

A Complete Trading System

The Turtle Trading System was a Complete Trading System, one that covered every aspect of trading, and left virtually no decision to the subjective whims of the trader.

Most successful traders use a mechanical trading system. This is no coincidence.

A good mechanical trading system automates the entire process of trading. The system provides answers for each of the decisions a trader must make while trading. The system makes it easier for a trader to trade consistently because there is a set of rules which specifically define exactly what should be done. The mechanics of trading are not left up to the judgment of the trader.

If you know that your system makes money over the long run, it is easier to take the signals and trade according to the system during periods of losses. If you are relying on your own judgment during trading, you may find that you are fearful just when you should be bold, and courageous when you should be cautious.

If you have a mechanical trading system that works, and you follow it consistently, your trading will be consistent despite the inner emotional struggles that might come from a long series of losses, or a large profit. The confidence, consistency, and discipline afforded by a thoroughly tested mechanical system are the key to many of the most profitable traders' success.

The Turtle Trading System was a Complete Trading System. Its rules covered every aspect of trading, and left no decisions to the subjective whims of the trader. It had every component of a Complete Trading System.

The Components of a Complete System

A Complete Trading System covers each of the decisions required for successful trading:

- Markets - What to buy or sell
- Position Sizing - How much to buy or sell
- Entries - When to buy or sell
- Stops - When to get out of a losing position
- Exits - When to get out of a winning position
- Tactics - How to buy or sell

Markets - What to buy or sell

The first decision is what to buy and sell, or essentially, what markets to trade. If you trade too few markets you greatly reduce your chances of getting aboard a trend. At the same time, you don't want to trade markets that have too low a trading volume, or that don't trend well.

Position Sizing - How much to buy or sell

The decision about how much to buy or sell is absolutely fundamental, and yet is often glossed over or handled improperly by most traders.

How much to buy or sell affects both diversification and money management. Diversification is an attempt to spread risk across many instruments, and to increase the opportunity for profit by increasing the opportunities for catching successful trades. Proper diversification requires making similar, if not identical bets on many different instruments. Money management is really about controlling risk by not betting so much that you run out of money before the good trends come.

How much to buy or sell is the single most important aspect of trading. Most beginning traders risk far too much on each trade, and greatly increase their chances of going bust, even if they have an otherwise valid trading style.

Entries - When to buy or sell

The decision of when to buy or sell is often called the entry decision. Automated systems generate entry signals which define the exact price and market conditions to enter the market, whether by buying or selling.

Stops - When to get out of a losing position

Traders who do not cut their losses will not be successful in the long term. The most important thing about cutting your losses is to predefine the point where you will get out *before* you enter a position.

Exits - When to get out of a winning position

Many “trading systems” that are sold as complete trading systems do not specifically address the exit of winning positions. Yet the question of when to get out of a winning position is crucial to the profitability of the system. Any trading system that does not address the exit of winning positions is not a Complete Trading System.

Tactics - How to buy or sell

Once a signal has been generated, tactical considerations regarding the mechanics of execution become important. This is especially true for larger accounts, where the entry and exit of positions can result in significant adverse price movement, or market impact.

Summary

Using a mechanical system is the best way to consistently make money trading. If you know that your system makes money over the long run, it is easier to take the signals and follow the system during periods of losses. If you rely on your own judgment, during trading you may find that you are fearful just when you should be courageous, or courageous when you should be fearful.

If you have a profitable mechanical trading system, and you follow it religiously, then your trading will be profitable, and the system will help you survive the emotional struggles that inevitably result from a long series of losses, or large profits.

The trading system that was used by the Turtles was a Complete Trading System. This was a major factor in our success. Our system made it easier to trade consistently, and successfully, because it did not leave important decisions to the discretion of the trader.

Markets: What the Turtles Traded

The Turtles traded liquid futures that traded on U.S. exchanges in Chicago and New York.

The Turtles were futures traders, at the time more popularly called commodities traders. We traded futures contracts on the most popular U.S. commodities exchanges.

Since we were trading millions of dollars, we could not trade markets that only traded a few hundred contracts per day because that would mean that the orders we generated would move the market so much that it would be too difficult to enter and exit positions without taking large losses. The Turtles traded only the most liquid markets.

Liquidity
The primary criterion used to determine the futures that could be traded by the Turtles was the liquidity of the underlying markets.

In general, the Turtles traded all liquid U.S. markets except the grains and the meats. Since Richard Dennis was already trading the full position limits for his own account, he could not permit us to trade grains for him without exceeding the exchange's position limits.

