

By breaking down a trading system into its components/ we can isolate each area to make sure it meshes with our risk/reward tolerances and goals and is more likely to be accurately implemented.

# A component approach to trading systems

BY PAUL M. KING

**T**here are several different ways to approach trading-system development. Although each trader needs to find what works for him, one concept that has nearly universal appeal is a component model of trading system design.

In this design, the keys to effective system development first rely on an understanding of the contribution made by each component of a trading system, and then how these relate to a trader's overall objectives.

Our goal in this article isn't to analyze example systems or play with parameters or rules in search of an infallible model, but to explain the basic trading system structure. To go forth and build viable systems, it is necessary to have a clear picture of what a trading system is and how it works.

There are three primary objectives that define most trading systems: implementation costs, risk and reward and expectancy. In turn, each objective relates to a specific trading system trait in its own way. There are many ways to break down trading-system performance, but there are nine main traits (see "Nine measures," right) that pro-

vide all the information that most traders need. Finally, each component contributes to the overall personality of the trading system.

If we clearly understand how each component of our system affects the system's behavior or performance, we have a much better chance of developing systems that precisely meet our objectives.

## THE MODEL

"Pyramid approach" (right) shows a diagram of the objectives, traits and components of a trading system. As the chart shows, each key part of the trading system is related to the others.

The objectives form the foundation of why we trade. To develop effective trading systems, we must know what the objectives are for our trading. The objectives for a trading system are split into three main areas:

- **Implementation costs** — spread, slippage, commission, interest payments, cost of carry, etc.,
- **Risk and reward** — expected return and maximum drawdown per period,
- **Expectancy** — average amount made per unit risked.

Traits are descriptions..of specific behaviors of a trading system. These characteristics determine if the system is suitable for an individual trader's personality. This is important. If a trading system does not mesh with your risk/reward tolerance then you can't be expected to follow it effectively and you will likely fail.

The trading system itself has individual components that are primarily responsible for each system trait. This relationship is the key to developing, testing and improving your trading systems. System components include:

- **Market and instrument type:** what markets you are trading and which instrument types (equities, options, futures, fixed income, foreign exchange, etc.),
- **Instrument filter:** which instruments in the chosen market you consider liquid and volatile enough to trade,
- **Setup and entry:** what conditions determine a trade is possible and should be entered,
- **Position sizing:** how big each position should be for the life of the trade,
- **Exit strategy:** when to exit winning and losing positions.

## TRADING OBJECTIVES

One of the keys to successful trading is to define your objectives before attempting to build a trading system. In any challenging activity, knowing what you are trying to achieve plays a big part in how you go about achieving it.

First, implementation costs need to be minimized. Most traders just accept implementation costs as a necessary evil of trading, but they are actually one part of your system that, to some extent, can be designed to your requirements.

The main implementation costs include commission, which is dependent on the market you choose to trade coupled with the executing broker you choose, spread and slippage. Spread and slippage are both dependent on how liquid the instruments you select are compared to your position size. Trading the most liquid instruments can significantly reduce spread and slippage.

Other implementation costs include dividends on short equity positions, margin interest, cost of carry for foreign exchange trades, and rollover for futures contracts. Each of these must be carefully considered relative to the expected return of the system to ensure they are not going to negate any positive return.

Risk and reward must be balanced from a psychological comfort level. In developing your system you must decide the level of risk you are prepared to take and the desired performance you wish to achieve.

Any system that makes money on average can be designed to achieve a specific risk and reward profile by choosing an appropriate position-sizing algorithm. Position-sizing is like the volume control on your stereo, it doesn't actually change the music playing but have it set too high and you get distortion; you will exceed your risk parameters and may blow up your account. Or if it is too low you will not be able to hear the music; you will not achieve your expected reward.

