**LAS VEGAS 1998**

# Channel Analysis

## The Key to Improved Timing of Trades

# BRIAN J. MILLARD

Currencies, fixed income, equities, and futures are all characterized by price movement which is simultaneously both random and cyclical. The random movement is, of course, totally unpredictable. Cyclical movement is somewhat predictable, although not totally, since the various cycles undergo gradual changes in amplitude and frequency.

Channel analysis provides a simple way of focusing on the predictable. This knowledge will enable the trader to enter and leave the market at the optimum time for maximum profits.

Using examples from the currency and stock markets, Brian shows you how the channel analysis method can be applied to both short-term and medium-term trading. You will learn fundamental relationships between short-term and medium-term trends, and how to decide when either type of trend is likely to change direction. You will be given guidelines and rules for estimating the future target area in which the trends will again reverse direction. This will enable you to choose the trades with the highest gain potential and lowest risk at the time trade is contemplated.

* * *

**Brian J. Millard** earned a PhD in chemistry and was a senior lecturer at London University for fifteen years before beginning to use his scientific training to analyze the stock market. He left the university setting in 1981 to establish his own investment publishing business, writing books and authoring investment software. He is the author of five books: *Stocks and Shares Simplified*, *Traded Options Simplified*, *Profitable Charting Techniques*, *Winning on the Stock Market* and *Channel Analysis*. The latest editions of the latter two books have been widely acclaimed as breaking new ground in the development of prediction tools for the market. John Wiley and Sons has taken over the publishing and distribution of his books, leaving him free to concentrate on investment research and software development.

Brian is one of the few independent investment researchers in the United Kingdom. His work has advanced the concept of channel analysis, first developed by J.M. Hurst, into the realms of probability and chaos theory. Probability and chaos theory have recently appeared in software as the program Sigma-p™. This software predicts turning points in long-term trends up to six months into the future. Brian is currently working on improved mathematical techniques for predicting trends even farther into the future.

Interest in Brian's work has increased dramatically over the past several years. Traders throughout the United Kingdom and Europe are discovering his low risk, high profit methods through the use of popular channel formulating and drawing software now available. Professional traders throughout the European Common Market have requested that he share his insights and expertise via seminars and personal appearances.



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# Channel Analysis - the Key to Improved Timing of Trades

Some sections of this written material have been given a slightly expanded treatment. This is in order that the most important concepts will still be completely understandable when revisited in the future. However, the topic of channel analysis will be covered in much greater depth in the oral presentation.

## PREDICTIVE POWER

The power of Channel Analysis (CA) is illustrated quite clearly by an analysis of the Dow Jones Index on the 17th July 1998. The Index was at a level of 9334.11, having just reached an all-time high for its Friday closing value. Few investors anticipated the crunch that was about to come, yet it can be seen from Figure 1 that the 40 week channel was about to turn down. Not only that, but a further analysis by the probability program Sigma-p (indicated by the chevrons) showed that the change in direction had probably already occurred!

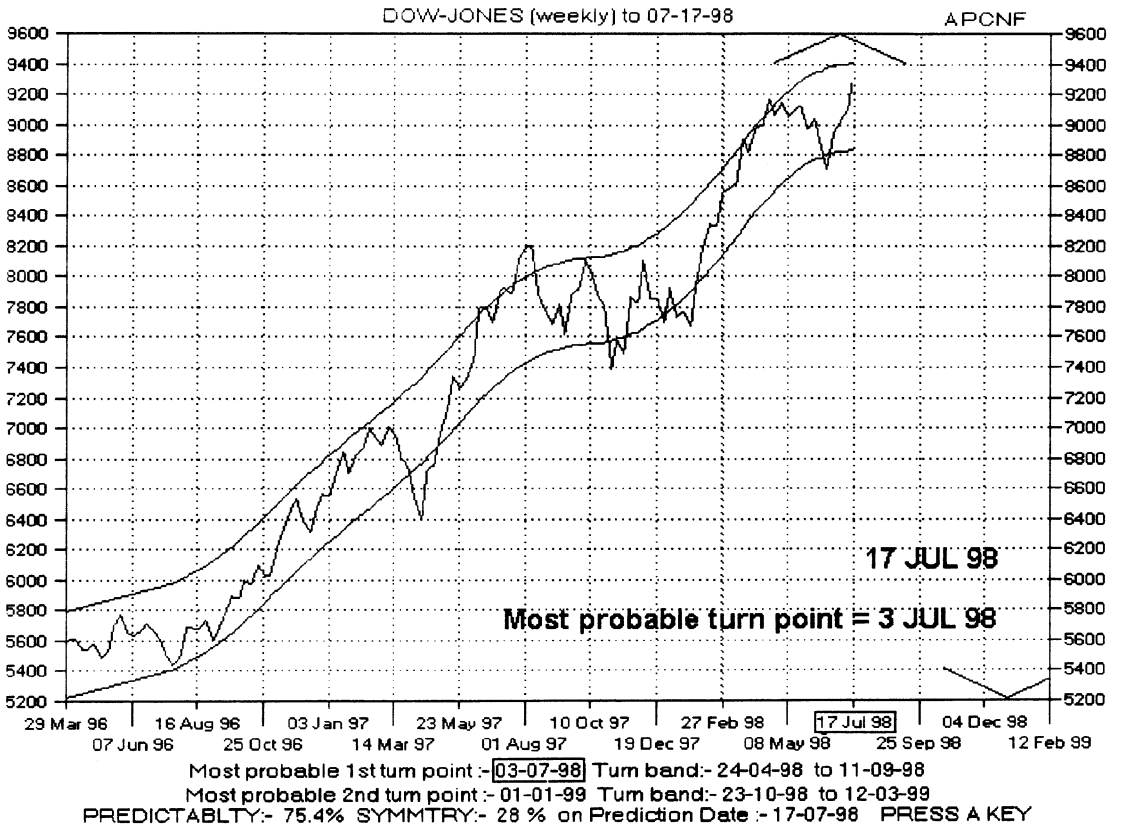



**FIGURE 1. Channel and Sigma-p analysis of the Dow Jones Index on the 17th July 1998.**

## GENERAL RULES FOR SUCCESSFUL TRADING

Whatever methods of decision-making are used, the following set of rules will increase the chances of success:-

**2a**

**RULES**

1. **A maximum of eight stocks in the portfolio**
2. **Invest approximately equal amounts in each**
3. **Diversify between sectors**
4. **Should be a logical reason for every action**

   **[no impulse buying/selling]**
5. **Avoid mañana attitude**
6. **Analyze mistakes and learn from them**

**Remember the penalty for a mistake:-**

To retrieve a specified percentage loss requires a larger percentage gain. For example, if 60% of an investment is lost, it takes a gain of 150% to recover this loss. This can be seen from Figure 2:-

**2b**

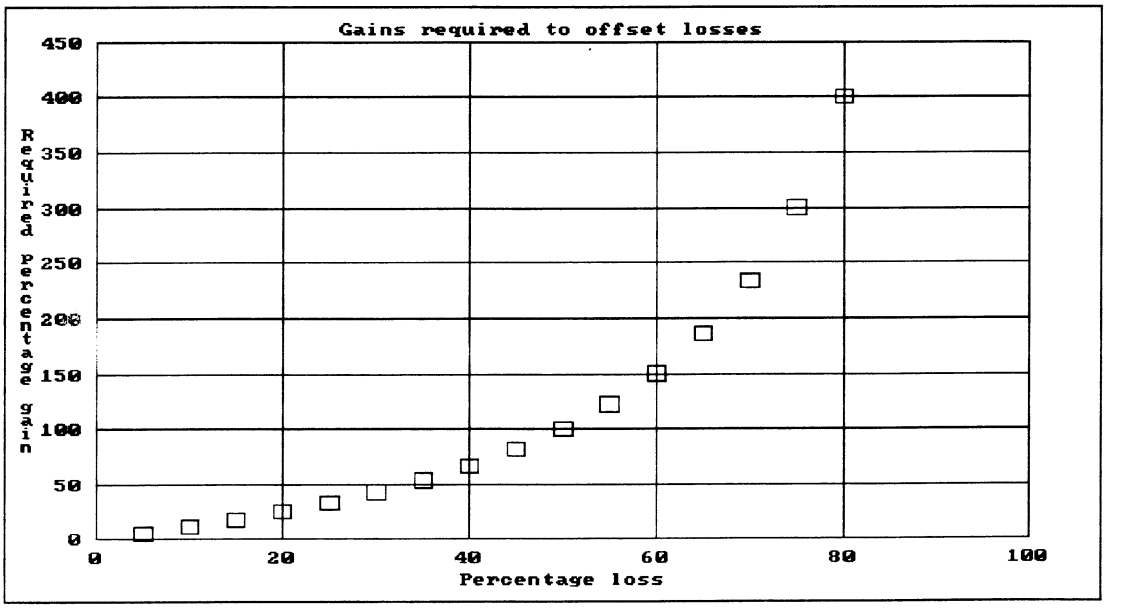



**FIGURE 2. Gains required to offset losses**

## TRADING FREQUENCY VERSUS PROFIT

What is the profit expectation from a trade? Is it 10%, 50% or even 100%, and how long does this profit take to accumulate?

The way to tackle this question is not to read books with titles such as "How I Made a Million Dollars in Three Weeks", but to investigate the rises and falls (trends) which occur in stock prices over various time intervals. From such data it will be possible to determine the optimum trading period for a particular stock.

**3**

**TRENDS**

1. **Trends must have a time-scale**
2. **Trends should be categorized as 'up' or 'down'**
3. **Up-trends start at a trough and end at a peak**
4. **Down trends start at a peak and end at a trough**
5. **Time-scale can be exact, e.g. '25-day trend'**
6. **or inexact, e.g. 'medium term trend'**

## DETERMINING TREND LENGTH

One method of analyzing trends is illustrated in Figure 3. The first step is to decide on a nominal trend-length. In Figure 3 the example is taken as 25 days, i.e. rises or falls which take about 25 days for completion. A centered 25-day average is then applied to the daily closing prices. The turning points (marked I, II and III) in this average give an approximate location for the start and end of the trends, but the exact start and end of each trend is found by scanning the data a few points either side of these turns to establish the low and high points (marked i, ii and iii) in the closing prices. A low point gives the start of an up trend and the next high point its end. Conversely, a high point gives the start of a down trend and the next low point its end.

By using a variety of centered averages on a wide selection of stocks, for example the Dow 30 constituents, it is possible to determine the average percentage rises or falls for various trend-lengths. A graph of the relationship between the length of up trends and percentage gain is shown in Figure 4.

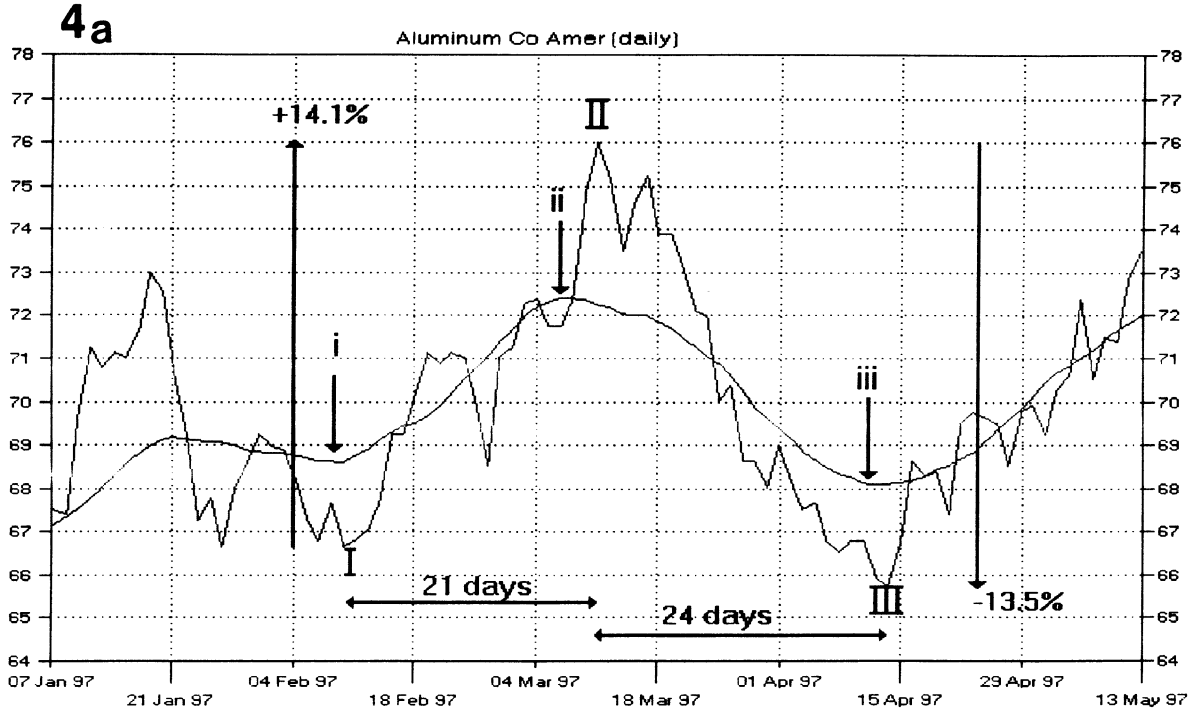



**FIGURE 3. How to determine trend-length and percentage rise/fall.**

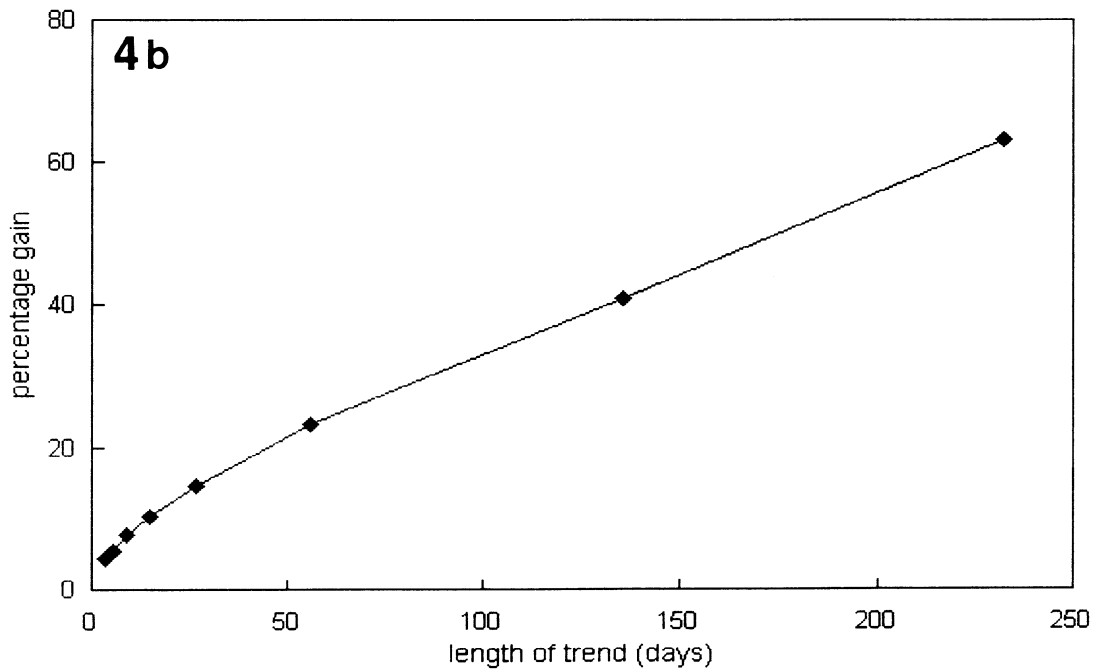



**FIGURE 4. Length of up-trends versus percentage gain for Dow 30 stocks.**

## Compounding of gains

It is possible to determine the effect of re-investing the gains made from one trade into the next for various lengths of trend. For example the average gain made among the Dow 30 constituents for an up-trend of length 25 days was 14.6% in one year.

Over a specified time interval we can carry out more trades using short term than long term trends, but the individual gains will be less. Allowing 5% to cover dealing costs, spreads, and the fact that investors will not enter and exit at the exact trough or peak in the stock price, we can then deduce the important relationship between the annual percentage gain made when different trend-lengths are used. The relationship is shown in Figure 5. The important point from this relationship is that **there is an optimum length of trends to give the maximum return per annum.** While this will vary from one stock to another, in the case of the typical Dow 30 constituent, this is around 60 days.

It is useful to categorize trends into short, medium, etc., as shown in Table 1.

**5a**

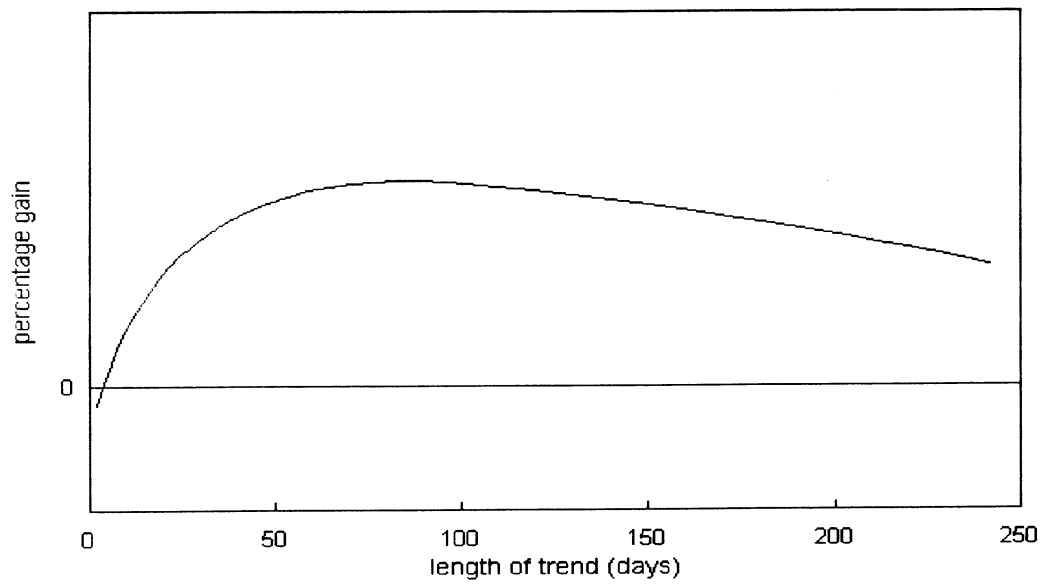



**FIGURE 5. Length of trend versus compounded annual gains. 5% is removed from each theoretical trade to cover costs, spreads and inexact timing.**

**5b**

| | Interval between data points | | | | |
|---|---|---|---|---|---|
| **Trend Category** | **Ticks** | **Hours** | **Days** | **Weeks** | **Years** |
| Random | 1 | 1 | 1 | 1 | |
| Very short | | | < 5 | N/A | N/A |
| Short | | | 5 to 60 | 3 to 12 | N/A |
| Medium | | | 60 to 260 | 12 to 52 | up to 1 |
| Long | | | 260 to 1300 | 52 to 260 | 1 to 5 |
| Very long | | | > 1300 | > 260 | > 5 |

**TABLE 1. Approximate categories of trends. (There are no entries in the ticks and hours columns because opening hours/ticks vary between markets).**

## CHANNEL ANALYSIS - TOOLS OF THE TRADE

The following tools are used to produce the charts in this presentation. Investors will be able to produce excellent channels using only #1 and #2.