We did not trade the meats because of a corruption problem with the floor traders in the meat pits. Some years after the Turtles disbanded, the FBI conducted a major sting operation in the Chicago meat pits and indicted many traders for price manipulation and other forms of corruption.

The following is a list of the futures markets traded by the Turtles:

Chicago Board of Trade

- 30 Year U.S. Treasury Bond
- 10 Year U.S. Treasury Note

ORIGINAL TURTLES

New York Coffee Cocoa and Sugar Exchange

- Coffee
- Cocoa
- Sugar
- Cotton

Chicago Mercantile Exchange

- Swiss Franc
- Deutschmark
- British Pound
- French Franc
- Japanese Yen
- Canadian Dollar
- S&P 500 Stock Index
- Eurodollar
- 90 Day U.S. Treasury Bill

Comex

- Gold
- Silver
- Copper

New York Mercantile Exchange

- Crude Oil
- Heating Oil
- Unleaded Gas

The Turtles were given the discretion of not trading any of the commodities on the list. However, if a trader chose not to trade a particular market, then he was not to trade that market at all. We were not supposed to trade markets inconsistently.

Position Sizing

The Turtles used a volatility-based constant percentage risk position sizing algorithm.

Position sizing is one of the most important but least understood components of any trading system.

The Turtles used a position sizing algorithm that was very advanced for its day, because it normalized the dollar volatility of a position by adjusting the position size based on the dollar volatility of the market. This meant that a given position would tend to move up or down in a given day about the same amount in dollar terms (when compared to positions in other markets), irrespective of the underlying volatility of the particular market.

This is true because positions in markets that moved up and down a large amount per contract would have an offsetting smaller number of contracts than positions in markets that had lower volatility.

This volatility normalization is very important because it means that different trades in different markets tend to have the same chance for a particular dollar loss or a particular dollar gain. This increased the effectiveness of the diversification of trading across many markets.

Even if the volatility of a given market was lower, any significant trend would result in a sizeable win because the Turtles would have held more contracts of that lower volatility commodity.

Volatility - The Meaning of N

The Turtles used a concept that Richard Dennis and Bill Eckhardt called N to represent the underlying volatility of a particular market.

N is simply the 20-day exponential moving average of the True Range, which is now more commonly known as the ATR. Conceptually, N represents the average range in price movement that a particular market makes in a single day, accounting for opening gaps. N was measured in the same points as the underlying contract.

To compute the daily true range:

$$\text{True Range} = \text{Maximum}(\mathbf{H-L}, \mathbf{H-PDC}, \mathbf{PDC-L})$$

where:

H – Current High

L – Current Low

PDC – Previous Day's Close

To compute N use the following formula:

$$N = \frac{(19 \times PDN + TR)}{20}$$

where:

PDN – Previous Day's N

TR – Current Day's True Range

Since this formula requires a previous day's N value, you must start with a 20-day simple average of the True Range for the initial calculation.

Dollar Volatility Adjustment

The first step in determining the position size was to determine the dollar volatility represented by the underlying market's price volatility (defined by its N).

This sounds more complicated than it is. It is determined using the simple formula:

$$\text{Dollar Volatility} = N \times \text{Dollars per Point}$$

Volatility Adjusted Position Units

The Turtles built positions in pieces which we called Units. Units were sized so that 1 N represented 1% of the account equity.

Thus, a unit for a given market or commodity can be calculated using the following formula:

$$\text{Unit} = \frac{\text{1% of Account}}{\text{Market Dollar Volatility}}$$

or

$$\text{Unit} = \frac{\text{1% of Account}}{N \times \text{Dollars per Point}}$$

Examples

Heating Oil HO03H:

Consider the following prices, True Range, and N values for March 2003 Heating Oil:

