits from some markets by buying and selling (not going short) while the long term trend is down!

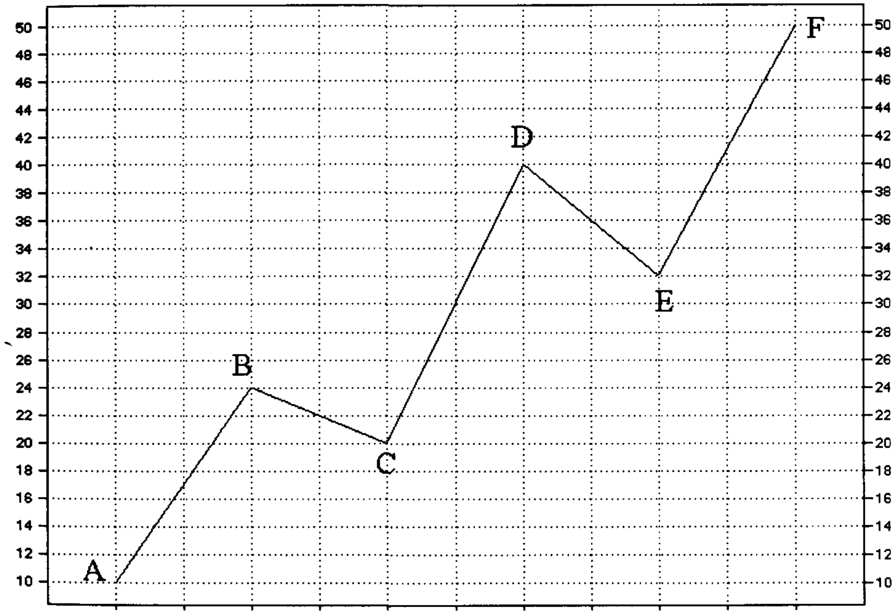

Figure 2.3. *Rises and falls in a stock starting at $10 and rising to $50 over a period of time.*

We will soon see that some unexpected conclusions will follow from a closer examination of short term trends. The starting point for this is to take a simple view, such as that shown in Figure 2.3, for a stock which starts at say $10 and eventually reaches $50 over a period of time.

The time axis is not labeled since it is not relevant to the immediate discussion, but we can take it to represent a period of years rather than weeks or days.

THE BUY-AND-HOLD INVESTOR

The investor who buys at $10 and reaches the end of the period of time without selling will see the price rise to $50, for a profit of 500% for the period.

THE FREQUENT TRADER

If we assume that the price moves in irregular steps such as those shown in the figure, then a (mythical) investor selling at each peak and buying at each trough would pass through the following sequential positions:

Point A: Buy 100 shares @ $10, pays $1000
Point B: Sell 100 shares @ $24, receives $2400
Point C: Buy 120 shares @ $20, pays $2400
Point D: Sell 120 shares @ $40, receives $4800
Point E: Buy 150 shares @ $32, pays $4800
Point F: Sell 150 shares @ $50, receives $7500

This investor turned $1000 into $7500 in the same period of time that the buy-and-hold investor turned the $1000 into $5000. Thus a gain of half as much again has been made by riding the short term up trends and exiting for the short term down trends. Since the starting price and ending price are exactly the same in both cases, the reason for the increased profit is the second investor ended up holding more shares than the first investor, 150 compared with 100.

It is illuminating to look more closely at the reason why more shares are being obtained by the approach of more frequent trading. It is the percentage amount by which the price falls from the intermediate high point to the next low point that is responsible. The example in Figure 2.3 showed two intermediate falls, the first from $24 to $20, a fall of 16.7%, while the second was from $40 to $32, a fall of 20%. The peak prices of $24 and $40 are irrelevant in isolation, as are the trough prices of $20 and $32. **It is the relationship between the peak and the trough that is the determining factor.** This means the same result would be obtained if we changed the value of the peak values and trough values as long as the fall from the first peak remained at 16.7% and the fall from the second peak remained at 20%. As an example, we could take intermediate peak prices of $30 and $45 and intermediate trough prices of $25 and $36. These also give falls of 16.7% and 20%. The position would then be:

Buy 100 shares @ $10, pays $1000
Sell 100 shares @ $30, receives $3000
Buy 120 shares @ $25, pays $3000
Sell 120 shares @ $45, receives $5400
Buy 150 shares @ $36, pays $5400
Sell 150 shares @ $50, receives $7500

We see quite clearly that the end result is the same in terms of the overall number of shares held at the end of the period and the percentage gain made. It is only if a trader cuts short the exercise that the intermediate peak prices have any meaning, since, for example the trader could exit with $5400 at point D in the second case compared with $4800 at point D in the first case.

We have now arrived at a surprising result. For a trader who trades in and out of one stock, the increased profit compared with the buy and hold investor depends *not* on the intermediate price rises, but on the intermediate price falls!

The vast majority of investors do not of course dip in and out of the same stock, but will sell one share to move into another one. Even so, the same principle applies that better returns will be made by frequent trading rather than staying with the same stock for many years. What is not obvious, since Hurst did not address the issue in any great depth, is what is meant by frequent trading. Is it a transaction every day, or every week or every month?

THE FREQUENCY OF TRADING

Since each price fall leads to an increased amount of stock being obtained, then it appears that the more frequently we trade, the larger our holding will be. This is partly true, but three assumptions have been made, which will have to be examined closely in order to decide how far we can take this method:

1. Dealing costs in buying and selling stock have been ignored.

2. The shorter term rises and falls in the example used are fairly extensive.

3. Perfect timing of buying and selling have been achieved, with the investor hitting the exact peaks and troughs in the price.

In practice, we will reach a limit when no profit will be made. This is because as we move to shorter and shorter trading intervals between peaks and troughs, the average percentage falls (and of course rises) in price get smaller and will no longer be sufficient to offset the dealing costs.

TYPICAL RISES AND FALLS

These are illustrated for the Dow 30 constituents in Table 2.1, where a nominal trading interval of 25 days was used. The data was obtained by using a 25-day centered average of the daily closing values to determine the approximate turning points in the trends, and then the lowest daily closing value within a few days either side of the turn taken as the start of the up trend. Similar logic was used in determining the start of the downtrend. The Table shows the average lengths of these down trends and up trends for a five year period in each of the stocks and the average percentage falls and rises in the stock price over the time span of the trend. For clarity, the percentage falls are shown as negative numbers.

The stock with the shortest down trend was **Allied Signal**, with an average of 15 days for the nominal 25 day trends, while the stock with the longest was **Woolworth** with 29.7 days. Across the whole group of 30 the average for down trends was 20.75 days.

The stock with the shortest up trend was **Westinghouse** at 16.8 days, while the stock with the longest was **United Technologies** at 36.1 days. Across the whole group the average was 26.7 days.

As far as the actual percentage rises and falls are concerned, you can see the largest average fall during the down trends was **Bethlehem Steel** at 18.6%, while the largest rise was also for **Bethlehem Steel** at 22.3%. Across the whole group the average fall was 10.3% and the average rise 14.6%.

It is interesting to see what happens as we shorten the trading interval, down to say a nominal 5 days. The method of determining the down trends and up trends is the same as before, except we are using a 5-day centered average. The data is given in Table 2.2.

The stock with the shortest down trend was **American Express**, with an average of 4.3 days for the nominal 5-day trends, while the stock with the longest was **Westinghouse** with 6.7 days. Across the whole group of 30 the average for down trends was 5.16 days.

The stock with the shortest up trend was **Bethlehem Steel** at 4.8 days, while the stock with the longest was **Union Carbide** at 6.2 days. Across the whole group the average for up trends was 5.53 days.

For the percentages, the largest faller was again Bethlehem Steel, with an average fall of 7.52%; this stock was also the largest riser at 8.01%.

You can quite clearly see that the result of shortening the trading interval from a nominal 25 days down to 5 days is to reduce the amount by which the average stock fell during a down trend from 10.26% to 4.6%. The amount by which the average stock rose during an up trend was also reduced from 14.6% to 5.5%.

Stock	days falling	% fall	days rising	%rise
A T & T	20.1	- 8.88	23.0	12.84
Allied Signal	15.0	- 8.25	24.2	12.82
Aluminum Co	23.5	- 11.71	29.0	16.05
American Express	20.3	-10.10	27.6	15.39
Bethlehem Steel	28.8	-18.59	21.7	22.26
Boeing Company	21.2	- 9.87	23.5	12.99
Caterpillar Inc	21.4	-11.60	32.6	19.20
Chevron Corp	16.3	- 7.69	28.3	10.72
Coca Cola	16.6	- 8.64	32.8	14.64
Disney	20.2	- 9.51	24.3	14.73
Du Pont	23.5	- 9.36	26.6	13.74
Eastman Kodak	21.6	-10.81	26.3	14.18
Exxon	17.4	- 6.50	30.4	9.72
General Electric	18.8	- 7.24	27.4	12.38
General Motors	24.7	-12.21	24.5	16.11
Goodyear Tire	21.1	- 9.98	26.5	15.69
IBM	27.3	-14.02	30.3	21.05
Internl Paper Co	19.2	-10.09	23.5	2.55
J P Morgan	17.7	- 8.59	26.5	11.78
MacDonalds	20.1	- 8.36	26.3	12.67
Merck & Co	23.2	-11.20	28.8	15.86
Minnesota M M	19.9	- 7.53	26.2	10.37
Philip Morris	19.7	-11.27	32.4	15.86
Proctor & Gamble	14.6	- 7.25	25.0	11.88
Sears Roebuck	18.4	-10.94	28.4	16.70
Texaco Inc	18.1	- 6.60	3.5	8.55
Union Carbide	20.7	-12.38	25.7	16.96
United Technols	19.2	- 9.14	36.1	14.68
Westinghouse	24.4	-13.65	16.8	16.52
Woolworth Corp	29.7	-15.69	21.3	19.37
Averages	20.75	-10.26	26.65	14.60

Table 2.1. *Dow 30 Constituents. The analysis of nominal 25-day trends over the 5 year period to mid 1998. Shown is the average length in days of a falling trend, the average percentage fall of falling trends (given a negative value), the average length in days of a rising trend and the average percentage rise.*

Stock	days falling	% fall	days rising	%rise
A T & T	5.7	-4.10	5.2	4.99
Allied Signal	4.9	-4.33	5.7	5.57
Aluminum Co	5.7	-5.19	6.0	6.21
American Express	4.3	-4.37	5.3	5.69
Bethlehem Steel	6.1	-7.52	4.8	8.01
Boeing Company	5.0	-4.32	5.5	5.27
Caterpillar Inc	5.1	-4.99	5.4	6.21
Chevron Corp	4.7	-3.80	5.9	4.55
Coca Cola	4.7	-3.78	6.0	5.08
Disney	5.0	-4.27	5.4	5.24
Du Pont	5.0	-4.12	5.6	5.08
Eastman Kodak	4.9	-4.44	5.4	5.06
Exxon	4.4	-3.11	5.2	3.59
General Electric	4.9	-3.43	5.7	4.49
General Motors	5.8	-5.57	5.2	6.18
Goodyear Tire	4.7	-4.40	5.6	5.75
IBM	5.6	-5.51	6.0	6.63
Internl Paper Co	5.2	-4.74	5.9	5.32
J P Morgan	4.9	-3.91	5.1	4.55
MacDonalds	4.7	-3.90	5.5	4.88
Merck & Co	5.4	-4.77	5.6	5.85
Minnesota M M	4.9	-3.36	5.3	3.82
Philip Morris	5.0	-4.73	6.0	5.60
Proctor & Gamble	5.3	-3.94	5.5	5.05
Sears Roebuck	5.0	-5.15	5.5	6.41
Texaco Inc	5.1	-3.31	5.0	3.75
Union Carbide	5.1	-5.38	6.2	6.65
United Technols	4.9	-3.97	5.8	5.29
Westinghouse	6.7	-6.55	5.7	7.07
Woolworth Corp	6.2	-6.42	5.0	6.65
Averages	5.16	-4.58	5.53	5.48

Table 2.2. *Dow 30 Constituents. The analysis of nominal 5-day trends over the 5 year period to mid-1998. Shown is the average length in days of a falling trend, the average percentage fall of falling trends (given a negative value), the average length in days of a rising trend and the average percentage rise.*

RELATIONSHIP BETWEEN TREND LENGTH AND PERCENTAGE CHANGE

In order to get a better grasp of the relationship between the length of trends and the amounts by which the price rises or falls during the duration of the trend, we show the results, in Figure 2.4, for up trends running from 3 days up to nearly one year. For trends of 50 days and longer, there is a steady increase in the percentage gains, although it is not a one-for-one relationship in the sense that doubling the length of time doubles the percentage gain. Below 50 days, there is a rapid fall off in the amount of gain.

THE EFFECT OF COMPOUNDING

If we just take the typical average gains and average length of the up trends in the Dow 30 constituents, we can look at the performance at the end of one year of our perfect investor who re-invests the proceeds from one deal into the next.

We will make the assumption that as soon as one trade is closed another is immediately opened. Assuming there are 260 business days in the year, the number of trades carried out in the year will be 260 divided by the length of the up trend. As well as the nominal 5 day and 25 day trends discussed earlier, data has also been obtained for nominal 3, 9, 15, 51, 101 and 201 days. Odd numbers have been used so the moving average, used to give an approximate position for the start of the trends, can be centered. The data, part of which was used to generate Figure 2.4, is now collected in Table 2.3.

It can be seen that the compounding effect results in a steady rise in gain for a year's trading as we shorten the trading interval, moving from 72.8% for the trading interval of 232.4 days up to a massive 1654.6% for a very short trading interval of 3.76 days. As with Tables 2.1 and 2.2, the trading interval is not a convenient whole number of days because it is the average of large numbers of trends within each stock and the average of these

values for all 30 stocks. Since we are simply trying to establish an overall picture for the effect of compounding, this does not matter.

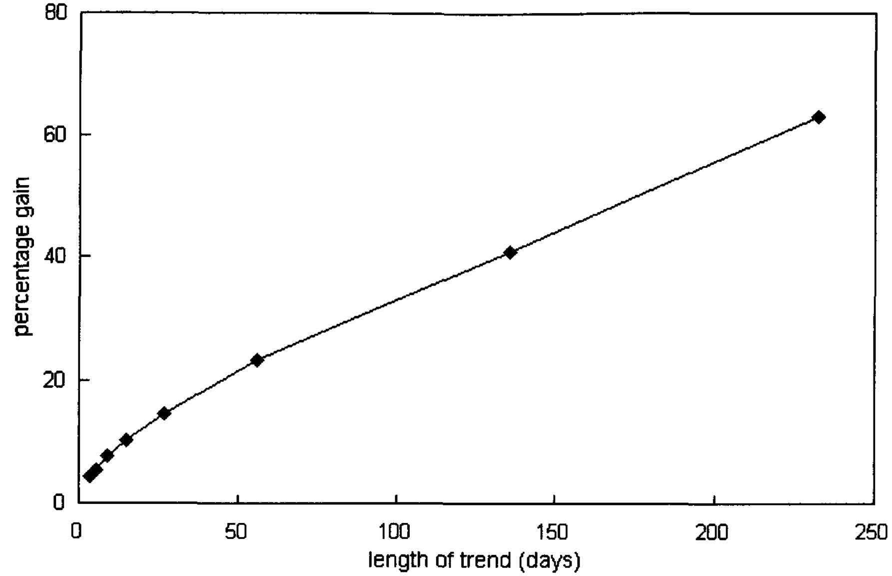

Figure 2.4. *How the percentage gain for up trend increases with the length of the trend.*

This compounding effect is naturally very impressive, and seems to confirm quite clearly that the frequent trader, for example using a trend of 3.76 days which results in nearly 70 trades in a year, will make about 22 times as much profit as the trader who makes just one trade in the year. As a general principle this is correct, but as we will soon see, when more realistic figures are used, there will be a lower limit to the frequency of trading.

ADJUSTING FOR REAL LIFE

There are two modifications to be made to the figures. First, we have ignored the effect of dealing costs, the spread of prices and some value placed on the investor's time. As a round figure, we should consider these to add up to about 5% of the capital employed. Thus the investor has to achieve a gain of 5% per trade in order to cover costs and make the exercise worthwhile in terms of time and effort. Second, we have been discussing the perfect trader who buys at the exact beginning and end of the up trend. Bearing in mind that we cannot know when a trend has started until the price moves up from its previous falls in order to give us a trough price, and cannot know when a trend has ended until the price moves down to generate a peak price, then our definition of a perfect investor should change to that of an investor who enters the trend one day after the lowest price and exits one day after the highest price. This will of course lower the amount of gain made from each up trend.

Nominal trend (days)	Rise time (days)	Average % rise	Compounded rise % per annum
3	3.8	4.23	1654.6
5	5.5	5.48	1128.5
9	9.1	7.64	713.8
15.1	10.27	437.7	437.7
25	26.7	14.6	277.9
51	55.9	23.1	163.1
101	135.3	40.8	93.1
201	232.4	63.07	72.8

Table 2.3. *The effect of compounding over one year the rises from various lengths of up trends if all of the rise is available*

Nominal days	Rise time (days)	Avge % Rise	Compounded % rise annum	Adjusted for 5% costs
3	3.8	4.23	1654.6	-41.4
5	5.5	5.48	1128.5	25.3
9	9.1	7.64	713.8	110.0
15	15.1	10.27	437.7	142.0
25	26.7	14.6	277.9	144.6
51	55.9	23.1	163.1	117.0
101	135.3	40.8	93.1	80.1
201	232.4	63.07	72.8	66.9

Table 2.4. *How applying a minimum gain of 5% to cover dealing costs, etc. reduces the compounded gain dramatically.*

By using these two modifications of a lower gain per trend, and removing 5% from the gain per trend in order to cover for costs, the data shown in Table 2.5 are obtained. These data establish an important point. As we lower the trading interval, the gains made over one year start to increase, then start to decrease again. Thus, there is an optimum trading interval to provide the maximum gain over one year for the frequent trader. In Table 2.5 this is for a nominal period of 51 days.

This optimum period of 51 days applies to our perfect trader who manages to get into a stock the day after it bottoms out and leaves it the day after it tops out. Moreover, the investor does this for each and every trade. To bring a bit of realism into the exercise it is necessary to look at a more typical investor. This typical investor captures only a proportion of the available gain made during the up trends. It is a matter of conjecture as to how much this proportion is, but one difficulty is that it will vary with the length of trend, since a day or two late in entering and leaving a trend of 5 days duration will have a greater effect on the profit made than the same delay applied to a long term trend of say 100 days duration. This can be seen by comparing Tables 2.4 and 2.5 for the gains made from each up trend. The gain from the 5-day trend was reduced from 5.48% to 2.28%, *i.e.* effectively halved by entering and leaving one day after the start and end of the trends. For the 101-day trend the effect was to reduce the gain from 40.82% to 31.14%. Because of this decreasing effect as we move to longer trading intervals, we must use a sliding scale, although this can be fairly crude since we are only trying to establish a principle. Noting that the typical investor will do worse than the investor who was a day late entering and leaving the trend, we can for the sake of progressing the argument, put the levels of gain actually achieved, to those shown in Table 2.6. These would result over the one year period in a heavy loss of 91.5% for the 3-day trader to a maximum gain of 62.4% for the trader taking advantage of 51 day trends, falling back to 51.5% for the trader using the 201 day trends.

Nominal days	Rise time (days)	Average % rise	Avge %rise (1 day late)	Compounded 5% costs/trend
3	3.8	4.23	1.75	-89.8
5	5.5	5.48	2.83	-64.4
9	9.1	7.64	4.85	-4.2
15	15.1	10.27	7.28	47.4
25	26.7	14.6	11.32	81.8
51	55.9	23.14	19.27	86.5
101	135.3	40.82	36.14	68.4
201	232.4	63.07	57.36	60.2

Table 2.5. *If the investor enters and leaves the trends one day late the average rise per trend is reduced. The effect on the compounded gains is more severe for the shorter trends.*

Obviously, the length of up trends which give the maximum return over a one year period (and of course over any periods longer than this) are very dependent upon the exact gains made for these trends. Since we have been taking an average view of the whole 30 constituent stocks, we would expect to find stocks that give a higher maximum return and others that give a lower return and that these occur at different trading intervals for the various stocks. As we saw for the individual Dow 30 constituents, the length of the trends will vary considerably from one stock to another, as will the gains made for these trends. If we take **Bethlehem Steel** as an example, the annual gain for up trends is best for a trading interval of around 75 days and gives an annual compounded gain of around 150%.

In general, the conclusion we have come to is that the relationship between trading interval and the gain achieved by compounding the individual trades will have the shape shown in Figure 2.5. For the investor who seeks a gain of more than 5% per trade in order to offset dealing costs, etc., we expect the maximum return for a stock to occur for trading intervals of between say 50 and 100 days, although there may be some that fall outside of this range. It is not possible to give any idea of the percentage gain that will be achieved at this optimum point; it can vary substantially.

The investor who is prepared to take a smaller gain per trade than the 5% minimum we have been considering so far will see the maximum return occur at a lower trading interval, although due to the rapid fall off of the percentage gain with trend length as this interval will not be much lower than this range of 50 to 100 days.

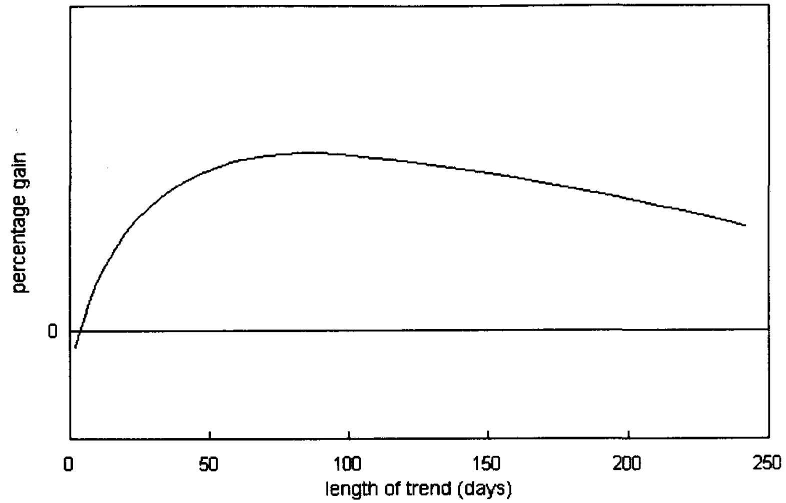

Figure 2.5. *The relationship between trading interval and the gain compounded over one year. The maximum return is given by trading intervals of between 50 and 100 days.*

Nominal days	Rise time (days)	Average% rise	Possible% rise	Compounded 5%costs/trend
3	3.8	4.23	1.5	-91.5
5	5.5	5.48	2.5	-69.6
9	9.1	7.64	4.0	-24.9
15	15.1	10.27	6.0	0
25	26.7	14.6	9.0	46.6
51	55.9	23.14	16.0	62.4
101	135.3	40.82	32.0	58.3
201	232.4	63.07	50.0	51.5

Table 2.6. *A more realistic view of the gains which might be achieved. It is assumed that only a proportion of the rise for each up trend is captured by the investor. The column headed 'Possible % rise captured' are simply guesses to illustrate the overall effect.*

Finally, in the development of this theory of the optimum trading interval, we must not forget that we have been considering an investor who has only been trading on up trends. Inevitably any investor will suffer losing trades, although the methods shown in later chapters of this book will reduce this number. The overall effect of introducing some losing trades into the compounding effect will be to reduce the annual gain made. The effect on the optimum trading interval is not as easy to determine. If, on balance, an investor makes more winning trades than losing trades, then with only a few trades in one year there is a sporting chance that none of them will be losers. As the number of trades made in one year rises, the probability of making a losing trade in the sequence of trades increases. Thus there will be a greater effect in reducing the annual profit as the trading interval decreases. The net effect is to shift the optimum to a longer trading interval.

We will take this concept of the maximum trading interval, approximately between 50 and 100 days, forward in the rest of this book. It will modify our view of the optimum cycles and channels to use when deciding the best entry and exit points for individual stocks.

CHAPTER 3

How Prices Move

There are two schools of thought on price movement and how to predict it. The fundamentalists believe the way to make a successful investment is to concentrate on methods of determining the value of a company. This is done by studying the way that it is managed, the various financial statements emanating from the company, the markets in which its products are being sold, comparisons with other companies operating in the same field, and so on. On the other hand, technical analysts base their predictions on historic price movement, although most of them would agree that there is some value in the fundamental approach. The technical analysts are of the opinion that the positive and negative aspects of a company are reflected in the stock price, and that a lot of unnecessary effort in studying the fundamentals can be avoided if you carry out the correct price analysis.

The major difficulty with technical analysis is there are a hundred and one ways to use it. In its simplest form it consists of plotting charts of the historical price data to see if there are any patterns developing that give an indication of movement in the near future. In its more complex form, it requires a computer to carry out extensive mathematical calculations before the analyst can decide what might happen to the stock price. Many of the indicators used to show the best times to buy or sell were developed in the past for particular types of markets. A major pitfall is that investors still apply such indicators to markets quite different in behavior from those based on the indicator for the original research and development. Many indicators based on fairly simple mathematics were developed by non-mathematicians, who applied them incorrectly. The use of moving averages is a case in point, as will be shown later in this book. Used incorrectly, moving averages can seriously damage your wealth!

The difficulty with the fundamentalist approach is that the investor might have to wait a long time before realizing a profit. Although you discover that a company is undervalued, and that its stock price ought to be much higher, and until other investors come to the same conclusion, the price cannot be expected to move down in the required direction. This composite view of investors towards the company is not being measured by an analysis of the fundamentals. However, technical analysis correctly applied will give a reasonable indication that the weight of outside opinion about the company is either optimistic, pessimistic or neutral. From that knowledge the investor can determine whether to buy, sell or do nothing. Of course, opinions about a stock, sector, or market can change rapidly, leaving the investor to base his decision on outdated materials. By giving the investor an early warning sign technical analysis is subjected to its severest test.

Some technical analysis methods are far too simplistic. In their most trivial form they come down to a set of rules that should be obeyed without any other understanding of the meaning behind them. Typical of such rules are those of the form 'buy when the stock price rises above the x-day average' or 'sell when the y-day average falls below the x-day average,' where x and y depend upon which technician you are speaking to. The difficulty with rules such as these is that they may have been formulated for a market quite different from that in which they are being applied. It is only when the investor starts to ask what lies behind these rules that an understanding begins to develop. This understanding is invaluable in deciding whether or not the current market is the type in which these rules should be applied.

By adopting a logical approach, gradually developing the idea of cycles and channels in stock prices, foreign currencies and commodities as we

proceed through this book, the investor will come to understand quite clearly that we will have arrived at a method that is universal in its application.

ARE STOCK PRICES RANDOM?

The answer to this question should be 'no,' since billions of dollars, pounds, yen, marks, francs, crowns, etc. are invested in stocks at any one time. We must make the assumption that the people who invest these vast sums are not simply putting their money into a 100% unpredictable lottery. As well as these actual investors, further amounts of dollars, pounds, yen, marks, francs and crowns are being paid to institutions, stockbrokers, financial commentators and the like in the form of commissions and salaries.

Financial commentators play an interesting part in the market. If in their absence, markets behaved in a totally random fashion, then the presence of such commentators would induce an indeterminate number of investors to buy or sell the particular stocks being commented on. This action would then mean that the market in those particular stocks ceased to be totally random. From this concept it follows we should be able to accept the idea if stock prices move randomly most of the time, there will be occasions when press, radio and TV comment will cause them to move in an ordered fashion.

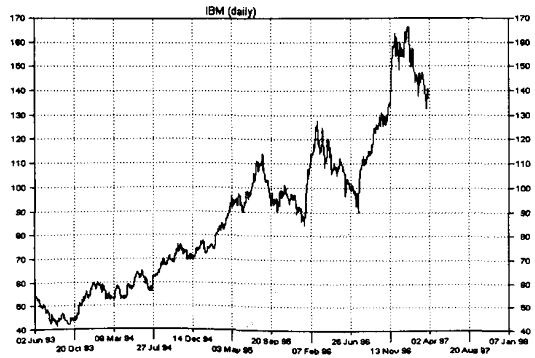

Figure 3.1. *A chart of the daily closing prices of IBM since June 1993.*

It will help to clarify our thinking if we restate this idea as follows:

- Stock prices contain random day-to-day movement
- Stock prices contain upwards and downwards trends
- The start and end of an individual trend is itself a random event

The word 'trend' means an underlying price movement that lasts between a few minutes and many years.

