The Maximum Favorable Excursion Strategy

Maximum favorable excursion (MFE) is the peak profit that a trade earns before the trade is closed out. Reviewing the performance of a trading system allows us to measure the tendency of the MFE of the trades. This article explains how to use the information to enhance profitability.

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Maximum favorable excursion (MFE), a concept originally created by John Sweeney to measure the distinctive characteristics of profitable trades, can be used as part of an analytical process to enable traders to distinguish between average trades and those that offer substantially greater profit potential. Using MFE analysis, traders can classify above-average performance during a trade and thereby recognize opportunities to enhance profitability with the MFE risk management strategy.

Following the strategy, traders can increase profit potential relative to risk by adding to positions based on the trading characteristics of a system. This strategy can be used with all systems, whether they are mechanized, discretionary, long, short, intraday, or end of day. The returns of the system must, however, exhibit certain characteristics to take advantage of this risk management strategy.

Since every trading methodology is different, it will take a thorough performance evaluation to determine if the MFE strategy is suitable for the system.

APPLYING MFE STRATEGY

The objective of the MFE strategy is to add to positions during trades that offer greater than normal profit potential. With this in mind, the first step is to determine whether the trading system exhibits exploitable MFE characteristics. The second step is to determine the point at which to add to positions. The third and final step in using the MFE strategy is to reevaluate the system's performance after applying the strategy to ensure that the risk-reward characteristics remain intact.

Before we examine the analysis itself, let's walk through some key concepts. To better explain MFE, consider the notion of support and resistance as applied to price charts.

A tenet of basic technical analysis is if the price action of a security penetrates and remains above a specific resistance level, that resistance level becomes a support level for the

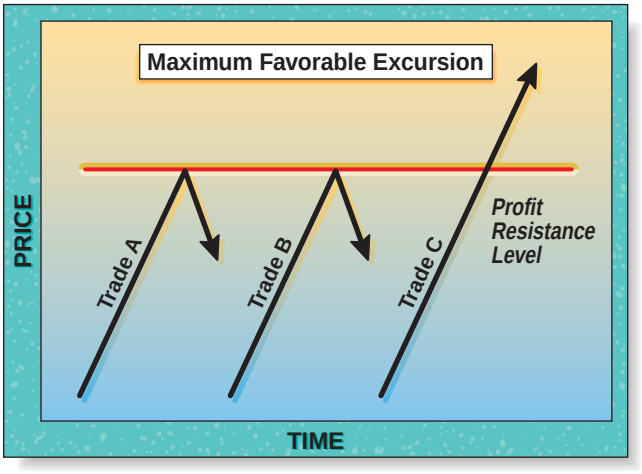

FIGURE 1: PROFIT/LOSS VERSUS TIME. Trades A and B fail to penetrate the profit resistance level. Trade C, however, breaks through. This profit implies a stronger momentum surge than the other trades.

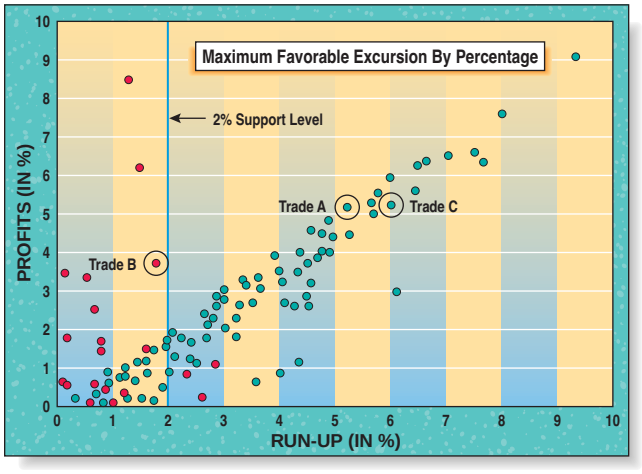

FIGURE 2: MAXIMUM FAVORABLE EXCURSION ANALYSIS. The vertical axis represents the closed profit or loss for each individual trade. The horizontal axis represents the amount of unrealized profit or runup achieved by the trade during its life. Trade A was a winning trade that had a runup of slightly better than 5% and closed with a profit of 5%. Trade B was a losing trade with an unrealized profit of nearly 2%; however, the position reversed to close with more than a 3% loss.

security. While this is a generalization, these support levels do typically hold the security for a period before new market conditions take control.

The same concept of support and resistance can be applied to the price behavior of a security during the life of the trade. Once an open profit has penetrated a specific percentage level, the trade typically remains above the support level for the duration.

