TECHNICAL ANALYSIS-BASED FUTURES TRADING SYSTEM

by

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B.B.A., Ryerson Polytechnic University, 1996

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF BUSINESS ADMINISTRATION

in the Faculty
of
Business Administration

SIMON FRASER UNIVERSITY

August 1997

APPROVAL

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ABSTRACT

The present thesis attempts to design a technical analysis-based complete trading system which will generate capital gains that are visibly superior to the results that can be achieved through a more passive buy-and-hold strategy. According to the Efficient Market Hypothesis, given the same level of risk, no strategy should be superior - or inferior - to the buy-and-hold approach. The model's performance is tested on 14 years of weekly data, and 6 years of daily data on the Light Sweet Crude futures; 2 years of daily data for the Heating Oil futures; and, finally, on 2 years of daily data for each of the S&P 500 and the U.S. T-Bond futures. The results are found to be statistically superior - under a 5% confidence interval - with respect to the buy-and-hold strategy.

ACKNOWLEDGEMENT

The author is grateful to Dr. John Heaney for his patient assistance and guidance on this thesis. Thanks are also extended to Dr. Geoffrey Poitras, for his helpful comments.

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I. PURPOSE AND OVERALL GOALS OF THIS THESIS

While it is true that the early empirical analysis in the area of finance suggested that markets are fully efficient - thus making all market-timing attempts an exercise in futility - cracks have meanwhile developed in the initially solid body of theory related to the topic of market efficiency.

In the recent years, scores of academics thoroughly documented many instances during which the behavior of security markets takes on somewhat-predictable price patterns. These findings are extremely important, because they offer to the investment community unique and profitable trading opportunities, that were previously un-heard-of under the initial assumption of market efficiency.

The present thesis will use a brief description of the Efficient Market Hypothesis as a starting point from which a literature survey of the major already-known market anomalies can be successfully built upon. The documented existence of the January, Monthly, Weekly, and Daily Effects permits the investor to make educated guesses regarding the most appropriate points in time to execute a potentially profitable financial transaction. However, it is well-known fact that the above-mentioned market anomalies usually result in capital gains that are rather small, especially on an after-commission basis.

For the above reasons, the present thesis attempts to design a technical analysis-based complete trading system which will generate capital gains that are visibly superior to the results that can be typically achieved through a more passive buy-and-hold strategy.

II. THE EFFICIENT MARKET HYPOTHESIS

Early empirical analysis in the area of finance suggested that markets are efficient, a concept that has been crystallized into a body of theory known as The Efficient Market Hypothesis. According to Eugene Fama (1965), an efficient capital market is a market that is efficient in processing information. As security prices follow a random walk, it should be impossible to predict changes in stock prices based on the securities' past price behavior. In addition to this, being able to accurately predict the stocks' future returns based on publicly available information should prove an equally unrealizable proposition.

In his 1965 study, Fama investigated whether there was any serial correlation in the day-to-day price changes of the 30 stocks composing the DJIA for the period 1957-1962. Although he found statistically significant positive serial correlation, the paper's conclusions pointed to the fact that the correlations were too small to be of any economic significance. In the light of Fama's results, investors were advised to refrain from trying to time the market: instead, a passive, buy-and-hold strategy should not only assure gains, but secure the absolute highest gains one could ever achieve in the stock market.

III. LITERATURE SURVEY SUBSTANTIATING SEVERAL EXAMPLES OF ALREADY WELL-DOCUMENTED MARKET ANOMALIES

Many of the academics who tried to disprove The Efficient Market Hypothesis concentrated their research efforts on finding instances in which, time after time again, one could - albeit over a brief period of time - predict with a high degree of accuracy the direction of stock indices. Several such discovered anomalies were the fact that firms with low Price-Earnings ratios, small firms, firms that pay no dividends, and firms that have lost much of their value in the past, all earn returns that are higher than those predicted by the Capital Asset Pricing Model (i.e. This model states that, in equilibrium, the market portfolio is the unique Mean-Variance efficient tangency portfolio, and it consequently recommends a passive strategy as being the most potentially profitable investment approach.)

An even more intriguing anomaly is the observation that became known as "The January Effect" (i.e. or "Turn-of-the-Year Effect"). This market anomaly refers to the phenomenon that small stocks have unusually high returns during the period beginning on the last trading day of December and continuing through January, with the effect becoming progressively less pronounced as the month wears on. Michael Rozeff and William Kinney (1976) found seasonal patterns in an equally-weighted index of NYSE prices over the period 1904-1974. The average monthly return in January was an impressive 3.48%, while other months averaged only about 0.42%. Moreover,

more than one-third of the annual returns occurred in January alone. However, when a similar study was conducted by Josef Lakonishok and Seymour Smidt (1986) on a stock index that is composed of only large firms - i.e. the Dow Jones Industrial Average (i.e. DJIA) - Rozeff and Kinney's priorly documented high returns in January were not observed anymore: high-capitalization (i.e. large) stocks do not have higher returns in January than in other months. Consequently, finding a January effect only in an equal-weighted index suggested that this market anomaly is primarily a small firm phenomenon, in perfect agreement with the conclusion originally reached by Rolf Banz (1981).

As an immediate extension of the above idea, the research conducted by Marc Reinganum (1983) concluded that the January returns were significantly higher for small firms whose prices had declined during the previous year. Reinganum attempted to link The January Effect to tax-loss selling: he reasoned that the prices of firms - which have previously experienced a price decrease - are prone to suffer further declines in the latter months of the year, as owners sell off the shares, in an attempt to realize capital losses. After the arrival of the New Year, however, prices are predisposed to bounce up again, in the absence of further selling pressure.

Reinganum's findings were further reinforced by Jay Ritter (1988), who used the buy/sell ratio of individual investors at Merrill Lynch in order to conclude that: small stocks, taken as a group, display a "Turn-of-the-Year Effect"; small stocks that are good candidates for

tax-loss selling experience the strongest "January Effect"; and the fact that this particular market anomaly is most visible following bear markets.

Jay Ritter and Navin Chopra (1989) demonstrated that statistical inferences about the risk-return relationship are heavily dependent upon whether equally weighted or value-weighted portfolio returns are used in the estimation. While using value weighted - rather than equally weighted - portfolio returns, Ritter and Chopra found that, for the 1935-1986 period, the market's risk-return relation does not exhibit a January seasonal. In addition to this, for small firms, a positively sloped risk-return relation was discovered in both bullish and bearish markets. In January, small firms outperform the market, irrespective of whether there is a positive or a negative return on the value-weighted market portfolio. Moreover - during the course of January - High-Beta small firms were observed to have greater returns than low-Beta small firms, even when the overall market return was negative.

An equally interesting market anomaly is the amply documented "Monthly Effect" in stock returns. Using value-weighted and equally-weighted daily stock index returns for the period 1969-1986, Joseph Ogden (1990) tested the hypothesis that the monthly and January effects are due - at least in part - to a standardization in the payments system in the United States (i.e. a concentration of cash flows at the turn of each calendar month). Ogden's "The Turn-of-Month Liquidity

Hypothesis" stated that, as a result of the above-mentioned standardization, investors realize substantial cash receipts at the turn of the month, and especially at the turn of the year. The reinvestment of these cash receipts was shown to induce a surge in stock returns at the turn of the month. The magnitude of each monthly surge was proven to depend on the size of aggregate liquid profits realized during the month in question. These liquid profits, in turn, were directly linked to and affected by the monetary policy of the United States' Federal Reserve System.

On an international level, Jeffrey Jaffe and Randolph Westerfield (1989) examined stock market returns in the U.K., Japan, Canada, and Australia, in order to determine if a "Monthly Effect" in stock market returns exists in countries other than the U.S. Jaffe and Westerfield's study found only weak evidence supporting a U.S.-like Monthly seasonal pattern in the stock markets of the above-mentioned countries. While a country-unique monthly seasonal was documented to exist in Japan, only Australia exhibited a pattern somewhat similar to that of the U.S.

The weekly and intradaily patters in common stock prices are two other kinds of market anomalies that are worth mentioning. Phillip Prince (1982) examined daily returns in the Dow Jones 65 Stock Composite Index over the 1960-1964 time period. While Prince attributed the observed negative Monday effect to systematically high Friday closing prices, he failed to realize that the negative Monday

close-to-close return accrues during the course of the Monday trading day.

While analyzing hourly returns in the DJIA over the period 1963-1983. Michael Smirlock and Laura Starks (1984), found that, in the first third of their sample, Monday returns in the first hour of trading were positive, while returns accruing later in the day were negative. However, in the last third of their sample, the above-mentioned pattern was noticed to completely reverse: i.e. there were negative returns early in the day on Monday, and positive returns later in the day.

By studying transaction-by-transaction data for NYSE stocks for the fourteen months between December 1, 1981, and January 31, 1983, Lawrence Harris (1986)'s paper examined the "Day-of-the Week Effect" in further detail. Among the observations, it was noted that, for large firms, the negative Monday close-to-close return accrues before the market opens, while for smaller firms, most of the close-to-close return accrues during the Monday trading day. In addition to this, it was noted that, on Monday mornings, prices tend to drop, while on the other weekday mornings, the prices in question tend to rise. Over the course of the rest of the trading day, price patterns were similar throughout all weekdays. Finally, Harris documented a strong tendency for prices to rise on the last trade of the day. In the light of the above-presented conclusions, Harris' paper recommended to the stock buyers to avoid transacting early on Monday morning; at

the same time the sellers of stock were advised to actively refrain from engaging in early transactions on Tuesday-through-Friday.

While the "Day-of-the-Week Effect / Week-End Effect" was initially reported for U.S. stock returns, Jeffrey Jaffe and Randolph Westerfield (1985) examined the daily stock market returns in the U.K., Japan, Canada, Australia, and the U.S. Their paper concluded that each of the considered countries had a strong weekly pattern. The daily returns of the U.S. and Canada were found to have the highest correlation (i.e. 0.442), a fact that can be easily and logically attributed to the geographical proximity between the two countries. In stark contrast, the daily stock returns in Australia were found to be virtually uncorrelated (i.e. 0.022) with their U.S. counterparts.

Josef Lakonishok and Edwin Maberly (1990) employed NYSE odd-lot sales and purchases; sales and purchases of cash-account customers of Merrill Lynch; and NYSE block transactions, in order to thoroughly analyze and document regularities related to the trading patters of individual and institutional investors. Lakonishok and Maberly concluded that Monday is the trading day characterized by the lowest trading volume. Individuals are most likely to transact on Monday (i.e. relative to the other days of the week); of these transactions, individuals have a higher propensity to sell - rather than to buy - on Monday. Quite on the contrary, the propensity of institutional investors to transact on Monday was lowest, relative to the other days of the week.

IV. INTRODUCTION TO THE FIELD OF TECHNICAL ANALYSIS

Financial markets move in trends caused by the changing attitudes and expectations of investors with regard to the business cycle. The technical approach to investment is essentially a reflection of the idea that the stock and commodity markets move in trends which are determined by the changing attitudes of investors to a variety of economic, monetary, political and psychological forces. The art of technical analysis is to identify changes in such trends at an early stage, and to maintain an investment exposure until a reversal of that trend is indicated.

Human nature remains more or less constant and tends to react to similar situations in consistent ways. By studying the nature of previous market turning points, it is possible to develop some characteristics which can help identify major tops and bottoms. Technical analysis is therefore based on the assumption that people will continue to make the same mistakes that they have done in the past. The stock and commodity markets, which are a reflection of people in action, never repeat a performance exactly, but the recurrence of similar characteristics is sufficient to permit the technician to identify major juncture points. Since no single indicator could signal every cyclical market juncture, technical analysts have developed an arsenal of tools to help identify the points where trend reversals occur.

Technical analysis is not concerned with the extremely difficult and subjective tasks of forecasting trends in corporate profitability, and of assessing investors' attitudes toward these profits. This science is concerned only with the identification of major turning points in the market's assessment of these factors. Since the *"market"* is a reflection of changes in the balance of opinion between buyers and sellers as expressed in the price mechanism, the essence of technical analysis is to identify important changes in the trends of these prices.

V. LITERATURE SURVEY OF TECHNICAL ANALYSIS-RELATED ACADEMIC STUDIES

William Brock, Josef Lakonishok, and Blake LeBaron (1992) tested and evaluated two of the simplest and most popular trading rules - the Moving Average and the Trading Range Break (i.e. Resistance and Support Levels) - by their ability to accurately forecast future price changes. In the first method, buy and sell signals were generated by two Moving Averages (i.e. a long period and a short period). Buying occurred when the short-period Moving Average rose above the long-period Moving Average; while selling was implemented when the short-period Moving Average fell below the long-period Moving Average. Brock, Lakonishok, and LeBaron also introduced a band around the Moving Average, as an attempt to reduce the number of buy and sell signals by eliminating the "whiplash" signals which might have otherwise occurred when the short and long period Moving Averages are close. They tested the Moving Average rule both with, and without a 1% band.

In the second method - i.e. The Trading Range Break-Out - signals were generated as stock prices hit new highs and lows. As the underlying reasoning goes, the selling pressure caused by the large number of investors who are willing to sell at the market's peak will induce resistance to a price rise above the previous peak. Consequently, buy signals were generated when the price penetrated the resistance level (which was defined as the local maximum).

Conversely, the price has difficulties penetrating the support level, because many investors are willing to buy at the minimum price: if the price goes below the support level, the expectation is for it to drift downward. Because of this, sell signals were generated when the price penetrated the support level (i.e. the local minimum price).

The data series used in this study was a collection of 90 years of daily data (i.e. the DJIA from the first trading day in 1897 to the last trading day in 1986). Overall, their results provided strong support for the technical strategies. The results from trading strategies based on the Moving Average rules showed that buy signals consistently generated higher returns than sell signals. The buy returns were all positive with an average one-day return of 0.042 % (I.e. an annualized rate of 12%). For the sells, the results were even stronger: all the sell returns were negative with an average daily return of -0.025% (I.e. an annualized rate of -7%). The negative returns generated by the sell signals were especially noteworthy: these returns cannot be explained by various seasonalities, since they are based on about 40% of all trading days. Moreover, the returns following buy signals were less volatile then returns following sell signals.

The results for the Trading Range Break rule displayed an average buy-sell return of 0.86%. The buy return was positive across all the considered rules, with an average of 0.55%. The sell returns were negative across all the rules taken into consideration, with an average of -0.24%.

Salih Neftci (1991) investigated statistical properties of technical analysis in order to determine if there is any objective basis to the popularity of its methods. Initially, the article attempted to devise formal algorithms to represent various forms of technical analysis, in order to see if this set of rules is well-defined. Then, the paper discussed under which conditions technical analysis might capture those properties of stock prices previously left unexploited by linear models of the Wiener-Kolmogorov prediction theory.

After recognizing the fact that technical analysis covers a broad category of highly subjective forecasting rules, Neftci employed The Trend Crossing Method (i.e. as the price of DJIA taken over the period 1911-1976 crossed trend lines determined by appropriate local maxima / minima, bull / bear markets were signaled), and The Moving Average Method (i.e. which involved interpreting the intersection of these averages as buy / sell signals). In the end, the paper concluded that the two above-mentioned rules generated well-defined techniques of price forecasting.

Louis Lukac, Wade Brorsen, and Scott Irwin (1988) successfully challenged the idea that technical trading systems cannot generate profits. The paper simulated trading of twelve technical systems, for a diversified portfolio of twelve commodities from 1978 to 1984. Considered were three types of Channel systems; three types of Momentum Oscillators; two types of Moving Averages; a combination

system; systems with trailing stops; and, finally, Alexander's Filter Rule (i.e. a trading system widely analyzed by academics, but seldom used in real-life situations by actual technical analysts). Among the paper's main conclusions, seven of the twelve considered systems had gross returns significantly greater than zero. Four out of the twelve systems had significant mean monthly aggregate net returns: Channel, Directional Parabolic (i.e. the combination system), Mll Price Channel (i.e. a variation of the Channel system), and the Dual Moving Average Crossover (i.e. a type of Moving Average-based technical indicator). The system most widely used in previous academic studies - Alexander's Filter Rule - did not have significantly positive net returns. Finally, among the futures markets considered, Deutschmark, sugar, and corn appeared to be the most inefficient markets, since they yielded the highest number of significant returns.

Two years later, Louis Lukac and Wade Brorsen (1990) reported the results of a comprehensive test of the profitability of technical trading systems, when employed in a futures markets environment. The study was a major improvement upon earlier papers which tended to examine a single technical trading system, Alexander's Filter Rule, which is very seldom used by actual technical analysts. Trading was simulated for 23 trading systems - many of which involved the concepts of oscillators, volatility, breakouts, and momentum, all highly popular and often used by commodity traders - on 30 futures markets for a period of 11 years (i.e. 1975-1986).

The paper's findings were that all but two of the trading systems considered had significant gross returns. Sharp differences, however, were noted in returns by commodity: in general, returns in the exchange rate futures were the highest, while the lowest returns were registered in the livestock futures. The returns in the exchange rate markets may truly represent some inefficiency, as governments often intervene in these markets, in an attempt to stabilize exchange rates. In this context, the results strongly rejected the random walk model, and suggested that disequilibrium models more appropriately describe daily future prices. Although returns were less than expected by many users of these systems, the systems that employed Breakouts; Simple Averages of Momentum; and a combination of the previous two trading strategies did generate returns significantly above transaction costs.

VI. POPULAR TECHNICAL INDICATORS

MOVING AVERAGES

A Moving Average (MA) is a technical indicator that is very useful in determining the overall direction of a market trend. By calculating an average of successive numbers over a specified time period, Moving Averages smooth out erratic fluctuations in the market price movements and may accurately signal the moment when a trend reversal takes place. Two types of Moving Averages are widely used: Simple (SMA) and Exponential (EMA). SMA's main strength is the relative easiness with which its daily numerical value can be computed by hand (i.e. however, as all serious traders monitor the performance of their holdings with the help of highly specialized software, SMA's main point of strength diminishes considerably in importance in today's technically-advanced business environment).

Formula 1 (Simple Moving Average)

$$MA = (P1 + P2 + ... + PN) / N$$

where: P is the daily closing price of the investment

N represents the number of days in the moving average

The numerical result obtained after applying the above formula is then constantly updated by dropping the oldest price value in the

succession, adding the newest one, and then repeating the totaling and averaging mathematical operations. Unfortunately, a Simple Moving Average may, under certain circumstances, generate false signals: if the price to be dropped is substantially higher than the rest of the daily numerical values, SMA falls abruptly.

Conversely, when a low price is dropped, SMA raises significantly. In both cases, the change in the average's graphical shape fails to reflect the currently-prevailing market realities. The Exponential Moving Average is a better trend-following tool than a Simple MA. Its formula assigns greater weight to the last trading day's price (i.e. recent behavior of the market is rightfully considered more important than the trader's overall mood that prevailed two weeks ago), while slowly "fading away" old price data (i.e. rather than simply dropping it away, as the SMA does). Consequently, the graph of the EMA does not oscillate abruptly in response of deleting old numerical data, while it responds to present changes in price more promptly relative to the SMA. Although the EMA's formula is significantly more elaborate than the version presented on the previous page, a software program such as "Windows on Wall Street by Market Arts" will easily complete all the required calculations at the touch of a few buttons.

Formula 2 (Exponential Moving Average)

EMA(today) = P(today)*2 / (N+1) + EMA(yesterday)*(1 - 2 / (N+1))

where: P(today) = today's price

N = number of days in the EMA

In order to obtain a plotted graph of the indicator, the trader must choose the Moving Average's length (i.e. in days). In doing so, the individual must be aware that a relatively short average is more sensitive to price changes, therefore enabling him to catch new trends sooner. Furthermore, the selection of a short number of days will produce graphs that change direction more often, often producing whipsaws. On the contrary, a relatively long MA leads to fewer whipsaws, but misses turning points by a wider margin.

When the slope of the Moving Average raises (i.e. especially when prices advance above the MA), a bullish market sentiment is indicated, and therefore the trader is well-advised to take / maintain a long position in investment in question (i.e. subject to similarly bullish trading signals that are generated by concurrently-used additional technical indicators). When the slope of the Moving Average falls (i.e. especially when prices plummet below the MA), a bearish market sentiment is indicated, and therefore the trader is well-advised to take / maintain a short position in the investment in

question (i.e. subject to similarly bearish trading signals that are generated by concurrently -used additional technical indicators).

An additional trading strategy based on this indicator studies the relationship between the actual price of the investment and 2 Moving Averages that were calculated over a span of 12, and respectively 24 days (i.e. or any other combination such as 14 and 28; or 18 and 36). The best time to Initiate a trade - by purchasing the investment vehicle in question - occurs when the price crosses above both Moving Averages. Thereafter, the investment should be held as long as the 12-day MA is above the 24-day MA (i.e. or similarly, when the 18-day MA is above the 36-day). Finally, the position must be promptly liquidated when the price falls below both averages, and the 24-day MA is above the 12-day one (i.e. or when the 36-day MA Is above the 18-day one).

Moving Averages can also be used as *support* and *resistance* zones, as shown on the graph presented to the left page. In an uptrend, a rising MA tends to serve as a floor below prices, while a falling MA serves as a ceiling above them. A trading strategy centered around these facts would recommend the acquisition of long positions when the price Is near a rising MA (i.e. and conversely, taking short positions when the price of the commodity in question is situated near a falling MA).

Moving Averages give the most accurate signals in a strongly trending market that, due to strong underlying fundamentals (i.e. the current poor wheat crop), will maintain its main direction - either bullish or bearish - for a few months. The speculator should therefore always trade along the market trend - by going long in an uptrend, and taking short positions in a downtrend - and he should use the signals generated by Moving Averages only to select a particular transaction's entry point. This indicator performs poorly in either a trendless market, or in a situation in which the direction of the main trend alternates between bullish and bearish every other few days. Furthermore, other indicators should be used in order to generate correct exit signals, as the cross point of the MAs often lags reality by quite a few days.

OSCILLATORS

While Moving Averages are especially valuable in rapidly-advancing bull markets, it is strongly recommended that a number of technical indicators be used simultaneously, in order to re-affirm the trading recommendations suggested by any one of them. Representing complex mathematical relationships between present and previous investment prices, Oscillators are one category of technical indicators that work especially well in conjunction with Moving Averages.

Shaped in the form of weaving curved lines (i.e. much alike a sine wave), they often employ upper and lower reference lines which are set to highlight the graph's entrance into an *overbought zone* at the

top, or an *oversold zone* at the bottom. In an *overbought* condition, nearly all investors who have had any intention of buying this particular investment have already allocated most of the money they intend to commit for the time being. In an *oversold* condition, the participants have already done most of their selling.

The general rule is to buy the investment when the Oscillators indicate an oversold condition, and to sell it when the indicators in question show an overbought reading. Due to the immense practical value of this group of technical indicators, the following pages of this paper are dedicated to thoroughly exploring the most widely used Oscillators: Moving Average Convergence Divergence (MACD); Price Momentum; Stochastic; and the Relative Strength Index.

MOVING AVERAGE CONVERGENCE DIVERGENCE (MACD)

Moving Average Convergence-Divergence, or MACD for short, consists of two separate lines (i.e. the Fast MACD and the Slow Signal Lines) whose point of crossover gives accurate trading signals. The formula required for the calculation of this indicator is slightly more complex, and therefore is best calculated with the help of a powerful technical analysis software program such as *Windows on Wall Street.*

Formula 3 (MACD)

Fast MACD = (12-day EMA) - (26-day EMA)

Slow Signal = 9-day EMA of the Fast MACD

MACD Histogram = (Fast MACD) - (Slow Signal)

where: 12-day EMA = the Exponential Moving Average of the daily closing price taken over a 12 day time window;

26-day EMA = the Exponential Moving Average of the daily closing price taken over a 26 day time window;

The Fast MACD Line reflects mass consensus over a shorter period of time, while the Signal Line illustrates the investors' overall assessment of the market conditions over a longer time span. As a result, the MACD Histogram shows the difference between the players' long-term and short-term consensus of value.

The intersection point of the Fast MACD and the Signal Lines pin-points changing market tides, attesting to the fact that the balance of power is shifted between buyers and sellers in the market. A long position should be taken in the investment in question when the Fast MACD Line rises above the Slow Signal Line. Conversely, a trader should adopt a bearish stance as soon as the Fast MACD Line falls below the Slow Signal Line. A rising slope of the MACD Histogram

attests to the fact that bulls are becoming stronger, while a falling one signals that bears are taking control.

Divergences between MACD Histogram and prices signal that the current trend is losing momentum, and therefore alert investors about the soon-to-occur major reversals in the overall direction of the market. Bullish divergences - indicated by prices that decrease to new lows, paired with an indicator that traces a higher bottom - identify major buying opportunities. Bearish divergences - indicated by prices that increase to new highs, paired with an MACD Histogram that traces lower tops - flag major selling opportunities.

MACD, although a valuable indicator, is best used in conjunction with other technical studies. Its most reliable signals are generated once every few months, whenever the major price trend reverses. For added certainty, a buy signal has to be re-enforced by the presence of an additional four or five bullish / oversold indicators. Conversely, a sell signal has to be accompanied by several other bearish / overbought technical indicators.

The presence of current divergence between prices and the MACD Histogram indicate that the current bull / bear market is running out of steam. Given the fact that this state of divergence can continue for quite some time, the trader has to be prepared to wait patiently for some of the other indicators used in the overall analysis to generate a specific, more time-exact "buy" or "sell" signal.

PRICE MOMENTUM

Momentum is a technical indicator that measures trend acceleration (i.e. the speed or slope at which the price of the investment ascends or declines). Offering a timely warning signal when a change in the course of prices is about to happen, Momentum compares today's closing price with the price value that occurred a number of days ago.

Formula 4 (Momentum)

$$M = P(today) - P(today-N)$$

$$ROC = P(today) / P(today-N)$$

where: M = the Momentum

ROC = the Rate of Change of the price

P(today) is today's closing price

P(today-N) is the closing price "N" days ago

The slope of the line connecting the daily Momentum values indicates whether momentum is rising or falling. When Momentum rises to a new peak, the optimism of the market participants is growing, the ongoing uptrend is gaining strength, and prices are likely to rally higher. When the Momentum line traces a lower peak, the pessimism of the market players is increasing, the uptrend has stopped accelerating, thus indicating that lower prices are likely ahead. When

prices rise but Momentum falls, a top is near and investors are well-advised to start liquidating their positions in the market. A sound trading strategy revolves around holding significant positions in the investment vehicle currently under consideration, as long as the Momentum line keeps reaching new highs.

Given the fact that Momentum's reliability is somewhat inferior to that of other technical indicators, a trader would be well-advised to use its "buy" and "sell" signals only in conjunction with a battery of other technical studies, solely for re-enforcement purposes.

THE STOCHASTIC

The Stochastic is a hybrid quantitative study of several different types of Moving Averages. Two lines (i.e. %K and %D) are calculated and plotted as a percentage between 0 and 100. By oscillating between *overbought* and *oversold* regions (i.e. with respective thresholds set at 80 and 20), this technical indicator measures the capacity of "bulls" or "bears" to close the market near the upper or lower edge of the recent.

When prices rally, the markets tend to close near the high of the day: therefore, an uptrend is likely to continue as long as the price and the Stochastic lines rise in the same time. During downtrends, the daily closes tend to occur near the day's lows: consequently, when the investment's price and the Stochastic lines fall simultaneously, the bear market is likely to continue.

Formula 5 (Stochastic)

%K = 100 * [Close - Lowest(14)] / [Highest(14) - Lowest(14)]

%D = 3-day MA of %K

where: Close = the latest closing price;

Lowest(14) = the lowest low of the last 14 days;

Highest(14) = the highest high of the last 14 days

Trading signals are generated when the two curves leave the *overbought* or *oversold* zones and the %K crosses over the %D, preferably after the latter has peaked (or bottomed). The most powerful buy and sell signals of the Stochastic are given by the *divergences* between this indicator and the price of the corresponding investment. The divergence between prices and the %D line is a valuable sign that the market may soon follow the direction of the indicator, as shown on the graph displayed on the left page.

Bullish divergences occur when prices fall to a new low, while the Stochastic refuses to decline to a new low. They show that bears are losing power, prices are falling out of inertia, and bulls are ready to seize control, thus often marking the end of a downtrend. *Bearish divergences* occur in uptrends, and they identify market tops. They emerge when prices rally to a new high while the Stochastic refuses

to rise to a new peak. In this case, the bulls are running out of steam, prices are rising out of inertia, and bears are ready to take control, thus often signaling the end of an uptrend.

The Stochastic is an extremely valuable technical indicator, which can be successfully applied to any market, as long as the width of the Stochastic window is chosen appropriately. A short-term window - for example 9-day - makes the Stochastic extremely sensitive to any variations in price of the commodity under analysis. While this would generate very "prompt" trading signals, the danger lies in the fact that the wide oscillations in the indicator may sometimes result in false signals. Conversely, a long-term time window - 24-day, for example - will generate a Stochastic that will turn only at important tops and bottoms, therefore forcing the commodities speculator to actively forfeit a lot of potentially profitable opportunities.

RELATIVE STRENGTH INDEX (RSI)

The RSI measures the strength of a trading vehicle by monitoring changes in its closing prices. The concept is that the ratio of net up-change to net down-change in prices over a selected interval will accurately reflect the strength of the market's momentum. A large amount of *gain* to the upside - as opposed to *loss* to the downside - indicates a period of rallying prices and is correspondingly illustrated by ever-increasing RSI values.