At this point we have taken the comments of the financial commentator to be the trigger for converting aimless random movement in a stock price to something which is non-random. This is a rather simple view, since many other triggers can be envisaged. to illustrate the point, a few examples of triggers that produce a rise in price will suffice. Thus there is the trigger caused by a broker telephoning clients to tell them to invest in stock X; there is the trigger of followers of the chart of stock X seeing that the price has started to climb and taking action to get on board; there is the trigger of the company issuing financial figures which are far better than had been expected, and so on.

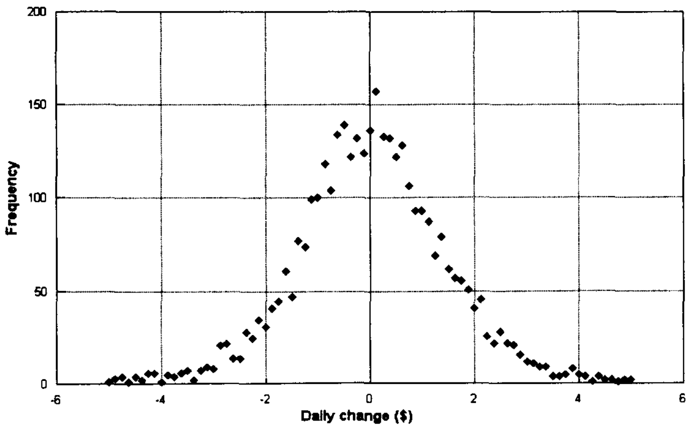

Figure 3.2. *The distribution of daily changes in the IBM closing price. A total of 3600 daily changes have been analysed. A rise of $1/8 is the most common, followed by a fall of $1/2. A zero change is the third most common.*

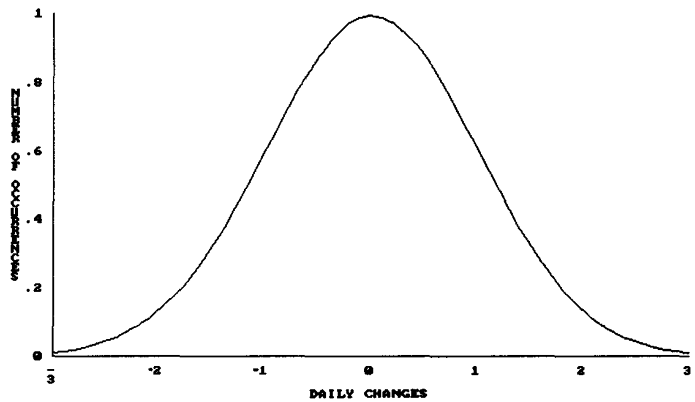

Figure 3.3. *A random distribution of daily changes would conform to this envelope.*

Although the argument just put forward is a logical one, it is not easy to demonstrate whether the price movements in a particular stock are random or not. Before doing this we need to decide on our time scale. This could be minutes, days, weeks or intervals of many weeks. Whichever we take, the intervals must be constant. We will take the day as our unit of time.

A good starting point is to look at the daily changes in the closing prices for a stock over a long period of time. In Figure 3.1 we show a chart of **IBM** daily closing prices since June 1993. The chart is characterized by a lengthy rise punctuated by three short-lived corrections. One way in which the data can be investigated is to analyze the changes in the closing price from one business day to the next. The smallest change in the data is $$^1/_8$, but there are of course many occasions when the closing price is unchanged for the next day. In Figure 3.2 the data is presented for **IBM** stock for a period of 3600 days, giving sufficient data to draw a conclusion. The central vertical line in Figure 3.1 represents a change of zero, *i.e.* those occasions in which a day's closing value was the same as the previous day. The horizontal scale covers daily changes from a fall of $6 to a rise of $6. A few extreme values which occurred on the occasion of the 1987 crash have been left out in order not to extend the horizontal scale more than is necessary. The vertical scale represents the number of occasions when a particular change has occurred. As an example, a rise of exactly $2 occurred on 41 occasions and a fall of $2 on 31 occasions.

As far as we are concerned, it is not the exact values in Figure 3.2 that are important, but the shape of the envelope outlined by the plotted points. If the daily price changes were completely random, then the shape of the envelope would be like that shown in Figure 3.3. which is the classic probability shape. While it is not exactly the same, there is enough similarity to draw the conclusion that there is a high degree of random behaviour in the daily price changes in **IBM**. As more data points are used, the plot of daily changes will be more similar to the probability curve. Just as a probability curve is defined by two quantities known as the mean and standard deviation, so can the daily changes in a stock be described by two such quantities. Such a plot can be used to estimate the probabilities of various price changes occurring between one day and the next. Changes other than those from one day to the next can be analyzed in this way, for example changes over a 30 day period or even one year period. With a reasonable amount of data, it is possible to estimate the probability of a certain change occurring, so, for example, it should be possible to make a statement such as 'there is a 7.5% probability of a fall of $3.50 in the stock price by 30 days time." However, this is not the objective of the current exercise, it is to see whether stock prices move in a random fashion or not. Quite clearly, the day-to-day movement in the **IBM** stock price is highly random. This is also the case for the day-to-day movement in any other stock analyzed over a long period of time.

At this stage in our thinking we come to the conclusion that investing in the stock market behaves purely according to the laws of chance. Whether we make a profit or not lies in the lap of the Gods.

SEQUENCES OF DAILY CHANGES

Investors do not normally buy a stock with the aim of selling it the next day. They envision holding that stock for a period of time, from a few

days to a few years. Since the change from one day to the next is highly random, it would appear logical to assume that the change in price from the beginning to the end of the holding period is also random.

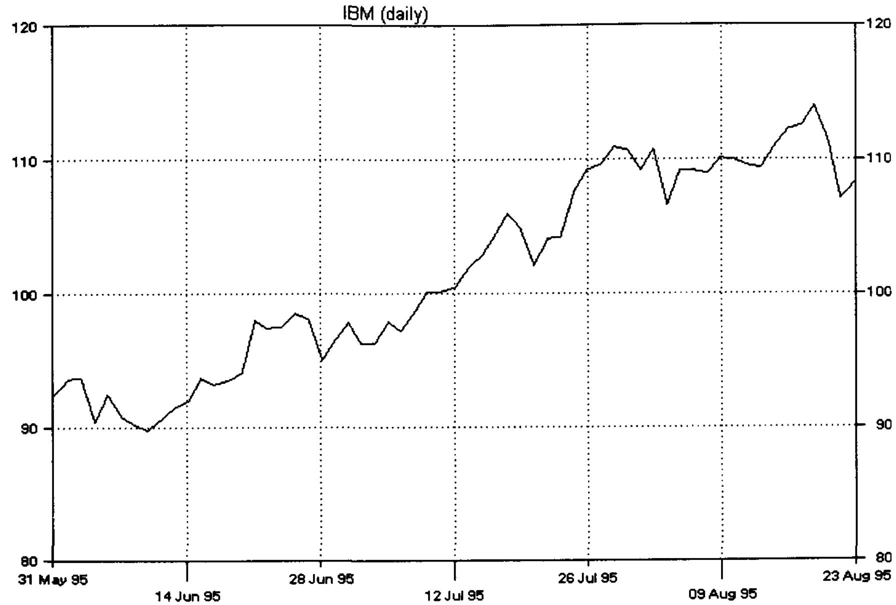

Figure 3.4. *A period of rising price in IBM stock.*

Fortunately the logic is faulty, because we cannot extrapolate from individual daily changes to the change over a period in this way. **The actual sequence of daily changes may not be random.** If we look at a change in price over a lengthy period, where the final price is higher than the starting price, then the price ends up higher because the sum of all the daily rises is greater than the sum of all the daily falls during this period. There are two reasons why this should be so:

1. **There are more daily rises than falls.**

2. **The individual daily rises tend to be greater than the individual daily falls.**

In the case of a period where the final price is lower than the starting price, then the reasons would be:

3. There are more daily falls than rises.

4. The individual daily falls tend to be greater than the individual daily rises.

All of these may occur, and of course they may occur by chance, but it is worth exploring the idea of sequences to see if we can establish that sequences of upward or downward moves in a stock might be caused by something other than random behavior. This can be done by comparing a period when prices rose with a period of similar time span when prices fell, using **IBM** as an example.

Price rise

Such a period is shown in the chart in Figure 3.4 in which the **IBM** stock prices from May 31, 1995 to August 23, 1995 are plotted. The actual rise started on June 8 with the closing price at $89^3/_8$ and ended on August 17, 1995. Out of 47 daily changes during this period there were 32 daily rises and 15 daily falls. The average daily rise was $1.348 and the average fall $1.258.

Price fall

Such a period is shown in Figure 3.5, where the price fell from $112^1/_8$ on May 20, 1996 to $90.25 by July 23, 1996. This particular period was chosen because the length of time is similar to that of the rise with which it is to be compared. Out of 42 daily changes during this period, there were 27 daily falls and 15 daily rises. The average daily fall was $1.36 and the average daily rise was $0.99.

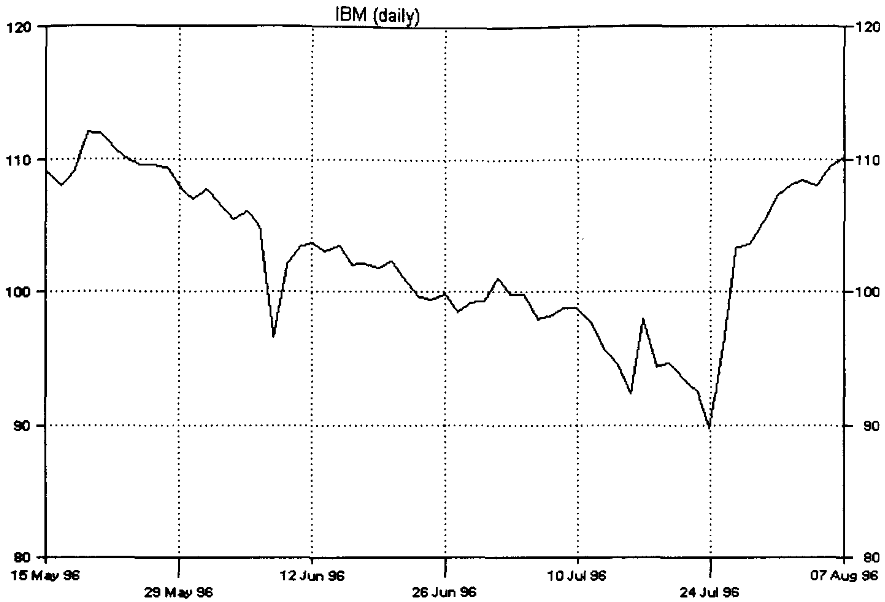

Figure 3.5. *A period of falling price in **IBM** stock.*

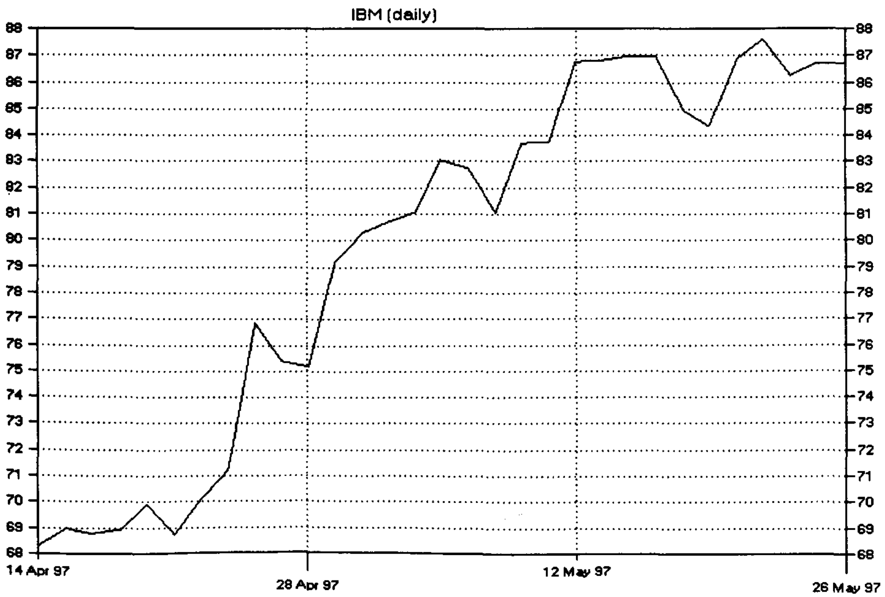

Figure 3.6. *In a period of rising prices there are usually more rises than falls. In this example from **IBM** there are 19 daily rises, 9 daily falls and 1 no change.*

You can see that during the sustained rise there were more than twice the number of rises than falls, with the average daily rise being higher than the average daily fall. Similarly, during the sustained fall there were nearly twice as many falls as rises, with the average daily fall being greater than the average daily rise.

We can now see that although the daily rises during a prolonged rise become larger than the norm, as do the daily falls during a prolonged fall, **it is the imbalance between the number of daily rises and the number of daily falls which is the prime cause of the overall rise or fall during a period.** This is illustrated in Figure 3.6. During the period covered by the chart there were 19 rises in price, 9 falls in price and 1 no change. This behavior is not restricted to **IBM** stock, but is universal, and applies to all stocks in all markets, as well as currencies and commodities. Of course, a sufficiently long data history must be used to establish the overall values for the average daily rise and fall, and a number of rising and falling periods have to be studied. This is because there may be a few occasions when there is hardly any imbalance between the number of rises and falls exists, but where the overall rise or fall is caused by a greater change in the individual rises or falls.

If, during a period in which there is an overall increase in the stock price there are more rises than falls, then it follows that there is an increased chance of sequences of successive daily rises compared with the number to be expected over the total history of the stock. Conversely, for periods where there are more falls than rises, there will be an increased chance of sequences of successive daily falls.

In order to simplify the discussion, we need a term to describe these sequences of successive rises or falls. Since these sequences are the building blocks from which longer term trends will be built upon, the term 'block' is appropriate. The minimum dimension of a block is two days (two successive rises or falls). In theory there is no upper limit to the number of successive daily rises or falls, but in practice a run of 10 successive rises or falls is almost unheard of. We can therefore take the maximum dimension of a block as being around 10 days. It should also be noted that it is possible to have a sequence of no changes in stock price, and of course with an inactive stock, this might run to many days. Such a sequence can still be considered a block, but neutral in its effect. We will see more of this type of block in the following chapter.

Over a long history of stock price movement, we will find that for sequences of two or more successive rises or falls, there are more of these than would be statistically predicted. In terms of blocks, this means that there are more blocks of a particular size than would be expected on the basis of a random distribution of daily changes. In other words, blocks tend to be bigger than the predicted size. From this we can deduce that stock price movement is not totally random.

It is difficult to come to an arithmetical value on the amount of random behavior present in stock prices, but it appears to be around 50%, so that about 50% of price movement is not random. This is not a constant amount, since there is a variation in random behavior. Stocks go through periods when their behavior is very random, and other periods when their behavior is much less so. In the latter case the price seems to meander with no apparent direction. Stocks that move in this fashion are of no use to investors. On the other hand, stocks that show strong trends are the ones that generate good profits for us.

INTERVALS OTHER THAN DAYS

The interesting point about the exercise we have just gone through is that we will arrive at the same conclusion irrespective of the time interval used. The only difference is the random content of price movement increases as we shorten the interval. Thus intra-day trading on hours or ticks is more difficult than trading on daily closing prices. On the other hand, we will see in later chapters there is an advantage in moving to longer intervals. For example using weekly data in addition to daily data.

Daily Ranges

It is also worth pointing out that the intervals used must be constant, since the theory of cycles developed later in this book demands that sampling occurs at fixed intervals. This puts us in difficulty when drawing cycles and channels on the typical stock market chart showing daily ranges. The two extremes of the daily range occur at random points of the day, although one extreme might be at the day's close. The policy adopted in this book is to use many charts that display the daily or weekly closing prices in order to achieve absolute clarity in presenting the concepts of cycles and channels. Where charts are shown with the vertical bars showing daily or weekly ranges. If channels are drawn they will use the closing prices, that may or may not be at the extremities of the bars. More often, the daily range will be used simply to find out if the stock was rising or falling towards the end of the day, with a view of anticipating the price trend at the beginning of the next business day.

We shall see in the following chapters that by using the technique of channel analysis we will be able to filter out the random behavior and concentrate on the predictable element of price movement. This will quickly show us those stocks that will provide us with healthy profits and those that will not.

We will be able to predict the start and end of price trends with reasonable success by using the idea of '*prediction boxes*'. These boxes are target areas into which we expect the current trend to take the price in the future before the trend comes to an end and the price reverses. The horizontal width of the box represents the uncertainty as to the time the price trend will reverse direction. The vertical height of the box represents the uncertainty the stock price at the time the trend reverses direction. Sometimes these prediction boxes will be quite large, but at other times they will be remarkably small, giving an astonishingly accurate prediction of the end of the current trend in terms of price and time.

Naturally, the further into the future we try to predict, the less accurate

our prediction will be. We do not need to determine the price more than 50 to 100 days into the future. This is because we saw in chapter 2 that a trading interval of 50 to 100 days provides the optimum return.

CHAPTER 4

Trends within Trends

Before entering a discussion of trends in stock prices, we need to define what we mean by **'trend.'** The dictionary defines it as *'general direction and tendency.'* If after a period of time a stock price is higher than it was at the beginning, then we can argue the general direction and tendency is up. However, if we take a situation such as that shown in Figure 4.1, when the price showed a sustained, gentle decline followed by a rapid movement that took the price higher than at the start, then we are in some difficulty. If anything, we can argue the general tendency is down, since this was the direction of the price movement for the majority of the time. Quite obviously, the dictionary definition of 'trend' is far too vague for our purposes. We need a much clearer view of what constitutes a stock market trend.

From the last chapter we saw that price movement, using the day as the unit of time, consists of random day-to-day movement plus sequences of successive daily rises or falls, that are much less random. We called these blocks. The minimum duration of rising and falling blocks is 2 days, and a practical maximum is about 10 days. In addition there are neutral blocks in which the price remains unchanged for a number of days. These neutral blocks also have a minimum duration of 2 days but may have a much longer duration than 10 days in an inactive stock.

If the unit of time is a week, then price movement consists of random week-to-week movement plus sequences of successive weekly rises or falls that are much less random. These weekly blocks have the minimum duration of two weeks, and again the practical maximum seems to be around 10 weeks. We can of course have time units of minutes, hours, months or even years.

Our very restricted definition of a random movement is therefore a movement that lasts for one unit of time, and whose direction is not the same as that of the block or random movement that precedes it. This allows us to have a run of random movements where the movement over each unit of time is different from that over the previous unit of time.

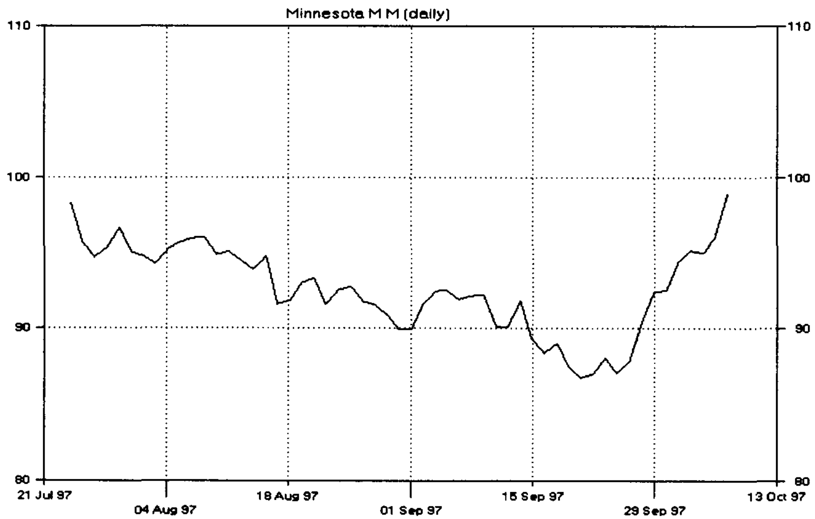

Figure 4.1. *The price movement in this chart can be viewed as either a down trend since the price was falling for most of the period, or an up trend since the price was higher at the end than at the start.*

UNINTERRUPTED TRENDS

We can start with a definition of a trend as *a series of price movements that takes the price higher or lower than it was at the start of the movement.* A neutral trend is one where the price ended up exactly the same as at the start.

An uninterrupted trend is obviously *a trend where all the price movements are in the same direction*, in other words, a block according to our definition. If we ignore neutral trends, then the shortest uninterrupted trend is therefore a 2-day (or 2-week) block. The longest is a block of about 10 days (or 10 weeks) duration. We can now use the terms 'block' and 'uninterrupted trend' interchangeably and qualify blocks further as rising blocks, falling blocks and neutral blocks.

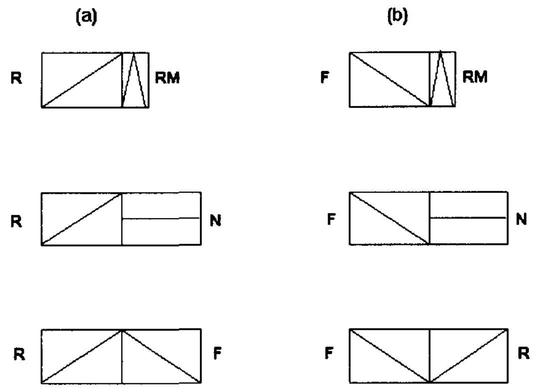

Figure 4.2. *(a) rising blocks (R) can be terminated by either a random movement (RM), a neutral block (N) or a falling block(F) (b) falling blocks can be terminated by either a random movement, a neutral block or a rising block. In this context blocks are sequences of rises, falls or sideways movements that last for more than one unit of time. A random movement is one that lasts for just one unit of time and is in a different direction from the movement in the previous unit of time. Units of time can be ticks, hours, days, weeks, etc.*

A block becomes terminated either by a random one day (or one week) movement or by another block operating in a different direction. Since we are principally concerned with either rising or falling trends, a neutral block can be viewed in the same light as a one day (or one week) random movement in that it will terminate a rising or falling block. Thus:

- Rising blocks are terminated by either a random daily (or weekly) movement, a neutral block or a falling block.
- Falling blocks are terminated by either a random daily (or weekly) movement, a neutral block or a rising block.

These concepts are shown in Figure 4.2.

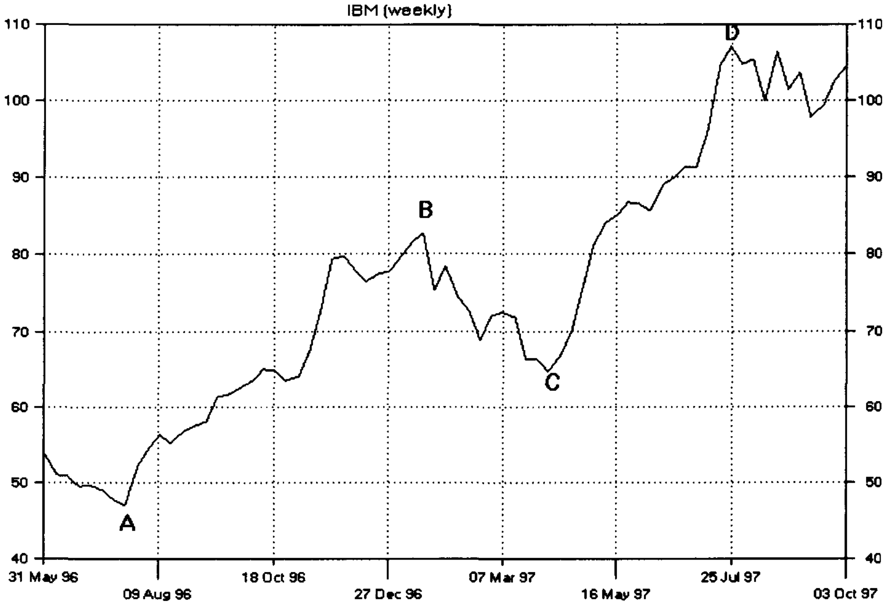

Figure 4.3. *A section of IBM weekly closing prices. The one year trend from point A (July 19, 1996) to D (July 25, 1997) lasted 53 weeks. This can be broken down into three shorter term trends, A to B (26 weeks), B to C (11 weeks) and C to D (16 weeks). These can be broken down into blocks, the longest block being one of seven successive rises from point C. The end of this block was caused by a random sideways movement. Note the sequence of seven random movements that followed point D.*

INTERRUPTED TRENDS

In Chapter 2 we discussed the trends for the Dow 30 stocks over various periods of time, looking at various rising trend lengths up to 101 days. Since we have seen that the longest uninterrupted trend is about 10 days, then to achieve a trend of 101 days means that such trends cannot be uninterrupted. These longer-term trends are therefore composed of varying numbers of blocks. These will be a mixture of rising and falling blocks and there may also be neutral blocks present during the lifetime of the trend.

TRENDS ARE ADDITIVE

Once we look at a long-term trend which is composed of a considerable number of blocks, then it will be obvious that shorter sections of it, composed of just a few blocks, will themselves constitute trends. We will be able to split a long-term trend into a number of shorter-term trends, and each of these shorter-term trends into a number of even shorter-term trends until we reach the smallest component, one block. The block can be based on daily, weekly or even intraday movements. This is shown in Figure 4.3. **This view of trends as being additive is one of the most important concepts of this book.**

Thus:

- Blocks build into very short-term trends
- Very short-term trends build into short-term trends
- Short-term trends build into medium term trends
  and so on.

Since we have applied the terms 'very short term,' 'short term' and 'medium term' to these trends, we can see that trends must have a time scale attached to them. This means that the term 'up trend' in isolation has no real meaning unless the rest of the sentence is describing the time frame over which the trend is operating. We will see shortly that trends are derived from cyclical movement that must have a time base.

As an example, we can assume the presence of a short term trend which causes a stock price to rise by say $2 over a period of four weeks, and fall by $2 over the next four week period. At the same time that this trend is in existence, we can assume there is a longer term trend coexisting such that it causes the price to rise by say $8 over a period of say 40 weeks. Such a trend is shown in the lower left of Figure 4.4.

When we combine the two, the net result is the composite trend shown in the right of Figure 4.4. When viewing a chart, it is this net result we will see. Although we will also be able to see the net result is due to some short term trends and a longer term trend coexisting, we will not be able to deduce the exact profile of any of these component trends by simply viewing the chart.

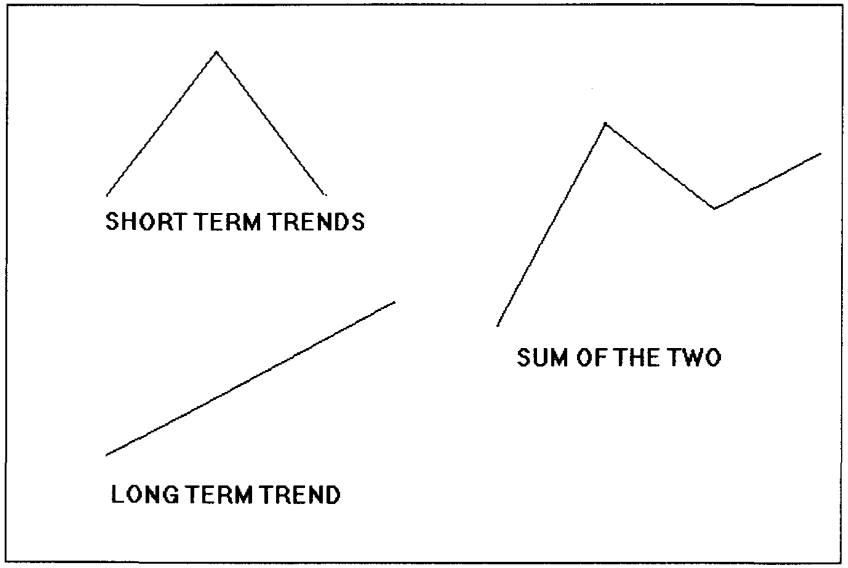

Figure 4.4. *If the short term trends shown on the upper left exists at the same time as the long term rising trend shown on the lower left, then the investor will actually see the combined trend seen on the right, which is the sum of the two components. The initial leg rises even faster than the rise in the component trends.*

The arithmetic of combining the two trends is simple. It is a matter of deciding how much the long-term trend contributes for each leg of the short-term trends. Thus over the first four weeks, the short-term trend results in a rise in price of $2. Since the long-term trend rises by $8 in 40 weeks, this is equivalent to a rise of 80 cents in four weeks. If we add this to the rise due to the short-term trend, we see that the total effect of the two trends is to cause a rise in price of $2.80. The following four weeks the long-term trend again adds 80 cents to the price, but the short-

term trend is causing a fall of $2. Thus the net effect is for a fall of $1.20. For the final four weeks there is no short term trend, so that we see the unchanged long trend.