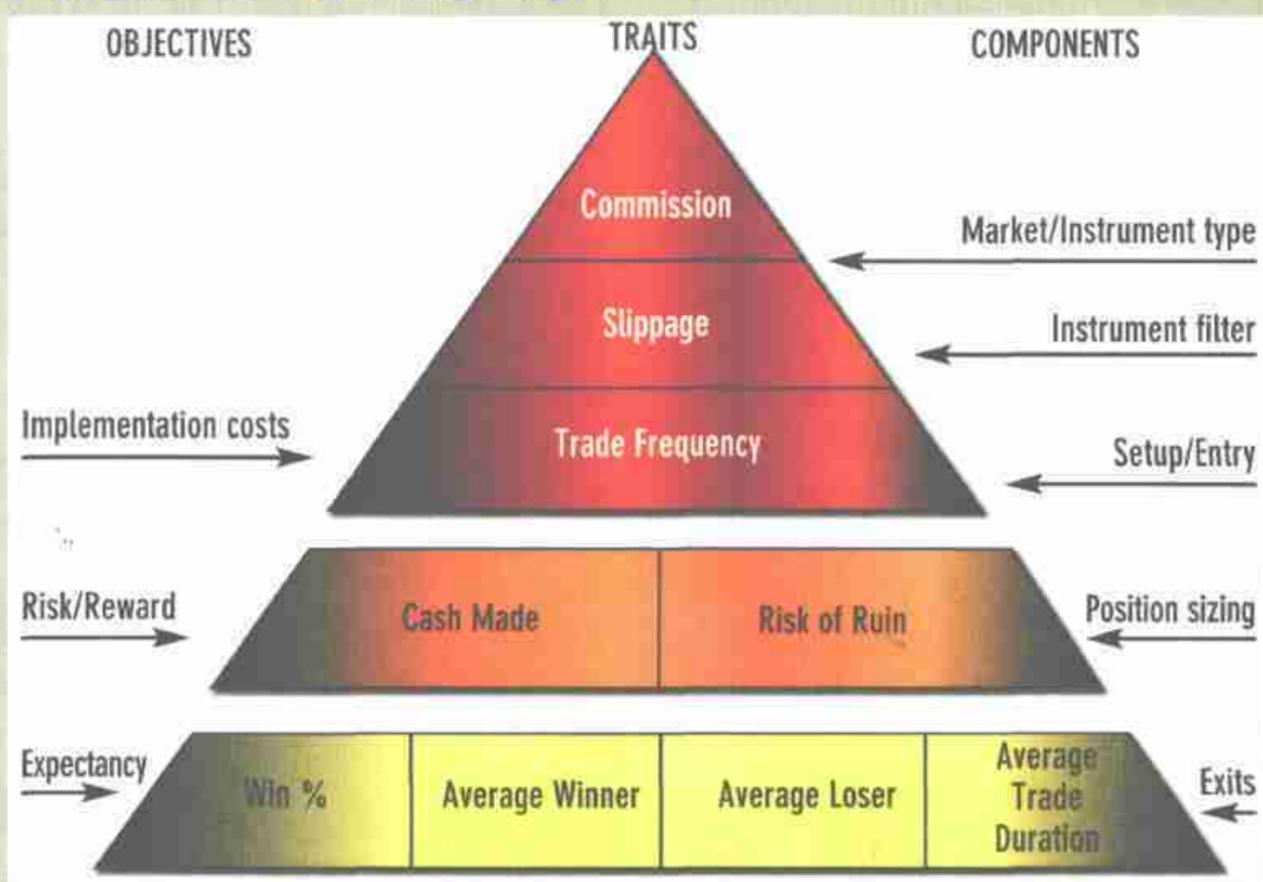
Expectancy measures the average profit your system makes per-unit-risked. Systems can be designed to achieve a certain expectancy primarily by design-

## NINE MEASURES

These measures will vary depending on your trading system design and you will have to be comfortable with each of these characteristics to stick with it.

- Commission: how much you pay for entering and exiting a trade
- Slippage: the difference in price of your actual entry or exit to your system's signalled price.
- Trade frequency: the number of trades per period
- Cash made: the absolute amount of cash you make
- Risk of ruin: your chances of a drawdown that would cause you to suspend trading
- Win percentage: how often you have winning, and therefore losing, trades
- Average winner size: the average size of your winning trade
- Average loser size: the average size of your losing trades
- Average trade duration: the average length of your trades from entry to exit

## PYRAMID APPROACH



ing effective exits that focus on creating average winners that are much larger than average losers. This de-emphasizes your winning percentage. Many times, it will mean an equal or greater number of losing trades. This can be a successful system as long as the average winners are multiples greater than the average loser.

Having clearly defined objectives before commencing system development will allow you to make rational decisions about how your system design and testing are working.

### SYSTEM TRAITS

Traits of a trading system are specific behaviors that can be manipulated by decisions you make when developing each component. They describe the overall personality of the trading system and determine exactly how it meets your goals.

Commissions vary by the services provided by your broker and the size of your trades. For some instrument types, such as foreign exchange, the commission is hidden in the spread, not separately calculated. Minimizing commission is one of the easiest ways to increase the expectancy of your system, especially for high-frequency trading.

