

Channel Breakout

Part 2: Exits



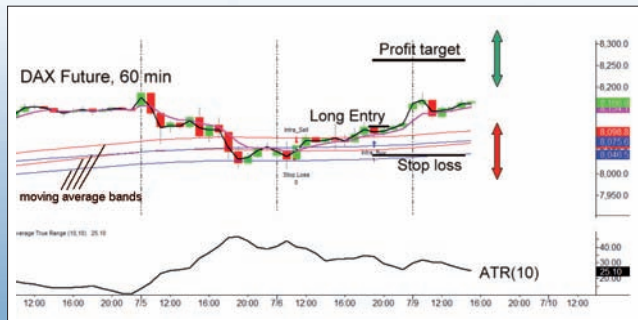
In the first part of this series of articles we presented a modern channel breakout system which was derived from the original Turtle Trading strategy. We explained its entry logic and checked its robustness on the DAX future on different intraday time frames. After focusing on the entries, we want in this article to have a closer look at how to find good exits.

Before we start testing exits we want to repeat briefly the entry logic of our trading system. Its entry signals are generated by breakouts from four exponential moving average bands (Figure 1). As an important filter for the entries we restrict them to special time periods, so-called equilibrium phases. Such phases are characterized by lower market volatility, measured with daily average true ranges.

We trade only breakouts from such equilibrium regions since we found them to have a higher average profitability. The entry logic is built symmetrically in long and short, and trading positions are not closed with an end-of-day exit, but kept overnight.

The system works over a wide range of intraday time frames, with best results achieved between 25 and 90 minute bars. Furthermore,

F1) Channel Breakout System



Channel Breakout System with variable Profit Target and Stop Loss: Entry signals are generated by breakouts out of four exponential moving average bands. With the entries in place we check how the variation of different exits affects the trade results. Chart: Adjusted DAX-Future, 60 Minutes, 07/04/2007-07/09/2007.

the strategy proved to be very robust within parameter variations and shows good results in different market phases.

Here in this second part of our series of articles we will stay with the 60 minute time frame of the DAX future and check different exits. We will investigate profit targets and look for suitable stop losses and break-even stops. As we did in the entries, we will treat long and short positions symmetrically in the exits as well.

For our quantitative analysis we take back-adjusted futures data from Tradestation 8 (www.tradestation.com). All computer tests are again calculated with 2 DAX points (= €50) slippage and commissions per round turn.

Exits

Everybody knows that the exits are as important as or even more important than the entries. However, in the literature or on the internet you can find many more publications about entries than about exits. The reason for this is simply that each entry needs a special scenario. This scenario can be an indicator, a pattern, a change of fundamentals etc., but in any case it is something unique and interesting. By contrast, the finding of exits seems to be more boring. It would be nice to also wait with the exit for a special scenario like a pattern and so take the exits like an entry but just the opposite way. But as we all know, this is not possible. Our accounts would be ruined while waiting for the special moment to exit in cases when the market moves against us. Thus exits need a different approach. You have to start with an entry and then put your exits in place, always in dependence of your entries. We have pointed out in earlier articles that the dynamics of the entry has a big influence on the dynamics of suited (???) suitable exits [1, 2]. Because of this fact the exits cannot be viewed independently from the entries and they should not be found by using random market data or random entries. If you randomise you lose the advantage of applying the dynamics of your special entries to the exits.

