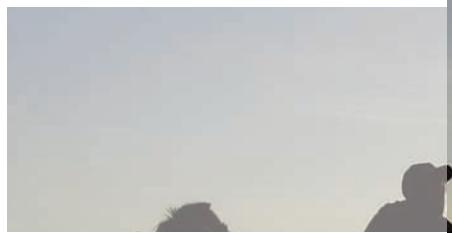


Developing Exit Strategies

Part 1



"Look at it this way: Whether your trading system resembles a gunslinger shooting from the hip or a well-aimed sniper lying in ambush, knowing where your trades are heading could mean the difference between riding into the sunset or lying fatally wounded on a dusty street at high noon. To stay alive you must know when to draw and when to run."^[1]

Everybody knows that stops are necessary, but nobody really likes them. Often you get the feeling that the stop has just thrown you out of the market before it turned in your direction and you missed the big move.



In this article we use statistic research to investigate exits quantitatively. In the course of our performed tests it became obvious that an exit can never be considered independently from the relative entry. It is important to be aware that the dynamic of the entry has substantial influence on the dynamics of a useful exit. Imagine an entry into a quiet, non volatile market and compare it with an entry which was triggered during a phase of high activity, e.g. after a "news-breakout". In the first case it could be good to take profits at a small profit target as the market moves sideways without any direction. In the second case a wide stop could work much better as it gives the trade enough room to develop.

For this reason we do not recommend to test exits with random entries or with entries taken every trading day. We found that working with random entries leads the statistic results in the wrong direction. The outcome of the results is dominated by profane market situations, which occur most of the time, but which are not applicable to your own special market strategy. Therefore we concentrate our work in

F1) Bund-Future, 5-Minutes-Chart



The figure shows a long bar breakout after a consolidation within the first two trading hours.



this article on one defined entry setup and develop corresponding exits on it. To enter the market we use a volatility-based breakout system, which provides useful entry signals based on 5-minute bar futures data. To find good exits for this strategy we make a small journey into the field of statistics. We analyse the course of the single trades in order to determine useful stop-levels and profit targets. This analysis looks at the beginning a bit exotic. As soon as you are familiar with it you will however be rewarded with a better understanding of your trading system and its appropriate exits.

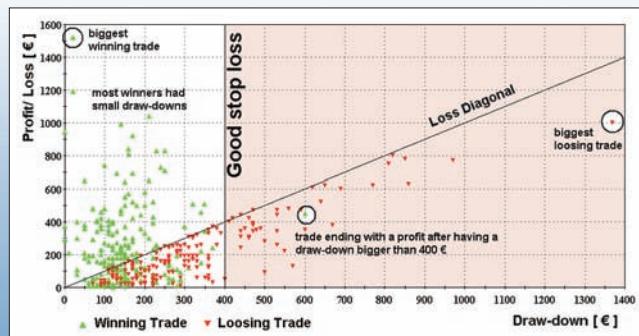
Basic System Logic

To enter the market we combined elements of Toby Crabels Opening Range Breakout (ORB) with a volatility filter. Part of Toby Crabels ORB mythology was to look at each day's opening price and place a buy-stop and a sell-stop-order a fixed amount away from the opening [2]. This basic idea was picked up and modified in the 90's by many famous traders like Linda Bradford Raschke or Larry Williams. We took this logic and added a filter to it in the following way: A trade can only be entered if there is a significant breakout bar in the direction away from the opening. We enter into its direction with a stop order (Figure 1). The distance of the stop within the long bar is determined dynamically by the average true range of the last 23 bars. The higher the average true range, the wider we place the distance of the entry levels. For the Bund Future 5 minute chart the AverageTrueRange (23) typically has values between 2 and 10 ticks. It can, however, become much bigger after a breakout. Furthermore we are only buying new intraday highs and only selling new intraday lows during the trading day. This makes sure that we have confirmation for today's market direction by the price itself. Long and short entries are taken symmetrical. This principle, that the short and long side is considered symmetric, will be applied through the whole article, also for the exits. The Easy Language Code for the entry is in shortened form as follows:

LongEntryPoint=
IntradayHigh + 3* AverageTrueRange(23)

ShortEntryPoint=
IntradayLow - 3* AverageTrueRange(23)

F2) Maximum Adverse Excursion Diagram



This diagram shows all trades of our base system, tested on the Bund-Future, 5 minute bars, from 01/1997-12/2005.