Formula 6 (RSI)

RSI = 100 - 100 / (1 + RS)

where:

RSI = the Relative Strength Index;

RS = the Relative Strength, an RSI sub-component that is calculated according to the following formula:

$$RS = \frac{\text{Average of net } \textit{UP} \text{ closing changes for a selected number of days}}{\text{Average of net } \textit{DOWN} \text{ closing changes for the same number of days}}$$

When RSI falls and subsequently turns up, it identifies a market bottom (i.e. the beginning of a new rally, and therefore the most appropriate time to purchase the investment). When the indicator reaches a peak and then turns down, it identifies a market top (i.e. the end of a bull market, and therefore the tight time to sell the investment and crystallize the capital gains realized up to that point).

Another very successful trading strategy centers around bullish and bearish divergences. Divergences between RSI and prices indicate that the trend is weak and ready to reverse, and therefore give extremely reliable buy and sell signals, accurately pin-pointing all of

the major market tops and bottoms. Reliable *buy signals* are generated when prices fall to a new low, but RSI makes a more shallow bottom than during its previous decline (i.e. bullish divergence). Similarly, dependable sell signals are produced when prices rally to a new peak, but RSI makes a lower top than during its previous rally (i.e. bearish divergence). The graph displayed on the left page attempts to illustrate the previously-described relationships.

Always correctly identifying the major tops and bottoms, the Relative Strength Index generates some of the most reliable "buy" and "sell" signals in the world of technical analysis. Although this indicator has a superior track record, it is still desirable to incorporate it as a part of a balanced package of indicators. In doing so, signals generated by the RSI would have to be always confirmed by "weaker" indicators such as MACD and Price Momentum. While the number of days in the time window made be made to vary in accordance to the commodity's typical cycle length - measured bottom to bottom - a time length of 14-days is often used as a default value.

VOLUME

Often plotted in the form of a histogram, Volume represents not only the actual number of contracts - or shares - traded, but also the degree of financial and emotional involvement of the market participants. Although not an technical indicator on its own, the Volume enables the experienced technician to gain an accurate feeling about the strength of the currently-prevailing bull - or bear -

market, therefore being a tool that is just as valuable and versatile as the technical indicators previously introduced.

Volume is always analyzed in conjunction with the behavior of the commodity's price. As a rule, high volume confirms trends. Low volume signals that a potential trend reversal is imminent. If a recent price increase is accompanied by rising volume, the current uptrend is considered to be gaining momentum. At this point, traders are advised to maintain their long positions, as much higher prices will likely materialize in the short-term future.

When prices increases are accompanied by significant drops in volume, the bull market is losing steam. At this point, professional traders are closing their positions, and it is only the novice, the greedy, and the soon-to-be-not-so-fortunate that engage in buying binges at this dangerously-advanced stage of the bull-market.

As the market trend reverses from bullish to bearish, the price declines that often follow drastically reduce the values of the remaining investors' portfolios. As these individuals desperately dump their holdings at ridiculously low prices - thereby forcing the market to fresh new lows, with their each subsequent wave of panic selling - they generate a lot of market activity, and therefore, a correspondingly high volume. Consequently, increasing volume on falling prices signals a strengthening bear market, and it is the most appropriate time to adopt short positions.

Price declines that are accompanied by lighter volumes signal that most of the interested sellers already disposed of their fast-depreciating assets, while the professional traders are beginning to buy back the contracts they previously shorted, in order to cover their positions. Consequently, the bear market is about to end, and higher prices will soon prevail again.

GUIDELINES FOR INTERPRETING THE VARIATIONS IN VOLUME

Situation 1:

Prices increase + volume increases = strengthening bull market

Trading Strategy: Hold long positions

Situation 2:

Price increases + volume decreases = weakening bull market

Trading Strategy: Sell long positions; Acquire short positions

Situation 3:

Price decreases + volume increases = strengthening bear market

Trading Strategy: Hold short positions

Situation 4:

Price decreases + volume decreases = weakening bear market

Trading Strategy: Close short positions; Acquire long positions

VII. ASSUMPTIONS MADE WHILE BUILDING THE TRADING MODEL

The following model attempts to forecast the optimum entry and exit points for trading in the Light Sweet Crude future contracts.

The actual model, together with the resulting graphs and computer reports were realized by using the "Windows on Wall Street" software package. The daily data (Closing Price, Daily High, Daily Low, Volume, and Open Interest) for the Light Sweet Crude future contracts was obtained from Dial Data.

As thoroughly presented in the earlier part of the thesis, the trading system is based on technical indicators and the operating principles of technical analysis.

Other similar studies that I have researched in the library were based only on one or two filters: due to the fact that, to this day, there is no actual filter that is guaranteed to give consistent results, I chose to incorporate a multitude of filters in my model. While no filter - on its own - is capable of generating accurate results, time after time again, by using a larger number of filters I increase the accuracy of the results (and therefore the reliability of the model).

The following technical filters are taken into consideration, and, subsequently, will be incorporated in the actual trading model.

LIST OF CONDITIONS THAT HAVE TO BE MET WHEN EXITING A SHORT POSITION AND / OR ENTERING A LONG POSITION

- The slope of the two Simple Moving Average (SMA) employed increases more than in the previous day (suggesting an acceleration in the upward price trend)
- The slope of the two Weighted Moving Average (WMA) employed increases more than in the previous day (suggesting as well an acceleration in the upward price trend). WMA's award greater significance to the most recent price data.
- Any of the below:
    - Bullish divergence between the MACD Histogram and the commodity price.
    - Bullish divergence between the Momentum and the price
    - Bullish divergence between the Stochastic and the price
    - Bullish divergence between the RSI and the price
- The Stochastic's shape forms a "HOOK" formation. This is signified by the rate of change in the Stochastic first decreasing at an accelerating rate, slowing down, and then beginning to increase at a slowed-down rate.
- The RSI and the Momentum - after reaching the oversold regions - from successively higher lows.
- 2 days before the signal is generated, the price decreases while volume decreases. 1 day before the signal is generated, the price increases while the volume increases.

LIST OF CONDITIONS THAT HAVE TO BE MET FOR EXITING A LONG POSITION AND / OR ENTERING A SHORT POSITION

- The slope of the two Simple Moving Average (SMA) employed decreases more than in the previous day (suggesting an deceleration in the upward price trend)
- The slope of the two Weighted Moving Average (WMA) employed decreases more than in the previous day (suggesting as well an acceleration in the downward price trend). WMA's award greater significance to the most recent price data.
- Any of the below:
    - Bearish divergence between the MACD Histogram and the commodity price.
    - Bearish divergence between the Momentum and the price
    - Bearish divergence between the Stochastic and the price
    - Bearish divergence between the RSI and the price
- The Stochastic's shape forms an inverted "HOOK" formation. This is signified by the rate of change in the Stochastic first increasing at an accelerating rate, slowing down, beginning to increase at a slowed-down rate, and ultimately beginning to decrease at a slowed-down rate.
- The RSI and the Momentum - after reaching the overbought regions - from successively lower highs.
- 2 days before the signal is generated, the price increases while the volume decreases. 1 day before the signal is generated, the price decreases while the volume decreases.

VIII. DESIGNING THE TRADING MODEL

CALCULATION OF THE STOCHASTIC

The Stochastic's two lines, %K and %D are calculated over "n", and respectively, "m" days, as follows:

%K = 100 * [Close - Lowest(n)] / [Highest(n) - Lowest(n)]

where: Close = the latest closing price

Lowest(n) = the lowest low of the last "n" periods

Highest(n) = the highest high of the last "n" periods

%D = m-period MA of %K

For computer programming purposes, the above expressions are represented as:

stoch (n,m)

By default, "n" and "m" are set to the following values (i.e. which can be changed anytime later on, should the need arise):

n = 9, and m = 6.

CALCULATION OF THE RELATIVE STRENGTH INDEX

The RSI is calculated over "n" periods, as follows:

$$RSI = 100 - 100 / \left(1 + \frac{\text{Average of net UP closing changes over "n" periods}}{\text{Average of net DOWN closing changes over "n" periods}} \right)$$

For computer programming purposes. the above expression is represented as:

rsi (n)

By default, "n" is initially set as follows:

n = 9 (i.e. the same as the "n" for the Stochastic)

CALCULATION OF THE MACD HISTOGRAM

The MACD is calculated according to the following formula:

MACD Histogram = (Fast MACD) - (Slow Signal)

= [(12-period EMA) - (26-period EMA)] - [9-period EMA of the Fast MACD]

For computer programming purposes, the above expression is represented as:

(mov (close,12,E) - mov (close, 26,E)) - mov(mov(close,12,E) - mov (close,26,E),9,E))

CALCULATION OF THE MOMENTUM

The Momentum is calculated over "n" periods, as follows:

M = Today's close - closing price "n" periods ago

For computer programming purposes, this is represented as:

mo (n)

By default, "n" is set as follows:

n = 9

COMBINING THE ABOVE-MENTIONED BUILDING BLOCKS TO CREATE THE OVERALL TRADING MODEL

The trading model is built according to the following formula:
INDICATOR = The Simple Moving Average taken over "q" periods of:
{ [Stochastic * (RSI + MACD) / Momentum] ^ Volume }

For computer programming purposes, this is expressed as:

```
mov ((( stoch ( n,m ) * ( rsi ( n ) + (( mov ( close,12,E )
- mov ( close,26,E )) - mov ( mov ( close,12,E )
- mov ( close,26,E ),9,E ))) / mo ( n )) ^ Vol ),q,S )
```

Where, "n", "m", and "q" are assigned the following default settings:

n = 9; m = 6; q = 2

The value of this final indicator is calculated on a period-by-period basis. The above equation will plot as a "zig-zag"-like line, whose points of turn accurately indicate significant turning points in the market. For this reason, the slope of this line is closely monitored: during each trading period, the slope of the indicator is calculated (i.e. as the rate of change In the value of the indicator, from the last period to the most recent period).

While a slope which continues to remain negative signlfies the presence of a bear market, a continuously positive slope attests to the existence of a bull market. These instances are of somewhat

minor interest, as they only bring further credibility to a trend direction which has been priorly established. On the contrary, the instances in which the slope of the indicator changes sign are of paramount importance, as they signify potential opportunities for buying and selling. As soon as a formerly positive slope (i.e. an indicator of a bull market) either goes through zero or turns negative, a potential "sell" signal may be in place. Also, as soon as a formerly negative slope (i.e. an indicator of a bear market) either goes through zero, or turns positive, a potential "buy" signal may be generated.

Although the indicator in question was designed in such a way as to generate a rather smooth (i.e. wiggle-free line) line, unexpectedly wild price fluctuations in the underlying futures may result in undesirable "noisy" smaller zig-zags in the plot line. These points do not represent actual up-most peaks and down-most bottoms, but rather intermediary (i.e. minor) points situated in-between. To make sure that the trading model does not - by mistake - recognize these instances as favorable buying / selling opportunities, the following adjustment is made in the way in which the indicator is put to use.

When the slope of the indicator either reaches zero or changes sign, a difference is calculated between the last point where the slope reached zero or changed sign the last time. If the absolute value of the difference between a local minimum and a local maximum is less than a variable "a", the potential "buy" or "sell" signal is not given

anymore, and the trading signal that was last generated still remains in place. To ensure that minor oscillations in the underlying indicator are not about to generate false "buy" and "sell" signals, a new trading signal is generated only if the following two conditions are simultaneously met:

- The slope of the indicator reaches zero or changes sign.

AND

- The absolute value of the difference (i.e. in the indicator's magnitude) between the last local minimum and the local maximum is equal to at least the value "a".

The model will open a long position when: the formerly negative slope of the indicator either reaches zero, or becomes positive; the value of the slope is greater than, or equal to the value of the slope for the previous day; and at least a value of "a" exists between the last-registered market "top" and the new would-be "bottom".

The model will close a short position when: the formerly negative slope of the indicator either reaches zero, or becomes positive; the value of the slope is greater than (i.e. but not equal to) to the value of the slope for the previous day; and at least a value of "a" exists between the last-registered market "top" and the new would-be "bottom".

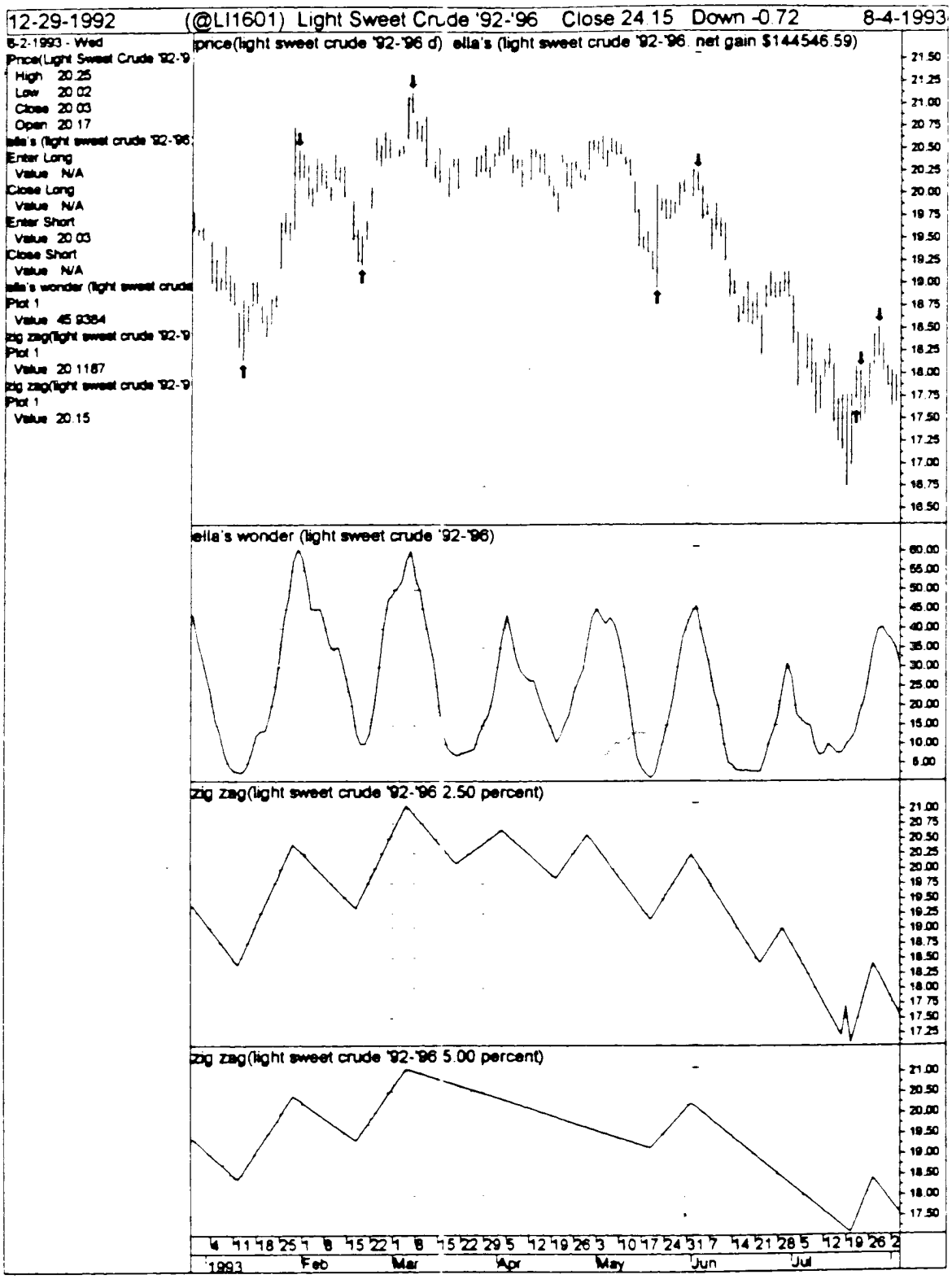
The model will close a long position when: the formerly positive slope of the indicator either reaches zero, or becomes negative; the value of the slope is smaller than, or equal to the value of the slope for the previous day; and at least a value of "a" exists between the last-registered market "bottom" and the new would-be "top".

The model will enter a short position when: the formerly positive slope of the indicator either reaches zero, or becomes negative; the value of the slope is smaller than (i.e. but not equal to) the value of the slope for the previous day; and at least a value of "a" exists between the last-registered market "bottom" and the new would-be "top".

Assigning a relatively larger value to the variable "a" is guaranteed to be the most conservative - and the most highly recommended - investment approach possible. While it is true that fewer trades will be generated, the probability that these transactions result in profit is, certainly, higher.

A more thorough explanation of exactly how this model works is presented in Section X, "Additional Explanations Regarding the System's Performance".

FIGURE 1: Market Arts screen on daily Crude data



An additional way through which the frequency of the trading signals can be further controlled is by employing a new variable, "z" = "a" / The Time Spread between Two Adjacent Highs (i.e. or Lows). In this case, an account is made of the of the number of trading periods between the two most recently recorded highest high and lowest low values of the indicator, in an attempt to measure the cyclicallity with which the underlying futures contract reaches tops and bottoms. The time spread between two adjacent "bottoms" - and the time spread between two adjacent "tops" - is calculated. Then, a third, time-based condition may be imposed on the top of, and in the addition to, the above-mentioned entry / exit criteria: a new "bottom" or "top" is registered only after a certain amount of time - as is measured by the variable "z" - has elapsed. By default, "z" is initially assigned to the value: z = 2.

After entering the formula for the newly-designed indicator, and the entry and exit decision criteria, the computer is then programmed to execute the following steps (i.e. whose eventual outcome is then displayed in Figure 1):

- Plot the indicator's line, which is then displayed in the panel entitled "ella's wonder"
- Use the "Overlay" function to transform the initially drawn line into a straight line, which is then displayed in the panel entitled "zig zag"

- Finally, the computer makes the appropriate calculations and decisions, and then plots on the commodity's price panel the trading recommendations: green-colored upward-pointing arrows placed below the price for entering a long transaction; green colored downward pointing arrows placed above the price for closing a long transaction; and similar yellow-colored arrows, placed below - and respectively above - the price, to enter a short position, or to close a previously-opened short position.

Additional Explanations:

- In Figure 1, additional panels (i.e. "ella's wonder", and two" zig zag") were displayed in order to show in greater detail how the computer program works. In reality, the trading system will only plot the upward and downward-pointing green and yellow arrows, as the sole means of alerting the trader of up-coming potentially profitable trades. The rest of the work is performed internally by the computer.

- At the appropriate prompt, the user of the trading model is asked to specify what value of "z" he prefers to use. While, Initially, z = 2, this value can be changed to either a smaller, or a larger value, according to the user's personal trading strategy. An overly-active investor may prefer a system that will generate a relatively large number of short-termed trades: In this case, a small value of "z" (

i.e. z = 2) will help him achieve just that. On the contrary, a very passive investor may want to engage in only a small number of long-term transactions: consequently, his needs will be better met by assigning a relatively larger value for "z" (i.e. z = 5).

IX. ANALYSIS OF THE TRADING SYSTEM'S PERFORMANCE

The technical analysis-based trading system was first tested on 14 years of weekly data (i.e. from March 31, 1983 to June 27, 1997) on Light Sweet Crude (traded on NYMEX). The data used for testing purposes was that of the most recent trading month: however, one week before the expiration date, the month in question was rolled over to the next (i.e. nearest) trading month. The process was repeated throughout the entire period under consideration, to ensure that no trades were executed on a contract that was trading too dangerously close to its expiration date.

Figure 2 displays the trading signals generated by the system over the period 1984-1997. Given the fact that too much graphical information was condensed into just one page, Figures 3, 4, and 5 attempt to break down the given 1984-1997 study period as follows: Figure 3 covers the time period 1984-1989; Figure 4 continues with 1989-1995, while Figure 5 documents the remaining 1996-1997.

FIGURE 2: Trading signals on weekly Crude data ('84 - '97)

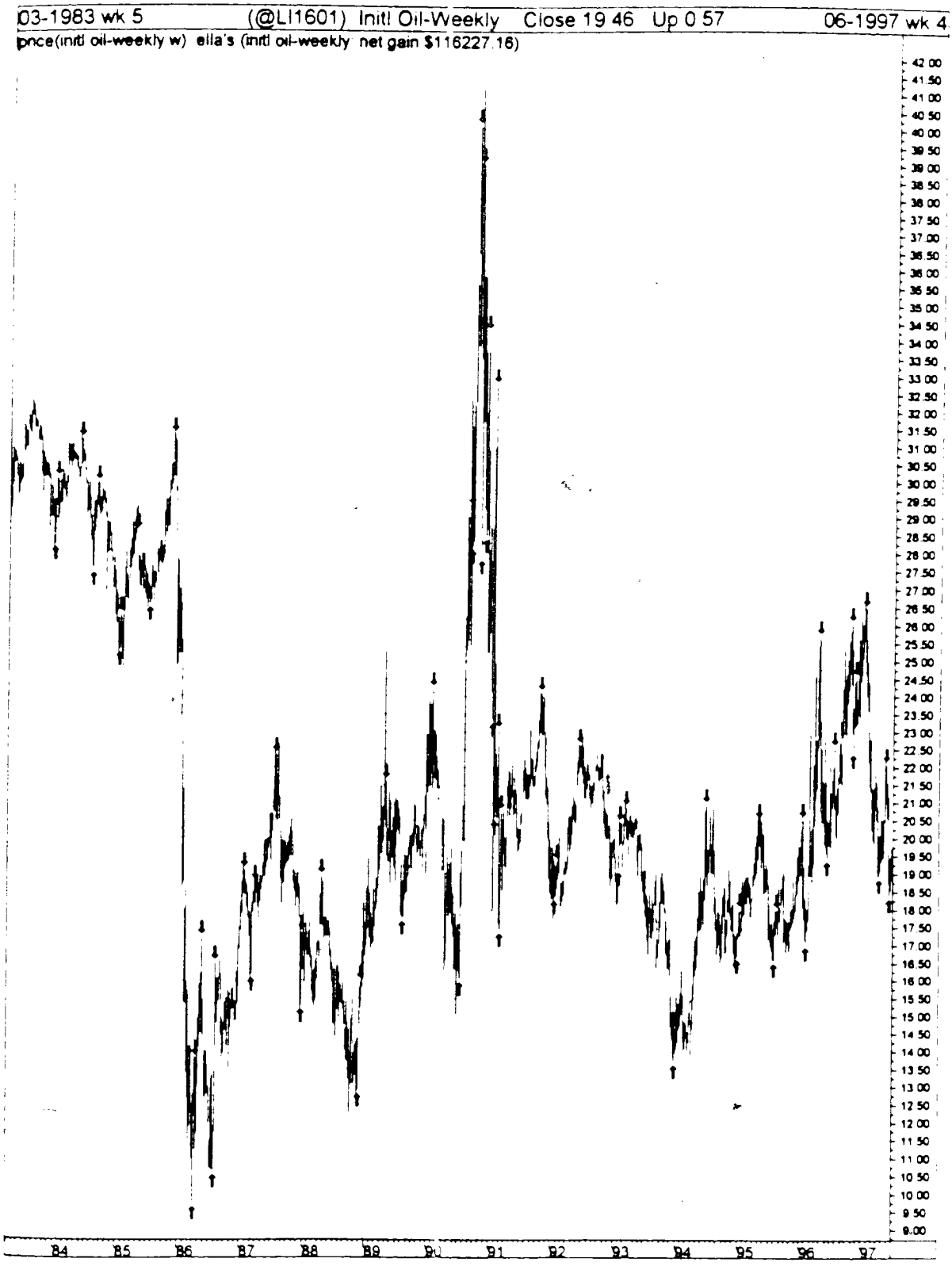


FIGURE 3: Trading signals on weekly Crude data ('84 - '89)

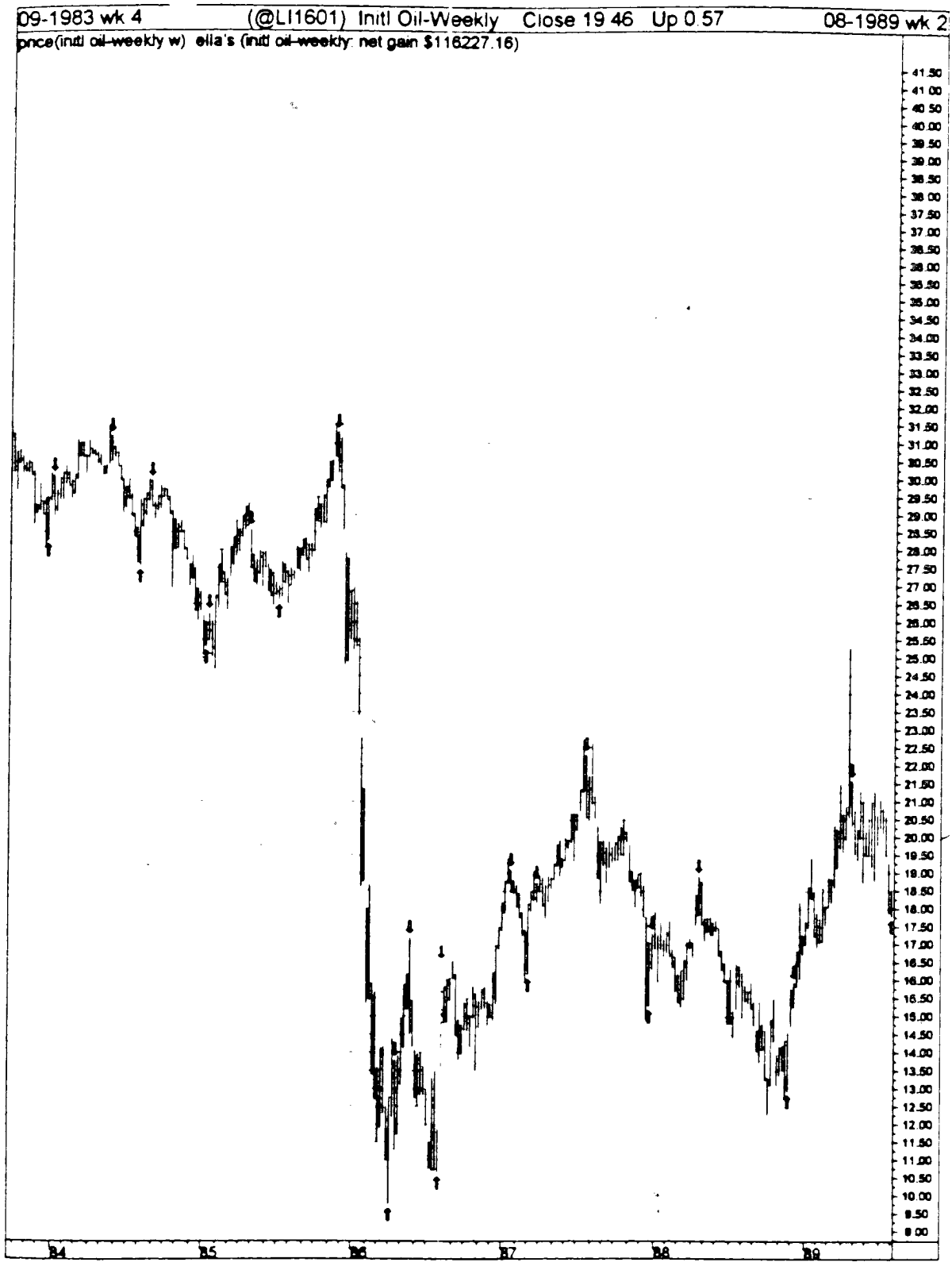


FIGURE 4: Trading signals on weekly Crude data ('89 - '95)

