



Trailing stops, curtailing losses

Starting with trailing stop rule can make your forex system easier to trade.

BY DANIEL FERNANDEZ

Trading systems are often difficult to execute because of their tendency to surrender profits after a position moves into favorable territory — a problem especially noticeable in trend-following systems. Many traders watch significant gains evaporate and turn into losses when a trading system fails to take action when market conditions move against it.

There are different ways to address this problem, but most represent some type of trade-off: Long-term profitability is typically sacrificed in favor to accommodate a rule that takes profits in some way as to avoid the psychologically challenging experience of watching winners turn into losers.

Traders can turn things in their favor by designing systems that are easier to trade from the start. Here we'll explore a trading system along these lines that uses a trailing stop. We'll see how the stop mechanism makes trading easier, and examine its impact on the trading strategy's performance.

Entry rules

The system, which was generated using one-hour data in the Euro/U.S. dollar pair (EUR/USD), uses a few simple rules to execute entries and exits:

Long entry (short exit):

1. The hour is 6 (GMT +1 (DST = GMT+2)).
2. The high of the previous hourly bar is less than the open 31 bars ago ($\text{High}[1] < \text{Open}[31]$).
3. The open nine bars ago is greater than the high 44 bars ago ($\text{Open}[9] > \text{High}[44]$).

Short entry (long exit):

1. The hour is 6 (GMT +1 (DST = GMT+2)).

2. The low of the previous hourly bar is greater than the open 31 bars ago ($\text{Low}[1] > \text{Open}[31]$).
3. The open nine bars ago is less than the low 44 bars ago ($\text{Open}[9] < \text{Low}[44]$).

Where,

0, 1, 2, etc., reference the most recently closed hourly bar, the previous bar, the bar two bars ago, etc. A new trade is entered on a new bar whenever one of the signal conditions is met.

The system's initial stop-loss is two times the 20-period Average True Range (ATR). A trade is closed whenever a stop-loss is hit or a signal in the opposite direction occurs. In the case of a signal in the same direction, the stop-loss is updated as if a new trade had been opened and the current price bar (which would represent a new entry if there wasn't already an open position) is used to calculate the trailing stop, which we'll discuss next.

The trailing stop

The system's trailing stop adjusts to price as the market moves in the position's favor — that is, moving higher as price rises in a long trade, and moving lower as price declines in a short trade. When price moves a specific distance — in this case, two times the 20-period ATR — the system moves the trade's stop-loss to break-even.

For every favorable move above this ATR profit level, the system places (for a long position) a stop-loss two times the 20-period ATR below the current hourly bar's open. This means once the EUR/USD pair reaches the ATR profit threshold, price can never trade below breakeven, but it can oscillate freely above this level and accommodate potential volatility bursts in the trade's favor. (The

stop-loss and trailing-stop values are not optimized.)

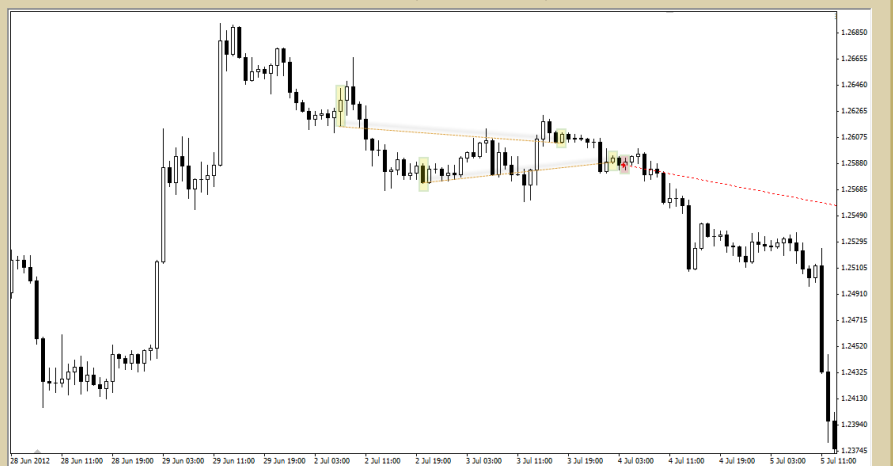
Figures 1 and 2 illustrate a sample trade. Figure 1 is a close-up that highlights the trade-entry setup, which resembles a consolidation pattern. After a successful downside run, Figure 2 shows how the short trade was exited with the trailing stop, which ensured only a limited portion of the open profit was given back because it progressively declined as price continued to fall. The next trade (a buy) was exited at breakeven after the EUR/USD pair failed to develop any favorable momentum.

Testing the system

The system was tested on EUR/USD hourly data from Jan. 1, 1988 to Jan. 1, 2014, with the Deutsche mark/U.S. dollar rate used as a proxy prior to 1999. (Interest earned and paid through swap rates was accounted for in the simulation using historical interest rate values.) The simulation used an initial account balance of \$100,000, and risked 1% of account equity on each trade's initial stop-loss amount.