When looking at the chart itself, we see a rise of $2.80 followed by a fall of $1.20. If we are unaware of the existence of the long-term trend, we come to the conclusion that we have a short term up trend giving a rise of $2.80 followed by a short term down trend giving a fall of $1.20.

It is this effect of exaggerating short term rises relative to short termfalls when there is an underlying longer term rise that is partly responsible for the results we obtained in chapter 3, when we saw that the average daily rises were slightly large than the average daily fallsduring a price rise, with the opposite applying during a price fall.

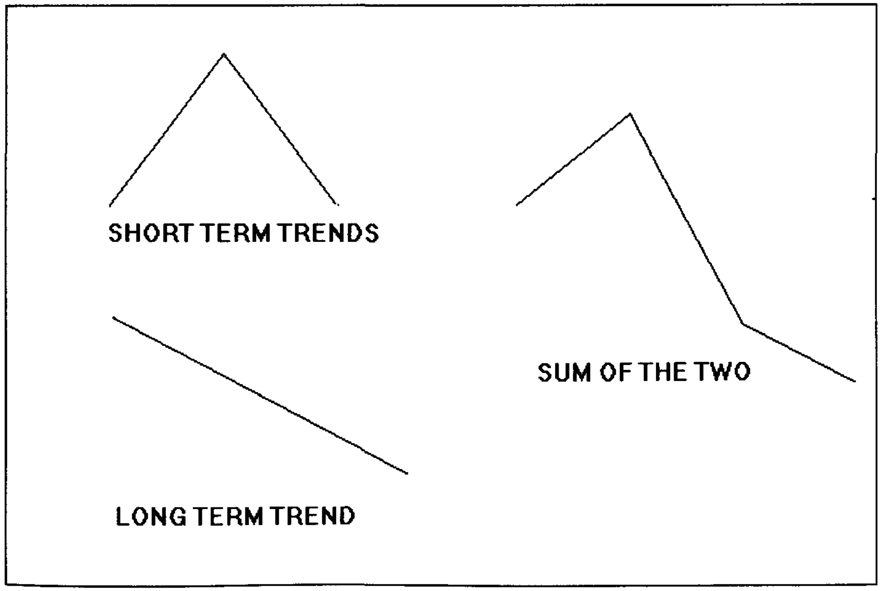

Figure 4.5. *If the short term trends shown on the upper left exists at the same time as the long term falling trend shown on the lower left, then the investor will actually see the combined trend seen on the right, which is the sum of the two components. The middle falling leg of the combined trend falls even faster than the comparable legs of the component trends.*

For the sake of completeness, it is worth looking at the effect of adding a long term down trend to the same short-term trends as in the previous example. In this case we can take the long term down trend as causing a fall of $8 over a 40-week period. The net effect of adding these trends is shown in Figure 4.5. The arithmetic is now different. Over the first four weeks the long-term trend causes a fall of 80 cents, while the short-term trend causes a rise of $2. The net effect is for a rise of $1.20. Over the next four weeks the long-term trend still causes a fall of 80 cents, but the short-term trend causes a fall of $2. The net effect is a fall of $2.80. Finally, for the last four weeks there is no short term trend, so that we see the unchanged long term trend.

When looking at the chart, we see a rise of $1.20 followed by a fall of $2.80. If we are unaware of the existence of the long-term trend, we come to the conclusion that we have a short term up trend giving a rise of $1.20 followed by a short term down trend giving a fall of $2.80.

DISTRIBUTION OF TRENDS IN STOCK PRICES

It is possible to analyze stock price movement for the numbers of trends that fall into various time categories. As an example, such an analysis for the weekly closing prices of **Eastman Kodak** stock over a 10-year period gave the following results:

Long term trends. There were six rising trends with an average persistence of 76 weeks, the maximum length being 147 weeks and the minimum 32 weeks. There were also six falling trends with an average persistence of 31 weeks. The maximum length of trends was 46 weeks and the minimum 11 weeks.

Shorter term trends. There were 31 rising trends with an average persistence of 13 weeks, the maximum being 31 weeks and the minimum 3 weeks. There were also 31 falling trends with an average persistence of 11 weeks, the maximum being 27 and the minimum being 3 weeks.

This distribution will vary from one stock to another. Obviously stocks that have shown a long climb will have very few individual trends, and these will mostly be of the long-term variety. Other stocks will have oscillated quite rapidly over their history and will have a predominance of short-term trends. Even so, it is extremely useful to have an indication of the distribution of trends for an individual stock of interest. The persistence of these trends is a useful piece of information, giving an indication of how long a new trend might be expected to last.

THE SHAPE OF TRENDS

In Figures 4.4 and 4.5 we drew trends as straight lines. This was done for clarity in illustration the point that trends were additive. We will show through the many examples in this book that trends are cyclical in nature. This means they have low points (troughs) and high points (peaks) that recur at intervals. Perfect cycles are *sine waves*, and their peaks and troughs recur at exactly the same intervals in time. They also have identical vertical displacements. Because of the random content of stock price movement, cycles in the stock market are subject to a variation in the position of their peaks and troughs in time and their vertical displacement can vary.

Sine Waves

A perfect sine wave is shown in Figure 4.6. A radio wave would be a good example of such a wave. We can describe this sine wave exactly by three quantities:

- Wavelength (or frequency)
- Magnitude (or amplitude)
- Phase

The **wavelength** is the distance between successive troughs or successive peaks. For radio waves in the broadcast spectrum, this distance is measured in meters. In radar the distance is in centimeters or less. As far as the stock market is concerned the units depend on the rate at which price data is sampled. Thus we could have wavelengths of minutes, hours, days, weeks, months or even years.

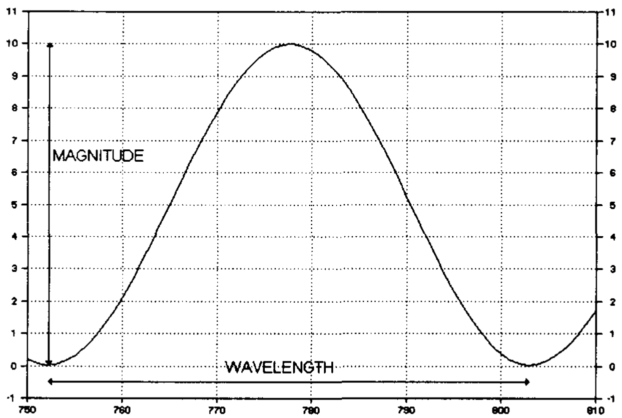

Figure 4.6. *A sine wave. The wavelength is the distance between two successive peaks or troughs. The magnitude is the vertical distance between a trough and the next peak (or a peak and the next trough).*

Radio waves can also be specified by frequency such as kilocycles and megacycles, where frequency is an inverse of wavelength. If we have a stock market sine wave with a wavelength of two weeks, then its frequency would be 52/2, *i.e.* 26 cycles/year.

There is confusion over the meaning of the term 'amplitude' when applied to sine waves. Many take it to mean the complete vertical distance covered in rising from a trough to the next peak. However, mathematical calculations to produce sine waves use a value for amplitude that is one half of this. To avoid ambiguity, we will use the term 'magnitude' rather than 'amplitude.' Thus the **magnitude** of a sine wave is *the vertical distance from trough to peak.* For stock market waves the magnitude would be in a currency such as dollars, pounds, etc. and for currencies it would be in the form of ratio measurements. For a market index such as the Dow it is of course measured in points. The amplitude is one half of the magnitude and is therefore the vertical distance from the horizontal centerline of the wave-form to a peak or trough.

The **phase** of a sine wave is a measure, in degrees or radians; of how far along from some arbitrary stating point the wave has traveled. If two sine waves of the same wavelength and magnitude are exactly in phase, then they can be exactly superimposed on each other. If they are 180 degrees out of phase, then the trough of one is exactly lined up with the peak of the other.

It is not necessary to go into any more depth about the mathematical aspect of sine waves. However, the term 'cycle' may cause confusion, since it is loosely used to describe a repetitive sine wave, or may be used for just a section of a sine wave which takes the price from say a trough to the next trough. In this book we will use, for example '10 week cycle' to mean a repetitive sine wave of wavelength equal to 10 weeks, and use the phrase 'one complete wave of the 10 week cycle' to signify just the section from one point to the next identical point. This latter form will be used quite frequently because it enables us to predict the next peak or trough in a stock market cycle and therefore determine whether the current trend due to that cycle is rising or falling.

RELATIONSHIP BETWEEN TRENDS AND CYCLES

An up trend is simply the rising half of a sine wave and a down trend the falling half. If a sine wave has a wavelength of say 10 weeks, then the rising half will take 5 weeks to move from the trough to the following peak, and the falling half the same time to move from the peak to the following trough. We can now see why trends have to have a time scale attached to them. Taking two different stock market cycles of wavelength 40 days and 400 weeks, we show the up trends of both of these in Figure 4.7. The trends are obviously quite different, and they are different in two ways. Firstly, one-trend takes ten times as long as the other to run its course, while secondly, the price rise caused by the 20-week wave is larger than that caused by the 10 week wave.

This latter effect is a general one and of great importance—the greater the wavelength, the greater the magnitude. It leads the investor to focus on long term trends as well as short term ones.

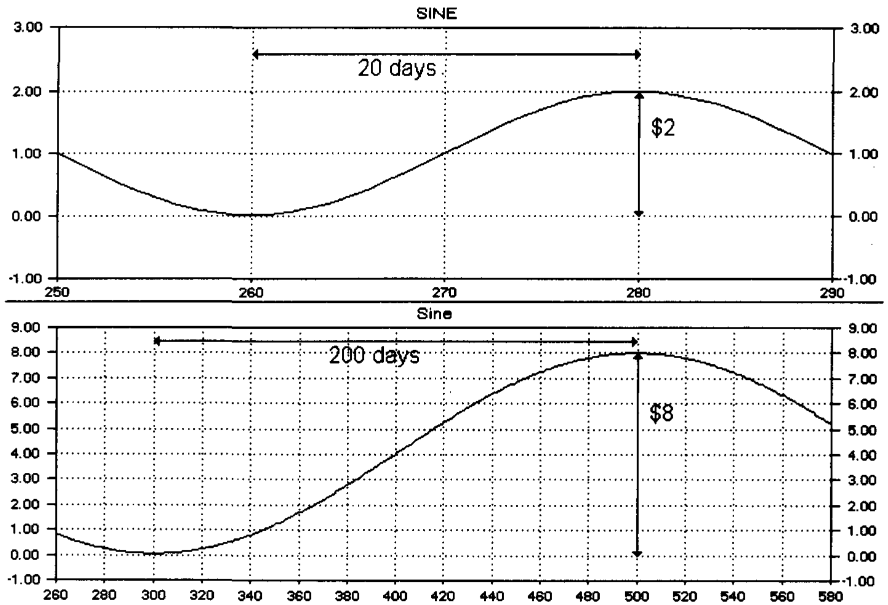

Figure 4.7. *An up trend is simply the rising part of a sine wave. The above up trends are derived from two different sine waves. The first of wavelength 40 days and magnitude $2 takes the price up by $2 in 20 days. The second of wavelength 400 days takes the price up by $8 in 200 days.*

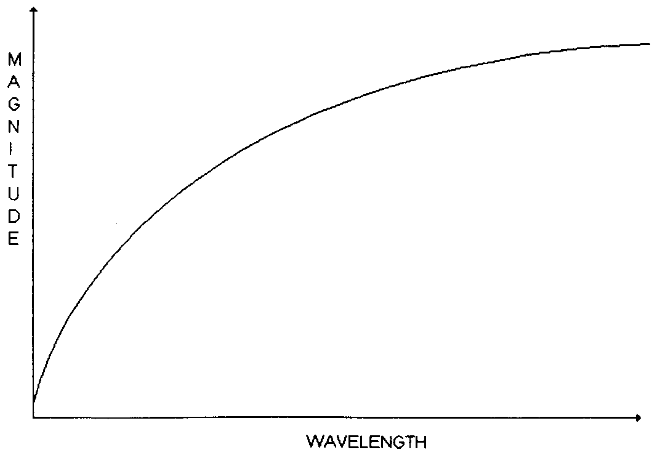

Figure 4.8. *The approximate relationship between cycle magnitude and wavelength in stock prices.*

It is generally considered that the important cycles present in stock market data have wavelengths of: 18 years, 9 years, 3 to 4 years, 18 months, 12 months, 26 week, 13 week, 6.5 weeks and 3.25 weeks. The general form of the relationship between the wavelength of the various cycles present in stock price data and their magnitude is shown in Figure 4.8. The magnitude increases rapidly with increasing wavelength until wavelengths of over four years are reached; at which point the magnitude increases only slowly.

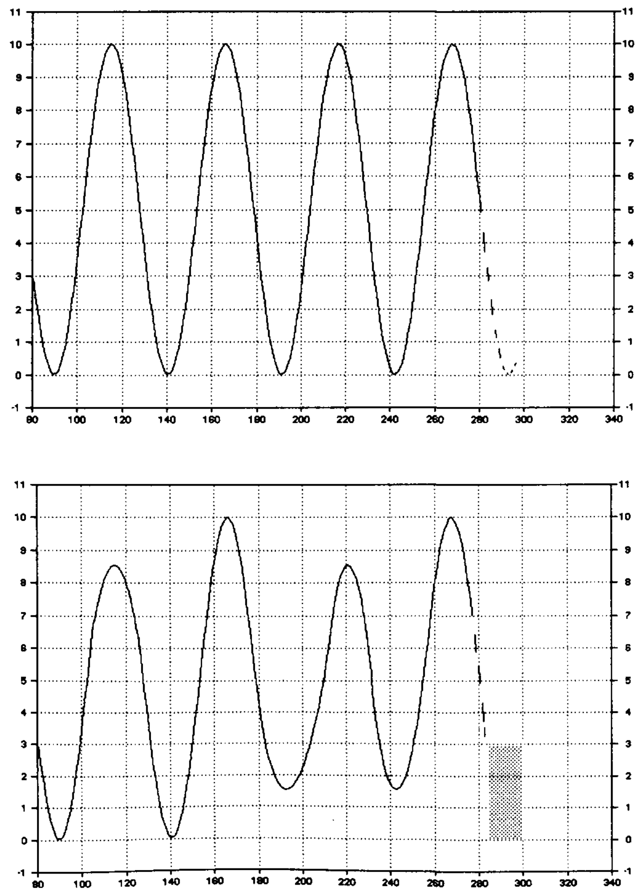

Figure 4.9. *Upper panel: The next turning point in a perfectly regular sine wave can be predicted accurately into the future. Lower panel: If there is a fluctuation in magnitude and wavelength then a 'prediction box' (hatched area) must be drawn which takes into account the smallest and largest changes in either.*

Fluctuation over time

The relationship shown in Figure 4.8 is only approximate, for the reason that each of the three components of a stock market cycle, disguised wavelength, magnitude and phase, are fluctuating with time. The fluctuation in wavelength is not large, but because it exists we use the term 'nominal wavelength' to describe a cycle in the data. Thus a nominal one-year (52-week) cycle can change between limits of about 45 and 60 weeks. Fluctuation in phase is difficult to observe clearly, as it appears to manifest itself as a fluctuation in wavelength, since the position of the next peak or trough will be shifted. However, the shape of the cycle will remain the same, since only a sideways movement in time is occurring, whereas a change in wavelength also changes the shape. The fluctuation in magnitude is much more important, because it can change within very wide limits over the course of time. This can mean that a particular nominal cycle can disappear from the data for a time because its magnitude has effectively dropped to zero. It is this fact that makes stock markets, currency markets and commodity markets moderately predictable rather than being highly predictable over the long term. In practice, we are faced with periods of time when the price of an individual stock, currency or commodity is quite highly predictable, and other periods when it is almost totally unpredictable. Fortunately, we will usually be able to predict which of these two states is paramount at any particular time.

The effect of these fluctuations on the degree of predictability of cycles is shown in Figure 4.9. The upper trace is a perfect cycle of exact peak-to-peak wavelength of 52 weeks. For the purposes of the example we will take the magnitude as being \$10. The rising portion of this cycle (the up trend) takes half of the wavelength. *i.e.* 26 weeks for completion will therefore make a positive contribution of \$10 to the price movement of the stock over this period of 26 weeks, while of course the falling part of this cycle makes a negative contribution of \$10 for the next 26 weeks. We can see that because it is completely regular its future movement is known exactly. If we determine that the trend is currently down, then we would be interested in knowing when it will change direction. The point

where it will bottom out, *i.e.* the trough, will be exactly 52 weeks on from the previous low point, and exactly 26 weeks on from the previous peak. In terms of the vertical position of this trough, it will be identical with that of the previous trough.

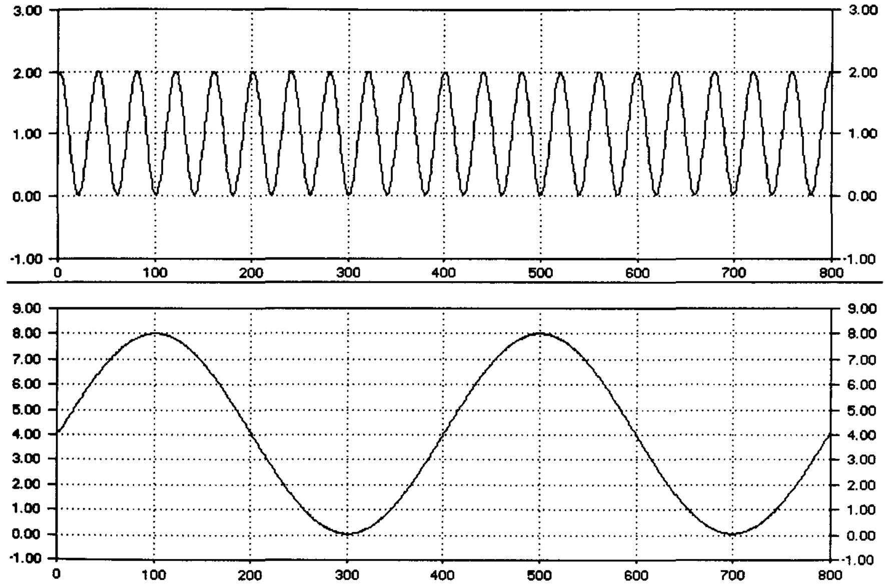

Figure 4.10. *Upper panel: a cycle with wavelength 40 days and magnitude \$2. Lower panel: a cycle with wavelength 400 days and magnitude \$8.*

In the lower trace, we have taken a cycle with the same nominal wavelength of 52 weeks, but where the wavelength is subject to a moderate but unpredictable variation, as is the magnitude. Because of the variation in wavelength we can no longer say that the next trough will occur exactly 52 weeks after the previous trough or 26 weeks after the previous peak. Our best estimate is that it will occur at a point 26 weeks on from the previous peak, plus or minus a number of weeks. We can get an idea of this range by looking at the previous variations of the wavelength as given by the past peak to peak distances. An even better way is to split these into half wavelengths, measuring the distances in time between peaks and the next trough and troughs and the next peak. This gives us twice as many measurements upon which to base the estimate.

Although the best estimate from these measurements would be given by a statistical calculation of mean and standard deviation, this is overkill in the context of what we are trying to achieve. It is enough to take the shortest value, for example 21 weeks, and the longest value, for example 30 weeks and use these. Applying these particular values means we can expect the trough to appear somewhere between 21 weeks and 30 on from the previous peak.

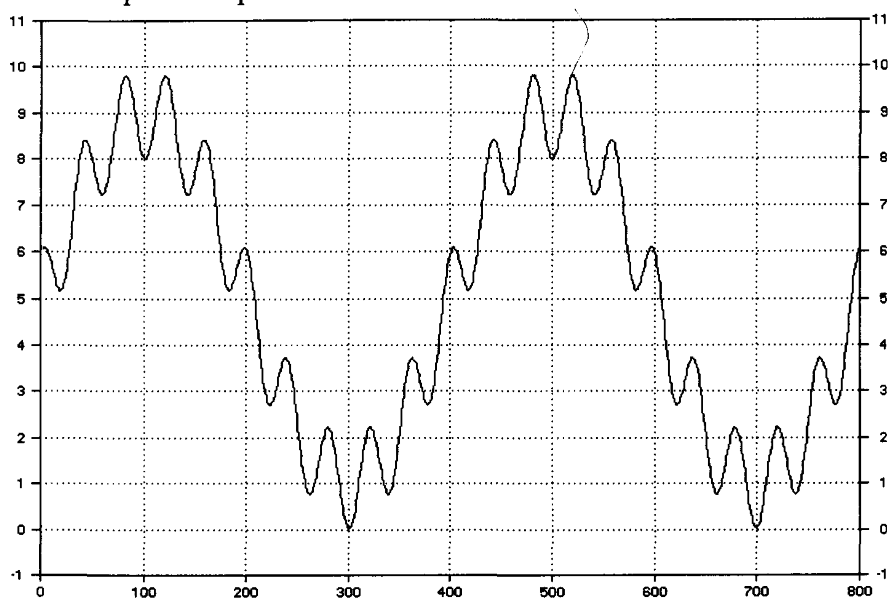

Figure 4.11. *This is the result of adding together the two cycles shown in Figure 4.10.*

Since the magnitude is also varying, we can use a similar approach. This time we take measurements of the rises from troughs to the next peak and the falls from peaks to the next trough. This might give, for example, the shortest rise/fall being $7 and the largest $10. Applying these particular values means we can expect the fall from the most recent peak to be between $7 and $10.

Applying both the wavelength estimation and the magnitude estimation from the position of the last peak gives us a window in which we expect

the next trough to appear. The window, or prediction box, has a height of $3 and a width of 10 weeks.

We have situations where the variation in both wavelength and magnitude is so high that although we could draw a prediction box by the same method as just discussed, its size is so large that its usefulness in determining the future movement is virtually zero.

CYCLES ARE ADDITIVE

Since trends are additive, and a trend is one half of a cycle, it follows that the cycles themselves are additive. Thus, what we see in stock price movement is the sum of all of the cycles present, taking into account the fact they are fluctuating from their nominal wavelength from time to time and that their magnitude and phase is also changing. In addition to the sum of these, there is also grafted on to this total picture an amount of random day-to-day movement.

We have discussed the addition of short-term trends to a long-term trend to give a composite trend, as shown previously in Figures 4.4 and 4.5. In

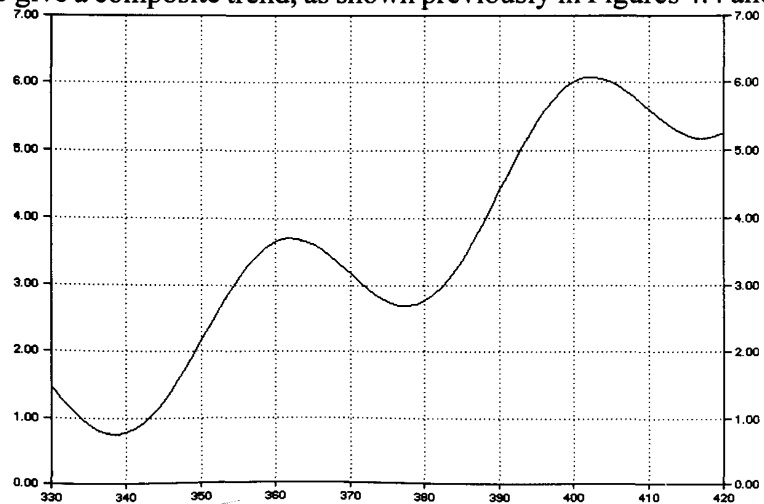

Figure 4.12. *A expanded section of Figure 4.11 showing the effect of a rising long wavelength cycle.*

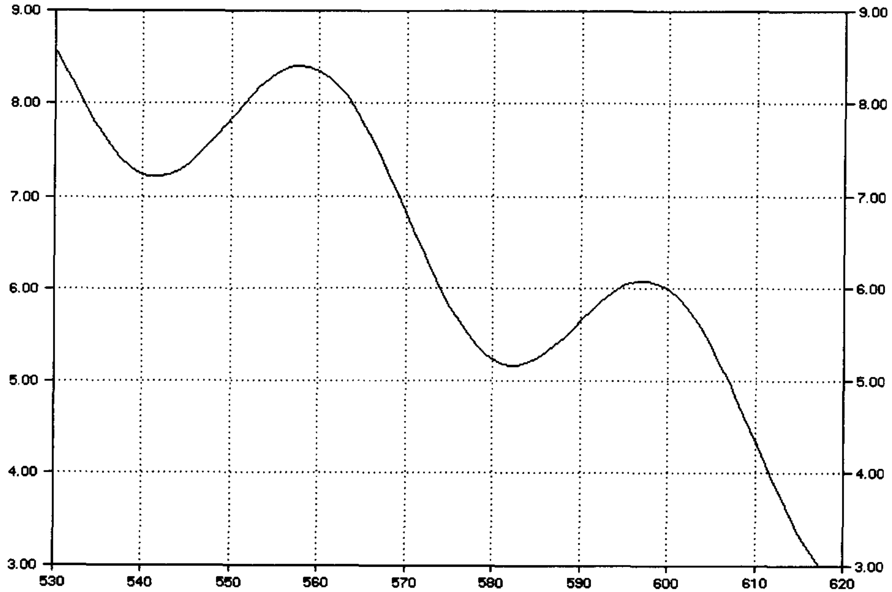

Figure 4.13. *A expanded section of Figure 4.11 showing the effect of a falling long wavelength cycle.*

those examples the long-term trend caused a price rise of $8 over a period of 40 weeks. In terms of cycles, this trend can be represented by the rising half of a cycle of wavelength 80 weeks (or 400 days) and magnitude $8. The short term trends caused rises and falls of $2 in four weeks, and was represented by a cycle of wavelength 8 weeks (or 40 days) and magnitude $2.

These two cycles, based on daily data, are shown in the two panels in Figure 4.10. The upper panel contains the cycle of wavelength 40 days and magnitude $2 and the lower one the cycle of wavelength 400 days and magnitude $8. These values can be checked by reference to the peak-to-peak and peak-to-trough distances in each case, since the vertical scales are in dollars and the horizontal scales are days from an arbitrary starting point. The addition of these two cycles to form a composite is simple. It is only necessary to take the readings off the vertical scales for each

cycle at the same point in time and add these together to produce a value that can be plotted at this same point. At point 600, for example, the reading of the upper cycle is $2 and of the lower cycle is $4. This gives a composite value of $6 that can be plotted at point 600. This process is repeated for all of the daily points available. The resulting plot is shown in Figure 4.11.

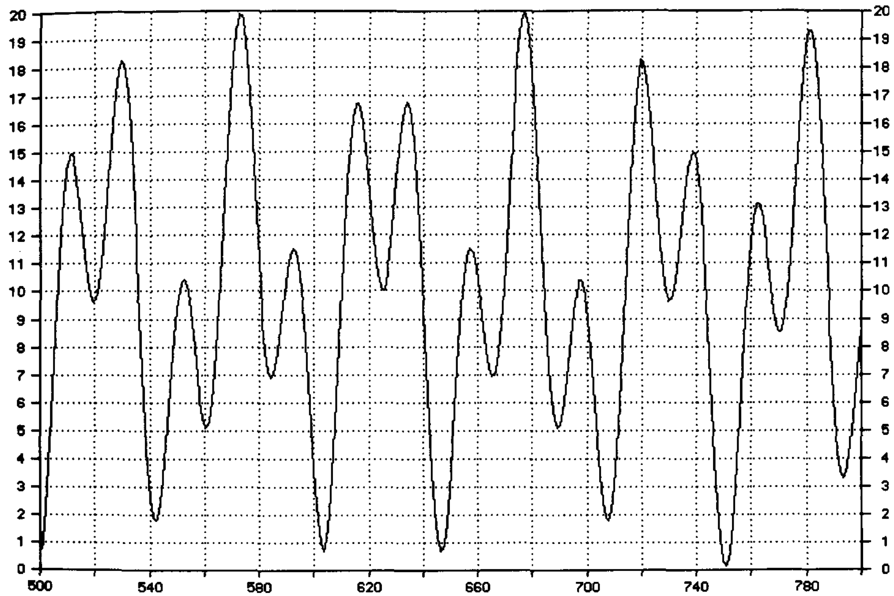

Figure 4.14. *The combination of a cycle of wavelength 21 weeks with one of wavelength 52 weeks.*

Of rather more interest is an expanded view of sections of this plot. The first, shown in Figure 4.12, shows the position between days 330 and 420. This is the section in which the long term cycle is rising. We can see quite clearly the relationship to the composite trends given in Figure 4.4. The rising legs increase the price about twice as much as the falling legs decrease it.