**6**

**TOOLS**

1. **Linear charts**
2. **Freehand drawing**
3. **Calculations:-**
   - **(a) centered moving average**
   - **(b) difference, centered average - data**
   - **(c) difference, centered average - centered average**
4. **Channel calculating/plotting software**
5. **Probability software**

### 1. A chart with a linear price/index axis

Channel analysis is based on the isolation of cycles or combinations of cycles. Perfect cycles are symmetrical about a zero line and they lose this symmetry if presented on a logarithmic scale.

### 2. Freehand drawing

As will be seen later, perfectly acceptable channels can be drawn on a linear chart freehand, i.e. by eye, as long as the rules of channel analysis are complied with.

### 3. Calculations

**(a) centered moving average (CMA)**

An odd span should be used so that when centered (moved back by (span -1)/2 points in time) an average point will be plotted at an exact tick on the time axis, and not fall between two adjacent ticks. **CMAs are used to isolate trends**. As spans increase, trends of increasing length are highlighted since a CMA allows through only those cycles of longer wavelength than the span being used in the CMA. **Note that the average will terminate(span -1)/2 points back in time.**

**(b) CMA - data difference (CMA - data)**

This is the arithmetical difference between the actual data and the centered moving average at each point along the time axis. A plot of this function isolates the mixture of all those trends of shorter length than, or equal to, the span of the average being used. It

can be viewed as a way of showing up the fluctuations which are eliminated by the use of the CMA in the first place.

**(c) CMA - CMA difference (CMA-CMA)**

This is the arithmetical difference between two centered moving averages of different spans. Typically the span of one is about half that of the other. Both spans should be odd. A plot of this difference will isolate cycles of wavelength close to the longer of the two spans.

### 4. Channel calculating and plotting software

This works by calculating CMA and using this as a template for an upper and lower boundary for the channel. The boundaries are moved apart by the computer until a specified number of data points (typically around 3.5% of the total number of points) lie outside of the boundaries.

### 5. Probability software

This does extensive calculations on the data in order to find the best estimate of the channel movement from the last calculated point ((span - 1)/2 back in time up to the present and into the future.

## INDICATORS VERSUS CHANNEL ANALYSIS

**7a**

**INDICATORS**

1. **Calculate a value from an equation**
2. **Check against a fixed benchmark**
3. **Example: 20% and 80% level with oscillator**
4. **Or check against a variable benchmark**
5. **Example: one average crossing another**

**7b**

**DISADVANTAGE OF INDICATORS**

1. **Benchmark may not have been tested in different markets**
2. **May not work for both short and long term traders**
3. **Usually do not indicate next change of trend**
4. **Do not give target area for movement**

8a

## CHANNEL/CYCLE ANALYSIS

1. **Due to fundamental nature of cycles, it works in all markets**
2. **Trader can decide on investment time-scale**
3. **Can predict changes well into the future**
4. **Can give target area into which price/index should move**

## THE COMPONENTS OF MARKET DATA

The future direction or level of a stock, index, currency, etc. is not predictable simply by producing a chart. Thus looking at a chart of the Aluminum Co. of America does not give the viewer much confidence that the future direction of the stock is very predictable. Part of the reason is that there is a great deal of random, unpredictable movement present. It requires a transformation into something which is more predictable before a stab can be made at future movement.

8b

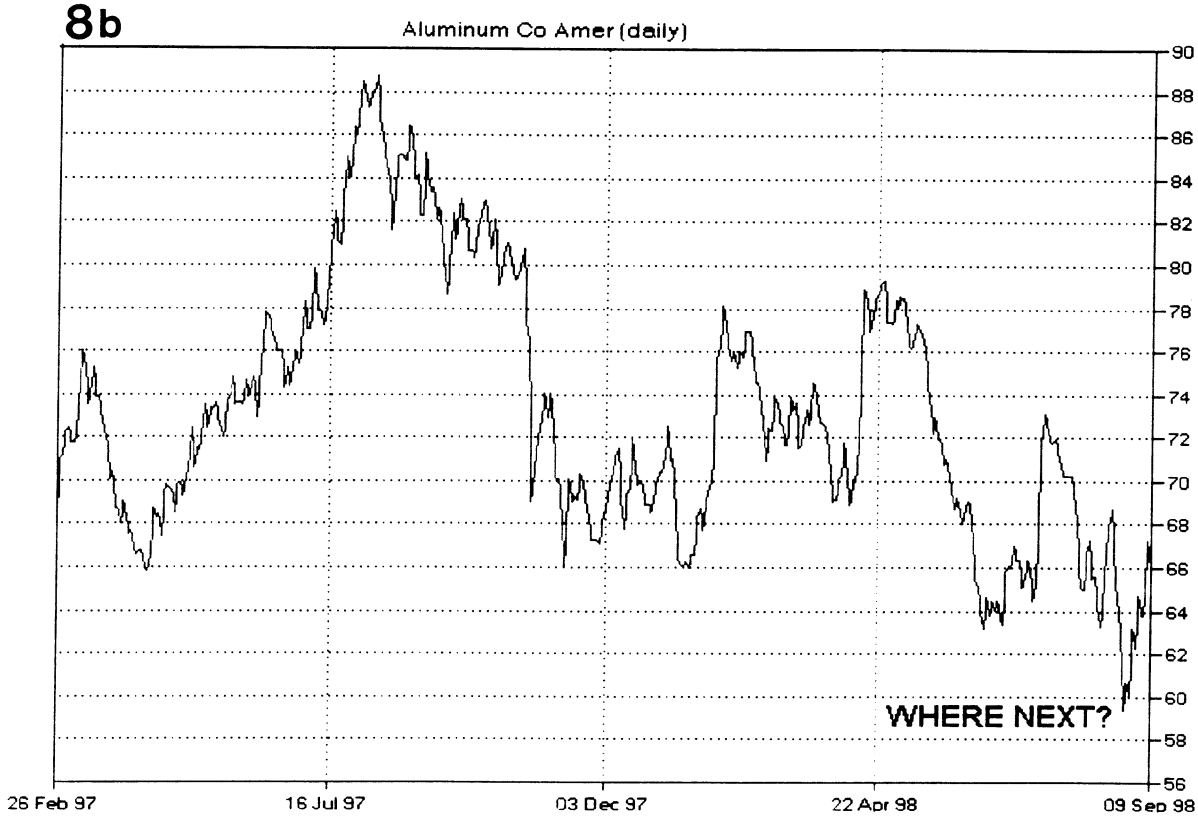



**FIGURE** **A chart of daily closings of Aluminum Co. of America**

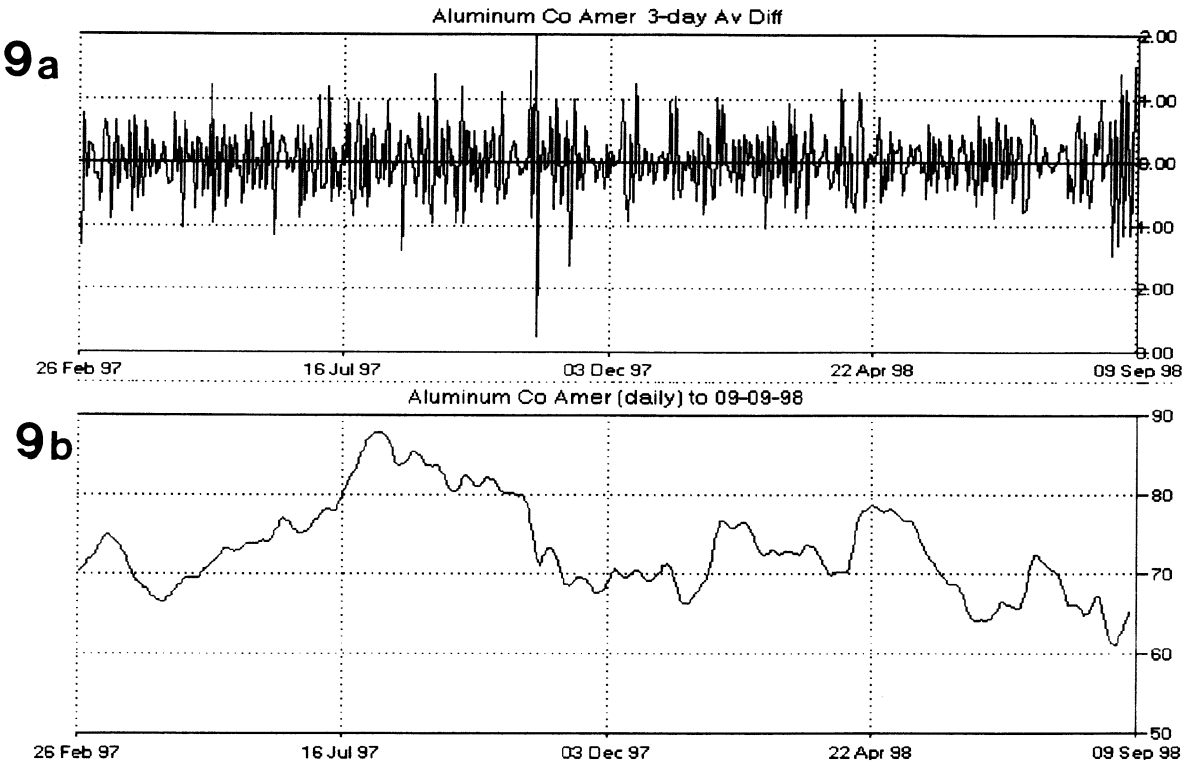



**FIGURE Upper panel: random movement isolated by 3-day average difference. Lower panel: a 3-week average leaves a complex mixture of cycles.**

To a large extent the point-to point, e.g. daily, random movement can be removed from the data, giving a trace such as that shown in the upper panel of Figure 7. Once this is done, what is left is the movement caused by all the cycles present in the data over that time period. This mixture of cycles is shown in lower panel of Figure 7.

## CYCLES - PERFECT AND OTHERWISE

A perfect cycle is a sine wave, such as a sound wave or radio wave. The future behavior of such a wave is exactly predictable (Figure 8). As far as an individual cycle is concerned, then in the case of a perfect cycle, which is a sine wave, its future behavior is exactly predictable at any point along its path as shown in Figure 8. The height of the peaks, the depth of the troughs and the position in time of these peaks and troughs are known in advance (Figure 8).

Cycles in stock, currencies and commodities are not as perfect as that shown in Figure 8. **They suffer from a variation in amplitude, wavelength and phase (Figure 9).** The amount of such variation changes over time so that cycles pass through periods of time when they are highly predictable and other phases when they are not predictable.

In Figure 9 it can be seen that from the perspective of the peaks, the position of the next trough in time is very predictable, while the position in terms of dollar value is still predictable but with less accuracy. The same comment applies to the prediction of a peak when at the position of a trough. Note also the change from insignificance to importance as we move forward in time.

10a

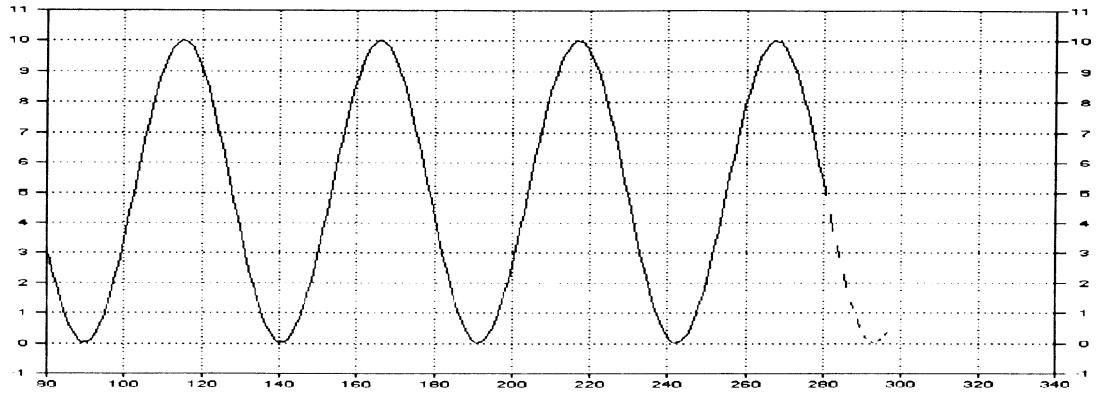


FIGURE · An example of a perfect cycle (sine wave).

10b

10c

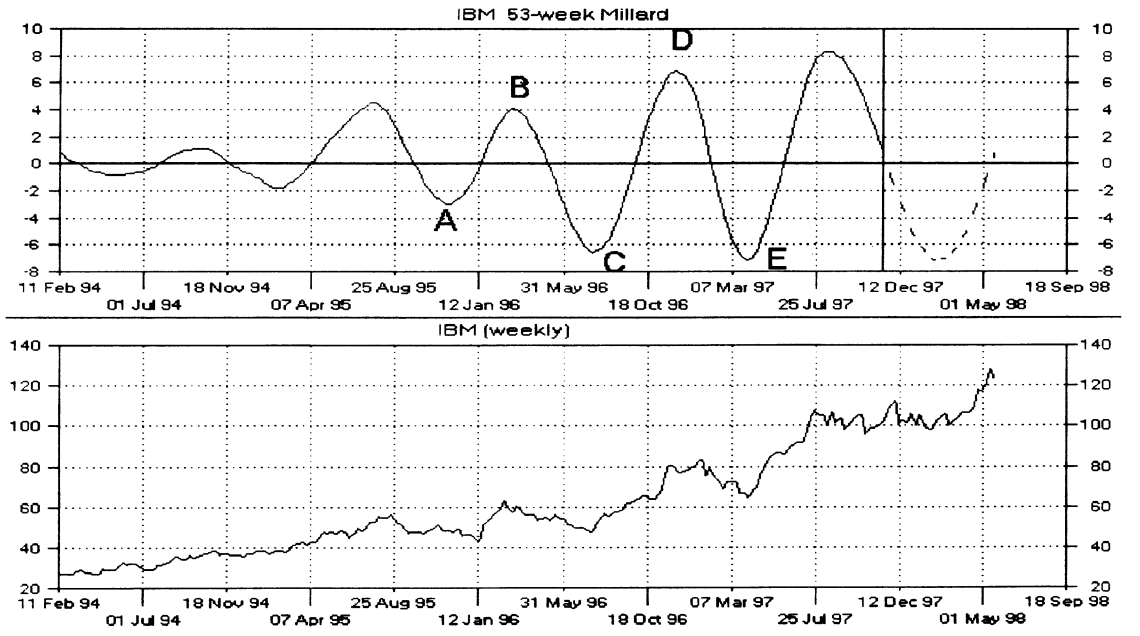



FIGURE Lower panel: IBM weekly closing. Upper panel: the one-year cycle derived from the data by the difference between the 53-week (weighted) and 27-week centered averages.

## PREDICTIVE POWER OF A CYCLE

In the case of IBM stock, at the time of analysis, we appear to have found a transformation (the 53-week cycle) which will enable us to predict ahead with a far better degree of certainty than was available simply by viewing the original stock price data.

The difficulty with this approach is that we are only viewing one cycle out of the many that are present at any one time in the stock. If the cycle is important in terms of amplitude, and expected to remain so for some time into the future, then it will make a large contribution to the future price movement. On the other hand, the cycle may well see a rapid diminution of its magnitude in the immediate future.

While we can expect to profit most of the time from such a situation where we have found an important cycle, there will be occasions when other cycles may well be moving in the opposite direction, thereby negating the effect of this one cycle.

We now have enough data in place to come to a conclusion about the components of price or Index movement:-

**11**

**COMPONENTS OF MOVEMENT**

1. **Random, unpredictable, point to point movement**
2. **Many cycles of differing wavelength, amplitude and phase.**
3. **Parameters also vary randomly for each individual cycle.**
4. **Wavelength variation is usually gradual**
5. **The next turning point in a cycle fairly predictable.**
6. **Magnitude variation is more random**
7. **This randomness varies from time to time**

## WHAT CHANNELS MEAN

Although Channel Analysis depends upon the existence of cycles in data, it uses a block or band of cycles of varying wavelength rather than an individual cycle. This has the major advantage that the variations noted above in individual cycles tend to cancel out, making the future direction of a block of cycles much more predictable than the individual cycles. A single channel divides the whole complex mixture of cycles present in the data into two parts. This is shown in Figure **12a**

There is no theoretical limit to the number of channels which can be drawn, but in practice, two or three will give us all the information we require. By careful selection of the channel parameters, we will be able to deduce the future direction of long term, medium term, short term and even intra-day trends. By this means, the requirements of daily, weekly and longer term traders can be satisfied.