Date	High	Low	Close	True Range	N
11/1/2002	0.7220	0.7124	0.7124	0.0096	0.0134
11/4/2002	0.7170	0.7073	0.7073	0.0097	0.0132
11/5/2002	0.7099	0.6923	0.6923	0.0176	0.0134
11/6/2002	0.6930	0.6800	0.6838	0.0130	0.0134
11/7/2002	0.6960	0.6736	0.6736	0.0224	0.0139
11/8/2002	0.6820	0.6706	0.6706	0.0114	0.0137
11/11/2002	0.6820	0.6710	0.6710	0.0114	0.0136
11/12/2002	0.6795	0.6720	0.6744	0.0085	0.0134
11/13/2002	0.6760	0.6550	0.6616	0.0210	0.0138
11/14/2002	0.6650	0.6585	0.6627	0.0065	0.0134
11/15/2002	0.6701	0.6620	0.6701	0.0081	0.0131
11/18/2002	0.6965	0.6750	0.6965	0.0264	0.0138
11/19/2002	0.7065	0.6944	0.6944	0.0121	0.0137
11/20/2002	0.7115	0.6944	0.7087	0.0171	0.0139
11/21/2002	0.7168	0.7100	0.7124	0.0081	0.0136
11/22/2002	0.7265	0.7120	0.7265	0.0145	0.0136
11/25/2002	0.7265	0.7098	0.7098	0.0167	0.0138
11/26/2002	0.7184	0.7110	0.7184	0.0086	0.0135
11/27/2002	0.7280	0.7200	0.7228	0.0096	0.0133

12/2/2002	0.7375	0.7227	0.7359	0.0148	0.0134
12/3/2002	0.7447	0.7310	0.7389	0.0137	0.0134
12/4/2002	0.7420	0.7140	0.7162	0.0280	0.0141

The unit size for the 6th of December, 2002 (using the N value of 0.0141 from the 4th of December), is as follows:

Heating Oil

N = 0.0141

Account Size = \$1,000,000

Dollars per Point = 42,000 (42,000 gallon contracts with price quoted in dollars)

$$\text{Unit Size} = \frac{0.01 \times \$1,000,000}{0.0141 \times 42,000} = 16.88$$

Since it isn't possible to trade partial contracts, this would be truncated to an even **16** contracts.

You might ask: "How often is it necessary to compute the values for N and the Unit Size?" The Turtles were provided with a Unit size sheet on Monday of each week that listed the N, and the Unit size in contracts for each of the futures that we traded.

The Importance of Position Sizing

Diversification is an attempt to spread risk across many instruments and to increase the opportunity for profit by increasing the opportunities for catching successful trades. To properly diversify requires making similar if not identical bets on many different instruments.

The Turtle System used market volatility to measure the risk involved in each market. We then used this risk measurement to build positions in increments that represented a constant amount of risk (or volatility). This enhanced the benefits of diversification, and increased the likelihood that winning trades would offset losing trades.

Note that this diversification is much harder to achieve when using insufficient trading capital. Consider the above example if a \$100,000 account had been used. The unit size would have been a single contract, since 1.688 truncates to 1. For smaller accounts, the granularity of adjustment is too large, and this greatly reduces the effectiveness of diversification.

Units as a measure of Risk

Since the Turtles used the Unit as the base measure for position size, and since those units were volatility risk adjusted, the Unit was a measure of both the risk of a position, and of the entire portfolio of positions.

The Turtles were given risk management rules that limited the number of Units that we could maintain at any given time, on four different levels. In essence, these rules controlled the total risk that a trader could carry, and these limits minimized losses during prolonged losing periods, as well as during extraordinary price movements.

An example of an extraordinary price movement was the day after the October, 1987 stock market crash. The U.S. Federal Reserve lowered interest rates by several percentage points overnight to boost the confidence of the stock market and the country. The Turtles were loaded long in interest rate futures: Eurodollars, TBills and Bonds. The losses the following day were enormous. In some cases, 20% to 40% of account equity was lost in a single day. But these losses would have been correspondingly higher without the maximum position limits.

The limits were:

Level	Type	Maximum Units
1	Single Market	4 Units
2	Closely Correlated Markets	6 Units
3	Loosely Correlated Markets	10 Units
4	Single Direction – Long or Short	12 Units

Single Markets – A maximum of four Units per market.

Closely Correlated Markets – For markets that were closely correlated there could be a maximum of 6 Units in one particular direction (i.e. 6 long units or 6 short units). Closely correlated markets include: heating oil and crude oil; gold and silver; Swiss franc and Deutschmark; TBill and Eurodollar, etc.

Loosely Correlated Markets – For loosely correlated markets, there could be a maximum of 10 Units in one particular direction. Loosely correlated markets included: gold and copper; silver and copper, and many grain combinations that the Turtles did not trade because of positions limits.

Single Direction – The maximum number of total Units in one direction long or short was 12 Units. Thus, one could theoretically have had 12 Units long and 12 Units short at the same time.

The Turtles used the term **loaded** to represent having the maximum permitted number of Units for a given risk level. Thus, “loaded in yen” meant having the