PRACTICAL APPLICATIONS AND LIMITATIONS OF ELLIOTT WAVE PRINCIPLE IN MODERN FOREIGN EXCHANGE MARKETS

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ABSTRACT

Elliott Wave Principle is widely used as a technical tool in financial market analysis nowadays, but very few studies have been done to assess its effectiveness in predicting fluctuations in the market. This study derives some simple trade plans to assess the affectiveness of Elliott Wave. Historical data for the DEM/USD foreign exchange market from 1985 to 1994 is used in the study. The data between 1985 to 1989 is used to establish wave relationships, whereas data from 1989 is used for the simulated trading. The results indicate a high rate of return compared to other form of investments, despite the simplicity and limitations of the trade plans. The results suggest Elliott Wave is an effective tool in predicting price movement in foreign exchange markets.

In addition, future market perspectives are formulated using Elliott Wave to illustrate the wave counting techniques and guidelines. Practical applications and limitations of Elliott Wave Principle are also discussed.

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CHAPTER I

INTRODUCTION

The financial markets have grown very rapidly in recent years. The high rate of growth is observed in both the volume and diversity of trade. The world financial market keep soaking up an ever-growing amount of capital, while the number of investment products also keeps growing at a very fast rate throughout the world. Today's financial market comprises of many different market segments, just to name a few: stock, index future, index option, commodity future, bonds, interest future, forex spot market, forex future etc. This rapid growth in volume and diversity has made the trading in financial markets more and more complicated. This increase in complexity has led to a high demand for technical analysis tools to facilitate the complicated trading. However, the effectiveness of technical analysis tools has always been a controversial subject. On the other hand, there is a general consensus among traders that while use of technical analysis alone is never sufficient to predict the exact market movement at all times, it is an indispensable tool for market analysis.

One of the most renowned technical analysis tools is Elliott Wave Principle. Elliott Wave Principle was first developed by R. N. Elliott when he published a series of articles in Financial World magazine in the 1930's. The theory was subsequently enhanced and promoted by a number of famous writers including Robert Prechter, A. J. Frost, Robert Beckman, Robert Balan, Glenn Neely and many others.

The fame of the Elliott Wave Principle was developed by market analysts and traders who performed remarkably well in market forecast by using Elliott Wave. However, it must be pointed out that Elliott Wave Principle is not an objective scientific tool. The application of the wave counting principles inherently requires a lot of subjective judgement. Therefore, a study of Elliott Wave is not an exact science. Instead, there is a strong emphasis on the building up of experiential knowledge. It is an art rather than science. However, in modern day financial markets, it has been commonly accepted that scientific approach alone is unable to account for all the market movements or produce a fully accurate forecast. The best results are usually produced by a combination of scientific study and market experience.

The objectives of the current study are:

- to ascertain the effectiveness of application of Elliott Wave Principle in modern foreign exchange markets.

- to derive practical wave counting and trading methods for Elliott Wave Principle.

- to identify the limitations in the practical application of the Elliott Wave Principle.

The focus is put on the foreign exchange market because with the rapid growth of international trade, the forex market is nowadays one of the most liquid and transparent markets. Among banks, investment houses, corporates, institutional and private investors, there is now an overwhelming awareness of the need to dynamically manage their currency exposure. The demand for the research and analysis of the dynamics of currency movements has grown rapidly. The forex market also has particular significance in Hong Kong. Being one of the major financial centres in the world, each day a large amount of forex trading are being conducted here. It is apparent that the forex trading in Hong Kong is getting more and more important, and therefore it is chosen as the financial market in this study.

Out of the foreign currencies that are traded every day, we have chosen the Deutsche Mark as the focus of study because it is one of the most highly traded currencies. The Deutsche Mark also forms the pivotal centre between two economic giants - the U.S and the European Bloc.

CHAPTER II

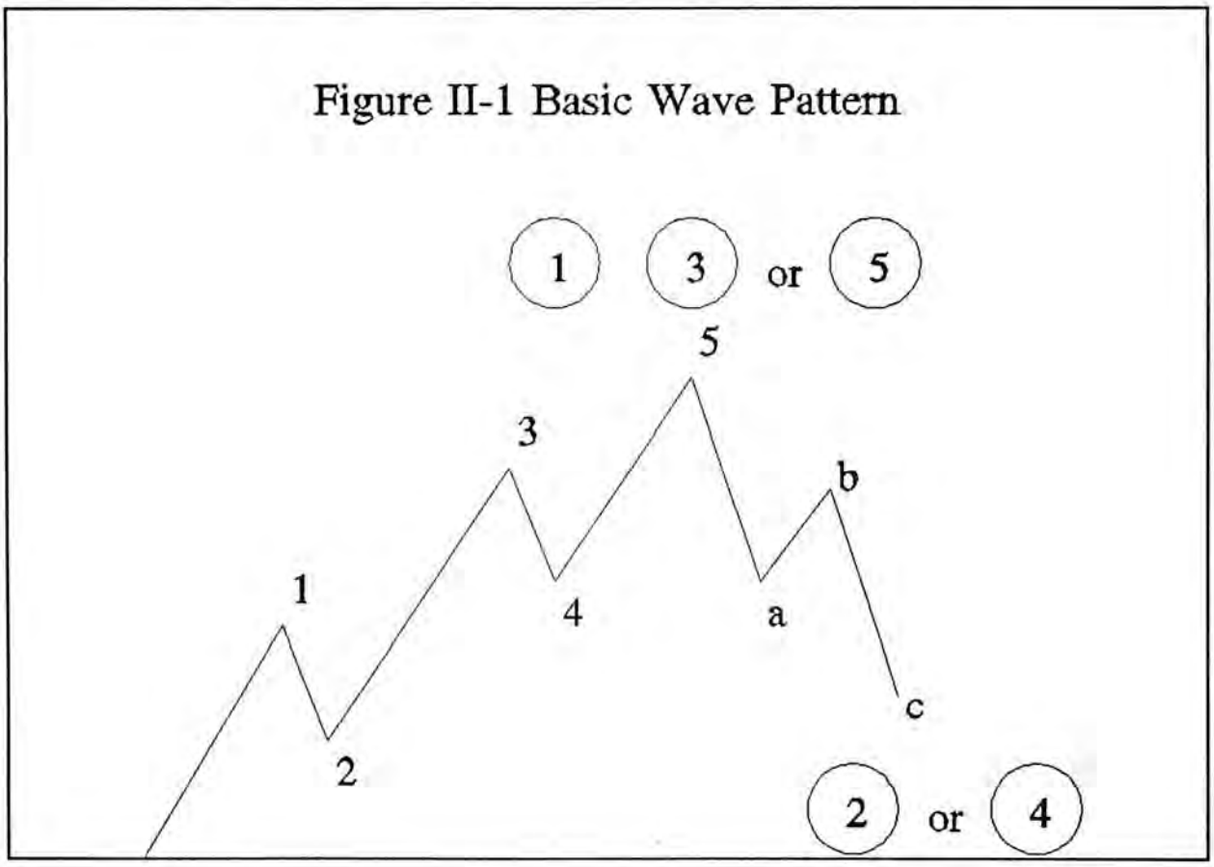
LITERATURE REVIEW

The Elliott Wave Principle was first developed by R. N. Elliott in a series of classical articles published in the Financial World magazine in the 1930's. However, it was A. J. Frost and R. R. Prechter who consolidated Elliott's initial works when they published in the 1970's the classical book on Elliott Wave Principle : "Elliott Wave Principle - Key to Stock Market Profits". Prechter has been one of the most important contributors in promoting the application of Elliott Wave Principle to modern financial markets. However, it must also be mentioned that many other writers have contributed to various aspects in the practical application of the theory, such as Balan, Weis, Beckman and Neely.

The basic concepts of Elliott Wave Principle are actually quite simple. The core concept is that any market movement always has a pattern of five waves in the direction of the main trend, then the entire sequence is "corrected" by a pattern of three waves going in the opposite direction. The entire sequence is illustrated in Fig. II-1. Waves 1,

3, and 5 are termed impulse waves and waves 2 and 4 are called corrective waves. In the sequence, wave 2 corrects wave 1; wave 4 corrects wave 3; and the entire impulse of wave 1 to 5 is corrected by the sequence a-b-c. One complete cycle hence consists of 8 waves, 5 up and 3 down in a bullish market and 5 down and 3 up in a bearish market.

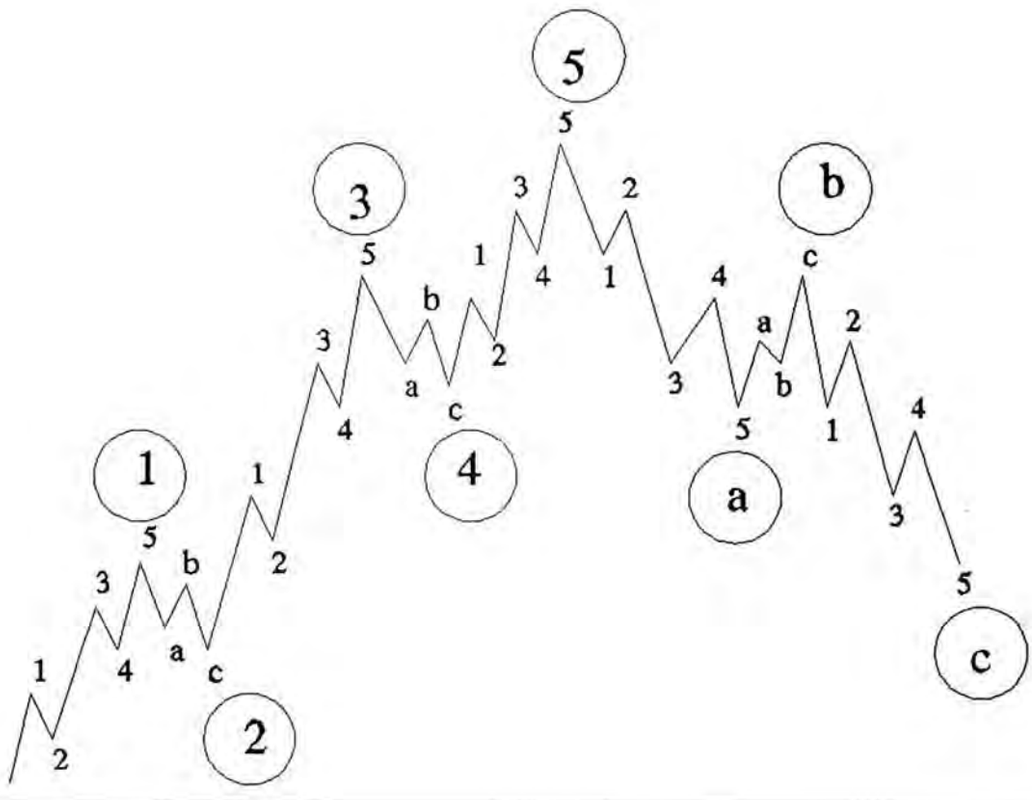
Figure II-1 Basic Wave Pattern



There is one very important concept in Elliott's theory. Each of the waves as shown in Fig. II-1 can always be broken down into smaller wave components, as illustrated in Fig. II-2. Therefore, when the complete wave cycle is viewed at one lower level, it actually consists of 34 subwaves. The subwaves again can be broken into further levels in a similar manner. All the pioneers of Elliott

Wave emphasised that the basic rhythm of "fives" corrected by "threes" is constant independent of the time unit of reference. In other words, the wave patterns in hourly charts are counted in the same way as daily, weekly or even yearly charts. The concept implies that if a wave count satisfy only low level counting but not high level counting, it cannot be accepted as a legitimate count.

Figure II-2 Basic Wave Pattern Showing Subwaves



With regard to the wave counting process, nearly all writers agree that three rules are considered as absolute, which must be complied by waves at all levels:

(1) Wave 2 cannot trace back past the starting point of

wave 1.

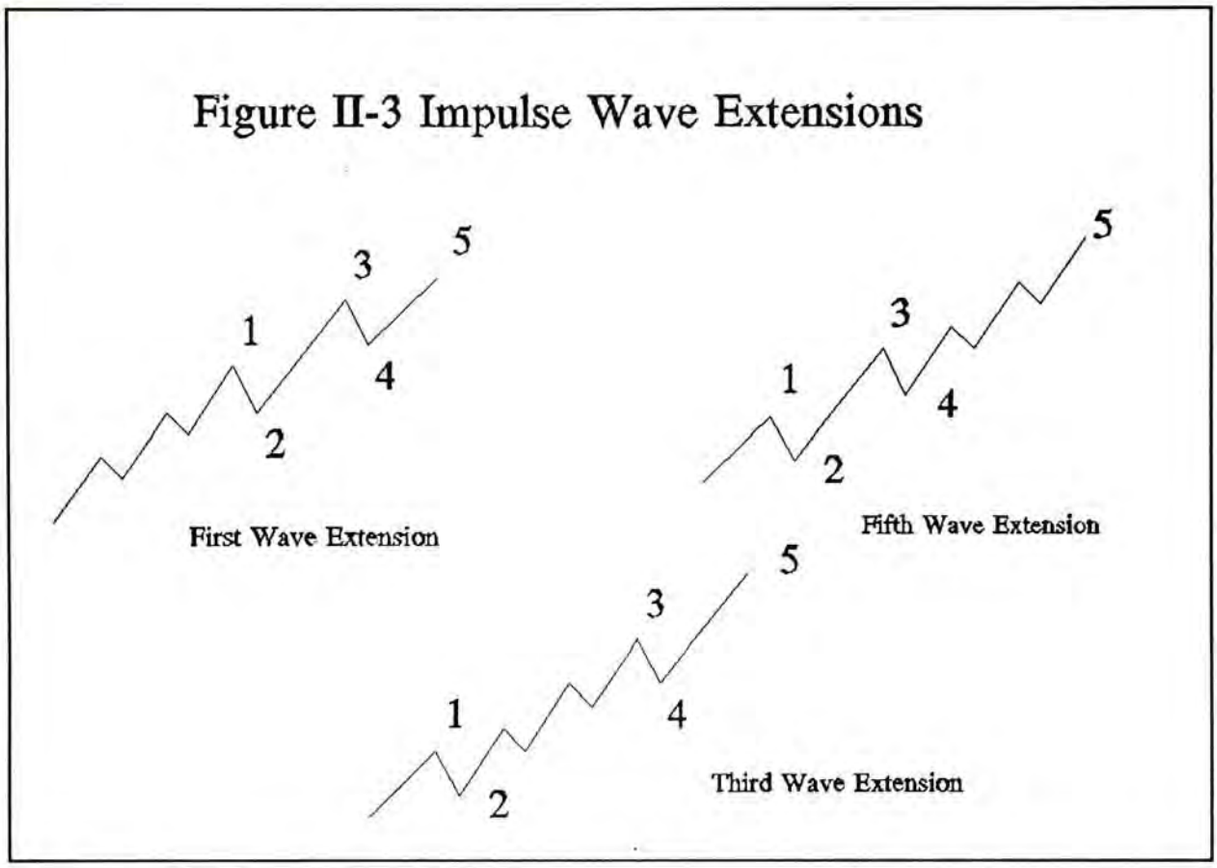
(2) Wave 3 cannot be the shortest out of the waves 1, 3 and 5. (It usually is the longest).

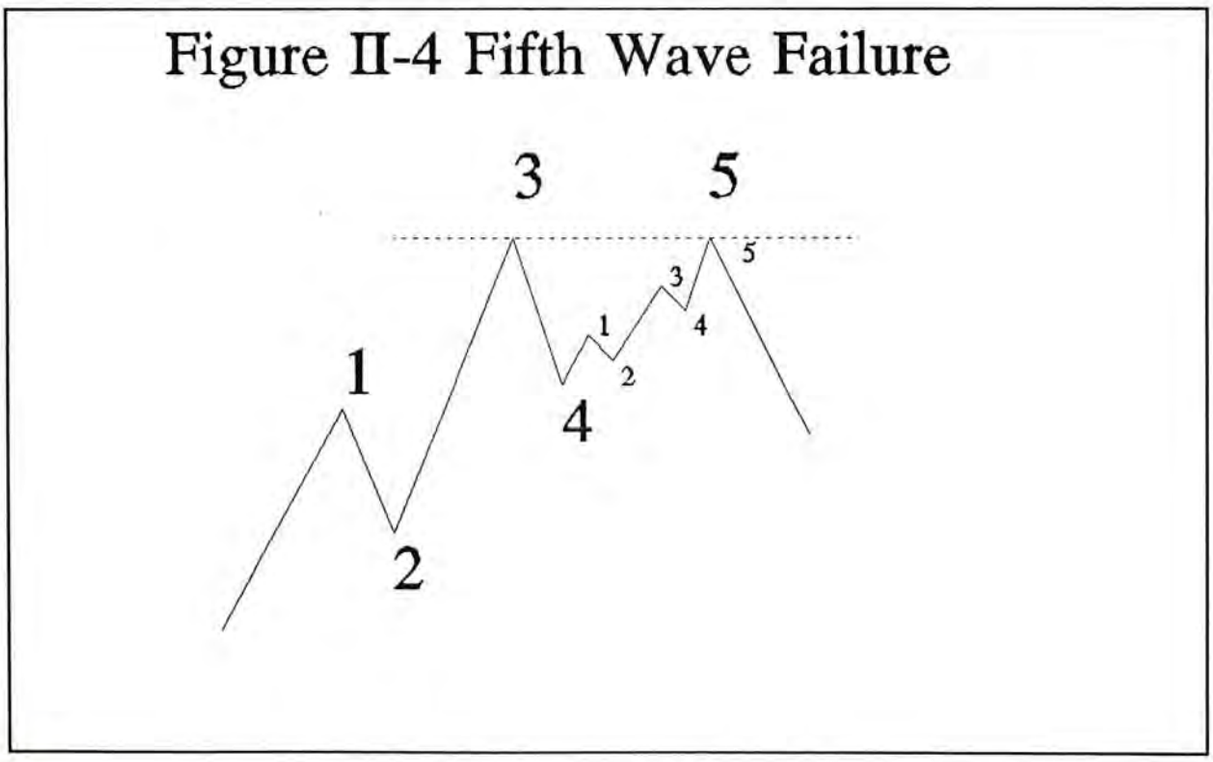
(3) Wave 4 cannot trace back past the ending point of wave 1.

Variations

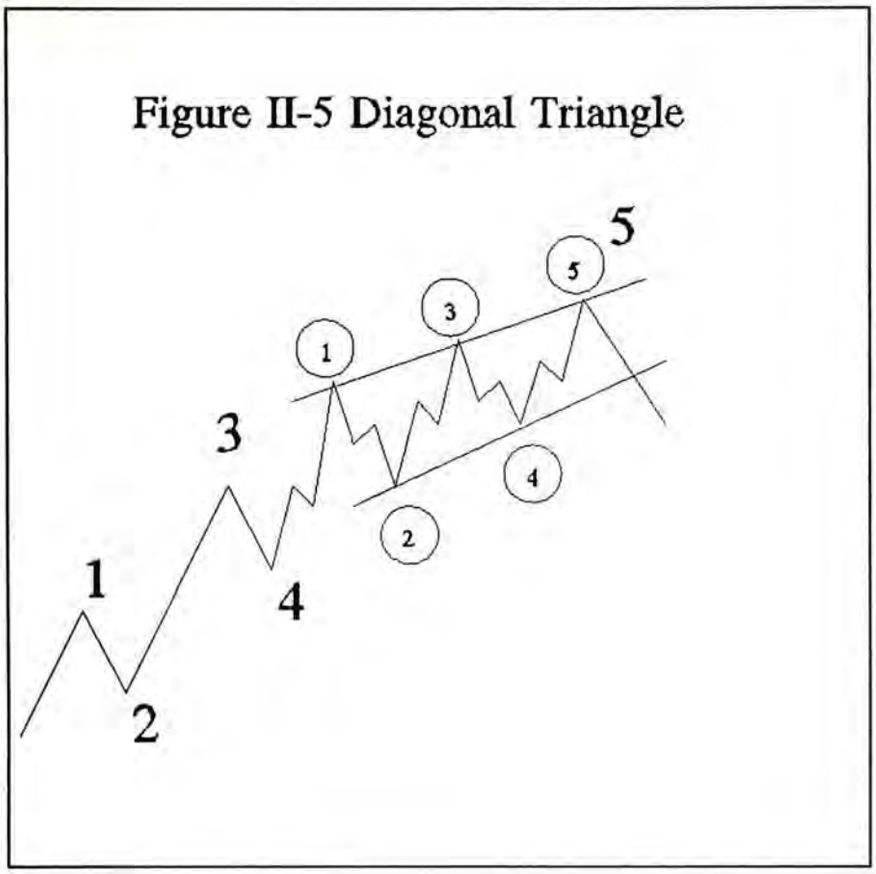
Although the basic concepts of Elliott Wave Principle appear to be very simple with only 3 basic rules, the practical applications of the theory are much more complicated than it appears to be, partly due to variations of the basic forms.

For impulse waves, there are 3 forms of variations, namely extensions (Fig. II-3), fifth-wave failures (Fig. II-4) and diagonal triangles (Fig. II-5). All these variational forms are comprehensively described in the book by Frost and Prechter.





For corrective waves, the waveforms are more complicated. The basic forms of corrective waves include simple zigzag



(Fig. II-6), flat correction (Fig. II-7), irregular correction (Fig. II-8), running correction (Fig. II-9) and horizontal triangle (Fig. II-10). Each of these waveforms possesses a different degree of corrective power. For instance, the flats and irregulars reflect a strong underlying larger trend of the impulse movement and hence the corrective power is weak. The running correction implies that the underlying larger trend is so strong that it refuses to correct. Horizontal triangles represent the market is hesitating.

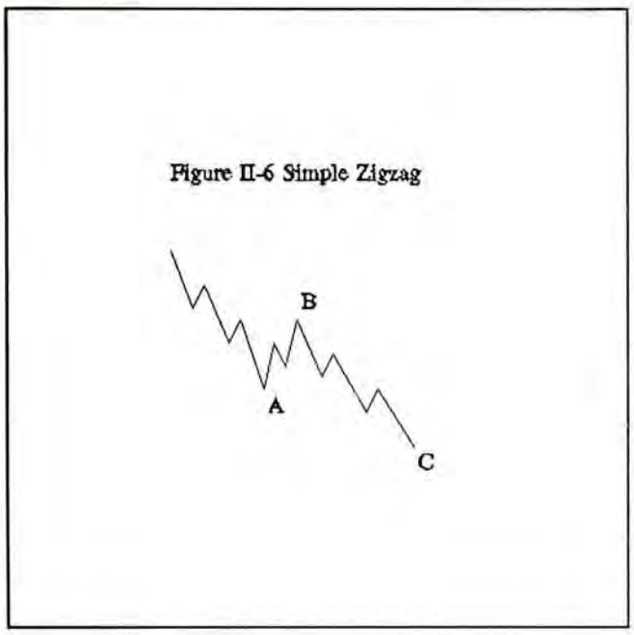


Figure II-6 Simple Zigzag

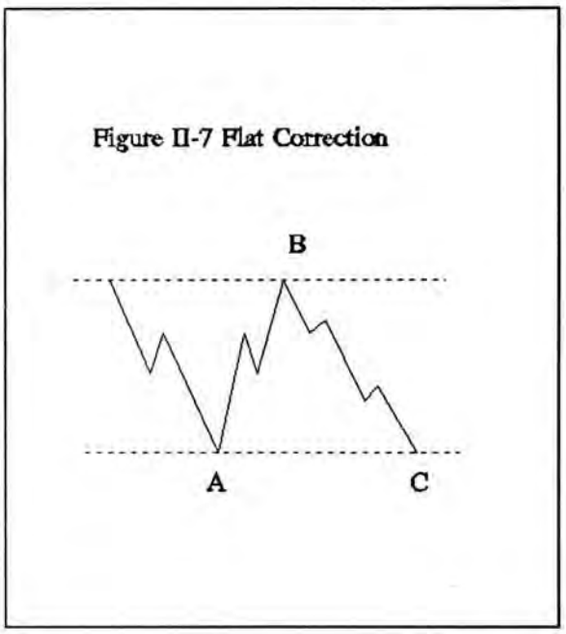


Figure II-7 Flat Correction

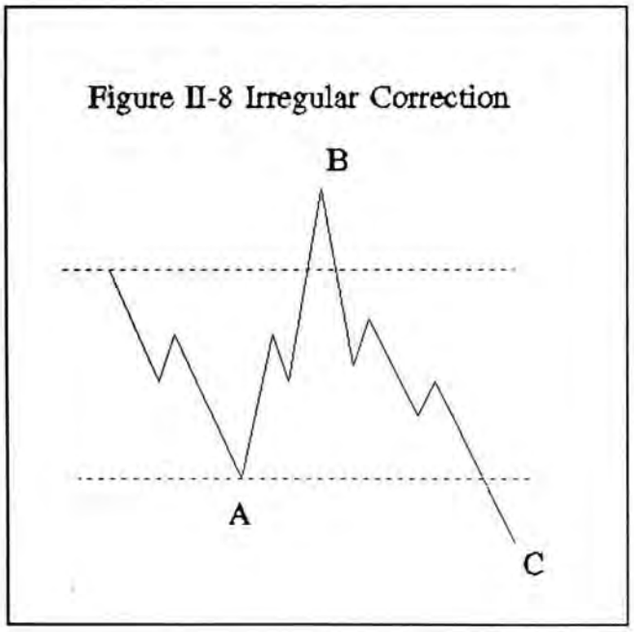


Figure II-8 Irregular Correction

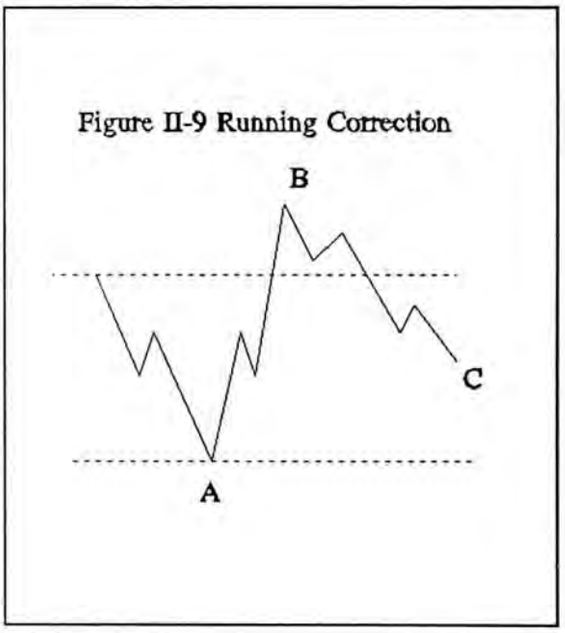


Figure II-9 Running Correction

One important characteristic to be noted for corrective waves is that the subwave structure is different for different pattern, and the structure is tabulated in Table II-1. The subwave structure is often very useful to distinguish the different corrective wave forms.

Figure II-10 Triangle Correction

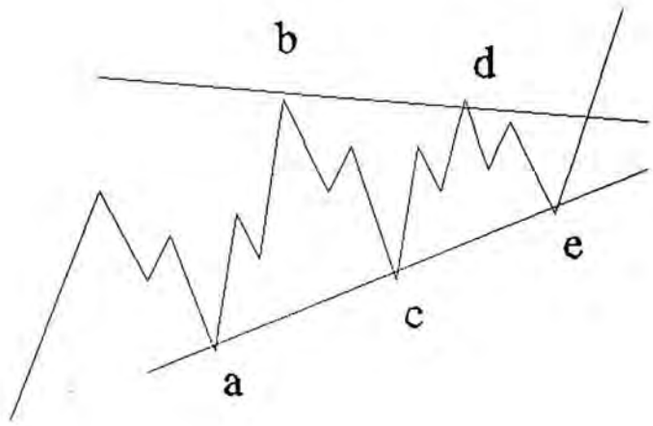


Table II-1

Subwave Structure for Corrective Waves

Corrective Wave Form	Subwave Structure
Zigzag	5-3-5
Flat	3-3-5
Irregular	3-3-5
Running Correction	3-3-5
Horizontal Triangle	3-3-3-3-3

To make things more complicated, the corrective wave patterns are not only limited to the basic forms listed above. There are the "double three" and "triple three" waveforms which are actually combinations of the basic corrective waves. Typical examples for double three and triple three are shown in Figs. II-11 and II-12

respectively. It should be noted that each of the "threes" in double three and triple three can be substituted by any of the five basic corrective forms (except possibly horizontal triangle which normally appears only as the last formation or as an intervening X wave in a multiple three). Hence there is a large number of possible combinations of corrective wave patterns and this makes the wave counting in corrective movements very complicated. R. Balan's book gives the best explanation on corrective waveforms, with a complete set of diagrams to illustrate the waveforms.

Figure II-11 Example of Double-Three

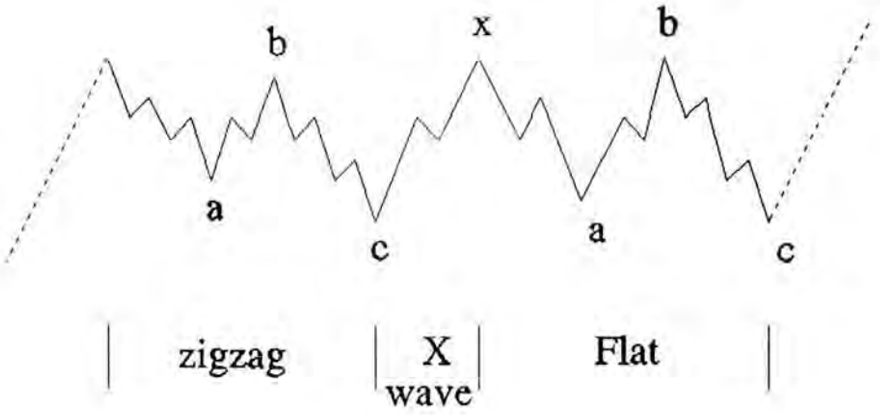
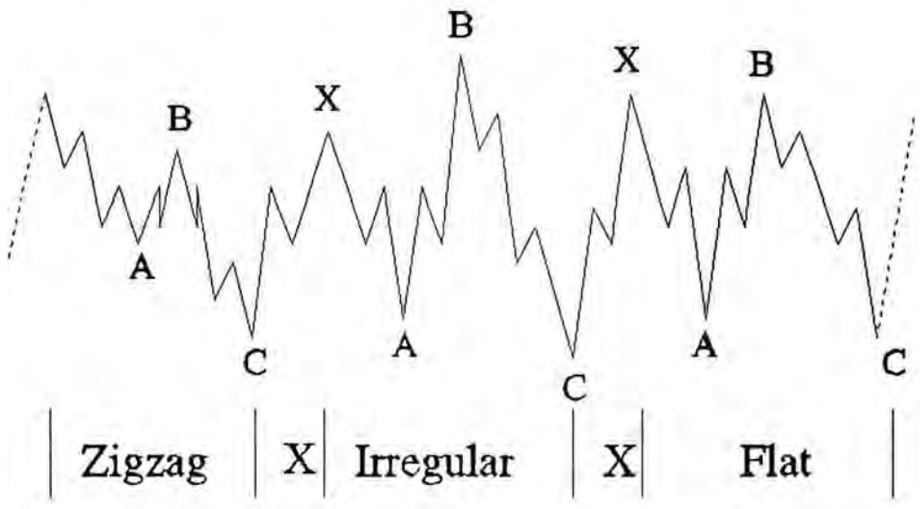


Figure II-12 Example of Triple-Three



Ratio Analysis

In Nature's Law, Elliott cited numerous examples where the Fibonacci numbers and ratios (sometimes called Golden Ratios) can be found in natural phenomenon. He also pointed out that the major turning points in market movements very often can be predicted to a high degree of accuracy by the use of Fibonacci ratios. In his writeups, there were numerous examples given to illustrate the surprising power of the Fibonacci ratios. However, he did not give definitive guidelines for the relationships between different waves within the impulse and corrective waveforms. Later, Frost and Prechter spelled out more specific wave length relationships. In particular, two relationships are of major importance. Firstly, the length of wave 5 is always a Fibonacci ratio of the net travel

from the beginning of wave 1 to the end of wave 3. Secondly, corrections often retrace a Fibonacci percentage of the preceding impulse waves. In other words, the length of wave 2 to length of wave 1 is in a Fibonacci percentage, and so is length of wave 4 to length of wave 3. These two guidelines are very useful for the current study.

It must be pointed out, however, that there is no complete method of ratio analysis so far. Otherwise, Elliott Wave Principle may become an exact science. The ratio analysis usually only points out the probable target points of a current price movement.

Applications on Real Markets

Generally speaking, there are very few literature written on the theory of Elliott Wave Principle. There are even fewer literature to explain the practical applications of the theory in the real-life financial markets. Even though there are many financial news and articles published daily which may quote Elliott Wave Principle to forecast the market trend, very few systematic studies of the principle are published thus far. We have not been able to find published materials which describe the systematic evaluation of Elliott Wave in any financial market.

However, there are two books that are extremely useful for

the practical applications of Elliott Wave theory. The first book was written by David H. Weis. This book describes a complete trading exercise using Elliott Wave, but the market for the simulated trading was not named. The second book was written by Robert Balan. This book covers a comprehensive range of rules and guidelines for applying Elliott Wave Principle in forex market. Some trading plans making use of Elliott Wave Principle are also suggested. However, there is no description on how to implement such trade plans in real or simulated trading.

CHAPTER III

METHODOLOGY

Elliott Wave Principle is often quoted in financial articles and newsletters for the prediction of market but there are very few systematic analysis of its actual predictive power. There is a wide gap between the usage of the theory and the systematic study of its usefulness and limitations. The current study attempts to provide some insights for filling this gap. The major objective of the current study is to ascertain the effectiveness of the Elliott Wave Principle to predict the fluctuations of the foreign exchange market. In particular, the Deutsche Mark forex market is used for in-depth analysis.

A commonly used method to evaluate technical analysis theories is to derive some trading plans based on the theory and then use the plans in simulated trading using either real-time or historical data of the market. The same general approach is employed in this study. A thorough study of the basic theory of Elliott Wave Principle is first carried out. Detailed rules and guidelines on wave counting are extracted. Some simple

trade plans are then formulated based on this study. The trade plans are used to do simulated trading based on historical market data. An initial amount of investment capital is assumed. At the end of the simulated trading, the percentage return over the trading period is then calculated. A comparison with the return of other common investment tools can give an indication on how effective the theory can predict the market movements.

