Appendixes

Appendix 1. The AIQ Expert System

An expert system is a decision making system that contains the knowledge of experts on a particular subject, and uses this knowledge to make decisions and solve problems.

Having an expert system is often said to be much like having a friend or business associate who is an expert in a particular field. When you have a problem, you call your friend or business associate to help you come up with a solution. In the case of AIQ TradingExpert Pro, it's like having many associates who are experts in the market. With one contact, you get their combined knowledge synthesized in one answer.

Artificial Intelligence

With Artificial Intelligence, computers can engage in human-like thought processes, such as reasoning, learning, and self correction...machines doing things that are considered intelligent behavior in humans. Expert systems are a branch of the science of Artificial Intelligence.

To create an Artificial Intelligence-based expert system, a knowledge engineer researches experts in a particular field and distills their knowledge and insights into a series of rules. By following the rules, the expert system can analyze a problem and solve it.

AIQ TradingExpert Pro is programmed with the knowledge and insight of many stock market professionals, and is capable of making market recommendations based on this knowledge and insight. Very important, these recommendations are made on a scientific basis free of bias, emotion, or hidden motives.

Technical analysis and the AIQ expert system

AIQ expert systems are programmed with rules that combine sound principles of technical analysis with the knowledge and experience of market professionals. Technical analysis, as used by AIQ, is based on the logic that price is the result of supply and demand. An AIQ timing signal, therefore, reflects all available knowledge and opinions— such as news of the day, earnings, product reports, and company forecasts.

Technical analysis recognizes price and volume movement as the voice of the market itself and hence the only data necessary to determine what the market is likely to do next.

However, the analysis of price and volume patterns can be very complex and time consuming. With AIQ, you don't have to be an experienced technician to reap the benefits of this analysis. The AIQ expert system does this for you.

Explanation of the AIQ expert system

As an expert system, TradingExpert Pro is comprised of two knowledge bases — one for market timing and a second for stock selection — and an inference engine. Knowledge, in the form of rules, is stored in the knowledge bases. The inference engine is the thinking component of an expert system.

Each of the two knowledge bases within TradingExpert Pro has its own unique rules. The rules operate on facts which are values of the technical indicators. The indicators are computed from daily price, volume, and breadth data received by modem from data service bureaus.

The rules employed in AIQ TradingExpert Pro are derived from the knowledge of many experts of market action and market timing. The reliability of these rules is maximized by combining them into a higher level of Expert Rules. Market analysts have found that no *single* rule or indicator works all the time. In an AIQ system, the Expert Rules and technical indicators work together to generate upside and downside signals.

Continuing research at AIQ has shown that a single knowledge base can be improved if it is split into several knowledge bases, one for each phase of the market cycle. This advancement has been incorporated in the market timing knowledge base of AIQ TradingExpert Pro. The crest, trough, up slope, and down slope are each addressed by a specific set of rules specialized and weighted for that specific phase of the market cycle.

Each market day, then, the system determines the strength and direction of the phase, or trend. If there is no trend, it is first determined if the cycle is at a crest prior to a downtrend, or in a trough before the next uptrend. A more specialized knowledge base is used for each of these conditions, increasing the overall market timing effectiveness of TradingExpert Pro.

The knowledge base fuels the second part of the AIQ expert system, the inference engine. The inference engine is the thinking component of an expert system, and mimics the way humans think.

To understand how the AIQ inference engine works, picture a decision tree. The procedure starts from the tree's trunk, where the major rules are located. Each rule is represented as a node, or fork, where the tree splits into three branches—representing a yes, a no, or a maybe. If the expert system determines that the premise of a rule is true, then the rule is considered to have fired, giving one of those three answers.

As each rule is evaluated, the process moves on to the next node and subsequent branches and continues to move on through the tree.

Each rule node has an assigned value. That value is added to a node total that is accumulated as the inference engine passes through the tree. When all the rules have been evaluated, the resulting node total is normalized and becomes an AIQ Expert Rating. Very important, AIQ Expert Rating signals for market timing and stock selection are based on scientific analysis, free of bias and emotion.