### Sampling frequency

The isolation of cycles in market data depends upon sampling at fixed intervals, where the interval can be ticks, hours, days, weeks or even years. Monthly sampling is not acceptable since the number of business days varies from one month to the next.

The use of daily ranges, with open, high low and closing values presented as bars, also contradicts this requirement. While it is perfectly in order to plot these bars, **only the closing value should be used in positioning the channels**, whether this positioning is done by eye or by calculation. The reason for this is that a high or low value will occur at a random point in the day, and therefore successive highs or lows are not spaced equally apart in time.

12a

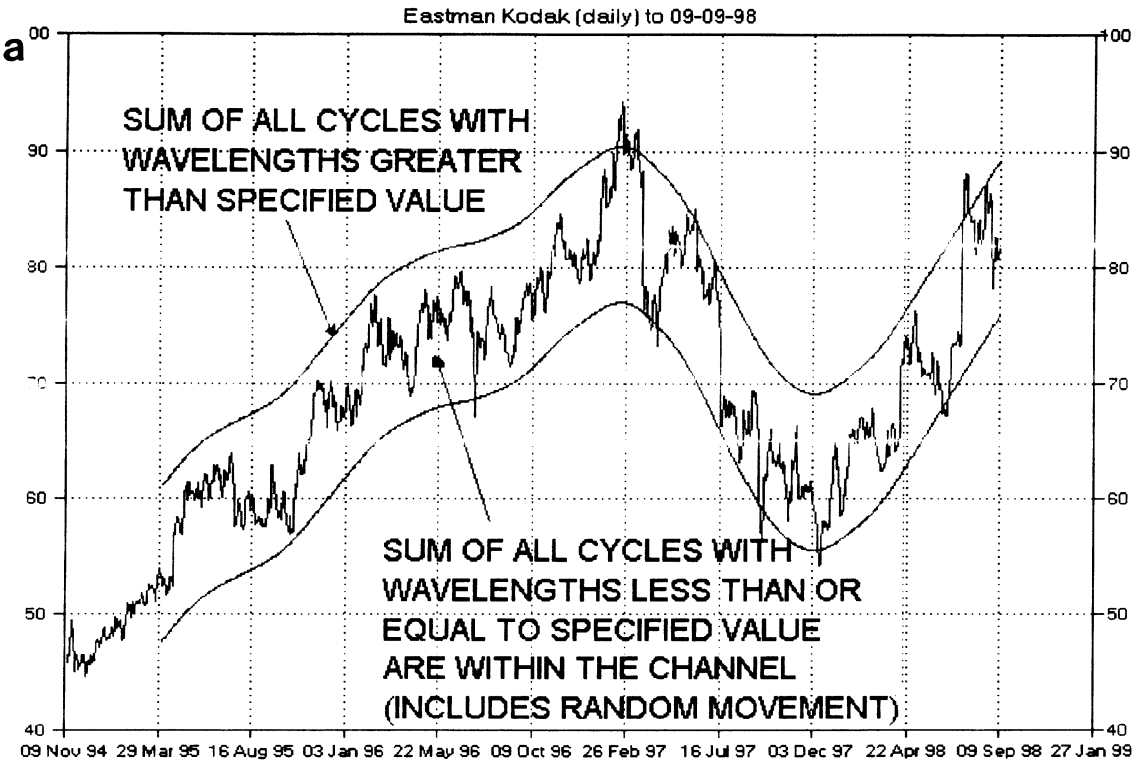



**FIGURE** **A channel drawn on the Eastman Kodak daily closing prices.**

## THE IMPORTANCE OF THE CHANNEL BOUNDARIES

An inspection of the upper and lower channel boundaries in Figure **12** shows that the Kodak stock price spends its time meandering between the two boundaries. Only a small proportion of the time is spent near either of the two boundaries. **Thus the boundaries represent low probability regions.**

Once near a boundary, the stock will spend only a few days (or whichever sampling interval is used) in the region before returning towards the center of the channel.

12b

### BOUNDARIES

- **If the true position of the boundaries of a specified channel is known, then it is 100% certain than the stock will shortly retreat once a boundary is reached.**

- **If we are able to predict correctly the position of the boundaries, as shown in Figure 11, then every trade we make will be 100% correct!**

When we know the channel will rise long enough for the lower boundary to rise to a higher level than the present position of the upper boundary, then whatever the price we pay to buy the stock, in the range B1 to B2, we can see that it will move into profit once the range reaches S1 to S2. With a falling channel we can use the same logic for short

selling. Thus selling at any price between S3 and S4 will give us a profit once the channel reaches the point where the buy-back range is B3 to B4.

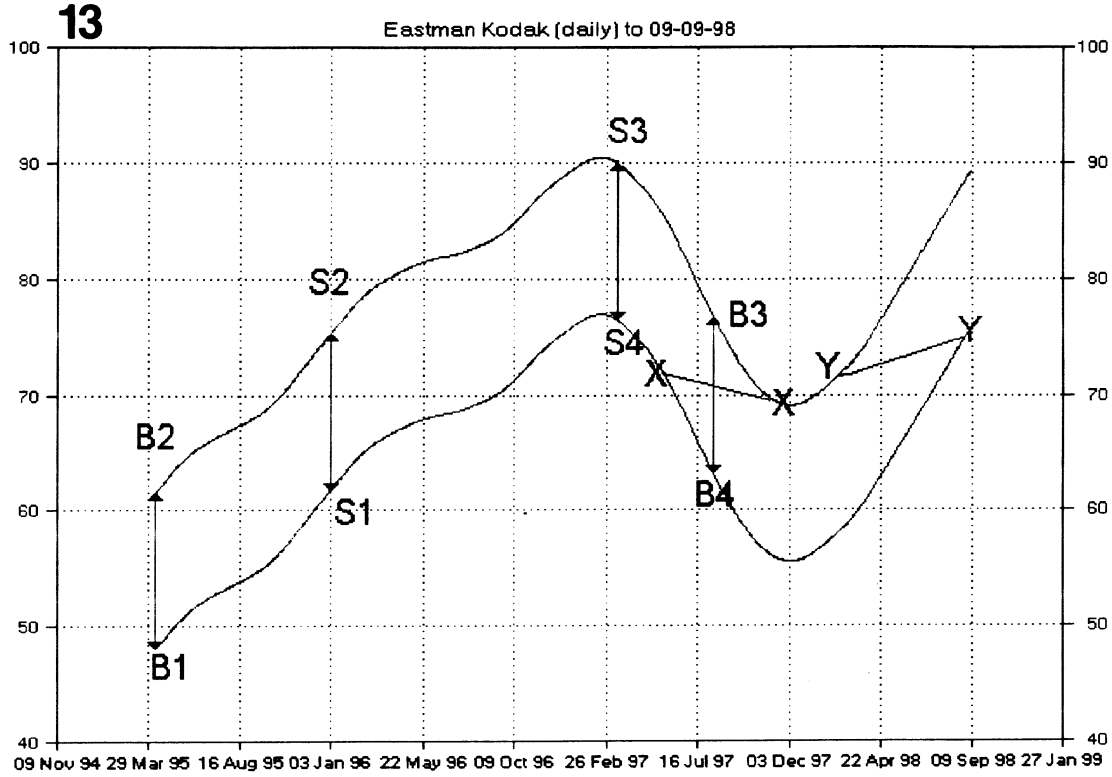



**FIGURE** **The boundaries of one of the channels in Eastman Kodak.**

On a shorter time-scale, we simply wait for the stock to approach a boundary before taking a decision. With a rising channel, we will be guaranteed a profit if we buy when the stock has fallen to the lower boundary, i.e. at point B1. With a falling channel we will be guaranteed a profit if we sell short at S3 when the stock has risen to the upper boundary.

**Note that we do not know how long it will take for the stock to reach the middle or opposite side of the channel**. For this reason, it is dangerous to sell short when the channel is rising, because the rising channel can carry the stock price to a higher level than it was when the decision was taken. The transaction Y - Y illustrates this point.

Similarly, it is dangerous to buy when the channel is falling because the falling channel can carry the stock lower, as shown by X - X. Both of these transactions would be unprofitable.

**It will not be possible to predict channels into the future with 100% accuracy, and it is this fact that will remove the guarantee of trading profits. The more accurate our predictions are, the greater will be the profit.**

The rest of this presentation will be concerned with the way in which channels can be positioned with the greatest accuracy. To do this we have to adhere to certain rules.

## RULES OF CHANNEL ANALYSIS

### 14a

**To draw channels up to the last data point:-**

1. **Start with the channel which will enclose the minor fluctuations**
2. **Draw a constant vertical depth smooth channel to enclose the minor fluctuations**
3. **Depth is such that as many as possible of the peaks and troughs are close to or touching the relevant boundaries**
4. **It is permissible to have one or two peaks or troughs penetrating the boundaries.**
5. **Once the inner channel is drawn, draw another channel outside of this so as to enclose the fluctuations in the inner channel.**
6. **If there are enough peaks and troughs in the outer channel, a further channel can be drawn outside of this.**

### 14b

**To extrapolate channels into the future:-**

1. **Start with the outer channel; and continue the curvature into the future**
2. **Taking the next innermost channel, do the same, but make it bounce off the previously drawn channel boundaries at points where it would otherwise cross.**
3. **Where channels are forced to change direction, use the principle of symmetry for a short distance either side of the turn.**

## CREATING A TRUE CHANNEL

In our list of tools of the trade mention was made of the centered average. The centered average is an excellent representation of a trend, whose time-scale depends upon the span used for the average. Contrast this with the unlagged average, i.e. one which is

plotted up to date, and it can be seen that unlagged averages do not represent the position of the trend.

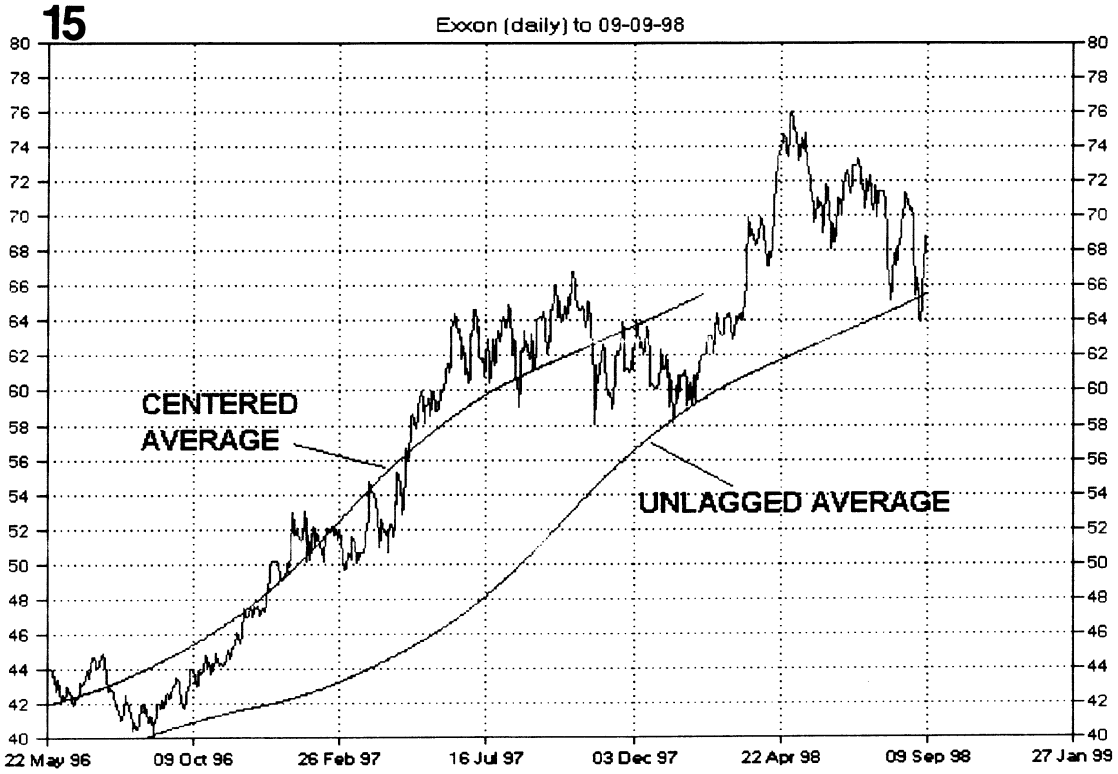



**FIGURE Centered and unlagged 201-day averages of Exxon.**

Using centered averages in this way draws attention to a very important fact: the average, which we now take to be a good representation of the trend, terminates half a span back in time. **Thus we do not know what the trend is doing over the last half span of the average.** The penalty therefore for having a good mathematical way of isolating a trend is that we will have to estimate how it will have moved over this last half span and how it might move in the future. **It might even have changed direction between its last calculated point and the present time**.

It is simple to derive a channel from this average by making two exact copies, one of which will be the lower boundary and one the upper boundary of the channel. The copies are adjusted vertically above and below the position of the average until the criteria for peaks and troughs just touching these lines are met. We then have our constant-depth channel which will, of course, still terminate this half span back in the past. We will then have to estimate how the channels have been moving since the last calculated points half a span back. However, whereas to deduce the path of the centered average from its last calculated position is fraught with difficulty, the use of channels makes it much easier.

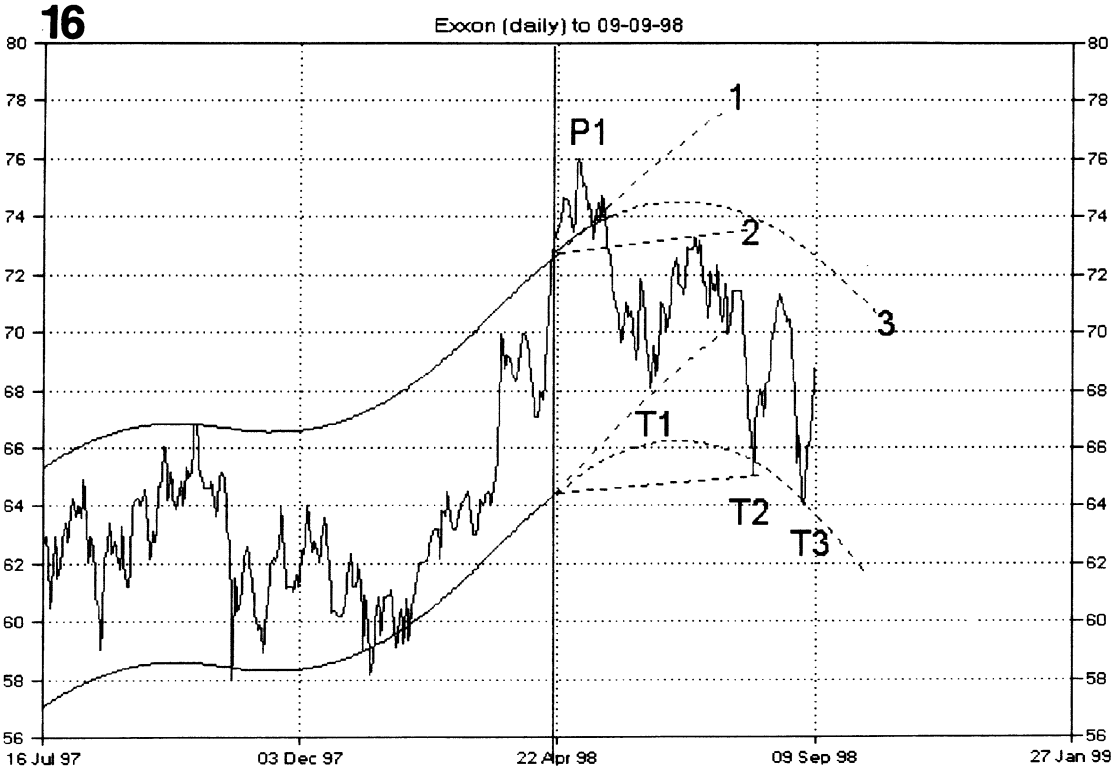
By using different spans for the average we can produce channels from short term to long term. Where channels are superimposed, the outer channel is the control channel, since it determines the turning points in the next inner channel, while the inner channel determines the turning points in the next inner channel, and so on.

Where channels are drawn by hand, short term, medium term or long term channels are produced by moving from minor peaks and troughs as the features which locate

channel boundaries through to very major peaks and troughs. Eventually there will be insufficient features to be able to draw a valid long term channel.

Whichever way a channel is drawn, whether by using a centered average template or simply by eye, it is the last section of the channel that is important, since this will decide how future movement will be estimated. It is the accuracy of this estimation that will determine how successful we will be in making profits, especially if the channel has indeed changed direction and we are able to deduce this fact. **The key to estimating the missing part of the channel is the presence of troughs and peaks along this half span which will enable us to establish one or other of the boundaries.** The fact that the channel must maintain constant depth means that establishing one boundary will automatically establish the other.

Taking Exxon as an example, the channel produced by the method of using the 201-day average as a template for the upper and lower channel boundaries is shown in Figure **16**




**The 201-day channel in Exxon.**

Initially we would extend the channel as at 1, allowing peaks P1 to sit above the boundary (otherwise an impossible upward bend has to be drawn) and T1 to stay within the channel. As more data comes in the trough at T2 forces a rethink. Finally, the trough at t3 gives us a realistic picture of a gradual turn which allows troughs T2 and T3 to be contained.

## THE IMPORTANCE OF CONSTANT ADJUSTMENT OF CHANNELS

The constant adjustment of the extrapolated channel as the data unravels is an essential part of channel analysis. The knowledge that a trends has changed direction or is about to change direction is crucial to investment success. As we have seen from the

examples so far, there is a delay in determining this fact, but the shorter we can make this delay, the more time will be left before the next change in direction. Thus there will be more time for a trade to mature to maximum profit.

As an example of a downward trend in a channel being reversed, the channel for J. P. Morgan is shown in Figure **17** As new peaks come in after P1 on 3rd March the channel is adjusted to bend upwards at an increasing rate in order to avoid too large a penetration of the upper boundary.