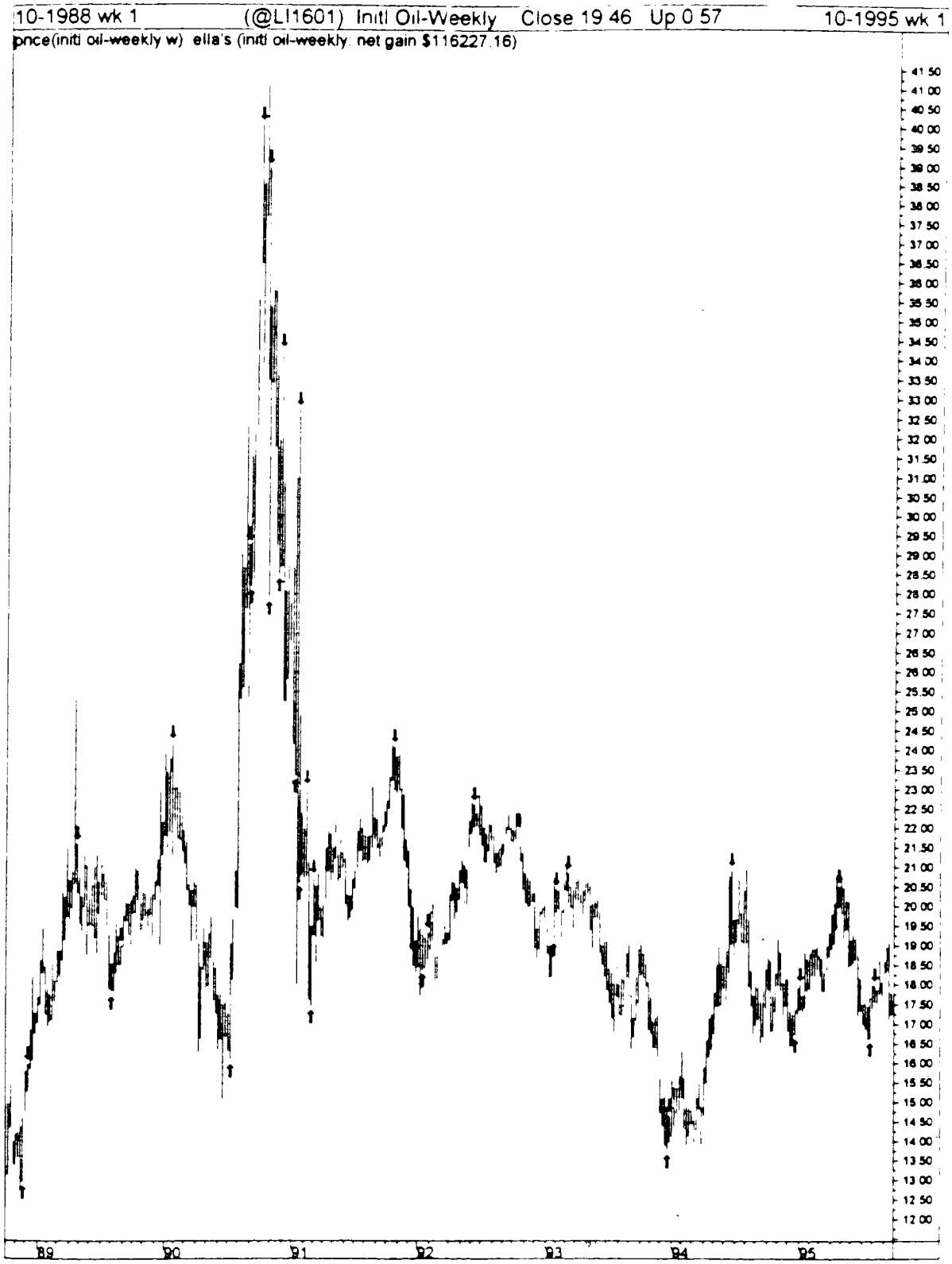


FIGURE 5: Trading signals on weekly Crude data ('95 - '97)

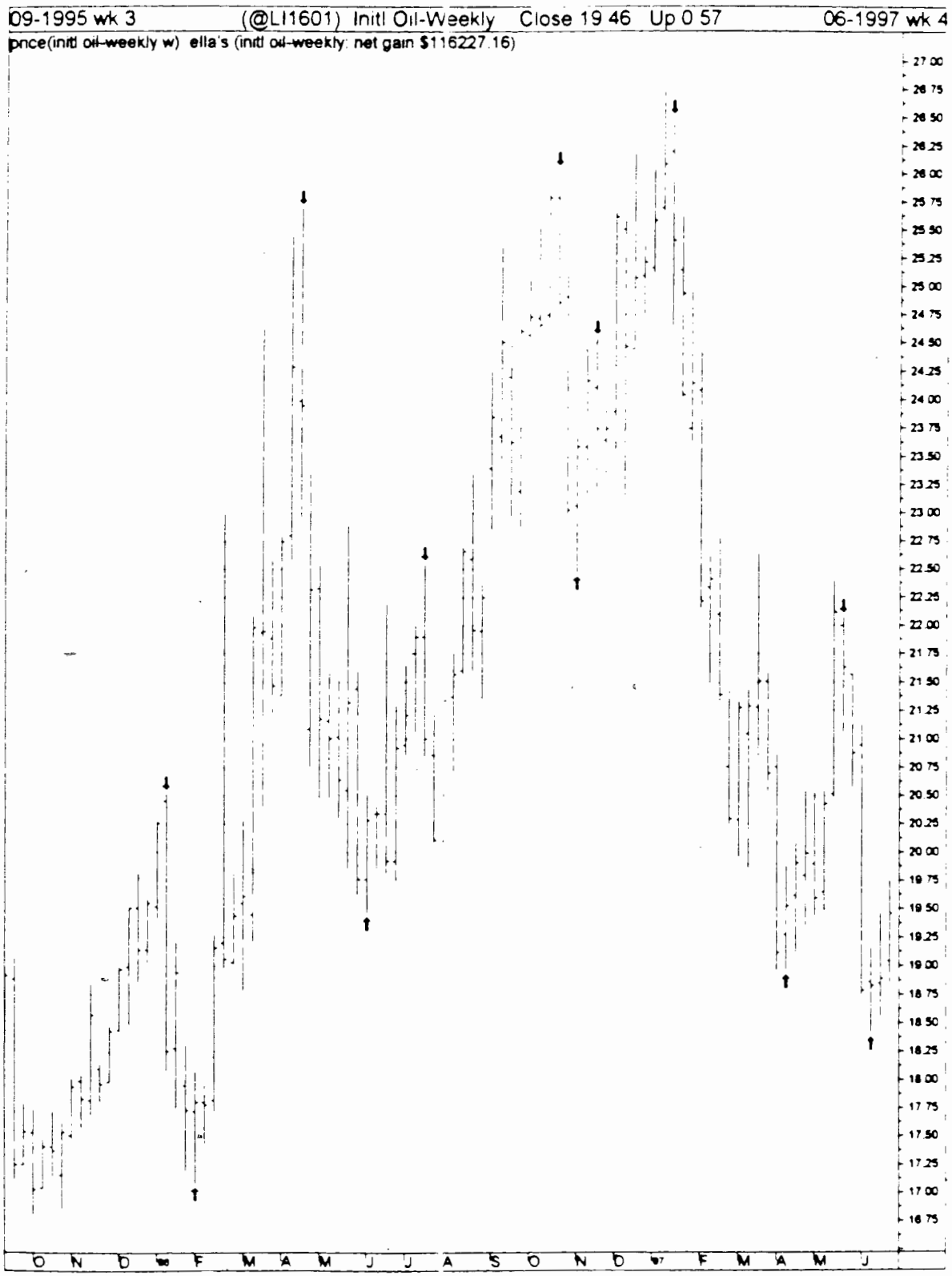
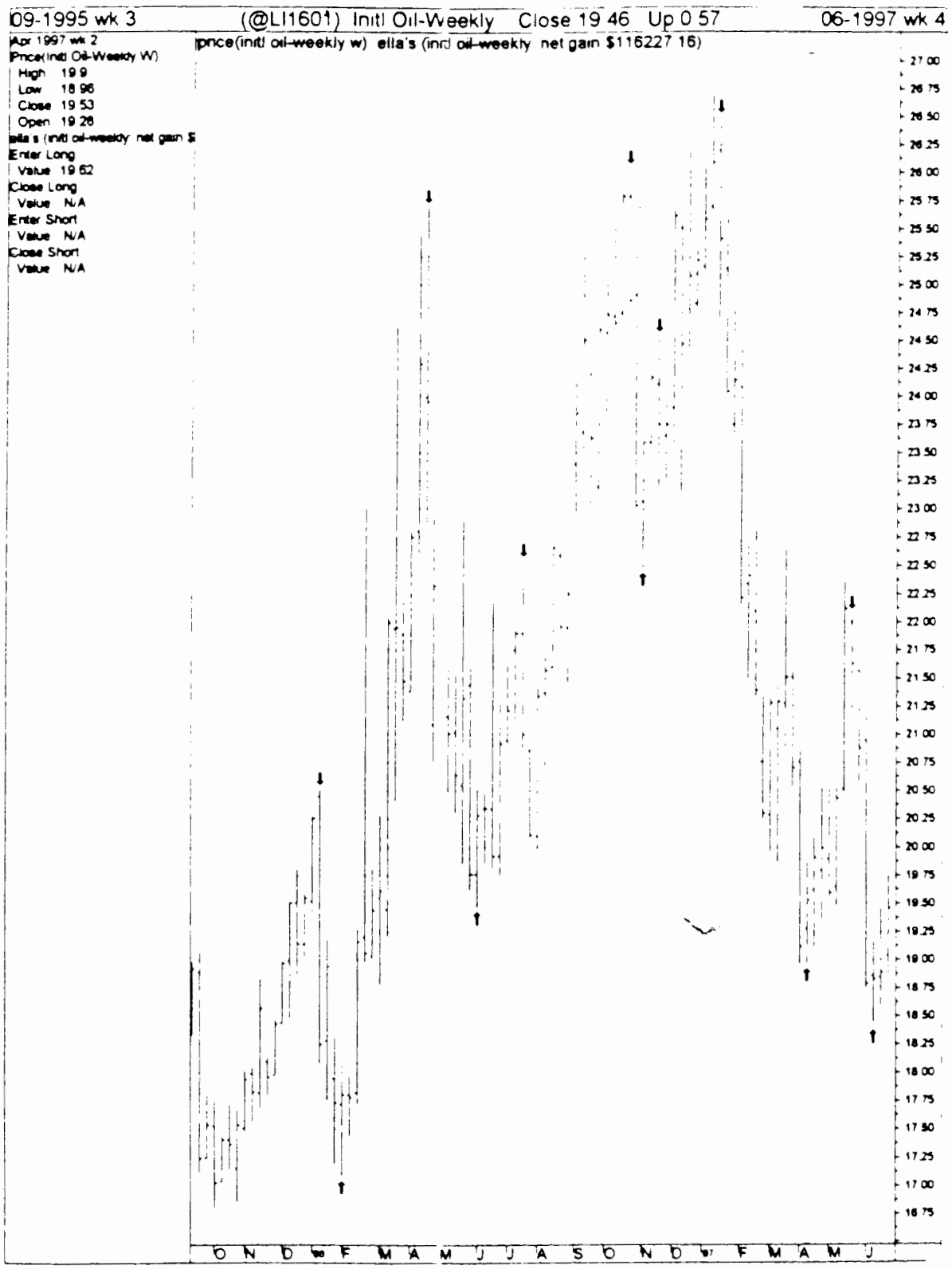


Figure 6 provides an even greater insight into how the investment process is handled by the system. This plot documents weekly data on Light Sweet Crude between 1996 and the middle of 1997. While referring to the data window appearing on the top left corner, the reader can obtain the following information:

On the second week of April - 1997 - Crude Oil closed on Friday at 19.53. The trading system generated a buy order, which was displayed as an upward-pointing arrow placed below the price. However, the actual buying order was executed at 19.62, which represented the opening price on the Monday of the following week, thus replicating closely how such a transaction would be implemented in the real-life. This information appears in the data window under the heading: "Enter Long - Value 19.62".

Consequently, on the Friday of the second week of April 1997, an upward arrow (i.e. urging the trader to consider going long) will appear on the price plot. After some thinking over the course of the weekend, the investor can place a buying order on Monday morning of the third week of April 1997, preferably a few hours before the opening of the Crude Oil market. It is quite reasonable to expect this order to be filled at the prevailing opening price of Monday morning - which, is 19.62. Finally, the "N/A" symbol which is assigned to the "Close Long", "Enter Short", and "Close Short" scenarios simply outlines the fact that no other trading recommendations were given at this particular point in time.

FIGURE 6: Screen print for weekly Crude data (April 1997)



Similarly, the data window displayed in Figure 7 informs the reader that - as of Friday evening of the week 4 of May 1997 - market conditions are appropriate for either selling (i.e. closing) a former long exposure to Crude Oil, or for adopting a short position in the commodity in question.

Should the trader choose to implement either of the above recommendations, the price at which these trades would be executed is the prevailing opening price on the morning of the following Monday (i.e. week 5, 1997). This price is indicated in the data window as "Enter Short - Value 21.57".

FIGURE 7: Screen print for weekly Crude data (May 1997)

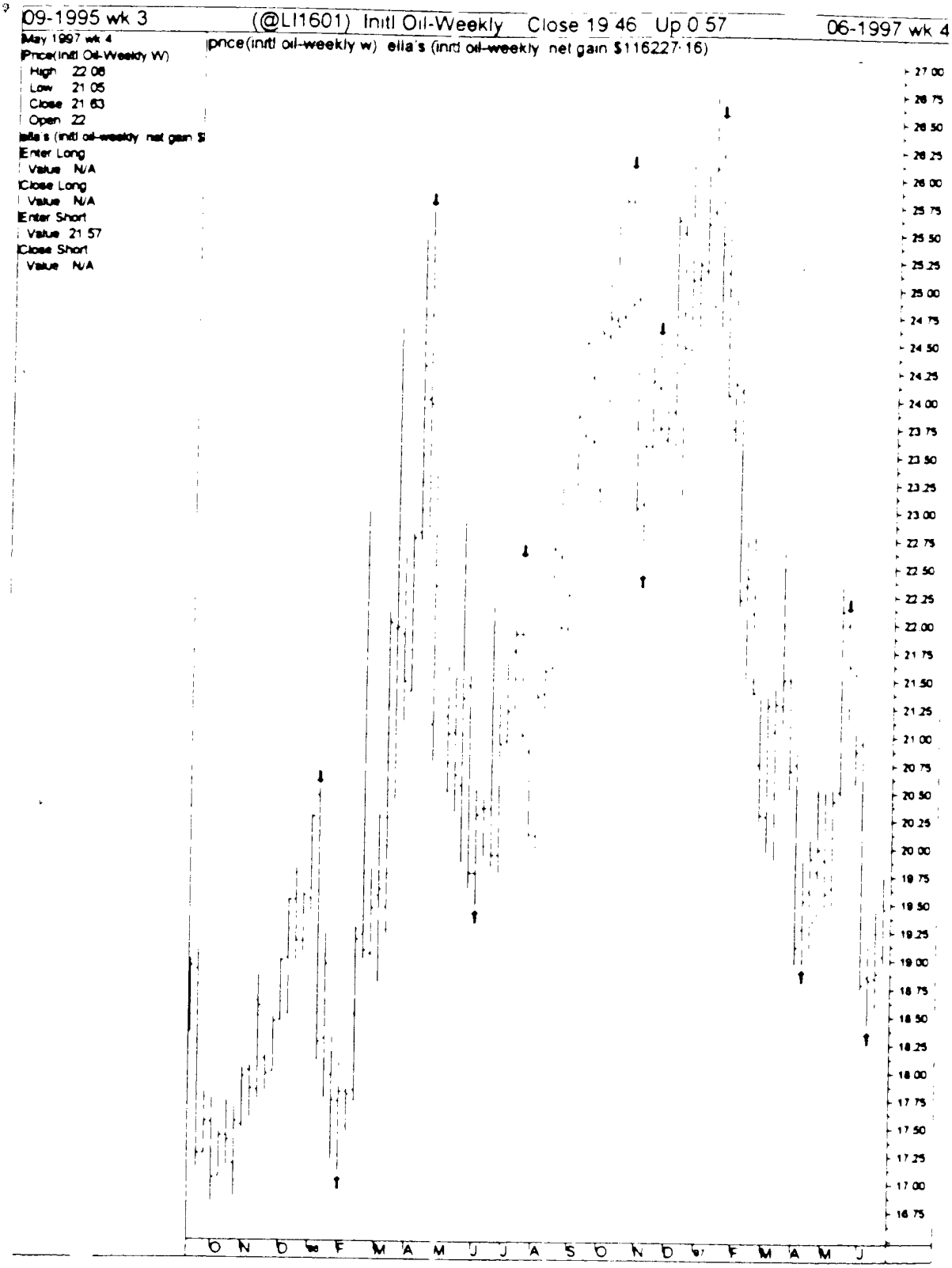
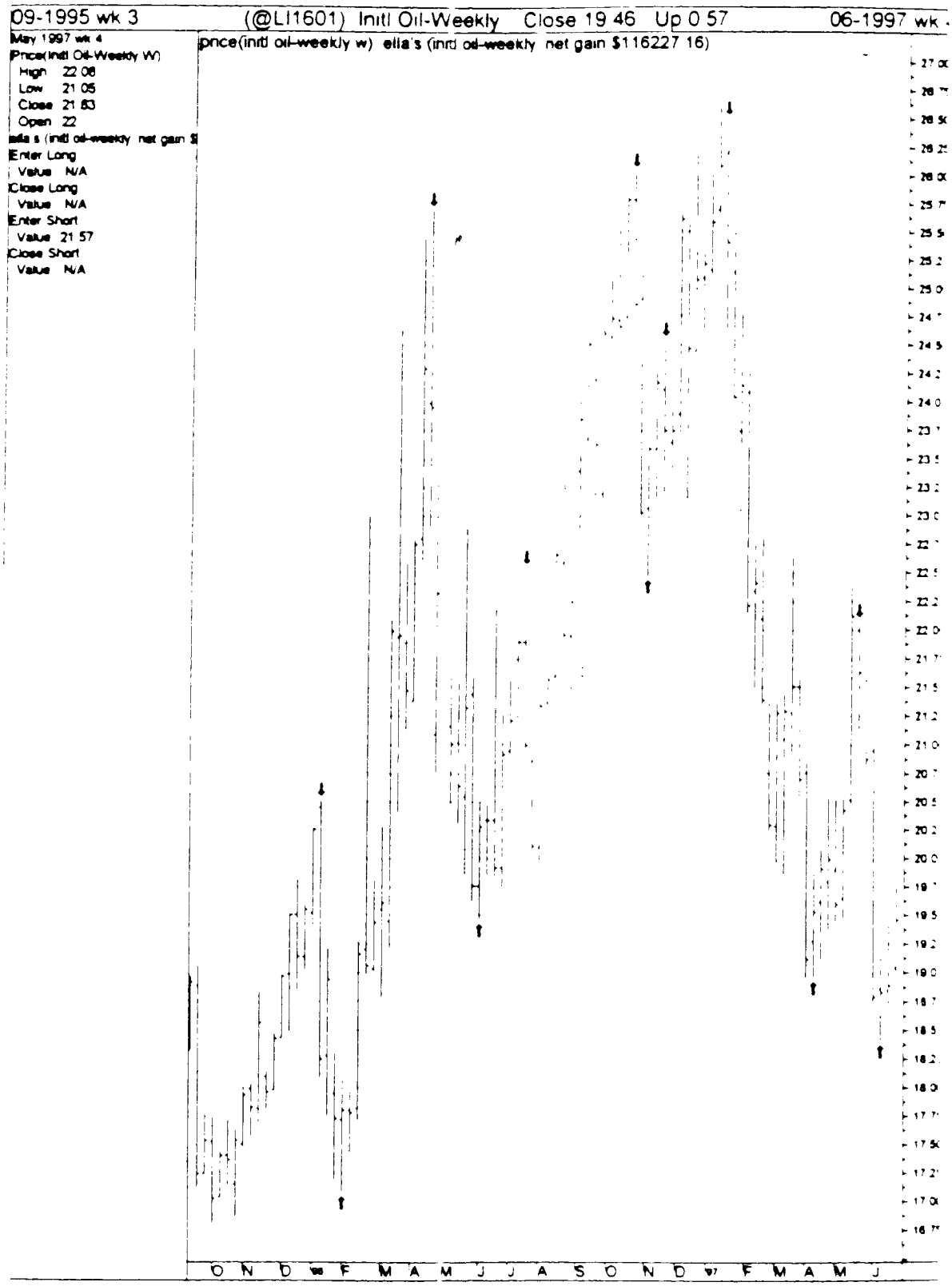


FIGURE 8: Screen print for weekly Crude data (other trades in 1997)



Figures 9, 10, and 11 provide a lot of information about the particularities of each of the trades that have been generated by the system over the period March 31, 1983 - June 27, 1997.

Moving across the columns on a left-to-right fashion, the reader can first see the type of the position adopted in the market (i.e. "Long" for entering into a long position; "LClose" for closing a previously long position; "Short" for entering into a short position; and "SClose" for closing a formerly short position).

The second column lists the date at which the alerting arrows were first displayed on the price plot. The third column gives the prices at which these trades were entered into: this price will always be the opening price on the following trading day.

The fourth column lists the commissions paid: the amount was set to an overly generous $25 / round (i.e. or $50.00 round-turn), in an attempt to replicate the most conservative scenarios possible.

Under the heading "Total Gain", the sixth column displays the monetary value of the gain - or loss - that has been realized from the last time of the last trade. Finally, the last heading, "Equity" lists the value of the money in the account at a certain date, thus displaying the magnitude of the funds that are available for investment during the next up-coming trade.

FIGURE 9: Trade by trade report for weekly Crude data (page 1)

TRADE BY TRADE REPORT FOR
Ella's on Intl Oil-Weekly
From 3/31/1983 to 8/27/1997 beginning with $5000.00
Active Stops Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	12/23/83	$29 59	$25 00				
LClose	01/06/84	$29 08	$25 00	$-93 93	$-135 75	$-135 75	$4864 25
Interest	05/25/84				$51 31	$-84 44	$4915 56
Short	05/25/84	$30 60	$25 00				
SClose	08/03/84	$28 72	$25 00	$-40 98	$250 47	$166 03	$5166 03
Long	08/03/84	$28 72	$25 00				
LClose	08/31/84	$29 03	$25 00	$-25 00	$5 49	$171 52	$5171 52
Short	08/31/84	$29 03	$25 00				
SClose	01/11/85	$26 00	$25 00	$-138 69	$487 17	$658 69	$5658 69
Long	01/11/85	$26 00	$25 00				
LClose	01/18/85	$25 91	$25 00	$-79 17	$-69 50	$589 18	$5589 18
Interest	04/26/85				$41 27	$630 45	$5630 45
Short	04/26/85	$27 84	$25 00				
SClose	07/03/85	$26 77	$25 00	$-25 00	$165 44	$795 89	$5795 89
Long	07/03/85	$26 77	$25 00				
LClose	11/22/85	$30 98	$25 00	$-25 00	$857 56	$1653 46	$6653 46
Short	11/22/85	$30 98	$25 00				
SClose	04/04/86	$13 50	$25 00	$-25 00	$3690 01	$5343 46	$10343 46
Long	04/04/86	$13 50	$25 00				
LClose	04/18/86	$11 80	$25 00	$-1232 64	$-1349 36	$3994 10	$8994 10
Interest	05/23/86				$23 72	$4017 82	$9017 82
Short	05/23/86	$15 43	$25 00				
SClose	08/01/86	$11 75	$25 00	$-25 00	$2094 75	$6112 57	$11112 57
Long	08/01/86	$11 75	$25 00				
LClose	08/08/86	$14 85	$25 00	$-25 00	$2875 23	$8987 80	$13987 80
Interest	01/23/87				$177 05	$9164 85	$14164 85
Short	01/23/87	$18 79	$25 00				
SClose	03/06/87	$18 35	$25 00	$-25 00	$281 11	$9445 96	$14445 96
Long	03/06/87	$18 35	$25 00				
LClose	03/27/87	$18 65	$25 00	$-56 44	$185 76	$9631 73	$14631 73
Interest	07/24/87				$131 18	$9762 91	$14762 91
Short	07/24/87	$20 53	$25 00				
SClose	12/24/87	$16 40	$25 00	$-628 01	$2914 81	$12677 73	$17677 73
Long	12/24/87	$16 40	$25 00				
LClose	12/31/87	$16 90	$25 00	$-25 00	$488 19	$13165 92	$18165 92
Interest	04/22/88				$154 66	$13320 58	$18320 58
Short	04/22/88	$18 38	$25 00				
SClose	11/23/88	$15 50	$25 00	$-25 00	$2816 77	$16137 35	$21137 35
Long	11/23/88	$15 50	$25 00				
LClose	12/09/88	$15 85	$25 00	$-25 00	$426 73	$16564 08	$21564 08
Interest	04/28/89				$227 46	$16791 54	$21791 54
Short	04/28/89	$20 38	$25 00				
SClose	08/04/89	$18 03	$25 00	$-420 17	$2459 88	$19251 42	$24251 42
Long	08/04/89	$18 03	$25 00				
LClose	09/01/89	$18 95	$25 00	$-25 00	$1186 18	$20437 60	$25437 60
Interest	01/26/90				$281 73	$20719 33	$25719 33
Short	01/26/90	$22 48	$25 00				
SClose	07/13/90	$18 75	$25 00	$-642 21	$4213 34	$24932 67	$29932 67
Long	07/13/90	$18 75	$25 00				
LClose	08/31/90	$28 20	$25 00	$-25 00	$15023 46	$39956 13	$44956 13
Short	08/31/90	$28 20	$25 00				
SClose	09/07/90	$28 55	$25 00	$-2956 68	$-607 65	$39348 48	$44348 48
Long	09/07/90	$28 55	$25 00				
LClose	09/28/90	$38 30	$25 00	$-25 00	$15086 74	$54435 21	$59435 21
Interest	10/19/90				$94 04	$54529 25	$59529 25
Short	10/19/90	$30 45	$25 00				
MLStop	10/26/90	$34 40	$25 00	$-5027 65	$-7768 95	$46760 30	$51760 30
Interest	11/23/90				$109 19	$46869 50	$51869 50

*** Continued on Next Page ***

FIGURE 10: Trade by trade report for weekly Crude data (page 2)

TRADE BY TRADE REPORT FOR
Ella's on Intl Oil-Weekly
From 3/31/1983 to 8/27/1997 beginning with $5000.00
Active Stops Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	11/23/90	$33.70	$25.00				
LClose	11/30/90	$29.15	$25.00	$-7486.00	$-7049.77	$39819.72	$44819.72
Short	11/30/90	$29.15	$25.00				
SClose	01/11/91	$31.00	$25.00	$-25.00	$-2892.89	$36926.83	$41926.83
Long	01/11/91	$31.00	$25.00				
LClose	01/18/91	$20.60	$25.00	$-15907.15	$-14107.39	$22819.45	$27819.45
Short	01/18/91	$20.60	$25.00				
SClose	01/25/91	$21.00	$25.00	$-1036.93	$-589.70	$22229.75	$27229.75
Long	01/25/91	$21.00	$25.00				
LClose	02/15/91	$20.45	$25.00	$-180.46	$-762.50	$21467.25	$26467.25
Short	02/15/91	$20.45	$25.00				
SClose	03/01/91	$19.65	$25.00	$-25.00	$984.42	$22451.66	$27451.66
Long	03/01/91	$19.65	$25.00				
LClose	03/08/91	$18.81	$25.00	$-499.56	$-1222.44	$21229.22	$26229.22
Interest	10/25/91				$456.50	$21685.72	$26685.72
Short	10/25/91	$22.98	$25.00				
SClose	01/17/92	$19.10	$25.00	$-999.54	$4451.46	$26137.18	$31137.18
Long	01/17/92	$19.10	$25.00				
LClose	01/31/92	$18.95	$25.00	$-350.78	$-294.33	$25842.85	$30842.85
Interest	06/12/92				$309.06	$26151.91	$31151.91
Short	06/12/92	$22.25	$25.00				
SClose	01/29/93	$20.40	$25.00	$-290.80	$2538.08	$28689.99	$33689.99
Long	01/29/93	$20.40	$25.00				
LClose	02/05/93	$20.13	$25.00	$-338.55	$-495.57	$28194.43	$33194.43
Interest	03/12/93				$87.53	$28281.96	$33281.96
Short	03/12/93	$20.51	$25.00				
SClose	12/23/93	$14.58	$25.00	$-252.01	$9565.49	$37847.45	$42847.45
Long	12/23/93	$14.58	$25.00				
LClose	12/30/93	$14.19	$25.00	$-1229.20	$-1195.46	$36652.00	$41652.00
Interest	06/24/94				$552.32	$37204.31	$42204.31
Short	06/24/94	$19.31	$25.00				
SClose	12/23/94	$17.32	$25.00	$-2187.48	$4296.81	$41501.12	$46501.12
Long	12/23/94	$17.32	$25.00				
LClose	01/06/95	$17.67	$25.00	$-25.00	$889.18	$42390.30	$47390.30
Interest	04/28/95				$399.90	$42790.20	$47790.20
Short	04/28/95	$20.49	$25.00				
SClose	07/28/95	$17.42	$25.00	$-25.00	$7106.62	$49896.82	$54896.82
Long	07/28/95	$17.42	$25.00				
LClose	08/11/95	$17.81	$25.00	$-25.00	$1178.47	$51075.29	$56075.29
Interest	01/12/96				$650.63	$51725.92	$56725.92
Short	01/12/96	$18.28	$25.00				
SClose	02/02/96	$17.80	$25.00	$-2072.19	$1438.87	$53164.79	$58164.79
Long	02/02/96	$17.80	$25.00				
LClose	04/19/96	$21.09	$25.00	$-90.32	$10696.07	$63860.86	$68860.86
Short	04/19/96	$21.09	$25.00				
SClose	06/07/96	$20.34	$25.00	$-4039.61	$2397.93	$66258.79	$71258.79
Long	06/07/96	$20.34	$25.00				
LClose	07/19/96	$20.86	$25.00	$-1495.50	$1771.12	$68029.91	$73029.91
Interest	10/25/96				$539.22	$68569.13	$73569.13
Short	10/25/96	$24.91	$25.00				
SClose	11/08/96	$23.59	$25.00	$-25.00	$3847.15	$72416.28	$77416.28
Long	11/08/96	$23.59	$25.00				
LClose	11/22/96	$23.65	$25.00	$-25.00	$146.84	$72563.12	$77563.12
Interest	01/17/97				$327.25	$72890.37	$77890.37
Short	01/17/97	$25.15	$25.00				
SClose	04/11/97	$19.62	$25.00	$-25.00	$17071.09	$89961.46	$94961.46
Long	04/11/97	$19.62	$25.00				
LClose	05/23/97	$21.57	$25.00	$-121.78	$9385.57	$99347.03	$104347.03
Short	05/23/97	$21.57	$25.00				

*** Continued on Next Page ***

FIGURE 11: Trade by trade report for weekly Crude data (page 3)

TRADE BY TRADE REPORT FOR:
Ella's on Intl Oil-Weekly
From 3/31/1983 to 6/27/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
SClose	06/13/97	$18 85	$25 00	$-25 00	$13105 12	$112452 15	$117452 15
Long	06/13/97	$18 85	$25 00				
Current	06/27/97	$19 46	$0 00	$-25 00	$3775 02	$116227 16	$121227 16

*** End Of Report ***

Figure 12 displays a "Systems Test Performance Report" for Light Sweet Crude, for the period March 31, 1983 to June 27, 1997. This report outlines several important points regarding the performance of the trading system:

- The annualized rate of return = 163.10% (i.e. 158.94% when the best and worst trades are not taken into account)
- The average gain per trade = 7.13%

- A total number of 51 trades have been generated
- The break-down of winning : losing trades stands at 37 : 14
- 72.55% of trades were winning in nature (i.e. somewhat higher than the 50% advocated by The Efficient Market Hypothesis)

FIGURE 12: Systems test performance report on weekly Crude data

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Intl Oil-Weekly
From 3/31/1983 to 6/27/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is LONG @ 18.85, entered on 6/13/1997 gain/loss $3775.02

SUMMARY

Total Net Profit:	$116227.16	Average trade gain/loss ($):	$2278.96
Total percentage gain/loss:	2324.54%	Average trade gain/loss (%):	7.13%
Annualized rate of return:	163.10%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$113263.46	Average trade gain/loss ($):	$2311.50
Total percentage gain/loss:	2265.27%	Average trade gain/loss (%):	7.66%
Annualized rate of return:	158.94%		

TRADE STATISTICS

Total no. of trades:	51	Percentage profitable trades:	72.55%
No. Profitable Trades:	37	No. Losing Trades:	14
Amount of profitable trades:	$150154.41	Amount of losing trades:	$-38541.26
Largest profitable trade:	$17071.09	Largest losing trade:	$-14107.39
Average profitable trade:	$4058.23	Average losing trade:	$-2752.95
No. of stop hits:	1	Average gain/loss per stop:	$-7768.95

LONG/SHORT BREAKDOWN

Number of Long trades:	26	Number of Short trades:	25
No. profitable Long trades:	16	No. profitable Short trades:	21
Average Long gain/loss:	$1434.44	Average Short gain/loss:	$2972.70

TRADE DURATIONS

Total no. periods in test:	744	Number of days in test:	5202
Most consecutive wins:	14	Most consecutive losses:	6
Amt. of consecutive wins:	$77105.85	Amt. of consecutive losses:	$-33171.20

RISK & EXPENSE

Max. equity drop (open):	$ -135.75	Max. equity drop (closed):	$ -135.75
Max. trade drawdown:	$ -15907.15	Average trade drawdown:	$ -989.57
Commissions expenses:	$ 2525.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$4614.01	Profit Factor:	3.90
Ratio Avg. Profit/Avg. Loss:	1.47	Ratio Profit/Commissions:	46.03

All previously-considered trades were based on weekly data on the Light Sweet Crude. To add further detail into how the trading system performs, a similar study was performed on daily data for Crude Oil, using a time period spanning January 1991 - February 1997 (i.e. approximately 6 years of daily data).