Generally, the exit distance can be a fixedpoint value or it can be flexible depending on the market value and/or volatility. The disadvantages of fixedpoint exits are obvious. It is clear that a stop cannot be best when it's not adjusted to the current market value of the traded instrument: a fixed 30 point-stop for the DAX future has a

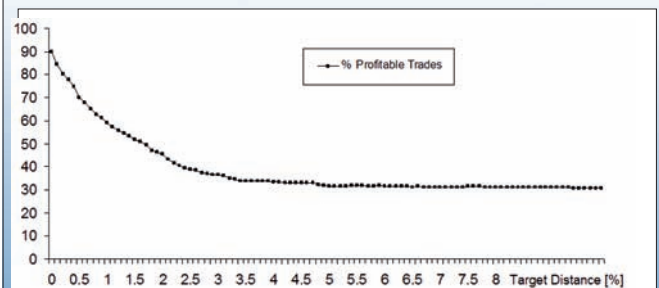
different meaning when the market is trading at 2,300 points as in 2003 or above 8,000 points as in July 2007. So we don't discuss such unsophisticated, fixedpoint exits. Instead, we focus on more „intelligent“ exits that adjust to current market conditions.

Profit Target

The most common of this intelligent exit-category is the percentage-based exit. Thus we start with a check of a percentage-based profit target without applying any other exits to our trading system. The percentage-based profit target is set a certain percentage away from the entry point. For example, if a long position in the DAX future is entered at 8,100 points and the percentage-based target is set at 1%, the target is placed 81 points (1% of 8,100) above the entry point at 8,181. If the target is set at 2% then it's 162 points (2% of 8,100) above 8100 at 8,262 and so on. We use our channel breakout system and vary our profit target in percentage terms from 0.1% up to 10% in increments of 0.1%. We calculate key figures of the trading system like total net profit, maximum intraday drawdown, percentage of profitable trades etc. for each target percentage. With the results of this calculation we can plot the system figures as a function of the varied profit target (Figures 2 and 3). From these figures you can see some interesting attributes of profit targets. Figure 2 shows that the percentage of profitable trades strongly depends on the target distance. With very small profit targets in place you get up to 90% profitable trades. And the farther the target is placed away, the smaller the percentage of profitable trades, ending with about 30% profitable trades when the target is very far or no profit target is in place. The answer to the question „Why not set the target at 0.1% and take the 90% profitable trades?“ is simple: With too small targets you cut your profits far too early. This way you get many small winning trades, but the remaining losing trades destroy the overall profitability of the trading system. This conclusion is proven if you watch other system figures like total net profit or maximum intraday drawdown as a function of the target distance.

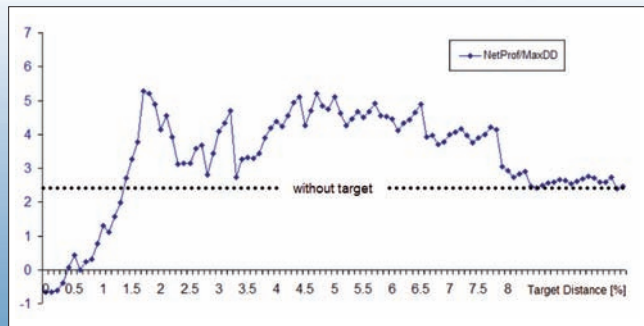
We plot here the ratio of net profit to maximum drawdown instead of net profit or drawdown alone since it contains more information (Fig. 3). You can see that only target distances above 1.3% improve the net profit/maximum drawdown ratio compared to the entry logic

F2) Percentage of profitable trades



Percentage of profitable trades as a function of profit target distance: Distance of target in percent of DAX value. E.g. 1% means 80 points if the DAX is trading at 8000 (20 points when the DAX trades at 2000 etc). No other exits are in place. Test data: Adjusted DAX-Future, 60 Minutes, 1/4/1999- 7/9/2007