One of the important requirements of the simulated trading is that the trade plans must be based on objective rules as far as possible. Setting up of an objective trade plan can minimize the variation of the trading results due to subjective judgement. Therefore, trade plans are formulated in the simplest manner possible, to facilitate a mechanical and straight forward trading mechanism. For instance, the trade plans have well-defined trade-initiation point, cut-loss point and profit-taking point. Case-by-case addition to positions and partial profit-taking actions, which are common in real-life trading, are not considered because they usually require ad hoc responses to the changes in the market trends and therefore rely much on subjective judgement. This may cause the trade plans unable to adapt to sudden changes in the market. However, this is not a major concern. This study does not aim at maximizing trading profits, but rather it attempts to evaluate the effectiveness of Elliott Wave by the performance of the trade plans. For the same reason,

the trade entry points are chosen at the levels where the highest confidence on the market trend is provided by Elliott Wave Principle, and not at the levels where profit can be maximized.

In terms of the trade time-frame, the trade plans focus on long term trading, where profits are expected to be derived from major market movements which usually take a few months to complete. The major reason is that long term trading can allow some simplifying assumptions to be made. For instance, transaction costs and interest differentials can be ignored because they are small compared to the major market movement involved in the trading. Also, for simulated trading, it has to be assumed that an order at a designated price can always be fulfilled. This is not necessarily true in real-life markets. However, because of this study is looking at major market movements, the impact is small.

In order to keep the trade plans simple, not every market movement is included in the simulated trading. Trading is restricted to impulse wave patterns. That is, only if the theoretical analysis predicts a possible unfolding of some form of impulse waves will trading be possibly initiated. There are far too many variations of the corrective waveforms, making it extremely complex to trade on these waveforms. Trading on corrective waveforms probably require sophisticated trading plans and years of actual

trading experience, which we do not possess. Therefore, corrective waves are included in the wave counting but not in the trading plans. However, it must be noted that impulse waveforms frequently appear as part of a corrective movement (for instance, the c wave of an a-b-c corrective wave), and these impulse waveforms are always included in the simulated trading.

In addition to the discussions above, there are two other important issues that should be considered in the formulation of the trading plans:

(1) The wave-counting rules based on Elliott Wave Principle are rather loose. Very often for the same period of market movements, many different possible wave counts can be derived which apparently conform to the basic rules, and yet the counts are contradictory to each other with regard to the predicted market trend. In fact, this has been one of the major criticisms of Elliott Wave Principle. Since there are so many inconsistent counts, it may be difficult to derive trading plans based on the theory.

(2) Counting of waves by itself is not sufficient to support the establishment of trade plans. There must be some means to predict the targets of the price movements. Most Elliott Wave analysts use Fibonacci ratios to forecast the turning points. However, there

are always many possible Fibonacci ratios used for the wave relationships. If the trade plan must be tailored to handle all the possible ratios, it will become very complicated. Some means is required to select one best ratio for each wave relationship.

The above issues are addressed in the following sections.

Wave-counting

In relation to the difficulties in wave counting as mentioned in point (1) above, we take two measures to overcome such difficulties. The first measure is based on the observation that the number of possible wave counts at a certain point in time is greatly reduced if a careful study of higher level wave counting (always involving a longer time period) is carried out and then the low level (i.e. short term) wave counts that are inconsistent with the long term wave counts are eliminated. It must be noted that one of the fundamental concepts of Elliott Wave Principle is that the waves of any degree in any series can always be subdivided and re-subdivided into waves of lesser degree, and the waves of any degree have to follow the same basic counting rules. If some wave counts comply with the counting rules for low level wave counts but are inconsistent with any of the possible high level wave counts, they should not be accepted.

The second measure is based on the well-defined rules of

Elliott Wave Principle regarding the internal wave structure. For instance, the waves 1, 3 and 5 of an impulse wave must be of 5-wave structure, and wave c of an a-b-c corrective sequence is also a 5-wave structure. The b wave of an a-b-c corrective sequence is always a 3-wave structure, while the a wave can be either be a 5-wave or 3-wave structure depending on whether it is a zigzag or irregular/flat respectively. Wave counts which do not comply with these rules should be discarded. It is our observation that in some financial analysis articles using Elliott Wave Principle, the rules regarding the wave structure are often ignored. That probably is one reason why at a certain point in time, there could be many different projections on the market proposed by wave analysts.

With the above two measures taken in the formulation of trading plans, the number of possible counts is limited. However, based on Elliott Wave Principle alone, it may not be possible to narrow it down to just one. The rules are simply not binding enough. Therefore, the formulation of trade plan must take this into consideration. In this study, it is handled by a weighed trading method. At the point where trade should be initiated, an expected wave trend must be first identified, e.g. a 5-wave impulse seems to be unfolding. Then the proportion of legitimate counts that are consistent with the expected wave trend is used to set up a weighing factor for the amount of trade

investments. In other words, the higher the ratio of counts in favour of the predicted wave form, the higher the weigh in the investment. This method has the advantage of simplicity and consistency across the whole trading period. Details are given in the subsequent chapters.

Fibonacci Targets

Regarding the issue of price targets as mentioned in point (2) earlier, Elliott did not lay down very systematic rules/formulas for calculating the target lengths of different wave forms. Instead, he only gave a vague relationship between the wave length ratios and the Fibonacci ratios. Other writers (including Frost, Prechter and Balan etc.) subsequently gave more specific guidelines for the use of Fibonacci ratios in predicting wave targets. However, very often there are many different possible ratios used for the same wave relationship. This situation makes it difficult to build simple and objective trade plans. The method we propose in this study is to perform a preliminary analysis of the wave ratios by analysing historical data. Impulse waves in historical data are identified. The various ratios of wave lengths are calculated. The average wave ratios for all the samples can then be derived. These values are then compared to the most commonly used Fibonacci ratios to select the preferred one for the market used in the study. The selected ratios are then consistently used in the formulation of the trade plans.

Data Source

The current study is focused on the Deutsche Mark/U.S. dollar market. Data source from Knight-Ridder for the period between January 1984 and March 1994 are used. The data contents include daily high, low and closing prices. As the study is concentrated on long term trading, the use of daily high-low-close charts is deemed to be sufficient. The data between January 1990 and March 1994 are used for simulated trading, whereas the data from January 1984 to December 1989 are used for the Fibonacci ratio analysis as mentioned in the previous section. The two periods do not overlap.

A Note on Notations

One of the basic principles in Elliott Wave is that each wave is a component of a higher degree wave, which in turn is a component of an even higher degree wave. Therefore, in wave counting, the analyst must be very conscious of the level that he is counting, in order to produce a consistent wave count. The use of a systematic notation for representing different level of wave cycle is very important. Throughout this report, the notation used is shown in Table III-1. It is assumed that only four levels of waves are considered.

Table III-1

Notation for Waves in Different Levels

wave level	notation for impulse waves	notation for corrective waves
High	(I),(II),(III),(IV),(V)	(A),(B),(C)
Intermediate	I,II,III,IV,V	A,B,C
Low	I,II,III,IV,V	A,B,C
Minor	1,2,3,4,5	a,b,c

CHAPTER IV

RATIO ANALYSIS

Elliott Wave Principle provides the form and framework to predict the market patterns, but to measure the potential for any price movement, Fibonacci tools are needed. Because simulated trading is done in this study, some means of estimating the target price levels for different waves have to be set up. However, a review of literature on Elliott Wave Principle reveals that the rules for the use of Fibonacci ratios in relation to the wave lengths are not well defined. Different writers preferred different set of ratios.

Fibonacci Relationships

In his original writings, Elliott did not clearly spell out the exact relationship between the various lengths of the waves within different waveforms. He only stated that the wave lengths within a waveform are often related by a Fibonacci ratio. Later, other writers (Frost, Balan, Weis etc.) have given more definitive relationships. However, for each wave relationship, there are often several

Fibonacci ratios proposed. For instance, for the 5 waves within an impulse, the common Fibonacci relationships are listed in Table IV-1.

Table IV-1

Commonly Used Fibonacci Wave Ratios

wave 2	0.382 of wave 1
	0.618 of wave 1
	0.5 of wave 1
	1.0 of wave 1
wave 3	1.618 of wave 1
	2.618 of wave 1
	4.618 of wave 1
wave 4	0.382 of wave 3
	0.236 of wave 3
	1.0 of wave 2
wave 5	0.618 of start of wave 1 to end of wave 3
	0.382 of start of wave 1 to end of wave 3
	1.0 of start of wave 1 to end of wave 3
	1.0 of wave 1
	1.618 of wave 1

Results of Ratio Analysis

To facilitate the simulated trading study, a consistent set of Fibonacci relationships need to be established for the 5 component waves of an impulse. Therefore, an analysis of the historical DEM data is performed to set up the preferred ratio relationships.

The analysis is done on the historical data between 1985 and 1989. The data after 1990 is reserved for the testing of the trade plans and cannot be included into the ratio analysis.

The preferred wave counting for the period from 1985 to 1989 will be explained in Chapter VI. Based on the impulse waves during this period, the wave ratios are calculated. Detailed calculations are tabulated in Table 1-1 of Appendix 1. A summary of the results is tabulated in Table IV-2.

Table IV-2

Summary of Ratio Analysis

Ratio	Average	Standard Deviation
Ratio of Wave 2 to 1	0.551	0.12
Ratio of Wave 3 to 1	1.594	0.23
Ratio of Wave 4 to 2	0.719	0.38
Ratio of Wave 4 to 3	0.254	0.14
Ratio of Wave 5 to 1	0.726	0.30
Ratio of Wave 5 to 3	0.458	0.17
Ratio of Wave 5 to length between origin of Wave 1 and end of Wave 3	0.354	0.13

Based on the results, the following observations can be drawn:

<u>wave 2</u>

The length of wave 2 can only be estimated from length of wave 1, and from the data analysis the ratio of wave 2 to wave 1 has an average value of 0.551, with a standard deviation of 0.12. This result is very close to the value of 0.5, which is one of the most commonly used ratios. The small standard deviation shows that the data is quite consistent.

wave 3

In terms of ratio analysis, wave 3 is always compared with wave 1 and never compared with wave 2. Therefore, only the ratio of wave 3 to wave 1 is calculated. The average value of this ratio is found to be 1.591 with a standard deviation of 0.23. It is close to the value of 1.618, but deviates much from 2.618 or 4.618. Therefore, the value of 1.618 will be used as a predictor of end of wave 3.

wave 4

The length of wave 4 is usually estimated from wave 3 or wave 2. The average ratio of wave 4 to wave 2 is 0.72 with a large standard deviation of 0.38. Because of large standard deviation, this relationship is not trust-worthy. When wave 4 is compared to wave 3, the average ratio is 0.254 with a standard deviation os 0.14. This value is much closer to 0.236 than 0.382, therefore the value of 0.236 of wave 3 is used as estimator for wave 4.

wave 5

The average ratio of wave 5 to length between start of wave 1 to end of wave 3 is 0.354 with a standard deviation of 0.13. This is surprisingly close to the ratio of 0.382.

The ratio of wave 5 to wave 1 gives a value of 0.726 which deviates quite significantly from either 1.0 or 1.618. Also, the standard deviation of 0.30 is large. Therefore,

this relationship is not preferred.

Summary of Results

Based on the ratio analysis, the preferred ratio relationships are tabulated in Table IV-3. These ratios will be used in the formulation of trade plans.

Table IV-3

Preferred Ratios for Impulse Waves

Wave	Fibonacci Relationship
Wave 2	0.5 of Wave 1
Wave 3	1.618 of Wave 1
Wave 4	0.236 of Wave 3
Wave 5	0.382 of (length between start of Wave 1 to end of Wave 3)

CHAPTER V

FORMULATION OF TRADE PLANS AND RESULTS OF SIMULATED TRADING

This chapter describes the setting up of trade plans and the results of the simulated trading when these plans are applied to historical data of the DEM/USD market.

As stated in Chapter III, the objective of the trade plans is to test the effectiveness of Elliott Wave theory. It is necessary to keep the trade plans as simple and objective as possible.

In order to facilitate the measurement of the overall performance, an initial capital of US$ 1 million is assumed. Any trade initiated will either be a long or short position on Deutsche Mark. Margin trading is assumed. A typical margin trading term available in Hong Kong is used: each contract size is DM100,000 and requires a deposit of US$8,000.

The number of contracts actually ordered will depend on the

weighing factor calculated in each case.

Formulation of Trade Plans

The simulated trades will be limited to impulse waves. In particular, the price movements of the wave 3 and wave 5 within an impulse wave are the target region of trade, for both bullish and bearish impulses. The wave 1 of the impulse wave is not included in this study because its occurrence cannot be predicted as reliably as wave 3 and 5. The unfolding of wave 3 and wave 5 can be assured by the fact that the preceding waves comply with Elliott Wave counting rules. For wave 1, it is the first wave in the 5-wave sequence and there is a lack of reference. Therefore, the trading of wave 1 is excluded. Two trade plans are built in this study to exploit the predicted impulsive movement of wave 3 and wave 5. They are referred to as Trade Plan No. 1 and Trade Plan No. 2 respectively in this report.

In each of the trade plans, the following trading details have to be pre-defined:

(1) Pre-conditions - The various criteria based on Elliott Wave Principle to decide whether an impulse wave is unfolding.

(2) Initiation of trade - The price level at which some trading actions will be taken.

(3) Cut-loss mechanism - A mechanism or price level must be predefined to protect the investment in case the actual market moves in the opposite direction of what is expected. There may be more than one stop-loss conditions, and any of the conditions can trigger the cut-loss action.

(4) Profit-taking - The price level where profit is taken and the trade is closed.

The following measures are taken to keep the trade plans simple:

(1) Once trade is initiated, there is no case-to-case addition to the position.

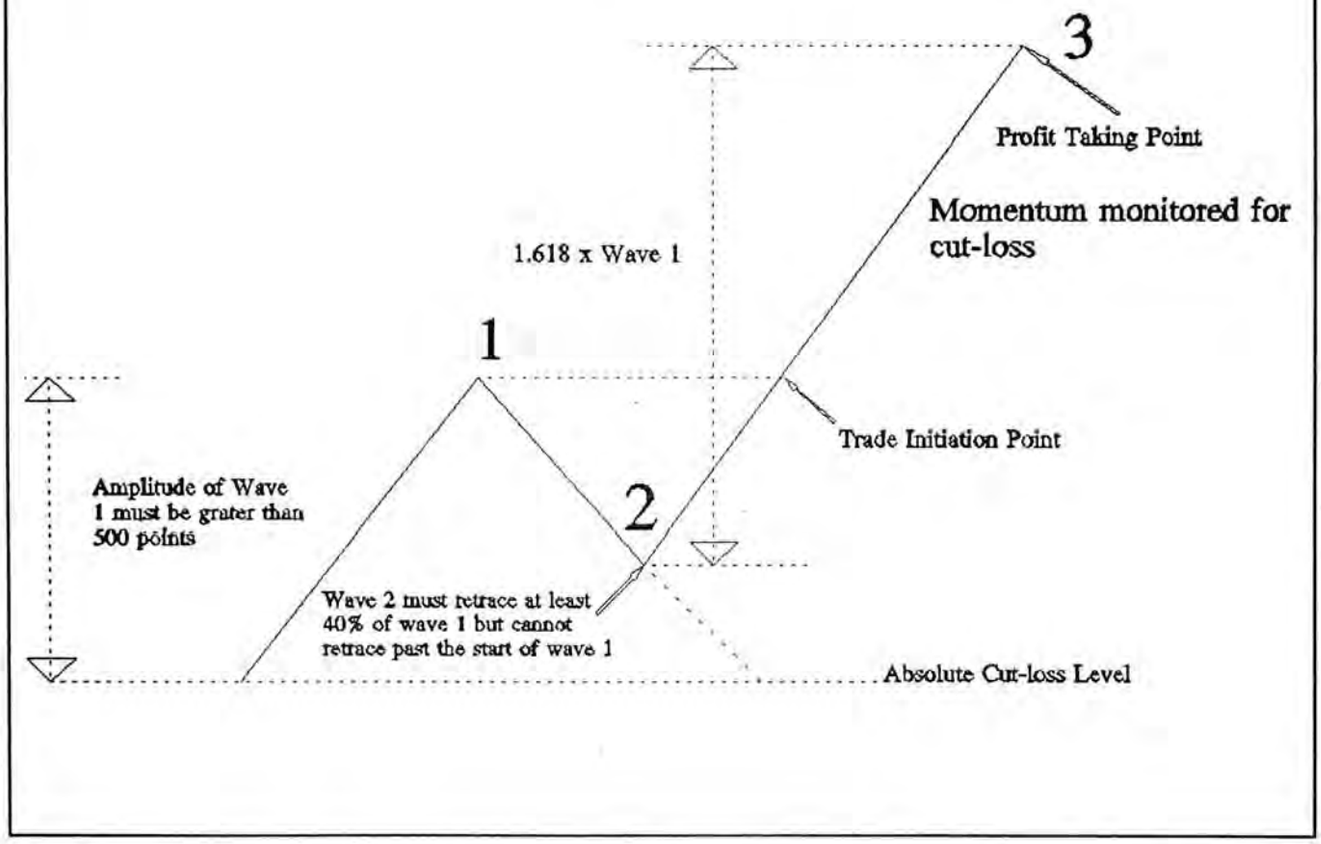
(2) When cut-loss action is activated, the current position is closed completely. No partial closing, or reverse trade (i.e. to start a trade in a direction exactly opposite the one before) is considered.

(3) Profit-taking action is done by closing the open position as a whole. There is no partial profit taking.

Trade Plan No. 1

The objective of this trade plan is to catch the powerful thrust of the wave 3 of an impulse and to make a profit out of the impulsive movement. The major characteristics of this trade plan are illustrated in Fig. V-1.

Figure V-1 Characteristics of Trade Plan No. 1



Pre-conditions of Trade

The occurrence of a wave 3 should be confirmed by the appearance of a wave 1 and a wave 2, both satisfying the rules of Elliott Wave. Therefore, the following pre-conditions are defined for this trade plan:

(1) Out of the legitimate wave counts which satisfy the basic rules of Elliott Wave, there is at least one wave count which predicts the unfolding of a 5-wave impulse.

(2) The amplitude of the apparent wave 1 should be at least 500 points in order to avoid initiation of trade due to unfolding of a minor subwave and not due to a major wave as intended for the long term trading.

(3) Wave 2 should retrace at least 40% of wave 1. This pre-condition is set up to ensure that the full wave 2 has occurred, and not some subwaves of wave 2. Based on the results of ratio analysis in Chapter IV, wave 2 was found to retrace at least 40% of wave 1. Therefore, a 40% retracement by wave 2 is set up as a trade pre-condition.

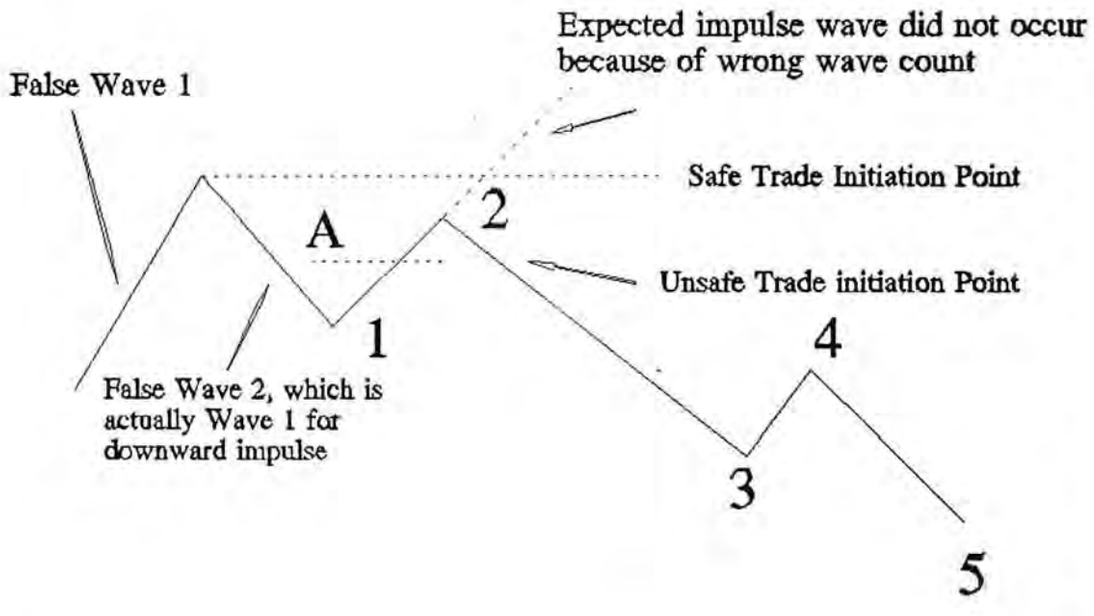
(4) Wave 2 cannot retrace more than all of wave 1. This is a fundamental rule in Elliott Wave Principle, and if violated, the unfolding wave pattern is certainly not an impulse.

Trade Initiation

The trade initiation point for this trade plan is set at the level which the apparent wave 3 has been formed and it has surpassed the end of the apparent wave 1 by more than 10 DEM points.

The trade initiation point is not set at an earlier point because it is necessary to protect against the possibility of wrong wave counting and that actually a reverse impulse is unfolding as shown in Fig. V-2. For instance, if the trade initiation level is set at point A in Fig. V-2, then a false Wave 3 will be caught and instead of a rally upward, the price soon turns into a decline. If instead, the trade initiation is set at a level higher than end of apparent wave 1, then the possibility of a downward impulse can be eliminated.

Figure V-2 Illustration to Show Unsafe Trade Initiation Point



One important issue to consider is that very often there are more than one valid Elliott Wave counts. The appearance of the potential wave 1 and wave 2 do not guarantee a wave 3 to occur, because the wave 1 and 2 could be just wave a and b of a corrective sequence of the

opposite direction. Therefore, in this trade plan, a weighed trading method is adopted. At the trade initiation point, a wave analysis is done and the percentage of legitimate counts which predict an impulse occurring is calculated, and the number of contract orders for the long or short position is determined as defined in Table V-1.

Table V-1

Trade Amount for Trade Plan No. 1

% of Wave Counts Agreeing with Predicted Occurrence of Wave 3	No. of Contract Orders
0-49%	50
50-74%	75
75-100%	100

Cut-loss Mechanism

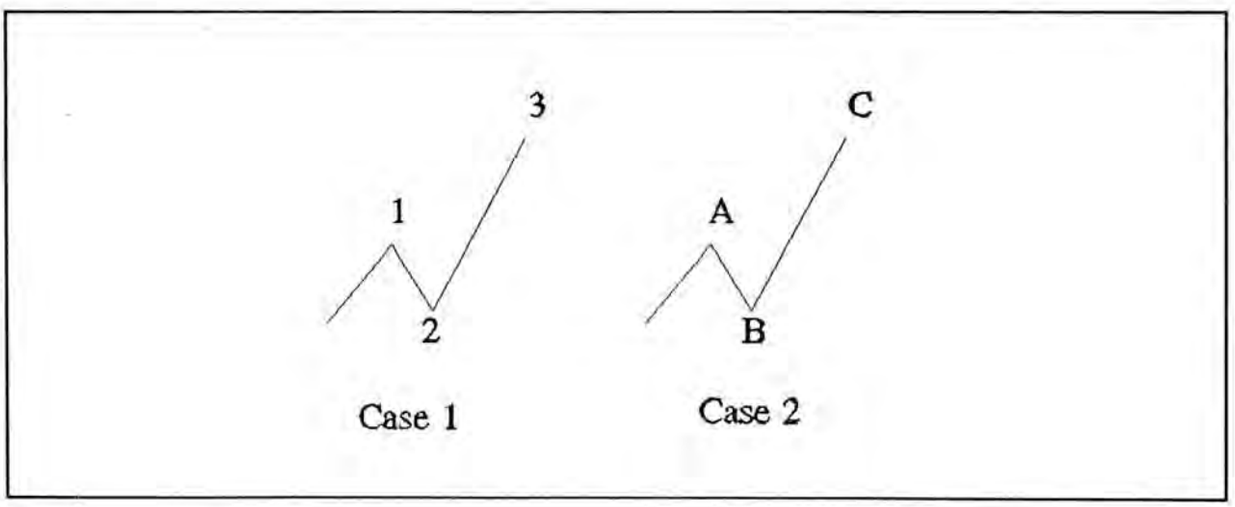
There are two cut-loss mechanisms defined. The first one makes use of the fact that wave 3 always has the highest momentum within an impulse. Therefore the momentum is closely monitored once trade is initiated. The monitoring is done by using the 5-day rate-of-change oscillator. This rate-of-change oscillator is calculated as follows (Ref. "The Technical Analysis Course" by T. A. Meyers):

5-day Rate-of-change Oscillator = (current day

closing price / closing price 5 days ago) * 100

This is a moving device and is calculated daily. For upward wave movement, momentum is sustained if the calculated figure is equal or over 100. Momentum is not sustained once the figure is below 100 and cut-loss action is triggered. For the downward wave movement, momentum is considered not sustained once the figure is over 100.

There is another cut-loss level which is considered as the absolute bottom line. If a wave 3 is unfolding, the expected wave 3 can have correction within its subwaves, such as a wave ii of wave 3. However, this wave ii can never retrace more than start of wave i, which is also end of wave 2. Therefore, another simple cut-loss point is set at the level equal to the end of wave 2.



Profit-taking

Based on the ratio analysis discussed in Chapter IV, the most reliable relationship for wave 3 is 1.618 of wave 1.

Therefore, this is taken as the target profit-taking level. Incidentally, this profit-taking level is also applicable if the waves 1, 2 and 3 are actually an a-b-c correction of opposite direction, as shown in the above figure. For the case that the a-b-c correction is a zigzag, the most commonly used estimator for the c wave is also 1.618 of the a wave.

The Trade Plan No. 1 is summarized by Table V-2.

Table V-2

Summary of Trade Plan No. 1

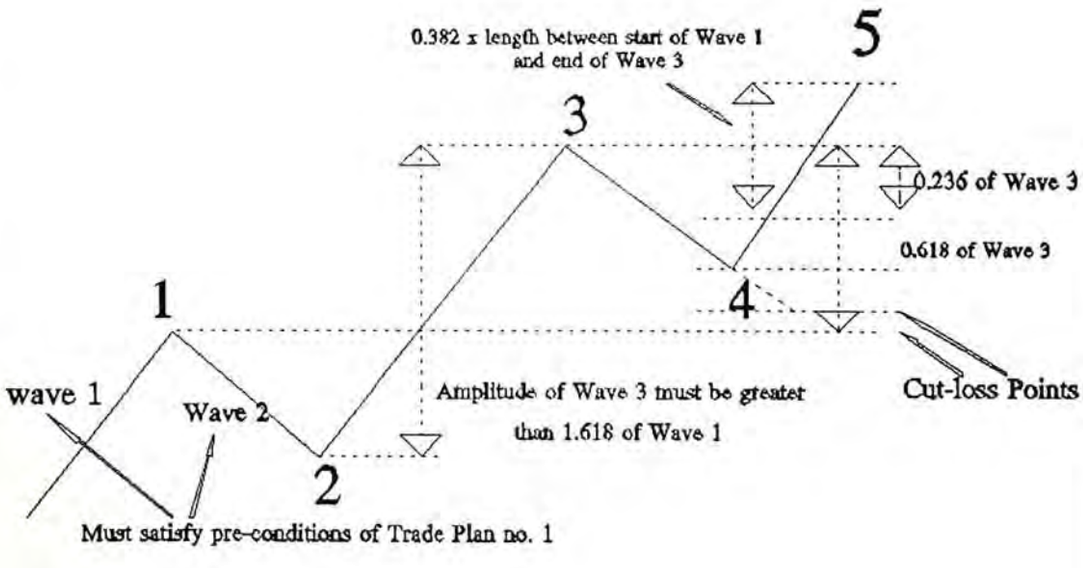
Pre-conditions	(1) At least one legitimate wave count predicts the unfolding of a wave 3. (2) Amplitude of apparent wave 1 is at least 500 points. (3) Apparent wave 2 does not retrace beyond origin of wave 1 but must retrace more than 40% of length of wave 1.
Trade initiation point	The point where the apparent wave 3 surpasses the end of wave 1 by 10 points.

Profit-taking point	The point where the apparent wave 3 is 1.618 of the length of wave 1.
Cut-loss mechanism	(1) Cut-loss when five-day rate-of-change oscillator is below 100 for bull market and over 100 for bear market. (2) The end of the apparent wave 2 is the absolute cut-loss point.

Trade Plan No. 2

The objective of this trade plan is to exploit the impulsive movement of a wave 5 to make a profit. The major

FIgure V-3 Characteristics of Trade Plan No. 2



characteristics of this trade plan are illustrated in Fig. V-3.

Pre-conditions of Trade

In order to make use of wave 5, the first step is to identify the completion of wave 3. The following are pre-conditions of trade:

(1) The apparent wave 1 and wave 2 satisfy the basic rules of Elliott Wave Principle, as stated in the Trade Plan No. 1.

(2) The apparent wave 3 is at least 1.618 times as long as the wave 1. This ratio of 1.618 is the most commonly used ratio in estimating wave 3 target, and has been confirmed in the ratio analysis of Chapter IV.

(3) There is at least one legitimate wave count which predicts a wave 5 will be coming.

Trade Initiation

If a wave movement satisfies all the pre-condition requirements, and the market starts to move in a direction to correct the apparent wave 3, the market has to be monitored closely for trade initiation. Ideally, the trade initiation point should be the bottom of wave 4. However, in practice, as the market unfolds, it is impossible to tell when the bottom of wave 4 appears. Therefore, the

trade initiation point is set at a point where the apparent wave 4 corrects 0.236 times of the length of wave 3. This Fibonacci ratio of 0.236 has been established in ratio analysis as the most probable ratio which relates the length of wave 4 to the length of wave 3 for the DEM/USD market.

When trade initiation point is reached, a long or short position of Deutsche Mark is initiated depending on whether the impulse is downward or upward respectively. Similar to Trade Plan No. 1, a weighing factor is placed on the trade amount as shown in Table V-3.

Table V-3

Trade Amount for Trade Plan No. 2

% of Wave Counts Agreeing with Predicted Occurrence of Wave 5	No. of Contract Orders
0-49%	50
50-74%	75
75-100%	100

Cut-loss Mechanism

One important consideration is to set up stop-loss points to protect for wrong wave counting or incorrect trade

initiation. In this trade plan, there are two cut-loss points derived from Elliott Wave Principle. The first point is the end of wave 1 and the second one is the point where wave 4 would correct more than 0.618 of wave 3. The first cut-loss setting is obvious because one of the fundamental rules of Elliott Wave Principle states that the wave 4 cannot overlap wave 2. The second cut-loss setting is based on the Fibonacci ratio relationship. From a review of literature, wave 4 rarely corrects more than 0.618 of wave 3. Therefore, this level is used as another cut-loss point.

Profit-taking

Once trade is initiated, it is necessary to monitor the end of wave 4 to derive the target end of the expected wave 5 for profit taking. To keep the trade plan simple, the point of deepest correction within the apparent wave 4 is taken as the start of wave 5. From the ratio analysis in Chapter IV, the most preferred relationship for projecting the end of wave 5 is:

> Length of wave 5 = 0.382 X (length of origin of wave 1 to end of wave 3)

The profit taking point is defined as the expected end of wave 5 determined from the above relationship.

The Trade Plan No. 2 is summarized in Table V-4.

Table V-4

Summary of Trade Plan No. 2

Pre-conditions	(1) Amplitude of apparent wave 1 is at least 500 points. (2) Apparent wave 2 retraces at least 40% of wave 1 but does not retrace more than the origin of wave 1. (3) Apparent wave 3 is at least 1.618 times wave 1.
Trade initiation point	The point where the apparent wave 4 corrects 0.236 or more times the length of wave 3.
Profit taking point	The point where the apparent wave 5 is 0.382 or more times the length between origin of wave 1 and end of wave 3.
Cut-loss point	(1) End of wave 2. (2) Point where apparent wave 4 corrects 0.618 or more times length of wave 3.

Trade Opportunities Scan

After establishing the trade plans, the daily high-low-close chart between Jan. 1990 and March 1994 is scanned through to identify possible trading points. With reference to Fig. V-4, at the beginning of 1990, no impulse seems to develop.

At around 1990/7/19, trading appears to be possible. The decline from 1.7050 to 1.6265 can be labelled as wave 1, and the retrace from 1.6265 to 1.7047 can be labelled as wave 2. The length of wave 1 is 785 points which is more than the minimum requirement of 500 points. Besides, wave 2 retraces close to the origin of wave 1 but does not go beyond that level. Therefore, the trade pre-conditions are all satisfied.

Similar process is repeated by going through the price movement between January 1990 and March 1994. When this scanning process is done, 19 possible trade points labelled as C1 to C19 are identified as shown in Figs. V-4 to V-6. With support of actual daily high-low-close data, the trade opportunities were checked in detail to see whether the trade pre-conditions are satisfied. After calculation using exact data, 6 of the 19 points were found unable to satisfy the pre-conditions and no trade is initiated. The results of this trade opportunity scan are summarized in Table V-5.