In an attempt to appeal to both overly-active and overly-passive traders, two scenarios were drawn. The first case - portrayed in Figures 13, 14, 15, 16, and 17 - assigns a small value to "z", and, for this sole reason, is guaranteed to generate a relatively large number of buy / sell signals.

FIGURE 13: System test performance report on daily Crude data for an active strategy

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is CLOSED

SUMMARY

Total Net Profit:	$144546.59	Average trade gain/loss ($)	$1853.16
Total percentage gain/loss:	2890.93%	Average trade gain/loss (%)	4.50%
Annualized rate of return:	567.92%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$136365.51	Average trade gain/loss ($)	$1794.28
Total percentage gain/loss:	2727.31%	Average trade gain/loss (%)	4.53%
Annualized rate of return:	535.77%		

TRADE STATISTICS

Total no. of trades:	78	Percentage profitable trades:	80.77%
No. Profitable Trades:	63	No. Losing Trades:	15
Amount of profitable trades:	$150699.70	Amount of losing trades:	$-7597.53
Largest profitable trade:	$10743.54	Largest losing trade:	$-2562.45
Average profitable trade:	$2392.06	Average losing trade:	$-506.50
No. of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	39	Number of Short trades:	39
No. profitable Long trades:	27	No. profitable Short trades:	36
Average Long gain/loss:	$1718.16	Average Short gain/loss:	$1951.13

TRADE DURATIONS

Total no. periods in test:	1329	Number of days in test:	1858
Most consecutive wins:	14	Most consecutive losses:	1
Amt. of consecutive wins:	$59493.04	Amt. of consecutive losses:	$-72.06

RISK & EXPENSE

Max. equity drop (open):	$ -25.00	Max. equity drop (closed):	$ 118.09
Max. trade drawdown:	$ -4997.05	Average trade drawdown:	$ -240.98
Commissions expenses:	$ 3900.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$1444.43	Profit Factor:	19.84
Ratio Avg. Profit/Avg. Loss:	4.72	Ratio Profit/Commissions:	37.06

FIGURE 14: Trade by trade report for an active strategy on daily Crude data (page 1)

TRADE BY TRADE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Short	02/10/92	$19 68	$25 00				
SClose	02/19/92	$18 73	$25 00	$-25 00	$190 16	$190 16	$5190 16
Long	02/19/92	$18 73	$25 00				
LClose	02/20/92	$18 65	$25 00	$-25 00	$-72 06	$118 09	$5118 09
Interest	05/05/92				$28 92	$147 01	$5147 01
Short	05/05/92	$20 84	$25 00				
SClose	05/20/92	$20 57	$25 00	$-64 32	$16 36	$163 38	$5163 38
Long	05/20/92	$20 57	$25 00				
LClose	05/22/92	$21 50	$25 00	$-25 00	$182 31	$345 69	$5345 69
Interest	06/25/92				$13 69	$359 38	$5359 38
Short	06/25/92	$22 65	$25 00				
SClose	08/12/92	$21 25	$25 00	$-25 00	$279 72	$639 10	$5639 10
Long	08/12/92	$21 25	$25 00				
LClose	08/14/92	$21 27	$25 00	$-25 00	$-44 72	$594 39	$5594 39
Interest	09/17/92				$14 33	$608 72	$5608 72
Short	09/17/92	$22 17	$25 00				
SClose	12/09/92	$18 97	$25 00	$-75 37	$755 95	$1364 67	$6364 67
Long	12/09/92	$18 97	$25 00				
LClose	12/11/92	$18 97	$25 00	$-25 00	$-50 00	$1314 67	$6314 67
Interest	12/22/92				$5 23	$1319 90	$6319 90
Short	12/22/92	$19 90	$25 00				
SClose	01/13/93	$18 59	$25 00	$-40 82	$364 39	$1684 29	$6684 29
Long	01/13/93	$18 59	$25 00				
LClose	01/29/93	$20 40	$25 00	$-57 24	$598 38	$2282 66	$7282 66
Short	01/29/93	$20 40	$25 00				
SClose	02/18/93	$19 52	$25 00	$-25 00	$263 08	$2545 74	$7545 74
Long	02/18/93	$19 52	$25 00				
LClose	03/05/93	$20 80	$25 00	$-25 00	$443 16	$2988 90	$7988 90
Short	03/05/93	$20 80	$25 00				
SClose	05/20/93	$19 80	$25 00	$-25 00	$332 88	$3321 78	$8321 78
Long	05/20/93	$19 80	$25 00				
LClose	06/02/93	$20 03	$25 00	$-58 52	$46 38	$3368 16	$8368 16
Short	06/02/93	$20 03	$25 00				
SClose	07/21/93	$18 00	$25 00	$-25 00	$795 56	$4163 72	$9163 72
Long	07/21/93	$18 00	$25 00				
LClose	07/22/93	$17 72	$25 00	$-212 85	$-192 16	$3971 56	$8971 56
Interest	07/28/93				$4 06	$3975 62	$8975 62
Short	07/28/93	$18 20	$25 00				
SClose	08/09/93	$17 63	$25 00	$-25 00	$230 32	$4205 94	$9205 94
Long	08/09/93	$17 63	$25 00				
LClose	08/10/93	$17 53	$25 00	$-82 28	$-102 08	$4103 86	$9103 86
Interest	08/30/93				$13 72	$4117 58	$9117 58
Short	08/30/93	$18 73	$25 00				
SClose	09/13/93	$16 95	$25 00	$-25 00	$814 11	$4931 69	$9931 69
Long	09/13/93	$16 95	$25 00				
LClose	09/16/93	$16 83	$25 00	$-95 14	$-120 14	$4811 56	$9811 56
Interest	10/01/93				$11 09	$4822 64	$9822 64
Short	10/01/93	$18 76	$25 00				
SClose	12/20/93	$14 40	$25 00	$-30 22	$2227 06	$7049 71	$12049 71
Long	12/20/93	$14 40	$25 00				
LClose	12/21/93	$14 40	$25 00	$-58 40	$-50 00	$6999 71	$11999 71
Interest	01/07/94				$15 37	$7015 08	$12015 08
Short	01/07/94	$15 40	$25 00				
SClose	01/13/94	$14 53	$25 00	$-25 00	$627 36	$7642 44	$12642 44
Long	01/13/94	$14 53	$25 00				
LClose	01/14/94	$14 78	$25 00	$-25 00	$167 09	$7809 53	$12809 53
Interest	02/03/94				$19 30	$7828 84	$12828 84
Short	02/03/94	$15 94	$25 00				

*** Continued on Next Page ***

FIGURE 15: Trade by trade report for an active strategy on daily Crude data (page 2)

TRADE BY TRADE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
SClose	02/17/94	$14 27	$25 00	$-25 00	$1291 43	$9120 26	$14120 26
Long	02/17/94	$14 27	$25 00				
LClose	02/18/94	$14 20	$25 00	$-84 27	$-119 14	$9001 12	$14001 12
Interest	03/22/94				$33 76	$9034 88	$14034 88
Short	03/22/94	$15 16	$25 00				
SClose	03/29/94	$14 40	$25 00	$-25.00	$652 34	$9687 22	$14687 22
Long	03/29/94	$14 40	$25 00				
LClose	03/30/94	$14 36	$25 00	$-45 36	$-90 73	$9596 49	$14596 49
Interest	05/23/94				$59 39	$9655 88	$14655 87
Short	05/23/94	$18 01	$25 00				
SClose	05/26/94	$17 74	$25 00	$-25 00	$169 34	$9825 22	$14825 22
Long	05/26/94	$17 74	$25 00				
LClose	06/21/94	$19 35	$25 00	$-25 00	$1293 20	$11118 42	$16118 42
Short	06/21/94	$19 35	$25 00				
SClose	06/30/94	$19 33	$25 00	$-83.22	$-33 37	$11085 05	$16085 05
Long	06/30/94	$19 33	$25 00				
LClose	07/13/94	$20 12	$25 00	$-199 47	$606 36	$11691 41	$16691 41
Short	07/13/94	$20 12	$25 00				
SClose	07/21/94	$19 38	$25 00	$-74 70	$562 98	$12254 39	$17254 39
Long	07/21/94	$19 38	$25 00				
LClose	08/02/94	$20 18	$25 00	$-176 14	$661 22	$12915 62	$17915 62
Short	08/02/94	$20 18	$25 00				
SClose	09/16/94	$16 83	$25 00	$-25 00	$2919 95	$15835 56	$20835 56
Long	09/16/94	$16 83	$25 00				
LClose	09/23/94	$17 84	$25 00	$-25.00	$1198 88	$17034 45	$22034 45
Interest	10/03/94				$16 60	$17051 05	$22051 05
Short	10/03/94	$18 17	$25 00				
SClose	10/17/94	$17 06	$25 00	$-134 10	$1295 57	$18346 61	$23346 61
Long	10/17/94	$17 06	$25 00				
LClose	11/03/94	$18 93	$25 00	$-25 00	$2506 36	$20852 97	$25852 97
Short	11/03/94	$18 93	$25 00				
SClose	12/16/94	$16 93	$25 00	$-25 00	$2678 79	$23531 76	$28531 76
Long	12/16/94	$16 93	$25 00				
LClose	12/19/94	$16 88	$25 00	$-58 68	$-134 19	$23397 56	$28397 56
Interest	02/21/95				$136 93	$23534 50	$28534 50
Short	02/21/95	$18 65	$25 00				
SClose	03/13/95	$18 18	$25 00	$-86 15	$668 47	$24202 96	$29202 96
Long	03/13/95	$18 18	$25 00				
LClose	03/14/95	$18 11	$25 00	$-410 19	$-162 35	$24040 62	$29040 62
Interest	04/21/95				$83 14	$24123 76	$29123 76
Short	04/21/95	$20 41	$25 00				
SClose	07/24/95	$16 88	$25 00	$-153.31	$4982 76	$29106 52	$34106 52
Long	07/24/95	$16 88	$25 00				
LClose	07/26/95	$17 48	$25 00	$-25 00	$1161 43	$30267 95	$35267 95
Interest	09/20/95				$148 80	$30416 75	$35416 75
Short	09/20/95	$18 05	$25 00				
SClose	10/06/95	$17 04	$25 00	$-25 00	$1930 37	$32347 12	$37347 12
Long	10/06/95	$17 04	$25 00				
LClose	10/09/95	$17 32	$25 00	$-25.00	$563 27	$32910 39	$37910 39
Interest	01/09/96				$262 78	$33173 17	$38173 17
Short	01/09/96	$19 94	$25 00				
SClose	01/17/96	$18 52	$25 00	$-25 00	$2666 67	$35839 84	$40839 84
Long	01/17/96	$18 52	$25 00				
LClose	01/19/96	$18 66	$25 00	$-25 00	$258 54	$36098 37	$41098 37
Short	01/19/96	$18 66	$25 00				
SClose	01/30/96	$17 56	$25 00	$-25.00	$2371 26	$38469 63	$43469 63
Long	01/30/96	$17 56	$25 00				
LClose	02/21/96	$19 70	$25 00	$-74 48	$5244 51	$43714 14	$48714 14
Short	02/21/96	$19 70	$25 00				

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FIGURE 16: Trade by trade report for an active strategy on daily Crude data (page 3)

TRADE BY TRADE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
SClose	02/26/96	$19 42	$25 00	$-395 73	$642 03	$44356 17	$49356 17
Long	02/26/96	$19 42	$25 00				
LClose	03/20/96	$20 90	$25 00	$-583 85	$3709 53	$48065 70	$53065 70
Short	03/20/96	$20 90	$25 00				
SClose	03/22/96	$21 89	$25 00	$-2689 73	$-2562 45	$45503 25	$50503 25
Long	03/22/96	$21 89	$25 00				
LClose	03/25/96	$22 20	$25 00	$-25 00	$684 86	$46168 11	$51168 11
Interest	04/12/96				$69 39	$46237 50	$51237 50
Short	04/12/96	$23 99	$25 00				
SClose	05/20/96	$22 45	$25 00	$-2309 18	$3237 50	$49475 00	$54475 00
Long	05/20/96	$22 45	$25 00				
LClose	05/22/96	$21 43	$25 00	$-4997 05	$-2523 90	$46951 10	$51951 10
Short	05/22/96	$21 43	$25 00				
SClose	06/06/96	$20 02	$25 00	$-25 00	$3366 51	$50317 61	$55317 61
Long	06/06/96	$20 02	$25 00				
LClose	06/18/96	$21 37	$25 00	$-52 62	$3678 52	$53996 13	$58996 13
Short	06/18/96	$21 37	$25 00				
SClose	06/24/96	$19 98	$25 00	$-25 00	$3785 75	$57781 88	$62781 88
Long	06/24/96	$19 98	$25 00				
LClose	06/26/96	$20 64	$25 00	$-87 82	$2023 05	$59804 93	$64804 93
Interest	07/16/96				$97 65	$59902 59	$64902 58
Short	07/16/96	$22 38	$25 00				
SClose	07/29/96	$20 28	$25 00	$-25 00	$6037 70	$65940 29	$70940 29
Long	07/29/96	$20 28	$25 00				
LClose	08/20/96	$22 08	$25 00	$-25 00	$6244 25	$72184 54	$77184 54
Short	08/20/96	$22 08	$25 00				
SClose	08/28/96	$21 74	$25 00	$-793 80	$1138 15	$73322 69	$78322 69
Long	08/28/96	$21 74	$25 00				
LClose	09/13/96	$24 20	$25 00	$-25 00	$8809 81	$82132 50	$87132 50
Short	09/13/96	$24 20	$25 00				
SClose	09/17/96	$23 31	$25 00	$-25 00	$3153 55	$85286 05	$90286 05
Long	09/17/96	$23 31	$25 00				
LClose	09/18/96	$23 85	$25 00	$-25 00	$2040 99	$87327 04	$92327 04
Interest	10/09/96				$146 08	$87473 12	$92473 12
Short	10/09/96	$25 04	$25 00				
SClose	10/11/96	$24 75	$25 00	$-25 00	$1020 69	$88493 80	$93493 80
Long	10/11/96	$24 75	$25 00				
LClose	10/14/96	$25 57	$25 00	$-25 00	$3046 74	$91540 55	$96540 55
Interest	10/22/96				$58 19	$91598 74	$96598 74
Short	10/22/96	$25 50	$25 00				
SClose	11/06/96	$22 65	$25 00	$-25 00	$10743 54	$102342 27	$107342 27
Long	11/06/96	$22 65	$25 00				
LClose	11/08/96	$23 59	$25 00	$-25 00	$4403 79	$106746 06	$111746 06
Interest	11/20/96				$101 03	$106847 09	$111847 09
Short	11/20/96	$23 40	$25 00				
SClose	11/26/96	$23 67	$25 00	$-2127 64	$-1340 26	$105506 84	$110506 84
Long	11/26/96	$23 67	$25 00				
LClose	12/09/96	$25 24	$25 00	$-25 00	$7278 12	$112784 95	$117784 95
Short	12/09/96	$25 24	$25 00				
SClose	12/12/96	$23 72	$25 00	$-25 00	$7041 73	$119826 68	$124826 68
Long	12/12/96	$23 72	$25 00				
LClose	12/19/96	$25 35	$25 00	$-25 00	$8526 16	$128352 84	$133352 84
Short	12/19/96	$25 35	$25 00				
SClose	12/24/96	$25 15	$25 00	$-25 00	$1001 91	$129354 75	$134354 75
Long	12/24/96	$25 15	$25 00				
LClose	12/31/96	$25 88	$25 00	$-1253 46	$3849 03	$133203 78	$138203 78
Interest	01/09/97				$93 71	$133297 50	$138297 49
Short	01/09/97	$26 32	$25 00				
SClose	01/29/97	$24 45	$25 00	$-25 00	$9774 07	$143071 56	$148071 56

*** Continued on Next Page ***

FIGURE 17: Trade by trade report for an active strategy on daily Crude data (page 4)

TRADE BY TRADE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	01/29/97	$24 45	$25 00				
LClose	01/30/97	$24 70	$25 00	$-25 00	$1463 77	$144535 33	$149535 33
Interest	01/31/97				$11 27	$144546 59	$149546 59

*** End Of Report ***

The second case - portrayed in Figures 18, 19, and 20 - assigns a large value to "z", and, consequently, will surely generate a relatively smaller of buy / sell signals.

When comparing the "System Performance Reports" for the two scenarios (i.e. Figures 13 and 18), the following conclusions emerge:

- The active system (i.e. Figure 13) generated a total of 78 trades, out of which 80.77% were profitable transactions, on an after-commissions basis
- The passive system (i.e. Figure 18) generated a total of 33 trades, out of which 78.79% were profitable transactions, on an after-commissions basis
- From the above information, it seems that - regardless of the trading style one would prefer to adopt - about the same proportion of trades entered into would result in some gain, a fact that attests somewhat to the consistency with which this particular trading model pin-points the optimal points at which a given transaction should be implemented.
- Moreover, the above result is perfectly consistent with the 72.55% profitability ratio that was obtained when the study was carried out on 14 years of weekly data (i.e. as presented in Figure 12).

FIGURE 18: System test performance report for a passive strategy on daily Crude data

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is CLOSED

SUMMARY

Total Net Profit:	$23165.84	Average trade gain/loss ($):	$702.00
Total percentage gain/loss:	463.32%	Average trade gain/loss (%):	5.38%
Annualized rate of return:	91.02%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$21637.04	Average trade gain/loss ($):	$697.97
Total percentage gain/loss:	432.74%	Average trade gain/loss (%):	5.54%
Annualized rate of return:	85.01%		

TRADE STATISTICS

Total no. of trades:	33	Percentage profitable trades:	78.79%
No. Profitable Trades:	26	No. Losing Trades:	7
Amount of profitable trades:	$24166.17	Amount of losing trades:	$-1680.72
Largest profitable trade:	$2263.89	Largest losing trade:	$-735.09
Average profitable trade:	$929.47	Average losing trade:	$-240.10
No. of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	17	Number of Short trades:	16
No. profitable Long trades:	11	No. profitable Short trades:	15
Average Long gain/loss:	$287.85	Average Short gain/loss:	$1099.50

TRADE DURATIONS

Total no. periods in test:	1329	Number of days in test:	1858
Most consecutive wins:	12	Most consecutive losses:	1
Amt. of consecutive wins:	$13887.55	Amt. of consecutive losses:	$-4.51

RISK & EXPENSE

Max. equity drop (open):	$ -25.00	Max. equity drop (closed):	$ -4.51
Max. trade drawdown:	$ -1370.32	Average trade drawdown:	$ -127.04
Commissions expenses:	$ 1650.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$680.39	Profit Factor:	14.38
Ratio Avg. Profit/Avg. Loss:	3.87	Ratio Profit/Commissions:	14.04

FIGURE 19: Trade by trade report for a passive strategy on daily Crude data (page 1)

TRADE BY TRADE REPORT FOR.
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	01/13/93	$18 59	$25 00				
LClose	01/14/93	$18 76	$25 00	$-25 00	$-4 51	$-4 51	$4995 49
Interest	03/05/93				$18 82	$14 31	$5014 31
Short	03/05/93	$20 80	$25 00				
SClose	09/13/93	$16 95	$25 00	$-25 00	$873 50	$887 82	$5887 82
Long	09/13/93	$16 95	$25 00				
LClose	09/16/93	$16 83	$25 00	$-66 51	$-91 51	$796 31	$5796 31
Interest	10/01/93				$6 55	$802 86	$5802 86
Short	10/01/93	$18 76	$25 00				
SClose	12/20/93	$14 40	$25 00	$-28 08	$1292 83	$2095 69	$7095 69
Long	12/20/93	$14 40	$25 00				
LClose	12/21/93	$14 40	$25 00	$-44 64	$-50 00	$2045 69	$7045 69
Interest	02/03/94				$23 36	$2069 04	$7069 04
Short	02/03/94	$15 94	$25 00				
SClose	02/17/94	$14 27	$25 00	$-25 00	$687 99	$2757 03	$7757 03
Long	02/17/94	$14 27	$25 00				
LClose	02/23/94	$14 36	$25 00	$-57 51	$-1 23	$2755 80	$7755 80
Interest	06/21/94				$68 95	$2824 75	$7824 75
Short	06/21/94	$19 35	$25 00				
SClose	09/16/94	$16 83	$25 00	$-508 70	$965 78	$3790 53	$8790 53
Long	09/16/94	$16 83	$25 00				
LClose	09/19/94	$17 18	$25 00	$-25 00	$132 29	$3922 82	$8922 82
Interest	11/03/94				$30 25	$3953 08	$8953 08
Short	11/03/94	$18 93	$25 00				
SClose	12/16/94	$16 93	$25 00	$-25 00	$893 27	$4846 35	$9846 35
Long	12/16/94	$16 93	$25 00				
LClose	12/19/94	$16 88	$25 00	$-36 60	$-79 01	$4767 34	$9767 34
Interest	04/21/95				$90 52	$4857 86	$9857 86
Short	04/21/95	$20 41	$25 00				
SClose	07/24/95	$16 88	$25 00	$-68 36	$1650 64	$6508 49	$11508 49
Long	07/24/95	$16 88	$25 00				
LClose	07/26/95	$17 48	$25 00	$-25 00	$358 18	$6866 67	$11866 67
Interest	09/20/95				$50 07	$6916 74	$11916 74
Short	09/20/95	$18 05	$25 00				
SClose	10/06/95	$17 04	$25 00	$-25 00	$615 41	$7532 15	$12532 15
Long	10/06/95	$17 04	$25 00				
LClose	10/10/95	$17 43	$25 00	$-25 00	$236 25	$7768 41	$12768 41
Interest	01/09/96				$87 54	$7855 95	$12855 95
Short	01/09/96	$19 94	$25 00				
SClose	01/30/96	$17 56	$25 00	$-25 00	$1481 48	$9337 43	$14337 43
Long	01/30/96	$17 56	$25 00				
LClose	02/07/96	$17 75	$25 00	$-41 30	$104 86	$9442 29	$14442 29
Interest	03/20/96				$45 70	$9487 99	$14487 99
Short	03/20/96	$20 90	$25 00				
SClose	03/22/96	$21 89	$25 00	$-751 61	$-735 09	$8752 90	$13752 90
Long	03/22/96	$21 89	$25 00				
LClose	03/25/96	$22 20	$25 00	$-25 00	$144 41	$8897 31	$13897 31
Interest	04/12/96				$18 85	$8916 16	$13916 16
Short	04/12/96	$23 99	$25 00				
SClose	05/20/96	$22 45	$25 00	$-644 57	$841 72	$9757 88	$14757 88
Long	05/20/96	$22 45	$25 00				
LClose	05/22/96	$21 43	$25 00	$-1370 12	$-719 38	$9038 50	$14038 50
Short	05/22/96	$21 43	$25 00				
SClose	06/06/96	$20 02	$25 00	$-25 00	$872 03	$9910 53	$14910 53
Long	06/06/96	$20 02	$25 00				
LClose	06/18/96	$21 37	$25 00	$-32 43	$953 77	$10864 30	$15864 30
Short	06/18/96	$21 37	$25 00				
SClose	06/24/96	$19 98	$25 00	$-25 00	$980 26	$11844 56	$16844 56

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FIGURE 20: Trade by trade report for a passive strategy on daily Crude data (page 2)

TRADE BY TRADE REPORT FOR:
Ella's on Light Sweet Crude '92-'96
From 12/31/1991 to 1/31/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	06/24/96	$19 98	$25 00				
LClose	07/16/96	$22 38	$25 00	$-41 84	$1970 37	$13814 92	$18814 92
Short	07/16/96	$22 38	$25 00				
SClose	07/29/96	$20 28	$25 00	$-25 00	$1713 13	$15528 05	$20528 05
Long	07/29/96	$20 28	$25 00				
LClose	07/31/96	$20 40	$25 00	$-25 00	$71 32	$15599 37	$20599 37
Interest	10/22/96				$128 82	$15728 19	$20728 19
Short	10/22/96	$25 50	$25 00				
SClose	11/06/96	$22 65	$25 00	$-25 00	$2263 89	$17992 07	$22992 07
Long	11/06/96	$22 65	$25 00				
LClose	11/08/96	$23 59	$25 00	$-25 00	$903 16	$18895 23	$23895 23
Interest	12/09/96				$55 81	$18951 04	$23951 04
Short	12/09/96	$25 24	$25 00				
SClose	12/12/96	$23 72	$25 00	$-25 00	$1390 87	$20341 92	$25341 92
Long	12/12/96	$23 72	$25 00				
LClose	12/13/96	$24 45	$25 00	$-25 00	$729 15	$21071 06	$26071 06
Interest	01/09/97				$53 03	$21124 10	$26124 10
Short	01/09/97	$26 32	$25 00				
SClose	01/29/97	$24 45	$25 00	$-25 00	$1804 30	$22928 40	$27928 40
Long	01/29/97	$24 45	$25 00				
LClose	01/30/97	$24 70	$25 00	$-25 00	$235 31	$23163 71	$28163 71
Interest	01/31/97				$2 12	$23165 84	$28165 84

*** End Of Report ***

- The annualized rate of return for the active-trading scenario (i.e. Figure 13) is 535.92%
- The annualized rate of return for the passive-trading scenario (i.e. Figure 18) is a more modest 85.01%
- The large difference between the above-quoted percentages Is totally attributed to the fact that the active scenario generated more than twice as many trades as the passive scenario (i.e. out of which about 70% were profitable).

- Since dwelling for too long on the annualized rates of return can be quite a quite deceiving and futile activity, due to the difference in the frequency of trading has been adopted in the two cases under consideration, a more accurate conclusion can be reached when one consults the Average % Gain - or Loss - per trade.

- The active scenario resulted in a 4.53% profit per trade, on average (i.e. Figure 13). The passive scenario resulted in a 5.54% profit per trade, on average (i.e. Figure 18).
- The difference among the two cases is extremely small, and most likely attributable to purely circumstantial causes. Moreover, these two results are perfectly in line with the 7.66% average profit per trade that has been documented in Figure 12, when the 14 years of weekly data were used. Even the range that currently exists between the 5.54% documented on Figure 18 and the 7.66% displayed on Figure 12 can be completely attributed to pure circumstance.