The Expert Ratings are based on a scale of 0 to 100. The higher the Expert Rating, the stronger the signal. An Expert Rating of 95 or higher is considered a strong signal, meaning that there is a strong possibility that the price trend is about to change direction.

Examples of technical indicators and Expert Rules

The technical indicators and Expert Rules in the knowledge bases of AIQ TradingExpert Pro are continually being refined and improved. The system presently uses more than 30 technical indicators and several hundred rules to generate Expert Rating signals.

Examples of technical indicators

The technical indicators chosen for use in the AIQ knowledge bases are those with the best track records. The following are a sample:

Average Price

Up/Down Volume Oscillator

Advance/Decline Line

Volume Accumulation Percentage

2l-Day Price Stochastic

Money Flow RSI

On Balance Volume

This short list is but an example of the kinds of indicators computed daily in the TradingExpert Pro system and then used as part of the knowledge bases. These and other indicators are discussed in greater detail in the Technical Indicators Reference Manual. They are mentioned here to introduce you to the concept of an expert system.

Average Price is an exponentially smoothed average equivalent to a 21-day moving average.

Up/Down Volume Oscillator is the percentage of up volume to down volume, and the concern is whether it is increasing or decreasing.

The *Advance/Decline Line* is the difference between the day's advances minus the day's declines summed to the previous day's total. The Advance/Decline Line is a very good indicator of the overall strength of the total market.

Volume Accumulation Percentage indicates buying pressure and/or selling pressure. Volume Accumulation Percentage is a percentage of total volume resulting from buying or accumulation averaged over the last 21 days. Accumulation pressure is determined by the relationship of the day's closing price to the high for the day and the low for the day.

The *21-Day Price Stochastic* is the percentage of the current closing price to the prior 21-day price range. The 21-day price range is the difference between the highest value in the last 21 days and the lowest. The day's closing price is a percentage of that represented on a scale of 0 to 100.

Money Flow RSI is a short-term indicator which attempts to measure the flow of money into or out of the market. It is similar to others such as Volume Accumulation Percentage in that both price and volume data are included in the calculation. However, with Money Flow RSI, the resulting value is normalized to a scale of 0 to 100 so that it can be used over a variety of situations independent of the price.

On Balance Volume shows accumulation versus distribution action. The indicator is computed as a summation of total volume on days when prices advance less total volume on days when prices decline.

Examples of Expert Rules

Examples of the Expert Rules used in the TradingExpert Pro system are given here. They are simplified and are only a small part of the total Expert Rule base within the system.

> **Note**
> The up or down signal given by each rule is only a contributing factor to an Expert Rating. It is the entire rule base that generates the Expert Rating.

A three-day increase in closing averages with increased volume for each day is an up signal. A three-day decrease in closing averages coupled with an increase in volume each day is a down signal.

If a closing value remains outside the upper Trading Band for four consecutive days, a strong upside signal is generated. A closing value below the lower Trading Band for four consecutive days is a strong downside signal.

The 21-Day Stochastic is the percentage of today's closing average price to the range of high and low averages for the previous 21 days. If the stochastic moves from below 20% to above 20%, and the Price Phase is increasing, it is an up signal. If the stochastic moves from above 80% to below 80%, and the Price Phase is decreasing, it is a down signal.

If today's closing value is the highest for the previous 21 days and the Advance/Decline Indicator is not at a 21-day high, it is a down signal. This represents a nonconformation— the price is moving one way but the Advance/Decline Indicator is moving in the other direction and not confirming the new high. If today's closing value is the lowest for the previous 21 days and not confirmed by the Advance/Decline Indicator, it is an up signal.

A 21-day high with a negative Advance/Decline Oscillator is a down signal. A new low with a positive Advance/Decline Oscillator is an up signal.

A strong up signal is indicated on a day when the Advance/Decline Line, the Advance/Decline Oscillator, Volume Accumulation Percentage, and the Volume Oscillator all turn positive. When all four indicators move into negative territory, it is a strong down signal.