F3) Ratio of Net Profit/Maximum drawdown



Ratio of Net Profit/Maximum drawdown as a function of profit target distance. Distance of target in percent of DAX value. No other exits are in place. Test data: Adjusted DAX-Future, 60 Minutes, 1/4/1999- 7/9/2007

without having a target in place. You can further see that the target region at about 2% seems to be very profitable, but it might not be a very robust parameter region since the results of the adjacent values (1.5% or 2.5%) produce much worse results. More robust seems the target region between 4 and 6 % since stable results are produced over a wider range of parameters. We performed the same tests of percentagebased profit targets also on other time scales besides the 60-minute scale shown here. We checked 15minute, 30-minute and 90minute bars. Interestingly, the results on these different time scales are all a bit similar to the 60minute time scale. On all tested time scales the profit target needs to be bigger than 1.5-2% in order to improve the profit/drawdown ratio compared with no target in place. However, the different time scales behaved slightly differently with regard to the region with the „best“ target. On the 15minute time scale the 4% target showed the best ratio of net profit to maximum dawdown whereas it was 5% on the 30-minute time scale and 2% on the 90-minute time scale. Interestingly, we did not got the rule that we had expected that the bigger the time scale, the farther the profit target should be placed away. Instead it seems that for the DAX with our breakout system targets between 3% and 5% have been a good choice in the test period of the last 8 years, more or less independent of the selected time frame. Good targets of 3-5% more than double the ratio of net profit to maximum drawdown.

Bear in mind that 3-5% means 240-400 points with the DAX future trading at over 8,000 points. This is a profit target value which looks big, especially when trading with a small account. But again it shows a typical fact of markets: profitable movements often go far beyond usual expectations.

Initial Stop Loss: Percentage Based Stop vs. Volatility Dependant Stop

When you initiate a new trading position you should always put a protective stop in place immediately. It is this most important stop loss which we want to investigate now. We will do this a bit more thoroughly than with the profit target. Besides the percentagebased stop, which is built in the same way as the profit target, we will be testing a volatilitybased stop.

But let's start with the percentagebased stop. We use our channel breakout system and vary the stop loss in percentage terms from

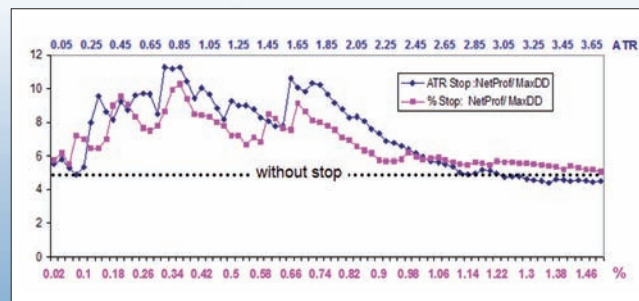
0.02% up to 1.5% in increments of 0.02%. We calculate total net profit and maximum intraday drawdown for each stop loss percentage and plot the net profit/maximum drawdown against the tested stop loss percentages (Fig. 4, purple dotted line). You can see from the figure that all the percentage- based stop losses help to improve the net profit/maximum drawdown ratio compared with the result with no stop loss in place. The best percentage stop is about 0.35% which is in current market conditions (DAX trading at 8,100) about 30 points. This is small compared with useful targets of 3-5% which we have just discussed above.

The second type of stop loss which we want to test is a bit more sophisticated. It is a volatilitydependent stop which is set according to the average true range of the last 10 bars. To understand how this stop works, please have a look at Figure 1. There you see the ATR(10) indicator at the bottom with its last value of 25.1 points. This means that 1 x ATR (10) is at the last bar 25.1 points, 2 x ATR (10) is 2 x 25.1 = 50.2 points and so on. But this simple calculation is only valid for the very last bar. Please note that this volatility stop can change dramatically from one day to another or even within a trading session. You see in Figure 1 that the ATR (10) changes its value between 10 and 50 within a few days.

So a 1 x ATR (10) stop can mean 10 points for one entry signal and 50 points for the next signal. Since the initial stop is put in place at the moment when the entry signal is triggered and kept in place until the trade is exited, volatility changes do not matter for the stop distance after the position is taken. But still the great changes of this volatilitybased stop from one signal to another happen and make it more difficult to use in a money or risk management scheme. With this kind of stop loss you only know the risk of your trade at the moment when you open the position, but not earlier.