X. ADDITIONAL EXPLANATIONS REGARDING THE SYSTEM'S PERFORMANCE

The technical analysis-based indicator which was being described in this thesis attempts to come as an improvement on a battery of already-existing and well-known indicators: the Stochastic, the RSI, the MACD, and the Momentum.

Each of the above-mentioned indicators - due to their design - have instances during which they fail to generate accurate buy and sell signals. The Stochastic, for example, was designed to ideally trace a sine-like curve, smoothly oscillating between a lower and an upper boundary. In reality, however, the Stochastic often either ascends too quickly (i.e. at a too steeper angle) for a trading action to be implemented, or, once ascended / descended, spends too much time in an almost sideways state, languishing either at the bottom or at the top of its trading range.

On the contrary, the RSI was designed in such a way as to generate buy / sell signals based on bullish and bearish divergences between itself and the commodity's price. As a direct consequence of this, the RSI's line usually traces a slowly sloping line (i.e. at an angle rarely exceeding 10%). Its plot, therefore, seldom finds itself in a potentially useful overbought or oversold region. All-too-often, the RSI is found vacillating in the middle of the trading panel, too high to be able to

initiate a safe buying signal, and too low to guarantee a trustworthy selling signal.

However, the RSI's individual contribution to the timing of a trend is quite significant, as its line usually: generates a bullish divergence right at the beginning of an upcoming significant bull market; ascends in tandem with an important price rise; generates a bearish divergence signaling a possible reversal of the trend; and, finally, closely follows any major price decrease that the commodity under observation may incur. Moreover, the RSI can accurately register even the most minute price oscillations in the underlying commodity to which it is applied.

The Momentum behaves in a remarkably similar fashion with the RSI: consequently, the reliability of its readings share many of the above-discussed strengths and weaknesses of the RSI.

The MACD, due to its design based primarily upon Moving Averages, tends to perform well when the market follows a well-defined and rather lengthy price rise or descent: as is true with any Moving Average-based indicator, the MACD fails to pick up minute price oscillations, and acts rather confused when the commodity's price incurs large swings that alternate in opposite directions.

The overall dependability of the four above-mentioned indicators is negatively affected by the fact that - being all "price-based" in design

- they all fail to take into account the influence of swings in the commodity's volume of trading activity. When analyzing a given commodity, its price behavior, by itself, presents only half of the story: it is only when one attempts to explain the price behavior in conjunction with the Volume, that an accurate picture of the market environment can be safely drawn.

A significant ascension in price, by itself, is almost meaningless: however, a similar price ascension followed by a sharp increase in volume is often the trademark of a market top, a short-lived situation during which the effervescent optimism of the non-professional players is certain to propel the market into reaching stratospheric - and unrealistic - highs, that, only a day later, prove impossible to maintain.

While bull markets often end in a shameful display of human greed, bear markets usually end in mass hysteria, as massive paper losses prompt the uninitiated to urgently liquidate their positions. In this situation, a sharp price decline followed by a steep increase in trading volume often punctuates not only a potential reversal in the price trend, but also a quite enticing buying opportunity for those eager to adopt long positions.

While many books on trading strategy seem to use interchangeably Volume and Open Interest as barometers of the market's degree of enthusiasm / despair, Open Interest tends to decrease drastically as

each contract approaches its expiration date: for this reason, a sharp decline in Open Interest can be equally attributed to a market that runs out of steam, and / or to a rapidly-approaching expiration date on the contract in question. Unfortunately, it is overly difficult to calculate the correct proportion of change in the Open Interest that can be attributed to a potential change in the market trend, and, finally, the proportion that can be directly attributed to the contract's eventual expiration.

In its early development stages, the indicator presented in this thesis initially incorporated Volume, as well as Open Interest, in its formula. However, the resulting relatively poor performance (i.e. when the indicator was run on the Light Sweet Crude) soon led the decision to incorporate only the Volume - and not the Open Interest, anymore - in the subsequent design phases. Therefore, in its final form, the indicator measures the degree of market optimism / pessimism solely by the means of the trading Volume.

The designed indicator tried to inherit some of the strong points of its four building blocks: ideally, this indicator would plot on a sine-like line which smoothly oscillates between and an upper and a lower trading extremity (i.e. much like the Stochastic); without being stuck for overly long periods of time either in the middle of the panel (i.e. unlike the RSI or the Momentum), or in the overbought / undersold regions of the trading range (i.e. unlike the Stochastic). Its slope is designed to be somewhat steeper than that of the "sleepy" RSI, while,

at the same time, being somewhat flatter than that of the overly active Stochastic.

As well, the indicator's sensitivity to changes in the underlying price allow it to register significant trend changes on the earliest day when they actually do occur (i.e. as it will be explained later, this is accomplished with the aid of the Volume).

In the early development stages, the initial formula used was:

INDICATOR 1 = Stochastic * (RSI / Momentum)

Unfortunately, the above expression generated a lot of noise, as RSI and Momentum are both highly volatile elements, both when taken separate, and, as well, when combined as (RSI / Momentum).

To reduce some of this noise, the fast-changing RSI is added to the slow-moving MACD, therefore, changing the indicator's formula as follows:

INDICATOR 2 = Stochastic * (RSI + MACD) / Momentum

While the above expression will generate a numerical result - when run by the computer program - this result is given a relatively high weighting when the corresponding Volume for the period in question is posting a significant increase; and correspondingly, is adjusted downward, when the Volume happens to display a significant

decrease. To do this, the above-presented expression is raised to the power of the Volume, as follows:

INDICATOR3 = [Stochastic * (RSI + MACD) / Momentum] ^ Volume

When run by the computer, the above formula will accurately recognize important peaks and valleys in the price behavior; however, its plot will unfortunately display a little noise, which can be easily diminished by calculating a Simple Moving Average - taken over a low number of days, "q" - as follows:

FINAL INDICATOR = the Simple Moving Average taken over "q" periods of:

{ [Stochastic * (RSI + MACD) / Momentum] ^ Volume }

It is essential that a small number is assigned to "q" (i.e. 2). This would make some of the undesirable noise disappear, without sacrificing the accuracy with which market peaks and bottoms are signaled. On the contrary, should a larger number be used for the value of "q", the indicator would then begin to display an undesirable time lag in its ability to pin-point major changes in the market's trend.

Once the final indicator's value is calculated, on a period-by-period basis, the slope of its line must be closely monitored, as this is the entity which is responsible for generating the actual buy and sell signals. During each period, the slope of the indicator is calculated (i.e. as the rate of change in the value of the indicator, from the last period to the most recent period). Ascensions in the price of the

underlying future will be accompanied by positive slopes, while price declines will be characterized by negative slopes. As soon as a formerly positive slope (i.e. an indicator of a bull market) either goes through zero or turns negative, a potential sell signal is in place. Similarly, as soon as a formerly negative slope (i.e. an indicator of a bear market) either goes through zero, or turns positive, a potential buy signal is generated.

A potential problem can be created by the fact the indicator is built to register even smaller zig-zags, points that do not represent the actual up-most peaks and down-most bottoms, but rather intermediary points situated in-between.

To correct this problem, another condition is imposed on the way the model works. When the slope of the indicator either reaches zero or changes sign, a difference is calculated between the last point where the slope reached zero or changed sign the last time. If the absolute value of the difference between a local minimum and a local maximum is less than the variable "a" - whose value is initially set to a default value, but then can be changed by the trader to a number that reflects more accurately his personal investment strategy - the potential buy or sell signal is not given anymore, and the trading signal that was last generated remains still in place.

A new trading signal will not be generated up until the following two conditions are met: The slope of the indicator reaches zero or

changes sign, and the absolute value of the difference - in the indicator's magnitude - between the last local minimum and the local maximum is equal to at least "a". In this way, minor oscillations in the underlying indicator are not about to generate false buy and sell signals.

A buy or sell signal will be generated only if the slope of the indicator reaches zero or changes sign, while a considerable spread lies between the last recommended trade and the new potential trading opportunity. A large value of "a" will result in less trading activity; however, this strategy will be able to pin-point major market peaks and bottoms, with no trading signals generated in-between. A smaller value of "a" will result in a larger number of trades. In addition to the market top and bottom, this strategy will also pin-point relatively minor peaks and valleys. It is not recommended that a too small value for "a" is chosen, as this will certainly generate a relatively larger number of false trades (I.e. as even the minutest reversals in the slope of the indicator will be, unfortunately, taken into account).

A further condition can be added, is wished, to the above model: while a long position stays open, there will be no short positions allowed to remain open (I.e. and conversely, while a short position remains open, there will be no long positions allowed to stay open). This means that, at any given point in time, the trading position is either long, closed, or short.

XI. OVERALL APPLICABILITY OF THE TRADING SYSTEM

No technical analysis-based trading system can guarantee fool-proof results, time after time again; and the system described in this thesis is, by no means, an exception. However, this trading strategy's odds of winning can be visibly increased by simply electing to trade on a very liquid and often-trending market.

This system should not be used to track the performance of individual stock issues. These entities - due to their nature - spend about 1/2 of their time trading sideways (i.e. for lack of fundamental news pertaining to their economic well-being), and even when they finally get out of a formerly narrow trading range, their price moves too swiftly for such a trading system to be able to accurately pin-point likely lows and highs.

The performance of individual stocks is motivated more by the actions of the firm's management, and the company's products, policies, and latest marketing gimmicks, rather than by changes in the nation's interest rates, debt policies, and consumer price index. In this sense, individual stocks represent a market that is more efficient in processing the available information - and for that reason alone, it does not represent a desirable financial environment in which to test a technical analysis-based trading strategy.

In theory, the trading system could be applied for a wide range of futures contracts: stock and bond indexes, the whole basket of existing currencies, the energy complex, metals, grains and livestock. However, even among the ranks of the commodities, grains and livestock are heavily influenced by the latest-breaking fundamental news related to whether, road conditions, and strikes (i.e. all occurrences for which the trading system does not make any allowances).

Some of the metals (I.e. Platinum, Palladium) and currencies (I.e. the ones other than the German Mark, Swiss Franc, Japanese Yen, U.S. Dollar, and Canadian Dollar) are not well-enough traded to ensure a very liquid environment: for that reason, the already-discussed trading system may lead to too many false buy and sell signals.

Consequently, the markets to which the system could be applied most successfully are, in order of expected profitability, the Light Sweet Crude, its virtually identical, but more volatile Heating Oil counterpart, S&P500, and U.S. Treasury Bonds.

XII. ADDRESSING CONCERNS RELATED TO DATA ROLL-OVER

The previously-used weekly and daily Light Sweet Crude data was rolled-over before the expiration date of the contract, in an attempt to mimic the life-like tendency not to trade in a contract that is just about to expire.

In order to address any existing concerns that the already-documented performance of the trading model may be negatively affected by the contract roll-over, the model was later tested on the most recent trading month (i.e. with no roll-over, whatsoever).

Two years of daily data - covering June 1995 to June 1997 - were collected on both Light Sweet Crude and Heating Oil.

Preliminary plots of the indicator's behavior - but not of the generated trading signals - are presented in Figures 21 (i.e. for the Light Sweet Crude) and 22 (i.e. for the Heating Oil).

FIGURE 21: Indicator plot for daily Crude data with no roll-over

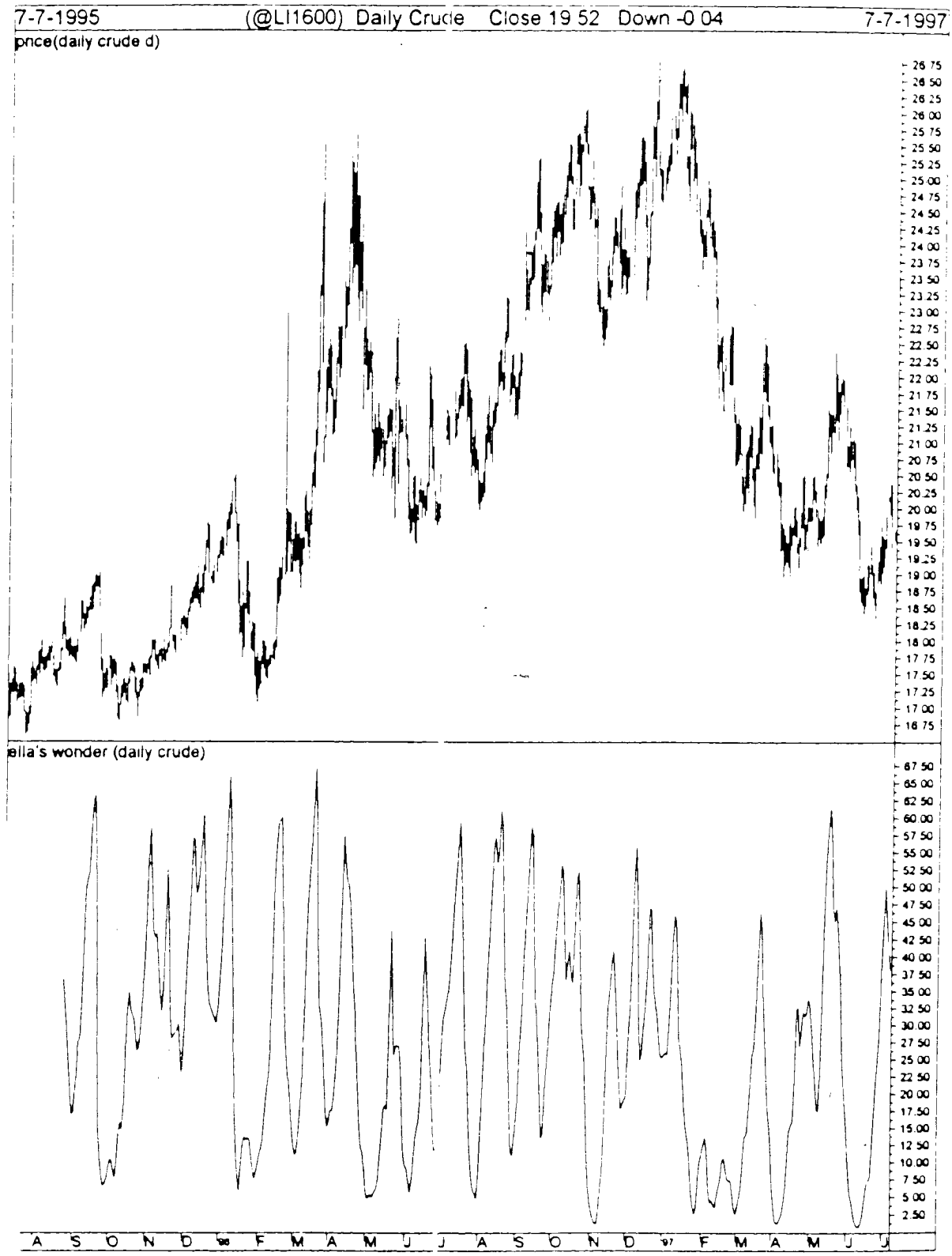
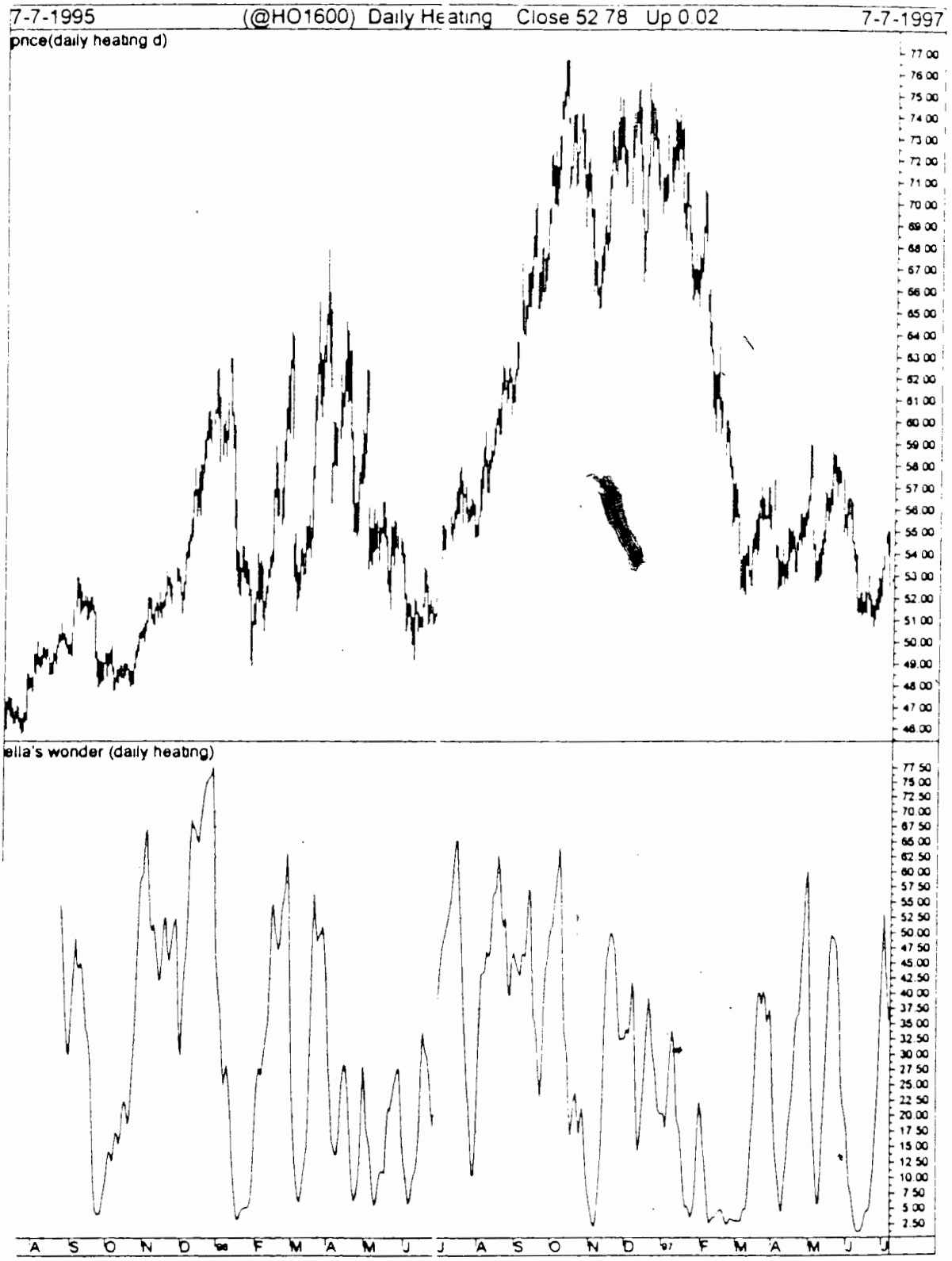


FIGURE 22: Indicator plot for daily Heating Oil data with no roll-over



The trading model was first run on the 1995-1997 daily data for the Light Sweet Crude.

Initially, the model was run on a "z" of 1.5, guaranteed to generate a relatively larger number of trades. The overall results are presented in the Performance Report displayed in Figure 23. Trade-by-trade details are given in the Figures 24 and 25.

In this case, 40 trades were generated (i.e. 20 long and 20 short). Out of these, 82.50% proved to be profitable transactions. The average percentage gain / loss registered per trade was a gain of 3.71%.

Then, the model was run a second time on the daily data of the Light Sweet Crude, this time employing a "z" of 2, guaranteed to generate a relatively smaller number of trades. The overall results are presented in the Performance Report displayed in Figure 26. Trade-by-trade details are given in the Figure 27.

In this case, only 21 trades were generated (i.e. 11 long and 10 short). Out of these, 80.95% proved to be profitable transactions. The average percentage gain / loss registered per trade was a gain of 4.38%.

FIGURE 23: System test perfomance report for daily Crude data with no roll-over (an active strategy)

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Daily Crude
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is SHORT @ 19.58, entered on 7/3/1997 gain/loss $45.51

SUMMARY

Total Net Profit	$18079.08	Average trade gain/loss ($)	$451.98
Total percentage gain/loss	361.58%	Average trade gain/loss (%)	3.97%
Annualized rate of return	180.54%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit	$15418.14	Average trade gain/loss ($)	$405.74
Total percentage gain/loss	308.36%	Average trade gain/loss (%)	3.71%
Annualized rate of return	153.97%		

TRADE STATISTICS

Total no. of trades	40	Percentage profitable trades	82.50%
No. Profitable Trades	33	No. Losing Trades	7
Amount of profitable trades	$19878.42	Amount of losing trades	$-1984.31
Largest profitable trade	$3181.93	Largest losing trade	$-521.00
Average profitable trade	$602.32	Average losing trade	$-283.47
No. of stop hits	0	Average gain/loss per stop	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades	20	Number of Short trades	20
No. profitable Long trades	17	No. profitable Short trades	16
Average Long gain/loss	$338.37	Average Short gain/loss	$556.23

TRADE DURATIONS

Total no. periods in test	522	Number of days in test	731
Most consecutive wins	14	Most consecutive losses	2
Amt. of consecutive wins	$6443.06	Amt. of consecutive losses	$-972.01

RISK & EXPENSE

Max. equity drop (open)	$ -25.00	Max. equity drop (closed)	$ 31.75
Max. trade drawdown	$ -641.10	Average trade drawdown	$ -100.49
Commissions expenses	$ 1975.00	Margin interest expenses	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned	$186.96	Profit Factor	10.02
Ratio Avg. Profit/Avg. Loss	2.12	Ratio Profit/Commissions	9.15

FIGURE 24: Trade by trade report for daily Crude data with no roll-over (an active strategy) - page 1

TRADE BY TRADE REPORT FOR:
Ella's on Daily Crude
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	10/06/95	$17 04	$25 00				
LClose	10/09/95	$17 32	$25 00	$-25.00	$31 75	$31 75	$5031 75
Interest	01/09/96				$34 88	$66 63	$5066 63
Short	01/09/96	$19 94	$25 00				
SClose	01/17/96	$18 52	$25 00	$-25.00	$309 03	$375 66	$5375 66
Long	01/17/96	$18.52	$25 00				
LClose	01/19/96	$18 66	$25 00	$-25.00	$-9 55	$366 11	$5366 11
Short	01/19/96	$18 66	$25 00				
SClose	01/30/96	$17 56	$25 00	$-25.00	$264 86	$630 96	$5630 96
Long	01/30/96	$17 56	$25 00				
LClose	02/21/96	$19 70	$25 00	$-31 38	$633 19	$1264 15	$6264 15
Short	02/21/96	$19 70	$25 00				
SClose	02/26/96	$19 42	$25 00	$-72 51	$38 68	$1302 83	$6302 83
Long	02/26/96	$19 42	$25 00				
LClose	03/20/96	$20 90	$25 00	$-96 12	$428 43	$1731 26	$6731 26
Short	03/20/96	$20 90	$25 00				
SClose	03/22/96	$21 89	$25 00	$-361 92	$-367 67	$1363 60	$6363 60
Long	03/22/96	$21 89	$25 00				
LClose	03/25/96	$22.20	$25 00	$-25 00	$39 77	$1403 36	$6403 36
Interest	04/12/96				$8 68	$1412 05	$6412 05
Short	04/12/96	$23 99	$25 00				
SClose	05/20/96	$22 45	$25 00	$-309 87	$360 01	$1772 05	$6772 05
Long	05/20/96	$22 45	$25 00				
LClose	05/22/96	$21 43	$25 00	$-641 10	$-356 55	$1415 51	$6415 51
Short	05/22/96	$21 43	$25 00				
SClose	06/06/96	$20 02	$25 00	$-25.00	$370 47	$1785 97	$6785 97
Long	06/06/96	$20 02	$25 00				
LClose	06/18/96	$21 37	$25 00	$-28 38	$405 91	$2191 88	$7191 88
Short	06/18/96	$21 37	$25 00				
SClose	06/24/96	$19 98	$25 00	$-25.00	$416 17	$2608 05	$7608 05
Long	06/24/96	$19 98	$25 00				
LClose	06/26/96	$20 64	$25 00	$-32 59	$200 49	$2808 54	$7808 54
Interest	07/16/96				$11 77	$2820 31	$7820 31
Short	07/16/96	$22 38	$25 00				
SClose	07/29/96	$20 28	$25 00	$-25.00	$681 46	$3501 77	$8501 77
Long	07/29/96	$20 28	$25 00				
LClose	08/20/96	$22.08	$25 00	$-25.00	$702 37	$4204 14	$9204 14
Short	08/20/96	$22 08	$25.00				
SClose	08/28/96	$21 74	$25 00	$-116 46	$91 35	$4295 49	$9295 49
Long	08/28/96	$21 74	$25 00				
LClose	09/13/96	$24 20	$25 00	$-25.00	$999 01	$5294 50	$10294 50
Short	09/13/96	$24 20	$25 00				
SClose	09/17/96	$23 31	$25 00	$-25.00	$327 68	$5622 18	$10622 18
Long	09/17/96	$23 31	$25 00				
LClose	09/18/96	$23 85	$25 00	$-25.00	$195 50	$5817 67	$10817 67
Interest	10/09/96				$17 12	$5834 79	$10834 79
Short	10/09/96	$25 04	$25 00				
SClose	10/11/96	$24 75	$25 00	$-25.00	$75 19	$5909 98	$10909 98
Long	10/11/96	$24 75	$25 00				
LClose	10/14/96	$25 57	$25 00	$-25.00	$310 63	$6220 62	$11220 62
Interest	10/22/96				$6.76	$6227 38	$11227 38
Short	10/22/96	$25 50	$25 00				
SClose	11/06/96	$22 65	$25 00	$-25.00	$1202 03	$7429 41	$12429 41
Long	11/06/96	$22 65	$25 00				
LClose	11/08/96	$23 59	$25 00	$-25.00	$464 80	$7894 21	$12894 21
Interest	11/20/96				$11 66	$7905 86	$12905 86
Short	11/20/96	$23 40	$25 00				
SClose	11/26/96	$23 67	$25 00	$-267 21	$-198 63	$7707 24	$12707 24

*** Continued on Next Page ***

FIGURE 25: Trade by trade report for daily Crude data with no roll-over (an active strategy) - page 2

TRADE BY TRADE REPORT FOR:
Ella's on Daily Crude
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	11/26/96	$23.67	$25.00				
LClose	12/09/96	$25.24	$25.00	$-25.00	$791.20	$8498.43	$13498.43
Short	12/09/96	$25.24	$25.00				
SClose	12/12/96	$23.72	$25.00	$-25.00	$761.40	$9259.83	$14259.83
Long	12/12/96	$23.72	$25.00				
LClose	12/20/96	$25.10	$25.00	$-25.00	$778.17	$10038.00	$15038.00
Short	12/20/96	$25.10	$25.00				
SClose	12/24/96	$25.15	$25.00	$-25.00	$-79.91	$9958.09	$14958.09
Long	12/24/96	$25.15	$25.00				
LClose	12/31/96	$25.88	$25.00	$-181.57	$383.45	$10341.54	$15341.54
Interest	01/09/97				$10.40	$10351.94	$15351.94
Short	01/09/97	$26.32	$25.00				
SClose	03/04/97	$20.77	$25.00	$-25.00	$3181.93	$13533.87	$18533.87
Long	03/04/97	$20.77	$25.00				
LClose	03/10/97	$20.32	$25.00	$-274.52	$-451.01	$13082.86	$18082.86
Short	03/10/97	$20.32	$25.00				
SClose	03/12/97	$20.85	$25.00	$-291.60	$-521.00	$12561.86	$17561.86
Long	03/12/97	$20.85	$25.00				
LClose	03/21/97	$21.51	$25.00	$-151.16	$505.12	$13066.98	$18066.98
Short	03/21/97	$21.51	$25.00				
SClose	04/07/97	$19.25	$25.00	$-25.00	$1845.63	$14912.61	$19912.61
Long	04/07/97	$19.25	$25.00				
LClose	04/11/97	$19.62	$25.00	$-25.00	$332.26	$15244.87	$20244.87
Interest	05/19/97				$57.96	$15302.83	$20302.83
Short	05/19/97	$21.30	$25.00				
SClose	06/12/97	$18.81	$25.00	$-558.13	$2320.51	$17623.33	$22623.33
Long	06/12/97	$18.81	$25.00				
LClose	06/17/97	$19.17	$25.00	$-25.00	$382.51	$18005.84	$23005.84
Interest	07/03/97				$27.73	$18033.57	$23033.57
Short	07/03/97	$19.58	$25.00				
Current	07/07/97	$19.52	$0.00	$-25.00	$45.51	$18079.08	$23079.08

*** End Of Report ***

FIGURE 26: System test performance report for daily Crude data with no roll-over (a passive strategy)

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Daily Crude
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is CLOSED

SUMMARY

Total Net Profit:	$7825.53	Average trade gain/loss ($):	$372.65
Total percentage gain/loss:	156.51%	Average trade gain/loss (%):	4.65%
Annualized rate of return:	78.15%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$6431.47	Average trade gain/loss ($):	$338.50
Total percentage gain/loss:	128.63%	Average trade gain/loss (%):	4.38%
Annualized rate of return:	64.23%		