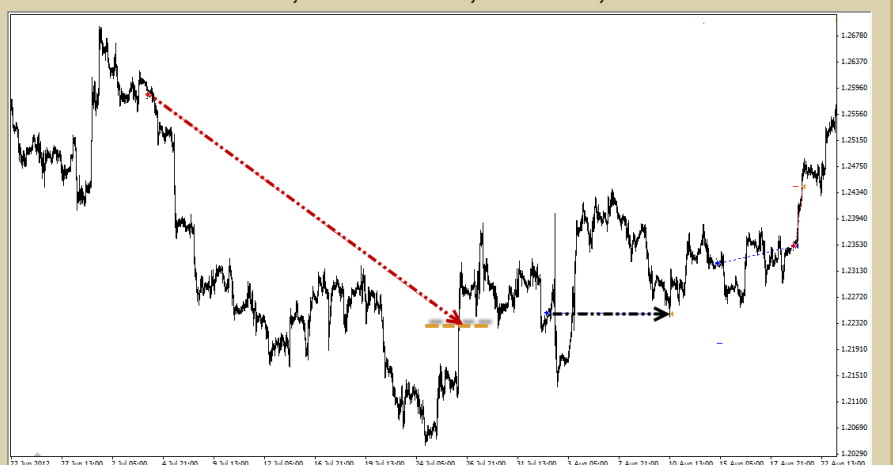
The test data was split into two periods: **In-sample** data from Jan. 1, 1988 to Jan. 1, 2005 was used for strategy generation, while the final eight years were used as an **out-of-sample** period.

FIGURE 1: SHORT-TRADE ENTRY, EUR/USD, 60-MIN.



This short trade was triggered by the entry setup, which essentially identifies a consolidation pattern.

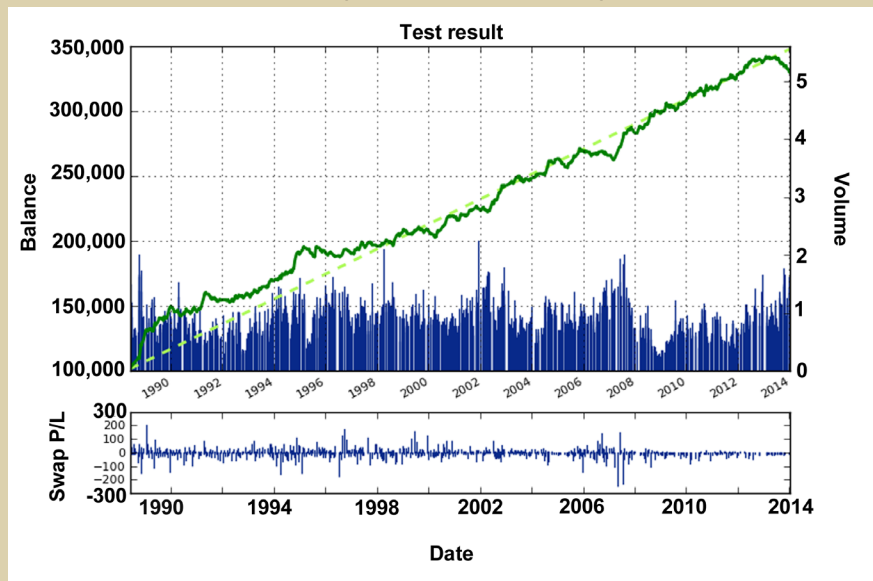
FIGURE 2: SHORT EXIT, LONG ENTRY, EUR/USD, 60-MIN.



The short trade was exited with the trailing stop, which prevented losing too much of the open profit. A second, long trade was exited at breakeven.

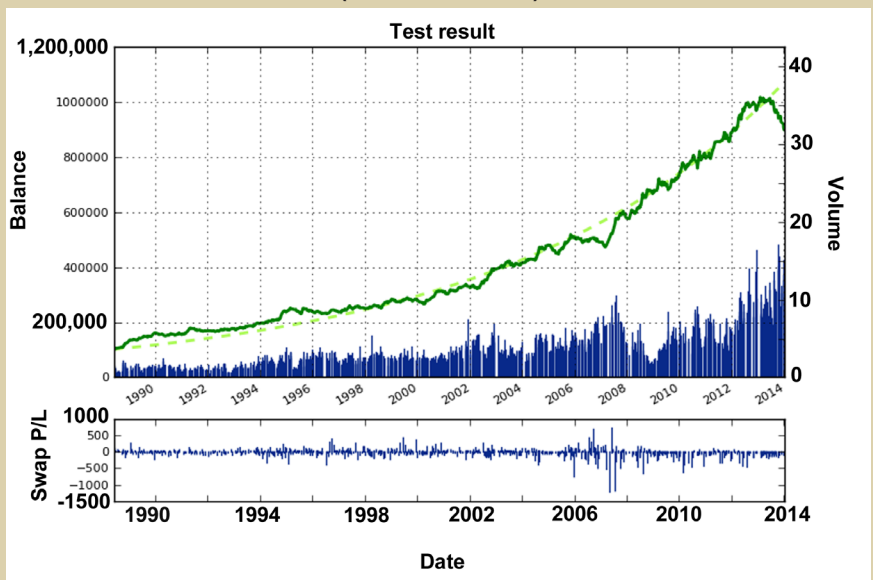


FIGURE 3: EQUITY CURVE (NON-COMPOUNDED)



The system generated a highly linear equity curve over the wide-ranging simulation period.