Vertical axis: Final profit (green) or final loss (red) of each trade.

Horizontal axis: intraday drawdown of each trade.

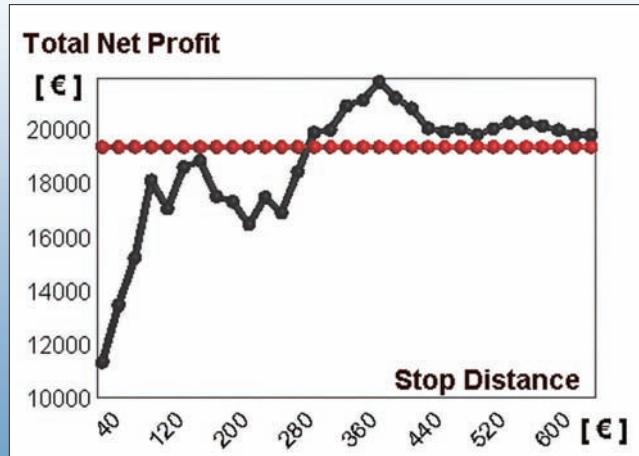
Orange area: 400 Euro as a useful stop loss point.

The strategy was applied to 5 minute data of the Bund future contract, in the period from 01/02/1997-12/31/2005. This basic system makes an overall profit of €19,370. Other main figures are a maximum equity drawdown of €2,860 and a biggest losing trade of €1,000. Slippage and commissions were not taken into account during this whole article in order to keep results easier to compare.

For our statistic tests the number of generated trades is more important than the profit. The more market situations we have to test our different stops, the more indicative the gained results will be for future trading. With 379 generated trades in 9 years, which is about one trade per week, we have a high amount of trades to check our exits thoroughly.

Our basic breakout system stays in the market until the close of the day, independent of what happens in between. Starting from this basis we next look for suitable exits. We use a statistic method which

F3) Total Net Profit of the Stop Loss



Black Line: Net profit depending on the set stop loss distance.

Red Line: Net profit of the base system without any stops. With stop distances higher than 300 Euro the system becomes more profitable than the base system.

was introduced by John Sweeney less than 10 years ago: the Maximum Adverse/Favourable Excursion (MAE/MFE) [3].

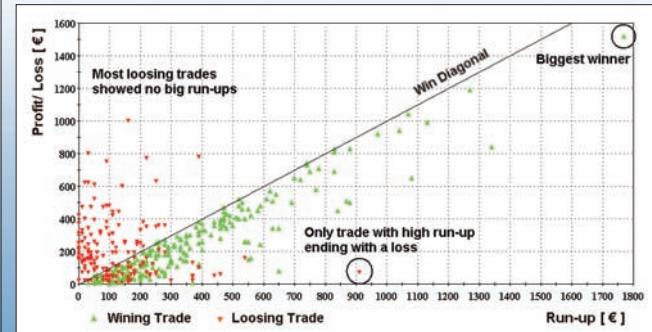
Finding Stop Loss Points: Maximum Adverse Excursion (MAE)

In order to find good stop points for your system you should take a deeper look into the distribution of trades and examine each trade individually. When you do so, you will discover that there are similarities between them, but that every trade also has its own set of characteristics. These characteristics can be examined by using the MAE technique developed by John Sweeney. The MAE is defined as the most intraday price movement against your position. In other words it is the lowest open equity during the lifespan of a trade.

Let us look at the MAE diagram for our long bar volatility breakout system (Figure 2). This diagram shows all 379 trades of this system, applied on the Bund-Future on 5 minute bars in the testing period from 1/1/1997 until 12/31/2005.