TRADE STATISTICS

Total no. of trades:	21	Percentage profitable trades:	80.95%
No. Profitable Trades:	17	No. Losing Trades:	4
Amount of profitable trades:	$8266.69	Amount of losing trades:	$-596.27
Largest profitable trade:	$1680.76	Largest losing trade:	$-286.59
Average profitable trade:	$486.28	Average losing trade:	$-149.07
No. of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	11	Number of Short trades:	10
No. profitable Long trades:	8	No. profitable Short trades:	9
Average Long gain/loss:	$136.70	Average Short gain/loss:	$616.68

TRADE DURATIONS

Total no. periods in test:	522	Number of days in test:	731
Most consecutive wins:	9	Most consecutive losses:	1
Amt. of consecutive wins:	$6011.80	Amt. of consecutive losses:	$-286.59

RISK & EXPENSE

Max. equity drop (open):	$ -479.83	Max. equity drop (closed):	$ -266.93
Max. trade drawdown:	$ -480.19	Average trade drawdown:	$ -87.16
Commissions expenses:	$ 1050.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$155.22	Profit Factor:	13.86
Ratio Avg. Profit/Avg. Loss:	3.26	Ratio Profit/Commissions:	7.45

FIGURE 27: Trade by trade report for daily Crude data with no roll-over (a passive strategy) - page 1

TRADE BY TRADE REPORT FOR:
Ella's on Daily Crude
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	01/30/96	$17.56	$25.00				
LClose	02/07/96	$17.75	$25.00	$-30.67	$3.83	$3.83	$5003.83
Interest	03/20/96				$15.83	$19.66	$5019.66
Short	03/20/96	$20.90	$25.00				
SClose	03/22/96	$21.89	$25.00	$-275.93	$-286.59	$-266.93	$4733.07
Long	03/22/96	$21.89	$25.00				
LClose	03/25/96	$22.20	$25.00	$-25.00	$16.67	$-250.25	$4749.75
Interest	04/12/96				$6.44	$-243.81	$4756.19
Short	04/12/96	$23.99	$25.00				
SClose	05/20/96	$22.45	$25.00	$-236.02	$253.71	$9.90	$5009.90
Long	05/20/96	$22.45	$25.00				
LClose	05/22/96	$21.43	$25.00	$-480.19	$-276.49	$-266.58	$4733.42
Short	05/22/96	$21.43	$25.00				
SClose	06/06/96	$20.02	$25.00	$-25.00	$259.79	$-6.79	$4993.21
Long	06/06/96	$20.02	$25.00				
LClose	06/18/96	$21.37	$25.00	$-27.48	$285.02	$278.23	$5278.23
Short	06/18/96	$21.37	$25.00				
SClose	06/24/96	$19.98	$25.00	$-25.00	$291.69	$569.92	$5569.92
Long	06/24/96	$19.98	$25.00				
LClose	07/16/96	$22.38	$25.00	$-30.55	$616.06	$1185.98	$6185.98
Short	07/16/96	$22.38	$25.00				
SClose	07/29/96	$20.28	$25.00	$-25.00	$528.11	$1714.09	$6714.09
Long	07/29/96	$20.28	$25.00				
LClose	07/31/96	$20.40	$25.00	$-25.00	$-10.42	$1703.67	$6703.67
Interest	10/22/96				$41.92	$1745.59	$6745.59
Short	10/22/96	$25.50	$25.00				
SClose	11/06/96	$22.65	$25.00	$-25.00	$701.12	$2446.71	$7446.71
Long	11/06/96	$22.65	$25.00				
LClose	11/08/96	$23.59	$25.00	$-25.00	$258.01	$2704.72	$7704.72
Interest	12/09/96				$18.00	$2722.72	$7722.72
Short	12/09/96	$25.24	$25.00				
SClose	12/12/96	$23.72	$25.00	$-25.00	$413.57	$3136.29	$8136.29
Long	12/12/96	$23.72	$25.00				
LClose	12/13/96	$24.45	$25.00	$-25.00	$199.63	$3335.92	$8335.92
Interest	01/09/97				$16.96	$3352.88	$8352.88
Short	01/09/97	$26.32	$25.00				
SClose	03/12/97	$20.85	$25.00	$-25.00	$1680.76	$5033.63	$10033.63
Long	03/12/97	$20.85	$25.00				
LClose	03/21/97	$21.51	$25.00	$-97.00	$266.82	$5300.45	$10300.45
Short	03/21/97	$21.51	$25.00				
SClose	04/07/97	$19.25	$25.00	$-25.00	$1029.62	$6330.07	$11330.07
Long	04/07/97	$19.25	$25.00				
LClose	04/11/97	$19.62	$25.00	$-25.00	$167.29	$6497.36	$11497.36
Interest	05/19/97				$32.92	$6530.28	$11530.28
Short	05/19/97	$21.30	$25.00				
SClose	06/12/97	$18.81	$25.00	$-327.49	$1294.98	$7825.26	$12825.26
Long	06/12/97	$18.81	$25.00				
LClose	06/13/97	$18.85	$25.00	$-25.00	$-22.78	$7802.48	$12802.48
Interest	07/07/97				$23.15	$7825.63	$12825.63

*** End Of Report ***

Then, the trading model was run on the 1995-1997 daily data for the Heating Oil.

Initially, the model was run on a "z" of 1.5, guaranteed to generate a relatively larger number of trades. The overall results are presented in the Performance Report displayed in Figure 28. Trade-by-trade details are given in the Figures 29, 30, 31, and 32.

In this case, 97 trades were generated (i.e. 49 long and 48 short). Out of these, 54.64% proved to be profitable transactions. The average percentage gain / loss registered per trade was a gain of 1.45%.

Then, the model was run a second time on the daily data of the Heating Oil, this time employing a "z" of 2, guaranteed to generate a relatively smaller number of trades. The overall results are presented in the Performance Report displayed in Figure 33. Trade-by-trade details are given in the Figures 34 and 35.

In this case, 49 trades were generated (i.e. 25 long and 24 short). Out of these, 79.59% proved to be profitable transactions. The average percentage gain / loss registered per trade was a gain of 3.68%.

Consequently, even when no roll-over took place (i.e. and only data pertaining to the most recently-traded contract is used), the obtained results are perfectly consistent with the conclusions that have been derived when the roll-over practice was in effect.

FIGURE 28: System test performance report for daily Heating Oil data (an active strategy)

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is LONG @ 52.78, entered on 7/7/1997, gain/loss $-25.00.

SUMMARY

Total Net Profit:	$12959.99	Average trade gain/loss ($):	$133.61
Total percentage gain/loss:	259.20%	Average trade gain/loss (%):	1.40%
Annualized rate of return:	129.42%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$12441.61	Average trade gain/loss ($):	$130.96
Total percentage gain/loss:	248.83%	Average trade gain/loss (%):	1.45%
Annualized rate of return:	124.25%		

TRADE STATISTICS

Total no. of trades:	97	Percentage profitable trades:	54.64%
No. Profitable Trades:	53	No. Losing Trades:	44
Amount of profitable trades:	$22047.50	Amount of losing trades:	$-9116.14
Largest profitable trade:	$1217.78	Largest losing trade:	$-699.40
Average profitable trade:	$415.99	Average losing trade:	$-207.19
No. of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	49	Number of Short trades:	48
No. profitable Long trades:	26	No. profitable Short trades:	27
Average Long gain/loss:	$106.63	Average Short gain/loss:	$160.56

TRADE DURATIONS

Total no. periods in test:	522	Number of days in test:	731
Most consecutive wins:	7	Most consecutive losses:	5
Amt. of consecutive wins:	$3703.42	Amt. of consecutive losses:	$-650.81

RISK & EXPENSE

Max. equity drop (open):	$ -140.03	Max. equity drop (closed):	$ -116.13
Max. trade drawdown:	$ -636.26	Average trade drawdown:	$ -100.17
Commissions expenses:	$ 4825.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$28.63	Profit Factor:	2.42
Ratio Avg. Profit/Avg. Loss:	2.01	Ratio Profit/Commissions:	2.69

FIGURE 29: Trade by trade report for daily Heating Oil data (an active strategy) - page 1

TRADE BY TRADE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	09/25/95	$48 90	$25 00				
LClose	09/26/95	$48 25	$25 00	$-93 16	$-116 13	$-116 13	$4883 87
Interest	09/29/95				$1 10	$-115 03	$4884 97
Short	09/29/95	$49 42	$25 00				
SClose	10/06/95	$48 34	$25 00	$-25 00	$56 21	$-58 82	$4941 18
Long	10/06/95	$48 34	$25 00				
LClose	11/03/95	$51 70	$25 00	$-44 32	$291 71	$232 89	$5232 89
Short	11/03/95	$51 70	$25 00				
SClose	11/08/95	$51 45	$25 00	$-25 00	$-24 82	$208 08	$5208 08
Long	11/08/95	$51 45	$25 00				
LClose	11/13/95	$51 55	$25 00	$-25 00	$-39 93	$168 15	$5168 15
Interest	11/28/95				$5 84	$173 99	$5173 99
Short	11/28/95	$52 90	$25 00				
SClose	12/01/95	$52 74	$25 00	$-25 00	$-34 43	$139 56	$5139 56
Long	12/01/95	$52 74	$25 00				
LClose	12/28/95	$60 95	$25 00	$-25 00	$746 18	$885 75	$5885 75
Short	12/28/95	$60 95	$25 00				
SClose	01/02/96	$59 95	$25 00	$-25 00	$46 16	$931 90	$5931 90
Long	01/02/96	$59 95	$25 00				
LClose	01/09/96	$60 43	$25 00	$-91 02	$-2 71	$929 20	$5929 20
Short	01/09/96	$60 43	$25 00				
SClose	01/17/96	$53 20	$25 00	$-25 00	$656 39	$1585 59	$6585 59
Long	01/17/96	$53 20	$25 00				
LClose	01/19/96	$53 60	$25 00	$-25 00	$-0 67	$1584 92	$6584 92
Short	01/19/96	$53 60	$25 00				
SClose	01/26/96	$51 05	$25 00	$-33 57	$262 09	$1847 00	$6847 00
Long	01/26/96	$51 05	$25 00				
LClose	02/01/96	$52 00	$25 00	$-25 00	$76 95	$1923 96	$6923 96
Short	02/01/96	$52 00	$25 00				
SClose	02/06/96	$51 70	$25 00	$-192 17	$-10 20	$1913 76	$6913 76
Long	02/06/96	$51 70	$25 00				
LClose	02/15/96	$56 90	$25 00	$-25 00	$642 87	$2556 63	$7556 63
Short	02/15/96	$56 90	$25 00				
SClose	02/21/96	$58 90	$25 00	$-281 79	$-314 73	$2241 90	$7241 90
Long	02/21/96	$58 90	$25 00				
LClose	02/28/96	$53 60	$25 00	$-25 00	$-699 40	$1542 50	$6542 50
Short	02/28/96	$53 60	$25 00				
SClose	03/05/96	$53 10	$25 00	$-121 06	$10 80	$1553 30	$6553 30
Long	03/05/96	$53 10	$25 00				
LClose	03/21/96	$61 35	$25 00	$-25 00	$964 28	$2517 58	$7517 58
Short	03/21/96	$61 35	$25 00				
SClose	03/22/96	$62 15	$25 00	$-183 77	$-147 70	$2369 88	$7369 88
Long	03/22/96	$62 15	$25 00				
LClose	03/28/96	$63 50	$25 00	$-25 00	$109 54	$2479 42	$7479 42
Short	03/28/96	$63 50	$25 00				
SClose	04/02/96	$59 70	$25 00	$-25 00	$396 09	$2875 51	$7875 51
Long	04/02/96	$59 70	$25 00				
LClose	04/03/96	$58 00	$25 00	$-219 62	$-273 55	$2601 96	$7601 96
Short	04/03/96	$58 00	$25 00				
SClose	04/04/96	$59 50	$25 00	$-230 10	$-245 96	$2356 01	$7356 01
Long	04/04/96	$59 50	$25 00				
LClose	04/12/96	$61 94	$25 00	$-25 00	$250 63	$2606 64	$7606 64
Short	04/12/96	$61 94	$25 00				
SClose	04/23/96	$57 25	$25 00	$-108 23	$524 07	$3130 71	$8130 71
Long	04/23/96	$57 25	$25 00				
LClose	04/30/96	$55 15	$25 00	$-25 00	$-347 33	$2783 38	$7783 38
Short	04/30/96	$55 15	$25 00				
SClose	05/03/96	$55 00	$25 00	$-25 00	$-28 90	$2754 48	$7754 48

*** Continued on Next Page ***

FIGURE 30: Trade by trade report for daily Heating Oil data (an active strategy) - page 2

TRADE BY TRADE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	05/03/96	$55 00	$25 00				
LClose	05/14/96	$55 30	$25 00	$-86 84	$-7 84	$2746 65	$7746 65
Short	05/14/96	$55 30	$25 00				
SClose	05/20/96	$55 25	$25 00	$-25 00	$-43 02	$2703 63	$7703 63
Long	05/20/96	$55 25	$25 00				
LClose	05/21/96	$54 00	$25 00	$-190 39	$-223 72	$2479 90	$7479 90
Short	05/21/96	$54 00	$25 00				
SClose	06/12/96	$50 90	$25 00	$-181 67	$377 97	$2857 87	$7857 87
Long	06/12/96	$50 90	$25 00				
LClose	06/18/96	$51 50	$25 00	$-25 00	$42 33	$2900 20	$7900 20
Short	06/18/96	$51 50	$25 00				
SClose	06/20/96	$51 60	$25 00	$-29 59	$-65 29	$2834 91	$7834 91
Long	06/20/96	$51 60	$25 00				
LClose	06/25/96	$51 17	$25 00	$-90 08	$-115 08	$2719 83	$7719 83
Interest	07/16/96				$12 21	$2732 04	$7732 04
Short	07/16/96	$57 18	$25 00				
SClose	07/29/96	$55 20	$25 00	$-25 00	$216 88	$2948 92	$7948 92
Long	07/29/96	$55 20	$25 00				
LClose	08/05/96	$58 30	$25 00	$-25 00	$395 00	$3343 92	$8343 92
Short	08/05/96	$58 30	$25 00				
SClose	08/07/96	$58 20	$25 00	$-25 00	$-35 73	$3308 19	$8308 19
Long	08/07/96	$58 20	$25 00				
LClose	08/20/96	$61 50	$25 00	$-25 00	$419 67	$3727 85	$8727 85
Short	08/20/96	$61 50	$25 00				
SClose	08/22/96	$62 40	$25 00	$-163 68	$-177 36	$3550 49	$8550 49
Long	08/22/96	$62 40	$25 00				
LClose	08/23/96	$62 00	$25 00	$-81 02	$-104 65	$3445 84	$8445 84
Short	08/23/96	$62 00	$25 00				
SClose	08/27/96	$61 25	$25 00	$-25 00	$51 87	$3497 71	$8497 71
Long	08/27/96	$61 25	$25 00				
LClose	08/30/96	$65 12	$25 00	$-25 00	$485 34	$3983 05	$8983 05
Interest	09/13/96				$9 48	$3992 52	$8992 52
Short	09/13/96	$67 35	$25 00				
SClose	09/17/96	$65 60	$25 00	$-25 00	$183 01	$4175 53	$9175 53
Long	09/17/96	$65 60	$25 00				
LClose	09/19/96	$66 80	$25 00	$-25 00	$117 39	$4292 92	$9292 92
Short	09/19/96	$66 80	$25 00				
SClose	09/20/96	$67 20	$25 00	$-111 02	$-105 50	$4187 42	$9187 42
Long	09/20/96	$67 20	$25 00				
LClose	09/26/96	$70 20	$25 00	$-25 00	$359 04	$4546 46	$9546 46
Short	09/26/96	$70 20	$25 00				
SClose	10/02/96	$71 55	$25 00	$-266 43	$-233 11	$4313 36	$9313 36
Long	10/02/96	$71 55	$25 00				
LClose	10/08/96	$76 65	$25 00	$-25 00	$612 06	$4925 42	$9925 42
Short	10/08/96	$76 65	$25 00				
SClose	10/11/96	$71 60	$25 00	$-25 00	$602 28	$5527 70	$10527 70
Long	10/11/96	$71 60	$25 00				
LClose	10/15/96	$73 85	$25 00	$-25 00	$280 04	$5807 74	$10807 74
Short	10/15/96	$73 85	$25 00				
SClose	10/17/96	$72 30	$25 00	$-25 00	$176 31	$5984 05	$10984 05
Long	10/17/96	$72 30	$25 00				
LClose	10/21/96	$73 50	$25 00	$-25 00	$131 89	$6115 95	$11115 95
Short	10/21/96	$73 50	$25 00				
SClose	10/25/96	$71 85	$25 00	$-25 00	$198 98	$6314 93	$11314 93
Long	10/25/96	$71 85	$25 00				
LClose	10/28/96	$71 30	$25 00	$-86 28	$-136 42	$6178 50	$11178 50
Short	10/28/96	$71 30	$25 00				
SClose	11/06/96	$66 75	$25 00	$-25 00	$661 76	$6840 26	$11840 26
Long	11/06/96	$66 75	$25 00				

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FIGURE 31: Trade by trade report for daily Heating Oil data (an active strategy) - page 3

TRADE BY TRADE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
LClose	11/15/96	$72.65	$25.00	$-25.00	$994.35	$7834.61	$12834.61
Short	11/15/96	$72.65	$25.00				
SClose	11/19/96	$73.60	$25.00	$-206.61	$-217.50	$7617.11	$12617.11
Long	11/19/96	$73.60	$25.00				
LClose	11/20/96	$72.10	$25.00	$-283.34	$-306.63	$7310.48	$12310.48
Short	11/20/96	$72.10	$25.00				
SClose	11/21/96	$74.10	$25.00	$-323.19	$-390.79	$6919.69	$11919.69
Long	11/21/96	$74.10	$25.00				
LClose	11/22/96	$72.50	$25.00	$-235.28	$-306.84	$6612.85	$11612.85
Short	11/22/96	$72.50	$25.00				
SClose	11/27/96	$71.35	$25.00	$-25.00	$133.81	$6746.66	$11746.66
Long	11/27/96	$71.35	$25.00				
LClose	12/06/96	$74.40	$25.00	$-25.00	$451.07	$7197.72	$12197.72
Short	12/06/96	$74.40	$25.00				
SClose	12/12/96	$68.70	$25.00	$-25.00	$882.59	$8080.31	$13080.31
Long	12/12/96	$68.70	$25.00				
LClose	12/17/96	$73.70	$25.00	$-25.00	$900.17	$8980.48	$13980.48
Short	12/17/96	$73.70	$25.00				
SClose	12/27/96	$70.60	$25.00	$-115.89	$537.00	$9517.48	$14517.48
Long	12/27/96	$70.60	$25.00				
LClose	01/02/97	$72.10	$25.00	$-31.16	$257.91	$9775.40	$14775.40
Short	01/02/97	$72.10	$25.00				
SClose	01/06/97	$73.50	$25.00	$-340.06	$-336.42	$9438.98	$14438.98
Long	01/06/97	$73.50	$25.00				
LClose	01/07/97	$72.40	$25.00	$-223.07	$-265.72	$9173.26	$14173.26
Short	01/07/97	$72.40	$25.00				
SClose	01/15/97	$70.40	$25.00	$-226.28	$340.84	$9514.10	$14514.10
Long	01/15/97	$70.40	$25.00				
LClose	01/16/97	$69.95	$25.00	$-123.79	$-142.62	$9371.48	$14371.48
Short	01/16/97	$69.95	$25.00				
SClose	01/22/97	$66.95	$25.00	$-25.00	$565.29	$9936.77	$14936.77
Long	01/22/97	$66.95	$25.00				
LClose	01/31/97	$65.85	$25.00	$-158.64	$-295.00	$9641.77	$14641.77
Short	01/31/97	$65.85	$25.00				
SClose	02/10/97	$61.80	$25.00	$-25.00	$848.98	$10490.75	$15490.75
Long	02/10/97	$61.80	$25.00				
LClose	02/12/97	$60.80	$25.00	$-262.74	$-300.26	$10190.49	$15190.49
Short	02/12/97	$60.80	$25.00				
SClose	02/25/97	$57.00	$25.00	$-27.49	$897.84	$11088.34	$16088.34
Long	02/25/97	$57.00	$25.00				
LClose	02/26/97	$56.40	$25.00	$-115.18	$-219.09	$10869.25	$15869.25
Short	02/26/97	$56.40	$25.00				
SClose	03/06/97	$53.50	$25.00	$-25.00	$764.69	$11633.94	$16633.94
Long	03/06/97	$53.50	$25.00				
LClose	03/10/97	$52.65	$25.00	$-155.39	$-313.88	$11320.06	$16320.06
Short	03/10/97	$52.65	$25.00				
SClose	03/12/97	$54.30	$25.00	$-467.56	$-560.67	$10759.39	$15759.39
Long	03/12/97	$54.30	$25.00				
LClose	03/17/97	$54.60	$25.00	$-48.18	$36.93	$10796.32	$15796.32
Short	03/17/97	$54.60	$25.00				
SClose	03/18/97	$56.20	$25.00	$-481.39	$-512.16	$10284.16	$15284.16
Long	03/18/97	$56.20	$25.00				
LClose	03/26/97	$55.30	$25.00	$-234.07	$-294.36	$9989.79	$14989.79
Short	03/26/97	$55.30	$25.00				
SClose	03/27/97	$56.30	$25.00	$-233.37	$-320.61	$9669.18	$14669.18
Long	03/27/97	$56.30	$25.00				
LClose	04/01/97	$54.10	$25.00	$-636.26	$-622.24	$9046.94	$14046.94
Short	04/01/97	$54.10	$25.00				
SClose	04/03/97	$53.25	$25.00	$-25.00	$170.31	$9217.25	$14217.25

*** Continued on Next Page ***

FIGURE 32: Trade by trade report for daily Heating Oil data (an active strategy) - page 4

TRADE BY TRADE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	04/03/97	$53.25	$25.00				
LClose	04/11/97	$54.25	$25.00	$-120.95	$216.52	$9433.77	$14433.77
Short	04/11/97	$54.25	$25.00				
SClose	04/17/97	$54.60	$25.00	$-184.36	$-142.96	$9290.81	$14290.81
Long	04/17/97	$54.60	$25.00				
LClose	04/30/97	$54.80	$25.00	$-25.00	$2.26	$9293.06	$14293.06
Short	04/30/97	$54.80	$25.00				
SClose	05/05/97	$52.85	$25.00	$-25.00	$457.71	$9750.78	$14750.78
Long	05/05/97	$52.85	$25.00				
LClose	05/19/97	$57.40	$25.00	$-25.00	$1217.78	$10968.56	$15968.56
Short	05/19/97	$57.40	$25.00				
SClose	05/28/97	$55.20	$25.00	$-136.10	$561.08	$11529.63	$16529.63
Long	05/28/97	$55.20	$25.00				
LClose	06/02/97	$55.90	$25.00	$-25.00	$159.30	$11688.93	$16688.93
Short	06/02/97	$55.90	$25.00				
SClose	06/23/97	$52.10	$25.00	$-25.00	$1082.79	$12771.72	$17771.72
Long	06/23/97	$52.10	$25.00				
LClose	07/03/97	$52.90	$25.00	$-205.53	$222.50	$12994.23	$17994.23
Short	07/03/97	$52.90	$25.00				
SClose	07/07/97	$52.78	$25.00	$-25.00	$-9.24	$12984.99	$17984.99
Long	07/07/97	$52.78	$25.00				
Current	07/07/97	$52.78	$0.00	$-25.00	$-25.00	$12959.99	$17959.99

*** End Of Report ***

FIGURE 33: System test performance report for daily Heating Oil data (a passive strategy)

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is LONG @ 52.78, entered on 7/7/1997, gain/loss $-25.00

SUMMARY

Total Net Profit:	$25335.92	Average trade gain/loss ($):	$517.06
Total percentage gain/loss:	506.72%	Average trade gain/loss (%):	3.87%
Annualized rate of return:	253.01%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$22132.57	Average trade gain/loss ($)	$470.91
Total percentage gain/loss:	442.65%	Average trade gain/loss (%)	3.68%
Annualized rate of return:	221.02%		

TRADE STATISTICS

Total no. of trades:	49	Percentage profitable trades:	79.59%
No. Profitable Trades:	39	No. Losing Trades:	10
Amount of profitable trades:	$26820.45	Amount of losing trades:	$-1602.98
Largest profitable trade:	$3577.26	Largest losing trade:	$-373.91
Average profitable trade:	$687.70	Average losing trade:	$-160.30
No. of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	25	Number of Short trades:	24
No. profitable Long trades:	18	No. profitable Short trades:	21
Average Long gain/loss:	$380.23	Average Short gain/loss:	$654.66

TRADE DURATIONS

Total no. periods in test:	522	Number of days in test:	731
Most consecutive wins:	18	Most consecutive losses:	5
Amt. of consecutive wins:	$10715.47	Amt. of consecutive losses:	$-677.43

RISK & EXPENSE

Max. equity drop (open):	$ -44.55	Max. equity drop (closed):	$ 1247.78
Max. trade drawdown:	$ -616.35	Average trade drawdown:	$ -84.17
Commissions expenses:	$ 2425.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$118.45	Profit Factor:	16.73
Ratio Avg. Profit/Avg. Loss:	4.29	Ratio Profit/Commissions:	10.45

FIGURE 34: Trade by trade performance report for daily Heating Oil data (a passive strategy) - page 1

TRADE BY TRADE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	10/06/95	$48.34	$25.00				
LClose	12/28/95	$60.95	$25.00	$-44.55	$1247.78	$1247.78	$6247.78
Short	12/28/95	$60.95	$25.00				
SClose	01/02/96	$59.95	$25.00	$-25.00	$52.10	$1299.88	$6299.88
Long	01/02/96	$59.95	$25.00				
LClose	01/09/96	$60.43	$25.00	$-95.13	$0.24	$1300.12	$6300.12
Short	01/09/96	$60.43	$25.00				
SClose	01/26/96	$51.05	$25.00	$-25.00	$924.03	$2224.15	$7224.15
Long	01/26/96	$51.05	$25.00				
LClose	02/01/96	$52.00	$25.00	$-25.00	$83.97	$2308.12	$7308.12
Interest	02/28/96				$14.87	$2322.99	$7322.99
Short	02/28/96	$53.60	$25.00				
SClose	03/05/96	$53.10	$25.00	$-132.56	$18.08	$2341.06	$7341.06
Long	03/05/96	$53.10	$25.00				
LClose	03/15/96	$57.90	$25.00	$-25.00	$611.34	$2952.40	$7952.40
Interest	03/28/96				$7.79	$2960.19	$7960.19
Short	03/28/96	$63.50	$25.00				
SClose	04/02/96	$59.70	$25.00	$-25.00	$424.86	$3385.05	$8385.05
Long	04/02/96	$59.70	$25.00				
LClose	04/03/96	$58.00	$25.00	$-232.25	$-288.06	$3097.00	$8097.00
Interest	04/12/96				$5.49	$3102.49	$8102.49
Short	04/12/96	$61.94	$25.00				
SClose	04/23/96	$57.25	$25.00	$-113.68	$561.61	$3664.10	$8664.10
Long	04/23/96	$57.25	$25.00				
LClose	04/30/96	$55.15	$25.00	$-25.00	$-366.89	$3297.21	$8297.21
Short	04/30/96	$55.15	$25.00				
SClose	05/03/96	$55.00	$25.00	$-25.00	$-27.50	$3269.71	$8269.71
Long	05/03/96	$55.00	$25.00				
LClose	05/14/96	$55.30	$25.00	$-90.96	$-5.03	$3264.68	$8264.68
Short	05/14/96	$55.30	$25.00				
SClose	05/20/96	$55.25	$25.00	$-25.00	$-42.55	$3222.13	$8222.13
Long	05/20/96	$55.25	$25.00				
LClose	05/21/96	$54.00	$25.00	$-201.55	$-235.46	$2986.67	$7986.67
Short	05/21/96	$54.00	$25.00				
SClose	06/12/96	$50.90	$25.00	$-170.96	$407.06	$3393.73	$8393.73
Long	06/12/96	$50.90	$25.00				
LClose	06/18/96	$51.50	$25.00	$-25.00	$48.65	$3442.38	$8442.38
Short	06/18/96	$51.50	$25.00				
SClose	06/20/96	$51.60	$25.00	$-29.90	$-66.34	$3376.04	$8376.04
Long	06/20/96	$51.60	$25.00				
LClose	07/16/96	$57.18	$25.00	$-94.59	$853.08	$4229.11	$9229.11
Short	07/16/96	$57.18	$25.00				
SClose	07/29/96	$55.20	$25.00	$-25.00	$268.72	$4497.83	$9497.83
Long	07/29/96	$55.20	$25.00				
LClose	07/31/96	$56.55	$25.00	$-25.00	$181.67	$4679.50	$9679.50
Interest	09/13/96				$32.09	$4711.59	$9711.59
Short	09/13/96	$67.35	$25.00				
SClose	09/17/96	$65.60	$25.00	$-25.00	$201.69	$4913.28	$9913.28
Long	09/17/96	$65.60	$25.00				
LClose	10/08/96	$76.65	$25.00	$-25.00	$1615.63	$6528.92	$11528.92
Short	10/08/96	$76.65	$25.00				
SClose	10/11/96	$71.60	$25.00	$-25.00	$707.92	$7236.84	$12236.84
Long	10/11/96	$71.60	$25.00				
LClose	10/15/96	$73.85	$25.00	$-25.00	$333.75	$7570.59	$12570.59
Short	10/15/96	$73.85	$25.00				
SClose	10/17/96	$72.30	$25.00	$-25.00	$213.31	$7783.90	$12783.90
Long	10/17/96	$72.30	$25.00				
LClose	10/21/96	$73.50	$25.00	$-25.00	$161.77	$7945.67	$12945.67