Figure 1 illustrates this support and resistance concept in terms of three individual trades. Trades A and B fail to penetrate the profit resistance level. Trade C, however, breaks through, implying a stronger momentum surge than the other trades. The goal of the MFE strategy is to identify this resistance level and add to positions at a specific support/resistance level to improve the system's total performance.

How much unrealized profit or runup does a trade have to experience before it is likely to realize additional gains? This is easily determined if we examine characteristics of the system over time using the maximum favorable excursion process.

MFE TRADING CHARACTERISTICS

Let's look at a trading system and evaluate its performance using a maximum favorable excursion process.

MFE begins by measuring each trade's individual unrealized profit potential or runup in relation to its closed profit/loss. Figure 2 is a maximum favorable excursion analysis. This same type of analysis could be performed using a spreadsheet. The vertical axis represents the closed profit or loss for each individual trade. The horizontal axis represents the amount of unrealized profit or runup experienced by the trade during the life of the trade. To make the MFE analysis easier to interpret, both winning and losing trades are plotted on the same graph. The green dots represent winning trades, while the red dots represent losing trades.

Take a look at two separate trades to understand the benefit of this MFE graph. Trade A was a winner with a runup of slightly better than 5%, closing with a profit of 5%. This was an efficient trade because it realized the majority of its profit potential. Trade B, on the other hand, was a loser that did not fare as well. At one point, the trade had an unrealized profit of nearly 2%, but the position reversed to close with more than a 3% loss. Not only did that trade lose money, but to make matters worse, it was extremely inefficient; it was up nearly 2% but gave it all back and more.

The MFE graphic is excellent at evaluating the relative efficiency of individual trades. The sign of a good system is the clustering of small losing trades with low runup and a clear line of winning trades in a 45-degree angle. The closer the winning trades follow the 45-degree line, the more efficient the trades are — the trade's unrealized profit or runup and the realized profit are relatively close. It is this type of trading characteristic that works best with the MFE risk management strategy.

Now that we know how to interpret the MFE graphic, let's return to Figure 2. The greater the runup, the less likely it is the trade will become a loser. The objective is to find the support area that benefits the majority of trades while maximizing the system's net profit in relation to risk–reward calculations.

In Figure 2, our trading system appears to have a logical support area between 2% and 3% runup. Consequently, trades that are up at least 2% are ideal for increasing the number of contracts or shares. A profitable movement beyond this area can be considered to be indicative of a trade that offers substantially greater profit potential.

Now, let's look at an actual trade to appreciate the signifi-

MFE RISK MANAGEMENT STRATEGY @ 1.0% ADDING 2 CONTRACTS

	ORIGINAL	ADJUSTED	DIFFERENCE
Net profit	$243,615.00	$552,773.00	126.90%
Percent profitable	80.51%	79.91%	-0.75%
Profit factor	6.67	5.39	-19.19%
RINA index	288.86	449.02	55.45%
Return retracement ratio	6.44	4.96	-22.98%
Average trade	$2,064.00	$2,266.00	9.79%
Maximum drawdown	$15,000.00	$34,855.00	132.37%
Average drawdown	$2,416.00	$3,515.00	45.49%
% Equity drawdown	17.85%	27.84%	55.97%

FIGURE 3: MFE STRATEGY, TWO CONTRACTS, 1%. Here are the before and after results of using an identical trading system with a strategy of adding two contracts if the open profit exceeds 1%.

MFE RISK MANAGEMENT STRATEGY @ 2.0% ADDING 2 CONTRACTS

	ORIGINAL	ADJUSTED	DIFFERENCE
Net profit	$243,615.00	$467,809.00	92.03%
Percent profitable	80.51%	79.17%	-1.66%
Profit factor	6.67	7.77	16.49%
RINA index	288.86	392.82	35.99%
Return retracement ratio	6.44	10.31	60.09%
Average trade	$2,064.00	$2,436.00	18.02%
Maximum drawdown	$15,000.00	$26,491.00	76.61%
Average drawdown	$2,416.00	$3,124.00	29.30%
% Equity drawdown	17.85%	11.68%	-34.57%

FIGURE 4: MFE STRATEGY, TWO CONTRACTS, 2%. Here are the before and after results of using an identical trading system with a strategy of adding two contracts if the open profit exceeds 2%.