On the vertical y-axis of the MAE diagram you see the final profit of the trades. Take care, winning and losing trades are drawn on this same axis. They are distinguished by their colour. A red point with a Profit/Loss value of 600 means that this was a loss of 600 Euro, whereas a green point placed at the same height of the vertical Profit/Loss axis means a 600 Euro winning trade. The horizontal x-axis shows the intraday drawdown of each trade. A closer look of the diagram reveals some interesting facts of the base system. It shows that the biggest losing trade ended with 1000 Euro loss and that this trade had a lowest open equity within the day of 1370 Euro. The diagram shows that the biggest winning trade ended with a profit of 1520 Euro and that this trade had to go through an intraday drawdown of only 20 Euro. This means that this trade was profitable from the beginning. It is striking that all the biggest winning trades can be found on the left side of the MAE-diagram. From the smaller winning trades there was only one which had an intraday drawdown of more than 400 Euro. These facts show the following: In the presented breakout system on the Bund-Future, winning trades normally do not go through phases of bigger losses or big reversals, but stay, for the majority of the time, in the profitable area. It is worth mentioning that many losing trades

F4) Maximum Favourable Excursion Diagram



This diagram shows all trades of our base system, tested on the Bund-Future, 5 minute bars, from 01/1997-12/2005.

Vertical axis: Final profit (green) or final loss (red) of each trade.

Horizontal axis: intraday run up of each trade.



are placed directly on, or at least very close, to the so-called loss-diagonal. A losing trade on the loss-diagonal means that its intraday drawdown is the same amount as its final loss. In other words, it means that the trade ended with the maximum loss it had during the day. This fact shows that losing trades, like the winning trades, are unlikely to turn its initial direction. From the diagram you can now conclude useful levels to set an initial stop. If you set the stop loss to 400 Euro or higher you take advantage of the following facts:

1. Only one winning trade would have been stopped out with a loss
2. All big winning trades stay far away from this 400 Euro stop
3. The 400 Euro stop prevented many of the losing trades from ending with even bigger losses

Adding a Stop to the Base System

Let us verify our findings with tests on our breakout system, with added stop-losses, applied on the Bund-future data. We add a stop loss from 20 Euro up to 740 Euro away from the entry point, in steps of 20 Euro. So the computer has to perform 38 calculations which can take, depending on the speed of your PC, between 30 minutes and some hours for the 9 years intraday data of the Bund-future. The tests give you for each stop level all the important statistic figures you need: net profit, maximum drawdown, biggest losing trade etc. You can then draw diagrams of all these figures, dependant on the set stop loss distance. See for example such a figure for the net profit (Figure 3). With this picture you see that if you set the stop-loss point too close then the total net profit suffers. For too tight stops between 20 and 120 Euro (left part of figure 3) the total net profit is very low, and clearly below the net profit of the breakout-system without a stop-loss. Obviously trades are stopped out often, which later would move into the right direction and would become profitable.

Let us look at wider stops. It is remarkable that any added stop, bigger than 300 Euro, makes the base system more profitable. The highest net profit is reached with a stop-loss of about 35-40 ticks. This confirms our above findings on the MAE diagram. It is important to mention that not with every trading system and not in every market you find a stop-loss

that improves the overall net profit. Profits are usually reduced by the boundaries which are imposed to the market by the stop-losses, especially in more choppy markets like the S&P500 future [4].

Let us see on the example of a 350 Euro initial stop how this affects the main risk figures of the base system: You get a reduction of the maximum drawdown from 2860 Euro (base system) to 2160 Euro (35 tick stop). Even better is the fact that the biggest loss is reduced significantly from 1000 Euro to 420 Euro. You may ask why it was not reduced to 350 Euro, to the amount which was set by our stop loss. The answer is a market gap which inhibited an execution of a trade at the exact stop price but at a 70 Euro worse price.

It is worth mentioning that you get good results with stop losses in the area of 150 Euro stop loss distance. However this stop level has values in its neighbourhood of lower net profit. Therefore, the 150 Euro stop-loss could be a random result that is more unlikely to hold in future. Better take any stop value above 300 Euro to stay away from any optimisation or curve-fitting.

Finding Profit Targets: Maximum Favourable Excursion (MFE)

John Sweeney's concept of MFE is complementary to MAE. It is defined as the most positive price movement for your position. It therefore corresponds to the highest open equity within the lifespan of the trade. Whereas MAE was useful to investigate your trade's draw-downs, MFE reveals their run-ups (Figure 4).