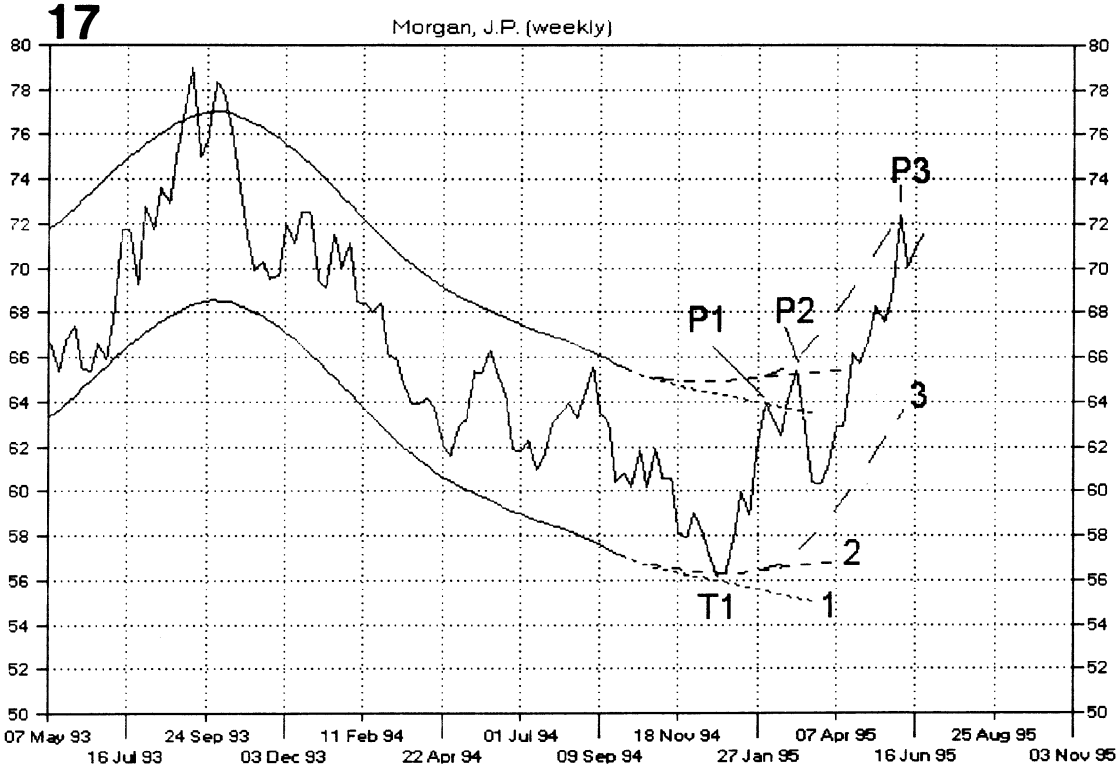



**FIGURE The long term channel in J. P. Morgan by early June 1995.**

## HOW AN OUTER CHANNEL HELPS IN DECIDING TURNING POINTS

The turns in the channels in Figures **16 + 17** were deduced solely from the position of peaks and troughs in the data. With an outer channel in which we are confident, a turn will be forced on an inner channel. A good example is IBM, as shown in Figure **18** Once two channels are drawn, then there are two extremes for extrapolating the outer channel. Labeled 1 and 2. Once these are in place there are two possibilities 3 and 4, for the inner channel, which must be made to bounce off the lower boundaries. Figure **18** shows the subsequent movement of IBM.

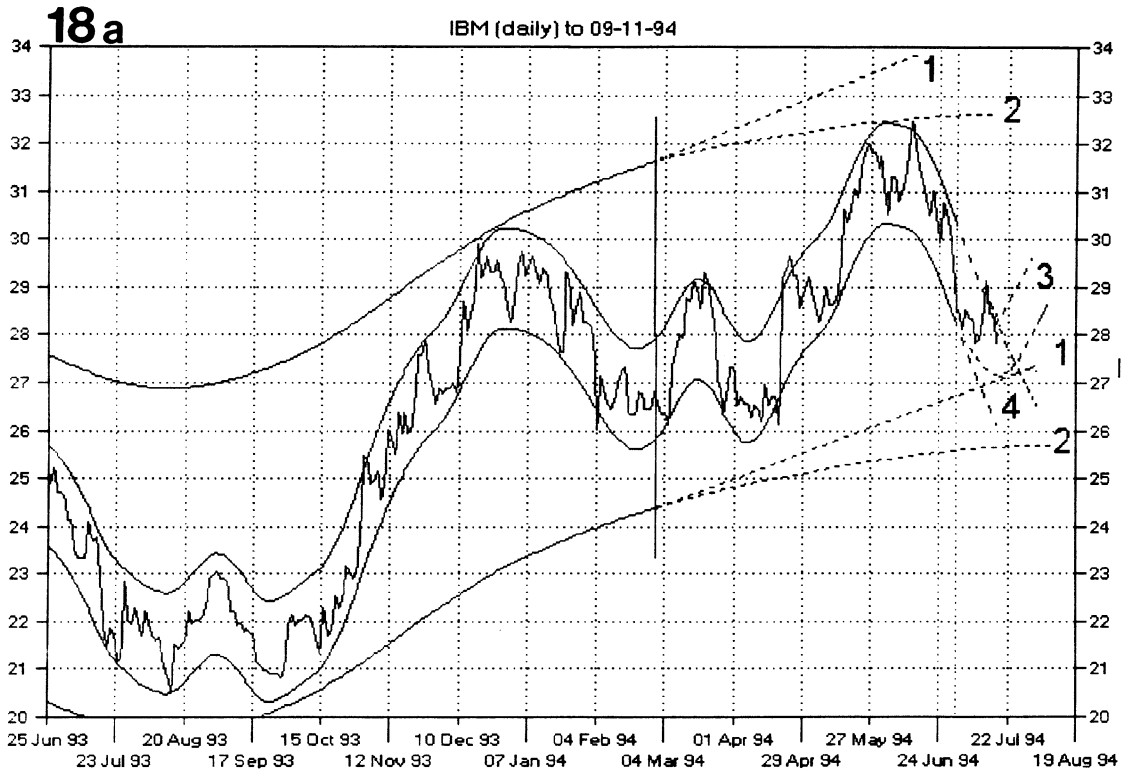



**FIGURE Channel extrapolation for IBM (daily closings)**

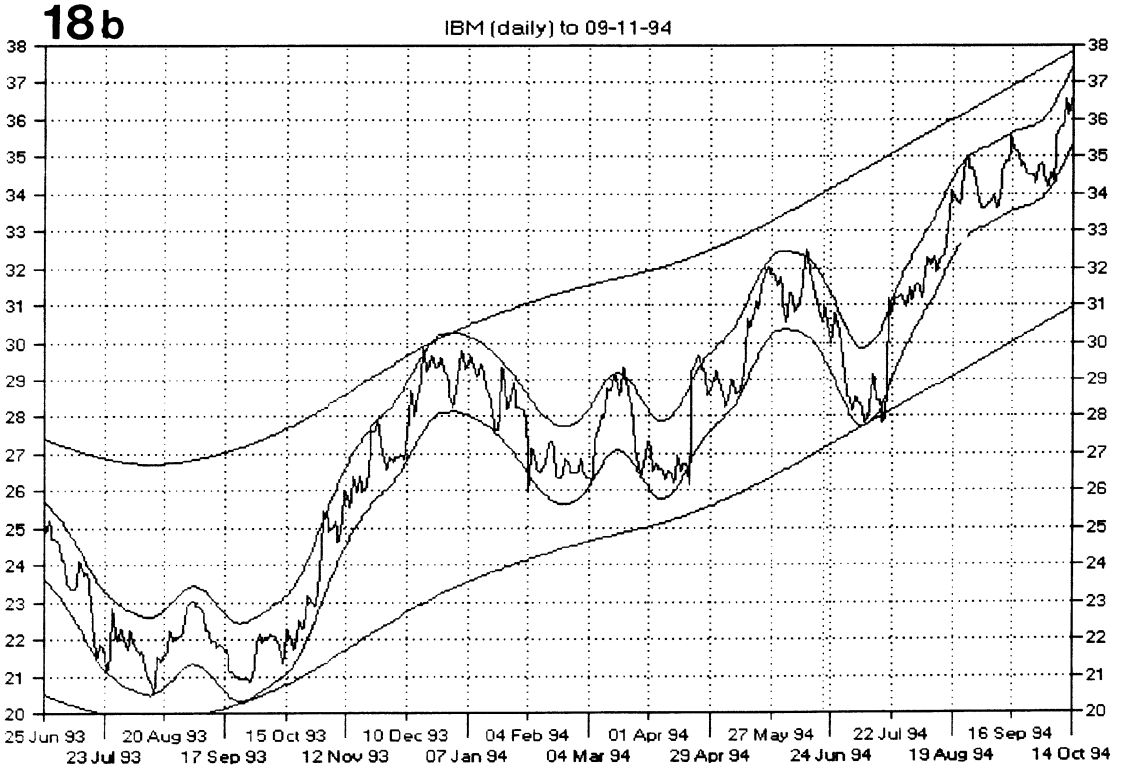



**FIGURE Subsequent movement of IBM.**

## ISOLATING POINT-TO-POINT RANDOM MOVEMENT

If channels are drawn by using centered averages as templates, then the shortest practicable span is one of 3 points, i.e. 3 days for daily data, 3 weeks for weekly data, etc. If channels are drawn by hand, then aim to bring as many peaks and troughs as possible to the channel boundaries. The result will be similar to that shown in Figure **19**