*** Continued on Next Page ***

FIGURE 35: Trade by trade performance report for daily Heating Oil data (a passive strategy) - page 2

TRADE BY TRADE REPORT FOR:
Ella's on Daily Heating
From 7/7/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Short	10/21/96	$73.50	$25.00				
SClose	11/06/96	$66.75	$25.00	$-25.00	$1136.59	$9082.26	$14082.26
Long	11/06/96	$66.75	$25.00				
LClose	11/08/96	$69.50	$25.00	$-25.00	$529.14	$9611.40	$14611.40
Interest	11/22/96				$15.41	$9626.81	$14626.81
Short	11/22/96	$72.50	$25.00				
SClose	11/27/96	$71.35	$25.00	$-25.00	$181.62	$9808.43	$14808.43
Long	11/27/96	$71.35	$25.00				
LClose	12/06/96	$74.40	$25.00	$-25.00	$581.95	$10390.38	$15390.38
Short	12/06/96	$74.40	$25.00				
SClose	12/12/96	$68.70	$25.00	$-25.00	$1127.19	$11517.56	$16517.56
Long	12/12/96	$68.70	$25.00				
LClose	12/17/96	$73.70	$25.00	$-25.00	$1150.33	$12667.89	$17667.89
Short	12/17/96	$73.70	$25.00				
SClose	12/27/96	$70.60	$25.00	$-139.91	$692.10	$13360.00	$18360.00
Long	12/27/96	$70.60	$25.00				
LClose	12/31/96	$72.00	$25.00	$-32.79	$313.58	$13673.58	$18673.58
Interest	01/07/97				$9.85	$13683.43	$18683.43
Short	01/07/97	$72.40	$25.00				
SClose	01/15/97	$70.40	$25.00	$-290.45	$465.43	$14148.86	$19148.86
Long	01/15/97	$70.40	$25.00				
LClose	01/16/97	$69.95	$25.00	$-155.39	$-172.24	$13976.61	$18976.61
Short	01/16/97	$69.95	$25.00				
SClose	01/22/97	$66.95	$25.00	$-25.00	$762.79	$14739.41	$19739.41
Long	01/22/97	$66.95	$25.00				
LClose	01/31/97	$65.85	$25.00	$-201.68	$-373.91	$14365.50	$19365.50
Short	01/31/97	$65.85	$25.00				
SClose	03/06/97	$53.50	$25.00	$-25.00	$3577.26	$17942.76	$22942.76
Long	03/06/97	$53.50	$25.00				
LClose	03/07/97	$53.80	$25.00	$-25.00	$78.51	$18021.27	$23021.27
Interest	03/26/97				$32.96	$18054.22	$23054.22
Short	03/26/97	$55.30	$25.00				
SClose	04/03/97	$53.25	$25.00	$-616.35	$803.71	$18857.93	$23857.93
Long	04/03/97	$53.25	$25.00				
LClose	04/30/97	$54.80	$25.00	$-186.12	$843.73	$19501.66	$24501.66
Short	04/30/97	$54.80	$25.00				
SClose	05/05/97	$52.85	$25.00	$-25.00	$820.98	$20322.63	$25322.63
Long	05/05/97	$52.85	$25.00				
LClose	05/19/97	$57.40	$25.00	$-25.00	$2127.94	$22450.58	$27450.58
Short	05/19/97	$57.40	$25.00				
SClose	06/23/97	$52.10	$25.00	$-216.12	$2482.33	$24932.90	$29932.90
Long	06/23/97	$52.10	$25.00				
LClose	07/03/97	$52.90	$25.00	$-329.24	$409.24	$25342.14	$30342.14
Short	07/03/97	$52.90	$25.00				
SClose	07/07/97	$52.78	$25.00	$-25.00	$18.77	$25360.92	$30360.92
Long	07/07/97	$52.78	$25.00				
Current	07/07/97	$52.78	$0.00	$-25.00	$-25.00	$25335.92	$30335.92

*** End Of Report ***

XIII. ADDITIONAL TESTING DONE ON S&P 500 AND U.S. T-BOND

The trading model presently discussed was originally designed with the price behavior of Light Sweet Crude and Heating Oil in mind. While the model works fine on the markets for which it was designed, its performance was also tested on two other markets - S&P 500 and the U.S. T-Bond - whose price patterns display the least possible resemblance to the behavior of the Light Sweet Crude.

The Light Sweet Crude / Heating Oil markets are strongly affected by demand and supply factors such as world-wide production; strikes and other work stoppages; and circumstances pertaining to transportation of the product. For this reason, the Light Sweet Crude / Heating Oil markets display an often-oscillating price behavior: an already-established trend is bound to remain in place as long as no new conflicting fundamental factors interfere. Given the complex and fast-changing world in which we live, this time period is often rather short.

Quite on the contrary, the S&P 500 and U.S. T-Bond are markets are mainly affected by economic factors and government policy, such as employment figures and changes in the level of interest rates. These factors tend to change at much larger intervals in time. For this reason, the stock and bond markets - after establishing an initial trend direction - tend to maintain their chosen path for quite sometime.

Two years of daily data 1995-1997 were used for both S&P 500, and U.S. T-Bond.

The Performance Report for S&P 500 is shown in Figure 36. A total of 56 trades were implemented (i.e. 40 long and 16 short). Out of these, 71.43% have resulted in profitable transactions. The average percentage gain / loss registered per trade was a gain of 1.64%. Trade-by-trade details are given in Figures 37 and 38.

The Performance Report for U.S. T-Bond is shown in Figure 39. A total of 19 trades were implemented (i.e. 10 long and 9 short). Out of these, 94.74% have resulted in profitable transactions. The average percentage gain / loss registered per trade was a gain of 2.57%. Trade-by-trade details are given in Figure 40.

Although the above results look promising, it is important to keep in mind that the trading model in question was initially designed for a market behavior that is quite different than that of the stock and bond markets. Given the fact that only 2 years of daily data were available for study, it is inappropriate - at this point in time - to positively assume that the trading model can be safely applied to these two markets. Before any reliable conclusions can be reached, a much lengthier study (i.e. on 15 years of weekly data, similar to the one already conducted on the Light Sweet Crude) should be performed.

FIGURE 36: System test performance report for daily S&P 500 data

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on 104 - S&P-500, Daily Data.
From 9/20/1995 to 7/1/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is LONG @ 901.25, entered on 7/1/1997. gain/loss $-25.00

SUMMARY

Total Net Profit:	$7235.61	Average trade gain/loss ($):	$129.21
Total percentage gain/loss:	144.71%	Average trade gain/loss (%):	1.64%
Annualized rate of return:	81.26%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$6497.58	Average trade gain/loss ($)	$120.33
Total percentage gain/loss:	129.95%	Average trade gain/loss (%):	1.58%
Annualized rate of return:	72.97%		

TRADE STATISTICS

Total no. of trades:	56	Percentage profitable trades:	71.43%
No. Profitable Trades:	40	No. Losing Trades:	16
Amount of profitable trades:	$8119.49	Amount of losing trades:	$-883.88
Largest profitable trade:	$905.61	Largest losing trade	$-167.58
Average profitable trade:	$202.99	Average losing trade:	$-55.24
No. of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	28	Number of Short trades:	28
No. profitable Long trades:	20	No. profitable Short trades:	20
Average Long gain/loss:	$196.61	Average Short gain/loss:	$61.80

TRADE DURATIONS

Total no. periods in test:	465	Number of days in test:	650
Most consecutive wins:	8	Most consecutive losses	4
Amt. of consecutive wins:	$2149.33	Amt. of consecutive losses:	$-370.54

RISK & EXPENSE

Max. equity drop (open):	$ -28.11	Max. equity drop (closed):	$ -3.11
Max. trade drawdown:	$ -143.27	Average trade drawdown:	$ -37.33
Commissions expenses:	$ 2775.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$0.00	Profit Factor:	9.19
Ratio Avg. Profit/Avg. Loss:	3.67	Ratio Profit/Commissions	2.61

FIGURE 37: Trade by trade report for daily S&P 500 data (page 1)

TRADE BY TRADE REPORT FOR:
Ella's on 104 - S&P-500, Daily Data.
From 9/20/1995 to 7/1/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Short	10/20/95	$588 90	$25 00				
SClose	10/27/95	$583 35	$25 00	$-27 96	$-3 11	$-3 11	$4996 89
Long	10/27/95	$583 35	$25 00				
LClose	12/14/95	$623 75	$25 00	$-25 00	$294 33	$291 22	$5291 22
Short	12/14/95	$623 75	$25 00				
SClose	12/19/95	$617 75	$25 00	$-25 00	$0 66	$291 87	$5291 87
Long	12/19/95	$617 75	$25 00				
LClose	01/04/96	$619 95	$25 00	$-65 07	$-31 24	$260 63	$5260 63
Short	01/04/96	$619 95	$25 00				
SClose	01/11/96	$605 60	$25 00	$-45 69	$71 19	$331 82	$5331 82
Long	01/11/96	$605 60	$25 00				
LClose	02/13/96	$661 80	$25 00	$-46 03	$442 48	$774 29	$5774 29
Short	02/13/96	$661 80	$25 00				
SClose	02/21/96	$651 05	$25 00	$-25 00	$43 39	$817 68	$5817 68
Long	02/21/96	$651 05	$25 00				
LClose	02/23/96	$658 95	$25 00	$-25 00	$20 29	$837 97	$5837 97
Short	02/23/96	$658 95	$25 00				
SClose	03/01/96	$654 00	$25 00	$-25 00	$-6 33	$831 64	$5831 64
Long	03/01/96	$654 00	$25 00				
LClose	03/06/96	$657 70	$25 00	$-25 00	$-17 15	$814 49	$5814 49
Short	03/06/96	$657 70	$25 00				
SClose	03/11/96	$642 50	$25 00	$-47 89	$83 80	$898 29	$5898 29
Long	03/11/96	$642 50	$25 00				
LClose	04/08/96	$647 00	$25 00	$-39 63	$-8 86	$889 43	$5889 43
Short	04/08/96	$647 00	$25 00				
SClose	04/11/96	$633 50	$25 00	$-25 00	$72 36	$961 79	$5961 79
Long	04/11/96	$633 50	$25 00				
LClose	04/29/96	$655 00	$25 00	$-25 00	$151 49	$1113 28	$6113 28
Short	04/29/96	$655 00	$25 00				
SClose	05/08/96	$647 60	$25 00	$-38 48	$18 78	$1132 06	$6132 06
Long	05/08/96	$647 60	$25 00				
LClose	05/23/96	$678 35	$25 00	$-27 36	$239 98	$1372 04	$6372 04
Short	05/23/96	$678 35	$25 00				
SClose	06/03/96	$669 40	$25 00	$-46 05	$33 74	$1405 79	$6405 79
Long	06/03/96	$669 40	$25 00				
LClose	06/06/96	$673 05	$25 00	$-25 00	$-15 21	$1390 58	$6390 58
Short	06/06/96	$673 05	$25 00				
SClose	06/21/96	$673 45	$25 00	$-66 14	$-53 78	$1336 79	$6336 79
Long	06/21/96	$673 45	$25 00				
LClose	07/02/96	$678 80	$25 00	$-69 99	$0 14	$1336 94	$6336 94
Short	07/02/96	$678 80	$25 00				
SClose	07/16/96	$633 50	$25 00	$-25 00	$371 23	$1708 16	$6708 16
Long	07/16/96	$633 50	$25 00				
LClose	07/19/96	$638 70	$25 00	$-25 00	$4 86	$1713 02	$6713 02
Short	07/19/96	$638 70	$25 00				
SClose	07/24/96	$630 05	$25 00	$-25 00	$40 58	$1753 60	$6753 60
Long	07/24/96	$630 05	$25 00				
LClose	08/23/96	$669 00	$25 00	$-25 00	$365 97	$2119 56	$7119 56
Short	08/23/96	$669 00	$25 00				
SClose	09/06/96	$665 30	$25 00	$-25 00	$-10 76	$2108 80	$7108 80
Long	09/06/96	$665 30	$25 00				
LClose	10/21/96	$714 55	$25 00	$-25 00	$474 39	$2583 19	$7583 19
Short	10/21/96	$714 55	$25 00				
SClose	10/29/96	$703 65	$25 00	$-25 00	$65 29	$2648 49	$7648 49
Long	10/29/96	$703 65	$25 00				
LClose	11/26/96	$757 30	$25 00	$-34 21	$531 25	$3179 74	$8179 74
Short	11/26/96	$757 30	$25 00				
SClose	12/09/96	$751 70	$25 00	$-35 23	$10 30	$3190 04	$8190 04

*** Continued on Next Page ***

FIGURE 38: Trade by trade report for daily S&P 500 data (page 2)

TRADE BY TRADE REPORT FOR:
Ella's on 104 - S&P-500, Daily Data.
From 9/20/1995 to 7/1/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Long	12/09/96	$751 70	$25 00				
LClose	12/10/96	$747 85	$25 00	$-65 19	$-91 82	$3098 23	$8098 23
Short	12/10/96	$747 85	$25 00				
SClose	12/17/96	$732 85	$25 00	$-25 00	$111 93	$3210 15	$8210 15
Long	12/17/96	$732 85	$25 00				
LClose	12/27/96	$764 60	$25 00	$-25 00	$304 61	$3514 77	$8514 77
Short	12/27/96	$764 60	$25 00				
SClose	01/02/97	$744 90	$25 00	$-25 00	$168 74	$3683 51	$8683 51
Long	01/02/97	$744 90	$25 00				
LClose	01/23/97	$778 10	$25 00	$-25 00	$335 91	$4019 42	$9019 42
Short	01/23/97	$778 10	$25 00				
SClose	01/28/97	$770 60	$25 00	$-25 00	$36 70	$4056 11	$9056 11
Long	01/28/97	$770 60	$25 00				
LClose	02/05/97	$780 00	$25 00	$-25 00	$60 16	$4116 27	$9116 27
Short	02/05/97	$780 00	$25 00				
SClose	02/06/97	$789 50	$25 00	$-55 89	$-160 73	$3955 55	$8955 55
Long	02/06/97	$789 50	$25 00				
LClose	02/19/97	$813 95	$25 00	$-41 40	$226 57	$4182 12	$9182 12
Short	02/19/97	$813 95	$25 00				
SClose	03/03/97	$795 00	$25 00	$-27 25	$163 19	$4345 31	$9345 31
Long	03/03/97	$795 00	$25 00				
LClose	03/11/97	$811 05	$25 00	$-59 59	$138 17	$4483 47	$9483 47
Short	03/11/97	$811 05	$25 00				
SClose	03/21/97	$791 15	$25 00	$-25 00	$182 07	$4665 55	$9665 55
Long	03/21/97	$791 15	$25 00				
LClose	03/25/97	$794 80	$25 00	$-25 00	$-5 52	$4660 02	$9660 02
Short	03/25/97	$794 80	$25 00				
SClose	04/03/97	$754 30	$25 00	$-66 22	$440 96	$5100 99	$10100 99
Long	04/03/97	$754 30	$25 00				
LClose	04/09/97	$765 45	$25 00	$-25 00	$98 94	$5199 93	$10199 93
Short	04/09/97	$765 45	$25 00				
SClose	04/14/97	$746 90	$25 00	$-25 00	$196 58	$5396 51	$10396 51
Long	04/14/97	$746 90	$25 00				
LClose	04/23/97	$780 00	$25 00	$-25 00	$409 63	$5806 14	$10806 14
Short	04/23/97	$780 00	$25 00				
SClose	04/28/97	$775 10	$25 00	$-25 00	$17 73	$5823 87	$10823 87
Long	04/28/97	$775 10	$25 00				
LClose	05/06/97	$834 50	$25 00	$-25 00	$777 58	$6601 44	$11601 44
Short	05/06/97	$834 50	$25 00				
SClose	05/08/97	$822 05	$25 00	$-25 00	$122 71	$6724 15	$11724 15
Long	05/08/97	$822 05	$25 00				
LClose	05/16/97	$831 55	$25 00	$-25 00	$85 20	$6809 35	$11809 35
Short	05/16/97	$831 55	$25 00				
SClose	05/19/97	$835 70	$25 00	$-88 77	$-108 81	$6700 54	$11700 54
Long	05/19/97	$835 70	$25 00				
LClose	06/20/97	$904 10	$25 00	$-25 00	$905 61	$7606 15	$12606 15
Short	06/20/97	$904 10	$25 00				
SClose	06/24/97	$905 00	$25 00	$-37 52	$-62 52	$7543 63	$12543 63
Long	06/24/97	$905 00	$25 00				
LClose	06/25/97	$896 50	$25 00	$-143 27	$-167 58	$7376 05	$12376 05
Short	[illegible]	$896 50	$25 00				
SClose	[illegible]	$901 25	$25 00	$-90 44	$-115 44	$7260 61	$12260 61
Long	07/01/97	$901 25	$25 00				
Current	07/01/97	$901 25	$0 00	$-25 00	$-25 00	$7235 61	$12235 61

*** End Of Report ***

FIGURE 39: System test performance report for daily T-Bond data

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on 106 + T.Bond-Daily Data.
From 11/2/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is LONG @ 106.69, entered on 4/14/199 ', gain/loss $471.07.

SUMMARY

Total Net Profit:	$3091.46	Average trade gain/loss ($):	$162.71
Total percentage gain/loss:	61.83%	Average trade gain/loss (%):	2.59%
Annualized rate of return:	36.82%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit:	$2654.90	Average trade gain/loss ($):	$156.17
Total percentage gain/loss:	53.10%	Average trade gain/loss (%):	2.57%
Annualized rate of return:	31.62%		

TRADE STATISTICS

Total no of trades:	19	Percentage profitable trades:	94.74%
No Profitable Trades:	18	No. Losing Trades:	1
Amount of profitable trades:	$3125.97	Amount of losing trades:	$-34.51
Largest profitable trade:	$471.07	Largest losing trade:	$-34.51
Average profitable trade:	$173.66	Average losing trade:	$-34.51
No of stop hits:	0	Average gain/loss per stop:	$0.00

LONG/SHORT BREAKDOWN

Number of Long trades:	10	Number of Short trades:	9
No profitable Long trades:	9	No. profitable Short trades:	9
Average Long gain/loss:	$149.65	Average Short gain/loss:	$177.21

TRADE DURATIONS

Total no periods in test:	438	Number of days in test:	613
Most consecutive wins:	12	Most consecutive losses:	1
Amt. of consecutive wins:	$2641.95	Amt. of consecutive losses:	$-34.51

RISK & EXPENSE

Max equity drop (open):	$ -31.50	Max. equity drop (closed):	$ 0.76
Max trade drawdown:	$ -53.69	Average trade drawdown:	$ -31.92
Commissions expenses:	$ 925.00	Margin interest expenses:	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned:	$0.00	Profit Factor:	90.58
Ratio Avg Profit/Avg Loss:	5.03	Ratio Profit/Commissions:	3.34

FIGURE 40: Trade by trade report for daily T-Bond data (page 1)

TRADE BY TRADE REPORT FOR:
Ella's on 106 + T.Bond-Daily Data.
From 11/2/1995 to 7/7/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
OUT							
Long	12/19/95	$119 47	$25 00				
LClose	01/04/96	$120 69	$25 00	$-31 50	$0 76	$0 76	$5000 76
Short	01/04/96	$120 69	$25 00				
SClose	01/11/96	$118 97	$25 00	$-25 00	$20 87	$21 63	$5021 63
Long	01/11/96	$118 97	$25 00				
LClose	01/22/96	$120 47	$25 00	$-25 00	$13 00	$34 63	$5034 63
Short	01/22/96	$120 47	$25 00				
SClose	03/18/96	$111 13	$25 00	$-44 50	$338 56	$373 20	$5373 20
Long	03/18/96	$111 13	$25 00				
LClose	03/26/96	$112 75	$25 00	$-25 00	$28 21	$401 41	$5401 41
Short	03/26/96	$112 75	$25 00				
SClose	04/12/96	$109 97	$25 00	$-25 00	$82 61	$484 02	$5484 02
Long	04/12/96	$109 97	$25 00				
LClose	04/23/96	$110 28	$25 00	$-51 36	$-34 51	$449 50	$5449 50
Short	04/23/96	$110 28	$25 00				
SClose	05/06/96	$107 25	$25 00	$-25 00	$99 09	$548 59	$5548 59
Long	05/06/96	$107 25	$25 00				
LClose	05/23/96	$109 44	$25 00	$-41 07	$62 69	$611 28	$5611 28
Short	05/23/96	$109 44	$25 00				
SClose	06/13/96	$106 97	$25 00	$-53 69	$76 03	$687 31	$5687 31
Long	06/13/96	$106 97	$25 00				
LClose	07/02/96	$109 03	$25 00	$-34 95	$59 15	$746 46	$5746 46
Short	07/02/96	$109 03	$25 00				
SClose	07/08/96	$106 44	$25 00	$-36 49	$86 07	$832 53	$5832 53
Long	07/08/96	$106 44	$25 00				
LClose	08/12/96	$112 06	$25 00	$-25 00	$256 91	$1089 44	$6089 44
Short	08/12/96	$112 06	$25 00				
SClose	09/06/96	$106 88	$25 00	$-25 00	$230 76	$1320 20	$6320 20
Long	09/06/96	$106 88	$25 00				
LClose	12/04/96	$115 38	$25 00	$-37 90	$450 67	$1770 87	$6770 87
Short	12/04/96	$115 38	$25 00				
SClose	01/28/97	$110 09	$25 00	$-25 00	$258 78	$2029 64	$7029 64
Long	01/28/97	$110 09	$25 00				
LClose	02/18/97	$113 84	$25 00	$-25 00	$188 59	$2218 23	$7218 23
Short	02/18/97	$113 84	$25 00				
SClose	04/14/97	$106 69	$25 00	$-25 00	$402 15	$2620 39	$7620 39
Long	04/14/97	$106 69	$25 00				
Current	07/07/97	$113 66	$0 00	$-25 00	$471 07	$3091 46	$8091 46

*** End Of Report ***

XIV. STATISTICAL RESULTS

The statistical significance of the results generated by the trading model was analyzed by the means of t-tests. The results - which are displayed in detail over the following pages - were found to be statistically significant at the 5% confidence level.

For the weekly data on Light Sweet Crude ('83 - '97):

t = 3.56669693 > 2 ; Skewness = 0.839430113 > 0

For the daily data on Light Sweet Crude ('91 - '97), when adopting an active strategy:

t = 8.26304354 > 2 ; Skewness = 0.96465717 > 0

For the daily data on Light Sweet Crude ('91 - '97), when adopting a passive strategy:

t = 5.105314869 > 2 ; Skewness = 0.695258407 > 0

For the daily data on S&P 500 ('95 - '97):

t = 4.849683655 > 2 ; Skewness = 1.171258769 > 0

For the daily data on U.S. T-Bond ('95 - '97):

t = 4.654224236 > 2 ; Skewness = 0.658845091 > 0

FIGURE 41: Statistical results for weekly Crude data (page 1)

Sheet1

GAIN	INTERE	GAIN+INT	EQUITY	%GAIN	%GainSquared
-$135.75					
$51.31	INT	-$84.44	$5,000.00	-1.69%	0.000285205
$250.47		$250.47	$4,915.56	5.10%	0.002596363
$5.49		$5.49	$5,166.03	0.11%	1.12936E-06
$487.17		$487.17	$5,171.52	9.42%	0.008874107
-$69.50					
$41.27	INT	-$28.23	$5,658.69	-0.50%	2.4888E-05
$165.44		$165.44	$5,630.45	2.94%	0.000863366
$857.56		$857.56	$5,795.89	14.80%	0.021892168
$3,690.01		$3,690.01	$6,653.46	55.46%	0.307581341
-$1,349.36					
$23.72	INT	-$1,325.64	$10,343.46	-12.82%	0.016425535
$2,094.75		$2,094.75	$9,017.82	23.23%	0.053958675
$2,875.23					
$177.05	INT	$3,052.28	$11,112.57	27.47%	0.075443134
$281.11		$281.11	$14,164.85	1.98%	0.000393848
$185.76					
$131.18	INT	$316.94	$14,445.96	2.19%	0.00048135
$2,914.81		$2,914.81	$14,762.91	19.74%	0.038983117
$488.19					
$154.66	INT	$642.85	$17,677.73	3.64%	0.001322411
$2,816.77		$2,816.77	$18,320.58	15.37%	0.023638741
$426.73					
$227.46	INT	$654.19	$21,137.35	3.09%	0.00095787
$2,459.88		$2,459.88	$21,791.54	11.29%	0.012742422
$1,186.18					
$281.73	INT	$1,467.91	$24,251.42	6.05%	0.003663739
$4,213.34		$4,213.34	$25,719.33	16.38%	0.026836984
$15,023.46		$15,023.46	$29,932.67	50.19%	0.251912092
-$607.65		-$607.65	$44,956.13	-1.35%	0.000182696
$15,086.74					
$94.04	INT	$15,180.78	$44,348.48	34.23%	0.117173848
-$7,768.95					
$109.19	INT	-$7,659.76	$59,529.25	-12.87%	0.016556537
-$7,049.77		-$7,049.77	$51,869.50	-13.59%	0.018472504
-$2,892.89		-$2,892.89	$44,819.72	-6.45%	0.00416606
-$14,107.39		-$14,107.39	$41,926.83	-33.65%	0.113216387
-$589.70		-$589.70	$27,819.45	-2.12%	0.00044933
-$762.50		-$762.50	$27,229.75	-2.80%	0.000784138
$984.42		$984.42	$26,467.25	3.72%	0.001383385
-$1,222.44					
$456.50	INT	-$765.94	$27,451.66	-2.79%	0.000778489
$4,451.46		$4,451.46	$26,685.72	16.68%	0.027825764
-$294.33					
$309.06	INT	$14.73	$31,137.18	0.05%	2.23793E-07
$2,538.08		$2,538.08	$31,151.91	8.15%	0.006638061
-$495.57					
$87.53	INT	-$408.04	$33,689.99	-1.21%	0.000146691
$9,565.49		$9,565.49	$33,281.96	28.74%	0.082603159
-$1,195.46					

FIGURE 42: Statistical results for weekly Crude data (page 2)

Sheet1

$552.32	INT	-$643.14	$42,847.45	-1.50%	0.0002253
$4,296.81		$4,296.81	$42,204.31	10.18%	0.010365224
$889.18					
$399.90	INT	$1,289.08	$46,501.12	2.77%	0.000768481
$7,106.62		$7,106.62	$47,790.20	14.87%	0.022113042
$1,178.47					
$650.63	INT	$1,829.10	$54,896.82	3.33%	0.001110147
$1,438.87		$1,438.87	$56,725.92	2.54%	0.000643398
$10,696.07		$10,696.07	$58,164.79	18.39%	0.03381646
$2,397.93		$2,397.93	$68,860.86	3.48%	0.001212629
$1,771.12					
$539.22	INT	$2,310.34	$71,258.79	3.24%	0.001051175
$3,847.15		$3,847.15	$73,569.13	5.23%	0.002734557
$146.84					
$327.25	INT	$474.09	$77,416.28	0.61%	3.75022E-05
$17,071.09		$17,071.09	$77,890.37	21.92%	0.048034688
$9,385.57		$9,385.57	$94,961.46	9.88%	0.00976847
$13,105.12		$13,105.12	$104,347.03	12.56%	0.015773273
$3,775.02		$3,775.02	$117,452.15	3.21%	0.001033039
Weekly Data on Crude '83-'97			Sample Size	51	
		RESULTS:	Average Return	7.43%	
			Kurtosis	2.893208311	
			Skewness	0.839430113	
			m	0.074294957	
			T-Value	3.56669693	
		T-Value with Miu = 0.03		2.126479296	
		T-Value with Miu = 0.0326		2.001660434	

FIGURE 43: Statistical results for daily Crude data - active strategy

(page 1)