On the other hand, a different section is shown in Figure 4.13 where the increase in price of the rising legs is about half of the decrease caused by the falling legs.

The important point about any pattern is that the cycle with the longer wavelength and largest magnitude dominates the movement and provides the major underlying trend. This cycle is the major cycle. The second cycle, the minor one, causes a fluctuation in the major trend. Thus in Figure 4.12 the major cycle is rising, and the rising part of the combined cycle rises at a faster rate than the equivalent part of the long wavelength, dominant cycle, because at this point the minor cycle is also rising. Since the cycles are additive, the net effect is to cause a more rapid rise.

In Figure 4.13, the dominant cycle is falling, and the falling part of the combined cycle falls at a greater rate than the equivalent point in the long wavelength, dominant cycle because at this point the minor cycle is also falling.

While the additive effect of two cycles that are rising at the same time is obviously favorable, there are occasions in stock price movement when several cycles are rising at the same time. The additive effect will be at its maximum when the group of cycles has coincident low points, so that they all rise from this position simultaneously. These situations, although not common, provide an outstanding potential for profit if they can be recognized in time.

CHART PATTERNS FROM CYCLES

Chartists place a great deal of emphasis on patterns in stock price movement. In general they look for the start of a recognizable pattern and then make the assumption that the probability is that it will complete its move in the previous way. The patterns they look for include support and resistance lines, double tops, double bottoms, head and shoulders and inverse head and shoulders, triangles, flags and so on. It is perfectly possible to explain each of these as being formed by a certain combination of cycles that are present in the stock movement at that particular time.

In Figure 4.11 we showed the result of adding two cycles together of

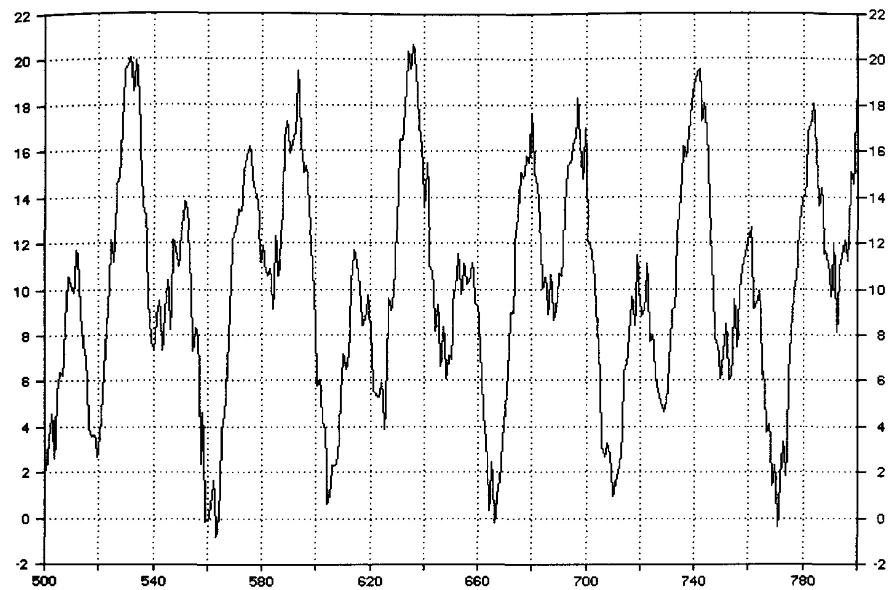

Figure 4.15. *The combination of a cycle of wavelength 21 weeks with one of wavelength 52 weeks with an added amount of random movement.*

wavelengths 40 and 400 days. It should be noted that there is a repeating pattern in the plot. For every point in the plot, there is an identical point 400 days, *i.e.* one complete wavelength of the major cycle further on. These repetitions separated by exactly one wavelength of the major cycle always happen when the two cycles that have been added together have wavelengths that are related by multiples of two. The reason is because if we start with the two peaks exactly aligned, then the minor cycle will always arrive at a peak at the same time as the major cycle, even though the minor cycle will have gone through at least one other peak in between the major cycle peaks.

Mathematically, the point when two cycles arrive at exactly the same relationship to each other as they were on a previous occasion is at a point that is the lowest common multiple of the wavelengths further on in time. Thus, if we have a cycle with wavelength 2 years and another with wavelength 3 years, the lowest common multiple is 6 years. Thus, every six years we will find that these two cycles pass through the same relationship to each other. Because of this, the combination of the two cycles will give patterns that are repeated at six-yearly intervals. If we have two cycles of 30 weeks and 40 weeks wavelengths then the repeats would be every 120 weeks.

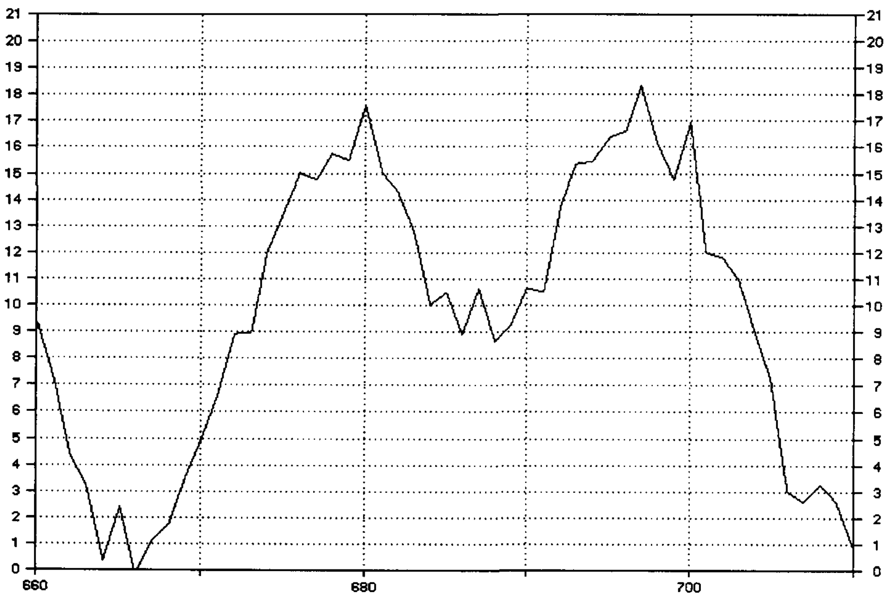

Figure 4.16. *A section from Figure 4.15 enlarged to show a double top formation.*

Figure 4.14 shows the result of combining two cycles, of 21 and 52 weeks respectively. Because of the limited span of the time axis, there are no repetitions of the visible pattern.

It is perfectly possible to add a random movement to the combination of cycles by the same additive process as was used earlier for two cycles. The result of doing this is shown in Figure 4.15. The interesting aspect of this Figure is that there are patterns present that the chartist will recognize. In order to see these more clearly sections of the plot are enlarged in Figures 4.16 and 4.17.

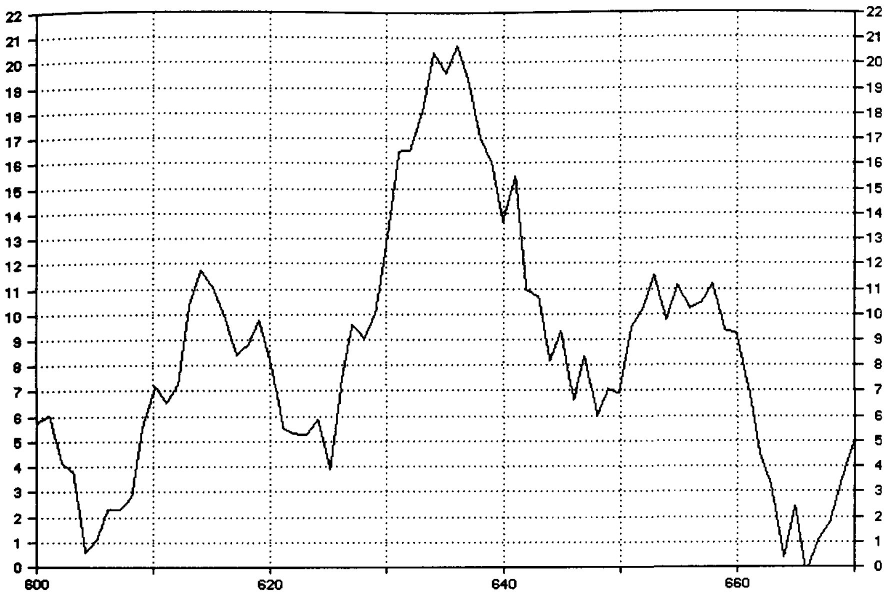

Figure 4.17. *A section from Figure 4.15 enlarged to show a head and shoulders formation.*

In Figure 4.16 we show how a double top formation occurs as the result of combining two cycles such as those used here. The addition of the random movement gives a better approximation to the patterns we see in charts of stock prices. The reason for the double top is that while the dominant cycle is passing through its maximum, the minor cycle is initially on the way down from its maximum. Once the minimum point of the minor cycle is reached, it rises again to its second maximum, giving the pattern shown. As the two cycles become less synchronized, one of the two peaks will become less prominent, until eventually the pattern vanishes altogether.

In Figure 4.17 we see a head and shoulders formation. The major cycle is just passing through its peak, and the most symmetrical version of the head and shoulders forms when a peak in the minor cycle coincides with the peak in the major cycle. Once we move away from the coincidence of the peaks, the pattern will become distorted so that one shoulder is higher than the other.

Although in these theoretical combinations, we have looked at the question of pattern repetition, in the case of real stock prices the chance of a pattern being repeated after an interval of time is low because of the variation in wavelength and magnitude. By the time two cycles are subject to such variation we arrive at the same position relative to each other as on a previous occasion, the variation in wavelength makes the relative positions quite different. Chartists concentrate more on a pattern of a general type as it develops and have a set of rules to help to decide if the pattern will become meaningful. It is the variation in wavelength and magnitude of the constituent cycles of a pattern that can cause it to fail.

CHAPTER 5

Graphical Channel Analysis—The Basics

Even though stock price movement is a complex mixture of trends, there are methods for isolating trends so they can be used as the basis for investment decisions. Investors who wish to place money for the longer term will be able to select a long term trend and time entry into this trend for the maximum profit, while short term traders will be able to choose short term trends to suit their quite different time scale. In this chapter, we will be using an approach where all we need is a chart of a stock price over a number of years, a pencil, a ruler and perhaps one of those flexible curves that enable you to draw curves of any shape. Although in the next chapter we will use calculators and computers to determine trends, starting with a graphical estimation will help build a better understanding of the various components of stock price movement and how they can be separated. The progress we make with a quite simple method will also be surprising.

In chapter 4, we explored the idea that different cycles can be combined together with random movement. This produced a composite movement similar to that shown by charts of stock prices. It was necessary to develop this theme in order to demonstrate that cycles are fundamental to how stock prices move over a period of time.

Of course, as investors, we want to do the opposite of this. First, we want to remove the random movement from our stock price data so we are left with predictable data, even though this will still be composed of a mixture of trends. Second, we want to separate this mixture of trends into its component parts. The least we want to see is a separation to the broad categories of very short term, short term, medium term and long term trends. Although these might have different meanings for different investors, in this context we can take long term trends to mean those that take a year or more to complete, medium term trends, those that take about three months to a year to complete, short term trends, those that take a few weeks to a few months to complete, and very short term trends, that only take a matter of days to complete.

Once we have categorized the trends as being in the present, we can estimate where they are in their development and how long they are likely to continue. This will give us a handle on how they should affect the stock price in the near future so that we can make a decision of when to buy and when to sell. Since there is a varying amount of random behavior in the market, we need to find ways of removing this so we can study the cycles present.

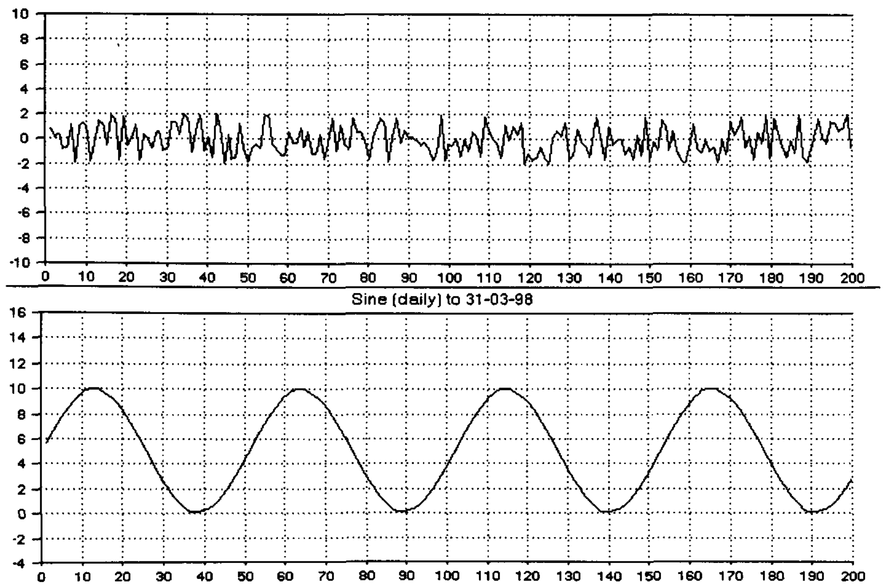

Figure 5.1. *Upper panel: random movement with a range of -\$2 to +\$2. Lower panel: a cycle with wavelength 52 weeks and magnitude \$10.*

Rather than start with actual stock market data, the principles are easier to understand if we use artificial data. This is because we know the wavelengths and magnitudes of the cycles in the data and will be able to verify that our methods give acceptable results. Once we are comfortable with the methods, we can then apply them to stock prices with the *proviso* that we know that the cycles will be subject to a variation in their wavelengths and magnitudes and that the amount of random content will also vary.

ONE CYCLE PLUS RANDOM MOVEMENT

A good place to start is with a simple combination of one cycle and some random data, using the additive method discussed in Chapter 4. The two components are a cycle of 52 weeks wavelength and magnitude of \$10 and a random movement that ranges from +\$2 to -\$2. The two separate components that are being combined are shown in Figure 5.1. The result of combining these two is shown in the upper trace of Figure 5.2.

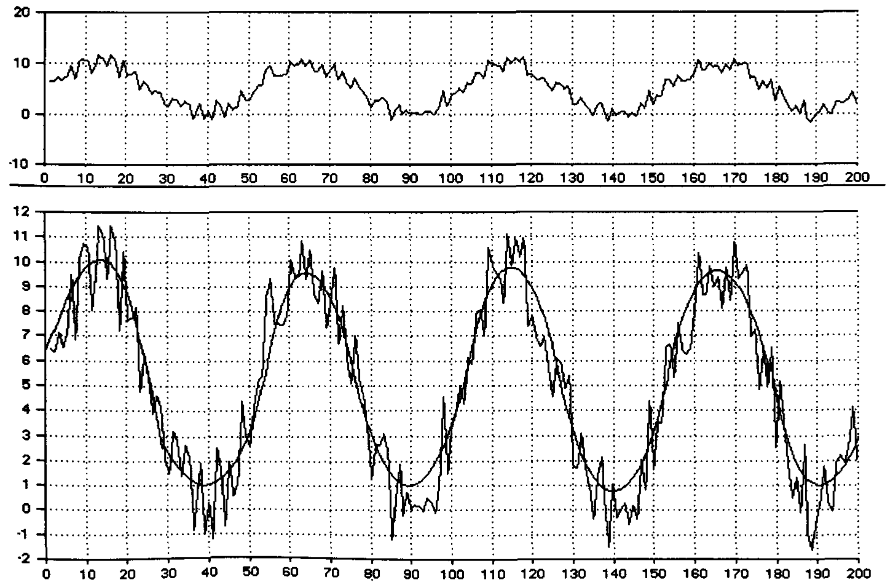

Figure 5.2. *Upper panel: the combination of the random and cyclic components. Lower panel: with the vertical scale expanded, it can be seen that a line drawn through the center of the fluctuations is close in shape to the original cyclic component.*

Finding the Cycle

If we now draw the best line we can so as to pass through the center of the short term fluctuations, we get the result shown in the lower trace of Figure 5.2. The line can either be drawn freehand or with the flexible curve. In the latter case it might be necessary to draw sections at a time. It is obvious that our line is a good approximation to a cycle, and if we examine it more closely we will find that the peaks are about 52 weeks apart, as are the troughs. Thus we can conclude we have a cycle of wavelength around 52 weeks. This is of course the wavelength used in constructing the combination in the first place, so that this simple method of drawing a line through the center of the noise has given us this vital information about the underlying wave form. Not only that, but if we examine the vertical distances between a peak and the next trough or a trough and the next peak we find they represent a value of about $10. So, not only have we extracted the wavelength, but also the magnitude with a reasonable degree of accuracy, by this very simple graphical method.

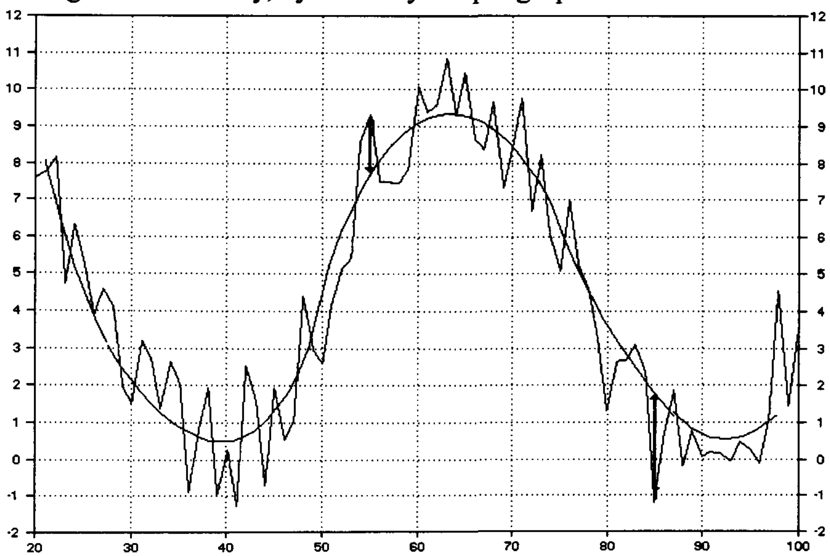

Figure 5.3. *The random movement is the difference between the line drawn through the center and the value of the data at each point across the plot. The differences at weeks 55 and 85, for example, are shown by the vertical arrows. Data below the line will have a negative sign, and those above a positive sign.*

Finding the Random Content

Since we have been able to find the cycle present in the data, the next step is to ask if we can estimate the amount of random movement incorporated into the data. The answer is yes, we can, because:

combined data = cyclic data + random data

Therefore:

random data = combined data - cyclic data

We can therefore find the random data by taking the difference between the combined data and the cyclic data that we have now isolated by the line we have drawn. This is done at each point in time as we move from left to right of the chart. This process is illustrated in Figure 5.3. The main reason for doing this is to show it is perfectly possible by this simple graphical method to determine the random movement at every point in the synthesized data. In practice there is not much value in doing this at this level of detail. This is because when dealing with random behavior it is not the individual random contributions in the past that are of interest. Such individual contributions, being random, will be unpredictable in the future. What is important is to gain an overall view of how much random content is present in the movement. Mathematically, if we know the mean and standard deviation of the random movement, we will be able to calculate the probable contribution of this random movement at any point in the future. Graphically, determining the maximum contribution of random behavior, will be extremely valuable.

A Simple Channel

We can see that in Figure 5.2 the fluctuations in the composite cycles are limited in their extent. We can emphasize this limited range by drawing a channel to contain the fluctuations. This must be done quite carefully and certain rules must be followed:

- The upper and lower boundaries of the channel must be at a constant vertical distance apart.
- The boundaries should be drawn so as to contain as much of the movement as possible.
- It is permissible to allow a few movements to penetrate the bound aries if this aids the drawing of smooth lines, but the penetrations should not be extensive.

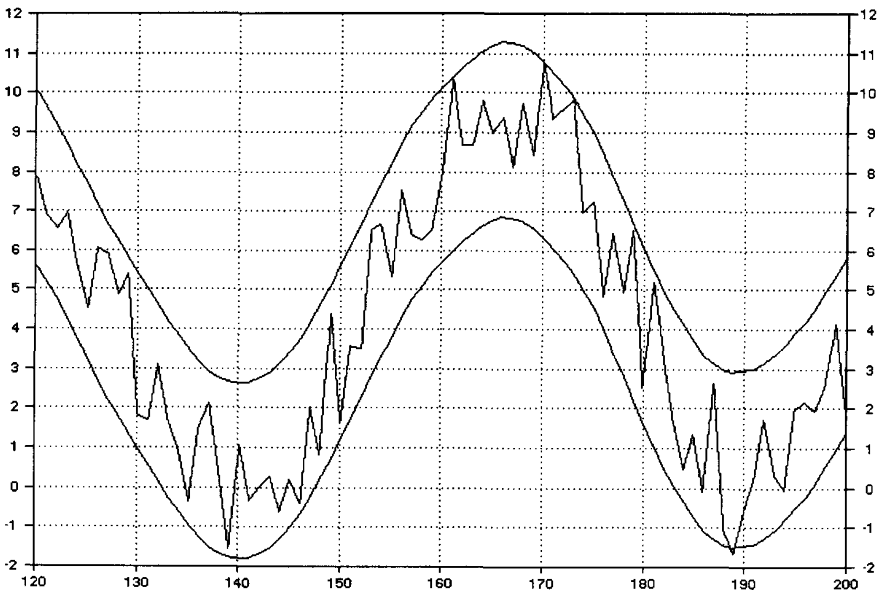

Figure 5.4. *A channel, of constant vertical depth, can be drawn so as to enclose the random fluctuations.*

Using these rules, two boundaries have been drawn to produce the channel shown in Figure 5.4. We can get a great deal of information from this channel. First, the peaks and troughs in the channel are regular, and tell us that there is a regular cycle in the data. The distance between two successive peaks or troughs is 52 weeks. This gives us the wavelength of this cycle directly. Second, the short-term fluctuations are contained in the channel. The vertical depth of this channel is close to $4, so we can say these short-term movements give a maximum excursion of $4. This is

close to the random value used in constructing the composite cycle in the first place (from -$2 to + $2). If we look at Figure 5.1 again, we will see that the extreme movement of $4 is rarely seen. The bulk of the random movement occurs in a band that is about $3.5 in height. So, by this simple exercise we have isolated the random movement and established the wavelength of the cycle as 52 weeks.

It is only necessary now to see if we can establish the magnitude of the cycle itself and we will have achieved a complete analysis of the data in the simplest possible way. The overall magnitude is given by the vertical height between a trough in the lower boundary and the next successive peak in the upper boundary. This is about $12.5. The magnitude of the 52-week cycle is the difference between these two, since the overall height includes the depth of the channel due to random movement. Thus, the magnitude of the 52 week cycle is $12.5 - $3.5 = $9.

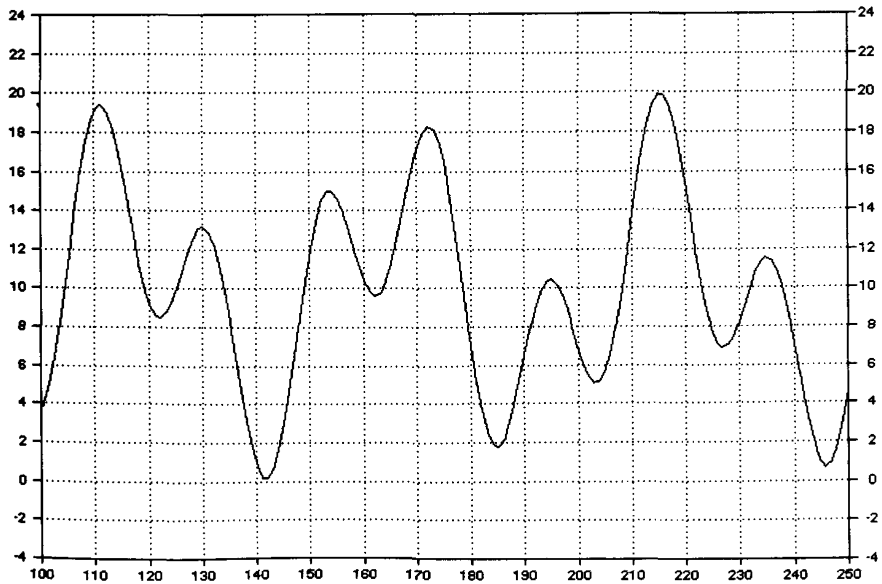

Figure 5.5. *The result of adding together two cycles of wavelength 21 weeks and 52 weeks.*

An alternative way to find the magnitude is to draw a line down the center of the channel. This line will be very close in shape to the one drawn earlier in Figure 5.2. This line is a truer representation of the original cycle, since it now has a minimum at about $0.5 and a maximum at about $9.5, giving an overall magnitude of $9. This is very close to the actual value of $10 that was used in constructing the composite waveform in the first place.

This simple example gives us a flavor for technique of channel analysis and how powerful it can be for isolating trends and random behavior in share prices. We can now move on to rather more complex sets of artificial data before applying the technique to real stock market data.

TWO CYCLES

Having seen that it is fairly simple to extract both the random movement and the cyclic movement from a mixture of the two, it is now of interest to see if we can apply the same technique to a combination of two different cycles. In Figure 5.5, we see the result of adding a cycle (cycle 2) of wavelength 21 weeks and magnitude $10 to our 52 week cycle (cycle 1) which also has magnitude $10.

Finding Cycle 1

In Figure 5.6 we show the result of drawing a channel of constant depth on the chart of these combined cycles to allow only the extreme movements to touch the upper and lower channel boundaries. The result shown in Figure 5.6 is the best compromise between keeping a constant channel depth, and drawing a smooth channel.

This exercise has resulted in the isolation of the 52-week cycle (cycle 1), because we can measure the distance between successive peaks in our channel and find they are approximately 52 weeks apart. Just as in the previous example the channel depth shows the extent of the random movement, then in the current example the channel depth represents the extent of the component of shorter wavelength (cycle 2). This channel depth is

around $10, the magnitude of this component. The magnitude of the longer-term component can be found by difference. The lower channel boundary has a minimum at around $0 and the upper boundary a maximum at around $20. Thus the amplitude of the 52 week component is $20 - $10 = $10.

Finding Cycle 2

We have already noted that the depth of the channel is due entirely to the cycle 2, and that its magnitude is about $10. The only other quantity we need is its wavelength. Noting the points where the extremes of cycle 2 touched the channel easily does this. These of course alternate between the upper and lower channel boundaries. Using the numbers on the time axis as a guide (Figure 5.6) the touching points or nearly touching places are at points 111, 122, 130, 142, 154, 163, 173, 185, 195, 216, 227, 235 and 246. These give distances in weeks of 11, 8, 8, 12, 9, 10, 12, 10, 11, 11, 8 and 11. Note that these are a constant distance apart. Although they are due to cycle 2, they are distorted slightly by the presence of cycle 1.

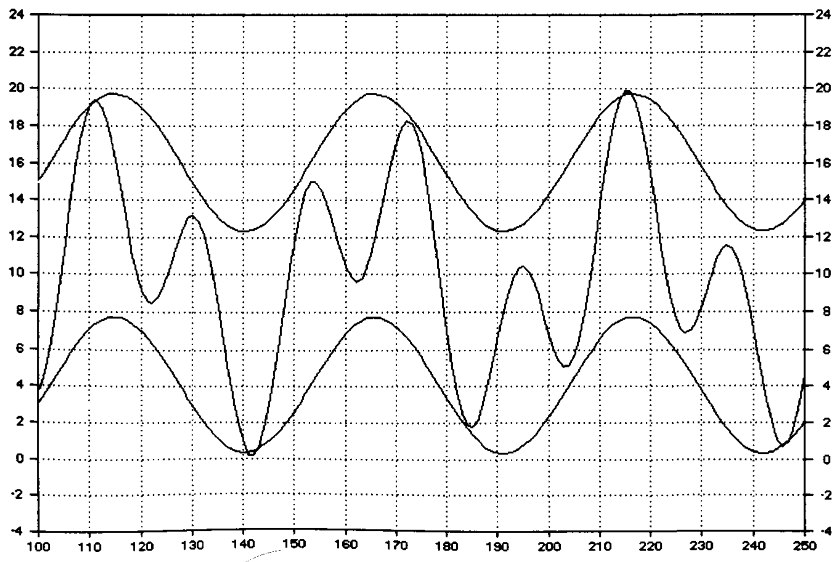

Figure 5.6. *A channel of constant depth is drawn so as to enclose only the extremities of the movement.*

The way to find the wavelength is to take a mean of all of these distances. The total is 121 for the 12 measurements, giving a mean value of just over 10 weeks. Since this value is the mean distance between successive peaks and troughs, it represents one half of the wavelength, which is therefore just over 20 weeks. This is an excellent result for the graphical method since the actual wavelength used in constructing the mixture of two cycles was 21 weeks.