**19**

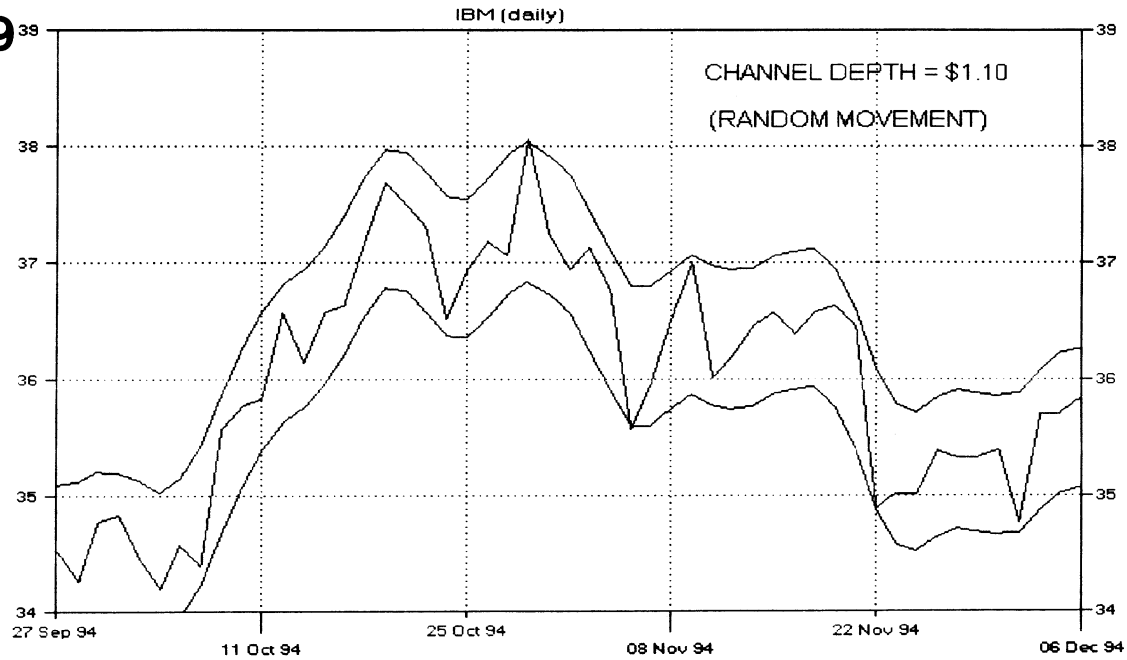



**FIGURE ´ The tightest possible channel in IBM.**

**19B**

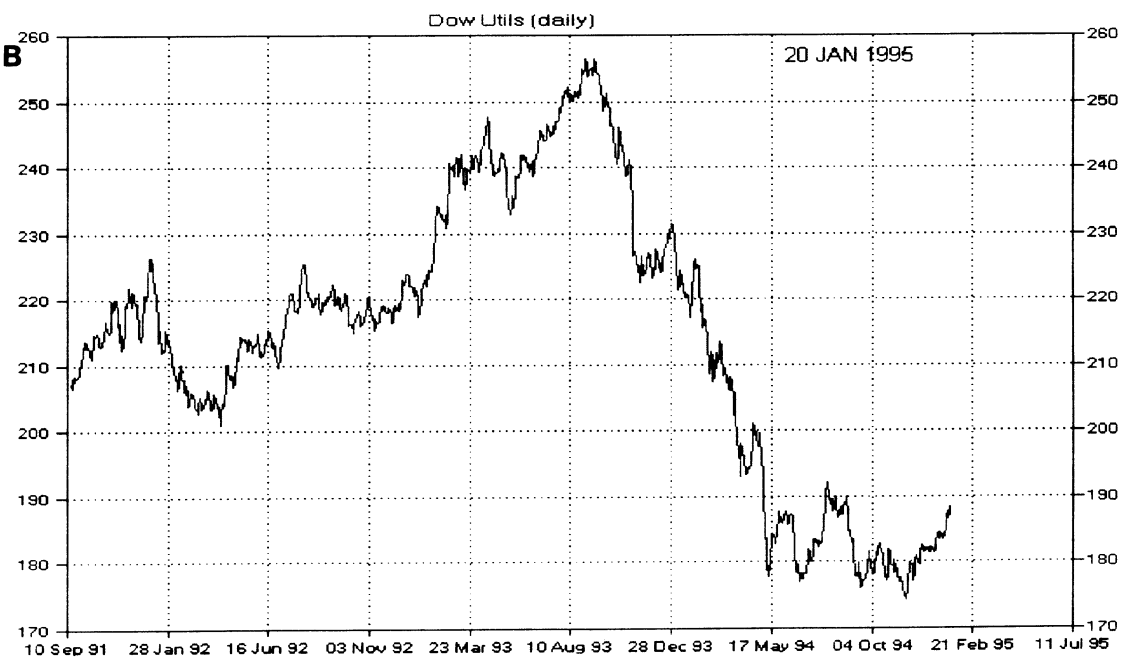



**FIGURE Dow Jones utilities on 21st January 1995**

20A

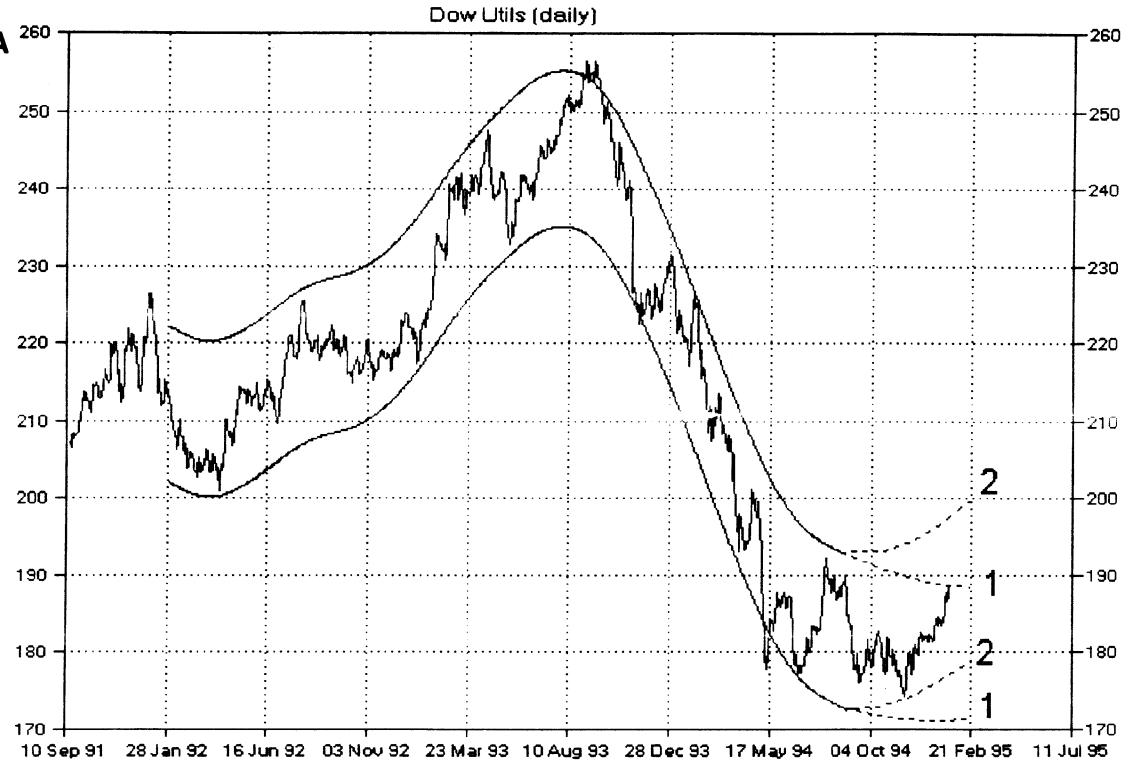



**FIGURE Dow Jones Utilities. Long term (201 day) channel.**

20B

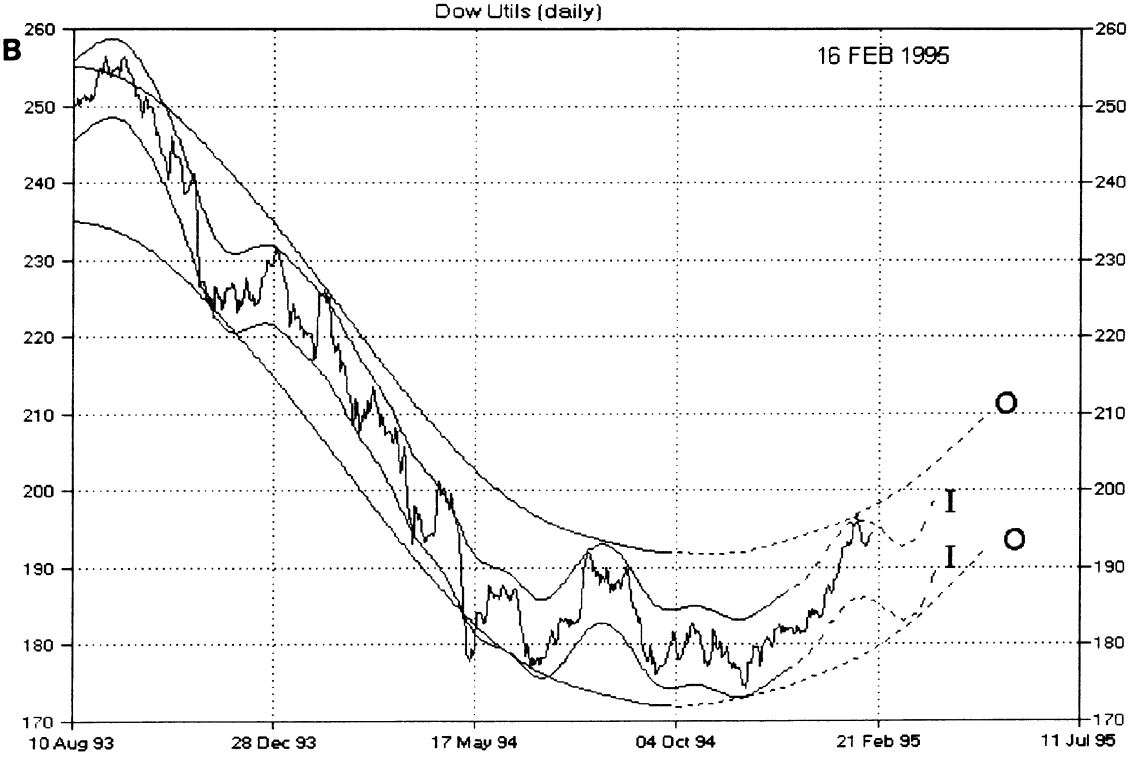



**FIGURE 20.B Dow Jones utilities on 16th February 1995.**

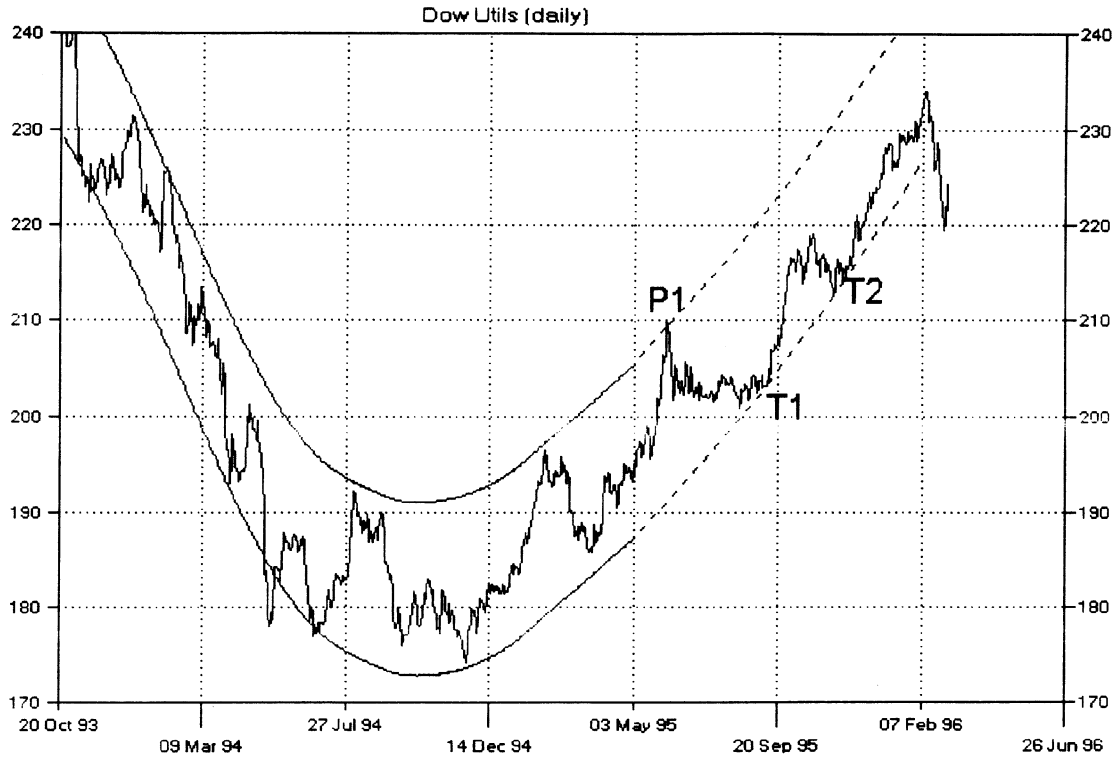



**FIGURE 21. Subsequent movement of the Dow Utilities Index**

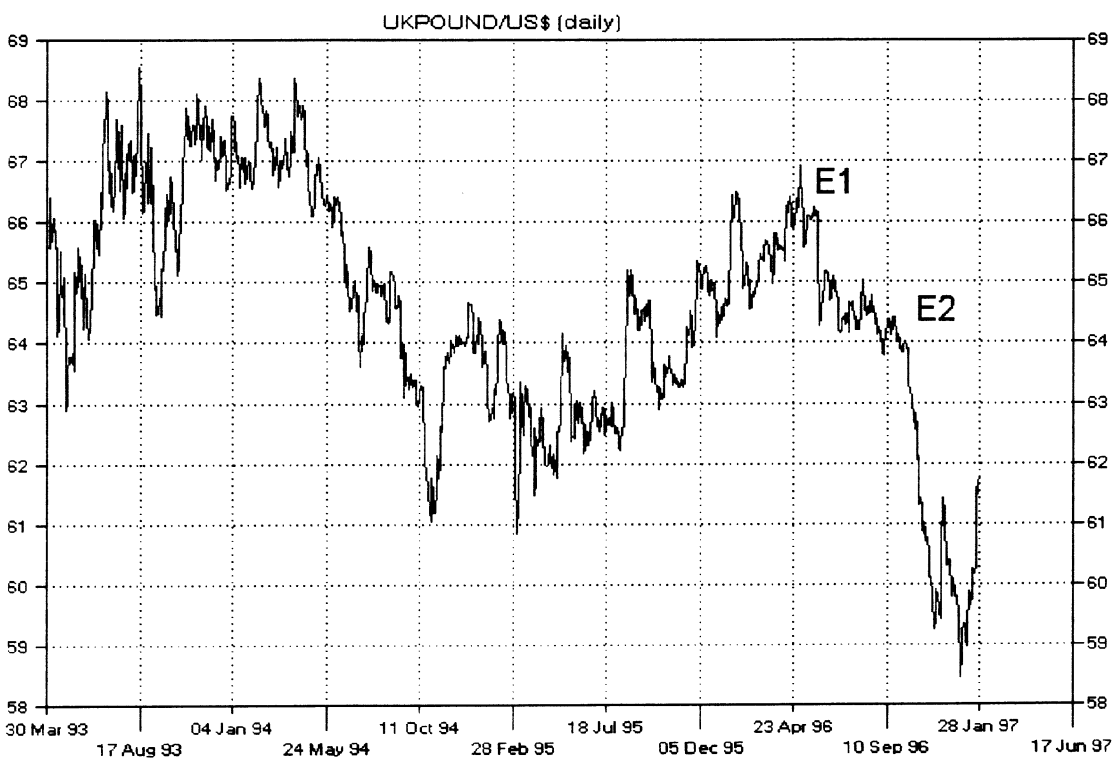



**FIGURE 22. The British Pound/US Dollar ratio.**

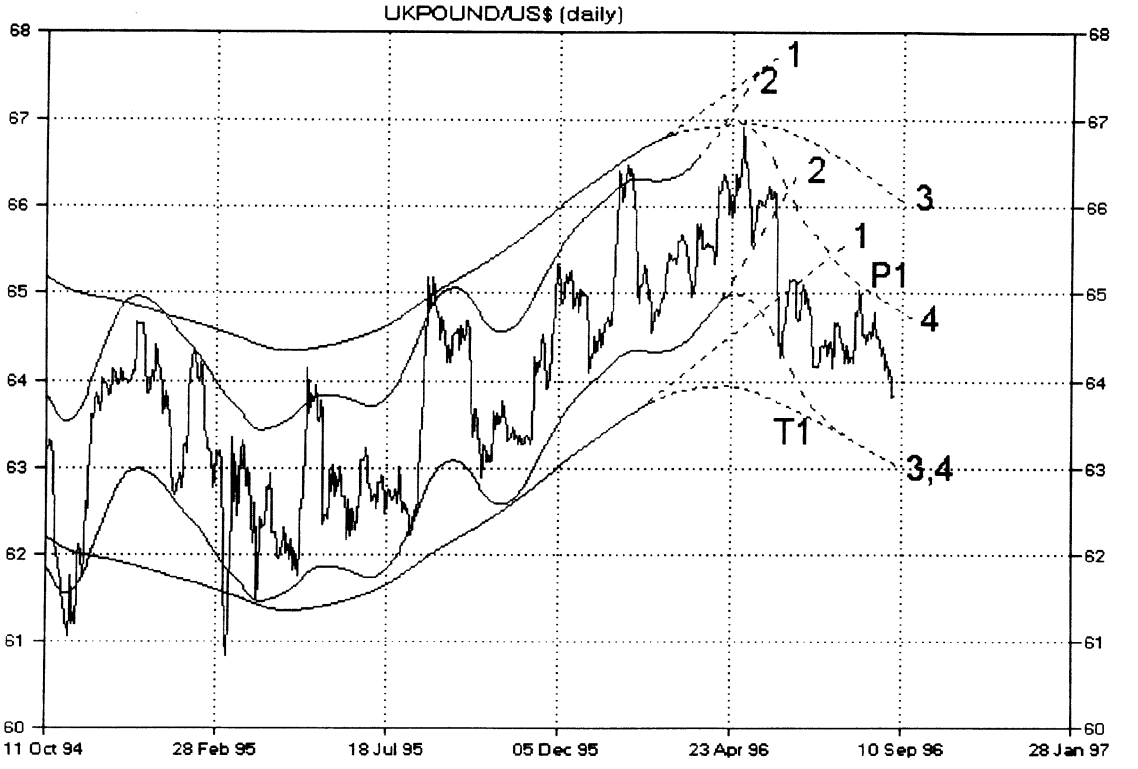



**FIGURE 23. Channels drawn for British Pound/US Dollar in Sept. 1996.**

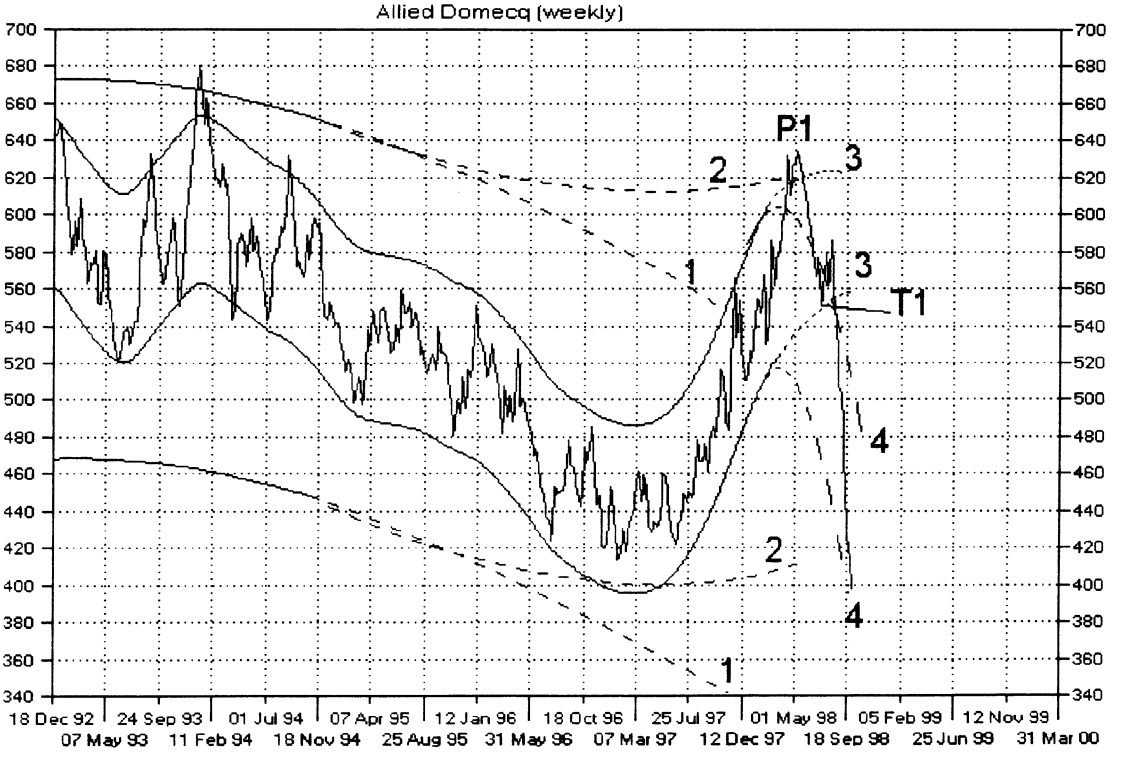