Figure V-4 Trade Opportunity Chart (1990 - 1991)

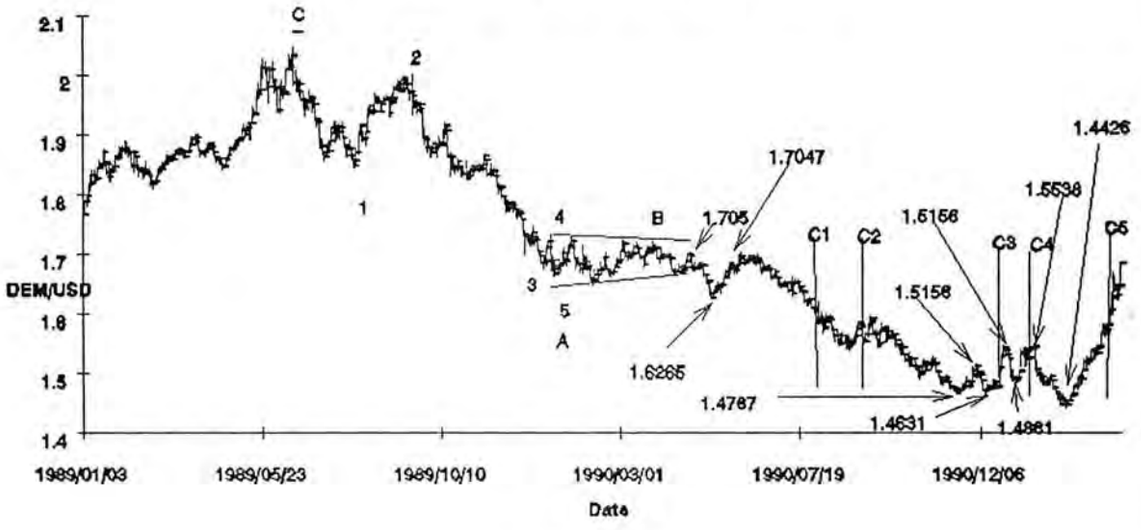
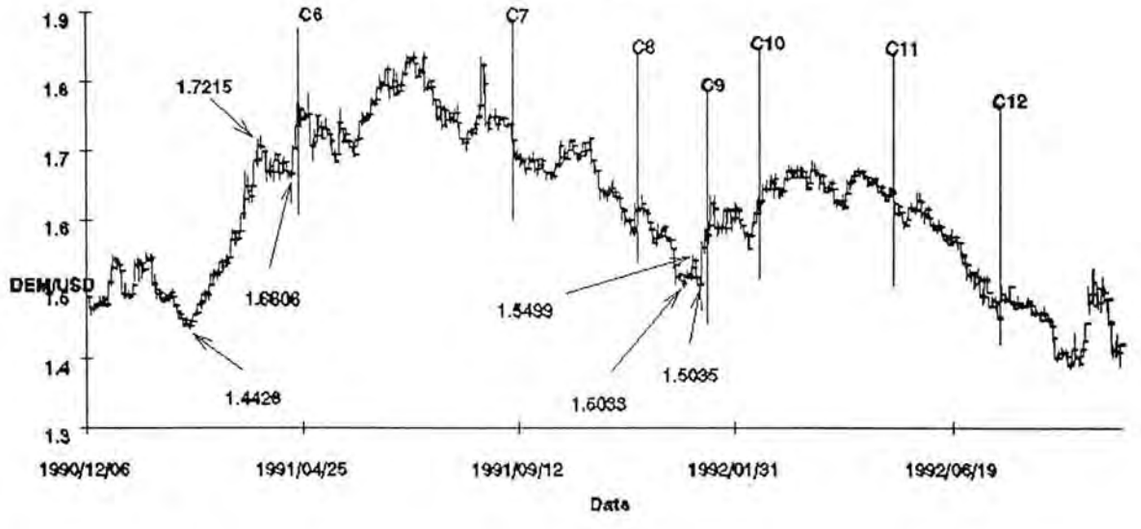


Figure V-5 Trade Opportunity Chart (1991 - 1992)



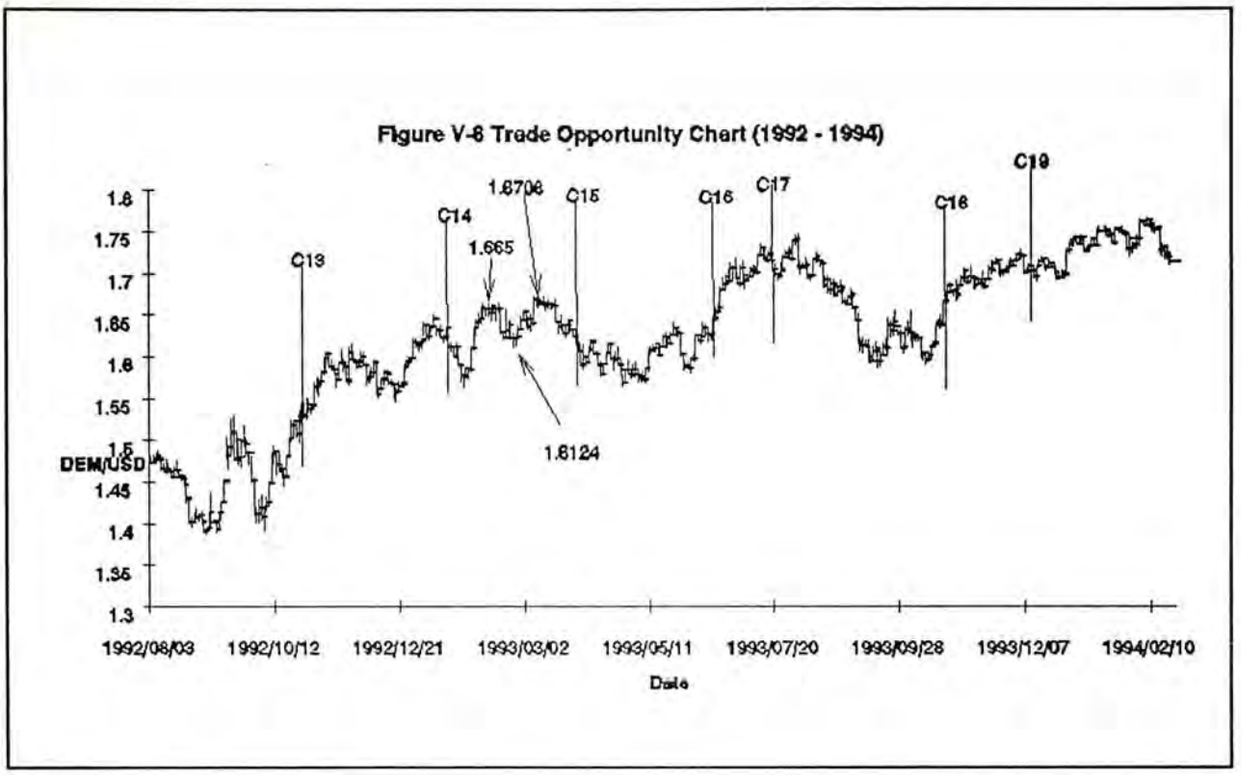


Table V-5

Results of Trade Opportunity Scan

Possible trade points	Pre-conditions testing	Trade case number if trade initiated
C1	All pass	1
C2	All pass	2
C3	Wave 1 is 1.4767 to 1.5156. Wave 2 is 1.5156 to 1.4631. Wave 2 retraces beyond origin of wave 1, therefore no trade.	
C4	All pass	3
C5	Wave 1 is 1.4631 to 1.5538. Wave 2 is 1.5538 to 1.4426. Wave 2 retraces beyond origin of wave 1, therefore no trade.	
C6	Wave 1 is 1.4426 to 1.7215. Wave 2 is 1.7215 to 1.6606. Wave 2 retraces much less than 40% of wave 1, therefore no trade.	
C7	All pass	4

Possible trade points	Pre-conditions testing	Trade case number if trade initiated
C8	Wave 3 is 1.8355 to 1.5625. Wave 4 should at least retrace to 1.6390 which it did not. Therefore, trade was not triggered due to wave 4 too short.	
C9	Wave 1 is 1.5033 to 1.5499. Length of wave 1 is 0.0466 which is less than 500 points. Therefore, no trade is triggered.	
C10	All pass	5
C11	All pass	6
C12	All pass	7
C13	All pass	8
C14	All pass	9
C15	Wave 1 is 1.6650 to 1.6124. Wave 2 is 1.6124 to 1.6708. Wave 2 retraces more than origin of wave 1, therefore no trade.	
C16	All pass	10
C17	All pass	11
C18	All pass	12
C19	All pass	13

There are 13 trade cases which have trade initiated and the periods of trade are shown in Figs. V-7 to V-9.

Figure V-7 Time Periods of Trade Cases (1 to 3)

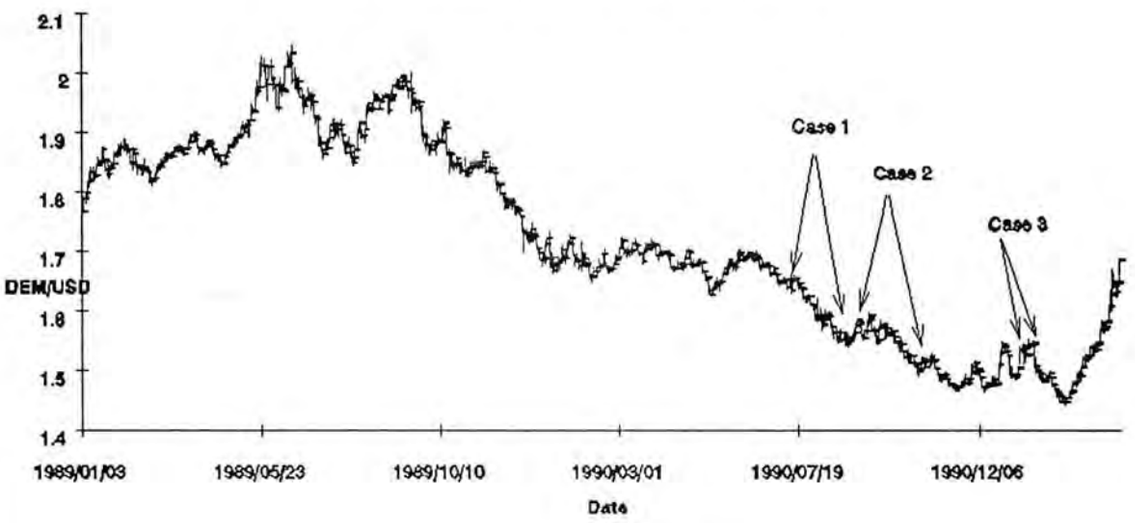
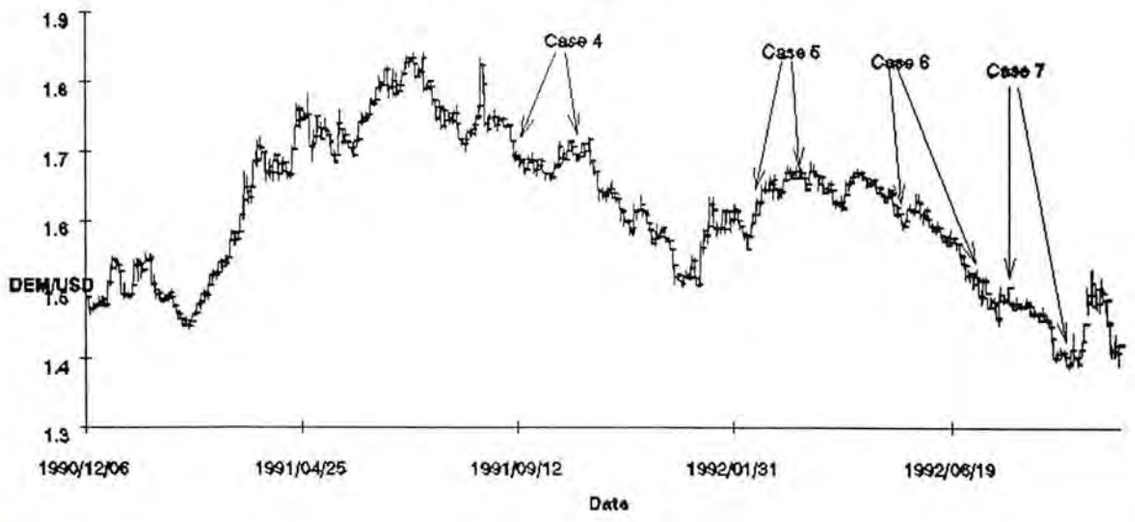
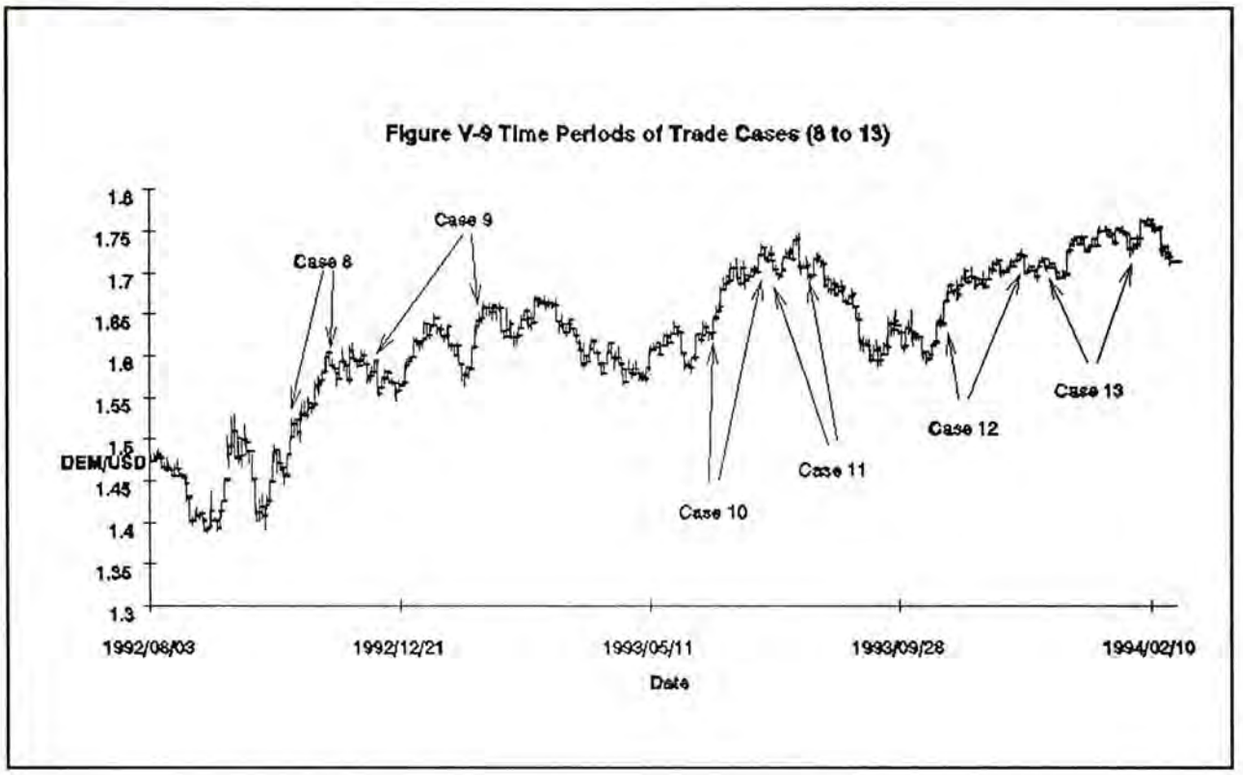


Figure V-8 Time Period of Trade Cases (4 to 7)





To illustrate the mechanism of the simulated trading, the Trade Cases 1, 2 and 5 are described in full details in the subsequent sections. The Trade Case 1 is a case where profit is taken out of a wave 3 of a downward impulse. The Trade Case 2 is a case where the wave 5 movement is successfully caught and profit is taken at full length of wave 5. The Trade Case 5 is a case where the wave 3 momentum does not sustain and trade is closed due to loss of momentum.

The calculations of the other cases together with the wave counting illustrations are detailed in Appendix 2.

Trade Case 1

Pre-conditions

When USD declines from 1.7050 (1990/4/24) to 1.6265 (1990/5/11), it fulfils the pre-condition as a wave 1 because its amplitude is more than 500 points. The rebound from 1.6265 (1990/5/11) to 1.7047 (1990/6/4) is qualified as a wave 2 because it retraces more than 40% of wave 1 but does not retrace more than the origin of wave 1.

Trade Initiation

The trade initiation point should be 10 points below the end of wave 2 and therefore should be 1.6255. As the USD continued to fall, trade initiation was triggered on 1990/7/23. A long position of DEM should be taken.

At this point, the possible wave counts should be reviewed. The legitimate wave counts are illustrated in Fig. 2-1 of Appendix 2. The Counts 1 to 3 all predict a downward 5-wave impulse is appearing, because a C wave of a zigzag A-B-C sequence is unfolding. The difference is that Count 1 treats the A-B-C as an X wave, Count 2 treats the A-B-C as the second leg of a large triangle, and Count 3 treats the A-B-C as component waves of a large B wave. All these counts agree with the basic counting rules. Count 4 is also legitimate but is different from the other 3 because it predicts the wave 5 of an impulse wave is unfolding. This downward impulse is the A wave of A-B-C of a large B

wave.

Therefore, 75% of the legitimate counts agree that the wave 3 of a downward impulse is unfolding. According to Trade Plan No. 1, 100 contracts of long position of DEM should be established at 1.6255 on 1990/7/23, which requires a deposit of US$ 800,000.

Profit-taking/Cut-loss

The profit-taking and cut-loss points have to be calculated. The expected length of wave 3 would be 1.618 times length of wave 1, i.e. 1270 points. Subtracting the 1270 points from the end of wave 2 which is 1.7047, the profit-taking point was 1.5777. Regarding the cut-loss points, the absolute cut-loss point was the end of wave 2, i.e. 1.7047. Another moving cut-loss point has to be determined through the use of the rate-of-change oscillator.

From 1990/7/23 onwards, the momentum of the wave 3 is monitored by the 5-day rate-of-change oscillator. Because the impulse is downward, the momentum is considered as sustained if the calculated rate-of-change oscillator is below 100; otherwise, cut-loss is triggered. Actual calculations indicate that from 1990/7/23 to 1990/8/6, the rate-of-change oscillator was always below 100. On 1990/8/6, the profit-taking point of 1.5777 was reached and the DEM long position was closed. Hence a gain of 478

points is achieved. For the 100 DEM contracts altogether, a total profit of US$302,973 was made with US$800,000 deposit.

The details this trade case can be found in Table 2-1 of Appendix 2.

For this particular trade case, the use of the rate-of-change oscillator is quite successful for the detection of a wave 3. In fact, a few days after the trade is closed, the momentum value falls below 100, and this indicates a loss of momentum, warning against the end of wave 3.

Trade Case 2

Pre-conditions

This case is a continuation of the Trade Case 1 and is also referencing the same impulse wave. Trade Case 1 attempts to catch the end of wave 3 while Trade Case 2 is trying to catch the wave 5.

From the previous analysis of Trade Case 1, the waves 1 and 2 already satisfy the pre-conditions. The target end of wave 3 is 1.5777. The price movement actually went further down than this value before rebound. On 1990/8/27, the market went down to 1.5387 and then rebounded. Because the rebound subsequently traced back more than 23.6% of the length of wave 3, this value of 1.5387 is considered as end of wave 3.

Trade-initiation

According to the rules of Trade Plan No. 2, the trade initiation point should be set up as the expected end of wave 4. In this case, the length of wave 3 is (1.7047 - 1.5386) which is equal to 0.1661. Therefore the trade initiation point should be set up as (1.5386 + 0.236 X 0.1661), which is equal to 1.5778.

This trade initiation point was reached only a few days later, on 1990/8/31, when the USD went up to 1.5800. Therefore, a trade should be initiated to long DEM in expectation of making a profit out of the coming wave 5.

It is necessary to determine the various legitimate wave counts in order to derive a weighing factor on the amount of trade. The possible wave counts are depicted in Fig. 2-2 of Appendix 2. There are only four legitimate wave counts which conform with the basic Elliott counting rules. These four counts actually match with the four counts in Trade Case 1 because there was no unexpected market movement. Out of the four counts, only three would forecast a wave 5 to be unfolded soon. The Count 4 considers the low of 1.5386 as end of the entire impulse wave starting from the point of 1.0479.

Hence 3 out of 4 counts predict the unfolding of a wave 5, a trade of 100 contracts of long position of Deutsche Mark is initiated at the point of 1.5778, as according to the

trade plan. This requires a deposit of US$ 800,000.

Profit-taking/Cut-loss

The cut-loss point is set up as the end of wave 2 and also at the point where the supposed wave 4 would correct over 0.618 of the length of wave 3. The values of these points are calculated to be 1.6265 and 1.6413 respectively. Obviously only the value of 1.6265 needs to be considered because this point will certainly be reached first.

Subsequently, the loss-cutting point of 1.6265 was not reached. The correction only brought the USD to the point of 1.5977 vs. DEM and the downward trend of USD resumed.

Once this apparent wave 5 started to reveal, then we can calculate the projected end of this wave 5 which is also the proposed profit-taking point for the trade plan. Since the point of deepest correction within wave 4, which is 1.5977, is treated as origin of wave 5, the profit-taking point should therefore be 1.5977 - 0.382 X (origin of wave 1 to end of wave 3), which is equal to 1.5341.

The profit-taking point was subsequently reached on 1990/10/9. The long position of DEM was closed accordingly and a gain of 437 points was achieved. For the 100 DEM contracts altogether, a total profit of US$284,619 was made.

The details for this trade case can be found in Table 2-1 of Appendix 2.

It should be noted that for this particular case, the termination of trade was done according to the trade plan, but the subsequent market movement indicated a better opportunity occurred later. The USD continued to decline to the value of 1.4767, rebounded back to 1.5482 and then fell to the level of 1.4425 before completing the C wave of the X wave. A bigger profit could have been made if DEM was bought in between the range of 1.4767 and 1.5482, and sold back between 1.5482 and 1.4425. The simulated trading performed was actually only catching the fifth wave of wave 3 of the larger C wave, instead of the fifth wave of the C wave itself. The magnitude of the fourth wave correction within the wave 3 itself was unexpectedly large and hence triggered the simulated trading. Nonetheless, a reasonable profit was still made by applying the trade plan, indicating a success of Elliott Wave methods.

Trade Case 5

Pre-conditions

The period of interest starts from 1992/1/8 when DEM was priced at 1.5035. Then DEM travelled from 1.5035 to 1.6340 (1992/1/15) and then back to 1.5569 (1992/2/10). The length of the potential wave 1 (1.5035 to 1.6340) was 1305 points and of the potential wave 2 (1.6340 to 1.5569) was 771 points. Also, as shown in Fig. 2-5 of Appendix 2, if

the current wave is part of the C wave, a 5-wave structure is expected. Therefore, the pre-conditions are satisfied.

Trade Initiation

According to the trade plan, the trade initiation point should be 10 points plus the end of wave 2, and therefore should be 1.6350. The market went beyond this point on 1992/2/18. Thus, a short position of DEM has to be established.

With reference to Fig. 2-5 in Appendix 2, there are 3 legitimate wave counts at this point. Only one of them predicts an impulse unfolding. Therefore, according the trade plan, 50 contracts of DEM short should be ordered.

Profit-taking/Cut-loss

The target of expected wave 3 was 1.618 times wave 1, i.e. at the level of 1.7680, which is our profit-taking point. The market momentum is monitored by the 5-day rate-of-change oscillator as before. The value is over 100 until 1992/2/27, when the rate-of-change oscillator fell to 99.44 and therefore cut-loss was triggered at the level of 1.6351. A profit of only 1 point was made, because the loss of momentum happens very soon after trade is initiated. The price movement then turns out to be a corrective wave, and the momentum indicator successfully initiates an escape action to avoid loss.

However, for some other cases, such as Trade Case 6, the momentum indicator is actually too sensitive and initiate a cut-loss prematurely.

The details for this trade case can be found in Table 2-2 of Appendix 2.

Results of Simulated Trading

For the entire period between January 1990 to March 1994, there are 13 trade cases done according to the two trade plans. The results of all these simulated trading are summarized in Table V-6.

Table V-6 Summary of Simulated Trading

Case	Trade							% of Favourable		Profit/Loss	Balance
No.	Plan No.	Trade Date	Position	Entry	Close	Exit	Reason For Exit	Counts	Contracts	in US$	in US$
											1,000,000
1	1	1990/07/23	Long DEM	1.6255	1990/08/06	1.5777	wave 3 target reach	75.00%	100	302,973	1,302,973
2	2	1990/08/31	Long DEM	1.5778	1990/10/09	1.5341	wave 5 target reach	75.00%	100	284,858	1,587,830
3	1	1991/01/14	Short DEM	1.5492	1991/01/17	1.5085	momentum fail	50.00%	75	-202,353	1,385,477
4	1	1991/09/09	Long DEM	1.6988	1991/09/19	1.6889	momentum fail	50.00%	75	43,964	1,429,440
5	1	1992/02/18	Short DEM	1.6350	1992/02/27	1.6351	momentum fail	33.33%	50	306	1,429,746
6	1	1992/05/13	Long DEM	1.6129	1992/05/22	1.6163	momentum fail	50.00%	75	-15,777	1,413,969
7	2	1992/07/21	Long DEM	1.5011	1992/08/24	1.4146	wave 5 target reach	40.00%	50	305,740	1,719,710
8	1	1992/10/23	Short DEM	1.5310	1992/11/12	1.5808	momentum fail	66.67%	75	236,273	1,955,982
9	2	1993/01/25	Short DEM	1.5883	1993/02/05	1.6628	wave 5 target reach	66.67%	75	336,030	2,292,012
10	1	1993/06/15	Short DEM	1.6433	1993/06/29	1.7047	wave 3 target reach	100.00%	100	360,181	2,652,193
11	2	1993/07/02	Short DEM	1.6853	1993/07/29	1.7407	wave 5 target reach	75.00%	100	318,263	2,970,455
12	1	1993/10/21	Short DEM	1.6572	1993/11/02	1.7011	wave 3 target reach	33.33%	50	129,034	3,099,490
13	2	1993/12/10	Short DEM	1.6960	1994/01/06	1.7457	wave 5 target reach	75.00%	100	284,700	3,384,189

The return rate of the simulated trading is given in Table V-7. The return rates for large time deposit and 30 years bonds based on U.S. Dollar taken from Financial Statistics Monthly are also shown for comparison.

Table V-7

Rates of Return for the Simulated Trading

Period	Rate of return of simulated trading	Rate of return for large time deposit	Rate of return for 30-year bonds
1990	58.78%	8.15%	8.61%
1991	-9.98%	5.84%	8.14%
1992	36.84%	3.68%	7.67%
1993	58.5%	3.17%	6.60%
1994 (Jan. to Mar.)	9.2%	N/A	N/A
Average annual rate of return from 1990 to 1993	36.04%	5.21%	7.76%

The results of the simulated trading indicate that except for the year 1991, the returns are very good compared to

the risk-free investments, ranging from 7 times to more than 10 times in the return rate. The loss in the year 1991 is due to two main reasons. The first reason is that based on the Trade Plan No. 1, a trade (Trade Case 3) is triggered on 1990/12/10, but it turns out that the wave 3 is a false one and cut-loss action is initiated due to loss of momentum, resulting in a loss of US$ 202,353. Secondly, there is too little chance of trade, with only one impulse wave fulfilling the pre-conditions.

Discussions on the Simulated Trading

(1) Even though there are a number of limitations in the proposed trade plans, these plans could be used to make a significant return in simulated trading, and the return compares very favourably with the average risk-free return rates. Even compared to other forms of investment, the returns are considered remarkably good.

(2) The trade plans are derived basically from the basic concepts of Elliott Wave Principle, and are bound by definitive rules of trade. Except for the wave counting, the trade plans are objective enough to be transformed into some form of computerised program trading. Yet the results indicate a very good return. As for the wave counting, by its inherent characteristic, it requires human judgement. However,

the wave counting basically is used to identify the trading opportunity and the weighing factor in the trade amount. The profit or loss depends not much on how the waves are counted, but rather depends on whether the market behaves in a fixed pattern as conceived by Elliott Wave. The success of the trade plans suggests that the market appears to have a fixed pattern of movement, and that Elliott Wave Principle is very effective in predicting the market fluctuations.

(3) The major limitation of the trade plans used in this study is that the trading is limited to impulse waves. It does not cover corrective waves. More sophisticated trade plans need to be developed to overcome this limitation. Specifically, there must be some proven criteria to identify the numerous forms of the corrective waves. Because of complexity of corrective waves, probably the setting up such trade plans require many years of market experience.

(4) Another limitation is that only long term trading is included. This seriously limit the trading opportunities. A possible further development of this study is to include medium and short term trades. However, to ensure the results are realistic, some assumptions taken in this project have to be carefully adjusted. For instance, the transaction costs may

need to be included. Moreover, the trading must be supported by hourly charts in order to ensure the wave patterns are correctly identified.

(5) Still one more limitation of the trade plans is that a very crude cut-loss mechanism is used. To support more sophisticated trading, the cut-loss point should be dynamically adjusted when the market movement goes beyond certain judgement levels. Also, the momentum measure to identify the wave 3 is not very effective. The momentum measure turns out to be too sensitive, and a number of trades were pre-maturely terminated. To improve the trade plan, another study should be launched to investigate the momentum characteristics of wave 3 of impulse waves.

(6) The ultimate test of the trade plans should be the real-time market, or at least by simulated testing using real-time market data. However, because of time limitation, such testing was not done in this project.

CHAPTER VI

WAVE ANALYSIS
AND MARKET PERSPECTIVES

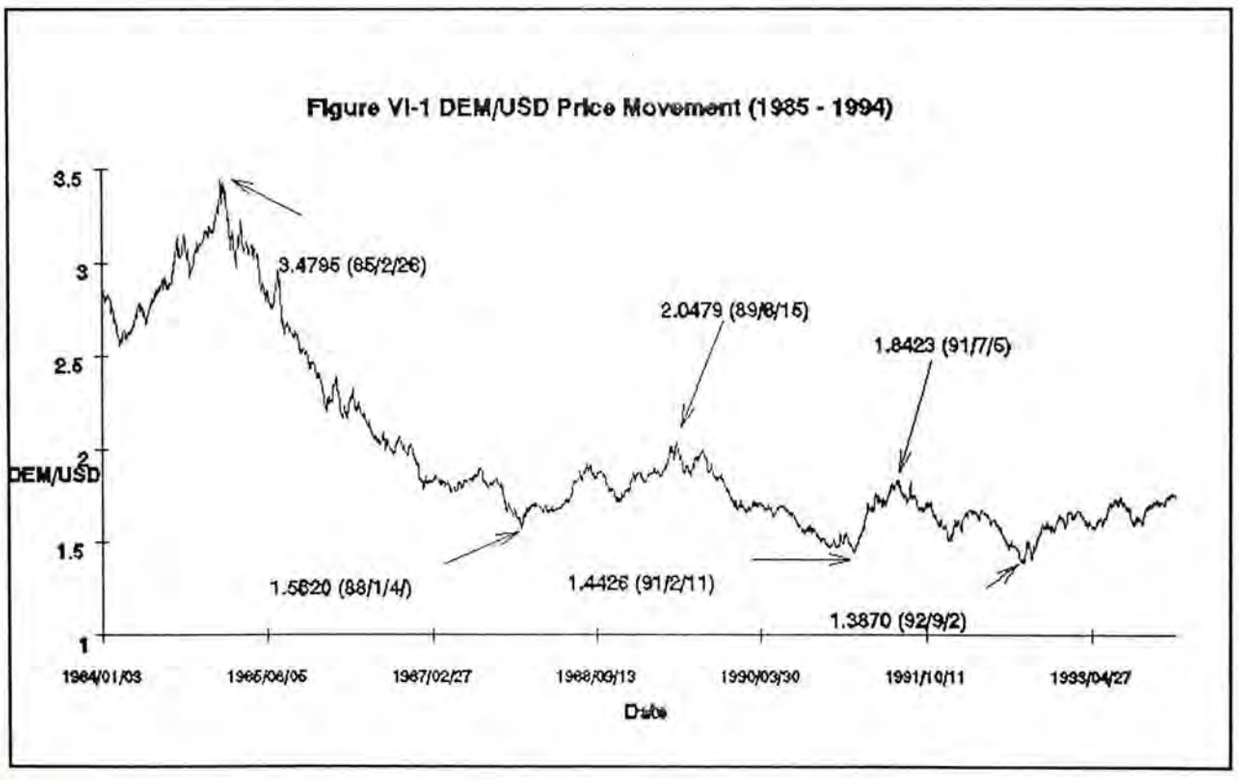
The preceding chapters have described the implementation of trading plans based on Elliott Wave Principle. In this chapter, the DEM/USD market behaviour is analyzed through wave counting. The objectives are two-folded. Firstly, Elliott Wave Principle is applied to see whether some valid wave counts consistent with the basic principle can be constructed from past market data. Secondly, and more importantly, it is intended that some perspective views of the future market trends can be developed from the experience we have gained so far on Elliott Wave, so that a comparison with the actual market development can be made later. The perspective views were formed when the first draft of this report was written, at early March of 1994. and slightly modified when the final report is prepared, which is first week of April of 1994.

Same as previous wave counting, the top-down approach is preferred. The period of interest starts from the historical high point of USD vs DEM in February 1985 up to March 1994. The broadest swing is reviewed first, then

lower level fluctuations are studied.

Analysis of the Broadest Swing

The daily close chart for the entire period between 1984 and 1994 is shown in Fig. VI-1. As can be seen from the figure, the USD started a major decline vs. DEM from the point of 3.4795, which was actually the historical high of USD against DEM, until it reached the level of 1.5620 on 1988/1/4. This major decline took place in a period of almost three years, and it is rather obvious that this decline resembles a typical Elliott five-wave structure. Confirmation of this five-wave structure requires breakdown of each wave segment to see whether it matches with the Elliott Wave Principle. This will be discussed later.



After the level of 1.5620 was reached, the price movement has a narrower swing and it has been constrained within the

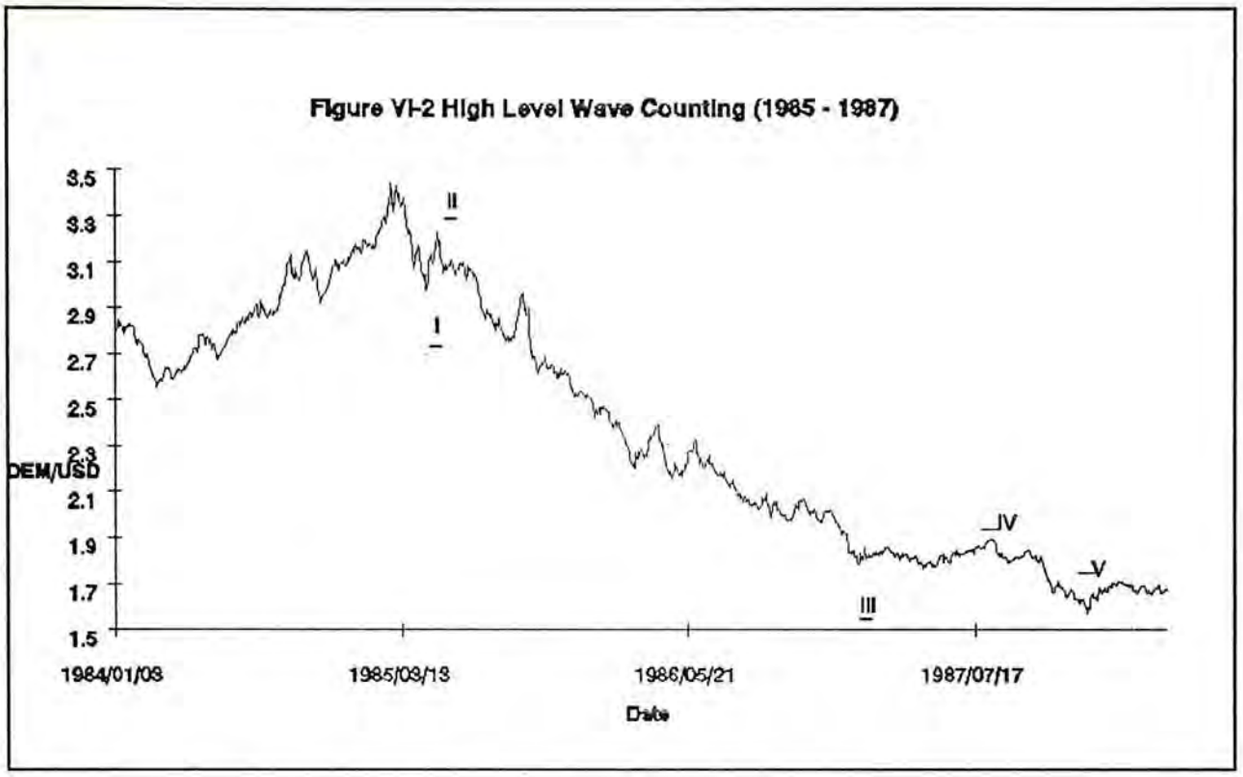
band between 1.3800 and 2.0500. The pattern for this period does not show any indications of an impulse waves of similar amplitude of the previous major decline (3.4795 to 1.5620). Therefore, as a starting point, the entire price movement during this period should be treated as a corrective sequence of the price movement for the above period.