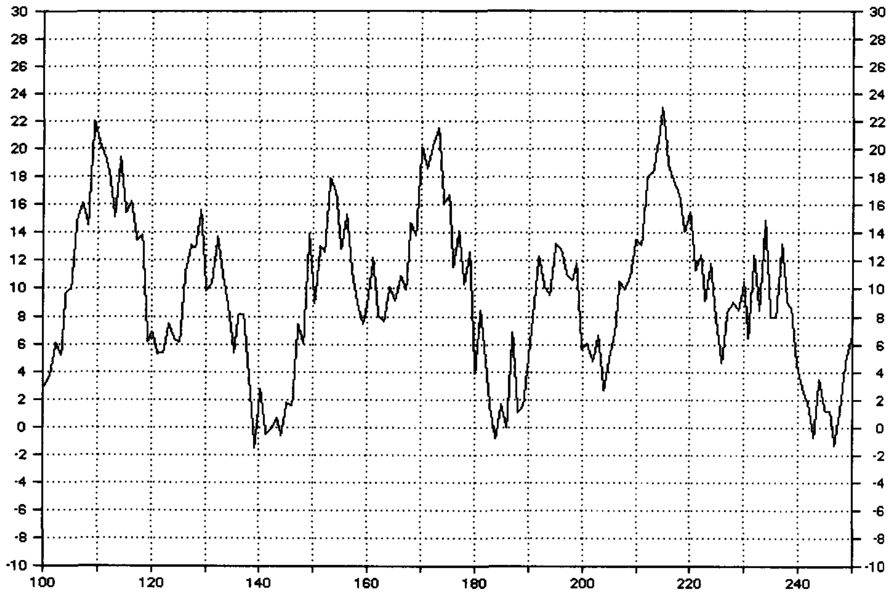

Figure 5.7. *Some random content has now been added to the combined cycles from Figure 5.5.*

Two Cycles Plus Random Movement

While we could analyze a large number of composite cycles to demonstrate the ease with which this graphical analysis can be carried out, it is only necessary to use as a final example the previous mixture of two cycles of 51 and 21 week wavelength and similar magnitude of $10 with some random movement added. Since we now have two cycles, the range of values of the random movement should be doubled from its previous of -$2 to +$2 to a new range of -$4 to +$4. This is done in order to

preserve the proportion of random movement in the total. This new composite waveform is shown in Figure 5.7.

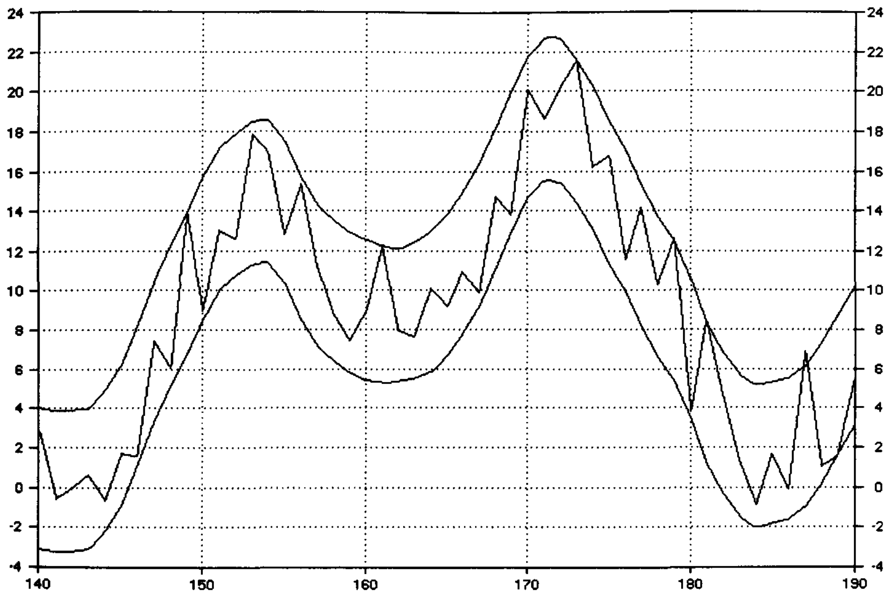

Figure 5.8. *A channel can now be drawn so as to enclose the minor fluctuations which are due to random movement.*

Finding the Random Content

In order to show the innermost channel that can be constructed; a section of the plot is enlarged in Figure 5.8. A smooth channel is drawn to keep to the rules of channel analysis. Note it is impossible to have all of the troughs on the lower boundary and all of the peaks on the upper boundary. A compromise must be made in order to keep a smooth channel of constant depth. By this means, we will see that about seven or eight peaks are close to the upper boundary, and a similar number of troughs lie close to the lower boundary.

This channel of course encloses the random movement within its boundaries. Since the random movement is not cyclical, the only property of it we can determine is the extent of the random excursions. This is given by the channel depth, about $6.5. Although we used a maximum range of $8 for the random content when building the composite wave form, the nature of random movements are very few values at these extremes of -$4 and +$4. The vast majority of the random movement lies within the range of -$3 to + $3. Thus this deduction of a range of $6.5 is therefore excellent.

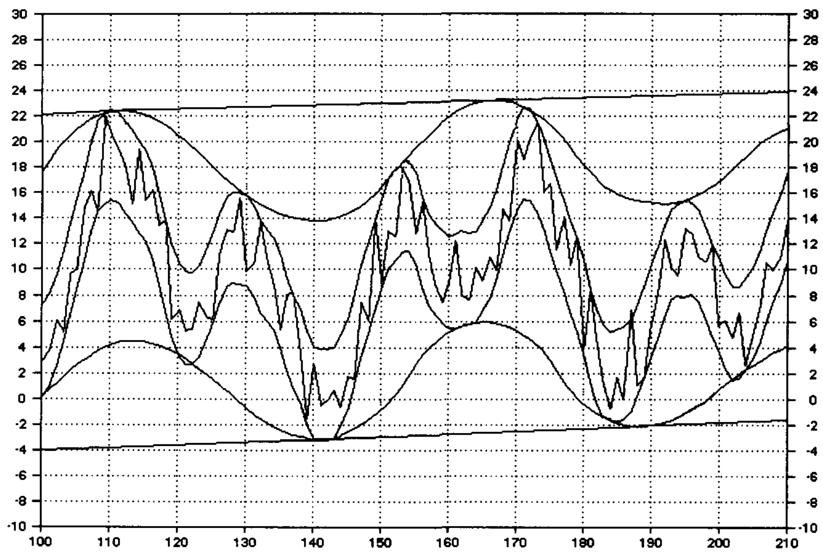

Figure 5.9. *Once the inner channel has been drawn, an middle one can be constructed of constant depth so as to enclose most of the peaks and troughs in the inner channel, and an outer one to enclose the peaks and troughs in the middle one.*

Nesting of Channels

In the previous example where we had combined two cycles without any random content, we were able to deduce the magnitudes and wavelengths of both cycles by drawing just one channel. Strictly speaking, we should have drawn another channel so as to touch the extremes of the first channel. This will be done in the present example. The idea of nesting of channels is that successive channels enclose cycles of successively longer wavelengths. Working from the inside out, we keep drawing channels so as to touch the extremities of the next innermost channel until we no longer have enough extremities to draw a valid channel. This is shown in Figure 5.9. We have already drawn the innermost channel as shown in Figure 5.8. The next (second) channel outside of this one is drawn to touch as many extremities of this first channel as possible, keeping to the rules about smoothness and the maintenance of constant depth. Once we have this second channel in place, we draw a third channel outside of this, again keeping to the rules of channel analysis. This channel is more or less horizontal, because there is no third cycle present to modify its envelope. If we had had quite a number of different cycles in our composite waveform, then we would be able to draw even more such channels, and indeed, this will normally be the case when we deal with long runs of actual stock market data.

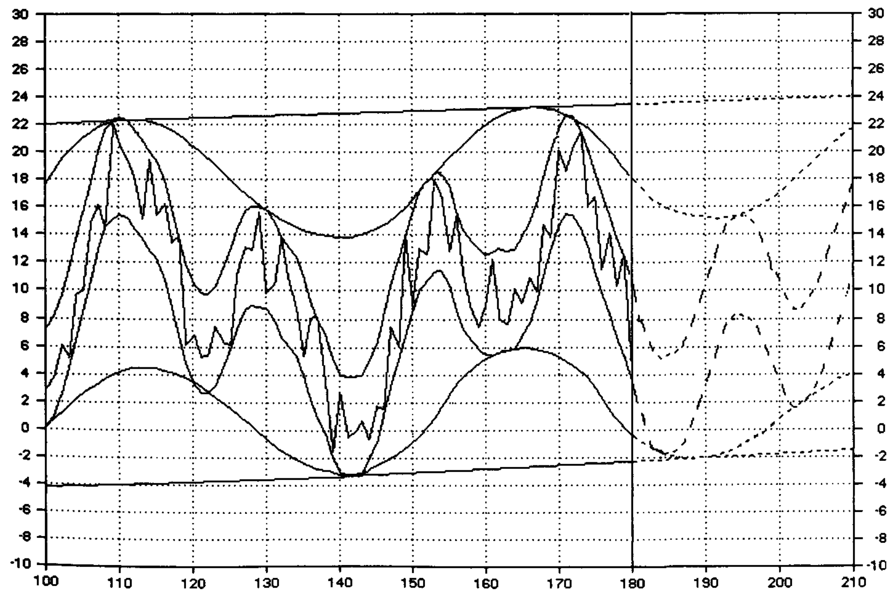

Figure 5.10. *It is possible to project channels into the future from the last available data at point 180 if the extrapolation proceeds from the outermost channel inwards.*

Finding the Magnitudes

Now that we have three channels, we will be able to find the magnitudes of the various components by difference. The principle of this is each channel encloses all those movements with the same or lesser wavelength (including the random movement) than the nominal wavelength of the channel. The channel depth is therefore the sum of the magnitudes of all of these movements. Thus, the inner channel contains only random movement and has a depth of about $6.5. The next channel contains random movement plus the movement of the shorter wavelength cycle. This channel depth is about $16. Therefore the magnitude of the shorter wavelength cycle is the difference between the two, *i.e.* about $9.5.

The outermost channel contains the movement of all the components, and has a depth of $26. The magnitude of the longer wavelength cycle is therefore the difference between its depth and the depth of the next inner channel. This gives $26 - $16 = $10.

We now have the magnitudes of the components as:

longer wavelength cycle = $10 (actual = $10)
shorter wavelength cycle = $10 (actual = $10)
random movement = $6.5 (actual = $6 to $8)

Finding the Wavelengths

The longer wavelength is found by noting the distance between the points where the middle channel touches the outermost channel. The upper boundary is touched at points 115 and 167, while the lower boundary is touched at points 141 and 191. This gives two measurements, by difference, of the wavelength: 52 weeks and 50 weeks. The mean of these is 51 weeks, which is a very close estimate to the actual value of 52 weeks.

The shorter wavelength is found by noting the distance between the points where the inner channel touches the middle channel. The upper boundary is touched at 110, 130, 154, 172 and 195, giving values of 20, 24, 18 and 23 weeks. The lower boundary is touched at 121, 142, 162, 185 and 203, giving values of 21, 20, 23 and 18 weeks. The mean of these eight measurements is 20.9 weeks, or 21 weeks to the nearest whole number. This is exactly the wavelength used in constructing the composite waveform. The analysis is now complete, and from a very simple exercise we have been able to determine from the complex waveform that there are three components—one random and two cyclical ones. We have been able to determine the magnitudes of all three components and the wavelength of each of the cyclic components with remarkable accuracy. This can only be done by strictly applying the rules of channel analysis. These rules can be restated as:

- Start with the channel that will enclose the minor fluctuations in the data.
- A smooth channel, whose upper and lower boundaries are a constant vertical distance apart, is drawn to enclose the minor fluctuations.
- The depth should be adjusted so that as many peaks as possible are close to or touching the upper boundary, with the same consideration for troughs and the lower boundary.
- In the case of very irregular data, it is acceptable to have one or two troughs or peaks penetrating the boundaries slightly. Boundaries can be adjusted inwards or outwards to achieve this aim.
- Once the inner channel is drawn, draw a channel outside of this to enclose the fluctuations in the inner channel. Keep a constant vertical depth and adjust this so as many peaks and troughs in the inner channel are close to or touching the boundaries. In the case where there are many

peaks and troughs in the inner channel it is acceptable to have one or two peaks or troughs penetrating the boundaries slightly.

- As long as there are sufficient peaks and troughs in the current outermost channel, it is acceptable to draw further channels outside of these.

One important point must be stated about the charts used in channel analysis. **These must be linear, not logarithmic.** The use of a logarithmic vertical price axis means that a channel of constant price depth would become narrower as we move towards the top of the chart. This makes the drawing of channels virtually impossible.

On a linear scale, because of the requirement of constant vertical depth, one gets the illusion that the channel is deeper where it runs horizontally, and narrower where it is rising steeply. This is just an illusion, but until the investor gets used to the way that channels should be drawn, it can cause a little difficulty.

There are several technical analysis methods that draw bands or channels on stock price data. Some of these are based on standard deviations, some on percentage rises or falls in the data, and so on. **Only constant depth channels satisfy the mathematical requirements to enable cycles to be extracted from the data in the way we have seen.**

Predicting the Future

In the following chapter, we will see how to apply the channel analysis technique to real stock market data. For the present we can show the steps followed using the synthetic data. We will assume that the actual data ends at point 180 on the horizontal time scale, as shown in Figure 5.10. Obviously, the key to predicting the movement of the price data in the near future is to make as accurate a projection as possible of the channels. The innermost channel is the one closest to the movement of

the actual data because it encloses the random movement. However, the smoothest channel, and hence the one easiest to project into the future is the outermost. **Because of this fact, the procedure to follow is the reverse of that used to produce the channels in the first place, where we started with the innermost and worked outwards.** Now, we start with the outermost and work inwards. When a channel reaches a boundary of the next outer channel, then by the rules of channel analysis, either zero or limited penetration is allowed. Thus, the channel must reverse direction to avoid this. When projecting channels forward in time, this reversal of direction must be converted into a smooth, rounded maximum or minimum, depending upon whether an upper or lower boundary is being reached.

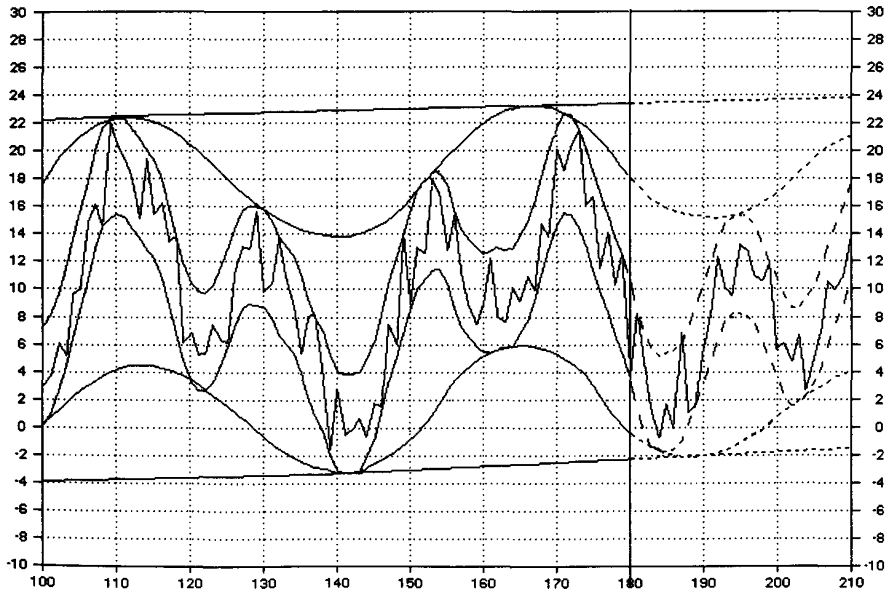

Figure 5.11. *The actual course of the data shows how accurate the prediction of channels (dashed lines) was.*

The outermost channel is running virtually horizontal, and its smooth projection from point 180 onwards is shown in Figure 5.10. We can project the next innermost channel, bearing in mind that we have established the wavelength of this channel is around 51 weeks. Because of this, we expect it to pass through a minimum. Its projection downwards from its present position will cause it to hit the lower boundary of the outermost channel at around week 188, so this is the natural point at which to make this middle channel bounce up again. As a further check, the minimum in this channel should occur at around week 188, since this is half a wavelength, 26 weeks on from the last maximum that was at point 172. Since these two facts agree, we can make the middle channel bend up again in a smooth transition from falling to rising to give a minimum at point 188. It will then keep rising for half a wavelength before peaking out again somewhere around point 214 (188 + 26). Following this line of reasoning the channel boundaries are shown as dashed lines in Figure 5.10.

The inner channel when projected forwards in the downwards direction is headed at point 180, will strike the middle channel at about point 184, and then reverse direction to rise. With the middle channel projection as shown in Figure 5.10, the inner channel will top out around point 195 and fall again towards the lower boundary of the inner channel, where it should arrive at about point 205.

In Figure 5.11 we can see the actual progress of the data from point 180 forwards. This shows that our estimate of the future course of the innermost channel was a good one. It must be pointed out of course, this estimate was based on an analysis of regular data created from regular cycles. It will be shown in the next chapter that since cycles in stock market data are subject to variation, it will not be quite as easy as the current exercise. Even so, we will see remarkable predictions achieved by this simple technique.

The further rules of channel analysis that enable us to project into the future once we have drawn channels up to the current position are:

- Work from the outside to the inside.

- Draw the outermost channel forwards in time, in a smooth

continuation of its current position at the last data point. **This is the control channel, since it determines the direction of all other channels** (Note: this is not the same as J.M. Hursts' 'control channel').

- Inner channels are drawn in a smooth continuation until they meet the boundary of the next outer channel. This causes a reversal of direction. It is important that the reversal is similar to reversals in the historical data, *i.e.* they are very smooth and rounded maxima or minima.

- We will never be able to draw the actual predicted price movement itself because of the existence of random behavior. The best we will achieve is a narrow channel within which the majority of this random behavior will be contained.

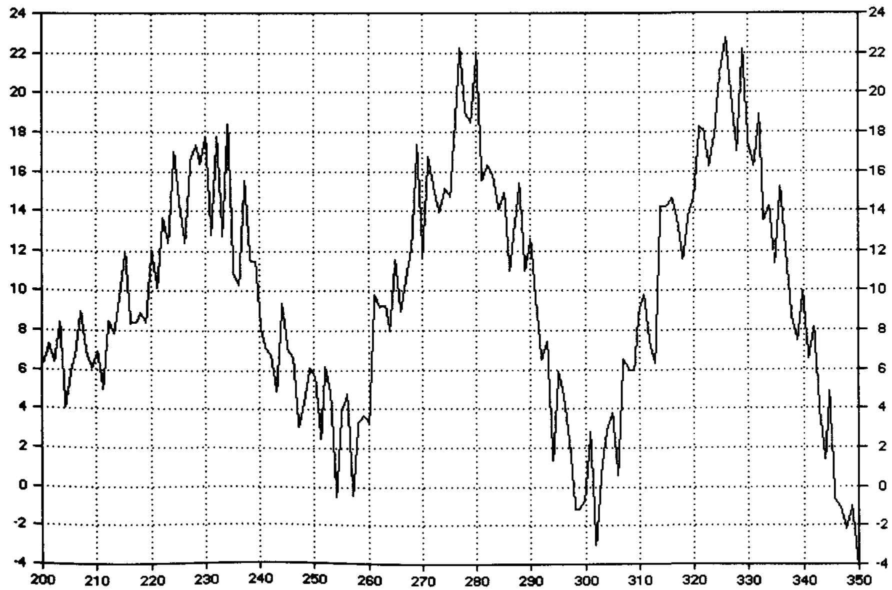

Figure 5.12. *The combination of a cycle of wavelength 45 weeks, a cycle of wavelength 52 weeks and random movement.*

Cycle Resolution

It is important to point out that the more channels we are able to draw, the better our prediction will be of future movement in the data provided the channels are quite distinct in shape. We saw with the simple example that it was possible to draw a channel to enclose each component, so that with the mixture of random movement and two different cycles we could draw three channels. From these three channels we were able to derive a great deal of information about the nature of each of the three components, but the main reason for the ease with which we could do this was because the cycles were quite widely separated in wavelength. **As a general rule, the greater the difference between the wavelengths, the easier will it be to resolve them.**

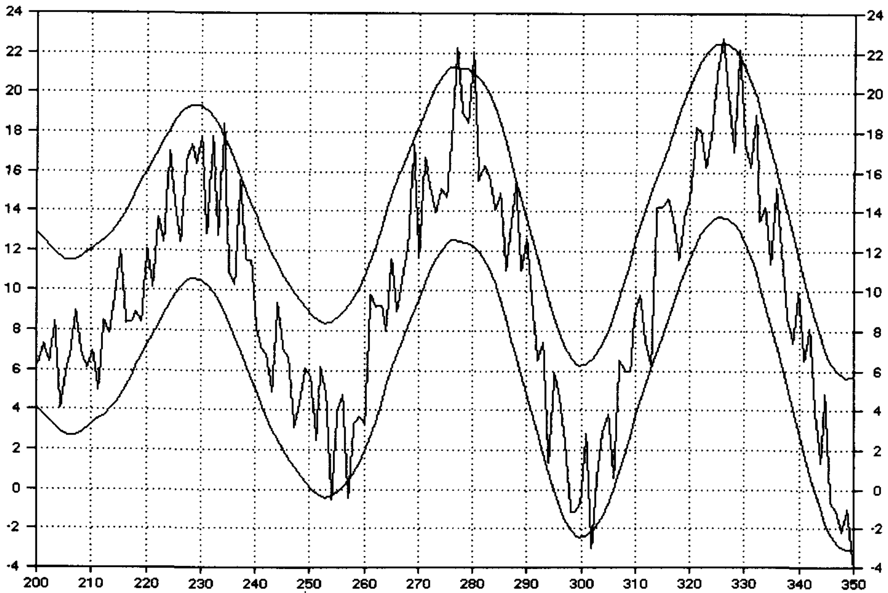

Figure 5.13. *One inner channel has been drawn to contain the short term fluctuations. The fact that it is not possible to draw a constant depth outer channel to touch each of the maxima and minima in the inner channel implies the existence of more than one cycle in the data.*

The difficulty we run into when the wavelengths of the two cycles are close together is illustrated by Figure 5.12. Here we have used the same level of random movement and the same 52-week cycle, but have replaced the 21-week cycle by one with a wavelength of 45 weeks. While it appears at first that there is only one cycle present with wavelength of about 50 to 52 weeks, it can be seen that its magnitude is changing as we move from point 200 to point 350. This change in magnitude is not caused by the random element, since that can be contained quite tightly in a channel, as can be seen from Figure 5.13. Thus, we conclude that there is at least one other cycle present. Although it is not immediately obvious, we find that the distance between successive peaks and troughs is not constant, but gives values, for example, of 22, 26, 23, 23 and 25 weeks. Since the wavelength is twice these distances, we can see that the apparent wavelength runs through the successive values of 44, 52, 46, 46 and 50 weeks. Taking the two extreme values, will lead us to the conclusion that we have two cycles present with wavelengths of around 44 weeks and 52 weeks. What is not possible to do is to gain any indication of the relative magnitudes of these two.

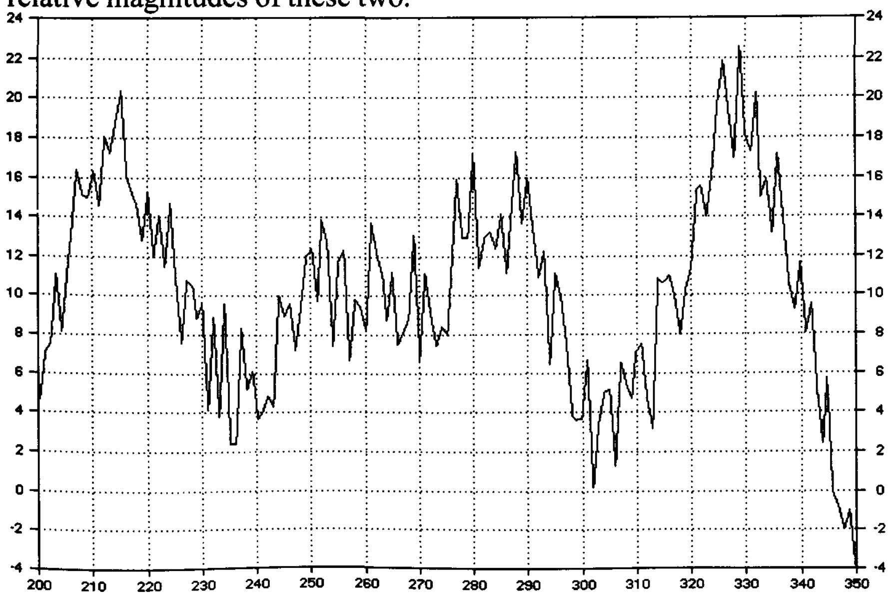

Figure 5.14. *The combination of a cycle of wavelength 40 weeks, a cycle of wavelength 52 weeks and random movement.*

If we separate the two cycles rather more in wavelength, say to 40 and 52, we get the situation shown in Figure 5.14. The center part is now distorted, giving us the much firmer impression that we are dealing with at least two cycles. We are just about at the smallest amount of separation of the cycles that will allow us to derive the magnitude of each component by graphical channel analysis. The graphics are shown in Figure 5.15. It is easy to draw the innermost channel to contain as tightly as possible the short-term movement caused by the random component. It is the next channel outward that requires some explanation. The only way in which the large vertical change in the inner channel between point 330 and 350 can be accommodated at the same time that the small changes in the inner channel in the central part of the plot is by having three peaks and two troughs in the upper boundary with coincidental peaks and troughs in the lower boundary. Finally, the outermost, third channel should be drawn so that its upper boundary is touched by the two peaks in the upper boundary of the middle channel. There are many ways in which this can be done, the two extreme positions being an upper boundary with a mini-

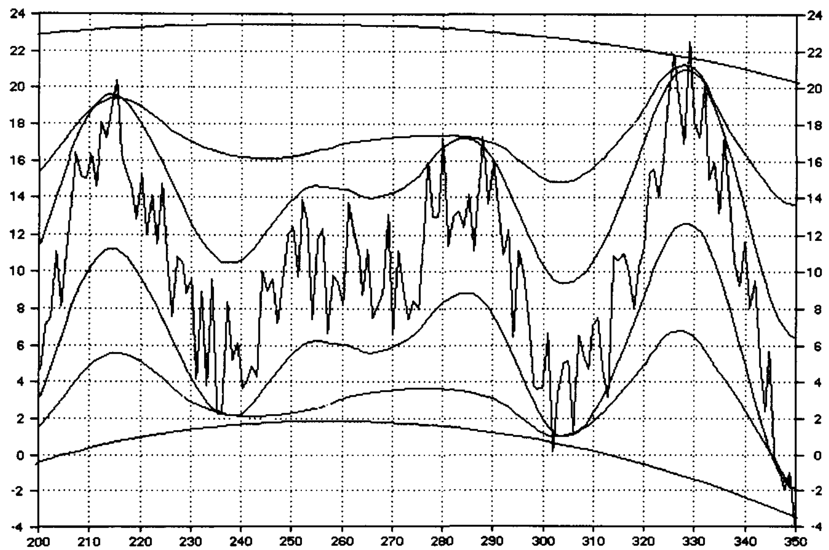

Figure 5.15. *One inner channel has been drawn to contain the short term fluctuations. The way in which the middle and outer channels can be drawn is explained in the text.*

mum in it at around point 250, or a maximum at around point 250. This is where the requirement for constant depth comes into play. The lower boundary can be drawn to accommodate the major trough at point 350 only if the channel has a maximum at point 250.