**FIGURE 24. The effect of a rapid fall on weekly channels.**

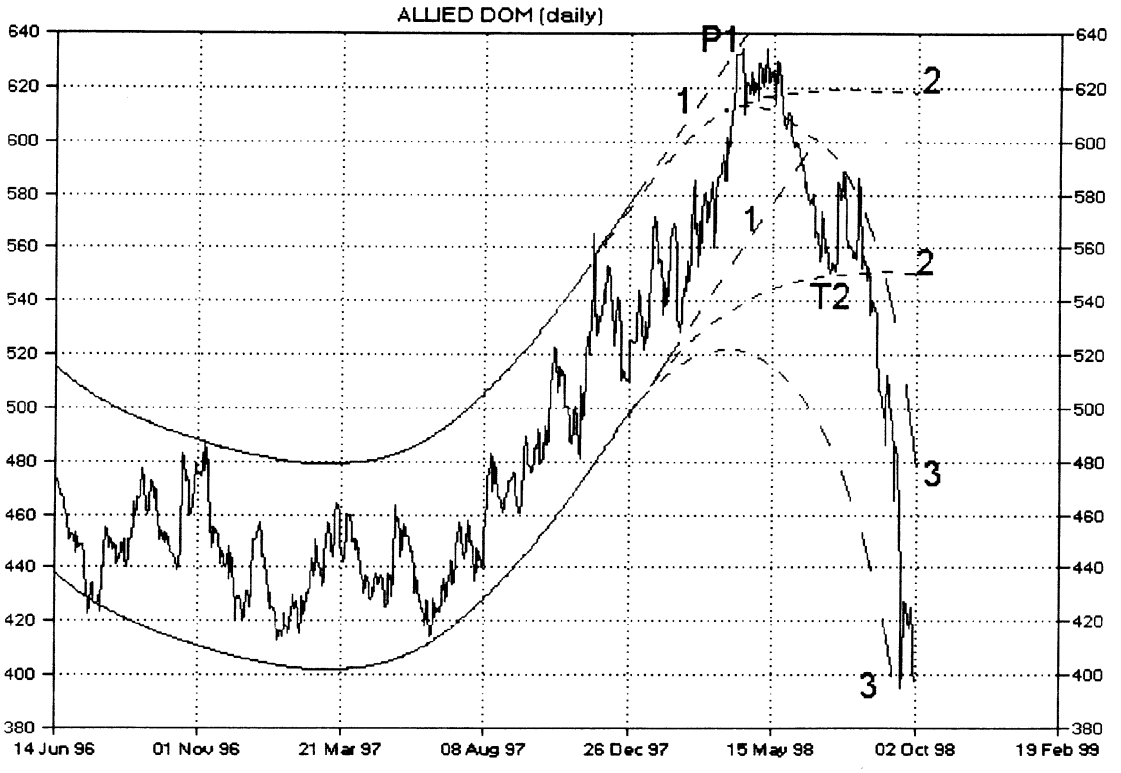



**FIGURE 25. The effect of a rapid fall on daily channels**

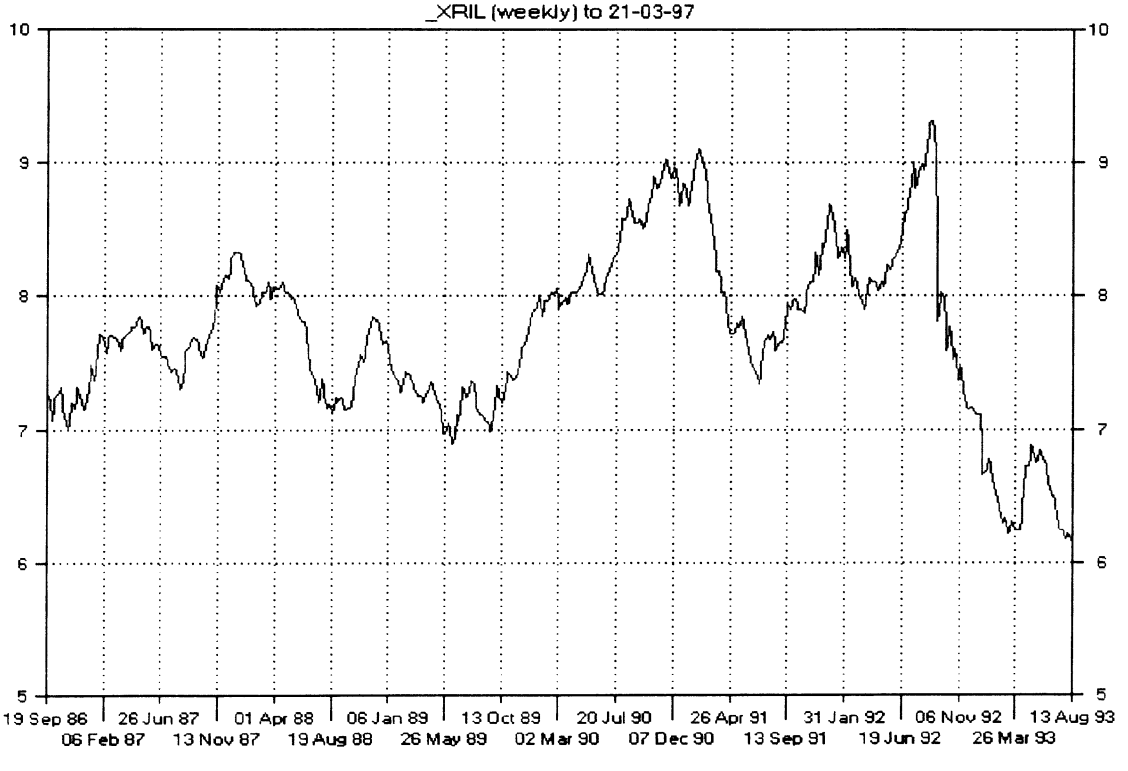



**FIGURE 26. Weekly movements of the Italian Lira versus US Dollar.**

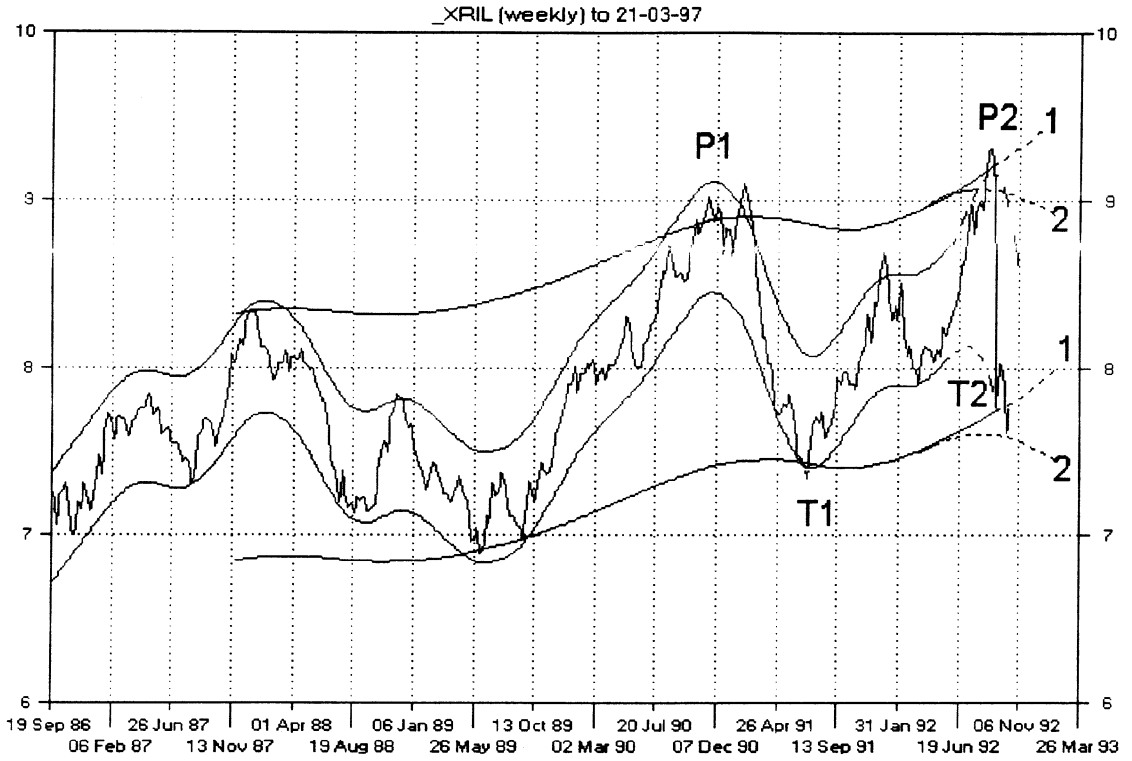



**FIGURE 27. Italian Lira. How channel analysis copes with a rapid fall.**

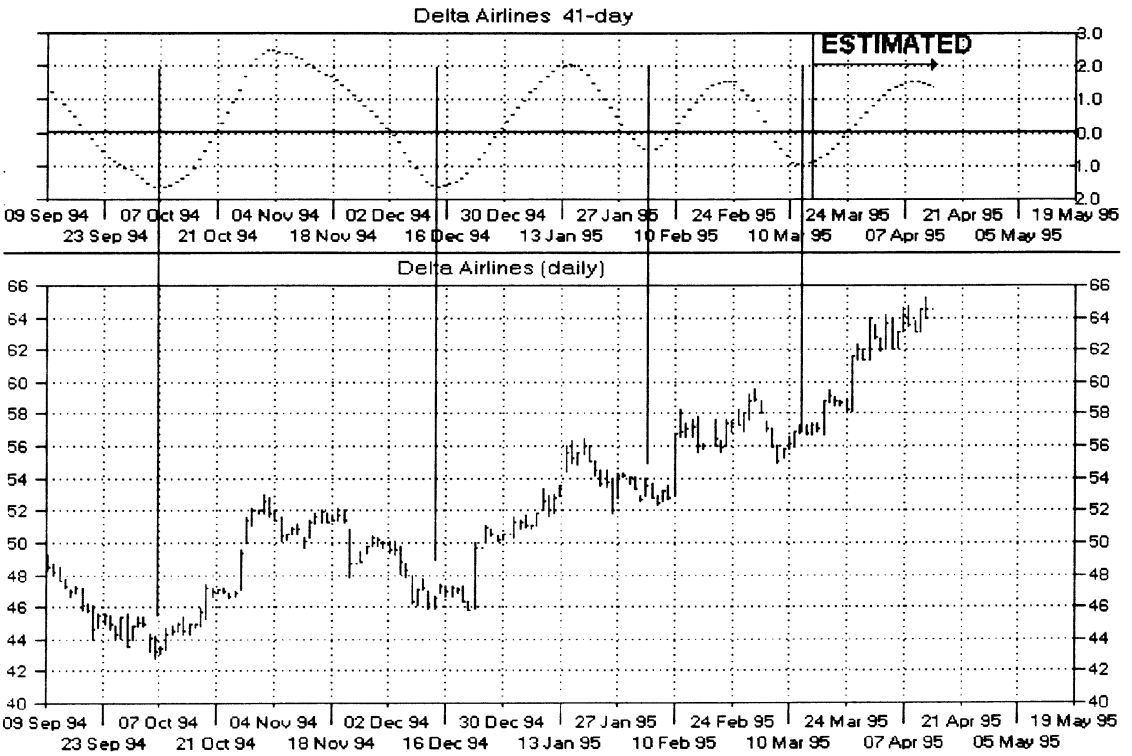



**FIGURE 28. Nominal 41-day cycle in Delta Airlines.**

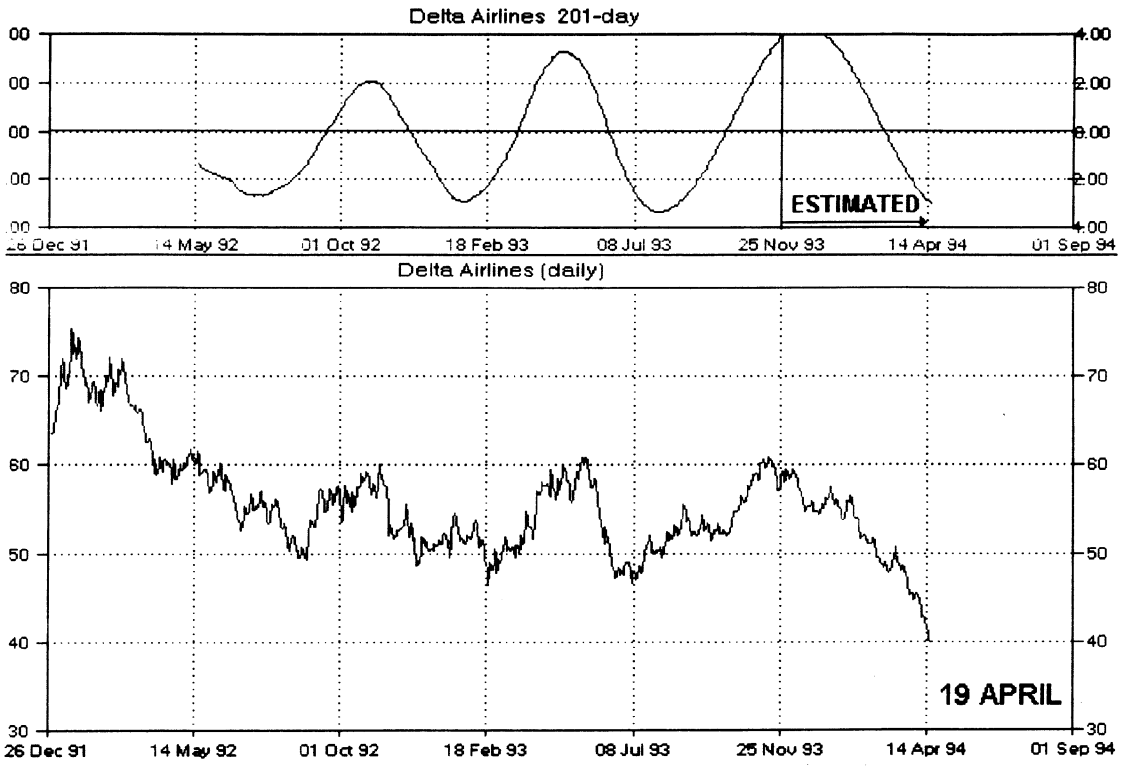



**FIGURE 29. Nominal 201 day cycle in Delta Airlines.**

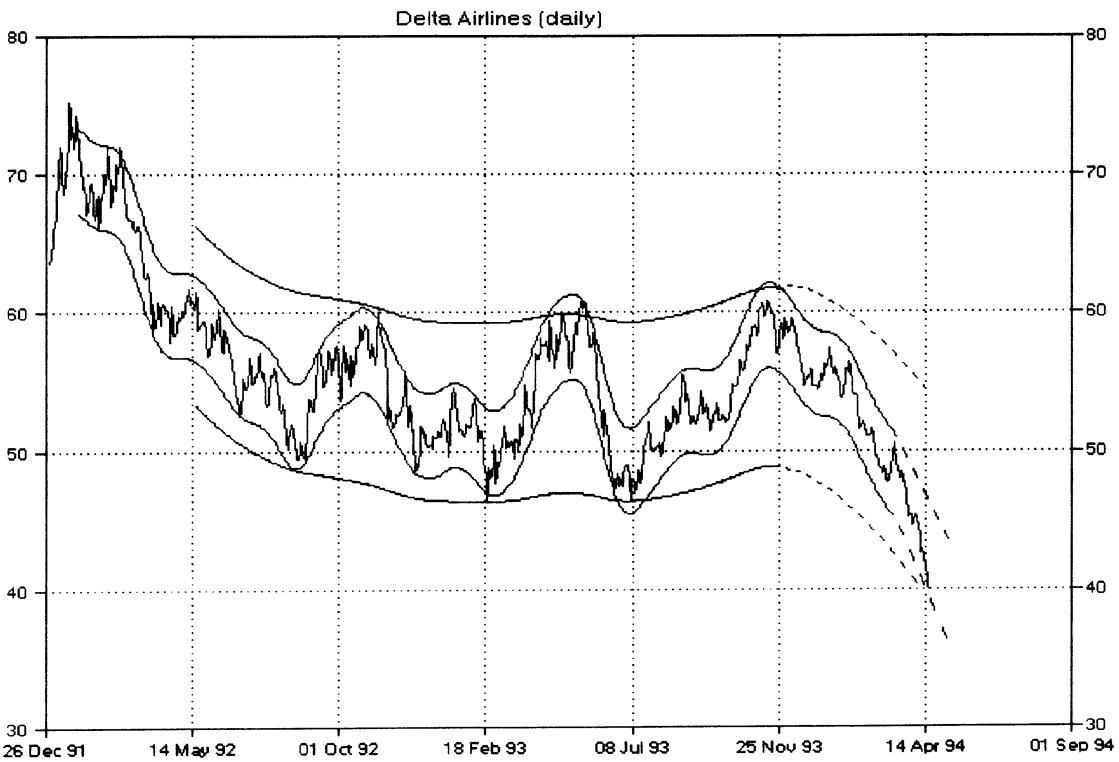