In order to simplify the subsequent discussion, the period of the USD decline from 3.4795(1985/2/26) to 1.5620 (1988/1/4) will be referred to as Phase 1 Price Movement, while the price movement from the latter point up until March 1994 will be referred to as Phase 2 Price Movement.

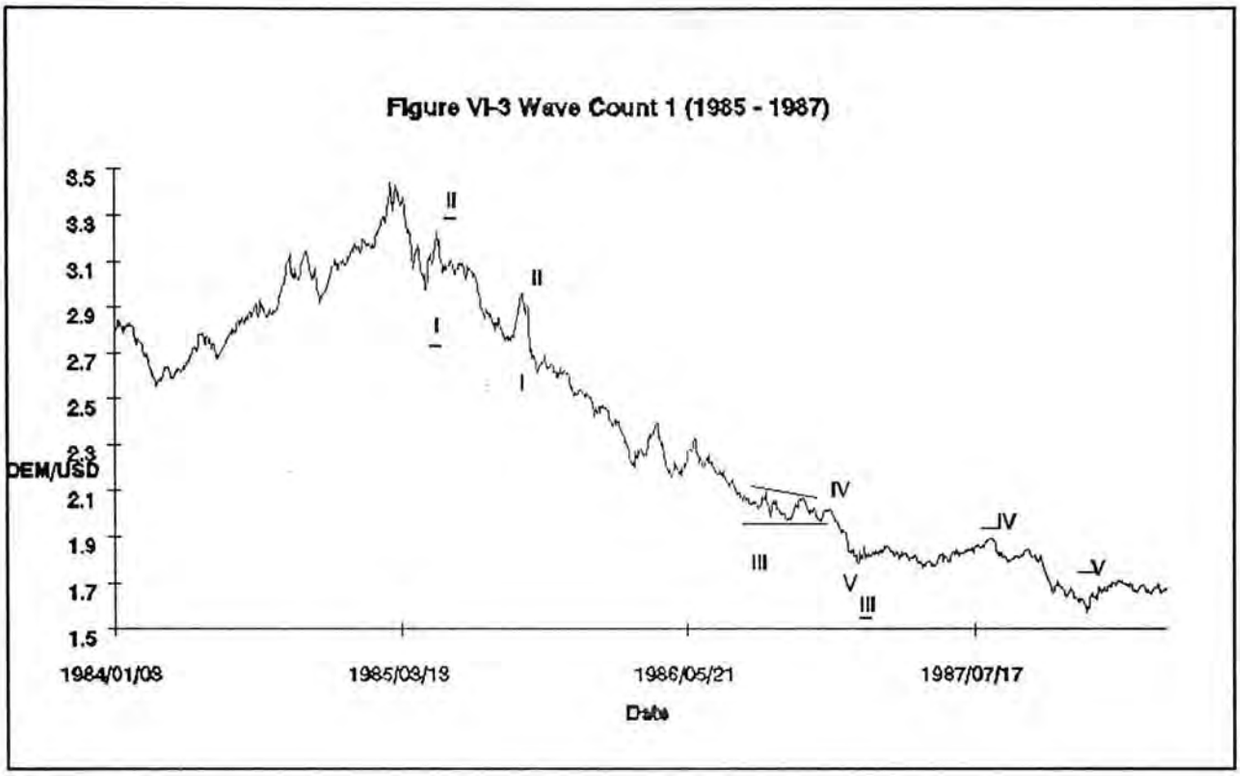
Phase 1 Price Movement

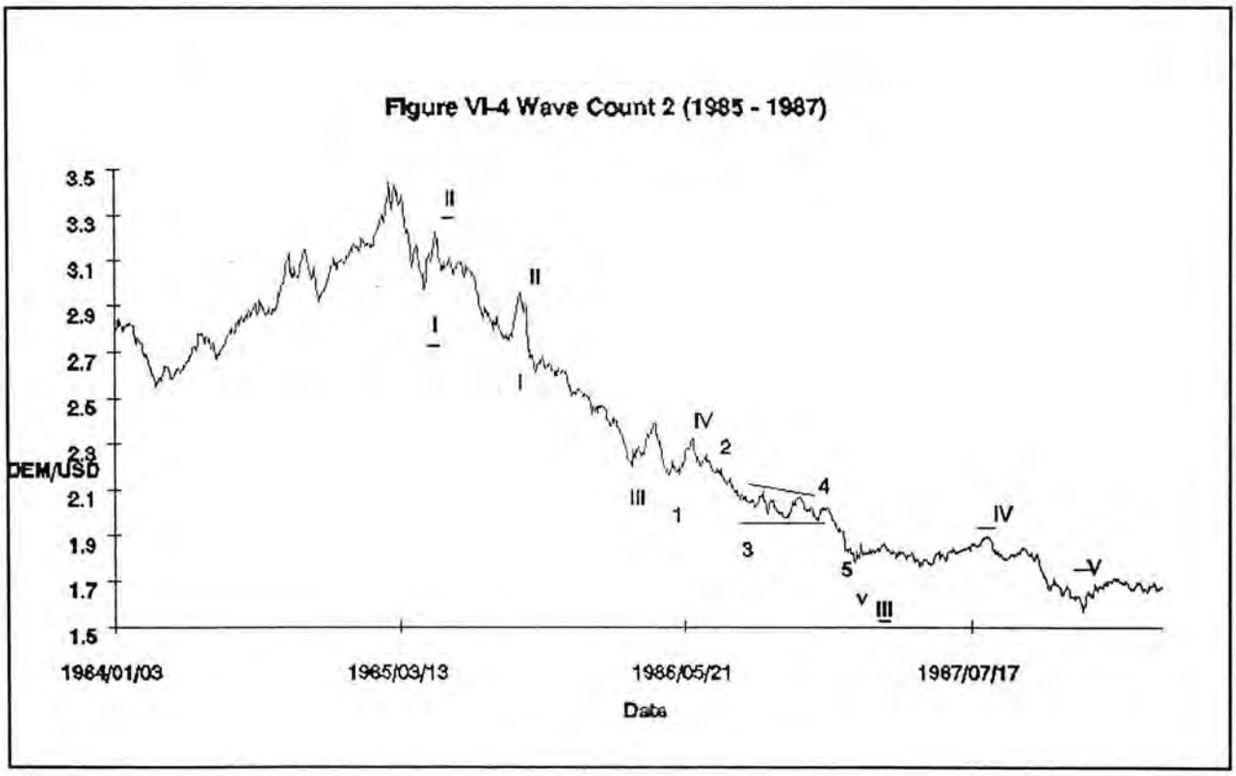
For this part of the price movement, it has all the characteristics of an impulse wave, as discussed before. Therefore, the counting starts on this assumption. The highest level of counting is labelled as an impulse wave I to V as shown in Fig. VI-2. The 5-wave pattern of this impulse wave has "the right look" of a typical impulse wave of the Elliott Wave Principle. The waves I, III and V can each be broken down into another impulse wave, which provides an added support to the counting of wave I to V.

However, within the wave III, there are three alternate counts for the extended waves. These three counts are shown in Fig. VI-3 to VI-5. The first 2 counts consider

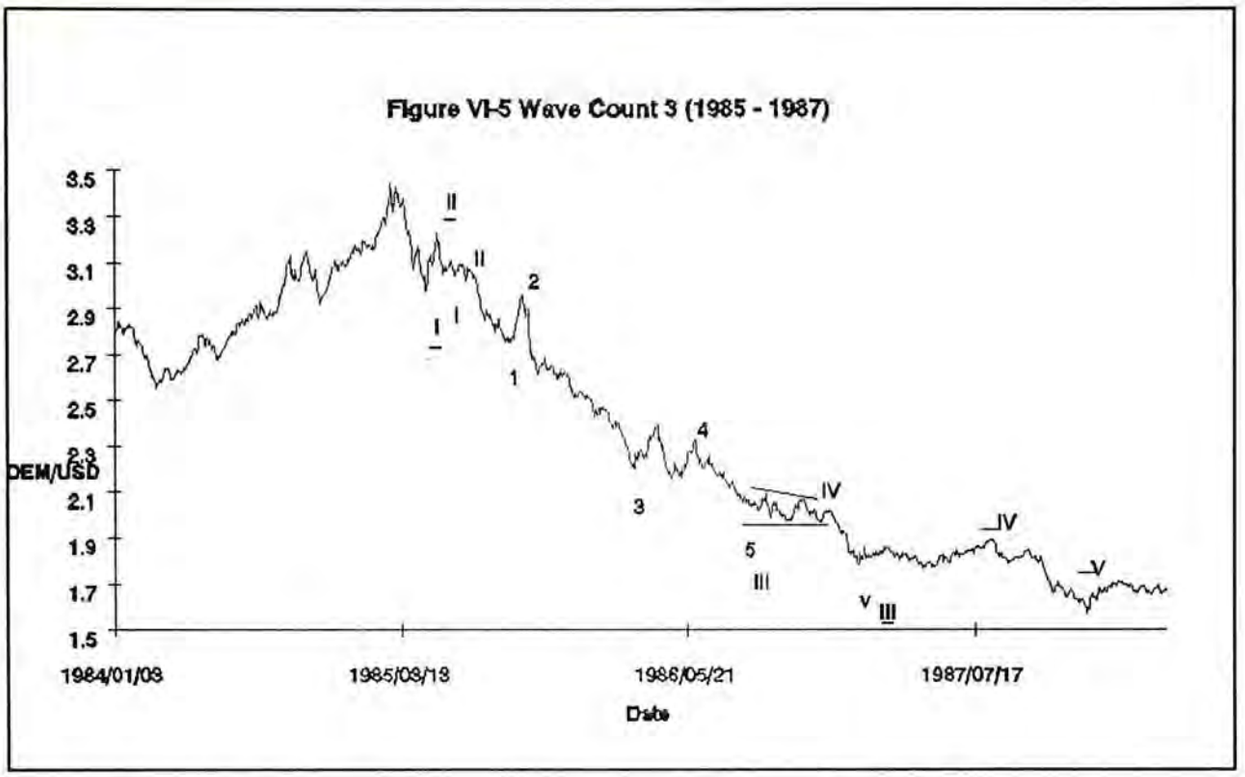


that wave III only has one level of extension. The difference of these two counts lies in the handling of the horizontal triangle. Count 1 treats the triangle as wave IV of III, whereas count 2 treats it as wave 4 of V of III. Both of these counts are legitimate as far as counting rules are concerned. But they both have drawbacks because count no. 1 ignores further wave extension in wave 3 while in count no. 2, the amplitude of the triangle does not fit well with the other subwaves of wave V of III.





The most preferred count is therefore the count no. 3, where the wave III is considered to have 2 levels of extension as shown in Fig. VI-5. This preferred count also

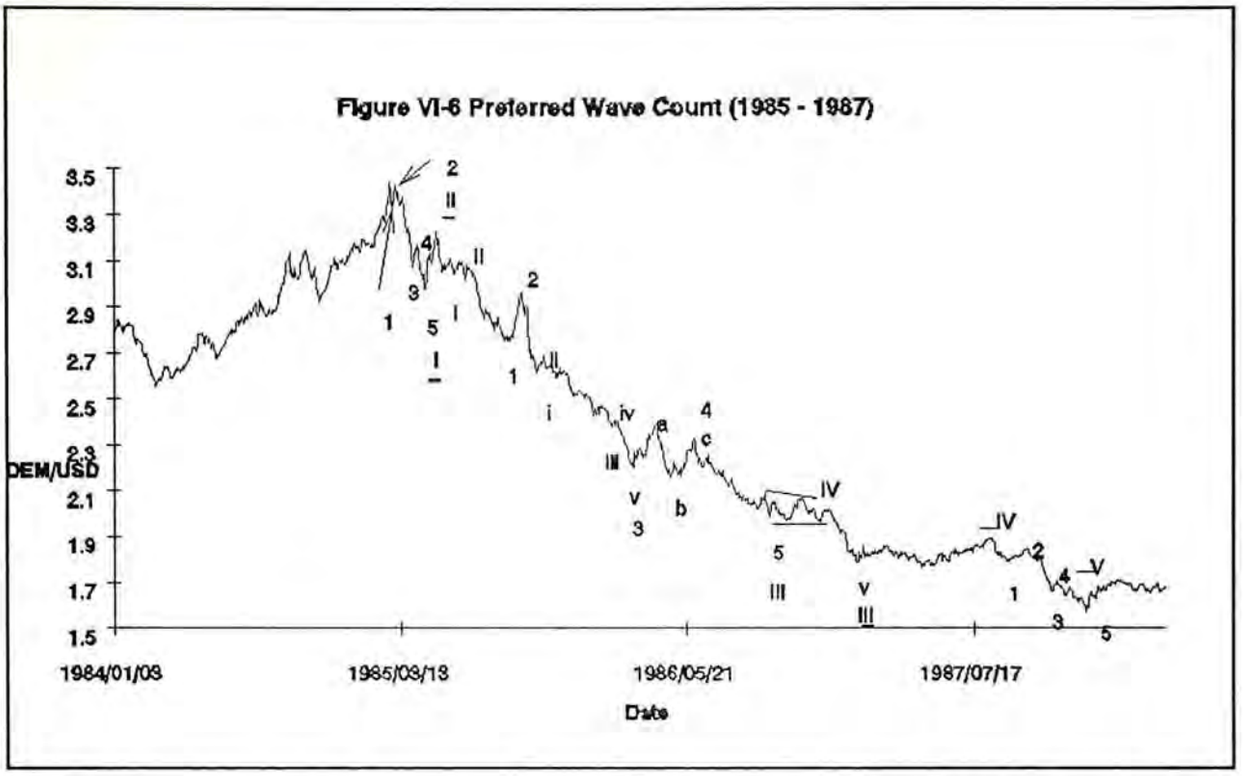


makes use of the general guideline that when the higher the power of an impulse, the more likely there will be impulse extensions. The impulse from 3.4795 to 1.5620 was undeniably a very strong one, and therefore the count with two levels of extension is more preferable.

The more detailed counting of subwaves are illustrated in Fig. VI-6, and this lower level counting apparently fits in very well with the basic counting rules. In general, it can be seen that the entire impulse wave for the US dollar decline from 3.4795 to 1.5620 followed very closely with the behaviour depicted by the Elliott Wave Principle.

Phase 2 Price Movement

As discussed earlier, the price movement during this time period is part of a long correction of the 3.4795-1.5620



impulse wave. There is no indication yet that this long correction has already completed. However, as will be discussed later, there is a good chance that this long correction will be completed soon from the viewpoint of wave counting. If this is the case, then the establishment for the wave counts for the present period is specially important, because Elliott Wave Principle may provide an insight into the upcoming major trend.

The corrective waves are always more complicated than the impulse waves. The Phase 2 Price Movement is no exception. Just counting from the broadest elements can already provide many different possible counts, and these counts are depicted in Fig. VI-7 to VI-10.

Figure VI-7 Wave Count 1 (1987 - 1994)

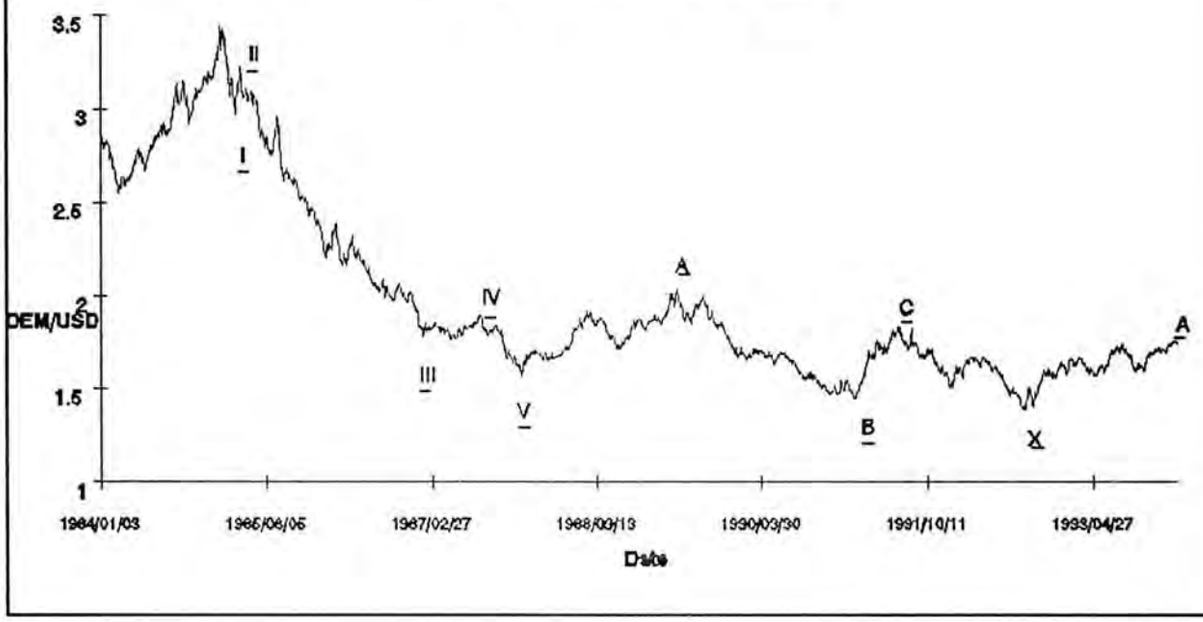
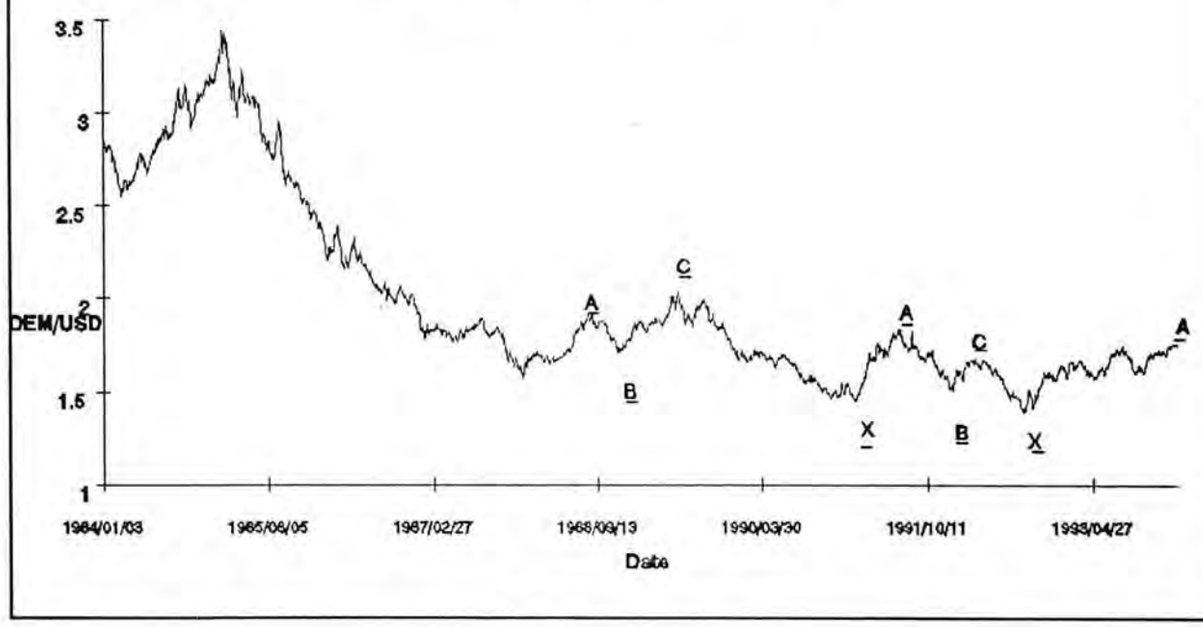


Figure VI-8 Wave Count 2 (1987 - 1994)



The count no. 1 (Fig. VI-7) considers the entire corrective sequence as a double three or triple three. The current development is part of the A wave of the second A-B-C sequence. The biggest problem with this count is that the

Figure VI-9 Wave Count 3 (1987 - 1994)

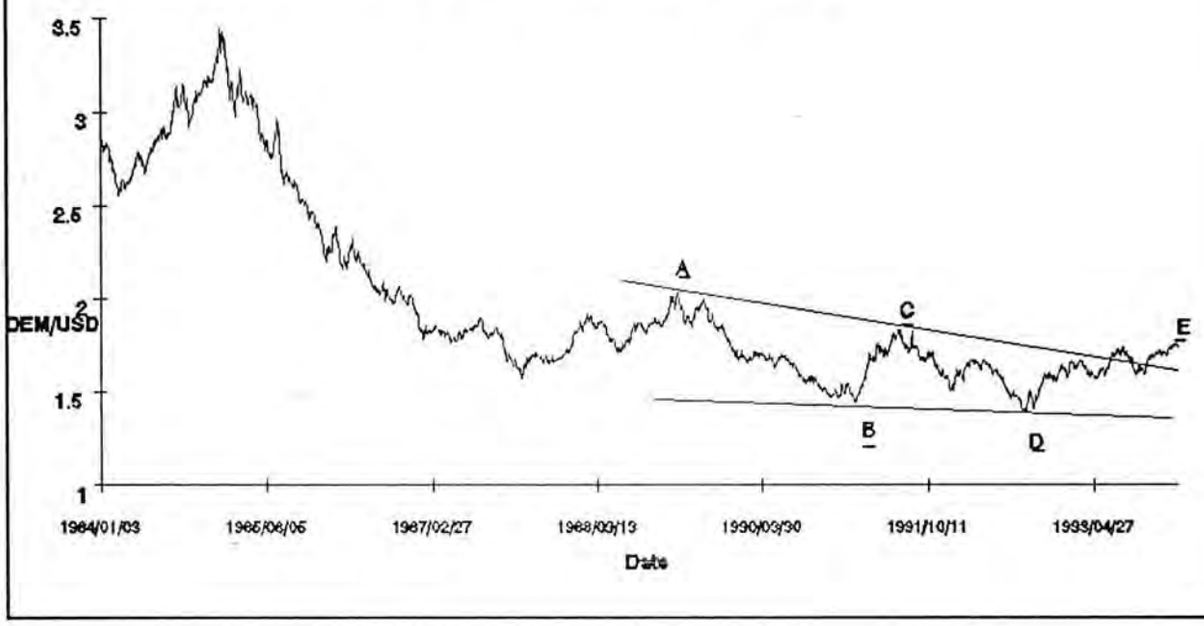
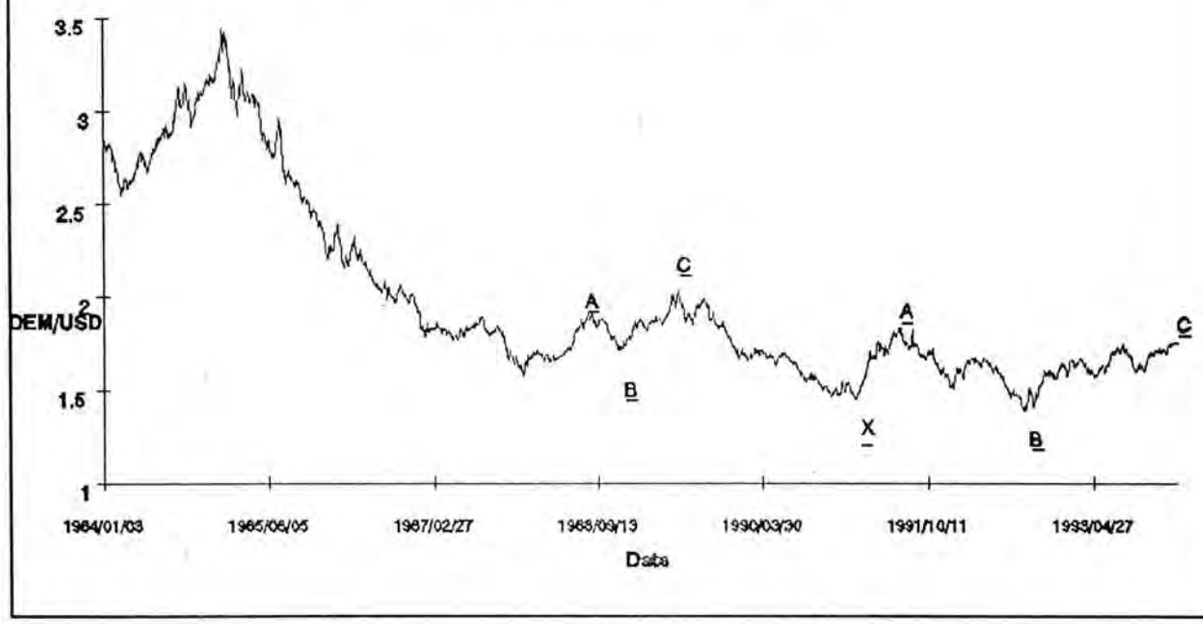


Figure VI-10 Wave Count 4 (1987 - 1994)



C wave of the first A-B-C is not a five-wave structure as would be expected out of a C wave. If it is counted as a five-wave impulse the third wave will be shorter than the first and fifth waves, which can never occur in an impulse wave based on Elliott Wave Principle.

The count no. 2 (Fig. VI-8) treats the corrective sequence as a triple three, with the A wave of the third A-B-C being unfolded. This count is still not preferred because the second of the 3 A-B-C sequences fits in better as a zigzag rather than an irregular flat, and it would require the A wave of this sequence to be a 5-wave impulse. Similar to the above case of count no. 1, the A wave cannot be counted as such because the third wave can never be the shortest wave among the first, third and fifth waves.

The count no. 3 (Fig. VI-9) treats the entire corrective sequence as a converging triangle. For such a triangle, every leg should have a 3-wave structure and out of each of the 3-wave structure, the last wave (C wave) should be a 5-wave structure. These requirements are basically satisfied. There is only one minor problem. The D leg of the triangle is slightly lower than the B leg and this should not happen for a horizontal triangle.

The count no. 4 (Fig. VI-10) is the most preferred count, because it does not have any of the above problems. The corrective sequence is considered as a double three sequence, which may or may not develop into a triple three sequence. The current movement is counted as the C wave of the second "three", with this C wave itself substituted by a double-three. If this count is correct, then the whole correction will either finish after the current C wave (as

in a double three) or it will finish after another A-B-C sequence with amplitude similar to that of the previous two A-B-C's. This count also satisfies one of the alternating principles as proposed by Frost and Prechter. They suggested that in a double three or triple three sequence, the form of the first two A-B-C should be alternating. In this case, the first A-B-C is a zigzag, and the second is a flat, therefore meeting the alternating principle.

Based on the preferred count of no. 4, the component waves were further analyzed and the results are shown in Figs. VI-11 to VI-14. This is a very important step because it Elliott Wave Principle holds for a certain financial market, the basic rules should be applicable to both high level waves as well as low level waves. As can be seen in the diagrams, the counting of the component waves satisfies the fundamental rules of Elliott Wave Principle surprisingly well, and therefore this is maintained as the most preferred count in this report. In fact, the counting of one level further down (to the extent the daily high-low-close chart can support) still gives basic compliance of the rules of Elliott Wave, which we found is not true for the non-preferred counts.

Figure VI-11 Preferred Count (1987 - 1989)

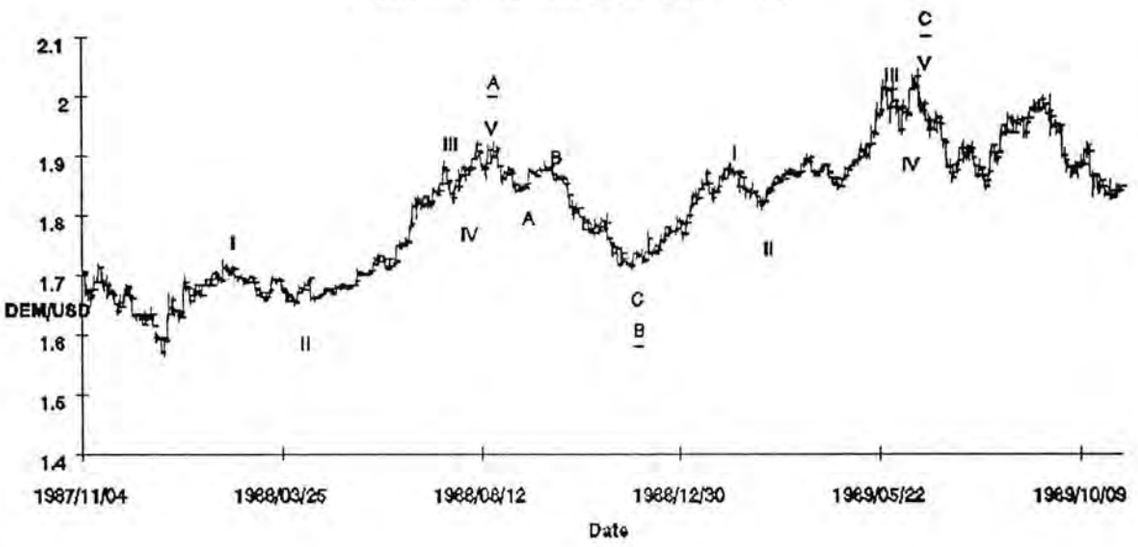


Figure VI-12 Preferred Count (1989 - 1991)

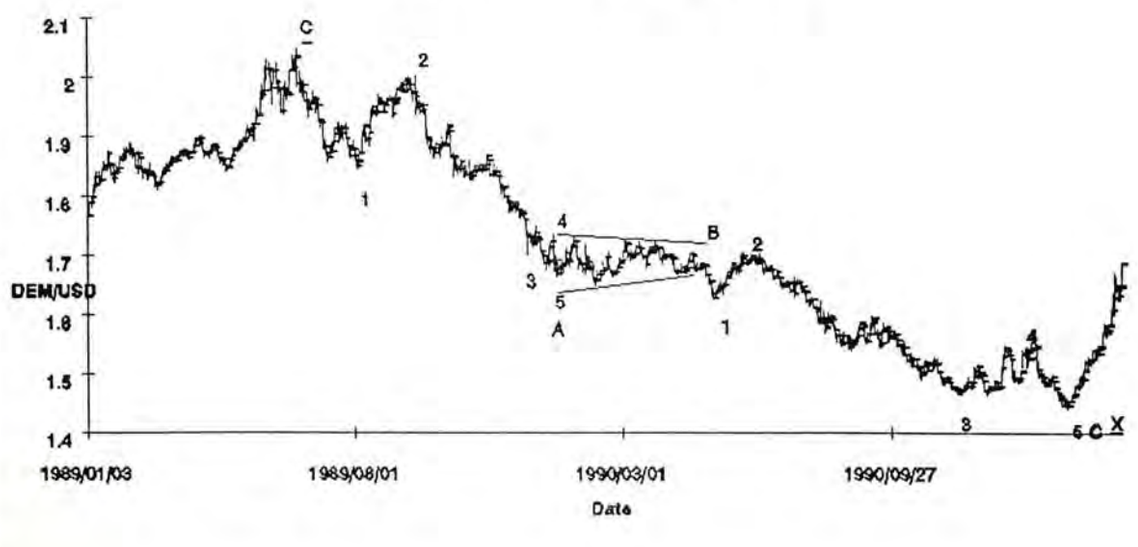


Figure VI-13 Preferred Count (1991 - 1992)

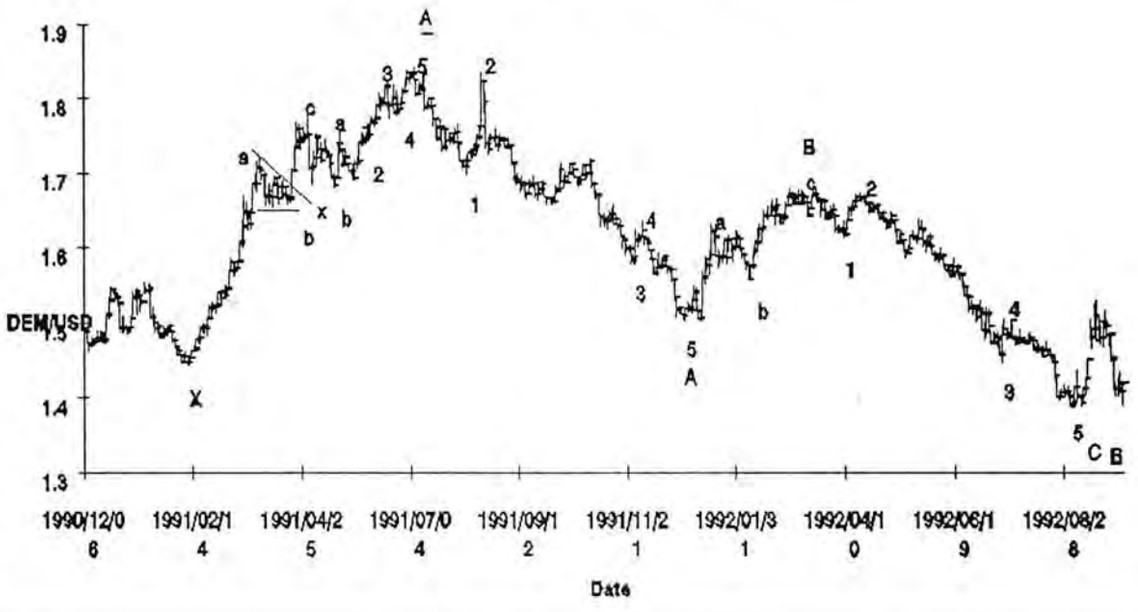
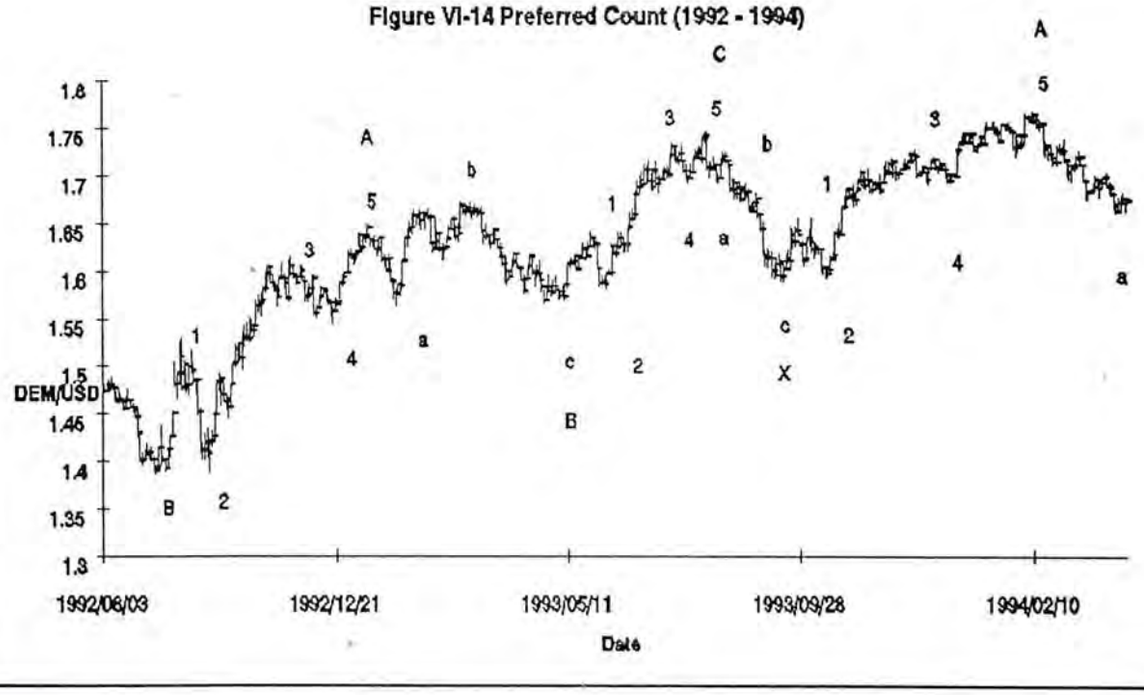


Figure VI-14 Preferred Count (1992 - 1994)



Future Market Perspectives

As discussed previously, there are two possible long term counts of the DEM market developed by the previous analysis. The more preferred count says that rise of USD from the level of 1.3870(1992/9/2) up to now is the C wave of a large double three. This C wave itself develops into a double three or triple three. The current position (end of March, 1994) is at the B wave of the A-B-C-X-A-B position. The A wave was from 1.5883 (93/9/15) to 1.7676 (94/2/8), and was apparently a five-wave impulse. The current A-B-C should be a zigzag, implying at the end of C wave the USD should be higher than the value of 1.7676.