The reader should go through this exercise using tracing paper over the chart in Figure 5.15, because this practice of checking alternate boundaries constantly as we move from left to right, *i.e.* from the past to the present is essential to the correct positioning of the boundaries. The constant vertical depth requirement will usually mean that any ambiguity in positioning the channel will be resolved as we move to the next feature in the alternate boundary. If, for example the major trough at point 350 had been higher than the previous trough at point 304, then we would decide that the outer boundary had a minimum at point 250 rather than a maximum. This would lead to a completely different forward projection of the channel. Hence future predictions of the movement would not only be wrong, but wildly so. It is imperative the first drawing of channels is always considered to be a rough estimate of their position. The investor should check very carefully, making adjustments as necessary before finalizing the position.

Now that we are comfortable with the channel positions, we need to analyze the result to determine the wavelengths and magnitudes of the components.

Magnitudes

We will be able to find the magnitudes of the various components by difference, as in the earlier example. The inner channel contains only random movement and has a depth of about \$8. The next channel contains random movement plus the movement of the shorter wavelength cycle. This channel depth is about \$15. Therefore the magnitude of the shorter wavelength cycle is the difference between the two, *i.e.* about \$7.

The outermost channel contains the movement of all the components, and has a depth of about $24. The magnitude of the longer wavelength cycle is therefore the difference between its depth and the depth of the next inner channel. This gives $24 - $15 = $9.

We now have the magnitudes of the components as:

longer wavelength = $9	(actual = $10)
shorter wavelength = $7	(actual = $10)
random movement = $8	(actual = $6 to $8)

Once again, this is an excellent result for a method where the analysis is totally carried out by visual estimation.

Wavelengths

The longer wavelength is found by noting the distance between the points where the middle channel touches the outermost channel. There are not many such points. We are looking for touching of alternate boundaries successively by peaks and troughs if possible. The best such occurrences are at points 304 and 329, giving a half wavelength of 25 weeks, *i.e.* **a wavelength of 50 weeks for the longest cycle.** Since we are looking at half wavelengths, it follows that an error of one week in placement will double the error in the wavelength. So that in arriving at this value of 50 weeks compared with the actual value of 52 weeks, we have been accurate to within a week in our estimation.

The shorter wavelength is found by noting the distance between the points where the inner channel touches the middle channel. We note successive touches at points 214, 236, 254, 270, 285, 304 and 329. The successive distances, which represent half wavelengths, are 22, 18, 16, 15, 19 and 25. This gives an average value of 19, which means **our estimation of the shorter wavelength is 38.** Since we know the actual value was 40 weeks, we have made an error of just one-week in our estimation of the channel touching points which of course will depend entirely on how we have drawn the channels.

The reader will find in practicing on charts such as those shown in this chapter, the graphical method is surprisingly robust, tolerating quite a latitude in the placement of the various channels. This robustness will be very welcome when we come to deal with real stockmarket data.

CHAPTER 6

Graphical Channel Analysis—Applications

In this chapter we will apply the simple techniques developed in the previous chapter to actual data, starting with stock price data. Although we will be dealing with much more complex movements, we will see it will still be possible in most cases to come to some conclusion, not only about the direction of movement in the near future, but also a target area into which this movement is likely to take the stock price.

DATA FREQUENCY

We have mentioned that when trying to extract cycles from data, it is essential the data has been sampled at constant intervals of time. The interval can be one or more weeks, one or more days, one or more hours, etc. Long term trends are best analyzed using weekly data, while daily data is better for the analysis of short-term trends. We will see that we can fine-tune the decision point by using both data sets.

What does give rise to a difficulty is the use of the daily range of data. Daily closing prices are obviously separated by a fixed interval of a trading day, but the time relationship between the high and low prices on one day and the high and low prices the next day is a random one. Because of these considerations we will begin with examples of the channel analysis of weekly closings, then move on to the additional information that will be obtained when daily data is used. Finally, we will show some bar charts that use weekly and daily ranges. You will see that the clearest pictures are given when channels are drawn on closing prices rather than on ranges.

TYPE OF DATA

By this we mean the type of data that will give the best results when channel analysis is applied. In the last chapter we saw there was a difficulty when two cycles were quite close in wavelength. Since it was only the distortion of what looked like a single cycle, it drew attention to the fact that we probably had a mixture of cycles. When it comes to the movement of stock, currencies, commodities, etc., then the data most amenable to channel analysis by graphical methods will be those where there are a number of strong cycles present and that are widely separated in wavelength. At this point it is useful to define what is meant by short, medium and long term as applied to cycles. Investors are more used to the idea of short, medium and long term trends, and a generally accepted view is that trends can be put into the following categories:

Long term - trends of one year or longer
Medium term - trends of three months to one year
Short term - trends of 5 days to than three months
Very short term - trends of less than 5 days, including intra-day trends

Since a trend is caused by one half of a cycle, then the cycles would have the following wavelengths:

Long term cycles - wavelengths of two years or longer
Medium term cycles - wavelengths of six months to two years
Short term cycles - wavelengths of 10 days to six months
Very short term cycles - wavelengths of minutes up to 10 days.

Although these are very broad categories, they turn out to be useful in our analysis. We want to see a strong cycle present in each of these above categories, and preferably no more than one cycle in each. We also want to see the wavelengths of these strong cycles being around the middle of each of the short and medium term categories, *i.e.* around two to three months for short term and around one year for medium term. Since the degree of random movement increases as the wavelength decreases we want to avoid cycles of less than a few weeks wavelength. This of course represents the ideal, and we are unlikely to find it.

Visual Estimation of Cycles

In the next chapter we will be looking at numerical ways of determining which cycles are present in stock market or other data. In this chapter, we are dealing with simple graphical analysis, since we need a quick and easy way of estimating whether we have the types of cycles present that will enable us to use channel analysis successfully. In Figure 6.1 is a chart of the weekly closing prices of **Delta Airlines** since the beginning of 1980. The immediate impression is that there are many cycles of quite varied wavelength and these are quite strong because of the vertical movement caused by each one. The vertical grids are exactly 100 weeks apart, so it is easy to get an approximate value for wavelengths of the various cycles present. This is done by looking at low points, that can be taken at the start and end points of a cycle, does this. The start and end points of long-term cycles are marked by lows that are much lower in value than those caused by cycles of shorter wavelength. It is also usual to see some short-term cycles also start at the same point as a longer-term cycle.

As an example of a quick analysis for long term cycles, the points marked A, B, C, D and E on Figure 6.1 designate the start and end points of such cycles. Very approximately, since the grids are 100 weeks apart, the distances can be estimated as:

A to B, cycle of wavelength 100 weeks

B to C, cycle of wavelength 120 weeks

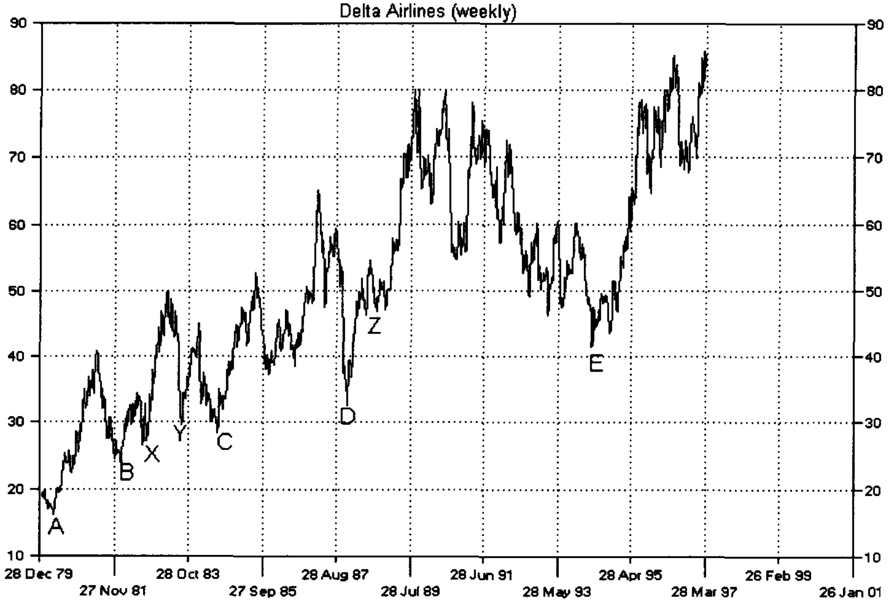

Figure 6.1. *A chart of the weekly closing prices of Delta Airlines since 1980 (see text for explanation of marked points)*

C to D, cycle of wavelength 160 weeks
D to E, cycle of wavelength 320 weeks

The distance between B and C can also be seen to contain three medium wavelength cycles:

B to X, cycle of wavelength 40 weeks
X to Y, cycle of wavelength 60 weeks
Y to C, cycle of wavelength 50 weeks

Point B is therefore the start of a medium term cycle of wavelength about 40 weeks as well as a long-term cycle of wavelength 120 weeks. A number of even shorter wavelength cycles can also be seen in the weekly data, for example the group at point Z.

In general, where a low point is particularly low in terms of historical low

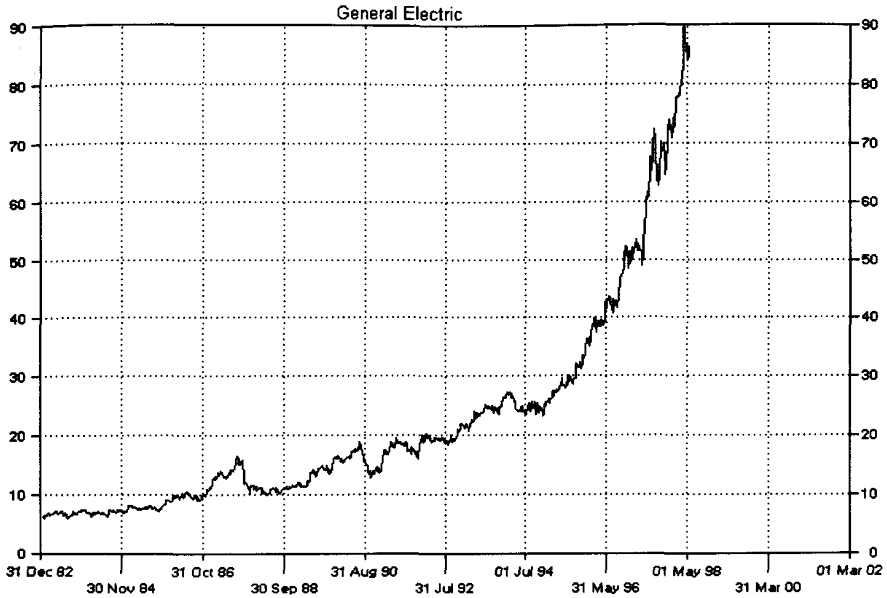

Figure 6.2. *Except for a very long term cycle, strong cycles appear to be absent in this chart of weekly closing prices of General Electric since 1983*

points, this is because a number of different cycles are all bottoming out at the same time. The opposite is true for high points that are particularly high. In later chapters we will see points in time in the near future where it can be anticipated that a number of cycles will reach their low points simultaneously are prime investment points, leading to a rapid and extensive rise in the stock price. Such points are rare, but can often be predicted. Similar predictions that a number of cycles are going to reach their high points simultaneously sound a warning that the stock should be exited speedily.

It is not necessary to spend a great deal of time on this exercise of visual estimation, and after a modest amount of practice you will be able to decide almost at a glance whether a chart is worthy of further consideration or should be discarded because there are either too few cycles or they are too weak.

Thus, a glance of **General Electric** in May 1998 (Figure 6.2) leads to the conclusion that there are not enough dissimilar cycles and that the chart is dominated by one very long wavelength that is probably coming to an end soon. Thus the criteria for a good analysis is not present and the investor should move on to another stock.

CHANNEL ANALYSIS OF DELTA AIRLINES

Now, we have seen that the **Delta Airlines** chart is a good candidate for graphical channel analysis. It is interesting to see what we can make of the position at around point E, since the stock made a very useful gain from that point onwards.

December 1994

In Figure 6.3 we see the chart as it appeared on the December 9, 1994. Three channels are drawn, and although it is rather difficult to see the

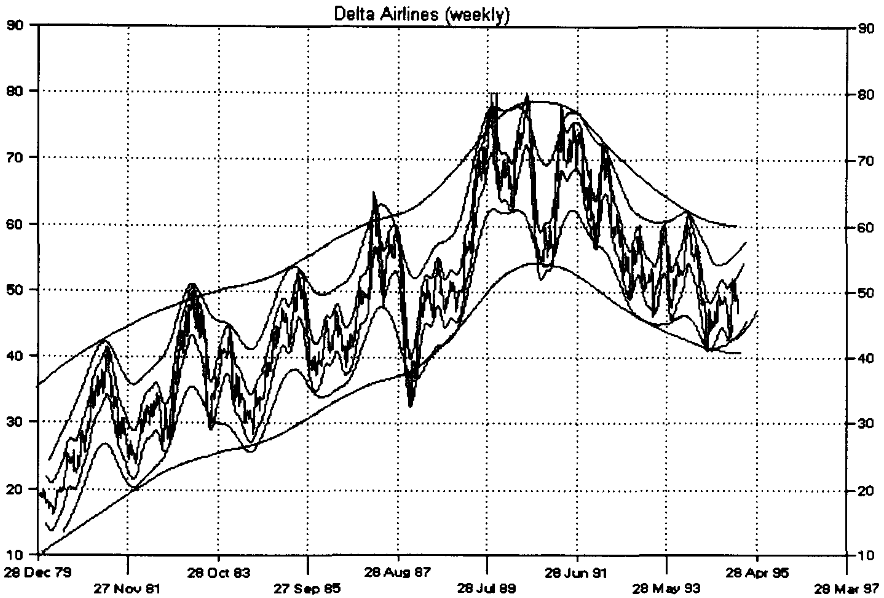

Figure 6.3. *Delta Airlines as at December 9, 1994. Three channels have been drawn. The inner and middle channels are rising, and the rate of descent of the outer channel is slowing.*

detail of the price movement within the inner channel, we are more concerned with the middle and outer channel shapes. This will give us an indication of the medium term outlook for the stock. The most recent trough in the inner channel is at a higher level than the previous trough in this channel. Because of this, we can draw the middle channel as having changed direction at the place where the penultimate trough occurred in the inner channel, so that the middle channel is now rising. Thus the medium term trend is now upwards. Normally, this would be an indication that we could consider buying the stock with a view to making a short to medium term profit. However, the contra-indication is that the actual stock price has fallen from its value the previous week, or, in other words the very short-term trend is downward. An investor should never buy until the very short-term trend has turned up, so it is necessary to wait for a rise in price before the stock can be bought.

As far as the long-term trend is concerned, we have just the beginnings of an indication the downward fall of the outer channel is beginning to come to an end. Thus the position on December 9 was:

*long term trend (outer channel) - **falling**, but expected to reverse soon*
*medium term trend (middle channel) - **rising***
*short term tend (inner channel) - **rising***
*very short term trend (current price versus previous value) - **falling***

Now everything is poised quite nicely for an imminent buying signal. This will be given when the very short-term trend changes direction. When this happens we can buy the stock, but with the reservation that if the long term trend is still down, there is much greater risk involved than if it is rising. The investor with a longer time scale would wait for a rise in the outer channel. The shorter-term investor would buy even if the outer channel is falling, but should exit the stock via a stop-loss at the first sign of a reversal of the middle channel.

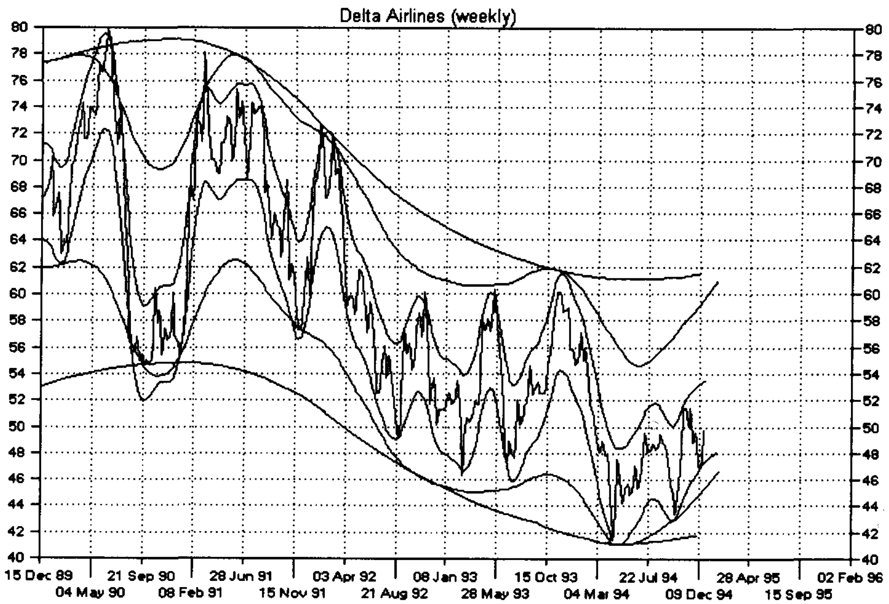

Figure 6.4. *The position in **Delta Airlines** two weeks later on December 23, 1994. The outer channel has now probably begun to rise and since the price has risen since the from that of the previous week it is time to consider buying the stock.*

In Figure 6.4 we see the position two weeks later on December 23. It took these two weeks before the very short-term trend changed direction; *i.e.* there was a rise in price from that of the previous week. This extra two weeks were also invaluable in clarifying the outer channel had probably changed direction, and was now rising. Thus the position on December 23 was:

long term trend (outer channel) - ***probably rising***
medium term trend (middle channel) - ***rising***
short term tend (inner channel) - ***rising***
very short term trend (current price versus previous value) ***rising***

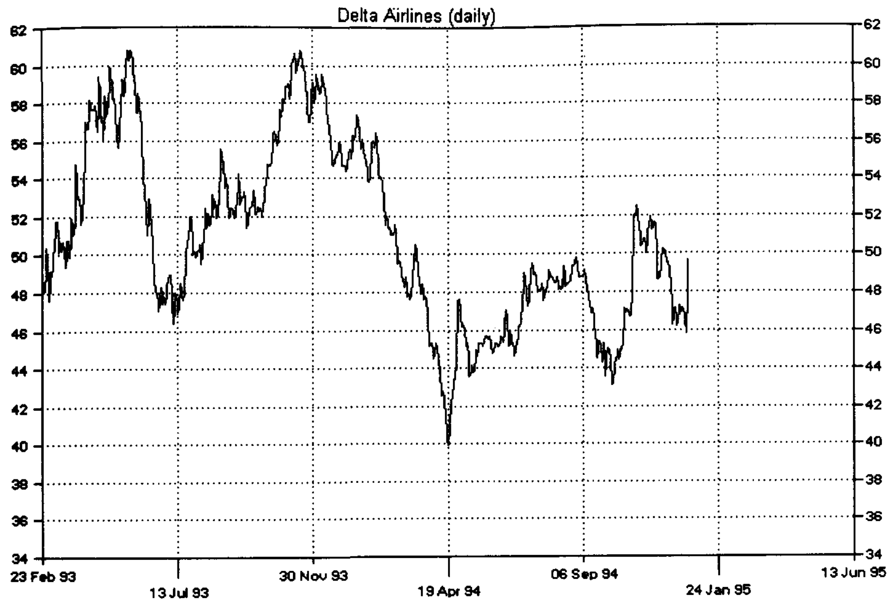

Figure 6.5. *The position in **Delta Airlines** on December 23, 1994 when daily data is plotted. There was a large jump in price from December 22.*

All signals are now at go. However, it is very useful to view the position with daily data as soon as we reach this point, because daily data will show up very short-term trends and short term trends that were not visible in the weekly data. This gives us an advantage in the situation where a short-term trend is still falling on the December 23. In such a case, waiting for this to change direction gives us a better buying price than jumping in immediately. Figure 6.5 shows the daily data chart for December 23. We can see that the stock price hovered in a band between $46 and $47 for a few days, but then made a large jump to just below $50 in a day. If we leave out the channel that would enclose the day to day fluctuations, then the two obvious channels that we can draw are shown in Figure 6.6. We can now see that there have been three fairly major low points in the recent history, on April 19, 1994 ($39^7/_8$), October 6, 1994 ($43^1/_8$) and December 22, 1994 ($45^3/_4$). The fact that these are successively higher will force a bend in the outer channel around the April low point, so that the outer channel is obviously rising. The inner channel had

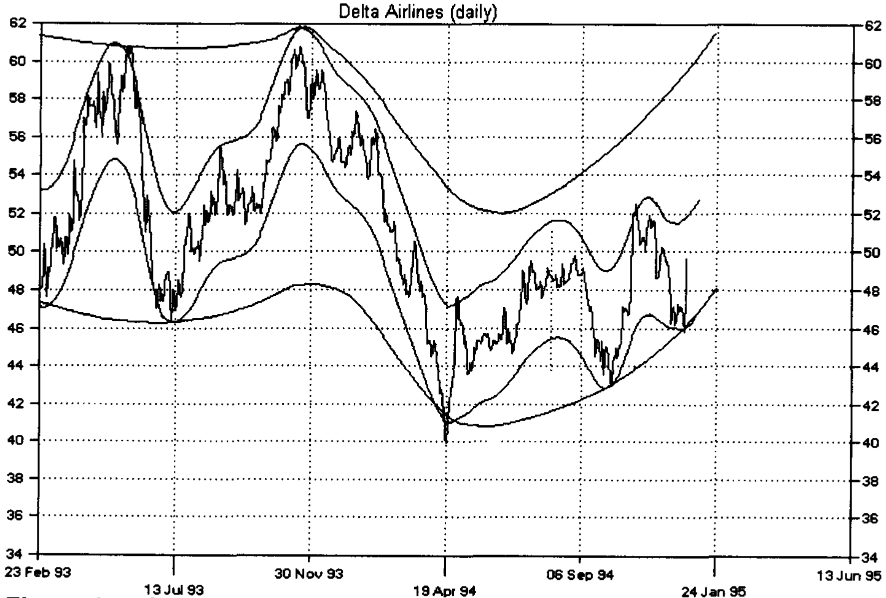

Figure 6.6. *Channels have now been drawn on the data from Figure 6.5. The outer channel can be seen to have turned up near the low point of April 1994, and the inner channel which was falling for most of December must therefore have bounced up from the lower boundary of this rising channel.*

a peak in it to coincide with the high point in the stock price of $52^1/2$ on November 2, 1994. This channel will now have arrived at the lower boundary of the outer channel, and therefore must be made to bounce back up.

Thus the daily data confirms fully the position seen in the weekly data, and the very short-term trend not visible in the weekly data is also rising. It therefore appears to be time to buy the stock.

We can fine-tune the buying decision more if we move to a chart of the daily ranges in **Delta Airlines** as shown in Figure 6.7. The only additional information in this chart that helps with our analysis is the behavior of the stock on the day we are making our decision, *i.e.* on the December 23. The stock opened at $45^7/8$, its low point for the day, and made an intermediate high of $49^7/8$ before closing at $49^5/8$. Thus, the very short-term intra-day trend is essentially rising, with a very small correction at the

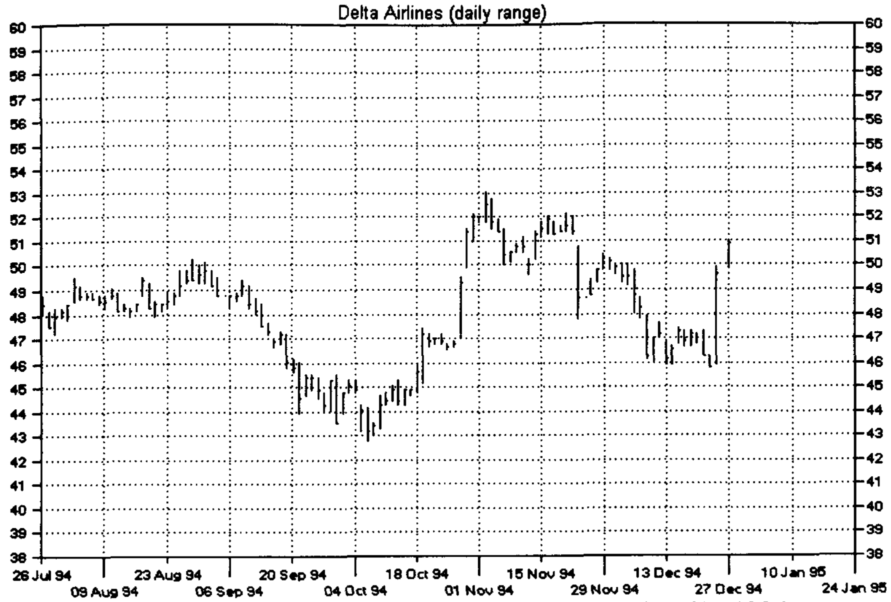

Figure 6.7. *Daily ranges in* ***Delta Airlines*** *up to December 27, 1994.*

close. Since this very short-term trend is also in our favor we would now be seeking to buy **Delta Airlines** the next trading day, which was the December 27. The stock opened at $49^7/8$ and rose throughout the day to a high of $51 before closing down slightly at $50^7/8$. The investor would have bought early in the day as soon as it was apparent the price was rising from its opening value.

This simple approach to daily ranges is to be much preferred to the estimation of the following day's trading range by means of the pivot point. This is taken to be the average of the three values of high, low and close for a day. Thus, by the close of business on the December 23 we will add $49^7/8$, $45^7/8$ and $49^5/8$ and divide by three to give a pivot point of $47^3/4$.

The next day's predicted low is then given by taking the value of the day's high from twice the value of the pivot point, *i.e.* 2 x $47^3/4$ - $49^7/8$ = $45^5/8$.

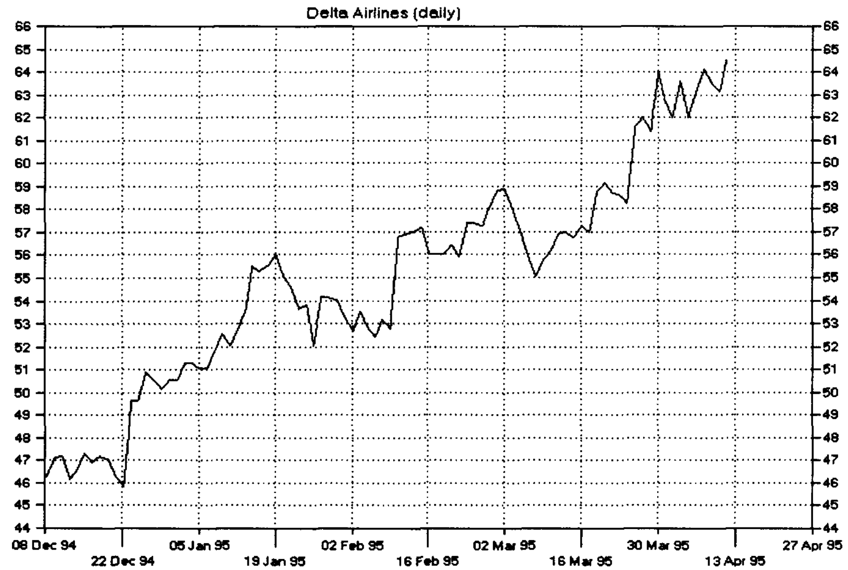

Figure 6.8. *The subsequent movement of* ***Delta Airlines*** *stock since buying in December 1994.*

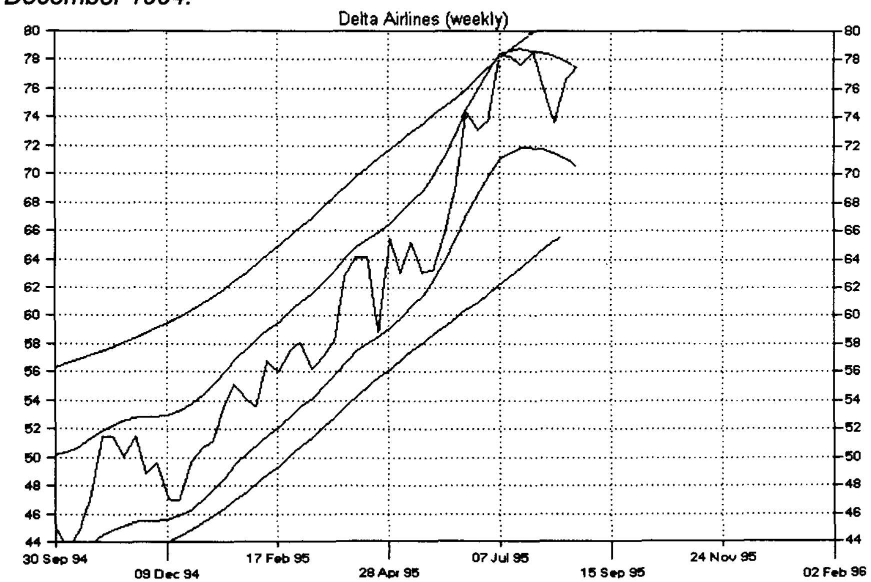

Figure 6.9. *The position in Delta Airlines in August 1995 with weekly data. The inner channel must be made to bend downwards in order to accommodate the peaks in July and August.*

The next day's predicted high is then given by taking the value of the day's low from twice the value of the pivot point, *i.e.* 2 x $\$47^3/_4$ - $\$45^7/_8$ =$\$49^5/_8$.