The final profit of the trades are again shown on the vertical y-axis and, like with the MAE diagram, winning and losing trades are drawn on this same axis and can be distinguished by their colour (green points=winning trades, red points=losing trades). The MFE diagram of the original breakout system without exits shows the following interesting facts:

Most winning trades end near the win diagonal, which marks the points where a trade ended with the highest intraday run-up. The biggest winning trade is a typical example. It had an intraday run-up of 1770 Euro and ended near this highest value with

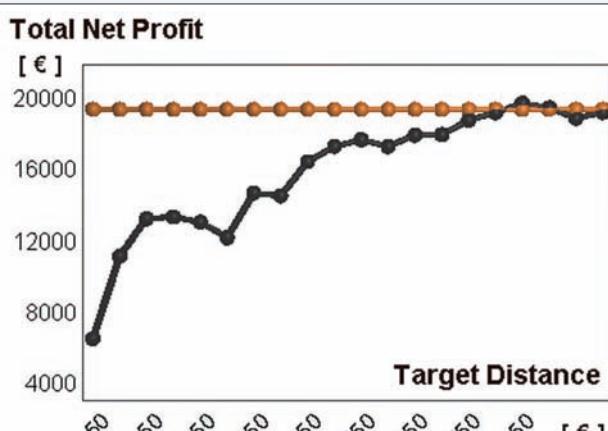
a final profit of 1520 Euro. Further from the MFE diagram you can see that only one trade, which had in between a profit of more than 600 Euro, finally ended with a loss. Thus, you can conclude that the winning trades are unlikely to turn their direction within a trading day. This rule holds true for our breakout system, especially for the big winning trades. The MFE diagrams reveals that the losing trades (red points) stay mostly on the far left side. This means that they usually have only small run-ups.

These findings suggest that profit targets will not be very effective for our system. If a losing trade never comes into a big profit and if winning trades do not significantly turn their direction, a profit target cannot find a point to skim the market.

Profit Targets

Let us verify our findings with further computer tests. We take our basic breakout system and add the following rule to it: Exit each trade immediately if a profit of x Euro is reached. The result is shown in Figure 5. From this figure you can see that the profit target only reduces the profits! The closer you set the profit target, the worse it gets. Only huge profit targets in the region of 800-850 Euro (=80-85 ticks) lead to a profit higher than the basic system with just MOC exit. Therefore, profit targets are a way to set a fixed amount to exit a trade and are only of small use for our dynamic entry setup with a breakout. The tests confirmed what the MFE diagram

F5) Total Net Profit of the Profit Target



Horizontal-axis: Profit target distance from entry.

Vertical-Axis: Red line: Profit of the base system without profit target.

Black line: Total net profit with added profit target.

the MAE/MFE concept is to get an overview over the population of all trades. You can see in the MAE/MFE diagrams the distribution of your system's winning and losing trades. One single chart shows you all intraday run ups and draw downs.

We applied the MAE/MFE method to derive useful stop levels and profit targets for a short-term breakout system in the Bund future. For this market our tests showed that wide enough placed stop losses increased the net profit of the base system, whereas profit targets proved to be useless. Therefore, the general rule that for a good trading system a combination of stops and profit targets is useful, was not applicable for our entry setup in this market. This, however, need not mean that profit targets cannot be valuable in other market environments, and that stops always help to increase the total net profit, as it was in this case. In part 2 of this article we will verify our findings on other big futures markets like Euro, DAX and S&P. It will be interesting to work out the differences between those markets concerning stop losses and profit targets. The instrument which supports us will stay the same: Checking thoroughly the distribution of the trades with Maximum Adverse/Favourable Excursion.

showed: Within our dynamic breakout market environment in the Bund future it is not possible to predict how far the breakout will lead the market. Therefore it is better not to set any profit targets but just let the market run as far as it can go.

Again, as with the stop-loss, this conclusion needs not to hold true for other markets with the same trading system or for the Bund-future with other entry setups. One example where profit targets proved to be rewarding is the long-term Bollinger Band Breakout System which was presented in an earlier *TRADERS'* article [5]. Furthermore Profit targets could become valuable if the exits are set to significant market points, e.g. at supports and resistances, gaps etc., where the market is more likely to turn.

Conclusion

To find the right exits for your strategy can be a difficult job. In this article we presented a method which can help you. The strength of

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