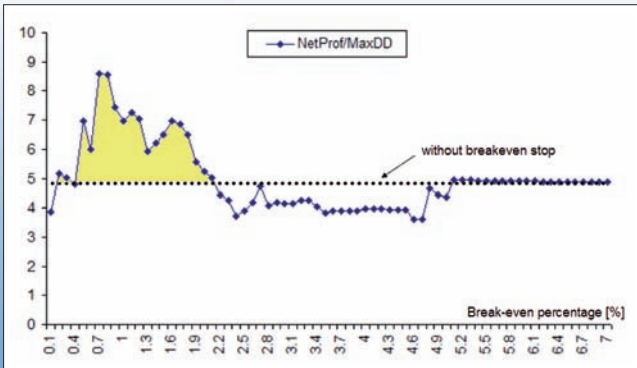
On the other hand, it is this flexibility which makes the volatilitybased stop superior to the percentagebased stop. Across nearly its whole range the volatilitybased stop is about 10-20% better concerning its reward/risk ratio than the simple percentage-based stop (Fig. 4). The best results within our tests on 60-minute DAX data you achieve with stop distances of about 0.65-0.8 x ATR (10).

F4) Ratio of Net Profit/Maximum drawdown



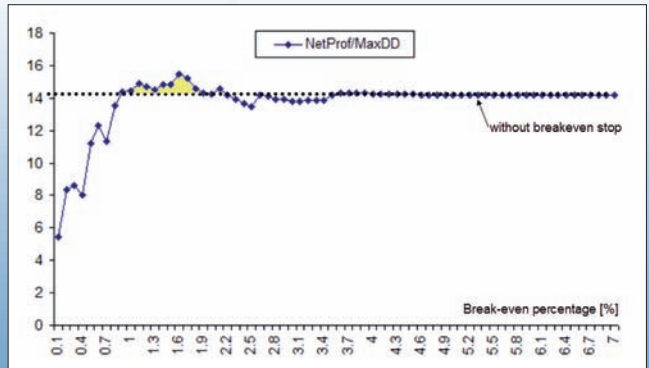
Ratio of Net Profit/Maximum drawdown as a function of volatility dependant ATR stop (blue) and percentage based stop (purple) Test data: Adjusted DAX-Future, 60 Minutes, 1/4/1999- 7/9/2007 Lower Scale: Distance of stop in percent of DAX value. 1% means 80 points if the DAX is trading at 8000- 20 points when it's trading at 2000 etc. Upper Scale: stop distance in Average True Range (ATR) units. 1.05 means 1.05 x ATR (10). During the tests a wide profit target of 6.5 percent is in place.

F5) Ratio of Net Profit/Maximum drawdown



Ratio of Net Profit/Maximum drawdown as a function of Break-Even percentage when no other stops are in place, wide profit target of 6.5% in place. Yellow: Region where the break-even stop improves the result. Test data: Adjusted DAX-Future, 60 Minutes, 1/4/1999- 7/9/2007

F6) Ratio of Net Profit/Maximum drawdown



Ratio of Net Profit/Maximum drawdown as a function of Break-Even percentage with optimized stop loss of 0.7 ATR and good profit target of 4.4% in place. Yellow: Region where the break-even stop improves the result. Test data: Adjusted DAX-Future, 60 Minutes, 1/4/1999- 7/9/2007