**FIGURE 30. Medium term and short term channels (25-day & 201-day).**

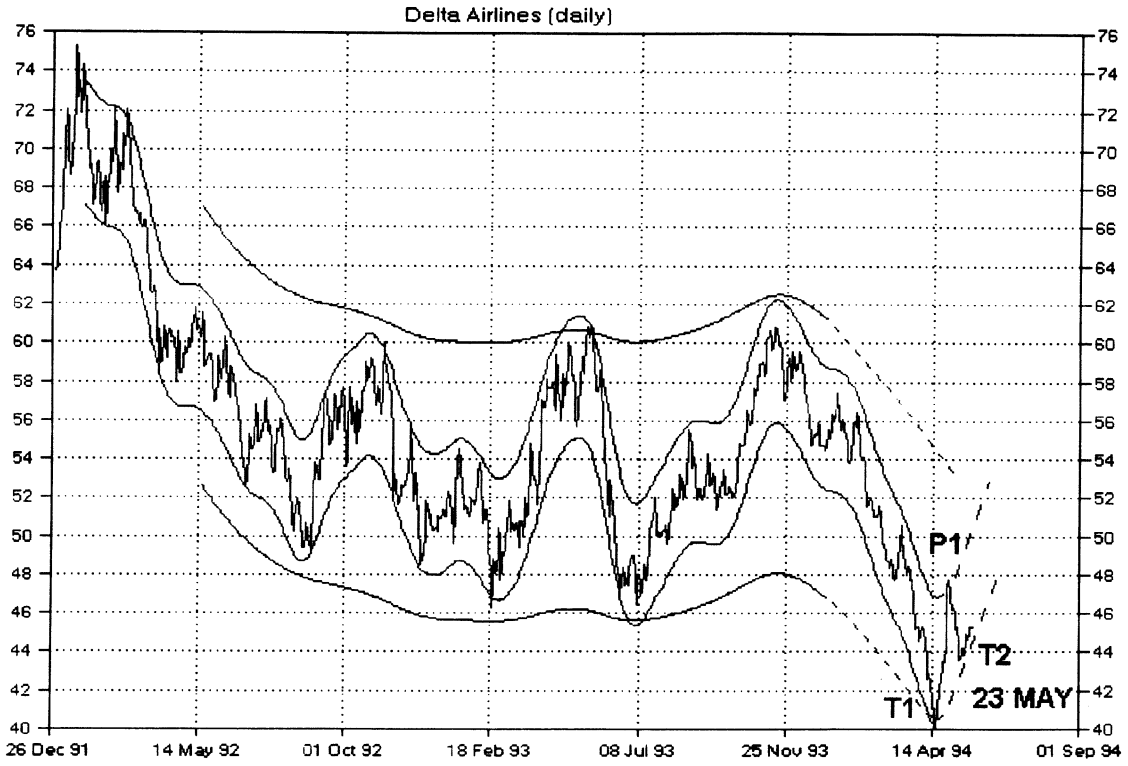



**FIGURE 31. Channels at 23 May 1994. Inner must now be rising.**

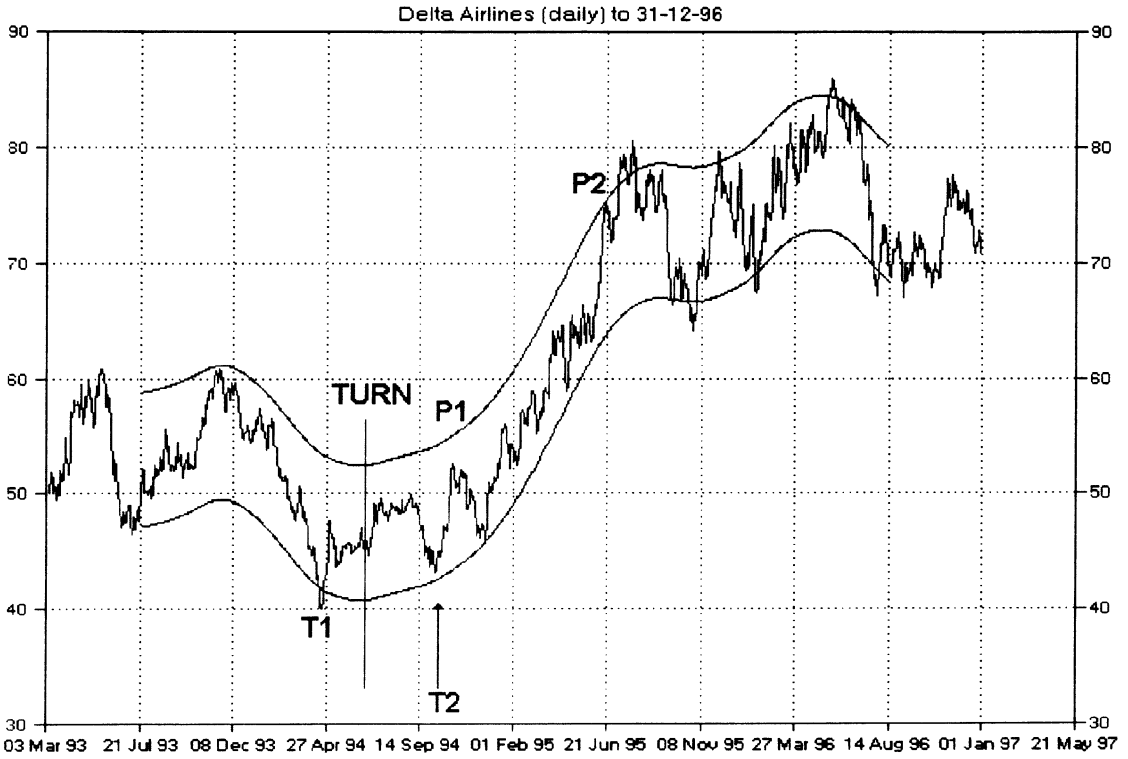



**FIGURE 32. Subsequent movement in Delta Airlines.**

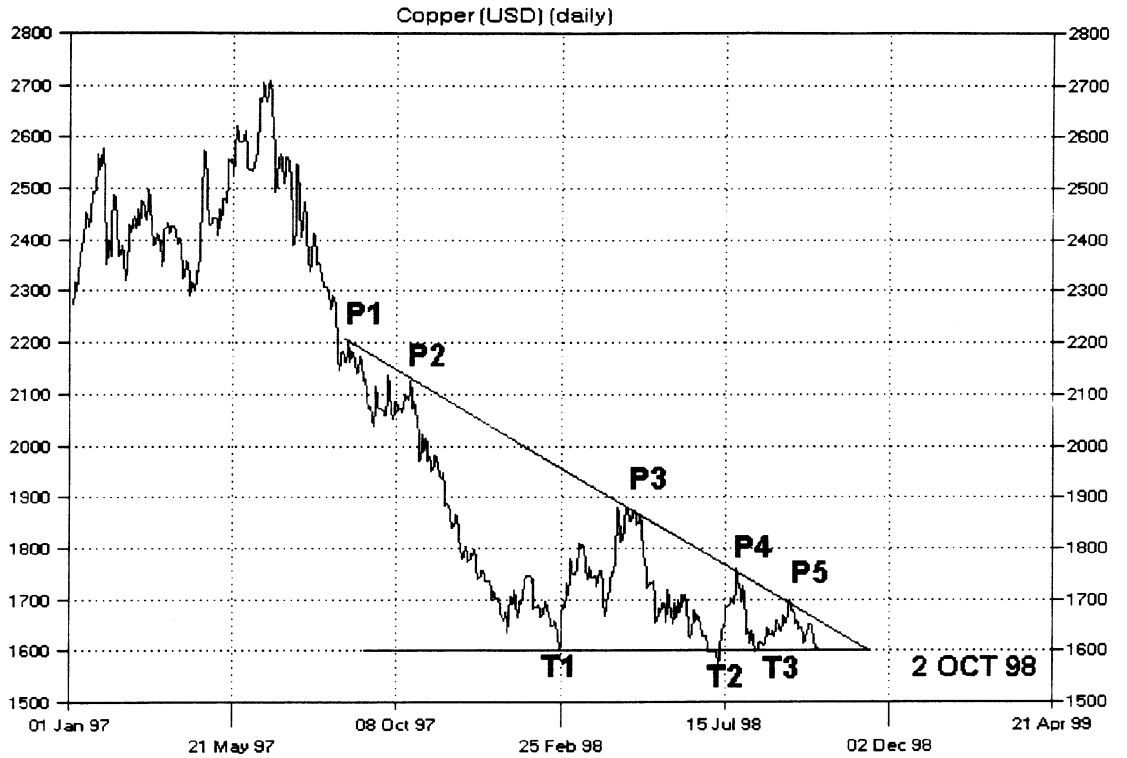



**FIGURE 33. The daily copper price by 2nd October 1998.**

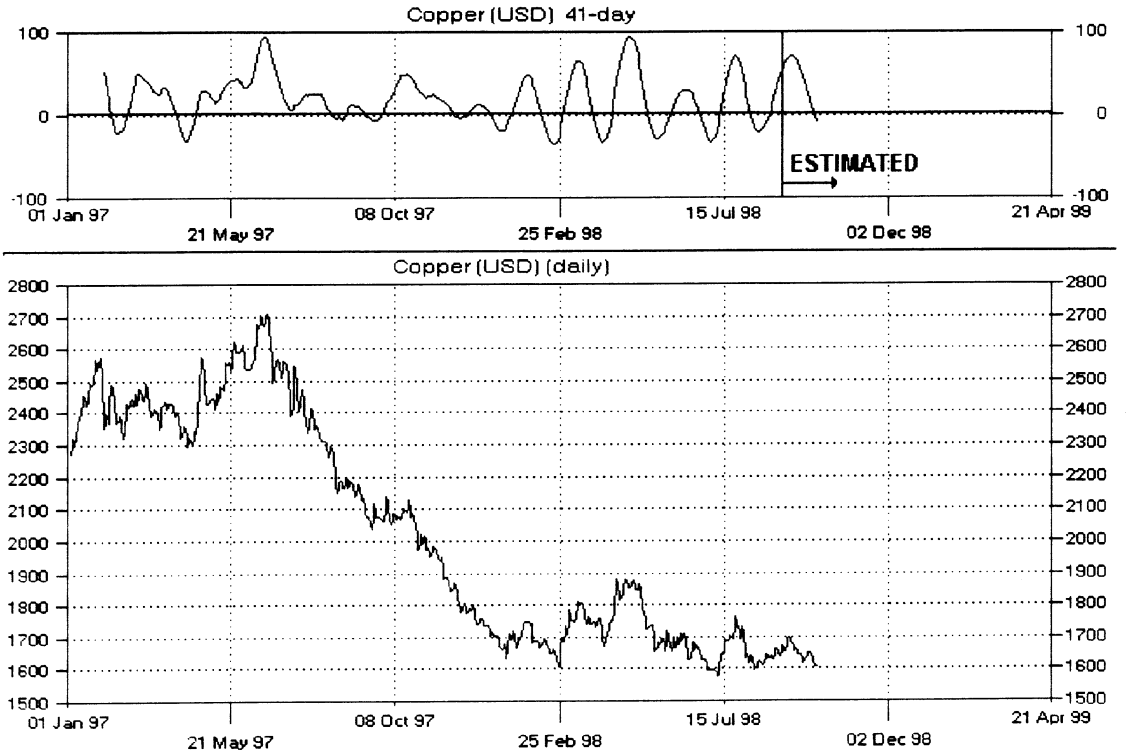



**FIGURE 34. Nominal 41-day cycle in copper.**

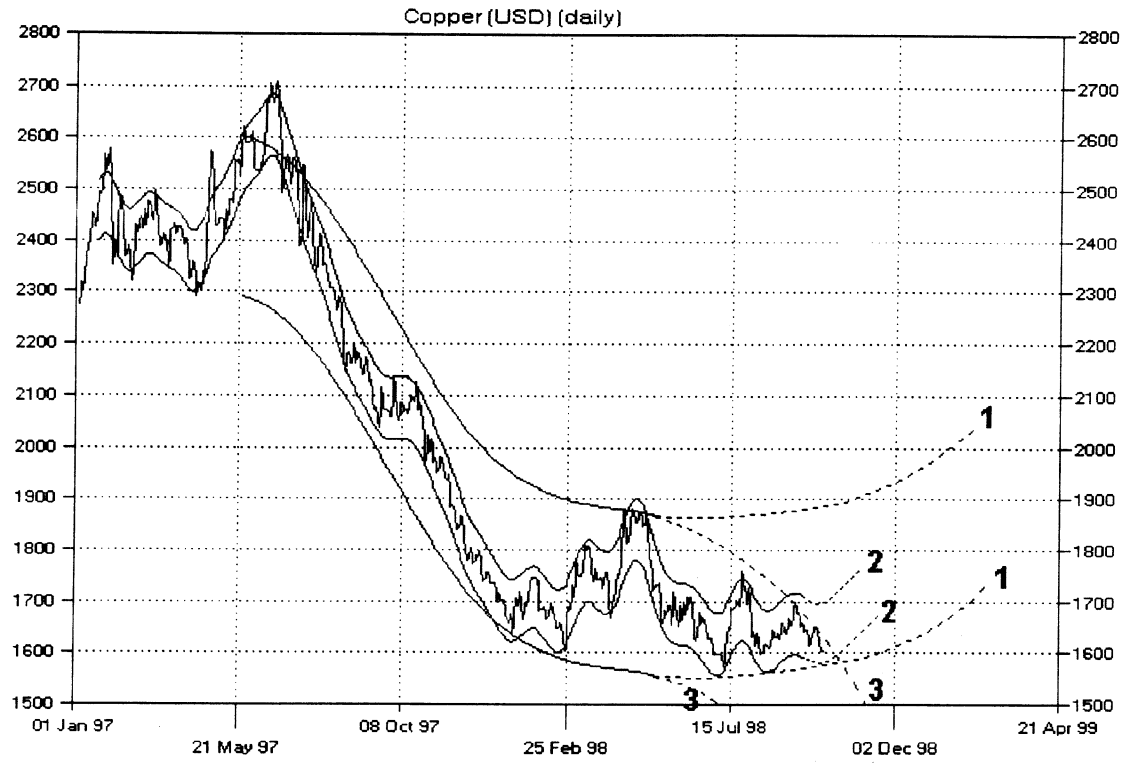



**FIGURE 35. Alternative 201-day channels in copper.**

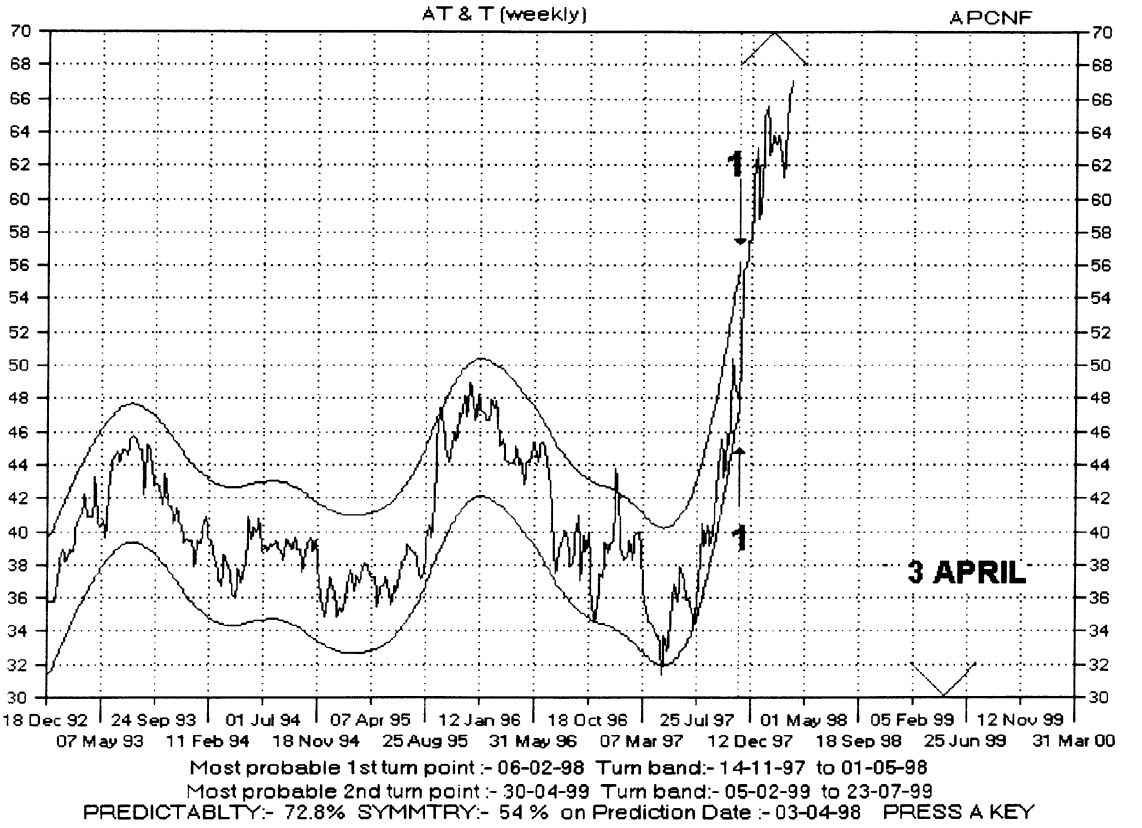



**FIGURE 36. Sigma-p prediction for AT & T on 3rd April 1998.**

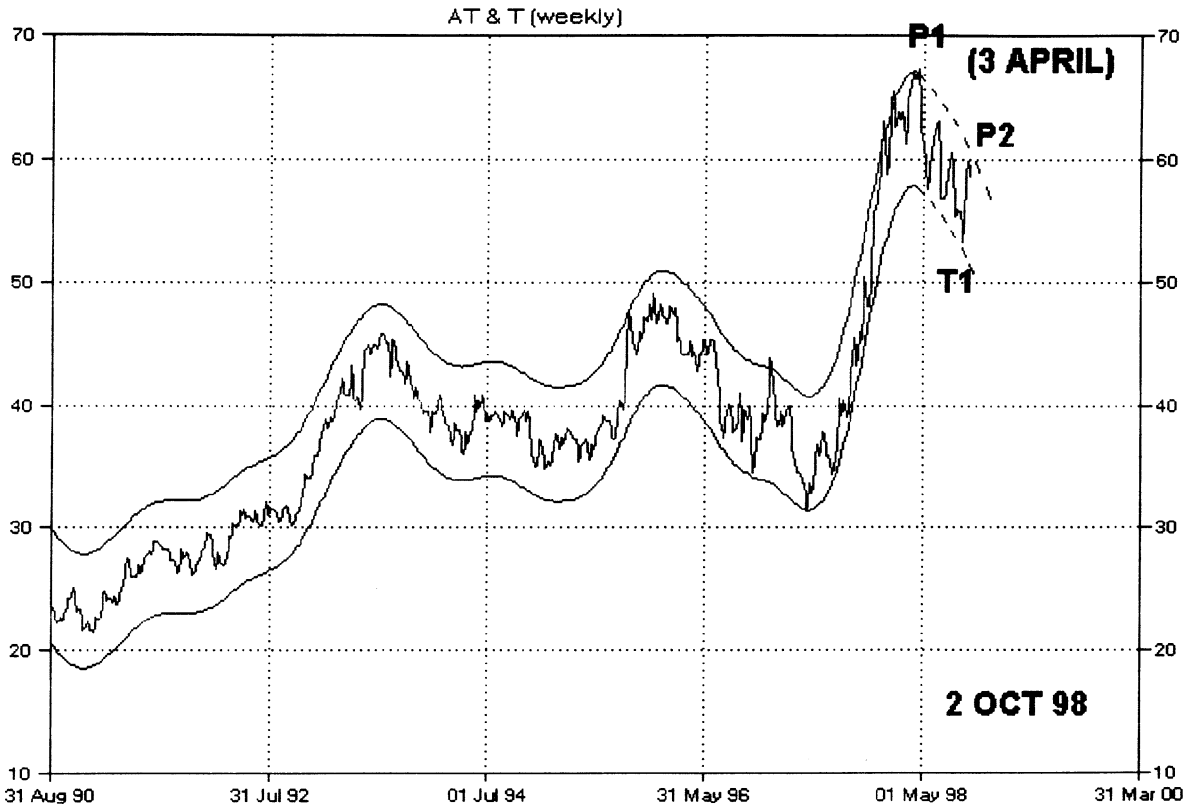



**FIGURE 37. Subsequent movement in AT & T by 2nd October 1998.**

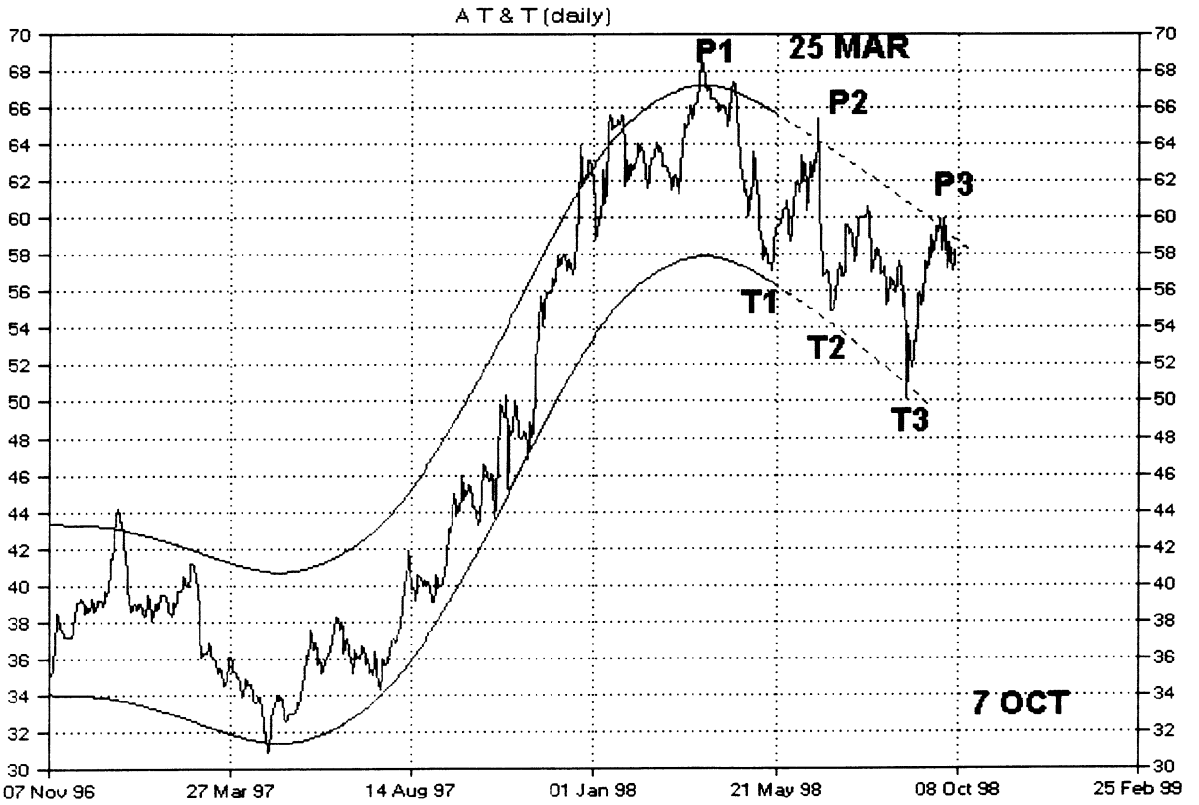