Slippage is the difference between the entry price your system selects and where the trade is filled and is usually negative. Slippage can be reduced by choosing to trade the most liquid instruments and placing trades during periods of higher liquidity like opens and closes. Slippage happens both on the entry and exit of a trade, so it is important to monitor the liquidity of an instrument during a trade and exit before it drops to an unacceptable level, if possible.

Trade frequency is determined by the sensitivity of your setup (rules that signal a potential trade) and entry (rules that actually get you into a position). Average trade frequency is directly under your control, but any setup/entry will go through periods of higher and lower activity. This clustering of trades is generally unavoidable, but you should have rules that determine how you will select between potential trades if you get too many for your available capital.

The ultimate objective of trading is to make money. The absolute amount of money that any system makes is dependent on the position-sizing algorithm and how you allocate capital to the system. Reward is always proportional to risk, but for any given system it is the position-sizing algorithm that determines your overall reward.

Since reward always goes hand-in-hand with risk, it is not possible to have a position-sizing algorithm that achieves a certain reward without generally taking a similar amount of risk. Therefore, it is the position sizing that determines the chances of hitting your maximum drawdown, which is a better definition of risk of ruin than total loss of capital.

Win percentage (how often you are right) is one of the least important aspects of a trading system, and also one that is hard to control unless you trade some short-term anomalous pattern that your system has been designed to detect. Most robust, long-term winning systems tend to make money from having average winners that are much larger than average losers, de-emphasizing winning percentage. For example, if you have average winners one-and-a-half times as big as average losers, then you can have 40% winning trades and still break even.

This is a much better situation to be in than relying on a system that has to be right a lot to make money. Even so, trading lower winning percentage systems is psychologically difficult to do.

Average win size is where the money is made in trading, generating large winning trades and riding them as far as they will go. Exits that are generous to

winning trades (that is, wider stops), that only tighten when further chance of large profits are diminished should be used to make winners as large as possible. Obviously for winners to get big, you must trade instruments that move, so only trading higher volatility instruments is also important. Letting profits run can also be psychologically difficult.

The average size of losing trades is where risk is reduced to a minimum in trading, keeping losers small and stopping them before they grow too big. Exits that are harsh on losers (that is, tighter stops), that never widen and tighten quickly when a position is inactive should be used to make losers as small as possible. Obviously for losers to stay small you must always stick to your exit strategy and exit a loser at the first opportunity rather than letting it get big. Cutting losers short is also psychologically difficult to do for most traders.

The average length of time you are in a trade is determined by how far your initial stops are away from your entry price relative to the underlying volatility of the market. Because of this, your average trade duration is under your control and you should choose an exit strategy that gives you an average trade length that is matched to your setup/entry frequency. You don't want to be generating few trades that you exit quickly or many trades you stay in too long; either situation is not a good use of your capital.

### **SYSTEM COMPONENTS**

Putting this all together relates the system traits to the main components of a trading system and describes interdependencies between them. This allows you to target the development and redesign of each system component in the context of the traits it affects and the objectives for your trading system it supports.

For example, when choosing a market and instrument type, your decisions should primarily be oriented around how to minimize commissions for the instrument type you want to trade by selecting the lowest cost execution venue or broker.

Similarly, the instrument filter should be concerned with finding the most liquid instruments within your chosen market. This should minimize spread and slippage and therefore reduce implementation cost.

Setup and entry should be designed to create trades at the desired frequency at times where there is the most chance for a move. Note that this has nothing to do with predicting the future direction of an instrument or the chance of a winning trade; that is determined by your exit strategy. We cannot tell in advance which trades will be the winners or losers so we simply want a setup and entry that is designed to get us in at a time when a good move is likely at the desired trade frequency.

Given any positive-expectancy system, position-sizing can be used to match the variability of return expected from the system to your desired risk and reward objectives. Finally, exit strategy encompasses most of the important traits of your system, including average winner size, average loser size, winning percentage, losing percentage and average trade duration. For this reason, the majority of your system development effort should be focused on good exits that seek to implement the trading adage, "cut your losses short and let your winners run."

The first step in building good trading systems is understanding how everything works together. Like a computer program, an engine or even a railway, different parts of a trading system affect other parts in ways you may never anticipate until you actually put it to use. But many of these surprises are avoidable, and the first step in eliminating their unknown effects is precisely and scientifically breaking down and understanding each component of the thing that you are building. IFM

**Paul King is a trader, trading coach and independent financial advisor. His company, PMKing Trading LLC is based in Vermont. He is also the author of the upcoming book *The Complete Guide to Building a Successful Trading Business*. He can be reached at [www.pmkingtrading.com](http://www.pmkingtrading.com).**