FIGURE 4: EQUITY CURVE (COMPOUNDED)



The drawdown near the end of the test period only appears larger because of the effect of compounding.

The system was generated seeking highly linear in-sample results (i.e., linear regression R^2 values greater than 0.98). Note: Other systems created with this process yielded similar results; this system was picked at random from the generated pool.

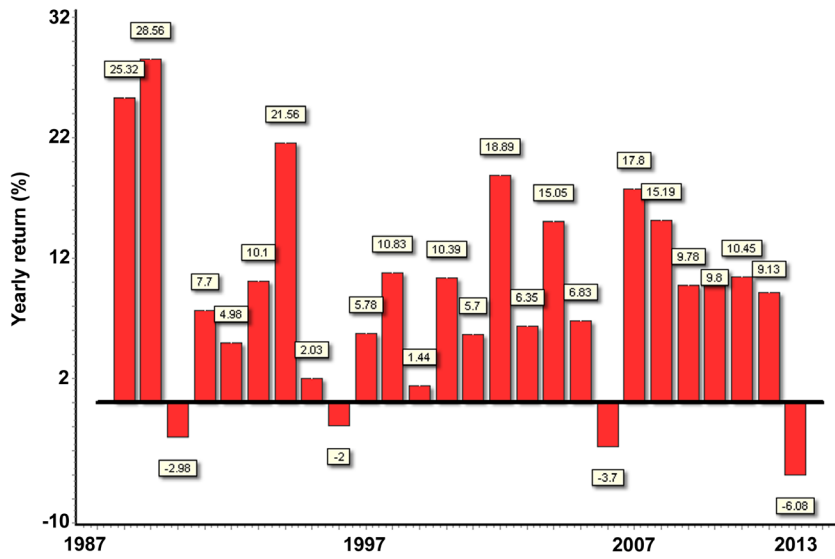
System performance

Figure 3 shows the system, on a non-compounded basis (i.e., always risking \$1,000 per trade), produced a highly linear equity curve over the past 26 years — a period that encompassed a wide variety of market conditions. Furthermore, this positive characteristic sustained itself through in-sample period. The R^2 value for the entire test — in-sample and out-of-sample — was 0.96 (see the linear regression line in the chart). Figure 4 shows the system’s compounded equity curve (i.e., risking 1% per trade),

The system produced a good simulated track record (Table 1). The ratio of overall average yearly profit to maximum drawdown was 0.87 (9.19% / 10.56%), with maximum drawdown length of 807 days occurring around 1995 (and a maximum drawdown length of less than one year over the past six years). The out-of-sample maximum drawdown length was 565 days. (The in-sample and total maximum drawdown lengths are equal because the longest drawdown occurred in the in-sample period.)

Figure 5 shows the system’s annual profits. There were only four losing

FIGURE 5: ANNUAL RETURNS



There were only four losing years in the 26-year test period.

years in the 26-year test period, and although the system is currently underperforming, it remains within the draw-down boundaries defined by the out-of-sample test. Also, the drawdown near the end of the test in Figure 4, only appears larger because of compounding; see the linear chart in Figure 3 to compare this drawdown with previous periods.

The system doesn't trade as much like a higher-frequency, shorter-timeframe system as it does a daily system with fine-tuned entries. This explains why the trailing-stop and stop-loss values are so large (two times the 20-period ATR) and why the system trades infrequently (0.6 trades per week on average, with an average trade duration of six days and 21 hours).

One favorable characteristic of this system is its historically high mathematical expectancy. The system has an overall reward-to-risk ratio of 1.39 and a winning percentage of 54%. The combination of a reward-to-risk ratio greater than 1.00 and a winning percentage above 50%, which is a function of the trailing stop, is not very common because it requires a very high per-trade expectancy. This is what makes this system psychologically easier to trade: A system that is expected to win more than 50% of the time is easier to trade than one with a sub-50% win rate.

Easier to trade systems using a trailing stop

The trailing stop gives us the opportunity to develop strategies with higher mathematical expectancies, linearity, and better out-of-sample testing results. When systems are developed to complement a position-management approach that forces an increase in the signal's mathematical expectancy, a better trading strategy is the result. ☒

Daniel Fernandez is an active trader focusing on forex strategy analysis, particularly algorithmic trading and the mathematical evaluation of long-term system profitability. For more information on the author, see p. 4.

TABLE 1:

	All data	In-sample	Out-of-sample
Average yearly return	9.19%	9.98%	7.65%
Total return	809%	377%	90%
No. of trades	840	553	287
Profit factor	1.64	1.8	1.55
Max. drawdown	10.56%	8.16%	10.53%
Max. drawdown length	807 days	807 days	565 days
Reward-to-risk ratio	1.39	1.48	1.38
Win percentage	54%	55%	53%
Ulcer Index	3.17	3.23	3.05
Years in test	26	17	6

The system's simulated track record had mostly positive characteristics, out-of-sample as well as in-sample.