This gives an estimated range for the following day of $4. As can be seen from the values given for trading on the next business day, the December 27, these estimates were not very good in this particular case, and the simple method of trying to determine the trend on the next day gives much more consistent results.

The development of the price on the daily chart over the next few months is shown in Figure 6.8. In the short term the price rose to $56 by January 19, 1995 and to $64 by March 30, 1995. The latter represents a gain of 29% in three months. Although this is not spectacular, the gain is being achieved at a rate of over 100% per annum, and by any standards is very acceptable. If other stocks which displayed similar gains in similar time periods were available to move into, then we would make a compound gain of around 175% in a year!

August 1995

By late August 1995 the weekly chart of **Delta Airlines** appeared as shown in Figure 6.9. The stock made a useful advance throughout the year, and although the outer channel appears to be still rising, the investor should be concerned because the inner channel would now have to be made to turn downwards in order to accommodate the series of peaks and troughs between July 1995 and late August. In order to clarify the position, attention now turns to a chart of the daily data, as shown in Figure 6.10. This shows that because the vertical excursions between peaks and troughs in the data are much greater than the channel depth, the channel must have passed its peak position for the time being. The expanded section shown in Figure 6.11 helps to clarify exactly how the inner channel would be drawn.

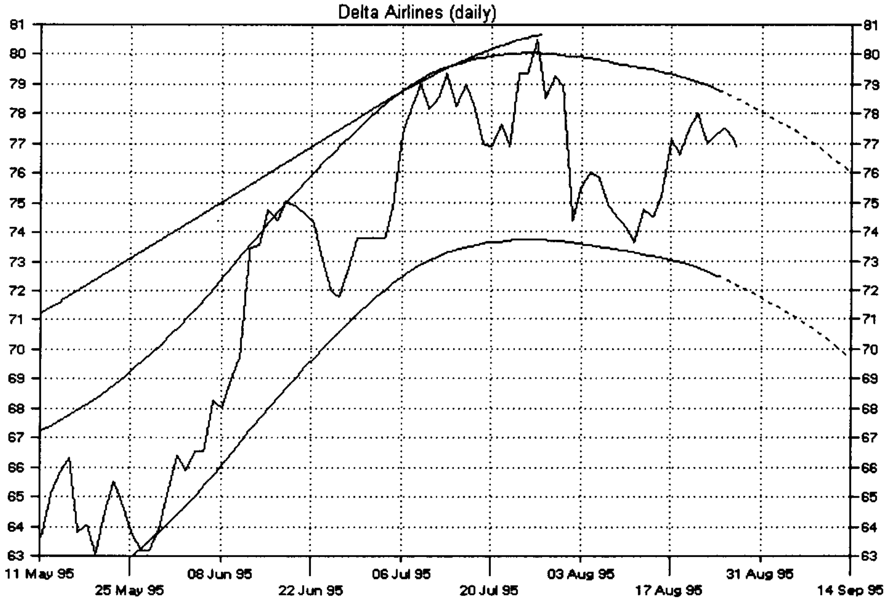

Figure 6.10. *Attention now turns to daily data in order to decide on the course of action in August 1995. The arrangement of peaks and troughs in July and August confirm that the inner channel must have topped out.*

The key features that lead the investor to the conclusion that the inner channel had topped out were the peak at $\$80\frac{1}{2}$ on July 27 and the vertical fall to $\$74\frac{3}{8}$ by August 2. The price rose from this to \$76, so the investor draws the lower boundary through the trough formed by this rise. While in this position the channel is still rising, its rate of increase is decreasing. The price then fell from the value of \$76 to $\$73\frac{5}{8}$ on August 11. It is this lower trough that is crucial, because it forces the lower boundary even lower. Because of the previous high peak on July 27, this means that the inner boundary is now definitely falling. This is a danger signal, and the investor would now be ready to sell at the best opportunity.

Since the trough has already been formed at the lower boundary, a bounce up from this position is to be expected, and the investor would probably wish to take advantage of this before selling the share. This bounce takes the price up to \$78 on August 22 before falling back to \$77. At this point in time the estimate of the position of the upper boundary puts it at about

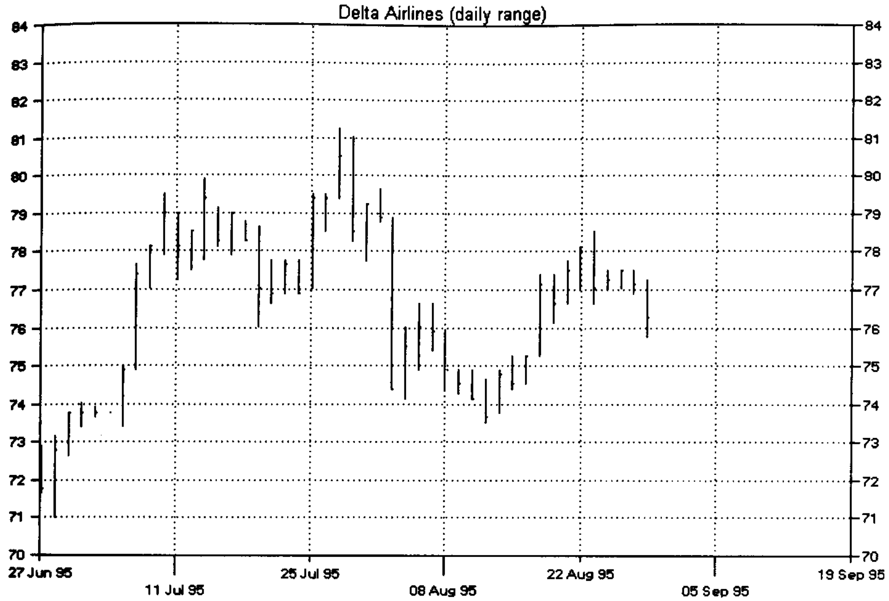

Figure 6.11. *The daily ranges in* ***Delta Airlines.*** *The last plotted bar is on August 29, 1995. A cautious investor would have sold on August 23.*

\$79. Thus the rise has taken the price to a level at which the probability of a fall is increasing rapidly, and the investor will realize that the selling point is imminent. The next rise from this trough peters out at $\$77\frac{1}{2}$ since there was a fall back to $\$77\frac{1}{8}$ in the next day, August 28. Because of this failure of the very short-term trend to rise to a higher level than the previous short term high, the investor must sell. The price closed at $\$76\frac{1}{4}$ on August 29.

A chart of the daily ranges for **Delta Airlines** is shown in Figure 6.11. The crucial period is between August 22 and 29. We noted that the close of \$78 on August 22 took the price within about one point of the upper boundary. The high for that day was $\$78\frac{1}{4}$, so that the close was only marginally lower. The next day the stock opened at $\$77\frac{3}{4}$. The cautious investor would sell at this point on August 23 since, with an open lower than the previous close, the very short-term trend is down. The less cautious investor would be hoping for a closer approach to the upper boundary than $78 and would stay with the stock. During the 23rd the price reached a high of $78½ before falling back. This was the highest level reached by the price for a couple of weeks, and the investor selling at this point would have been quite pleased. The investor who held on hoping for even better would see that the stock failed to rise above daily highs of $77½ on three successive days, while on the 29th the stock failed to reach even this level. Even the most optimistic investor would exit the stock at this point.

Thus we have seen a range of selling prices from around $77 for the investor who followed daily closes and came out at the start of trading on August 29, to between $77 and $78½ for the investor who followed intra-day movements closely.

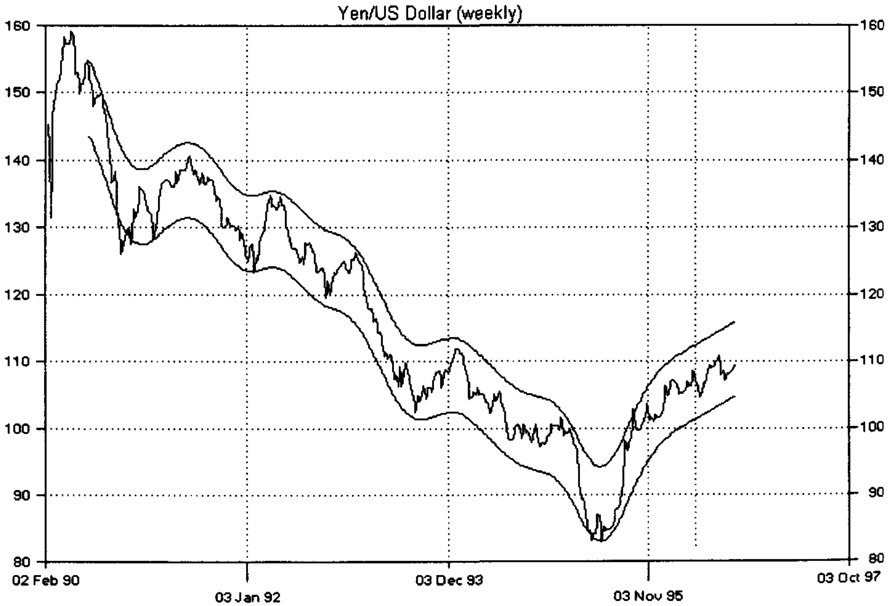

Figure 6.12. *Weekly closings of the Japanese yen versus the US dollar. One channel is drawn to show the difficulty of taking a decision in 1995 based solely on weekly data.*

CHANNEL ANALYSIS OF JAPANESE YEN IN 1995

A weekly chart of the yen versus the US dollar is shown in Figure 6.12. The prime question is whether an investor could have used channel analysis to take early advantage of the profit potential during the period May to June 1995, when the yen was trading in the 80-90 band. Clearly we can draw a channel as shown in the figure, but the rapid weekly rise and fall during the second two weeks in May would make it rather difficult to take an early decision. The first point where we would be quite satisfied that the channel was rising and the yen/dollar ratio was at the lower boundary and hence ready for a rise would be in September 1995. At this point (28th) the yen was trading at above 100 to the dollar once again, and the large move from the April low would have been missed.

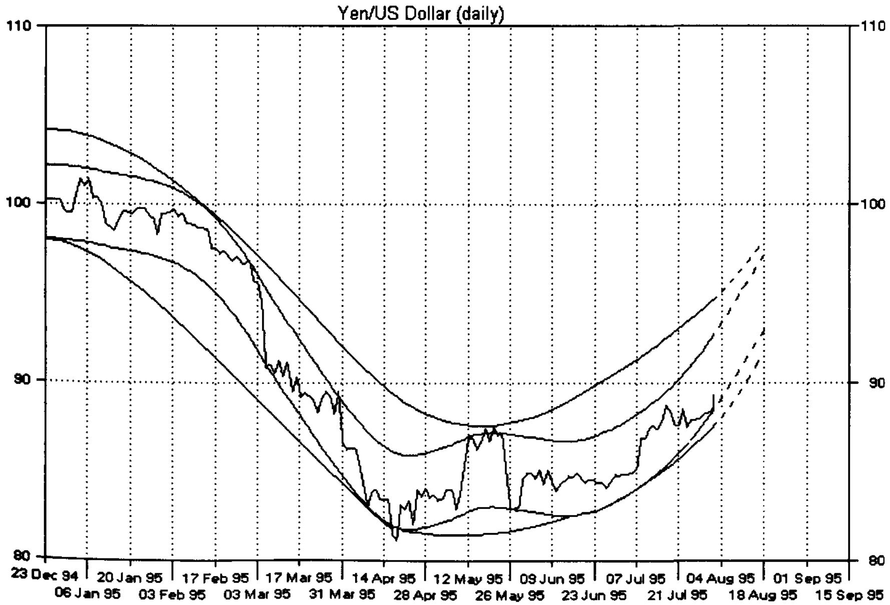

Figure 6.13. *When daily values are used the investor could take a positive view on August 2, that the dollar was strengthening since both channels appeared to be rising and the yen had just bounced up from the predicted lower boundary of the inner channel. A rise towards the 100 level by September could be anticipated.*

When daily data is used, the position would have crystallized much sooner. The center of Figure 6.13 shows the position in mid-May 1995. The yen/dollar ratio had risen slightly from its low point in April, and a trough was formed on May 9 at 82.895 because of the rise the next day to 83.84. At this point, the investor would consider the channel to be still falling, although the yen/dollar ratio is now towards the top of this channel. The rapid rise to 86.95 by May 12 took the yen/dollar ratio well above the estimated upper boundary of the channel, so that an adjustment was necessary to accommodate this new level. The adjustment would entail bending the channel upwards so that its low point was more or less coincident with the April low. Since the yen was now running along the top of the channel, the investor would have to wait for a fall to the lower boundary and then a bounce upwards to provide a trough to validate the lower boundary before any action could be taken.

The fall to 85.1 by May 25 took the yen/dollar ratio down to the estimated position of the now rising channel, but the next day a further fall to 82.875 took it well below the boundary. This would mean an adjustment to the boundary to make it turn down again. By the time the trough was formed on May 26, the channel was clearly established in a downward direction, leaving the investor on the sidelines for the time being. As time elapsed, the ratio ran along the middle of this channel, but then made a slight rise in July, culminating in a peak at 88.735 on the 18th. Turning the channel upwards once again, as shown in Figure 6.13 could only accommodate this peak. The investor is now in the same position as in May, with the yen/dollar ratio near the upper boundary of a rising channel. It was not until the August 2, with the yen at 88.305 that the investor judged the ratio to be near the lower boundary. It arrived there not by a fall, but by a sideways movement which allowed the boundary to catch up with it. At this point the investor could take action by selling the yen at around 88 to 89, and would have been very pleased by the very useful rise in the yen/dollar ratio to 104 by September 20.

CHANNEL ANALYSIS OF GOLD IN 1993

The movement of gold between December 1992 and February 1994 is shown in Figure 6.14. The most significant feature is of course the large rise in the price of gold between March and August 1993, moving from $326.4 on March 10, to $407.05 on July 30. Almost as significant is the subsequent fall back to $343.875 by September 13, 1993.

This rapid rise and fall provides a stiff test for channel analysis, since the investor would naturally have liked to have participated in this rapid rise, but would also have wished to have been warned about the equally rapid fall.

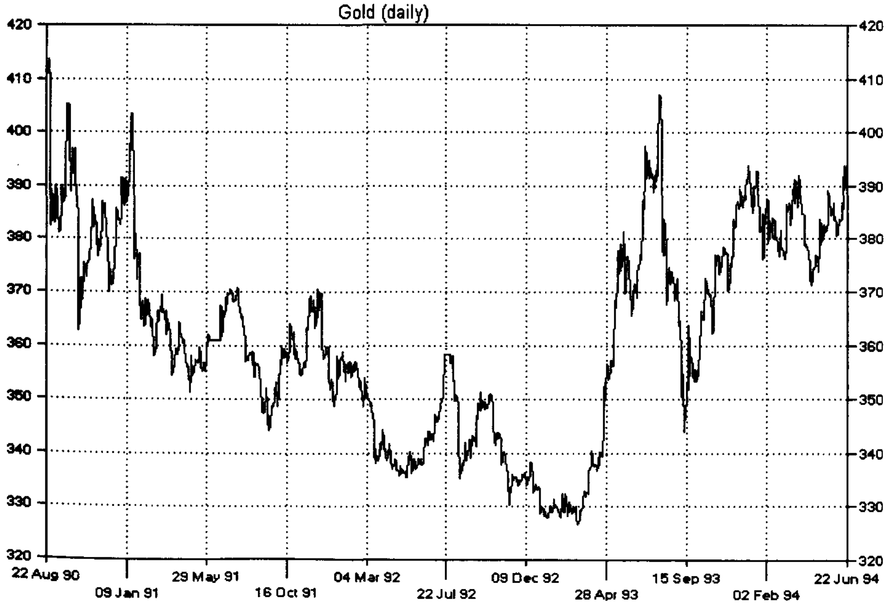

Figure 6.14. *Daily values for gold between August 1990 and June 1994.*

In Figure 6.15 the position on April 22, 1993, of gold at $340.65, has risen from $339.1 of the previous day. The two features that would encourage us to believe the inner channel is now rising are the trough at

March 10th and the peak at $340.35 on April 2nd. The only way we can accommodate both of these is by causing the inner channel to bend up-

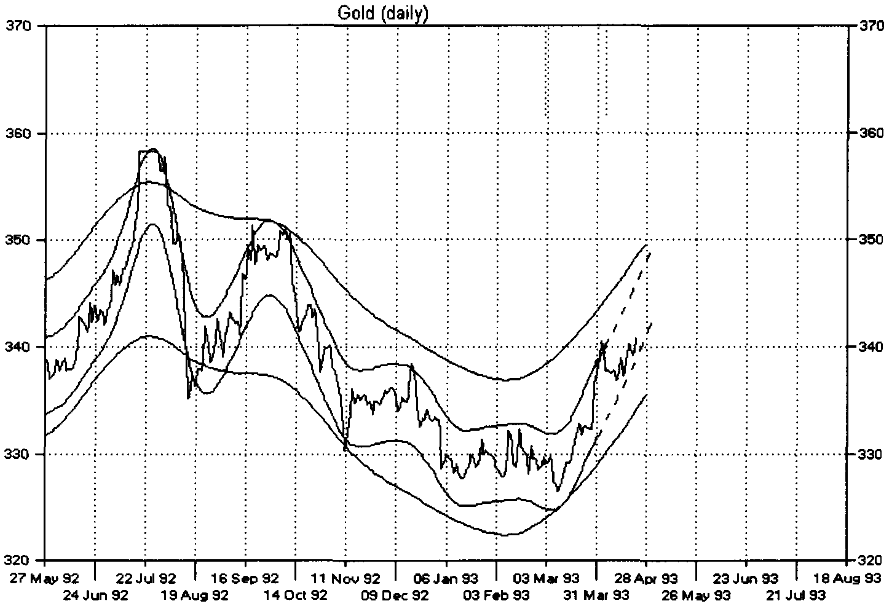

Figure 6.15. *Channel analysis of gold on April 23, 1993. The prime features that decide the current direction of both inner and outer channels are the trough on March 10 and the peak on April 2. These force bends in the channels so that they are both currently rising. This gives a positive outlook for gold in the medium term with a target of around $360 if the channels are extrapolated.*

wards with the trough on March 10 as the turning point. Once we have drawn the channel in this way, it becomes apparent that the latest trough on April 21 is at or very close to the lower boundary of the channel. Thus we can anticipate a rise of the gold price within this inner channel.

Our attention would now shift to an estimate of the position of the outer channel. At this point in time there is nothing to suggest this is not still falling. We are therefore in the position of having a medium term channel rising, and the long-term channel falling. We would therefore accept that there is a potential for profit, but that the falling outer channel will limit the probable rise in the gold price. A further point, which will be devel-

oped later, is that the inner channel is about halfway up the outer channel. These mid-channel points usually see the most rapid increase in price,

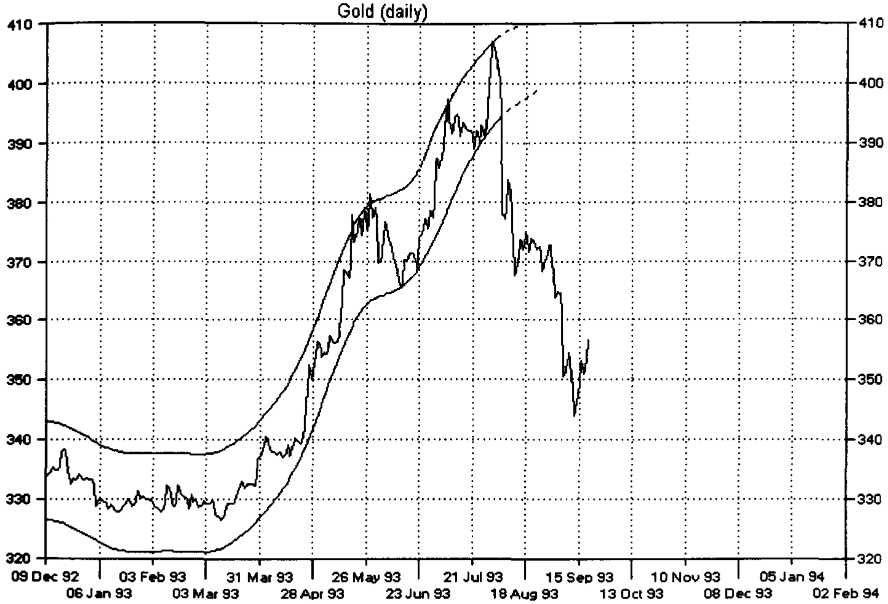

Figure 6.16. *The position in gold in early August 1993. The estimated future boundaries of the channels are shown as dashed lines. The fall through the estimated position of the lower boundary on August 5, was an indication that gold should be sold. The actual price movement until September 1993 is plotted to show that this decision would have been correct.*

and so we would expect a quick profit to be available from an investment in gold at this point. Although the subsequent rise to around $355 is in line with the predicted short-term target area, what is unexpected is the further rapid rise to just over $380. The investor who sold in late May 1993 could have gotten back in during June at a better price and benefited from a further rise to around $405 in early August.

The position on August 5, following the climb to the peak price of $407.05 on July 30 is shown in Figure 6.16. The group of minor troughs between July 21 and 27 would help to define the lower boundary of the channel as having a slight curve with its rate of climb now starting to decrease. The position of the peak on July 30 is also consistent with this decrease. By the next day the future channel direction could be estimated as shown by the dotted line in Figure 6.16.

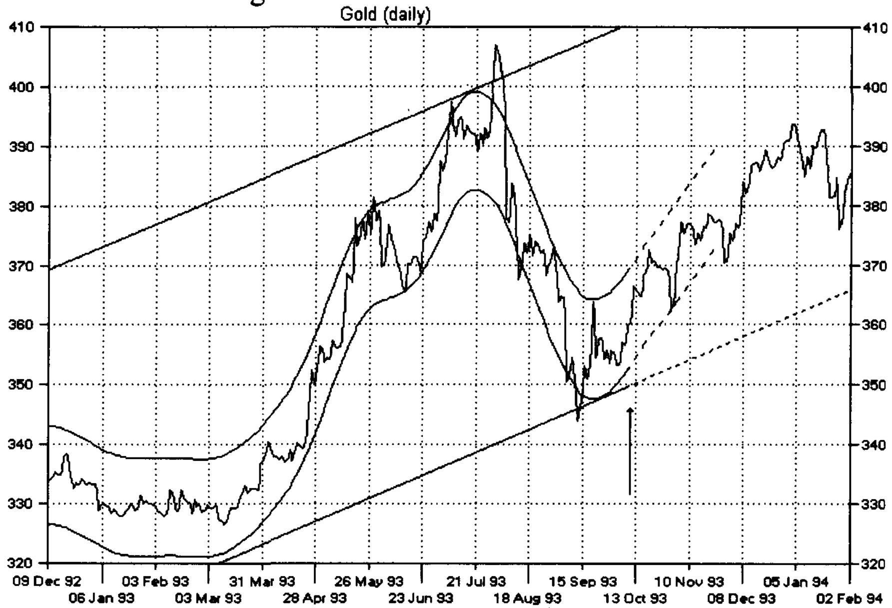

Figure 6.17. *The position in gold in early October 1993 (shown by arrow). The estimated future boundaries of the channels are shown as dashed lines. The actual price movement until February 1994 is plotted to show how good the estimation was in the near term.*

By August 4 the price had fallen over the previous few days in a series of small steps to $400.1. Since the channel depth is around $17, this brings the gold price to around mid-channel and falling. Since the lower boundary is now estimated around $392 (at the peak of $407 it was at $390, but it is predicted to be still climbing), the investor would probably decide that a further fall of $8 or so could be tolerated because of the expected bounce back up from the lower boundary once the latter was reached. However, the next day the gold price fell rapidly to $377.75, well below the position of the estimated lower boundary. Once a lower boundary is violated in this way, it is time to exit, since position of the boundary, and hence the channel, must be adjusted downwards to accommodate the new price level. This puts the direction of the inner channel firmly headed downwards, and it is time to exit gold with no ifs or buts. That this was

the correct decision can be seen from the subsequent behavior of the gold price in Figure 6.16, which fell to $343.875 by September 13.

A much clearer buying opportunity occurred once again in gold in October 1993 following its fall from the August peak to a low point of $343.875 on September 13, 1993. The position just a few weeks later is shown in Figure 6.17. As with the other turning points we have discussed, the rise from this low point to the high of $363.7 on September 21 would force us to incorporate a bend upwards in the channel, with the trough on September 13 as its turning point. From September 21 onwards we would be waiting for the gold price to arrive near the lower boundary, at which point we could buy. This happened in early October when the price fell to $353.2 before making a slight rise to $352.25. We have now formed a trough that we estimate at the lower boundary of the inner channel that is rising. We can now buy gold with the reasonable confidence that there will be a rise from this point. As Figure 6.17 shows, the price subsequently rose to a peak of $393.6 on January 1, 1994.

CHANNEL ANALYSIS OF GEC (LONDON MARKET)

The chart of the weekly closing prices of **GEC** on May 8, 1998, is shown in Figure 6.18. Before moving to the analysis of this stock, it is interesting to note the general shape of the inner channel. The magnitude of the cycles represented by the inner channel is increasing as we move from 1983 to the present time, the peak-to-peak, *i.e.* the wavelength, distance has also increased. It is also apparent that in general, the turning points in the inner channel are fairly symmetrical, *i.e.* the sections on either side of a vertical line drawn through an exact peak or trough would be almost mirror images of each other. While exact mirror images are rare (for an example see chapter 9, Figure 9.17), the channels do not deviate substantially from this relationship for some distance on either side of the turning point. This is true for channels in all markets. This fact can be used when the investor is uncertain of how to draw a channel that has just changed direction. If the new leg of the channel appears to be rising (or falling) at a rate that is grossly different from its rate of change prior to the turning point, then the channel should be adjusted to a more symmetrical position until new additional data clarifies the position.

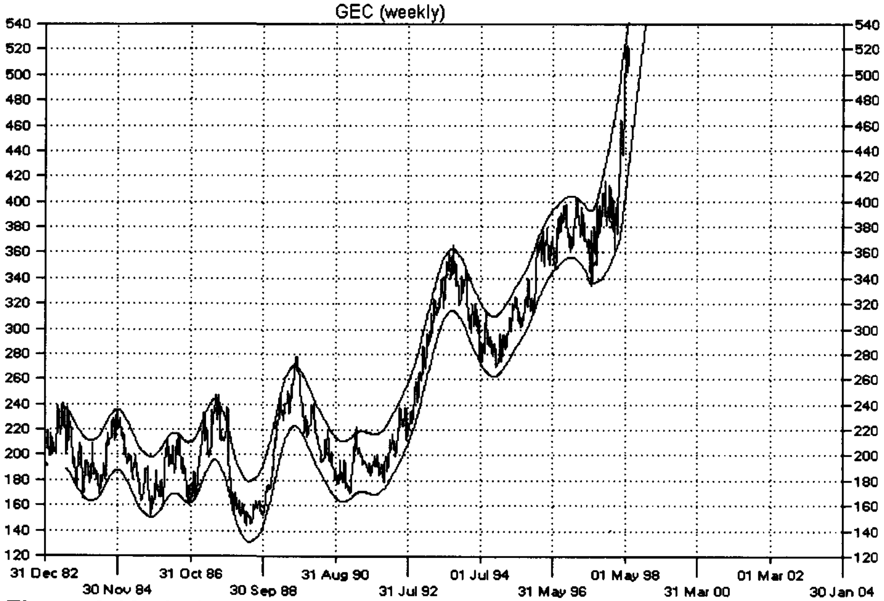

Figure 6.18. *A chart of* ***GEC*** *on May 8, 1998. Only one channel is drawn, but the purpose is to highlight the increasing magnitude of the cycles present. It is also apparent that the current rate of ascent of the channel cannot be sustained for very much longer.*

As far as **GEC** is concerned, it is interesting to see how channel analysis would have captured the rise from around 180p in December 1991 to just over 360p by late 1993, a rise of 100%. While not a rapid rate of rise, most investors would be very pleased to have doubled their money in two years.