However, before trying to estimate the target of end of C wave, the end of B wave has to be estimated first. There are two methods. The first method is to analyze the subwaves of the B wave. From wave theory, this must be a three-wave structure. Therefore, most likely the decline from 1.7676 (94/2/8) to 1.7100 (94/2/18) is the a wave, and from 1.7100 (94/2/18) to 1.7385 (94/2/24) is the b wave. The length of a wave is 576 points. If the most common Fibonacci relationship for the c wave is used, then end of c wave is 1.7385 - 1.618 * 0.0576 which is equal to 1.6457. This value is also the end of B wave. The second method is to use waves of one higher level. The A wave was from 1.5883 (93/9/15) to 1.7676 (94/2/8), and hence the length

of wave A was 1793 points. The common Fibonacci relationship for B wave is 0.618 times the length of A wave. Therefore, end of B wave should be 1.7676 - 0.618 * 0.1793 which is equal to 1.6568. At the time of finalising this report (first week of April, 1994), the USD has gone down to 1.6598 (94/3/25) and then went back up. This value is only 30 points off the target end of B wave, as calculated by the second method. Therefore, it is likely that the C wave is unfolding.

If the C wave is 1.618 times the length of A which was 1793 points, then the target end point of this C wave is 1.9499. The other possibility is that the C wave equals the length of A wave which will give 1.8391 as end of C wave. Out of these two possible targets, the second one has a much higher probability because of analysis of higher level waves. At one level higher, the current wave is C wave of an A-B-C sequence which is obviously a flat correction (ref. Fig. VI-10). This implies the end of C wave should be near the end of A wave, which was 1.8423 (91/7/5). This value only differs with the value of 1.8391 by 32 points.

With regard to time frame, a rough estimate is that the second A-B-C takes about the same time as the first A-B-C, which was about 11 months (92/9/2 to 93/8/2). Therefore, the end of C wave (also is the end of C wave) should occur around 94/7/2.

When this end of C wave is reached, there is a high chance that the large corrective wave from the point of 1.5620 (88/1/4) is fully completed. Then the USD will start a very major decline again, and the perspective of USD is very bearish 3 months from now.

From the long term wave count, there is a second but not so preferred count. This count treats the entire correction since January 1988 as a horizontal triangle and the current position is on the last leg (fifth leg) of the triangle. In fact, the price movement has already overshoot the boundary of the triangle (ref. Fig. VI-9). If this count is taken, then the picture of USD is very bearish. Based on wave counting rules, the completion of a triangle always marks the end of market hesitation and it will go on with the larger movement. The decline from the level of 1.7676 could already be the starting point of a long and major decline. The movement of 1.7676 to 1.6598 may be the wave 1 (or even a wave i) of a downward impulse, and the target end point of wave 2 is only 1.7137. This is based on the assumption of a 50% correction by wave 2, which is the most likely correction found by our ratio analysis. After that point, USD should continue on with the major bearish decline.

There is one critical judgement point to decide on this not so preferred count. The E leg of a triangle cannot overshoot the end of the C leg. If USD rallies above the

point of 1.8423, this count should be discarded.

In summary, the short term perspectives depend on two possible wave counts:

Preferred Count

USD will rally to the value of about 1.8391 by July 1994 and then start a major and long decline.

Second Preferred Count

USD has completed a long upward correction since January 1988, and is already on the way to a long and major decline. In very short term, it will only rebound back to the region of 1.7137, but will decline again.

Both counts are very bearish for the U.S. dollar in the long run.

CHAPTER VII

DISCUSSIONS

Experience in Wave Counting

Through the course of this project, we have acquired following experience in terms of wave counting:

(1) According to our experience, analysing the price action using a top-down approach seems to work best. In other words, try to gather at least a few years' data and start with the broadest swings first. The chart should be scanned through to identify any wave forms which resemble the five-wave impulse structure. Then all high level counts which fit in with these five-wave structures should be identified. After all counts are identified, then waves of one level lower should be analyzed. Counts which are inconsistent with the subwaves should be eliminated.

One of the major criticisms of the Elliott Wave Principle is that there are always too many possible counts. From our experience, if wave counting is done

sufficiently carefully with a long and broad view, the number of possible counts are very limited.

(2) In Elliott Wave Principle, some waveforms have well-defined patterns and these should be used as basic guidelines in wave counting. For instance, for an A-B-C corrective sequence, the C wave should always be a five-wave structure, unless it is substituted by a diagonal triangle, double-three, or triple-three. The A wave of a zigzag should be a 5-wave structure while that of a flat or irregular should be a 3-wave. Five-wave impulse always has a distinct structure and is easy to identify.

(3) For counting or confirming downward impulse waves, it is always helpful to get a chart with the Y-axis in reverse order. The general perception of an impulse wave is always upwards, and it is easy to miss or mis-count the downward impulse. A graph with reverse Y-axis will show the impulse in the upward direction, and will help very much in visualising the impulse wave.

(4) In determining the counts, the "right look" is important. For instance, for the USD rally between the period of 91/2/11 to 91/7/5, it is rather obvious that it cannot be counted as a 5-wave structure. In

fact, this was a big help in eliminating two of the long term wave counts as discussed in Chapter VII.

(5) The identification of triangles often is very helpful in wave counting. Triangles can often be easily spotted from the charts. Since based on Elliott Wave theory, the triangle is either a fourth wave, a B wave or an X wave, quick identification of a triangle can often help the subsequent identification of the entire pattern. An example can be found in Fig. VI-12, in which a triangle forming a B wave can be easily spotted.

(6) Frost and Prechter had suggested that the line joining start of wave 1 to end of wave 2 should not hug any part of wave 3 and this rule is quite useful for identifying wave 3 in our analysis of the DEM data. In all the cases where a 5-wave structure is identified in our study, all except one follows this rule. The one case that this rule fails is a case where the wave 3 extends and wave ii of the extended wave 3 touches the line joining start of wave 1 to end of wave 2.

Therefore, in general the above rule can be used as a useful guideline to help to identify the occurrence of third waves.

(7) The initial start-up for the practical application of Elliott Wave Principle is very difficult. The basic theory appears to be very simple, but once put into practice on real market data, there are far too many possible variations to get the learner confused, especially in the different forms of corrective waves. However, based on our experience, once the initial hurdle is overcome and certain experience is gained in analyzing actual data, the usage of Elliott Wave Principle will become much easier. The detailed analysis of historical market data is a very good means to master Elliott Wave.

Limitations of Elliott Wave

(1) The biggest weakness in Elliott Wave is the lack of guidelines to predict the timing of market movements. The difficulty is specially pronounced in the analysis of corrective waves. A correction can be very simple, such as a simple zigzag, or it can be very complicated and prolonged, as in the cases of double threes and triple threes. Elliott Wave theory can provide very little hints or guidelines for predicting the timing of the market turning points.

(2) The use of Fibonacci ratios in predicting wave targets are not as precise as one would expect from reading

the textbooks. From our experience, the use of Fibonacci ratios gives very good indications to the region where the turning point will most likely be. Also, when average values are taken over many samples, the wave relationships are pretty close to Fibonacci ratios. However, on a case by case basis, we do not find many cases the Fibonacci targets are as accurate as described in textbooks.

(3) The theory on the corrective waves is not very complete. There are several basic forms : zigzags, flats, irregulars, horizontal and diagonal triangles. And there are more complicated forms such as double threes and triple threes. Even more complicated is the substitution of forms. It seems nearly every wave in a double and a triple three can be substituted by a basic form or another complicated form. There are very few guidelines in analyzing these corrective waveforms. One major impact is that it is very difficult to project the end of correction, while it is much easier to estimate the end of an impulse. Again, may be this is one area which worth further study.

Practical Implementation Issues

Even though our study was carried out by means of simulated

trading, some useful and practical experience was gained. The experience brings some valuable insights to the practical implementation of Elliott Wave, and are discussed below:

(1) Apparent from our study, there are some common characteristics in the wave patterns of a certain market. It will be very helpful to practical trading if these characteristics are identified.

For instance, in our study of DEM forex market, a ratio analysis was performed before the simulated trading. The ratio analysis revealed that the wave 4 consistently is related to wave 3 on a smaller Fibonacci ratio of 0.236 than the commonly used ratio of 0.382. Similarly wave 5 is related to the length between origin of wave 1 to end of wave 3 by a ratio of 0.382 rather than 0.618. The success in subsequent trading confirms these wave relationships. This phenomenon suggests that if Fibonacci wave relationships are valid, there should be different ratios for different markets, probably due to market characteristics. Therefore, the analysis of historical data to identify the wave relationships may produce very helpful information to practical trading.

(2) In order to apply Elliott Wave, it is necessary to

form a high level view of the wave count before the future perspective can be developed. To support such a high level view, it is always useful to have a broad view of the past market movement covering at least a few years. The study of past data should preferably trace back to a major impulse wave because impulse waves always have a distinct pattern, providing the best checkpoint in wave counting. For instance, in our case of DEM study, we consistently develop our wave count by tracing back to the major turning point of 1.5620 on 1988/1/4, which was obviously the end of a major impulse. It must be pointed out, however, that while analysis of data of a few years ago is needed to identify the broadest swing, it is not necessary to scrutinize the waveforms down to lowest levels. In general, only waves of the highest two levels need to be considered. Usually the study of the low level waves is necessary only for the time period of previous few months.

(3) The impulse waveform is the most distinctive and reliable in Elliott Wave counting, and out of its component waves, the wave 3 is always the most powerful and usually has the largest amplitude. Hence, wave 3 always provides the best chance for reaping profits. Obviously the identification of an unfolding wave 3 is very critical to the success in trading based on Elliott Wave Principle. To confirm

that wave 3 is revealing, waves 1 and 2 must be confirmed first. To this end, we found that the basic rule that wave 2 cannot trace back beyond the origin of wave 1 is very useful and reliable . For all the impulse waves that we studied, there were a few cases wave 2 retraced almost all of wave 1 but never beyond the origin of wave 1. The possibility of an impulse should be ruled out once the apparent wave 2 retraces more than 100% of wave 1.

The other important aspect is to establish a momentum criterion for Wave 3. In the simulated trading, we have chosen a simple 5-day rate-of-change oscillator as the momentum measure. The results indicated the momentum indicator was too sensitive and in some cases the trade was pre-maturely terminated. A possible improvement might be the use of moving average oscillator instead of the rate-of-change oscillator. The moving average oscillator can smooth out glitches in the market movement. Another possible tool to use is the Standard Deviation Envelop, which is based on the moving average plus and minus a certain times of standard deviation of the averages' period. Our suggestion is to select the tool by evaluating the tools' performance using simulated trading on historical data, similar to the method used in this study.

(4) As discussed before, one of the major limitations of Elliott Wave Principle is the lack of guidelines to predict the timing of market movements.

The Spiral Calendar, which has become rather popular in recent years, may be a useful tool to supplement Elliott Wave Principle. The Spiral Calendar is a set of time units where the numbers of moons are measured in square roots of Fibonacci numbers, and based on historical data a theory has been proposed that these time units can be used to predict the major turning points of stock markets. Similar to Elliott Wave Principle, Spiral Calendar does not pinpoint a specific time for market change, but a series of probable time units. The use of this tool requires subjective judgement on the "degree" of the market trend being unfolded. Because of its value in predicting market timing, there is a good potential for the integration of Spiral Calendar and Elliott Wave Principle to become a very powerful and useful technical analysis tool, and the merging of these two theories may be a promising research topic.

(5) Throughout our study, the fundamental economic factors have been ignored. There are two reasons for this. Firstly, the basic concept of Elliott Wave assumes the wave development is a natural rhythmic pattern and is largely independent of the underlying economics.

Secondly, there are many different factors in macroeconomics which can affect financial markets. The role and importance of these factors vary from time to time, and the scope of study would be too large if these factors are considered in a study of more than 10 years' market. However, we are of the opinion that to be successful in financial markets, an integrated approach including study on both technical analysis and fundamental economics is the best approach. In fact, we have a preliminary observation that apparently there is a single underlying economic factor which drives the market within the same Elliott wave. For instance, for an impulse wave, the movement from wave 1 to wave 5 may be pushed by the same economic factor. When a new economic factor emerges as the controlling factor, a new wave, probably a correction to the impulse, would develop. The subwaves within a main wave may only reflect the different stages of the controlling factor's development. This concept of interrelationship between Elliott Wave and economic factor is not yet mature, but it certainly is an area worthwhile further study.

CHAPTER VIII

CONCLUSION

Even though Elliott Wave Principle is not an exact science, it is still possible to perform systematic study on its effectiveness. The success of the trade plans in simulated trading of this study suggests a useful value of Elliott Wave Principle in forex trading. The trade plans are very simple and have a lot of limitations, however. The true potential of Elliott Wave Principle should be measured by using more sophisticated trade plans.

On the other hand, there are a number of inherent limitations of Elliott Wave encountered during the study. Some of these limitations may warrant further study to enhance the value of Elliott Wave Principle.

There are many valuable experience gained in the simulated trading and wave counting. Some of the experience can be very helpful to practical trading. This study indicates analysis of historical data is extremely useful in gaining the experience in wave counting and formulation of practical trade plans.

APPENDICES

Appendix 1

Table 1-1 Results of Ratio Analysis

	Case 1		Case 2		Case 3		Case 4	
	Date	Price	Date	Price	Date	Price	Date	Price
Start of Wave 1	1985/05/06	3.2648	1985/02/26	3.4795	1986/06/02	2.3458	1987/08/11	1.9037
Start of Wave 2	1985/08/22	2.7352	1985/02/27	3.2755	1986/06/16	2.1911	1987/09/03	1.7879
Start of Wave 3	1985/09/12	2.9735	1985/03/15	3.4025	1986/06/23	2.2769	1987/10/01	1.8505
Start of Wave 4	1986/09/19	1.9849	1985/03/29	3.0506	1986/09/04	2.0231	1987/11/10	1.6491
Start of Wave 5	1986/12/12	2.0300	1985/04/08	3.1990	1986/09/12	2.1039	1987/12/07	1.6835
End of Wave 5	1987/01/28	1.7680	1985/04/18	2.9577	1986/09/19	1.9849	1988/01/04	1.5620
Length of Wave 1		0.5295		0.2040		0.1547		0.1157
Length of Wave 2		0.2383		0.1271		0.0858		0.0625
Length of Wave 3		0.9886		0.3519		0.2538		0.2014
Length of Wave 4		0.0451		0.1483		0.0809		0.0344
Length of Wave 5		0.2620		0.2413		0.1190		0.1215
Ratio of Wave 2 to 1		0.4500		0.6228		0.5546		0.5403
Ratio of Wave 3 to 1		1.8670		1.7249		1.6406		1.7404
Ratio of Wave 4 to 2		0.1893		1.1675		0.9425		0.5505
Ratio of Wave 4 to 3		0.0456		0.4216		0.3186		0.1709
Ratio of Wave 5 to 1		0.4947		1.1827		0.7693		1.0498
Ratio of Wave 5 to 3		0.2650		0.6857		0.4689		0.6032
Ratio of Wave 5 to (Start of		0.2047		0.5626		0.3688		0.4772
Wave 1 to End of Wave 3)								
Ratio of Wave 1 to Total		0.3538		0.3910		0.4287		0.3387
5-wave Impulse								

Appendix 1

Table 1-1 Results of Ratio Analysis

							Case 1 to 7	
	Case 5		Case 6		Case 7			Standard
	Date	Price	Date	Price	Date	Price	Average	Deviation
Start of Wave 1	1988/01/04	1.5620	1988/11/25	1.7091	1989/06/15	2.0479		
Start of Wave 2	1988/02/12	1.7250	1989/02/03	1.8896	1989/08/02	1.8440		
Start of Wave 3	1988/04/04	1.6485	1989/02/27	1.8096	1989/09/11	2.0016		
Start of Wave 4	1988/07/18	1.8730	1989/05/23	2.0288	1990/01/02	1.6807		
Start of Wave 5	1988/07/22	1.8212	1989/06/05	1.9365	1990/01/04	1.7355		
End of Wave 5	1988/08/09	1.9220	1989/06/15	2.0479	1990/01/08	1.6642		
Length of Wave 1		0.1630		0.1805		0.2039		
Length of Wave 2		0.0765		0.0800		0.1576		
Length of Wave 3		0.2245		0.2192		0.3209		
Length of Wave 4		0.0518		0.0923		0.0548		
Length of Wave 5		0.1008		0.1114		0.0713		
Ratio of Wave 2 to 1		0.4692		0.4432		0.7729	0.5505	0.1176
Ratio of Wave 3 to 1		1.3769		1.2141		1.5739	1.5911	0.2262
Ratio of Wave 4 to 2		0.6778		1.1538		0.3479	0.7185	0.3848
Ratio of Wave 4 to 3		0.2310		0.4212		0.1709	0.2543	0.1402
Ratio of Wave 5 to 1		0.6183		0.6173		0.3497	0.7260	0.2983
Ratio of Wave 5 to 3		0.4491		0.5084		0.2222	0.4575	0.1676
Ratio of Wave 5 to (Start of		0.3241		0.3486		0.1942	0.3543	0.1340
Wave 1 to End of Wave 3)								
Ratio of Wave 1 to Total		0.4529		0.5328		0.5314	0.4328	0.0785
5-wave Impulse								

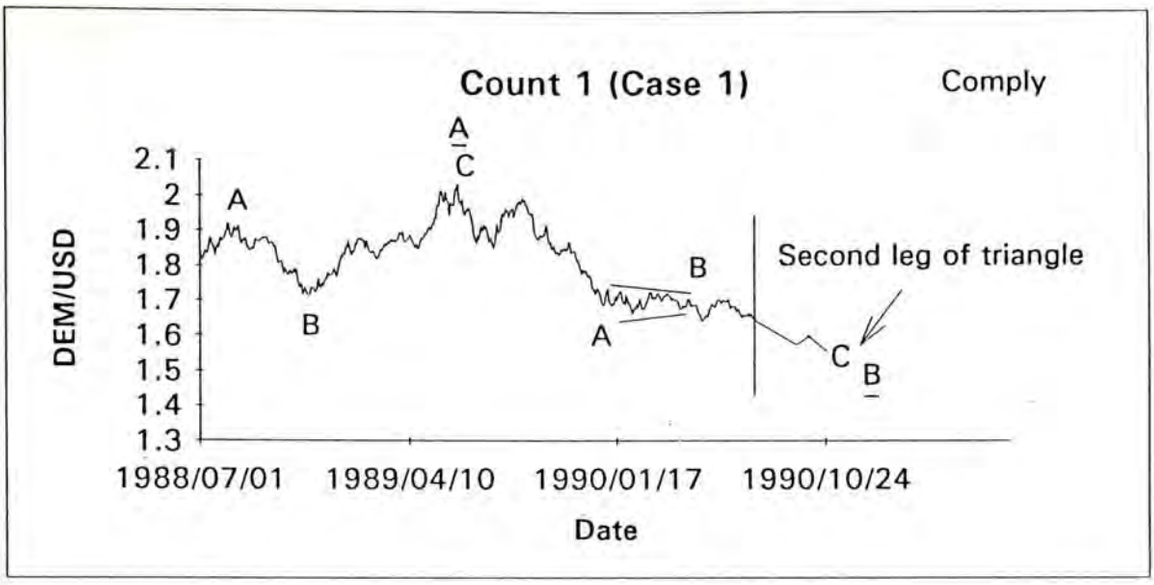
APPENDIX 2

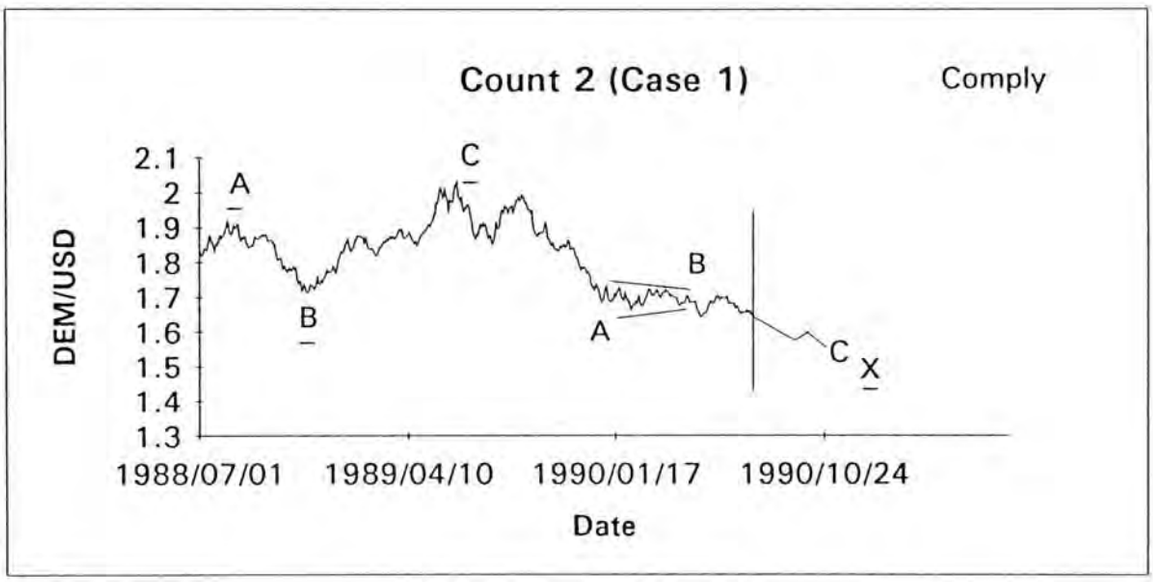
DETAILS OF SIMULATED TRADING

This Appendix presents the details of the calculations for Trade Cases 1 to 13. Firstly, all the possible wave counts for the 13 trade cases are shown in Figs. 2-1 to 2-13. For each case, all legitimate counts are shown, and those counts which comply with the expected wave to be unfolded are marked "Comply", whereas those counts which do not comply are marked "Not Comply".

The details of trade calculations are shown in Tables 2-1 to 2-5. For each case, the apparent wave lengths, the trade initiation points, the cut-loss points, the profit-taking points and the final profit/loss are shown.

Figure 2-1 Possible Wave Counts For Trade Case 1





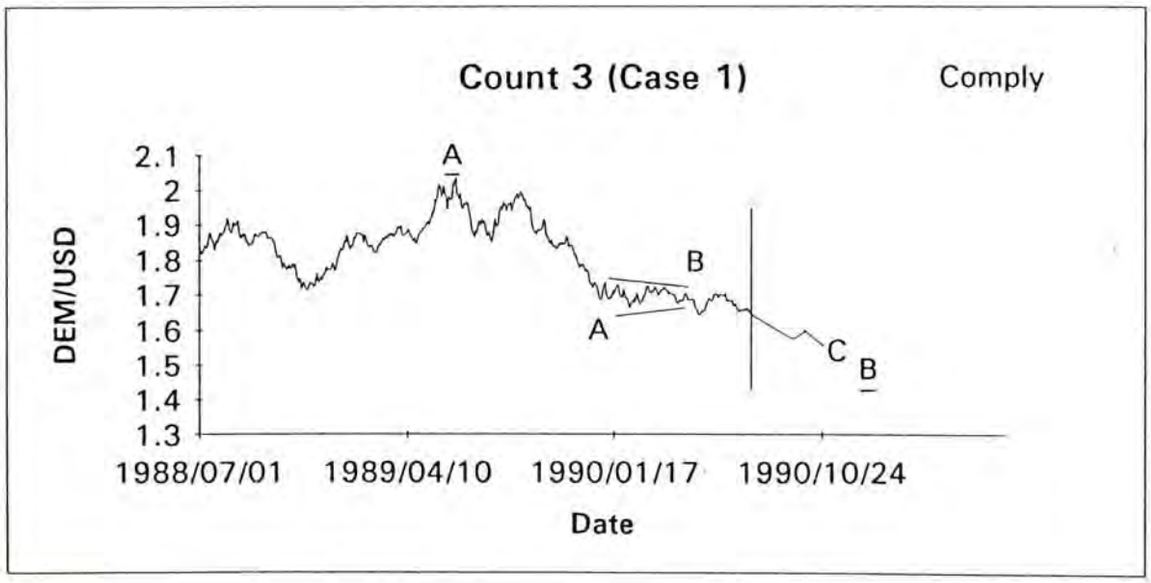


Figure 2-1 Possible Wave Counts For Trade Case 1

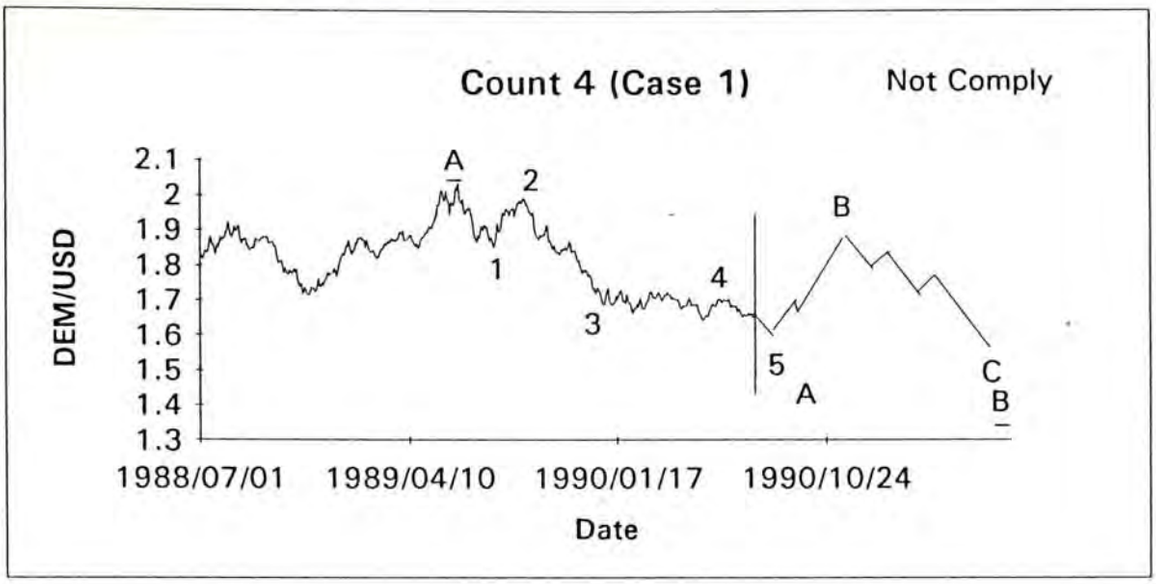
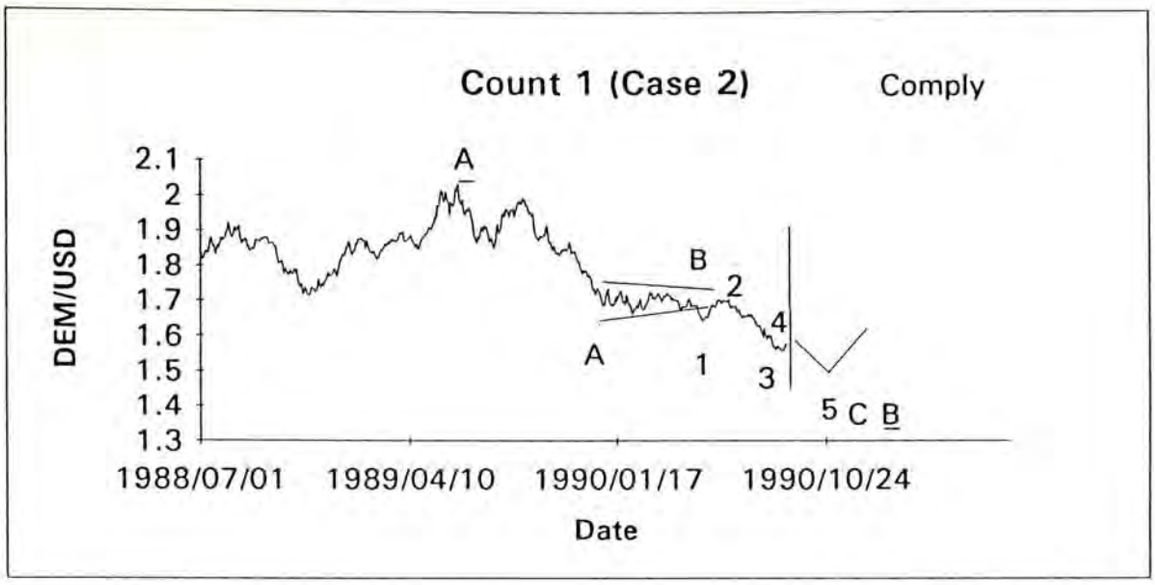
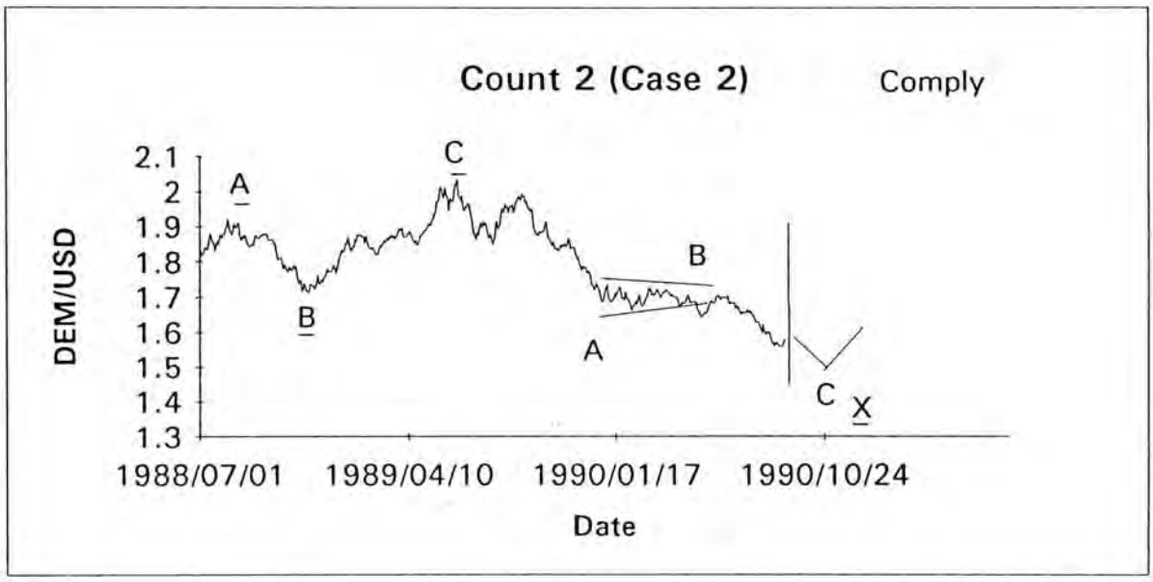