**FIGURE 38. Daily data gives much clearer features to estimate channel.**

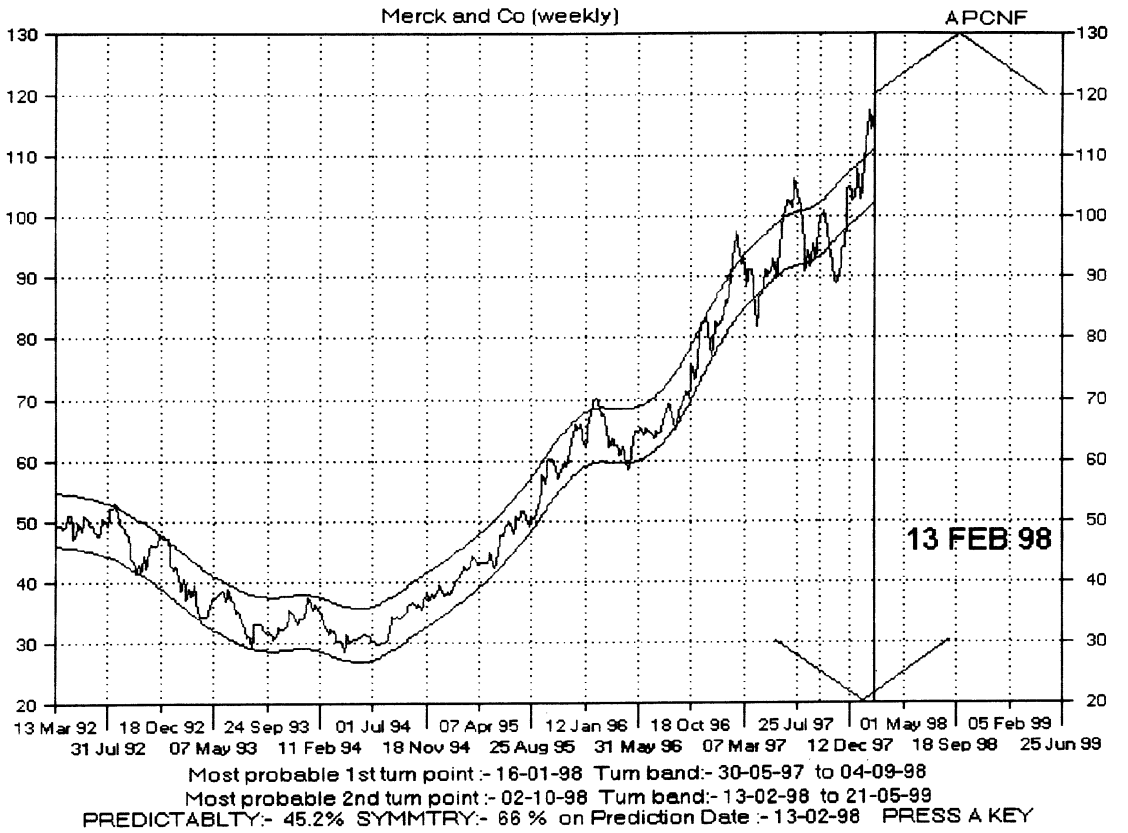



**FIGURE 39. Sigma-p prediction for Merck on 13 February 1998.**

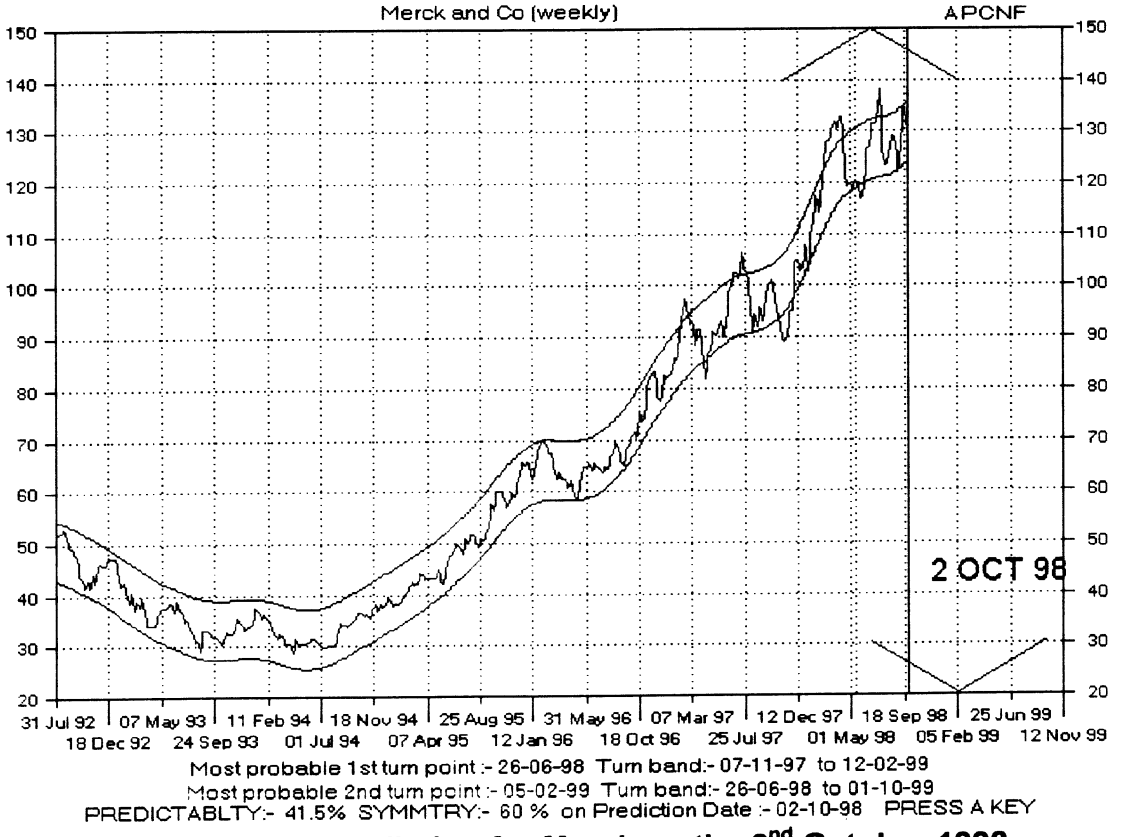



**FIGURE 40. Sigma-p prediction for Merck on the 2nd October 1998.**

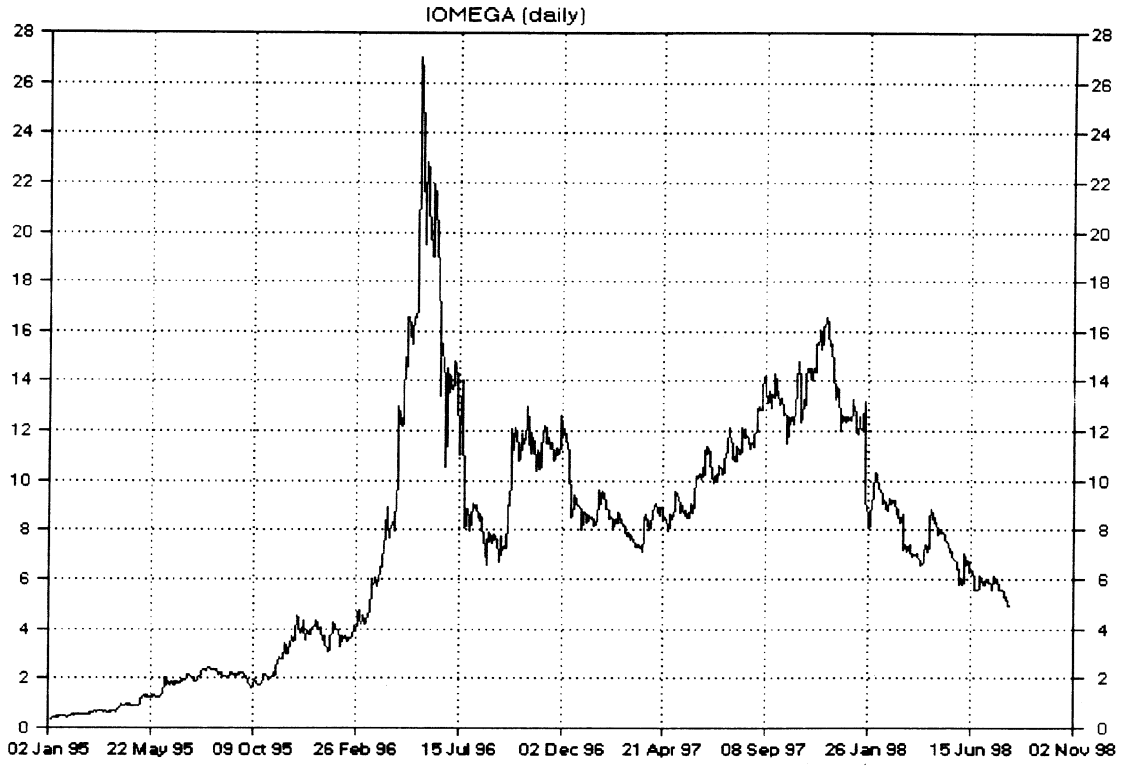



**FIGURE 41. Daily closes in Iomega.**

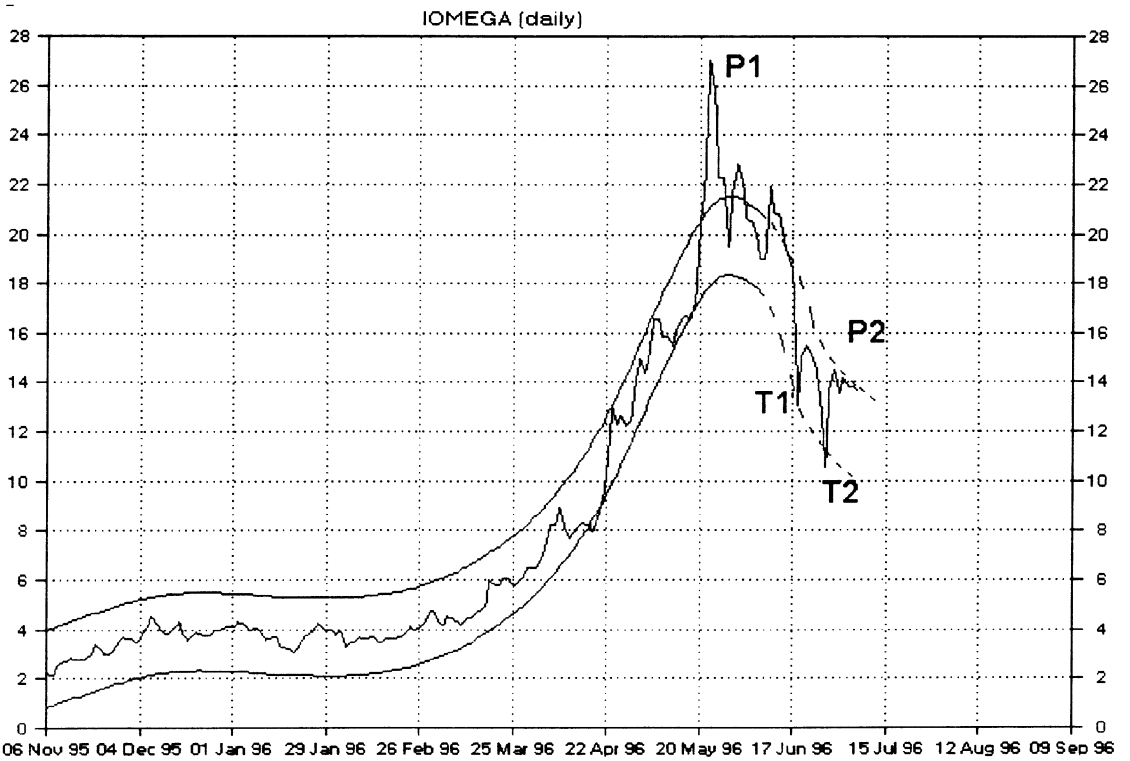



**FIGURE 42. Possible channel in Iomega.**

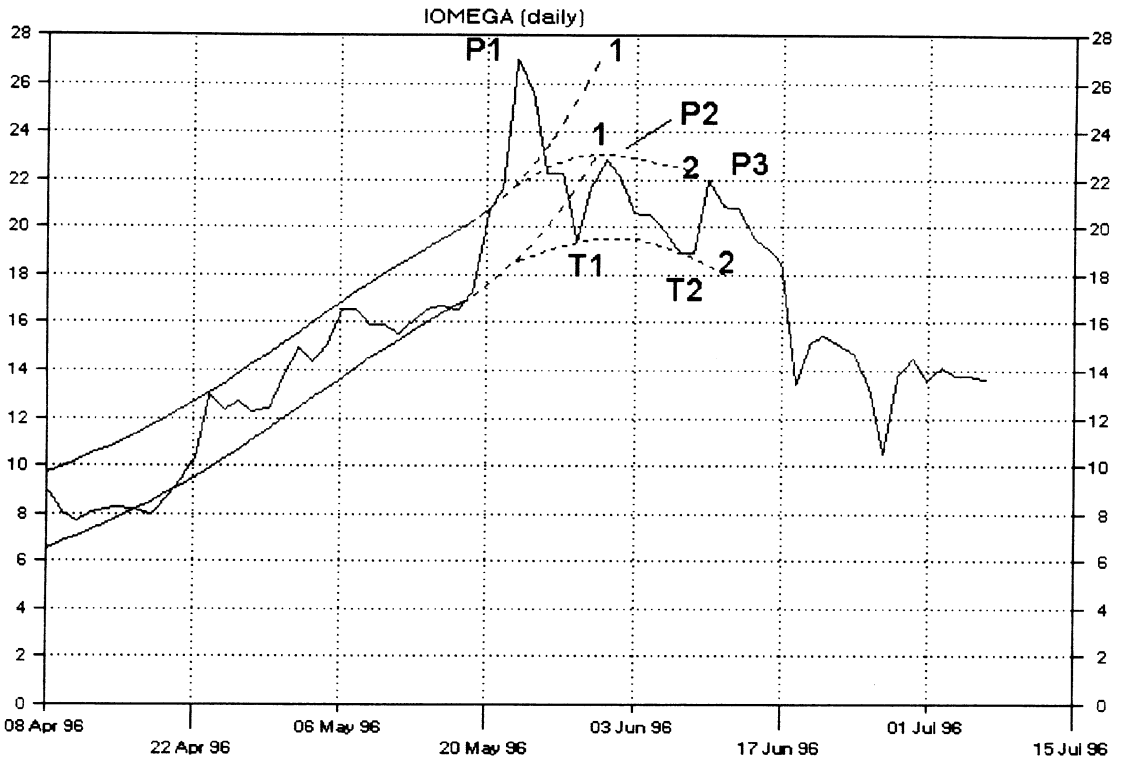



**FIGURE 43. Enlarged portion of Figure 42.**

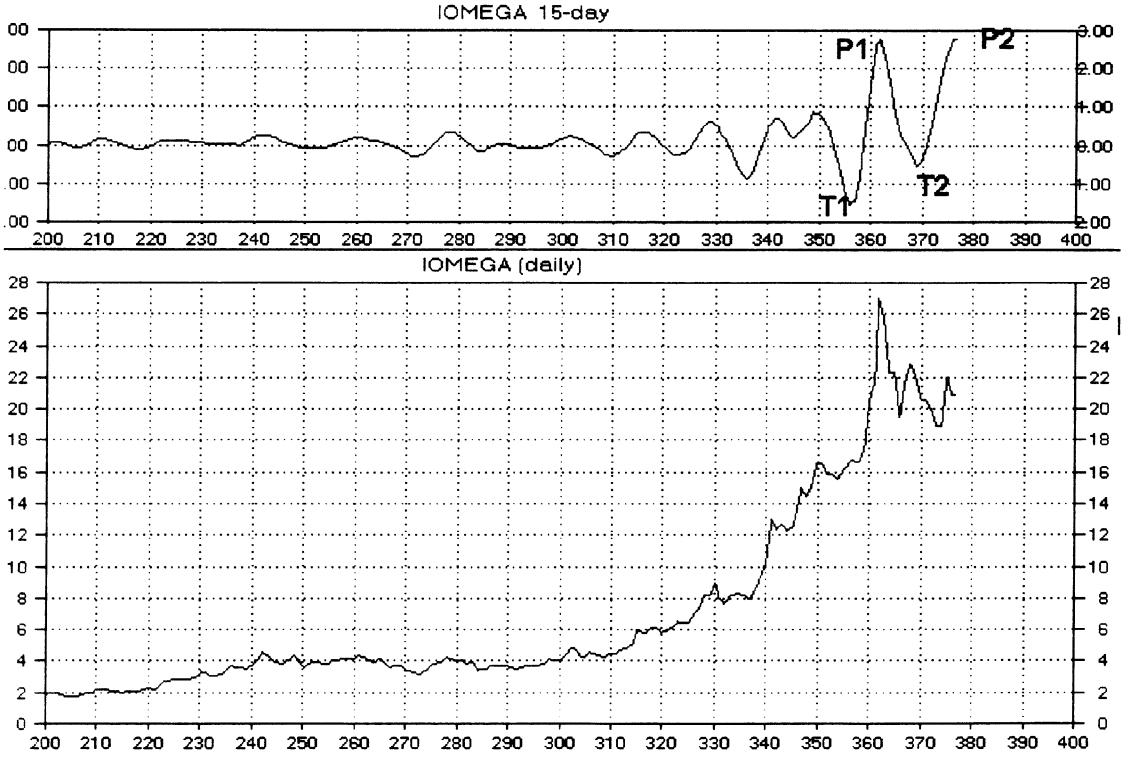



**FIGURE 44. Nominal 15-day cycle in Iomega.**

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