The position in **GEC** on December 6, 1991, is shown in Figure 6.19. While the channel was obviously falling from the peak in March 1991, the two recent peaks of 199p on September 6 and 198p on October 4 are in such a relationship to each other they force the upper boundary to follow

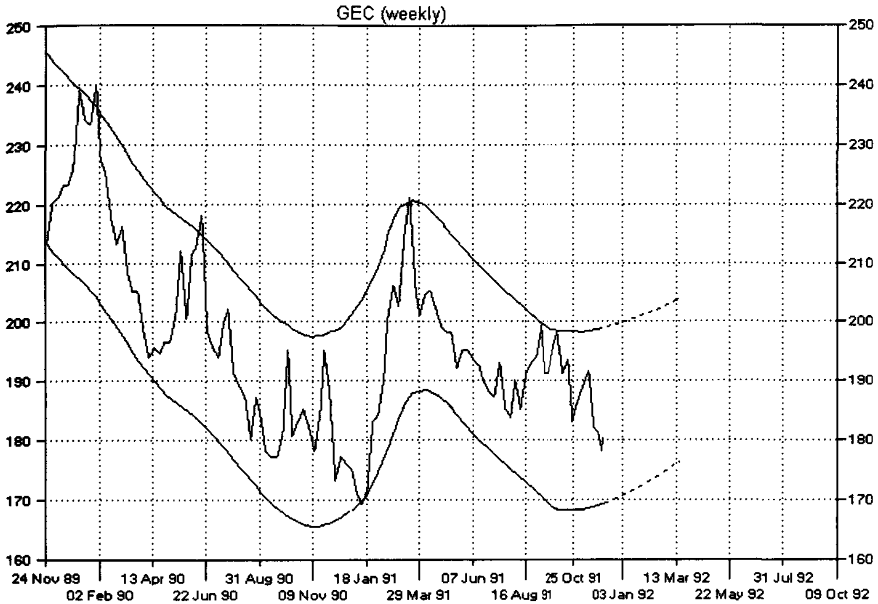

Figure 6.19. *The position in* ***GEC*** *with weekly data on December 6, 1991. The two recent peaks lead to the conclusion that the channel has now stopped falling. Because the price is rapidly approaching the lower boundary which is probably now rising, it is time to view daily data to clarify the position.*

a curve that will soon reach a minimum and start rising. The price, at 178p is therefore approaching a boundary that by this time is probably rising, and the investor will need to view daily data in order to see more clearly what is happening. The daily chart is shown in Figure 6.20. There was a trough in the data a few days earlier on December 3 at 177p. The investor is now hoping for a rise from 178p, since this would form a second trough at a higher level than the one at 177p, thus indicating a rising lower boundary. The next business day (December 9) the price did move up to 185p, so that the investor would now be ready to buy the stock.

WHAT CHANNELS REPRESENT

Channel boundaries represent the limits of excursion of all the cycles (and random movement) that have wavelengths shorter than the channel itself. Once a particular channel has been drawn, it is usually possible to determine whether it represents short, medium or long-term cycles simply by looking at it. However, to get an exact idea of the wavelength of the channel, we must look at the distance apart of successive peaks or successive troughs. If there is only one peak (or one trough), we can take the distance between this peak (or trough) and the next trough (or peak) and multiply it by 2 to get the wavelength. We will then be able to categorize

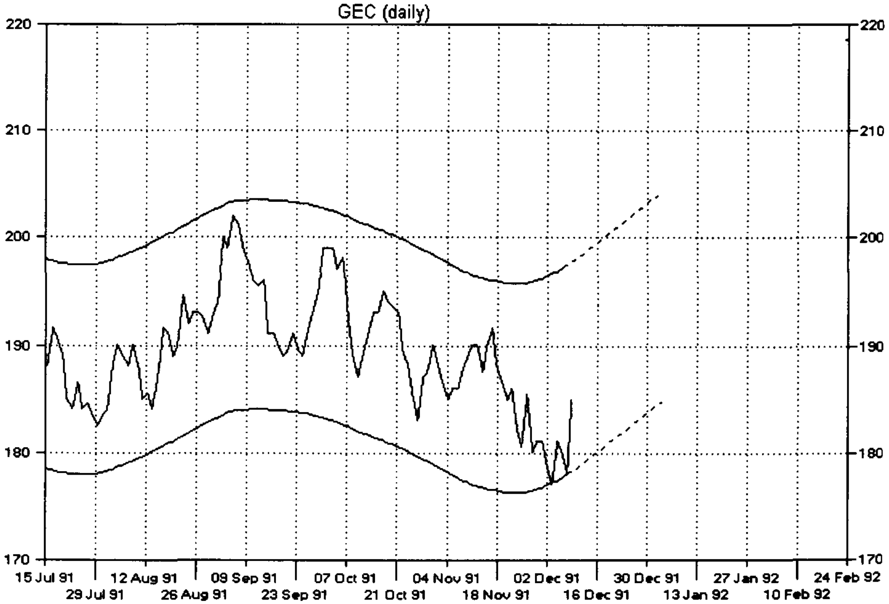

Figure 6.20. *Daily data in GEC on December 9, 1991. The price has now risen from the value of 178p on the previous business day. The trough so formed is at a higher level than the previous one, so that the lower boundary of the channel can now be estimated to be rising. The investor may now buy.*

a channel as being long, medium, short or very short term. An ideal channel analysis would give us three channels - long, medium and short term. Sometimes it might not be possible to draw the long-term channel be-

cause there are not sufficient peaks and troughs in the medium term channel to be able to draw another one outside of it. This will happen when the wavelength of the channel is greater than the time span of data that is available in the chart. The longer the amount of historical data that is available to us, the more likely we are to be able to draw a long-term channel. While it is an advantage to have a long term channel present, on many occasions we will find that we can do without it since the depth of the medium term channel is sufficient to provide us with a profit irrespective of the direction of the outer channel, although this profit will be much less if the outer channel is indeed falling. This is discussed later in this chapter.

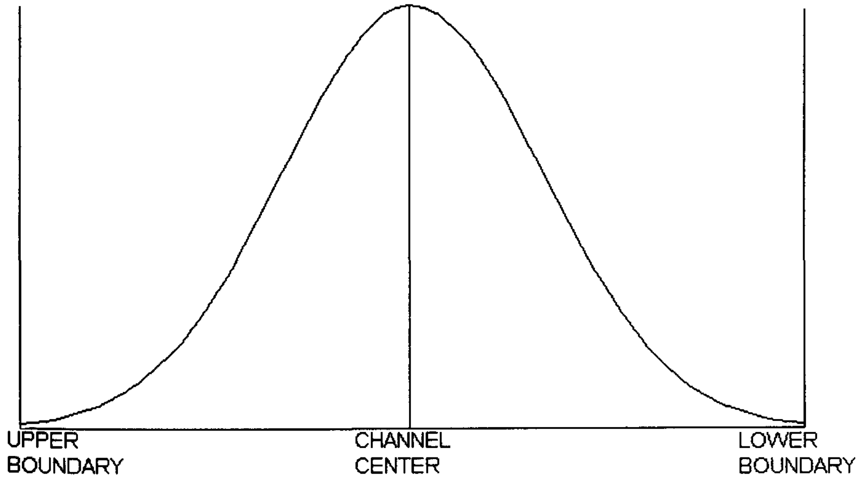

Figure 6.21. *The distribution of data values within a channel. The vertical axis represents the probability of the price being at the point relative to the channel boundaries as shown on the horizontal axis. Clearly the probability of the price being near a boundary is small.*

If we take an individual channel and look at how the stock price itself moves within the channel, we find that it spends very little time at the extreme boundaries. Most of the time the price is around the middle of the channel. For a very large number of observations we would get the distribution of prices shown in Figure 6.21. The vertical axis is the probability that a price will be at the position relative to the channel boundaries given by the horizontal axis. Those readers with a statistical knowledge will recognize the shape of this curve as being similar to that of the probability distribution. At this point, all we are interested in is the general shape of this curve. The probability of a price being in the center of the channel is very high, and the probability falls off rapidly as we move to either of the two boundaries. The boundaries themselves represent low probability areas. Depending upon how the channels are drawn, *i.e.* how much penetration of the boundaries by price peaks and troughs we allow when drawing them, then the boundaries represent probabilities of say 10% or less. The stock price will spend only a small proportion of its time at or close to the boundary, and will tend to move to an area of higher probability, *i.e.* towards the center. Therefore, if we know the boundary position exactly, and determine that a stock price is at the boundary, then it is almost a one-way bet that it will bounce back from this position. This is shown in Figure 6.22, with the theoretical (*i.e.* actual) boundary shown as a solid line.

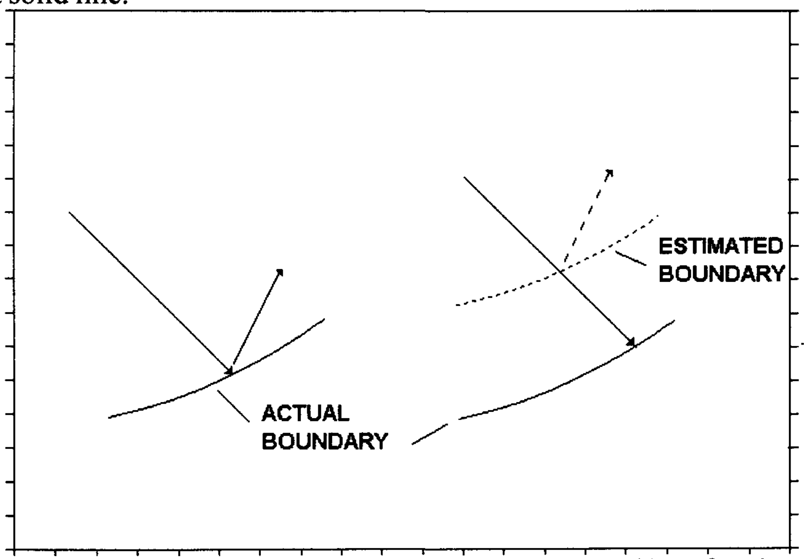

Figure 6.22. *The drawing on the left shows the actual position of a channel boundary. If, as the drawing on the right shows, we estimate the boundary to be higher than it is, then we have an incorrect expectation that the price will bounce upwards. It may well continue to fall, putting us in a losing position if we have made an investment when the price was at our estimated boundary position.*

As we will see from the many examples in this book, it is the determination of the exact position of the boundary itself that is subject to error. Such an estimate of the boundary position is shown as the dashed line in Figure 6.22.

When the stock price reaches this estimated lower boundary, we assume that the probability is now say 10% that the price will stay there, or in other words 90% that the price will bounce upwards, and take an investment decision accordingly. Of course, if we are in error, then the actual boundary is rather lower than the position we estimated on the price scale (it will not be higher because then the price would have bounced up sooner, and would not have fallen to the current level). Thus the current price is nearer to the center of the channel than we anticipated, and therefore the probability that it will reverse direction is lower than we think. The risk of being wrong about the future movement of the stock price is now very much higher.

We can see from this scenario that our prediction of future price movement depends entirely upon our estimation of the position of the channel boundary at the present point in time. Quite clearly, the more accurate we can be in the determination of boundary position, the better our trading performance will be. When we come to discuss turning points in a later chapter, we will see that it is when a channel is changing direction that our estimation of the boundary position is most likely to be in error. Unfortunately, the fact that a channel has changed direction is the most important fact we require to avoid making an incorrect investment. We therefore have to take particular care that we take into account all the peaks and troughs and their possible relationship to channel boundaries when trying to establish that a channel has changed direction.

Mid-channel Movement

One property of sine waves, important looking at the properties of channels, is the fact that the change in vertical position is greatest at the midpoint and least at the extremities. Since the channels, in their broadest sense, represent cycles, then the rate of change in the vertical position of a channel is greatest at the mid point. Translated to movement in stock prices, currencies, etc., this means that when a price is just below the mid-point of a rising inner channel we can usually expect a more rapid increase in price than when the price bounces up from a boundary. The trader who wishes to maximize the rate of return from a short term investment could therefore wait until this position is reached, rather than invest at the point at which the price has just formed a trough at the lower boundary. However, this author is of the opinion that this is taking the concept of compounding short term profits to the extreme, and a half- or full-channel profit, albeit slightly longer term, is being ignored for the sake of what might turn out to be a very truncated shorter term profit.

During the analyses of **Delta Airlines**, Gold, Japanese yen and **GEC**, several concepts have been mentioned that are now worth further explanation. These are best addressed using idealized data.

Falling outer channels

The first such concept is the question of increased risk of investing in short term trends when the outer channel which can be drawn so as to contain these trends is heading the wrong way. In Figure 6.23 we show a representation of a channel which rises to a maximum and then falls back again. Contained within the channel is a series of movements which are, by the concepts of channel analysis are due to all of those cycles of shorter wavelength than that highlighted by the channel itself.

Because of the additive nature of cycles, the result we see for the movements within the channel is the sum of the shorter-term movements plus the movement of the channel itself (*i.e.* plus the movement of the longer-term cycle). Thus we can see that during the upward sweep of the channel we have a 'two steps forward, one step back' progression, with the changes due to short term rises being about twice the changes due to short term falls. On the other hand, during the falling half of the channel, we have exactly the opposite occurring, with the effect of the falls being

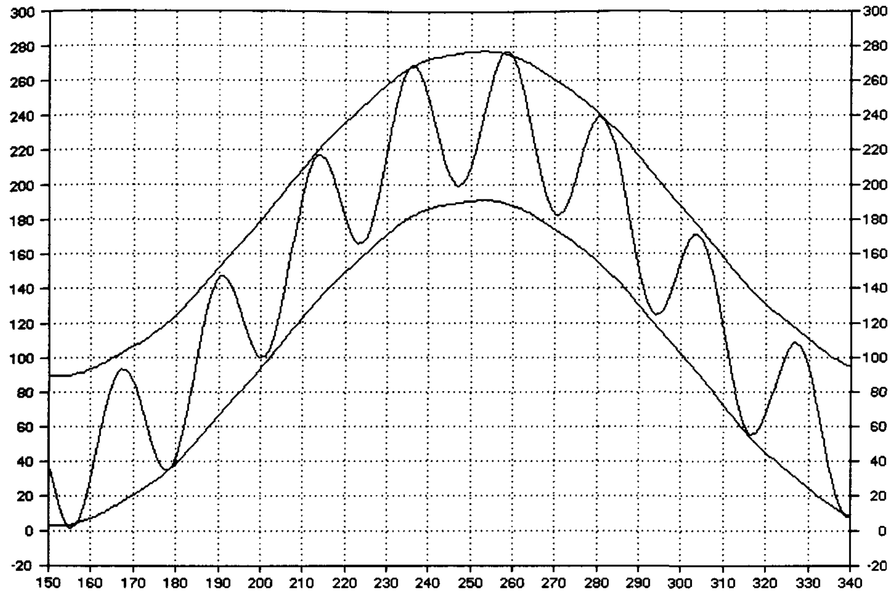

Figure 6.23. *The idealized concept of short term cycles contained within a long term channel. The additive nature of cycles means that the short term rises are enhanced relative to short term falls while the outer channel is rising. The opposite happens while the outer channel is falling.*

about twice the effect of the rises. The channels in GEC, as shown previously in Figure 6.18 showed exactly this behavior in the rise that took place from mid-1991 to the end of 1994.

Translated into risk, this means that if we invest during the upward sweep of the channel, even if our timing of entry into a short-term trend is not exact on, we will still come good quite soon. This is a manifestation of the Chinese proverb 'a rising tide lifts all boats' and means that the risk to our investment is low. If we focus on just one rise and fall of the short term trend, we can see that with perfect timing, during the upward leg of the channel, and buying at the exact minimum of a short term trend, the amount of profit we would make is about twice the amount of loss we would make if our timing was totally incorrect and we bought at the top of the short term trend. On the other hand if we buy during the downward leg of the channel, with perfect timing investing at the exact minimum of the short term trend, the amount of gain we would make is only half the amount of loss we would make if we bought at the top of the short term trend.

Thus on the upward leg of the channel, if our timing of the exact buying point is random, the odds are about 2 to 1 in our favor in this particular example, while on the downward leg of the channel, the odds are about 2 to 1 against us. In other words, in this example, the odds are around four times worse for us when we buy during the downward leg of the channel than if we buy during the upwards leg. This is why it is so important to invest when as many channels as possible are rising in order to offset any imperfections in our timing.

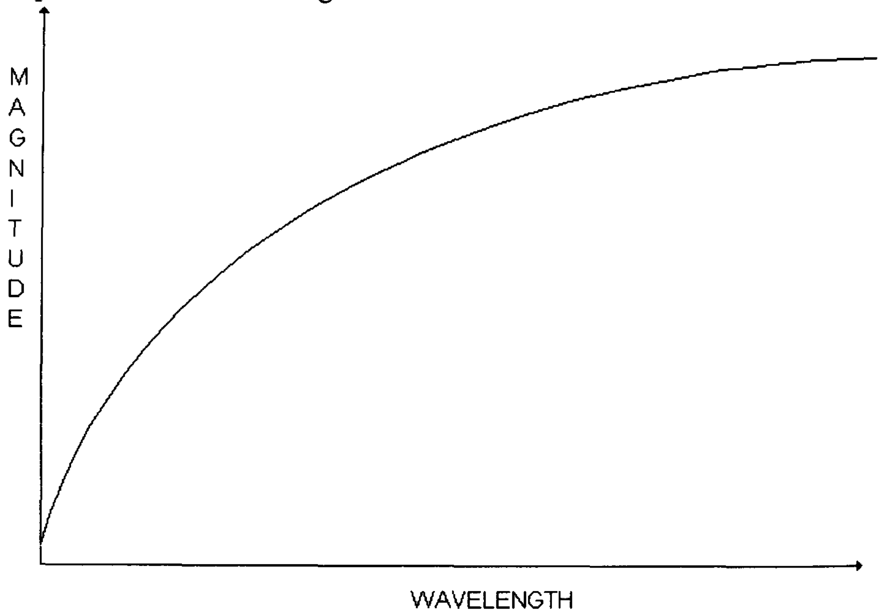

Figure 6.24. *The general form of the relationship between wavelength and magnitude of cycles. There is a minimum wavelength below which the risk in using that particular cycle as the investment vehicle becomes unacceptable.*

As our timing improves, then we can move away from the idea of risk to the question of the return that can be made. With perfect timing, we can see from Figure 6.23 that the return we would make from the short-term

trend during the upward leg of the channel is twice what it would be during the downward leg of the channel.

In Figure 6.23, there was no indication of whether we were dealing with very long term, medium term or short term cycles. The principle is the same irrespective of the wavelengths of the cycles. Whether we can accept an investment if the channel is falling depends entirely on the depth of the next inner channel. It is this latter depth that determines the potential profit, and as long as this would allow us a reasonable percentage gain, then we can still buy the stock. As we move to cycles of shorter and shorter wavelength, then the channel depth decreases. This is because as mentioned in a chapter 4, the magnitude of cycles decreases with decreasing wavelength, and the rate of fall off of magnitude increases sharply as we move to shorter wavelengths. This relationship is shown again in Figure 6.24. Because of this fact we will reach a point at which the return is not worth the risk of investing as the cycle wavelength represented by the channel falls, because the trends contained within the channel have reached the critical lower limit. We will find usually that this point is reached with channels that correspond to cycles that we defined earlier as being of medium wavelength.

In the Delta Airlines examples (Figures 6.3 - 6.6) which we have used, the middle channel corresponds to the medium term cycle. If this channel is falling, then we should not invest. It is only when the outer channel, which in this case corresponds to the long term cycle, is falling and the other inner channels (*i.e.* medium and short term cycles) are rising that it might be acceptable to invest as it is appreciated that the profit will be sharply reduced. Even so, this is only to be recommended if it is not possible at the time to find a stock with much better channel characteristics.

Reversal of Channel Direction

In the charts of **Delta Airlines** shown earlier, we made the point that both the inner and outer channels had changed direction around April 19, 1994.

If we look at the enlarged section around that date as seen in Figure 6.10, then we can discuss in more detail why we considered that this was a channel turning point.

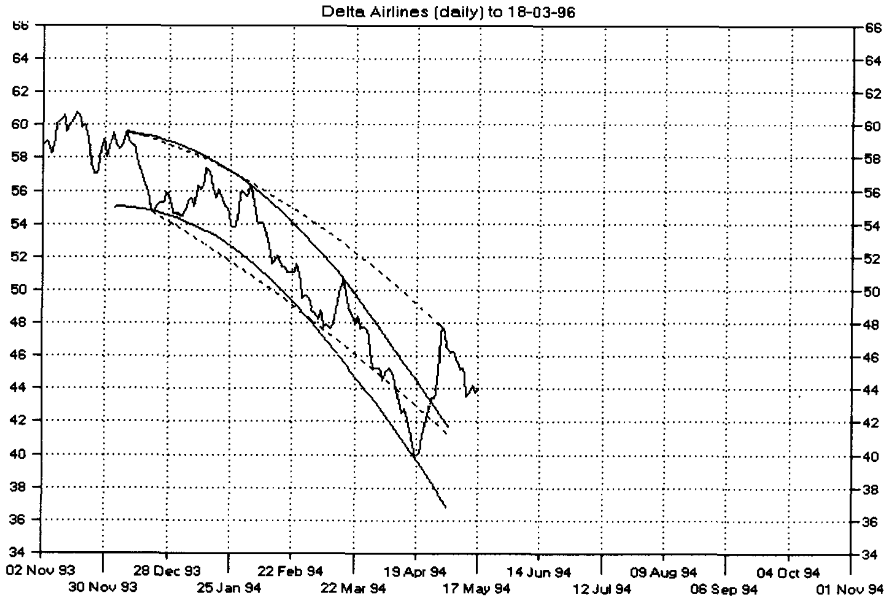

Figure 6.25. *Delta Airlines - once the trough had been formed on April 19, the channel would have been drawn as shown by the solid lines so as to accommodate this trough and the previous peak on March 10. Once the price rose above the upper boundary and eventually formed the peak shown, then the upper boundary had to be raised to the level shown by the dashed line. However, this would cause a major violation of the channel by the major trough which is not acceptable.*

Once the price rose from the low point at $\$39\frac{7}{8}$ on April 19, to form a trough, we would be able to draw the lower boundary of the channel so as to accommodate this trough on it. The peak of $\$50\frac{1}{2}$ reached some weeks previously on March 10, has also to be taken into account. The best constant depth channel that would be drawn from the data available a day or two after April 19, is shown in Figure 6.25. The channel can be extrapolated into the future as shown by the solid line, and at this point in time there is no violation of either the upper boundary or the lower boundary of the channel. The investor is therefore comfortable with this channel direction, and since it is still falling would take no buying action. However, after a few more days the price has risen quite sharply, and is soon just above the level at which we have drawn the upper boundary. At this point, we could accept this slight penetration of the upper boundary as part of the normal allowable penetration, but the price continues to rise even further, reaching a peak on May 2, 1994 at $\$47\frac{5}{8}$. Now we are in difficulty, because if we adjust the upper boundary so as to place this peak on it, as shown by the dashed line in Figure 6.25, then the new lower boundary (also shown dashed), will be well above the lower trough, *i.e.* the trough penetrates the lower boundary by an unacceptable amount.

Thus we have two extreme positions of the channel, the upper one which gives too large a penetration of the lower boundary by the major trough, and the lower one which gives too large a penetration of the upper boundary by the major peak. The only way in which we can keep the vertical

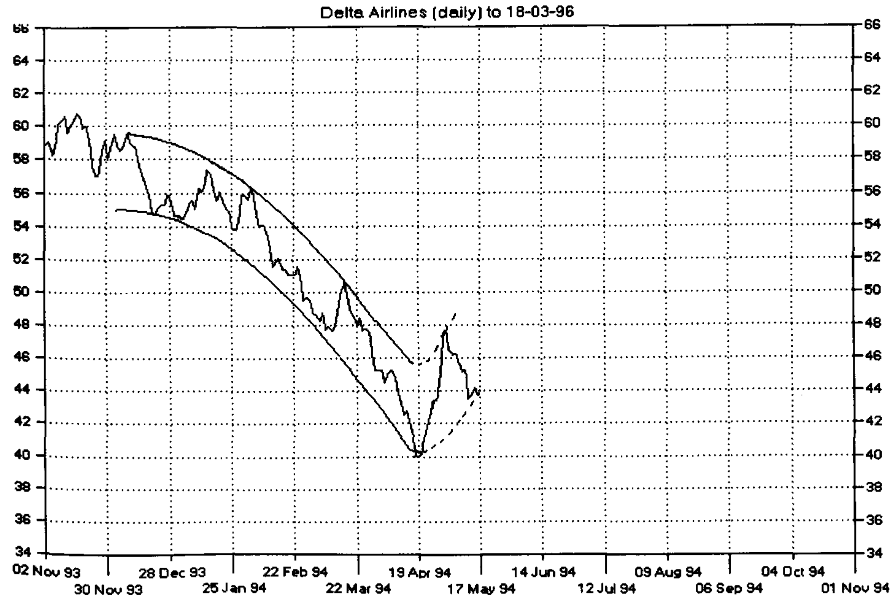

Figure 6.26. *The only way in which a constant depth channel can be drawn so as to avoid penetration above and below the channel boundaries is by causing it to bend with the trough of April 19 as the approximate turning point.*

depth of the channel constant and reduce both boundary penetrations to an acceptable amount is by causing the channel to change direction somewhere around April 19. This is shown in Figure 6.26. In drawing the turn in the channel direction, we also keep in mind the principle of symmetry of the channel around the turning point, so that the rate of rise in the channel immediately after the turn is fairly close to the rate of fall prior to the turn.

This type of argument will be applied whenever we have to decide if a channel has changed direction. Note the very important fact that it is only well after the channel has changed direction that we are able to decide that it did. Although in retrospect the channel changed direction around April 19, it was not until May 3, some ten days later, when the price fell from its level the previous day to form the peak that we had sufficient evidence to determine that the channel must have begun to climb.

Although we will discuss channel turning points in greater detail in chapter 10, we can see that as more time elapses after the actual turning point, the probability that the turning was real also increases. Although we would like the probability to be high that our turning point has occurred, working against us is the fact that the new direction of the channel will not be maintained forever. The probability of another change in direction is increasing all of the time we are waiting for confirmation of the previous turning point. We have to take a reasoned view that we wait just long enough to be confident that the channel has turned up before making an investment.

PROCEDURE

The overall procedure that we can apply to any stock is:

1. Check the chart of as much historical weekly data as possible for strong long term, intermediate and short-term cycles

2. If these are present, draw channels on the weekly chart; other

wise move to another chart

3. If there are major violations of both upper and lower boundaries within a short time of each other, see if forcing a bend in the channel can accommodate these

4. If short term and intermediate term weekly channels are rising, fine-tune the buying decision by looking at a chart of about one year's history of daily data, other wise wait for a change in direction of the channels

5. Draw channels on the daily chart, and if the short-term trend is rising and the price has risen from previous day can buy the next trading day, otherwise wait until these two factors are positive

6. If even more fine-tuning is needed, look at the daily range to estimate the direction of the intra-day trend at the market close. If the market closes at the high for the day, then obviously the intra-day trend is up, and the probability is that it will continue in the same way the next day so that the stock can be bought. If the intra-day trend is down, then on the next trading day wait for the intra-day trend to start to rise.

As far as the improvement to investment performance over the long term is concerned, it is the initial decision based on weekly data that is the crucial factor. Investors using the fine tuning of daily charts will probably achieve a return about one tenth better than investors who buy purely on the analysis of weekly data, while investors using intra-day data will achieve a slightly better return than the investor using daily charts. For those investors who do not have access to a computer and who prepare charts themselves, then it has to be said that the additional work involved in maintaining charts of daily data is not worth the additional effort.

Although this chapter has focused mainly on buying opportunities, ex-