Figure 2-2 Possible Wave Counts For Trade Case 2





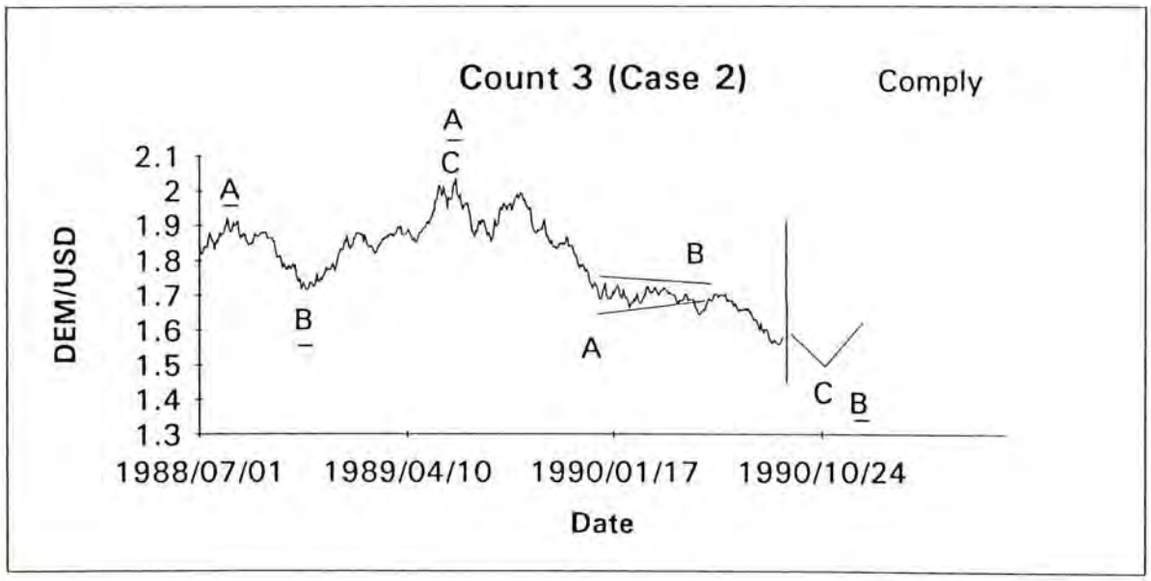


Figure 2-2 Possible Wave Counts For Trade Case 2

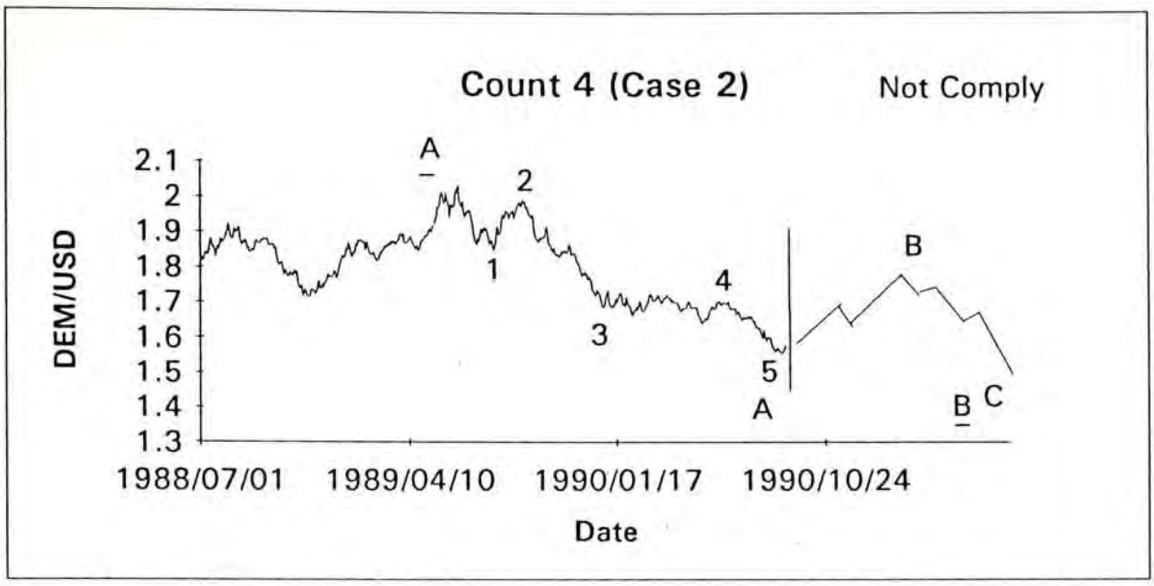
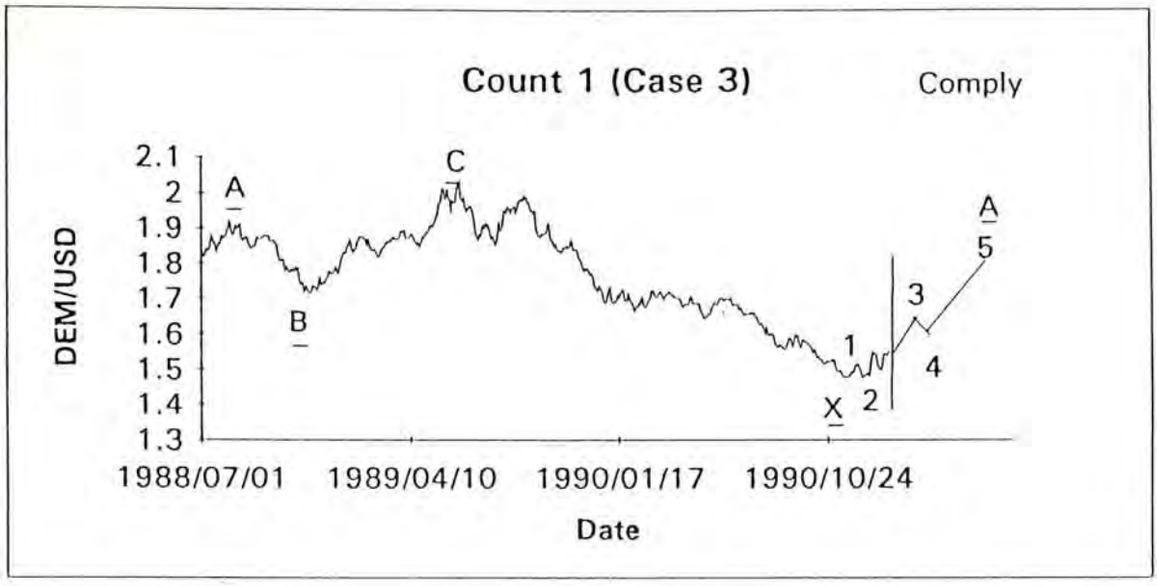
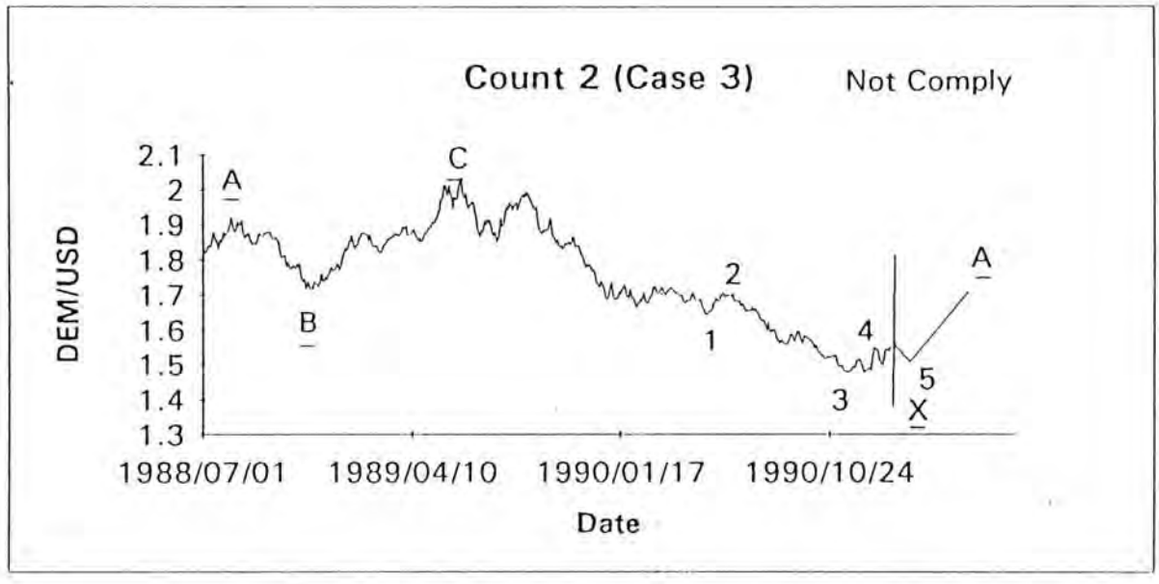


Figure 2-3 Possible Wave Counts For Trade Case 3





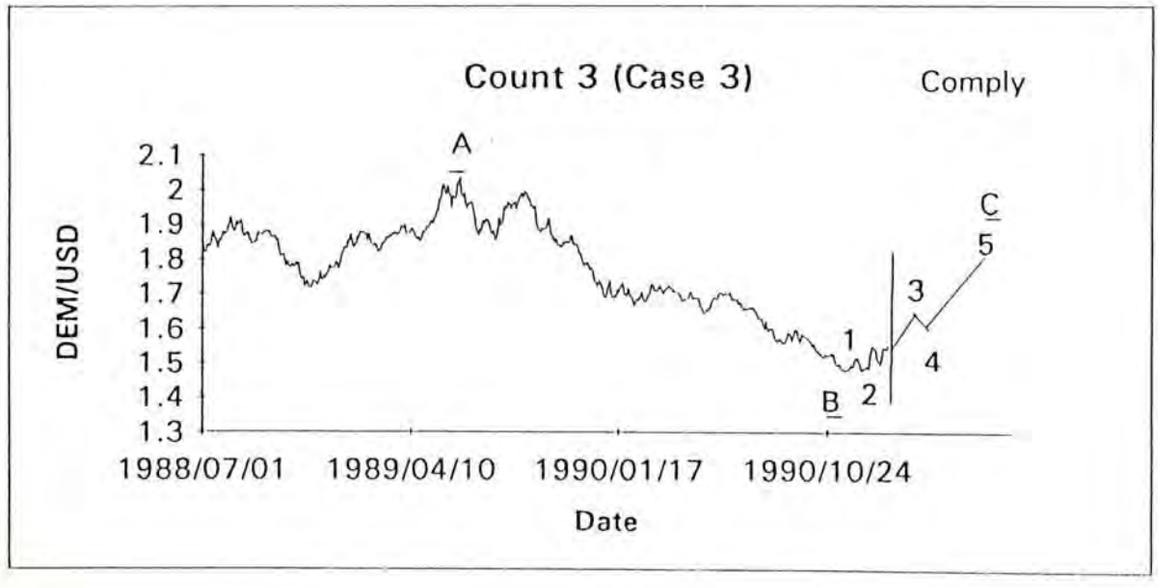


Figure 2-3 Possible Wave Counts For Trade Case 3

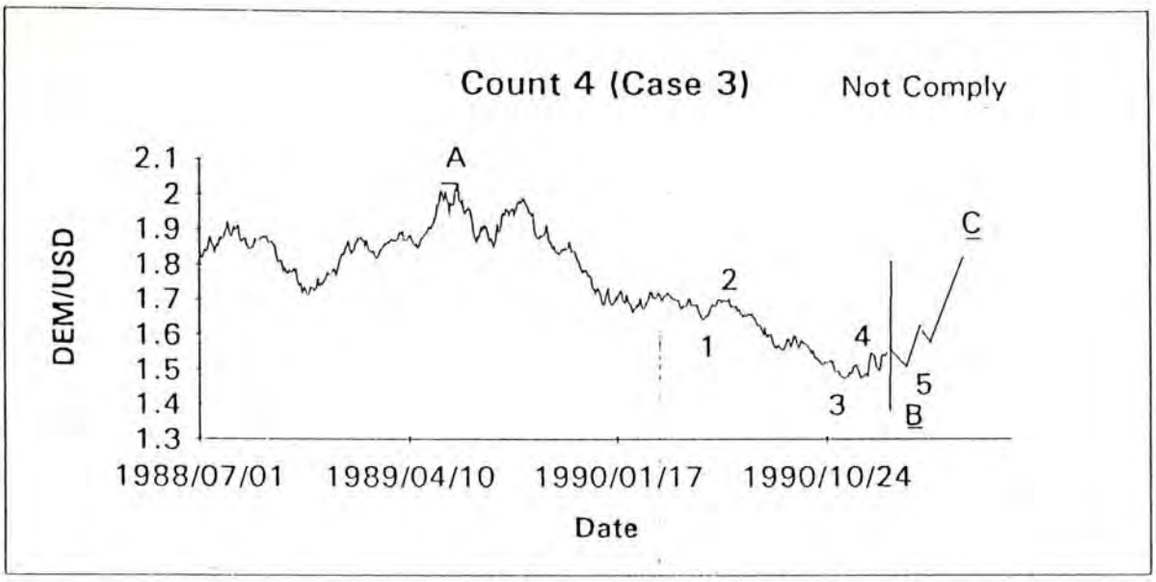
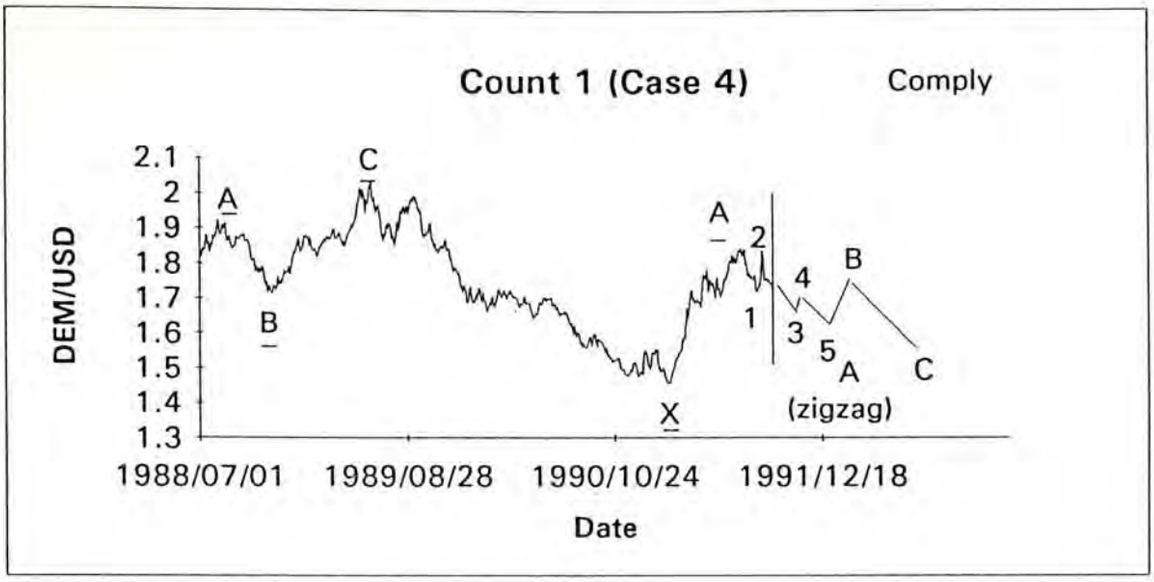
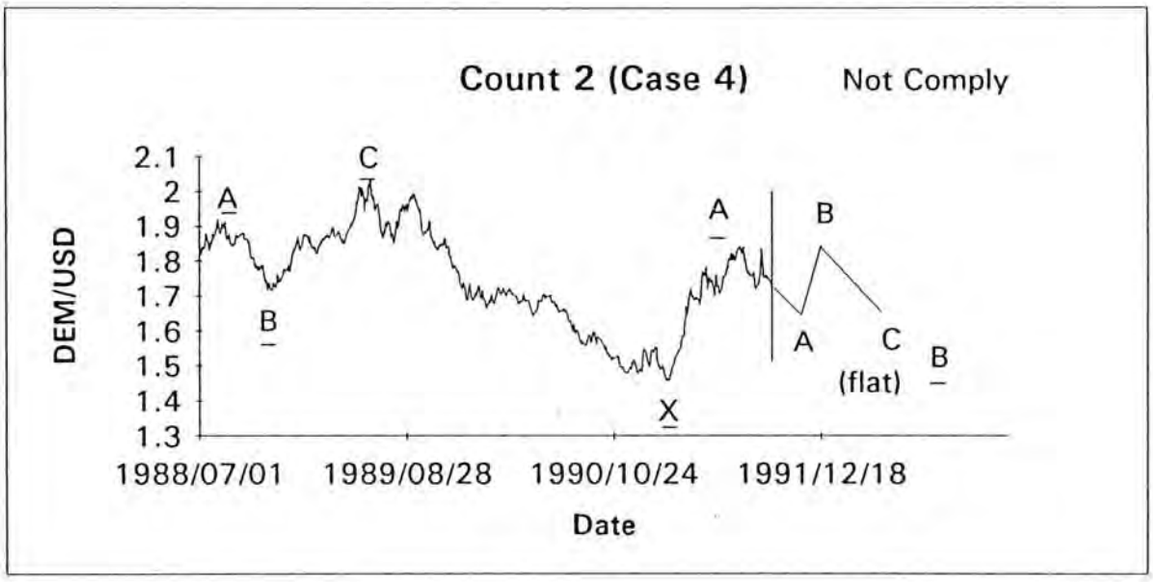


Figure 2-4 Possible Wave Counts For Trade Case 4





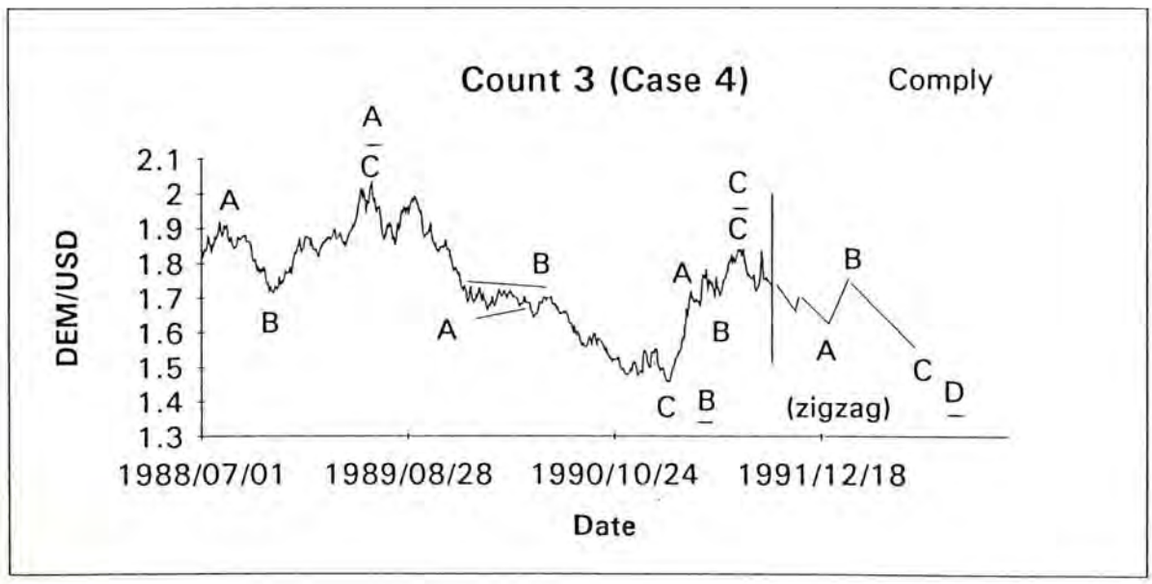


Figure 2-4 Possible Wave Counts For Trade Case 4

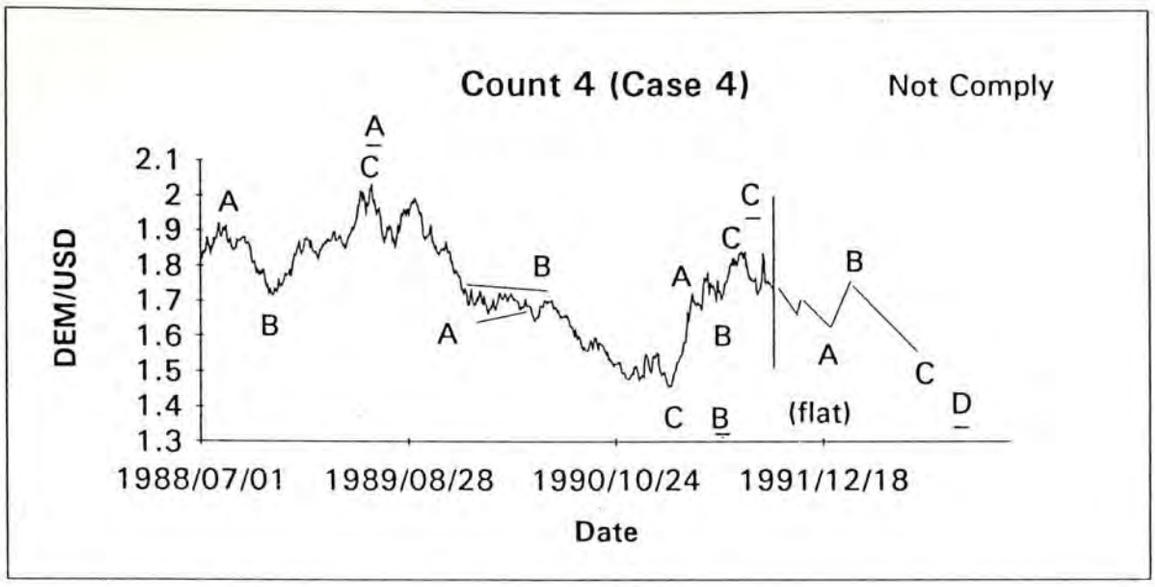
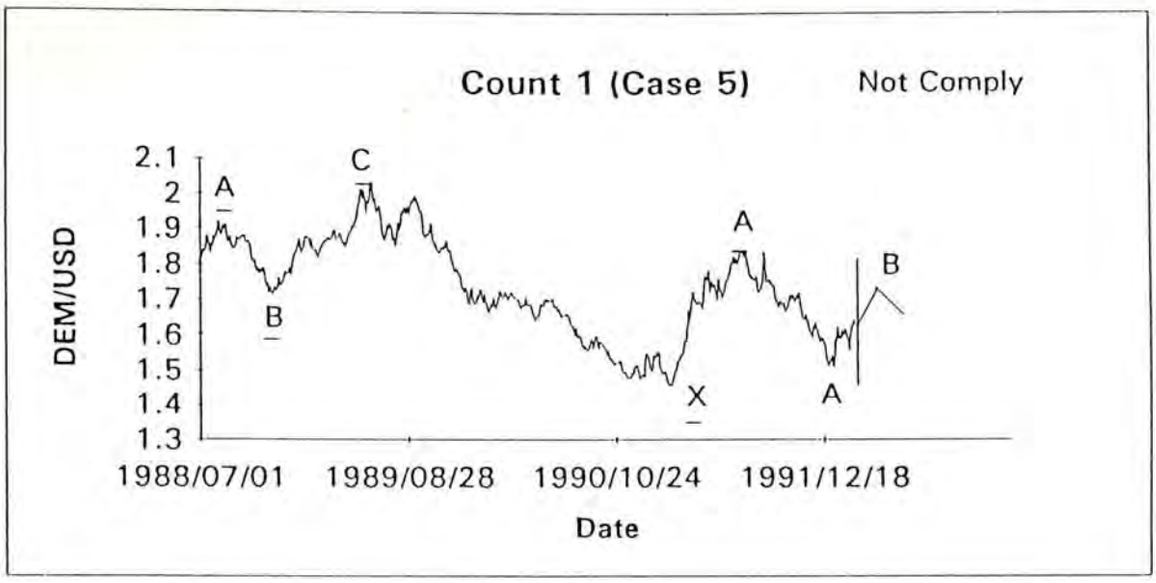
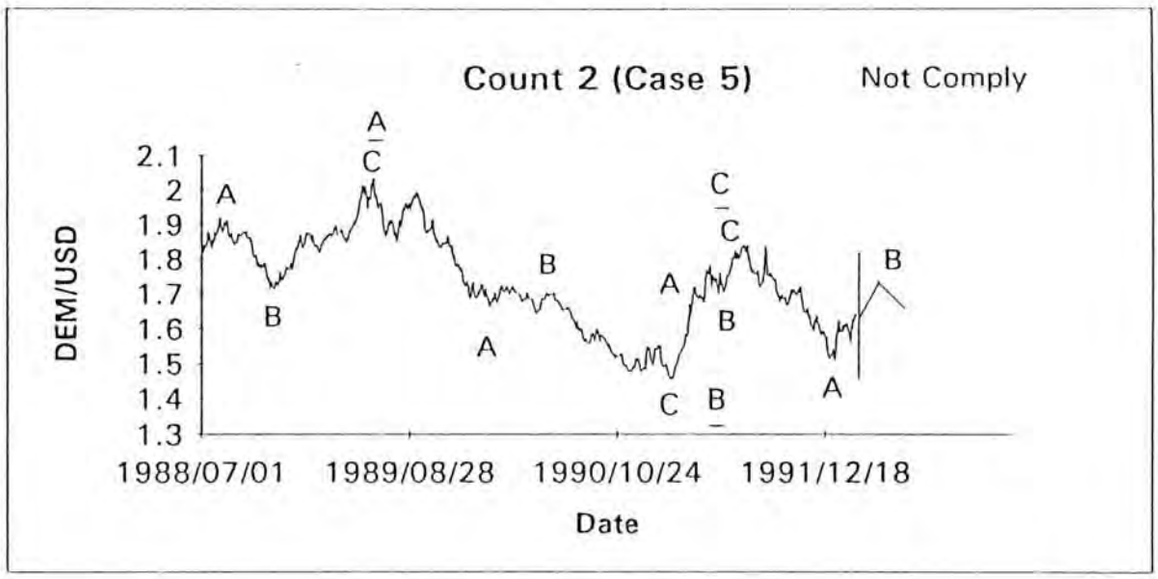


Figure 2-5 Possible Wave Counts For Trade Case 5





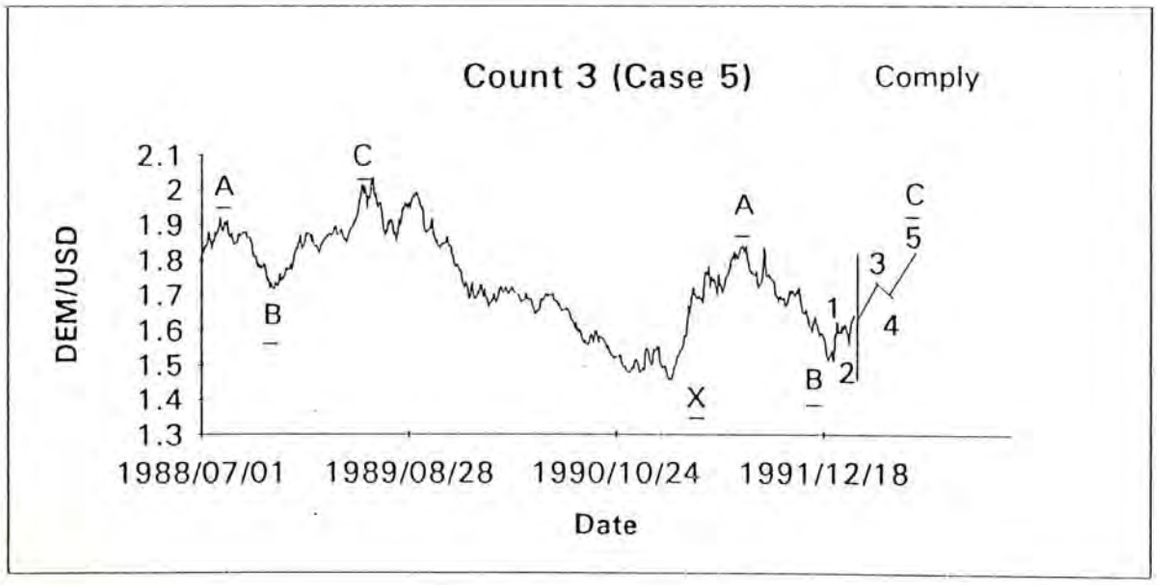
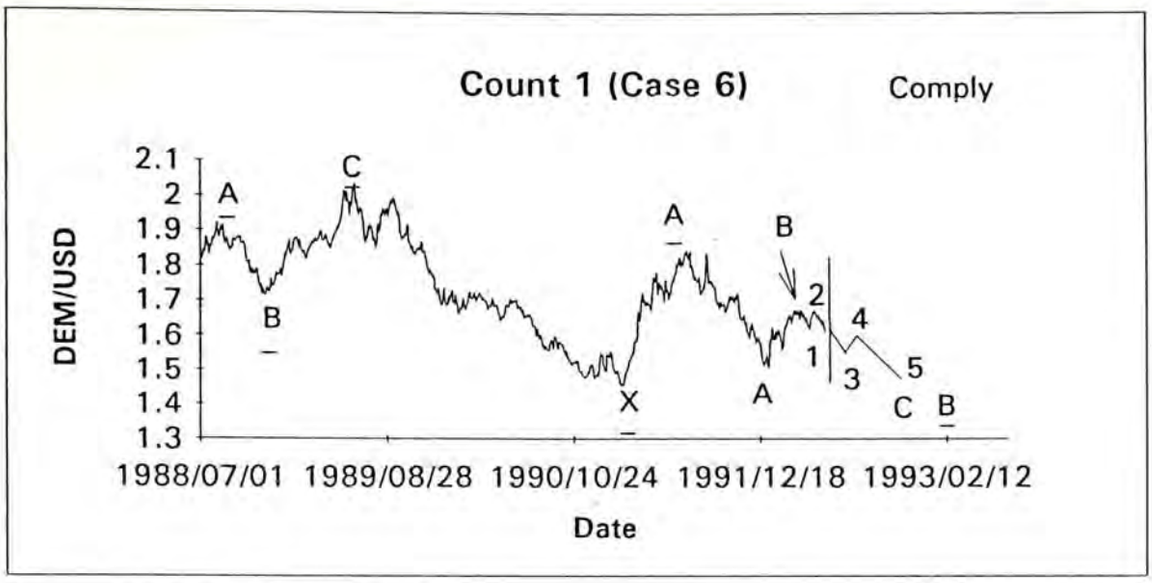
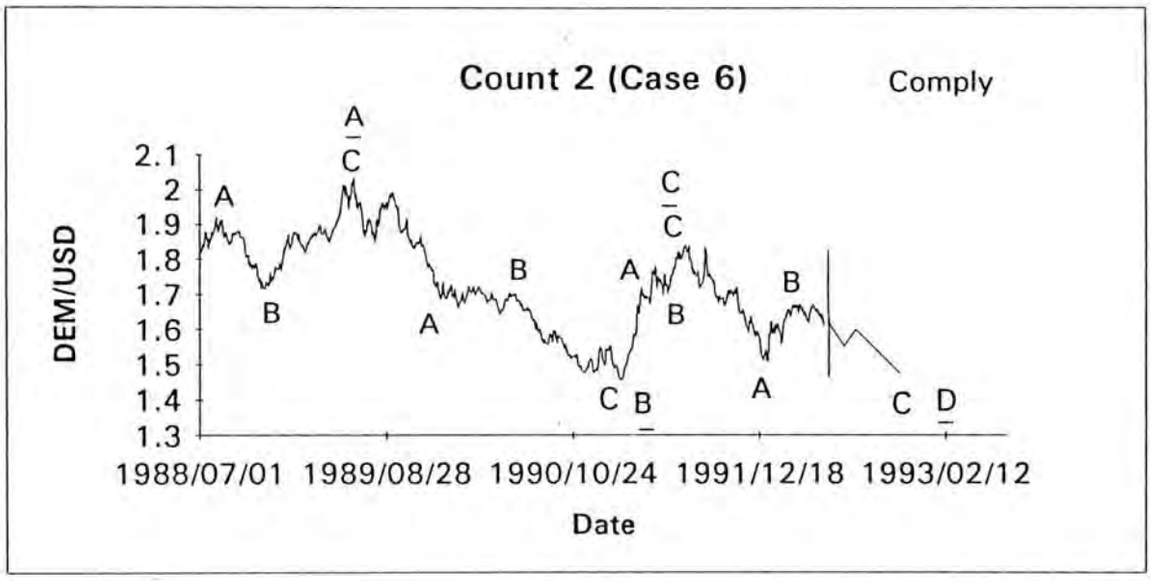