When closing value is above the exponentially smoothed average in excess of 3% and velocity is low, it is a down signal. When closing value is below the moving average in excess of 3% and velocity is low, it is an up signal.

A new low closing value with a positive VA PCT (Volume Accumulation Percentage) is an up signal. The reverse also is true: A new high closing value with a negative VA PCT is a down signal.

An upward price trend with a downward volume accumulation trend is a down signal. Conversely, a downward price trend with an upward volume accumulation trend is an up signal.

An example of a primary rule that branches into a set of secondary rules involves the 21-Day Price Stochastic. When the stochastic moves from a value less than 20 to a value greater than 20, the change is a weak up signal. This causes secondary rules such as price and volume movement to be evaluated. If the secondary rules confirm the weak up signal of the 21-Day Price Stochastic, the signal becomes stronger. Several of the indicators in the TradingExpert Pro system are used in this primary-secondary structure, some of which move into a tertiary structure of rules.

When average price is increasing and volume is increasing, an up signal is generated. When average price is increasing but volume is decreasing, a down signal is given.

The On Balance Volume indicator is used to look for nonconformations. If a new high closing price is unconfirmed by a new high On-Balance Volume, it is a down signal. The reverse also is true: a new closing low price unconfirmed by a new low On-Balance Volume is an up signal.

Appendix 2. Technical Analysis

Why technical analysis is the approach used in TradingExpert Pro

There are two approaches used in investment selection and market timing: fundamental and technical. Technical analysis is the approach used in AIQ TradingExpert Pro.

Fundamentalists look at why something is happening and predict how it will affect the future. Fundamental analysts predict future earnings for specific companies, or for the economy as a whole, and then determine whether securities are undervalued or overvalued. While this approach has merits in security selection, it falls short in market timing.

Very often, the market moves independent of economic activity. In 1962, the Dow Jones Industrial Average (DJIA) fell 28% despite the absence of any business slowdown for the next four years. More recently, while the market rose in 1991 and most of 1992, the economy was in the midst of a deep recession. Fundamental analysis would not have been advantageous in these periods.

Technical analysis is the study of market action, primarily through the use of charts and mathematical formulas, for the purpose of forecasting future price trends. While fundamental analysis looks at the cause of market movement, technical analysis studies the effect.

AIQ believes that technical analysis is the superior approach for market timing. Technical analysis eliminates all of the bias and emotion involved in the predictions of economic activity, upon which the fundamental approach is heavily dependent. Furthermore, technical analysis tells you precisely when to buy and sell and, since so few variables are involved (mainly price and volume), you can easily test the reliability of a technical analysis system by using readily available historical information.

Technical analysis as used by AIQ is based on three assumptions:

1. All knowledge is discounted and reflected in the price.
2. Prices move in trends, and trends persist.
3. History repeats itself.

1. All knowledge is discounted and reflected in the price.

Technical analysis assumes that all knowledge is discounted and is reflected in the current market price. Anything that affects the market price — whether it be fundamental, political, or psychological — is reflected in today's price. Since everything is already reflected, then it follows that the study of market price is all that is necessary. Price is a function of supply and demand. Prices rise when demand exceeds supply, and fall when supply exceeds demand. The reasons behind the rise or fall are not a concern.

2. Prices move in trends, and trends persist.

By examining charts and technical indicators, technicians attempt to identify trends in the early stages of their development, and then trade in the direction of the trend. By examining the market through the years, it becomes apparent that trends exist, and that a trend in motion is more likely to continue than to reverse.

3. History repeats itself.

A technical analyst believes that the key to understanding the future lies in a study of the past. Technical indicators reveal the bullish or bearish psychology of the market. Since these indicators have worked well in the past, it is assumed that they will work well in the future.

Technical analysis can appear complicated and intimidating. People often spend years of diligent research, studying and testing indicators, before feeling comfortable enough to use technical analysis to place trades. With AIQ TradingExpert Pro, you don't have to be an experienced technician to reap the benefits of technical analysis. The AIQ expert system does this for you. Using the power of your personal computer, the AIQ expert system sorts through huge amounts of technical data and issues quick and emotionless buy and sell signals.