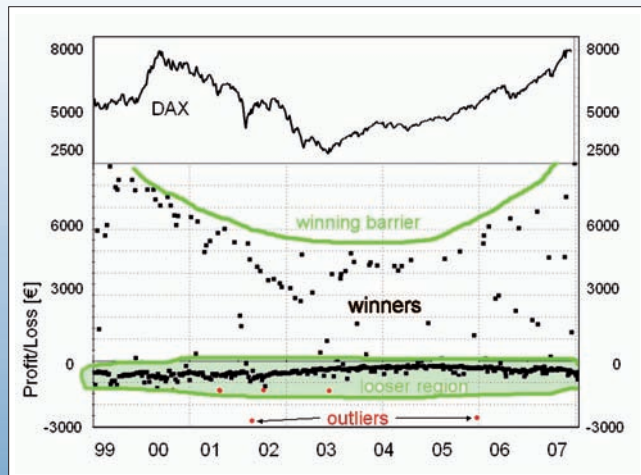
We finally want to mention that within the stop-loss tests discussed here, we left a wide profit target of 6.5% in place. Please note that also with the best targets between 4 and 5% in place or when working without a target the results concerning the stop losses are similar. Both the percentagebased and the ATRbased stop-loss help to improve the ratio of Profit to maximum drawdown significantly. And the ATR-range stop result is in our tests slightly better than the percentage-based stop for most stop parameters.

Break-Even Stop

Finally, we will test a stop which might not be so well known: the break-even stop. Its idea is simple: If your initiated trading position shows a high enough amount of profit, and only then, you place a stop at the level at which you have entered your trading position.

We want to focus here on percentagebased stops only and define the break-even percentage as follows: break-even percentage = profit reached of your position to activate the stop. For example, if the DAX

F7) Trade distribution



Trade distribution with following exits in place: volatility-based stop loss (0.7 ATR ranges) and percentage based profit target (4.4%). Top: DAX Index; Test data: Adjusted DAX-Future, 60 Minutes, 1/4/1999- 7/9/2007. The winning barrier moves with the point value of the DAX since profit targets are chosen percentage based. Most losing trades are limited by the stop loss. There outcome changes with market volatility since the stops are derived from the ATR (average true range). Negative outliers happen in this trading system because positions are kept overnight.

future traded at 8,000 points when you entered a long position you would place your 1% break-even stop at the moment when the DAX went up 1% (=80 points) to 8,080 points. You put the stop exactly at your entry level which is 8,000. (Note: We all know that this is not a good stop point since often such round-figure stops are „fished“, but we have to do this anyway since we are systematic traders).

Now we want to do something which is really important when testing exits. We will check how the stop works with and without other exits in place. First we will test the breakeven stop with no other good exits set (Figure 5; just with a wide profit target of 6.5%). Then we will test it in a situation when there is a good initial stop loss (0.7 x ATR (10)) and a good profit target (4.4%) in place (Figure 6).

You can see that in a situation with no other good exits in place the break-even stop has a range between 0.5 and 2% within which the ratio of net profit to maximum drawdown is improved (marked yellow in Figure 5). The interesting fact to note is, however, that if you have a good initial stop and a good profit target in place the break-even stop loses its power (Figure 6). With additional good exits in place, the profit/drawdown ratio is so good that the break-even stop can only improve it in a very small parameter area and not significantly.

Conclusion

It is important in which sequence the exits are applied. It makes a difference whether you optimize a stop loss with a good profit target in place or without any other exits. Each exit influences the outcome of some trades and therefore the total result of the other exits which are in place.

From all our tests we have found that for the DAX future a combination of an initial volatility-based stop loss and a percentagebased profit target is a good choice. Especially the profit

References

- [1, 2] Emilio Tomasini, Urban Jaekle: "Developing Exit Strategies", Part 1 and 2, TRADERS' April und June 2006

target improves the profit/drawdown ratio markedly. But more importantly, with a good stop loss and target in place other exits like a break-even stop or the very famous trailing stop do not help you much to improve results.

Finally, we wish to point out an important fact concerning all exits. Besides limiting your risks they help you to streamline your trades and to make them more calculable (Figure 7). Although you still have some outliers, most trades are bound by the set exits and cannot go (far) beyond that barrier. This streamlining of trades is the basis for any risk and money management in a bigger trading systems portfolio. If you have an idea of the risk and outcome of your trades you can better determine how many contracts to trade.

In the next few articles we plan to investigate how the channel breakout system and different exits behave on other markets. We are going to test the 10-year U.S. treasury note, light crude oil and build a portfolio of all markets examined.

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