Figure 2-6 Possible Wave Counts For Trade Case 6





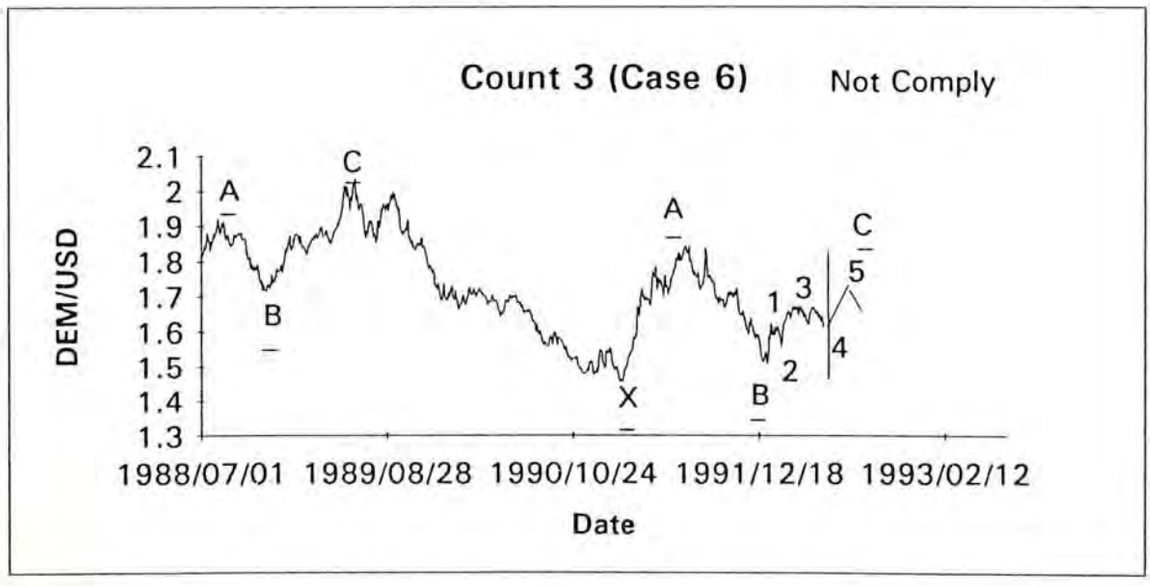


Figure 2-6 Possible Wave Counts For Trade Case 6

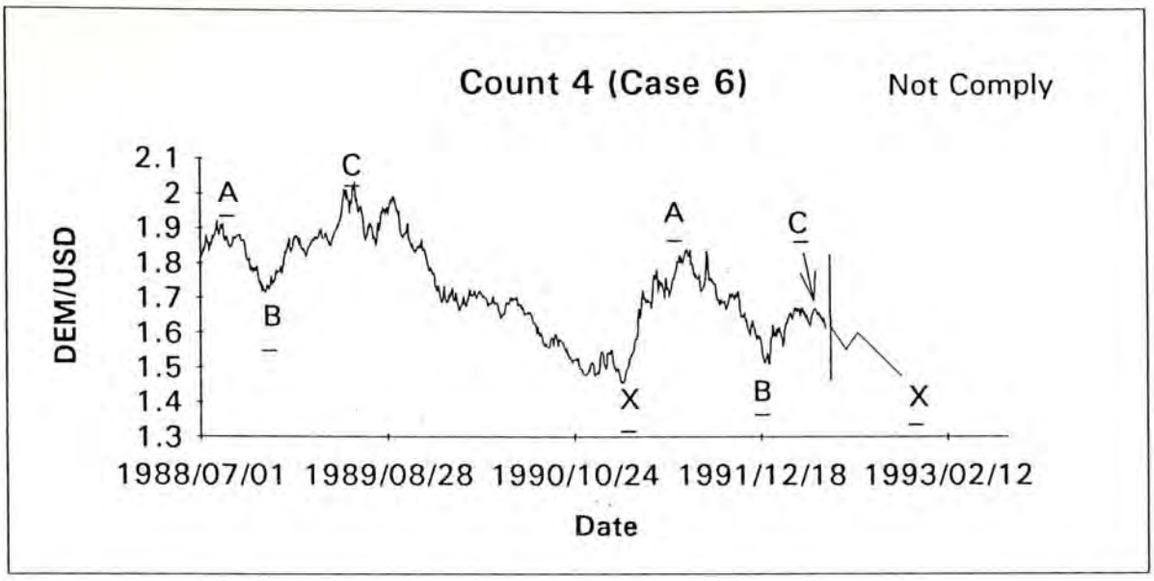
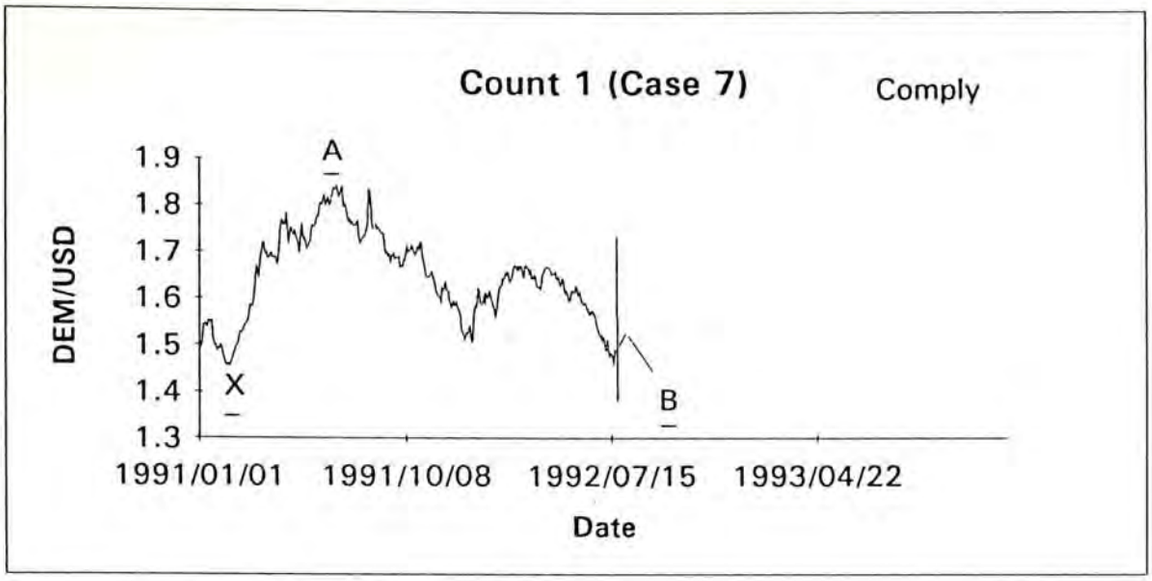
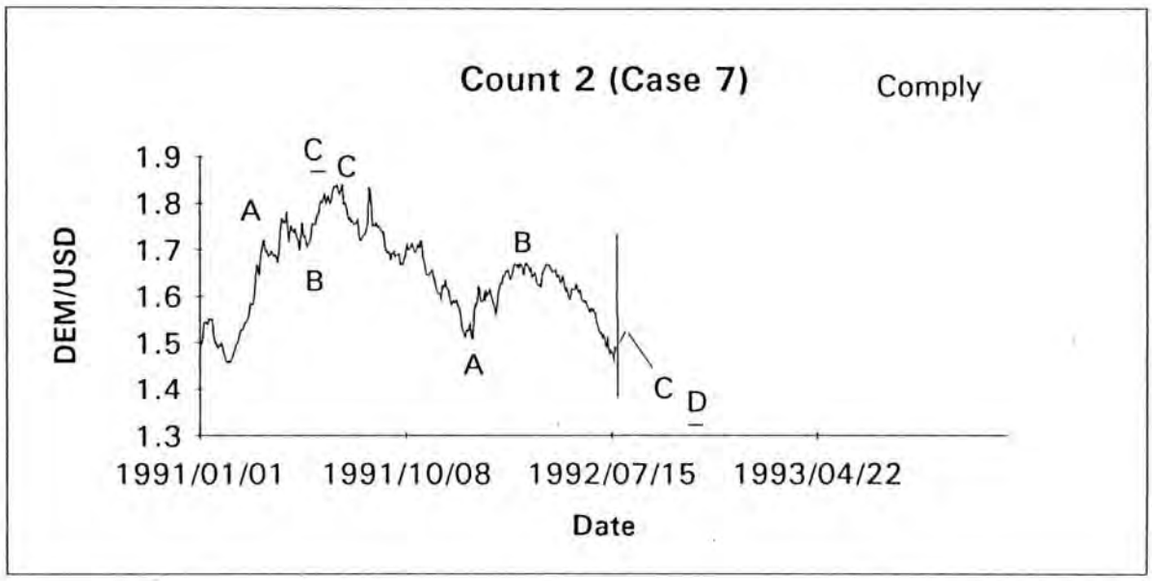


Figure 2-7 Possible Wave Counts For Trade Case 7





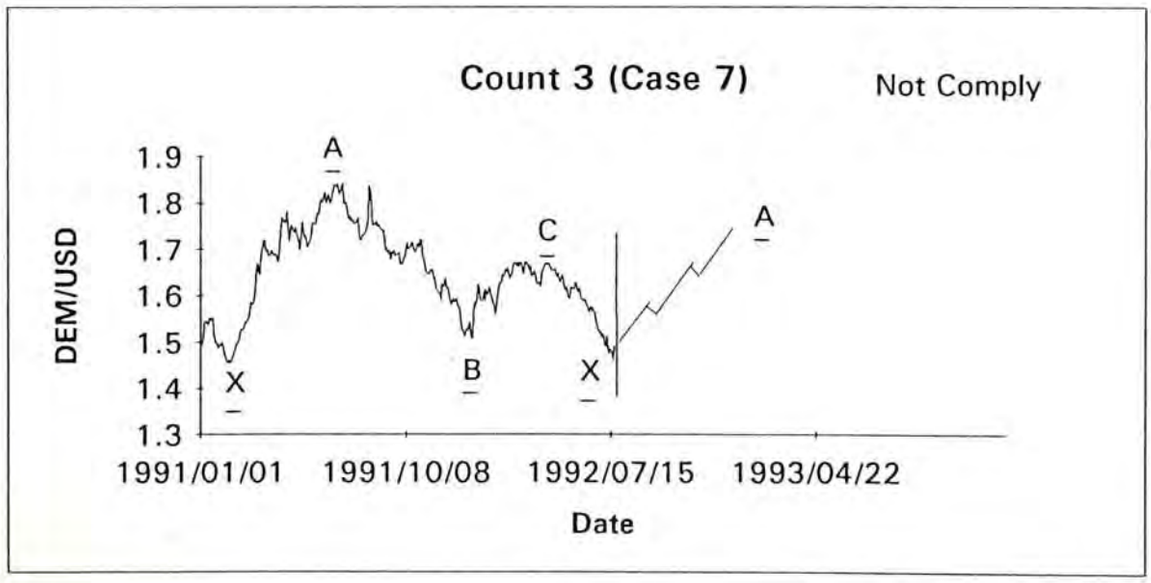
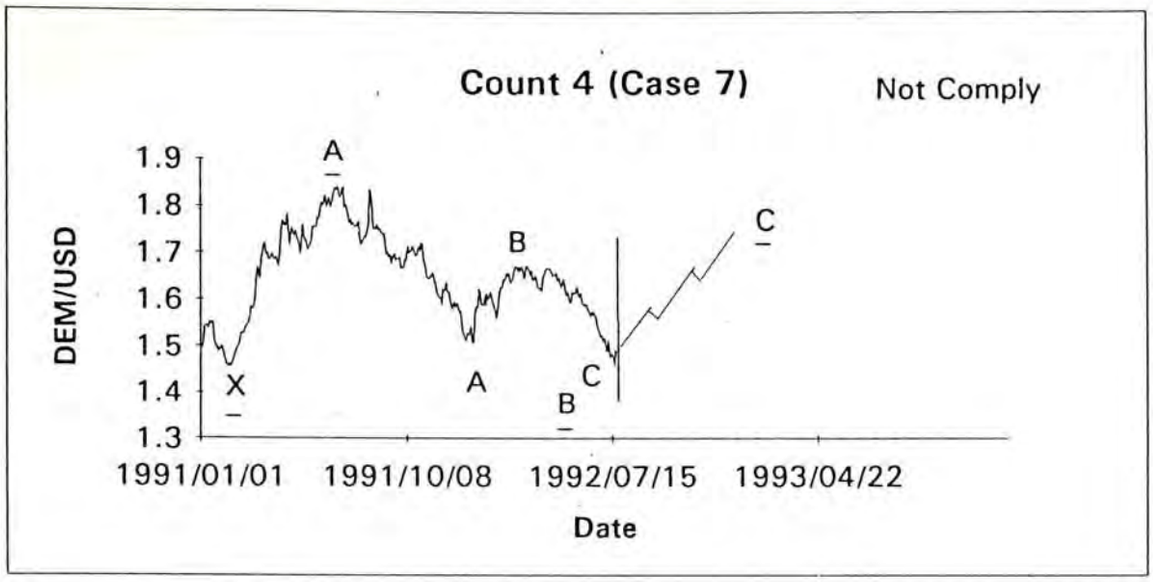


Figure 2-7 Possible Wave Counts For Trade Case 7



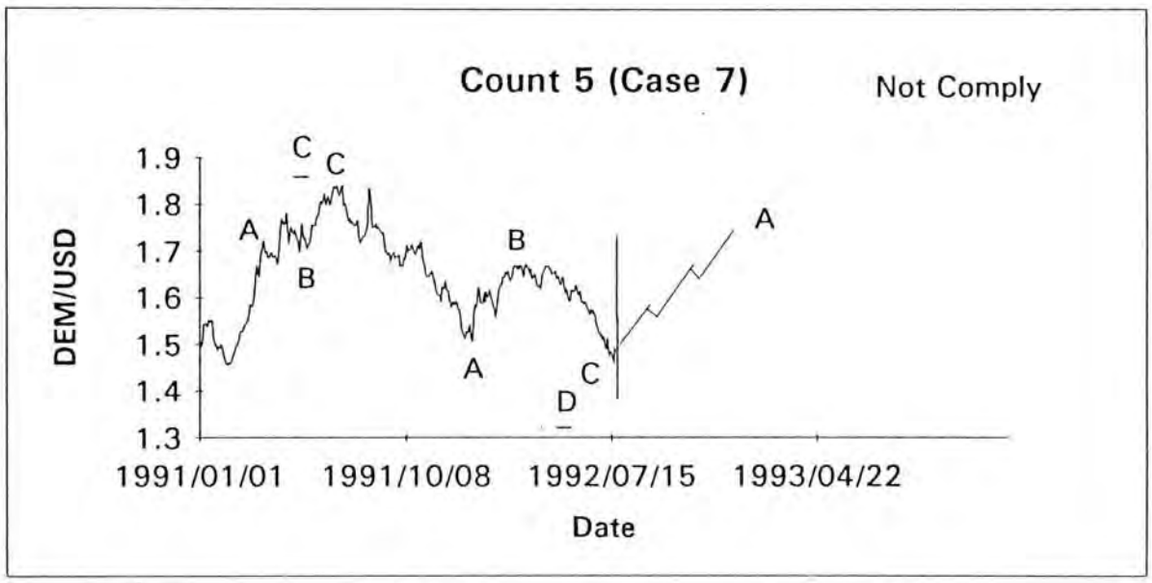
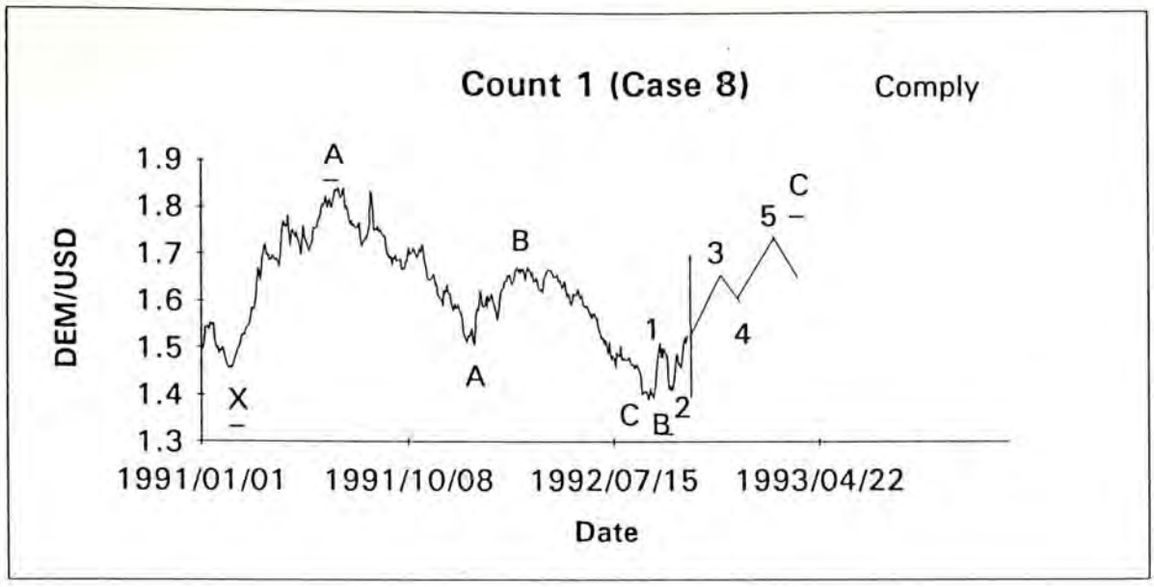
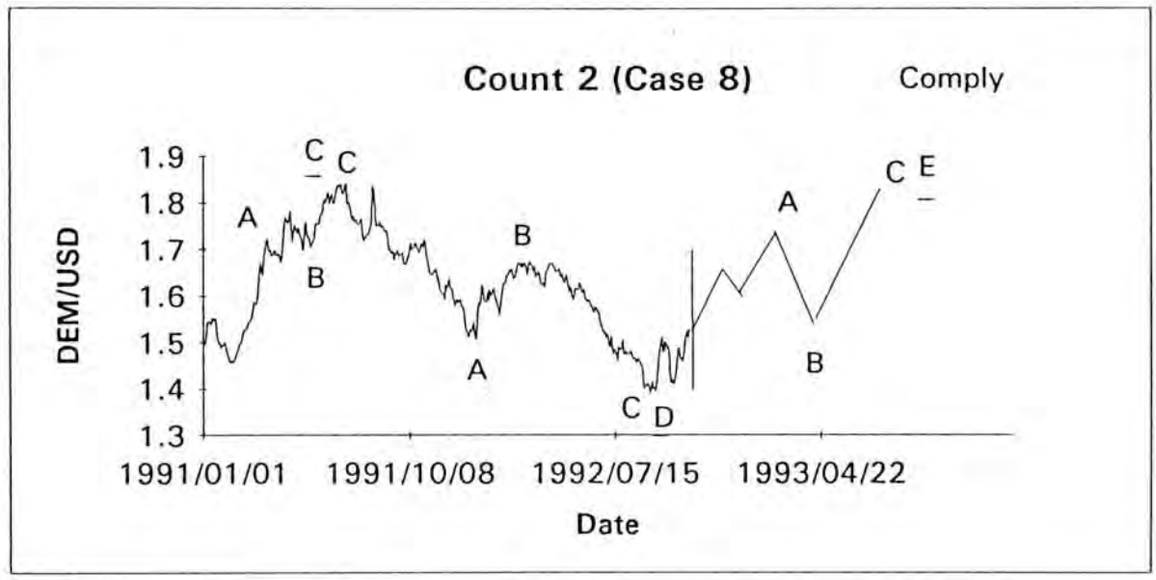


Figure 2-8 Possible Wave Counts For Trade Case 8





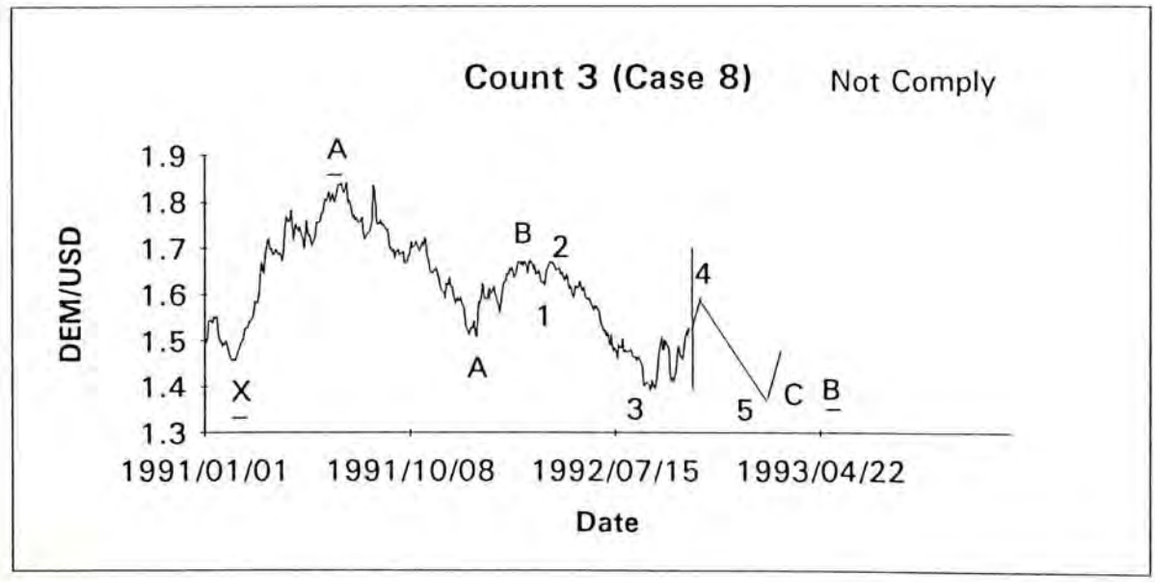
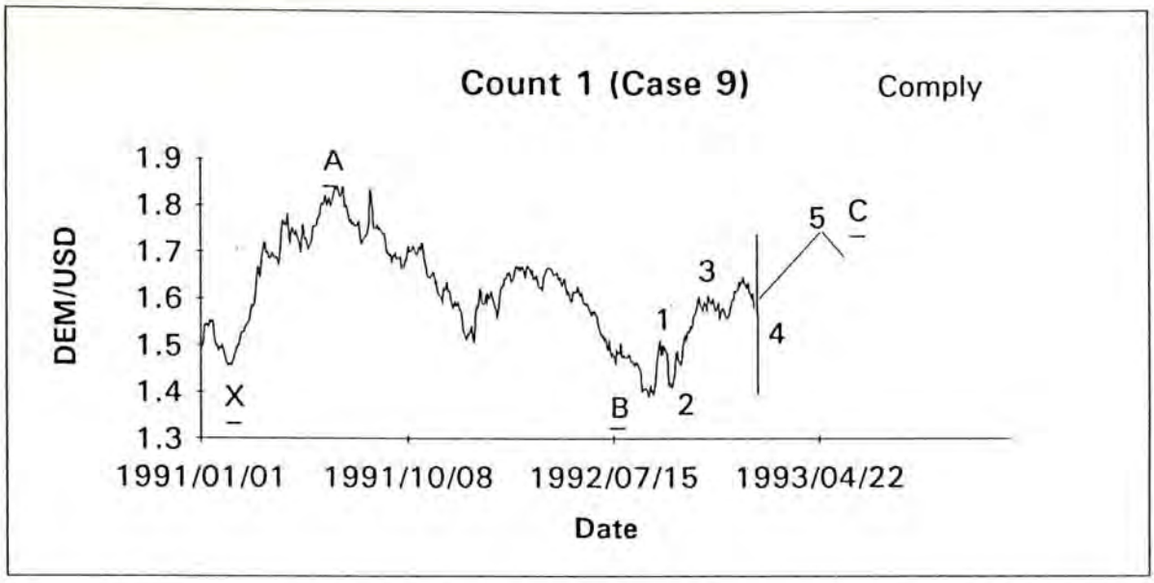
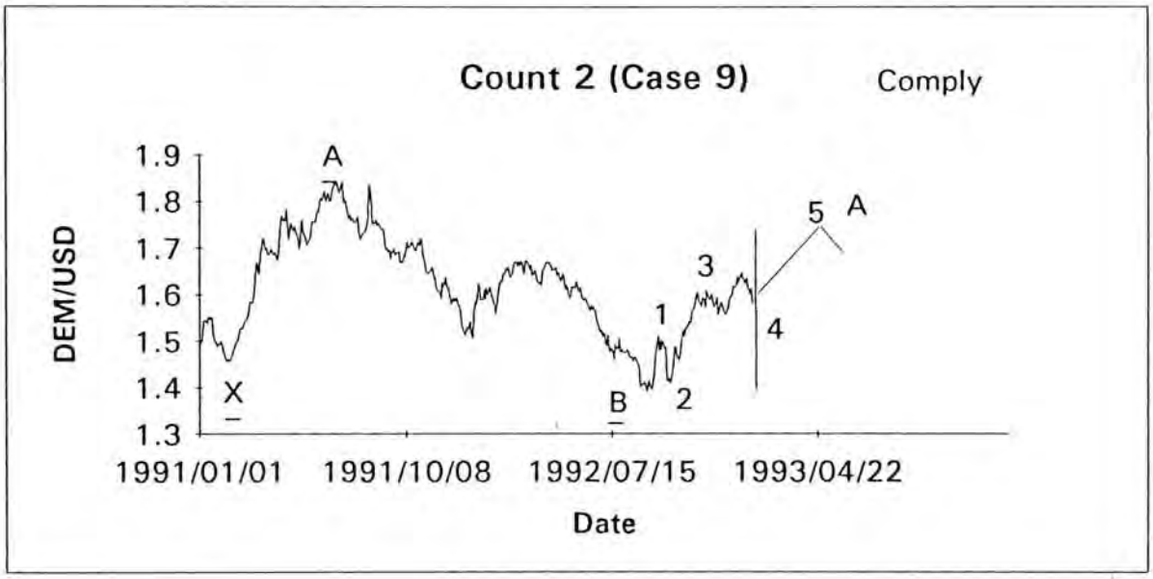


Figure 2-9 Possible Wave Counts For Trade Case 9





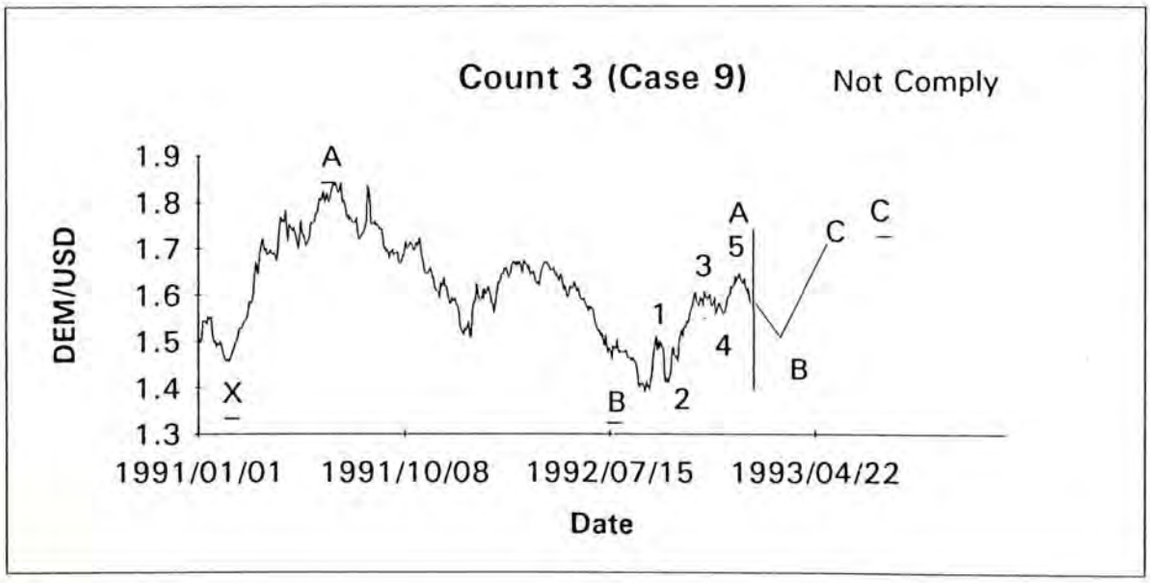
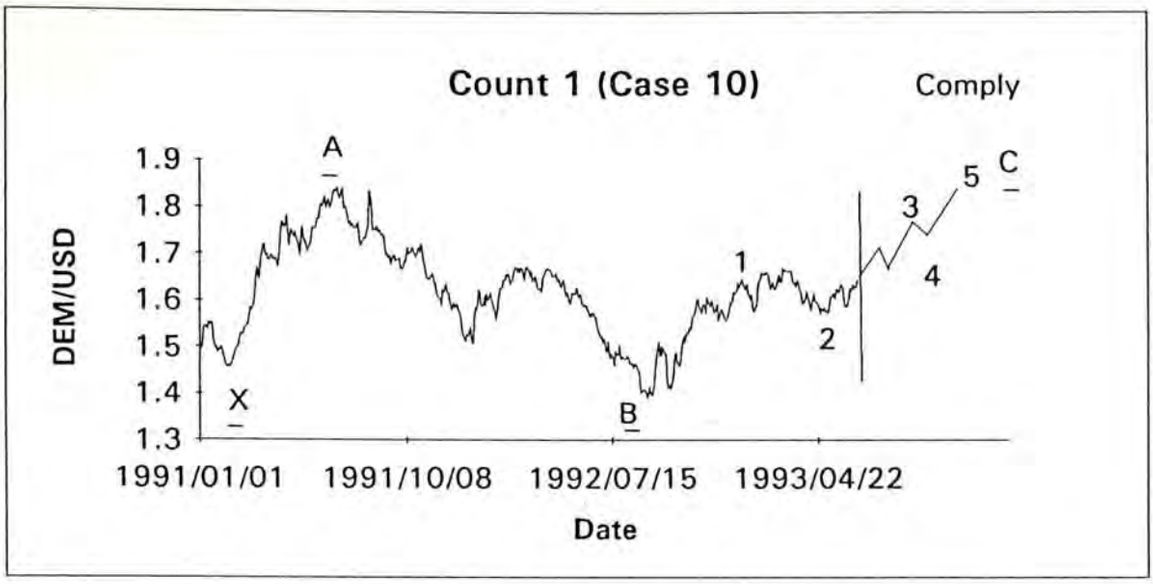
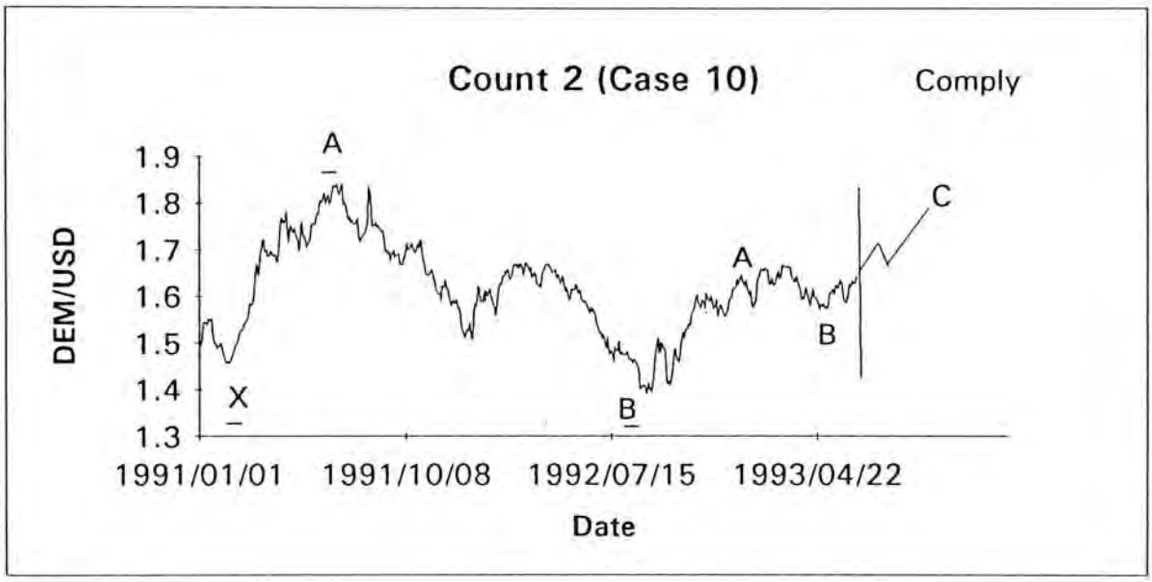


Fig. 2-10 Possible Wave Counts For Trade Case 10





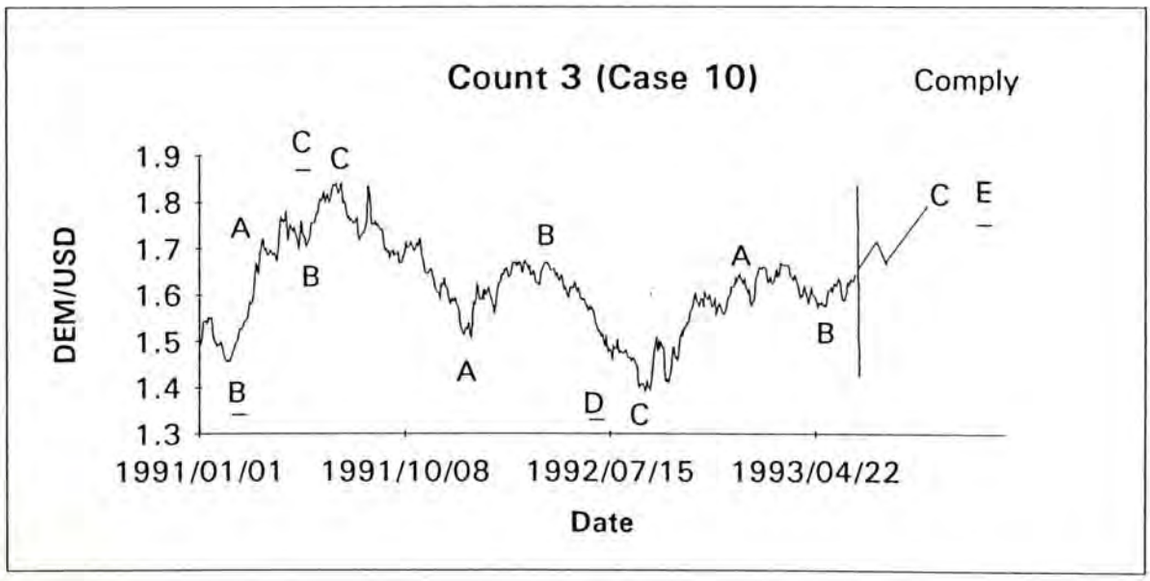


Fig. 2-10 Possible Wave Counts For Trade Case 10

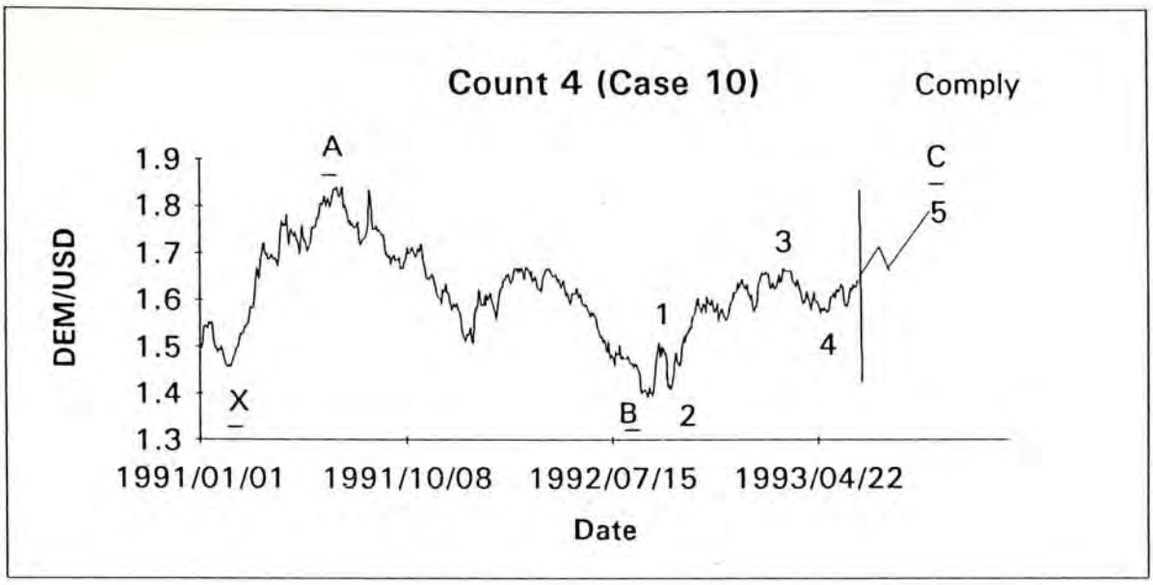
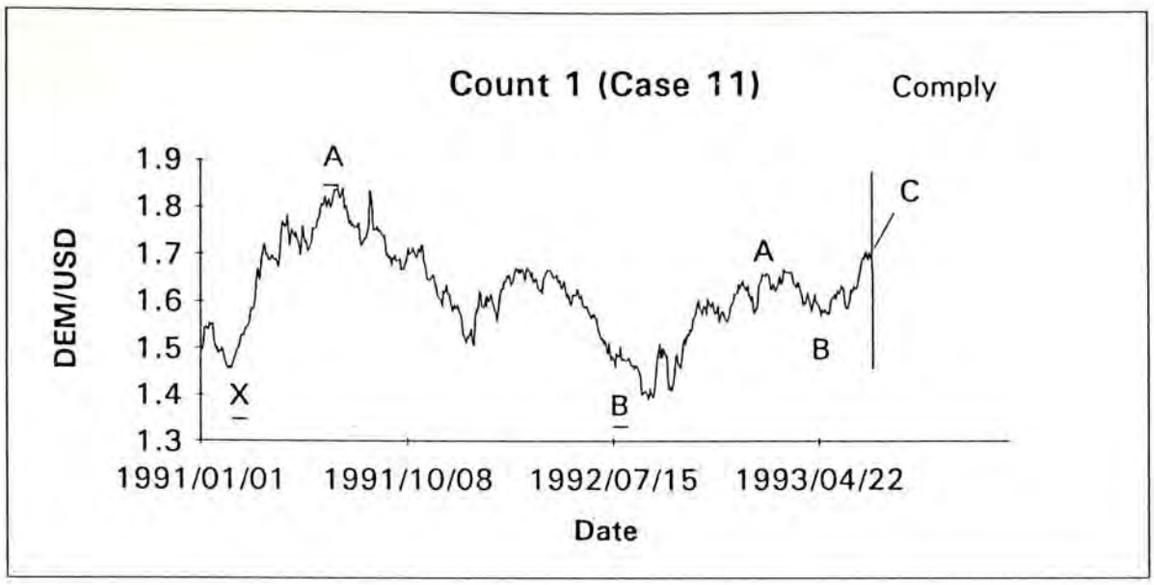
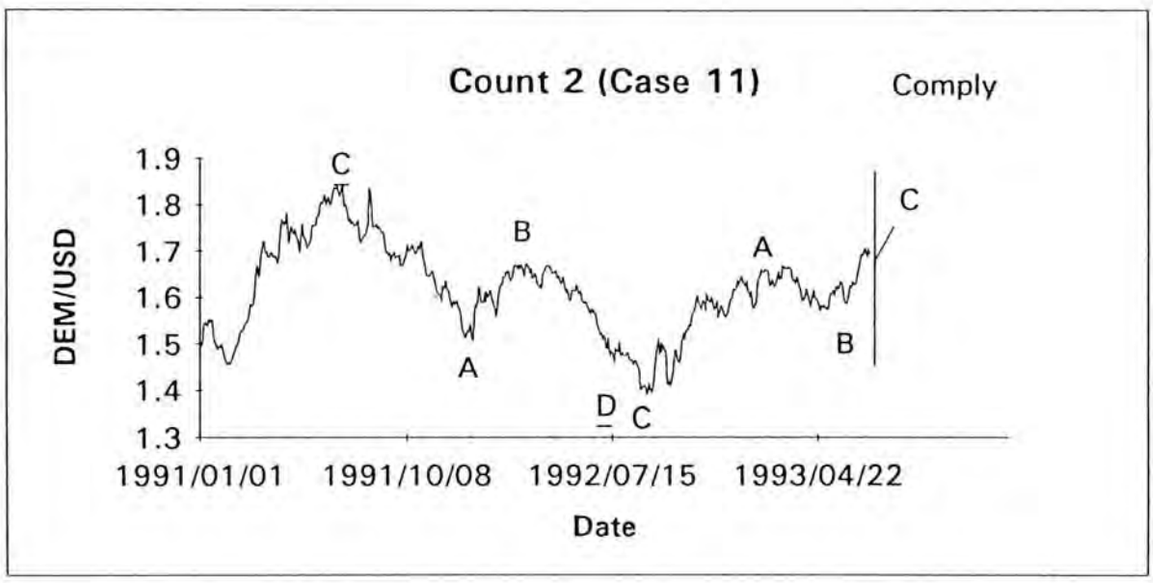