GAIN	INT	GAIN+INTR	EQUITY	%GAIN	%GainSquared
$190.16		$190.16	$5,000.00	3.80320%	0.001446433
($72.06)					
$28.92	INT	($43.14)	$5,190.16	-0.83119%	6.90874E-05
$16.36		$16.36	$5,147.01	0.31785%	1.01031E-05
$182.31					
$13.69	INT	$196.00	$5,163.38	3.79596%	0.001440934
$279.72		$279.72	$5,359.38	5.21926%	0.002724068
($44.72)					
$14.33	INT	($30.39)	$5,639.10	-0.53892%	2.9043E-05
$755.95		$755.95	$5,608.72	13.47812%	0.018165971
($50.00)					
$5.23	INT	($44.77)	$6,364.67	-0.70341%	4.94792E-05
$364.39		$364.39	$6,319.90	5.76576%	0.003324394
$598.38		$598.38	$6,684.29	8.95204%	0.008013894
$263.08		$263.08	$7,282.66	3.61242%	0.001304955
$443.16		$443.16	$7,545.74	5.87298%	0.003449193
$332.88		$332.88	$7,988.90	4.16678%	0.001736207
$46.38		$46.38	$8,321.78	0.55733%	3.1062E-05
$795.56		$795.56	$8,368.16	9.50699%	0.009038283
($192.16)					
$4.06	INT	($188.10)	$9,163.72	-2.05266%	0.000421341
$230.32		$230.32	$8,975.62	2.56606%	0.000658468
($102.08)					
$13.72	INT	($88.36)	$9,205.94	-0.95982%	9.21245E-05
$814.11		$814.11	$9,117.58	8.92901%	0.007972729
($120.14)					
$11.09	INT	($109.05)	$9,931.69	-1.09800%	0.00012056
$2,227.06		$2,227.06	$9,822.64	22.67272%	0.051405239
($50.00)					
$15.37	INT	($34.63)	$12,049.71	-0.28739%	8.25946E-06
$627.36		$627.36	$12,015.08	5.22144%	0.002726342
$167.09					
$19.30	INT	$186.39	$12,642.44	1.47432%	0.000217362
$1,291.43		$1,291.43	$12,828.84	10.06662%	0.010133675
($119.14)					
$33.76	INT	($85.38)	$14,120.26	-0.60466%	3.65617E-05
$652.34		$652.34	$14,034.88	4.64799%	0.002160382
($90.73)					
$59.39	INT	($31.34)	$14,687.22	-0.21338%	4.55322E-06
$169.34		$169.34	$14,655.87	1.15544%	0.000133504
$1,293.20		$1,293.20	$14,825.22	8.72297%	0.007609027
($33.37)		($33.37)	$16,118.42	-0.20703%	4.28615E-06
$606.36		$606.36	$16,085.05	3.76971%	0.001421073
$562.98		$562.98	$16,691.41	3.37287%	0.001137627
$661.22		$661.22	$17,254.39	3.83218%	0.001468564
$2,919.95		$2,919.95	$17,915.62	16.29835%	0.026563613
$1,198.89					
$16.60	INT	$1,215.48	$20,835.56	5.83368%	0.003403183

FIGURE 44: Statistical results for daily Crude data - active strategy (page 2)

$1,295.57		$1,295.57	$22,051.05	5.87532%	0.00345194
$2,506.36		$2,506.36	$23,346.61	10.73543%	0.011524955
$2,678.79		$2,678.79	$25,852.97	10.36163%	0.010736345
($134.19)					
$136.93	INT	$2.74	$28,531.76	0.00960%	9.2224E-09
$668.47		$668.47	$28,534.50	2.34267%	0.000548812
($162.35)					
$83.14	INT	($79.21)	$29,202.96	-0.27124%	7.35709E-06
$4,982.76		$4,982.76	$29,123.76	17.10892%	0.029271505
$1,161.43					
$148.80	INT	$1,310.23	$34,106.52	3.84158%	0.001475775
$1,930.37		$1,930.37	$35,416.75	5.45044%	0.002970734
$563.27					
$262.78	INT	$826.05	$37,347.12	2.21182%	0.000489214
$2,666.67		$2,666.67	$38,173.17	6.98572%	0.004880026
$258.54		$258.54	$40,839.84	0.63306%	4.00763E-05
$2,371.26		$2,371.26	$41,098.37	5.76972%	0.003328964
$5,244.51		$5,244.51	$43,469.63	12.06477%	0.014555863
$642.03		$642.03	$48,714.14	1.31795%	0.0001737
$3,709.53		$3,709.53	$49,356.17	7.51584%	0.005648783
($2,562.45)		($2,562.45)	$53,065.70	-4.82883%	0.002331755
$664.86					
$69.39	INT	$734.25	$50,503.25	1.45387%	0.000211373
$3,237.50		$3,237.50	$51,237.50	6.31861%	0.003992489
($2,523.90)		($2,523.90)	$54,475.00	-4.63313%	0.002146593
$3,366.51		$3,366.51	$51,951.10	6.48015%	0.004199236
$3,678.52		$3,678.52	$55,317.61	6.64982%	0.004422007
$3,785.75		$3,785.75	$58,996.13	6.41695%	0.00411772
$2,023.05					
$97.65	INT	$2,120.70	$62,781.88	3.37789%	0.001141011
$6,037.70		$6,037.70	$64,902.58	9.30271%	0.008654045
$6,244.25		$6,244.25	$70,940.29	8.80212%	0.007747733
$1,138.15		$1,138.15	$77,184.54	1.47458%	0.000217439
$8,809.81		$8,809.81	$78,322.69	11.24809%	0.012651962
$3,153.55		$3,153.55	$87,132.50	3.61926%	0.001309903
$2,040.99					
$146.08	INT	$2,187.07	$90,286.05	2.42238%	0.000586792
$1,020.69		$1,020.69	$92,473.12	1.10377%	0.000121831
$3,046.74					
$58.19	INT	$3,104.93	$93,493.80	3.32100%	0.001102905
$10,743.54		$10,743.54	$96,598.74	11.12182%	0.012369493
$4,403.79					
$101.03	INT	$4,504.82	$107,342.27	4.19669%	0.001761219
($1,340.26)		($1,340.26)	$111,847.09	-1.19830%	0.000143592
$7,278.12		$7,278.12	$110,506.84	6.58613%	0.004337706
$7,041.73		$7,041.73	$117,784.95	5.97846%	0.003574202
$8,526.16		$8,526.16	$124,826.68	6.83040%	0.004665435
$1,001.91		$1,001.91	$133,352.84	0.75132%	5.64486E-05
$3,849.03					

FIGURE 45: Statistical results for daily Crude data - active strategy (page 3)

$93.71	INT	$3,942.74	$134,354.75	2.93457%	0.000861173
$9,774.07		$9,774.07	$138,297.49	7.06742%	0.004994848
$1,463.77					
$11.27	INT	$1,475.04	$148,071.56	0.99617%	9.92349E-05
Daily Data on Crude '91-'97			Sample Size	78	
Active Strategy			Average Retur	4.56234%	
RESULTS:					
			Kurtosis	1.80386277	
			Skewness	0.96465717	
			m	0.04562343	
			T-Value	8.26304354	
		T-Value with Miu = 0.03		2.82962274	
		T-Value with Miu = 0.03458		2.0001205	

FIGURE 46: Statistical results for daily Crude data - passive strategy (page 1)

Sheet1

GAIN	INTE	GAIN+INT	EQUITY	%GAIN	%GainSquared
-$4.51					
$18.82	INT	$14.31	$5,000.00	0.29%	8.191E-06
$873.50		$873.50	$5,014.31	17.42%	0.03034614
-$91.51					
$6.55	INT	-$84.96	$5,887.82	-1.44%	0.00020822
$1,292.83		$1,292.83	$5,802.86	22.28%	0.04963621
-$50.00					
$23.36	INT	-$26.64	$7,095.69	-0.38%	1.4095E-05
$687.99		$687.99	$7,069.04	9.73%	0.00947204
-$1.23					
$68.95	INT	$67.72	$7,757.03	0.87%	7.6215E-05
$965.78		$965.78	$7,824.75	12.34%	0.01523405
$132.29					
$30.25	INT	$162.54	$8,790.53	1.85%	0.00034189
$893.27		$893.27	$8,953.08	9.98%	0.00995453
-$79.01					
$90.52	INT	$11.51	$9,846.35	0.12%	1.3665E-06
$1,650.64		$1,650.64	$9,857.86	16.74%	0.02803751
$358.18					
$50.07	INT	$408.25	$11,508.49	3.55%	0.00125839
$615.41		$615.41	$11,916.74	5.16%	0.00266695
$236.25					
$87.54	INT	$323.79	$12,532.15	2.58%	0.00066754
$1,481.48		$1,481.48	$12,855.95	11.52%	0.01327955
$104.86					
$45.70	INT	$150.56	$14,337.43	1.05%	0.00011027
-$735.09		-$735.09	$14,487.99	-5.07%	0.00257433
$144.41					
$18.85	INT	$163.26	$13,752.90	1.19%	0.00014092
$841.72		$841.72	$13,916.16	6.05%	0.00365844
-$719.38		-$719.38	$14,757.88	-4.87%	0.00237612
$872.03		$872.03	$14,038.50	6.21%	0.00385853
$953.77		$953.77	$14,910.53	6.40%	0.00409168
$980.26		$980.26	$15,864.30	6.18%	0.00381804
$1,970.37		$1,970.37	$16,844.56	11.70%	0.01368284
$1,713.13		$1,713.13	$18,814.92	9.11%	0.00829041
$71.32					
$128.82	INT	$200.14	$20,528.05	0.97%	9.5054E-05
$2,263.89		$2,263.89	$20,728.19	10.92%	0.01192856
$903.16					
$55.81	INT	$958.97	$22,992.07	4.17%	0.00173962
$1,390.87		$1,390.87	$23,951.04	5.81%	0.00337229
$729.15					
$53.03	INT	$782.18	$25,341.92	3.09%	0.00095265
$1,804.30		$1,804.30	$26,124.10	6.91%	0.00477018
$235.31					
$2.12	INT	$237.43	$27,928.40	0.85%	7.2273E-05
Daily Data on Crude '91-'97			Sample Size	33	
Passive Strategy			Average Return	5.55%	
	RESULTS:		Kurtosis	0.470727773	

FIGURE 47: Statistical results for daily Crude data - passive strategy (page 2)

Sheet1

Skewness	0.695258407
m	0.055535483
T-Value	5.105314869
T-Value with Miu =0.03	2.347448421
T-Value with Miu =0.0337	2.007311559

FIGURE 48: Statistical results for daily S&P 500 data (page 1)

Sheet1

GAIN	EQUITY	%GAIN	%GainSquared
-$3.11	$5,000.00	-0.06%	3.86884E-07
$294.33	$4,996.89	5.89%	0.003469521
$0.66	$5,291.22	0.01%	1.55588E-08
-$31.24	$5,291.87	-0.59%	3.48501E-05
$71.19	$5,260.63	1.35%	0.000183131
$442.48	$5,331.82	8.30%	0.006887099
$43.39	$5,774.29	0.75%	5.64654E-05
$20.29	$5,817.68	0.35%	1.21637E-05
-$6.33	$5,837.97	-0.11%	1.17567E-06
-$17.15	$5,831.64	-0.29%	8.64862E-06
$83.80	$5,814.49	1.44%	0.000207714
-$8.86	$5,898.29	-0.15%	2.2564E-06
$72.36	$5,889.43	1.23%	0.000150956
$151.49	$5,961.79	2.54%	0.000645676
$18.78	$6,113.28	0.31%	9.43719E-06
$239.98	$6,132.06	3.91%	0.001531572
$33.74	$6,372.04	0.53%	2.80371E-05
-$15.21	$6,405.79	-0.24%	5.63784E-06
-$53.78	$6,390.58	-0.84%	7.08208E-05
$0.14	$6,336.79	0.00%	4.8811E-10
$371.23	$6,336.94	5.86%	0.003431839
$4.86	$6,708.16	0.07%	5.24887E-07
$40.58	$6,713.02	0.60%	3.65417E-05
$365.97	$6,753.60	5.42%	0.002936434
-$10.76	$7,119.56	-0.15%	2.28412E-06
$474.39	$7,108.80	6.67%	0.004453264
$65.29	$7,583.19	0.86%	7.41292E-05
$531.25	$7,648.49	6.95%	0.004824435
$10.30	$8,179.74	0.13%	1.58561E-06
-$91.82	$8,190.04	-1.12%	0.000125691
$111.93	$8,098.23	1.38%	0.000191035
$304.61	$8,210.15	3.71%	0.001376531
$168.74	$8,514.77	1.98%	0.000392727
$335.91	$8,683.51	3.87%	0.001496426
$36.70	$9,019.42	0.41%	1.65567E-05
$60.16	$9,056.11	0.66%	4.41298E-05
-$160.73	$9,116.27	-1.76%	0.000310856
$226.57	$8,955.55	2.53%	0.000640059
$163.19	$9,182.12	1.78%	0.000315865
$138.17	$9,345.31	1.48%	0.000218595
$182.07	$9,483.47	1.92%	0.000368589
-$5.52	$9,665.55	-0.06%	3.26156E-07
$440.96	$9,660.02	4.56%	0.002083734
$98.94	$10,100.99	0.98%	9.59436E-05
$196.58	$10,199.93	1.93%	0.000371436
$409.63	$10,396.51	3.94%	0.001552417
$17.73	$10,806.14	0.16%	2.69201E-06
$777.58	$10,823.87	7.18%	0.005160895
$122.71	$11,601.44	1.06%	0.000111876
$85.20	$11,724.15	0.73%	5.281E-05

FIGURE 49: Statistical results for daily S&P 500 data (page 2)

Sheet1

	-$108.81	$11,809.35	-0.92%	8.48957E-05
	$905.61	$11,700.54	7.74%	0.005990604
	-$62.52	$12,606.15	-0.50%	2.45965E-05
	-$167.58	$12,543.63	-1.34%	0.000178483
	-$115.44	$12,376.05	-0.93%	8.70059E-05
	-$25.00	$12,260.61	-0.20%	4.15773E-06
	Daily Data	Sample Size	56	
	S&P 500	Average Return	1.64%	
	95-'97	Kurtosis	0.433335624	
	RESULTS:	Skewness	1.171258769	
		m	0.016413362	
		T-Value	4.849683655	
	T-Value with Miu = 0.0096		2.013155551	

FIGURE 50: Statistical results for daily T-Bond data (page 1)

Sheet1

	GAIN	EQUITY	%GAIN	%GainSquared
	$0.76	$5,000.00	0.02%	0.00%
	$20.87	$5,000.76	0.42%	0.00%
	$13.00	$5,021.63	0.26%	0.00%
	$338.56	$5,034.63	6.72%	0.45%
	$28.21	$5,373.20	0.53%	0.00%
	$82.61	$5,401.41	1.53%	0.02%
	-$34.51	$5,484.02	-0.63%	0.00%
	$99.09	$5,449.50	1.82%	0.03%
	$62.69	$5,548.59	1.13%	0.01%
	$76.03	$5,611.28	1.35%	0.02%
	$59.15	$5,687.31	1.04%	0.01%
	$86.07	$5,746.46	1.50%	0.02%
	$256.91	$5,832.53	4.40%	0.19%
	$230.76	$6,089.44	3.79%	0.14%
	$450.67	$6,320.20	7.13%	0.51%
	$258.78	$6,770.87	3.82%	0.15%
	$188.59	$7,029.64	2.68%	0.07%
	$402.15	$7,218.23	5.57%	0.31%
	$471.07	$7,620.39	6.18%	0.38%
Daily Data '95-'97		Sample Size	19	
U.S. T-Bond		Average Return	2.59%	
RESULTS:		Kurtosis	-0.865595683	
		Skewness	0.658845091	
		m	0.025928847	
		T-Value	4.654224236	
	T-Value with	Miu = 0.01475	2.006601364	

XV. SUMMARY AND CONCLUSIONS

The technical analysis-based trading system that has been developed in this thesis attempts to improve upon the individual performance of the Stochastic, RSI, MACD Histogram, and Momentum (i.e. a well-diversified battery of already popular and widely used technical indicators).

The newly built indicator aims to neutralize each of its sub-components weaknesses, while maintaining intact all of their individual points of strengths. In addition to this, the new indicator gives appropriate significance to significant oscillations in the underlying future's trading Volume (i.e. awarding more importance to a price activity that occurs during a high Volume, and giving less weighting to a price activity that happens on a low Volume).

Much of the indicator's performance has been tested on historical data, simply because that was the only data that was available for the study. However - since there are guarantees that future price behavior will mirror the trends, patterns, and volatility achieved in the past - it is essential for the model to be also tested on "fresh data". Given the fact that the present model was fully completed as of October 1996, the time period November 1996 - June 1997 can be appropriately regarded as "fresh data" on which the trading system is truly forecasting future changes in the underlying commodity's price trend.

During the course of the present academic study, relatively low values were assigned to the default setting of the variables "n" and "m", as follows:

n = 9; m = 6

These values were on purpose chosen on the low side, as - for the results to carry some validity - the trading system needed to generate a sufficiently large number of trades. However, in a real-life trading situation, a cautious investor may want to assign a larger value to the variable "n", and a smaller value to the variable "m". This approach is guaranteed to generate a smaller number of trades (i.e. a smaller number of observations, that - for academic purposes - may render the data sample inconveniently small). However, the probability that these trades will ultimately result in profit is, certainly, higher.

In order to better illustrate the above statement, the following changes are made in the values of "n", and "m", before the model is run on more time:

n = 18; m = 3

In the above scenario, the value of "q" remains unchanged, as 2 (i.e. due to the fact that a higher value than 2 will cause the indicator to lag behind too much, as its final moving average would be too "slow" to accurately pick up changes in the direction of the overall price trend).

INITIAL SCENARIO	ANNUALIZED ROR (%)	AVERAGE % GAIN / LOSS PER TRADE	% OF PROFITABLE TRADES	# TRADES
n = 9 m = 6 q = 2	163.10%	7.13%	72.55%	51 (37,14)

NEW SCENARIO	ANNUALIZED ROR (%)	AVERAGE % GAIN / LOSS PER TRADE	% OF PROFITABLE TRADES	# TRADES
n = 18 m = 3 q = 2	155.45%	12.43%	78.57%	28 (22,6)

The corresponding actual computer printouts are presented in the following pages.

FIGURE 51: System test performance report for Weekly Light Sweet Crude data for the case when m = 18; n = 3; and q = 2

SYSTEM TEST PERFORMANCE REPORT FOR:
Ella's on Intl Oil-Weekly
From 3/31/1983 to 6/27/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Current position is LONG @ 18.85, entered on 6/13/1997 gain/loss $3604.14

SUMMARY

Total Net Profit	$110775.82	Average trade gain/loss ($)	$3956.28
Total percentage gain/loss	2215.52%	Average trade gain/loss (%)	12.43%
Annualized rate of return	155.45%		

SUMMARY WITHOUT BEST AND WORST TRADES

Total Net Profit	$99339.36	Average trade gain/loss ($)	$3820.74
Total percentage gain/loss	1986.79%	Average trade gain/loss (%)	13.05%
Annualized rate of return	139.40%		

TRADE STATISTICS

Total no. of trades	28	Percentage profitable trades	78.57%
No. Profitable Trades	22	No. Losing Trades	6
Amount of profitable trades	$114917.14	Amount of losing trades	$-9664.85
Largest profitable trade	$16302.29	Largest losing trade	$-4865.84
Average profitable trade	$5223.51	Average losing trade	$-1610.81
No. of stop hits	1	Average gain/loss per stop	$-4865.84

LONG SHORT BREAKDOWN

Number of Long trades	14	Number of Short trades	14
No. profitable Long trades	10	No. profitable Short trades	12
Average Long gain/loss	$2555.39	Average Short gain/loss	$4962.63

TRADE DURATIONS

Total no. periods in test	744	Number of days in test	5202
Most consecutive wins	8	Most consecutive losses	2
Amt. of consecutive wins	$20745.08	Amt. of consecutive losses	$-6307.94

RISK & EXPENSE

Max. equity drop (open)	$ -25.00	Max. equity drop (closed)	$ 1733.40
Max. trade drawdown	$ -4240.73	Average trade drawdown	$ -715.18
Commissions expenses	$ 1375.00	Margin interest expenses	$ 0.00

PROFITABILITY / RATIOS

Amount of interest earned	$5523.53	Profit Factor	11.89
Ratio Avg. Profit/Avg. Loss	3.24	Ratio Profit/Commissions	80.56

FIGURE 52: Trade by trade report for Weekly Light Sweet Crude data for the case when m = 18; n = 3; and q = 2 (page 1)

TRADE BY TRADE REPORT FOR:
Ella's on Intl Oil-Weekly
From 3/31/1983 to 6/27/1997 beginning with $5000.00.
Active Stops Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity
Out							
Short	11/22/85	$30 98	$25 00				
SClose	04/04/86	$13 50	$25 00	$-25 00	$2757 07	$2757 07	$7757 07
Long	04/04/86	$13 50	$25 00				
LClose	04/18/86	$11 80	$25 00	$-929 94	$-1023 67	$1733 40	$6733 40
Interest	05/23/86				$17 76	$1751 16	$6751 16
Short	05/23/86	$15 43	$25 00				
SClose	08/01/86	$11 75	$25 00	$-25 00	$1554 16	$3305 32	$8305 32
Long	08/01/86	$11 75	$25 00				
LClose	08/08/86	$14 85	$25 00	$-25 00	$2134 60	$5439 92	$10439 92
Interest	07/24/87				$275 30	$5715 22	$10715 22
Short	07/24/87	$20 53	$25 00				
SClose	11/23/88	$15 50	$25 00	$-462 40	$2569 18	$8284 40	$13284 40
Long	11/23/88	$15 50	$25 00				
LClose	12/09/88	$15 85	$25 00	$-25 00	$249 41	$8533 80	$13533 80
Interest	04/28/89				$142 75	$8676 56	$13676 56
Short	04/28/89	$20 38	$25 00				
SClose	08/04/89	$18 03	$25 00	$-272 85	$1524 15	$10200 71	$15200 71
Long	08/04/89	$18 03	$25 00				
LClose	09/01/89	$18 95	$25 00	$-25 00	$724 36	$10925 06	$15925 06
Interest	01/26/90				$176 38	$11101 44	$16101 44
Short	01/26/90	$22 48	$25 00				
SClose	07/13/90	$18 75	$25 00	$-411 18	$2617 49	$13718 93	$18718 93
Long	07/13/90	$18 75	$25 00				
LClose	08/31/90	$28 20	$25 00	$-25 00	$9371 74	$23090 66	$28090 66
Short	08/31/90	$28 20	$25 00				
SClose	09/07/90	$28 55	$25 00	$-1856 34	$-398 33	$22692 33	$27692 33
Long	09/07/90	$28 55	$25 00				
LClose	09/28/90	$38 30	$25 00	$-25 00	$9398 56	$32090 90	$37090 90
Interest	10/19/90				$58 68	$32149 58	$37149 58
Short	10/19/90	$30 45	$25 00				
MLStop	10/26/90	$34 40	$25 00	$-3146 14	$-4865 84	$27283 75	$32283 75
Interest	03/01/91				$306 47	$27590 22	$32590 22
Long	03/01/91	$19 65	$25 00				
LClose	03/08/91	$18 81	$25 00	$-588 47	$-1442 10	$26148 12	$31148 12
Interest	10/25/91				$542 11	$26690 23	$31690 23
Short	10/25/91	$22 98	$25 00				
SClose	01/17/92	$19 10	$25 00	$-1182 47	$5296 43	$31986 66	$36986 66
Long	01/17/92	$19 10	$25 00				
LClose	01/31/92	$18 95	$25 00	$-412 04	$-340 27	$31646 39	$36646 39
Interest	06/12/92				$367 22	$32013 60	$37013 60
Short	06/12/92	$22 25	$25 00				
SClose	12/23/93	$14 58	$25 00	$-340 86	$12700 68	$44714 28	$49714 28
Long	12/23/93	$14 58	$25 00				
LClose	01/07/94	$15 40	$25 00	$-1422 10	$2744 59	$47458 87	$52458 88
Interest	06/24/94				$664 00	$48122 87	$53122 88
Short	06/24/94	$19 31	$25 00				
SClose	12/23/94	$17 32	$25 00	$-2747 27	$5422 02	$53544 90	$58544 90
Long	12/23/94	$17 32	$25 00				
LClose	01/06/95	$17 67	$25 00	$-25 00	$1132 56	$54677 46	$59677 46
Interest	04/28/95				$503 58	$55181 04	$60181 04
Short	04/28/95	$20 49	$25 00				
SClose	07/28/95	$17 42	$25 00	$-25 00	$8963 13	$64144 17	$69144 17
Long	07/28/95	$17 42	$25 00				
LClose	08/18/95	$17 90	$25 00	$-25 00	$1854 55	$65998 72	$70998 72
Interest	04/19/96				$1310 56	$67309 28	$72309 28
Short	04/19/96	$21 09	$25 00				
SClose	06/07/96	$20 34	$25 00	$-4240 73	$2520 57	$69829 84	$74829 84
Long	06/07/96	$20 34	$25 00				

*** Continued on Next Page ***

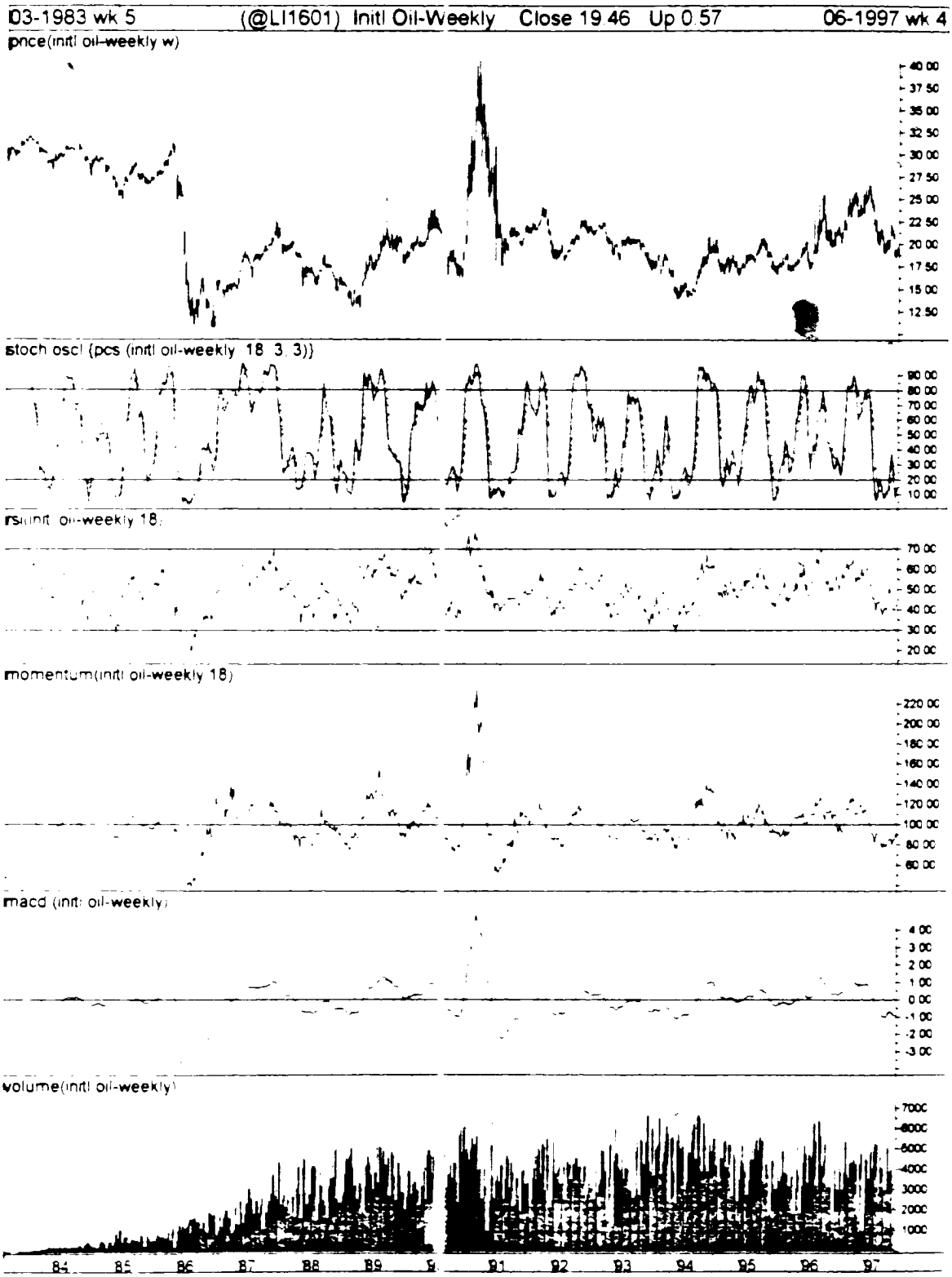
FIGURE 53: Trade by trade report for Weekly Light Sweet Crude data for the case when m = 18; n = 3; and q = 2 (page 2)

TRADE BY TRADE REPORT FOR:
Ella's on Initl Oil-Weekly
From 3/31/1983 to 6/27/1997 beginning with $5000.00.
Active Stops: Max Loss = 8.00%, Break Even = 15.00%

Txn	Date	Price	Commission	Drawdown	Gain	Total Gain	Equity	
LClose	06/21/96	$19 92	$25 00	$-1569 64	$-1594 64	$68235 20	$73235 20	
Interest	01/17/97				$1158 72	$69393 92	$74393 92	
Short	01/17/97	$25 15	$25 00					
SClose	04/11/97	$19 62	$25 00	$-25 00	$16302 29	$85696 22	$90696 22	
Long	04/11/97	$19 62	$25 00					
LClose	05/23/97	$21 57	$25 00	$-117 42	$8961 66	$94657 87	$99657 88	
Short	05/23/97	$21 57	$25 00					
SClose	06/13/97	$18 85	$25 00	$-25 00	$12513 80	$107171 68		$112171 68
Long	06/13/97	$18 85	$25 00					
Current	06/27/97	$19 46	$0 00	$-25 00	$3604 14	$110775 82		$115775 82

*** End Of Report ***

FIGURE 54: Screen Print of the individual technical indicators used.



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