MFE RISK MANAGEMENT STRATEGY @ 3.0% ADDING 2 CONTRACTS

	ORIGINAL	ADJUSTED	DIFFERENCE
Net profit	$243,615.00	$370,429.00	52.06%
Percent profitable	80.51%	77.98%	-3.14%
Profit factor	6.67	6.90	3.45%
RINA index	288.86	316.45	9.55%
Return retracement ratio	6.44	8.79	36.49%
Average trade	$2,064.00	$2,204.00	6.78%
Maximum drawdown	$15,000.00	$27,706.00	84.71%
Average drawdown	$2,416.00	$3,091.00	27.94%
% Equity drawdown	17.85%	11.26%	-36.92%

FIGURE 5: MFE STRATEGY, TWO CONTRACTS, 3%. Here are the before and after results of using an identical trading system with a strategy of adding two contracts if the open profit exceeds 3%.

cance of the MFE strategy. Trade C was up 6% during the trade and closed out with a profit of 5%. If we use the 2% MFE level to add to the position, then trade C1 would net 3% (trade C profit of 5% minus the 2% MFE delay). The total position for trade C plus trade C1 nets 8% of the price move with little effect on risk.

Our work indicates that each system typically has two or three different support levels. These levels allow traders to adjust the trading characteristics of the system, making it more or less aggressive. In the case of our system, adding positions at 1% would make it more aggressive than adding at 2% or higher, simply because the stronger the momentum behind the trade, the more likely it is to turn into a stellar performer.

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These trades must prove themselves worthy to justify being added to the open position. If you add to the positions too soon, you increase your risk exposure. If you add to positions too late, you limit the full potential of the strategy. The MFE graphic will certainly point you in the correct direction, but a thorough testing is required to appreciate the ramifications from a risk–reward perspective.

MFE PERFORMANCE EVALUATION

Now, let's crunch some numbers and evaluate the system's performance using a variety of MFE risk management support levels. Figures 3, 4, and 5 show the system results of adding two contracts to the original position once a predetermined MFE support level has been penetrated. Applying the MFE strategy to the trading system has a major effect on the net profit figure, but we also want to center on the risk calculations to value the true effects of MFE.

For example, in Figure 3 the system's net profit increased by 127%, but the percent equity drawdown increased by 56%. An aggressive trader may be willing to take on more risk for greater profit potential, but a more conservative trader may not. The results in Figure 4 show a sizable increase in the net profit of 92%, but with an actual decrease in the percent equity drawdown by 34%. The results in Figure 5 show a sizable increase to the system's profitability but certainly not to the same level as Figure 4. A larger net profit figure with less risk makes the MFE risk management setup in Figure 4 more palatable to traders if they were to properly evaluate total performance.

A variety of MFE support levels that can be used to improve trading performance can be seen in Figures 1 through 4. Traders must be willing to evaluate the performance of each level to best match their trading expectations with the risk profile of the system.

Based on the test results, the best risk–reward setting lies between the 2% and 3% support levels. This summary is based primarily on net profit, the RINA index, which combines net profit, time in the market, and drawdown calculations all boiled down into a single reward–risk ratio.

In addition, it is a good sign that the return retracement ratio, which is an alternative to the Sharpe ratio†, is greater than 3.0. Unlike the Sharpe ratio, the return retracement ratio is able to distinguish the difference between upside and downside return fluctuation, and finally, the percentage equity drawdown, which measures the highest high during a trade to the lowest low during the same or consecutive trades in a percent format, is only slightly larger than the lowest of the three examples. This combination of risk and reward evaluation tools makes it easier to center on specific MFE support levels appropriate for any trader, whether aggressive, moderate, or conservative.

CONCLUSION

To apply the MFE analysis, a trader must go through three stages. The first stage uses the maximum favorable excursion graphic to evaluate the characteristics of the system and see if there are any exploitable tendencies. This stage can help eliminate systems that trade inefficiently and offer little potential for exploiting the relationship between runup and realized profit. The second stage focuses on finding an appropriate MFE support level at which to add to positions. Finally, the third stage involves testing specific values to determine the MFE level that works best with the trading system.

In all, maximum favorable excursion is a powerful strategy that can benefit both discretionary and mechanical traders.

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RELATED READING

Sweeney, John [1985]. "Where To Put Your Stops," *Technical Analysis of* STOCKS & COMMODITIES, Volume 3: October.

_____ [1987]. "Using Maximum Adverse Excursions For Stops," *Technical Analysis of* STOCKS & COMMODITIES, Volume 5: April.

Zamansky, Leo J., and David C. Stendahl [1997]. "Evaluating System Efficiency," *Technical Analysis of* STOCKS & COMMODITIES, Volume 15: October. S&C