Fig. 2-11 Possible Wave Counts For Trade Case 11





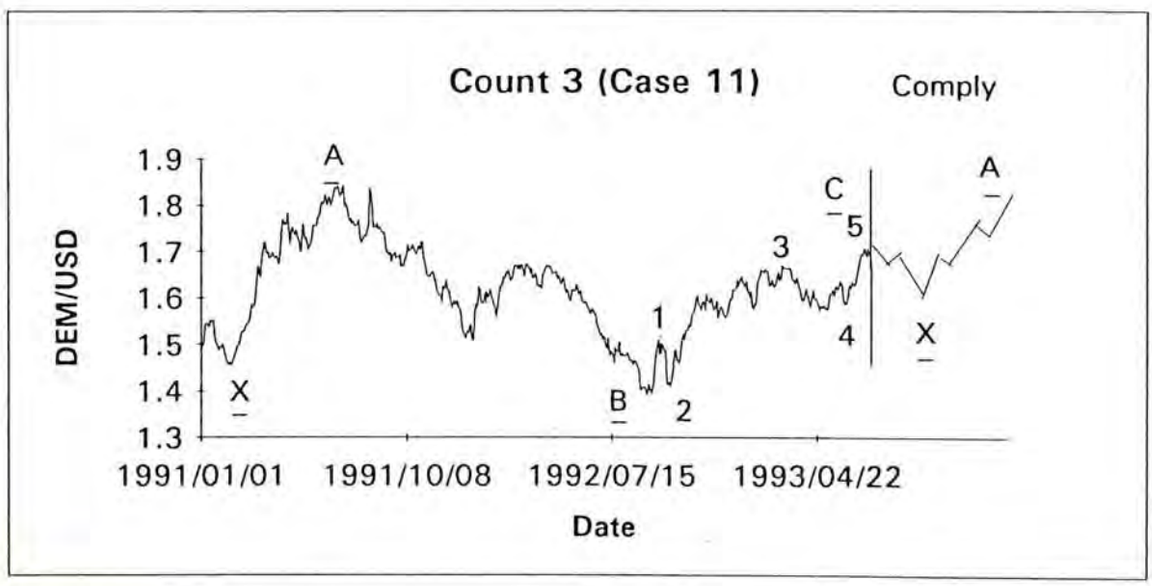
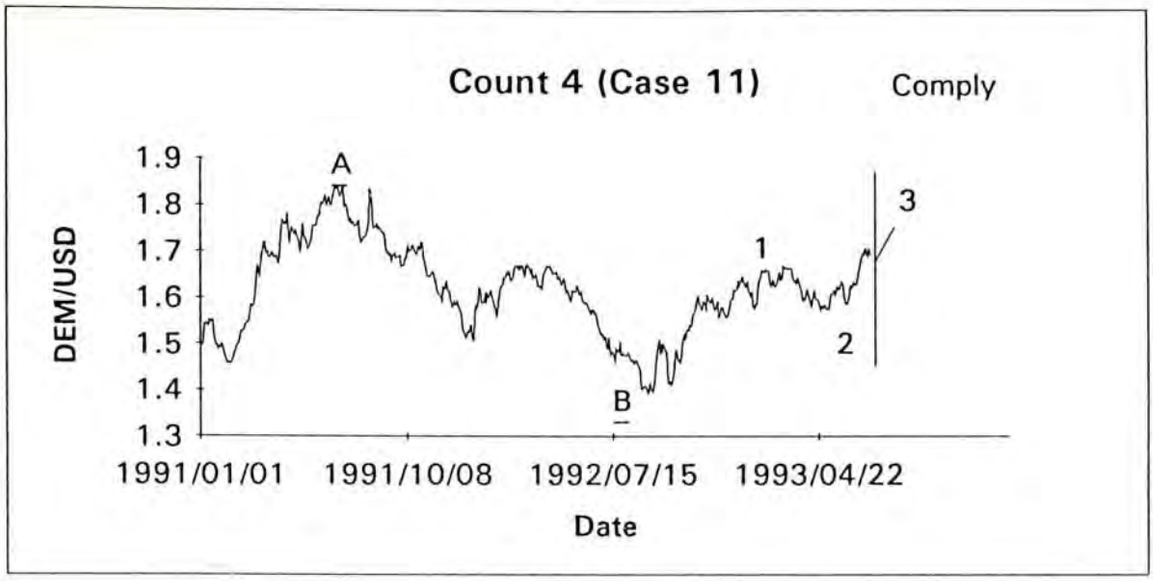


Fig. 2-11 Possible Wave Counts For Trade Case 11



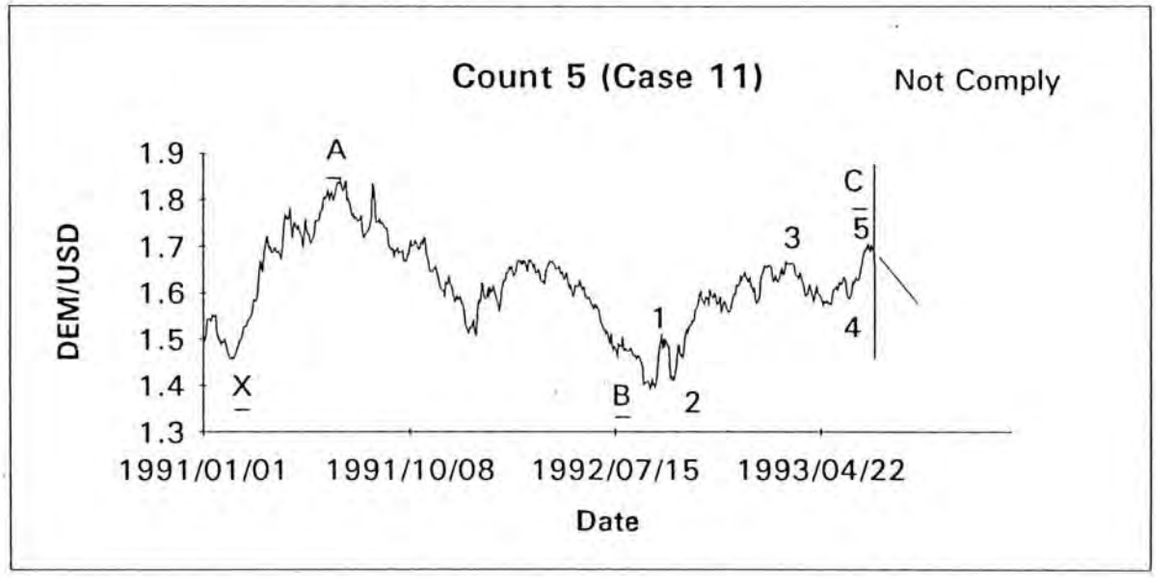
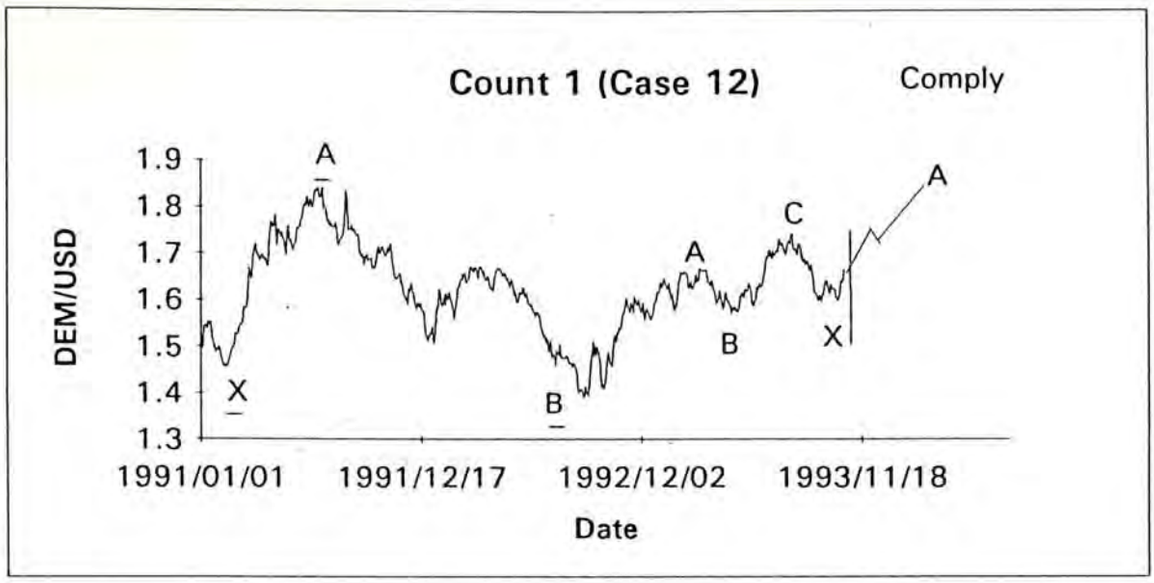
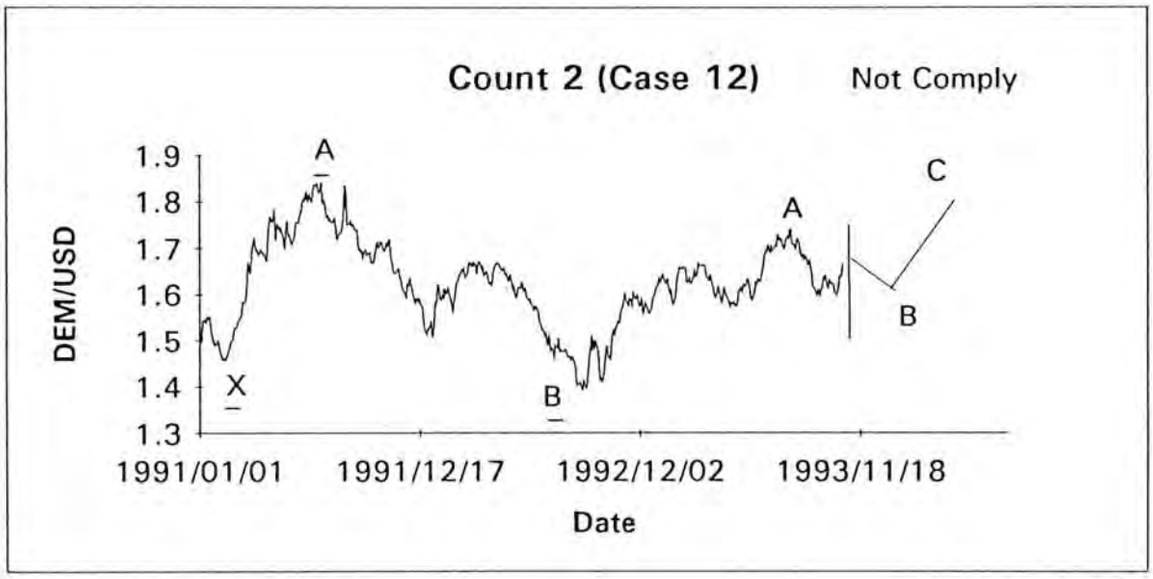


Fig. 2-12 Possible Wave Counts For Trade Case 12





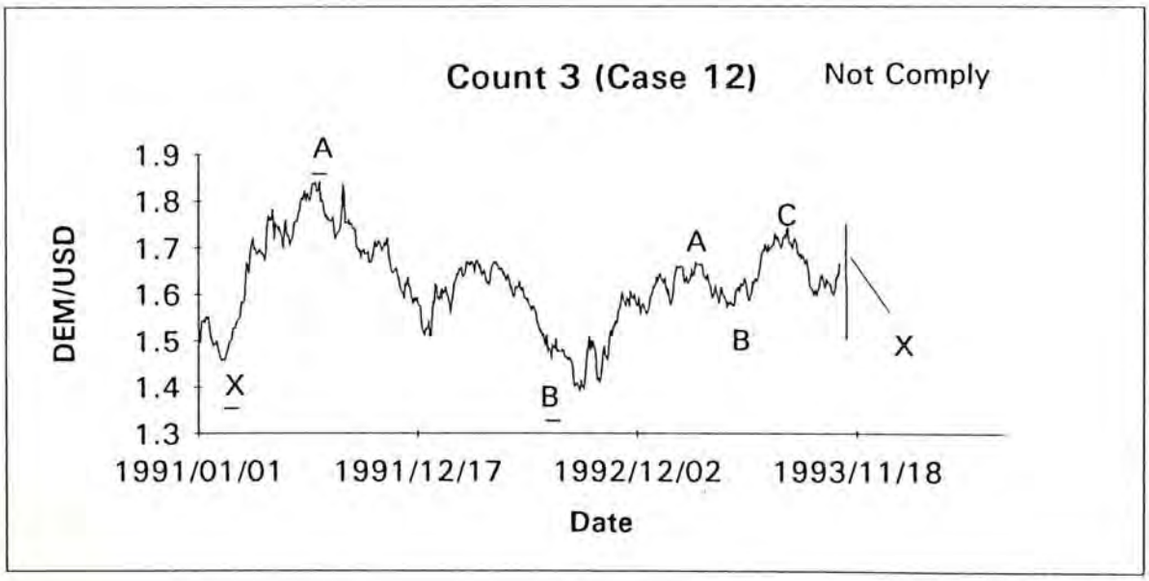
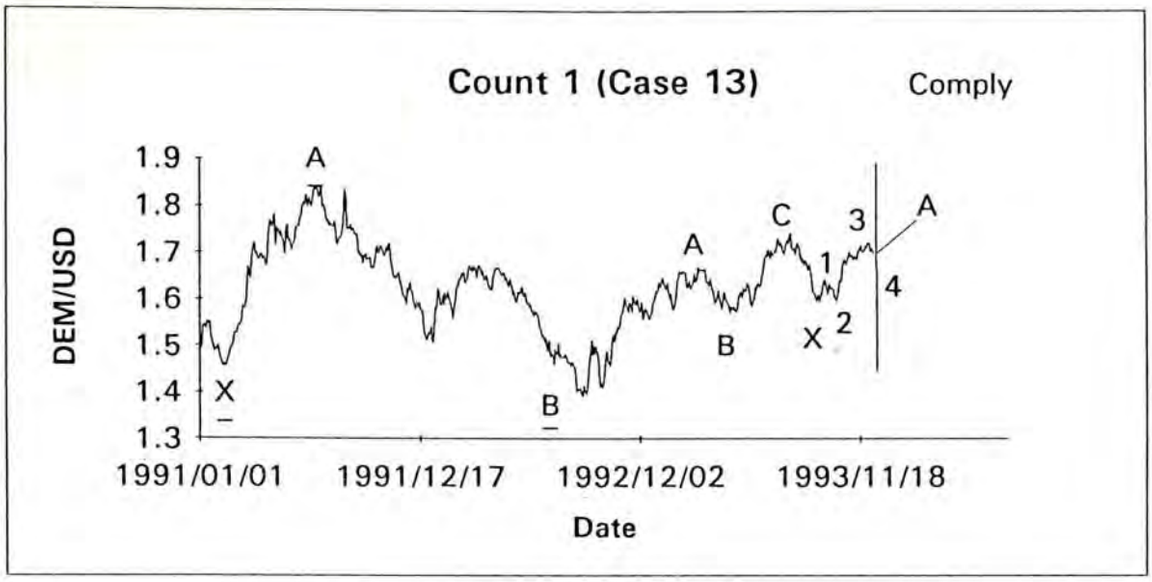
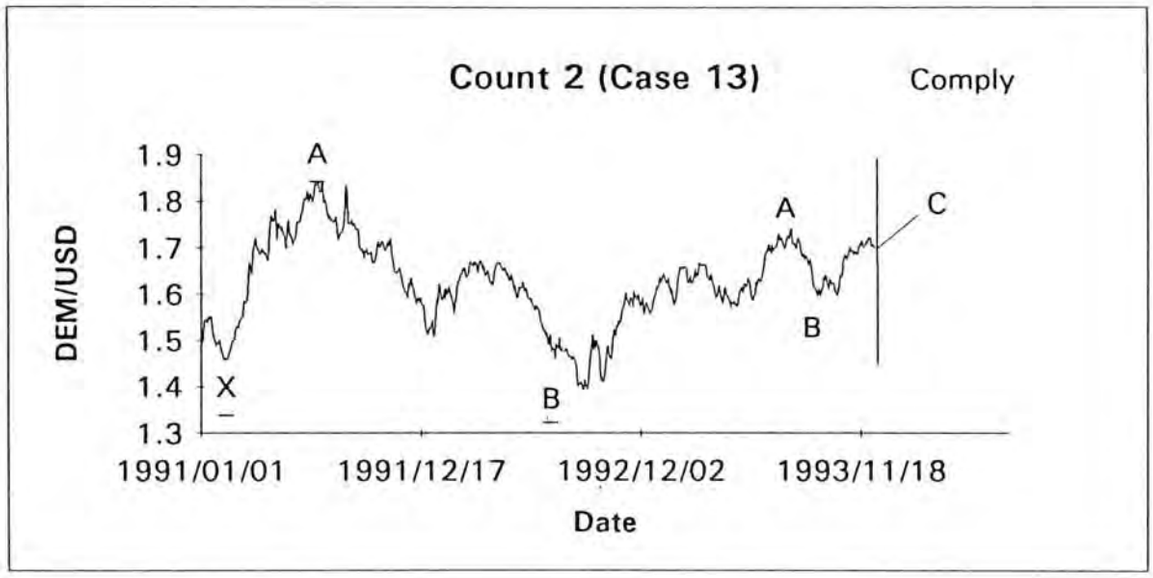


Fig. 2-13 Possible Wave Counts For Trade Case 13





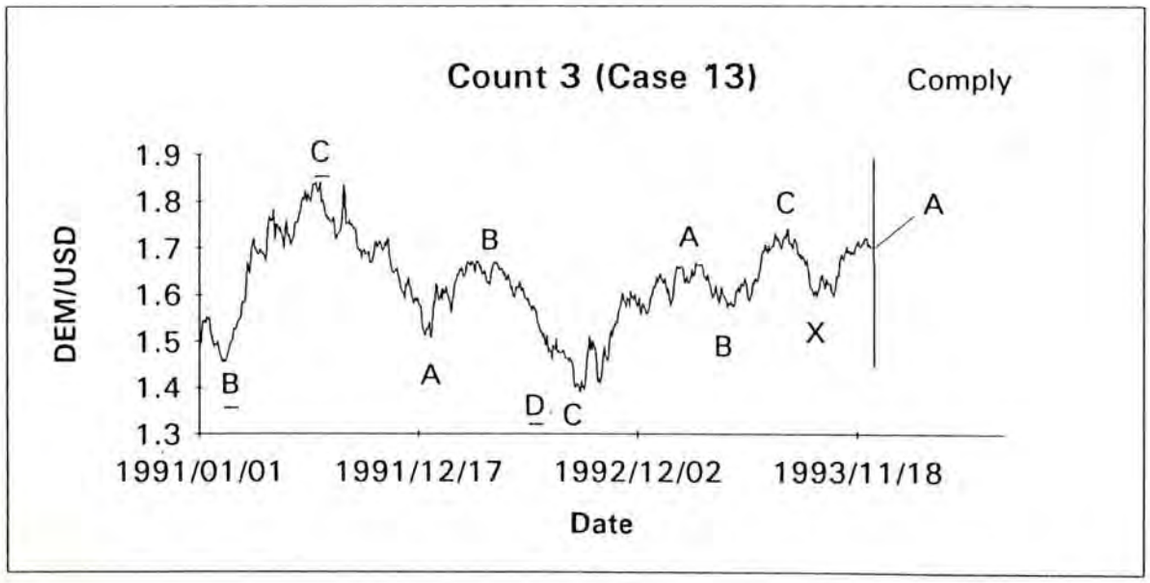


Fig. 2-13 Possible Wave Counts For Trade Case 13

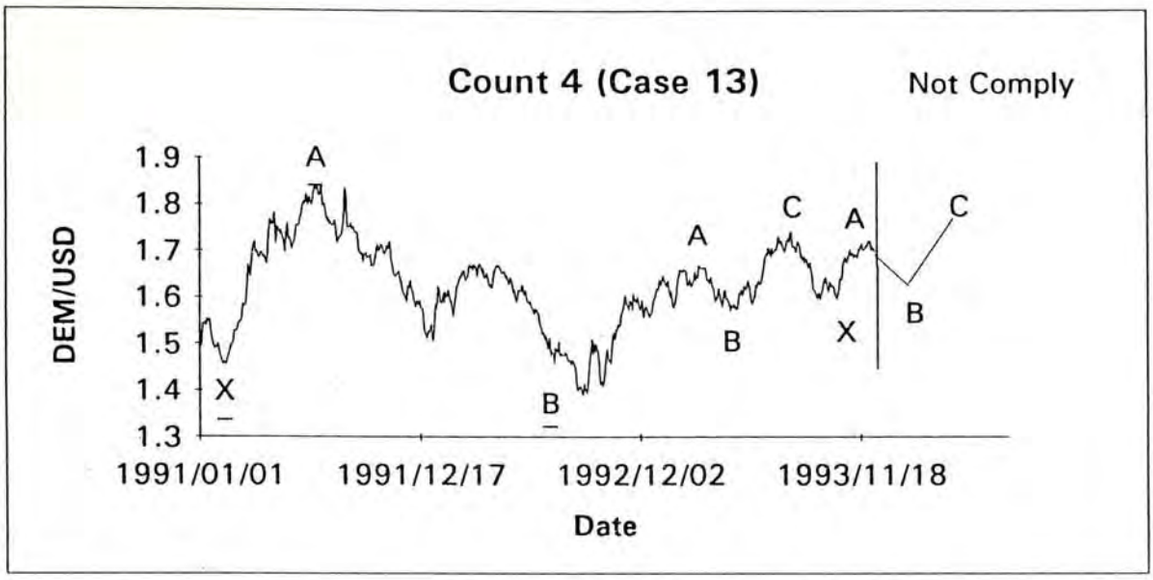


Table 2-1 Details of Trade Cases (Cases 1 - 3)

	Case 1		Case 2		Case 3	
	Trade Plan No. 1		Trade Plan No. 2		Trade Plan No. 1	
	Date	Price	Date	Price	Date	Price
Start of Apparent Wave 1	1990/4/24	1.705	1990/4/24	1.705	1990/12/10	1.4631
Start of Apparent Wave 2	1990/5/11	1.6265	1990/5/11	1.6265	1990/12/24	1.5482
Start of Apparent Wave 3	1990/6/4	1.7047	1990/6/4	1.7047	1991/1/2	1.4861
Start of Apparent Wave 4		N/A	1990/11/19	1.5386		N/A
Start of Apparent Wave 5		N/A	1990/12/24	1.5977		N/A
End of Apparent Wave 5		N/A	1991/2/11	1.4426		N/A
Length of Apparent Wave 1		0.0785		0.0785		0.0851
Length of Apparent Wave 2		0.0782		0.0782		0.0621
Length of Apparent Wave 3		N/A		0.1661		N/A
Length of Apparent Wave 4		N/A		0.0591		N/A
Length of Apparent Wave 5		N/A		0.1551		N/A
Ratio of Apparent Wave 2		0.9962		0.9962		0.7297
to Wave 1						
Apparent Wave 1 > 500 pts		Yes		Yes		Yes
Apparent Wave 2 over		Yes		Yes		Yes
Wave 1 > 0.4						
Trade Initiation	1990/7/23	1.6255	1990/8/31	1.5778	1991/1/14	1.5492
Position		Long DEM		Long DEM		Short DEM
Momentum Test Fail		No		N/A		Yes
Cut-loss point		1.7047		1.6413		1.4861
Profit-taking point		1.5777		1.5341		1.3484
Position Close	1990/8/6	1.5777	1990/10/9	1.5341	1991/1/17	1.5085
% of Favorable Counts		75%		75%		50%
No. of Contracts Traded		100		100		75
Profit/Loss in US$		302973		284858		-202353
Balance in US$		1302973		1587830		1385477

Table 2-1 Details of Trade Cases (Cases 4 - 6)

	Case 4		Case 5		Case 6	
	Trade Plan No. 1		Trade Plan No. 1		Trade Plan No. 1	
	Date	Price	Date	Price	Date	Price
Start of Apparent Wave 1	1991/7/5	1.8423	1992/1/8	1.5035	1992/3/20	1.6841
Start of Apparent Wave 2	1991/8/8	1.6998	1992/1/15	1.6340	1992/4/9	1.6139
Start of Apparent Wave 3	1991/8/19	1.8355	1992/2/10	1.5569	1992/4/20	1.6745
Start of Apparent Wave 4		N/A		N/A		N/A
Start of Apparent Wave 5		N/A		N/A		N/A
End of Apparent Wave 5		N/A		N/A		N/A
Length of Apparent Wave 1		0.1425		0.1305		0.0702
Length of Apparent Wave 2		0.1357		0.0771		0.0606
Length of Apparent Wave 3		N/A		N/A		N/A
Length of Apparent Wave 4		N/A		N/A		N/A
Length of Apparent Wave 5		N/A		N/A		N/A
Ratio of Apparent Wave 2		0.9523		0.5908		0.8632
to Wave 1						
Apparent Wave 1 > 500 pts		Yes		Yes		Yes
Apparent Wave 2 over		Yes		Yes		Yes
Wave 1 > 0.4						
Trade Initiation	1991/9/9	1.6988	1992/2/18	1.6350	1992/5/13	1.6129
Position		Long DEM		Short DEM		Long DEM
Momentum Test Fail		Yes		Yes		Yes
Cut-loss point		1.8355		1.5569		1.6745
Profit-taking point		1.6049		1.3458		1.5609
Position Close	1991/9/19	1.6889	1992/2/27	1.6351	1992/5/22	1.6163
% of Favorable Counts		50%		33%		50%
No. of Contracts Traded		75		50		75
Profit/Loss in US$		43964		306		-15777
Balance in US$		1429440		1429746		1413969

Table 2-1 Details of Trade Cases (Cases 7 - 9)

	Case 7		Case 8		Case 9	
	Trade Plan No. 2		Trade Plan No. 1		Trade Plan No. 2	
	Date	Price	Date	Price	Date	Price
Start of Apparent Wave 1	1992/3/20	1.6841	1992/9/2	1.3870	1992/9/2	1.3870
Start of Apparent Wave 2	1992/4/9	1.6139	1992/9/17	1.5300	1992/9/17	1.5300
Start of Apparent Wave 3	1992/4/20	1.6745	1992/10/5	1.3900	1992/10/5	1.3900
Start of Apparent Wave 4	1992/7/20	1.4476		N/A	1992/11/23	1.6160
Start of Apparent Wave 5	1992/7/24	1.5049		N/A	1992/12/17	1.5451
End of Apparent Wave 5	1992/9/2	1.387		N/A	1993/1/8	1.6496
Length of Apparent Wave 1		0.0702		0.1430		0.1430
Length of Apparent Wave 2		0.0606		0.1400		0.1400
Length of Apparent Wave 3		0.2269		N/A		0.2260
Length of Apparent Wave 4		0.0573		N/A		0.0709
Length of Apparent Wave 5		0.1179		N/A		0.1045
Ratio of Apparent Wave 2		0.8632		0.9790		0.9790
to Wave 1						
Apparent Wave 1 > 500 pts		Yes		Yes		Yes
Apparent Wave 2 over		Yes		Yes		Yes
Wave 1 > 0.4						
Trade Initiation	1992/7/21	1.5011	1992/10/23	1.5310	1993/1/25	1.5883
Position		Long DEM		Short DEM		Short DEM
Momentum Test Fail		N/A		Yes		N/A
Cut-loss point		1.5878		1.3900		1.5300
Profit-taking point		1.4146		1.1586		1.6628
Position Close	1992/8/24	1.4146	1992/11/12	1.5808	1993/2/5	1.6628
% of Favorable Counts		40%		67%		67%
No. of Contracts Traded		50		75		75
Profit/Loss in US$		305740		236273		336030
Balance in US$		1719710		1955982		2292012

Table 2-1 Details of Trade Cases (Case 10 - 12)

	Case 10		Case 11		Case 12	
	Trade Plan No. 1		Trade Plan No. 2		Trade Plan No. 1	
	Date	Price	Date	Price	Date	Price
Start of Apparent Wave 1	1993/4/26	1.5657	1993/4/26	1.5657	1993/9/15	1.5883
Start of Apparent Wave 2	1993/5/24	1.6423	1993/5/24	1.6423	1993/9/24	1.6562
Start of Apparent Wave 3	1993/6/2	1.5808	1993/6/2	1.5808	1993/10/12	1.5912
Start of Apparent Wave 4		N/A	1993/7/12	1.7358		N/A
Start of Apparent Wave 5		N/A	1993/7/21	1.6929		N/A
End of Apparent Wave 5		N/A	1993/8/2	1.7479		N/A
Length of Apparent Wave 1		0.0766		0.0766		0.0679
Length of Apparent Wave 2		0.0615		0.0615		0.0650
Length of Apparent Wave 3		N/A		0.1550		N/A
Length of Apparent Wave 4		N/A		0.0429		N/A
Length of Apparent Wave 5		N/A		0.0550		N/A
Ratio of Apparent Wave 2		0.8029		0.8029		0.9573
to Wave 1						
Apparent Wave 1 > 500 pts		Yes		Yes		Yes
Apparent Wave 2 over		Yes		Yes		Yes
Wave 1 > 0.4						
Trade Initiation	1993/6/15	1.6433	1993/7/2	1.6853	1993/10/21	1.6572
Position		Short DEM		Short DEM		Short DEM
Momentum Test Fail		No		N/A		No
Cut-loss point		1.5808		1.6423		1.5912
Profit-taking point		1.4569		1.7407		1.4813
Position Close	1993/6/29	1.7047	1993/7/29	1.7407	1993/11/2	1.7011
% of Favorable Counts		100%		75%		33%
No. of Contracts Traded		100		100		50
Profit/Loss in US$		360181		318263		129034
Balance in US$		2652193		2970455		3099490

Table 2-1 Details of Trade Cases (Cases 13)

	Case 13	
	Trade Plan No. 2	
	Date	Price
Start of Apparent Wave 1	1993/9/15	1.5883
Start of Apparent Wave 2	1993/9/24	1.6562
Start of Apparent Wave 3	1993/10/12	1.5912
Start of Apparent Wave 4	1993/12/3	1.7283
Start of Apparent Wave 5	1993/12/23	1.6923
End of Apparent Wave 5	1994/2/8	1.7676
Length of Apparent Wave 1		0.0679
Length of Apparent Wave 2		0.0650
Length of Apparent Wave 3		0.1371
Length of Apparent Wave 4		0.0360
Length of Apparent Wave 5		0.0753
Ratio of Apparent Wave 2		0.9573
to Wave 1		
Apparent Wave 1 > 500 pts		Yes
Apparent Wave 2 over		Yes
Wave 1 > 0.4		
Trade Initiation	1993/12/10	1.6960
Position		Short DEM
Momentum Test Fail		N/A
Cut-loss point		1.6562
Profit-taking point		1.7457
Position Close	1994/1/6	1.7457
% of Favorable Counts		75%
No. of Contracts Traded		100
Profit/Loss in US$		284700
Balance in US$		3384189

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