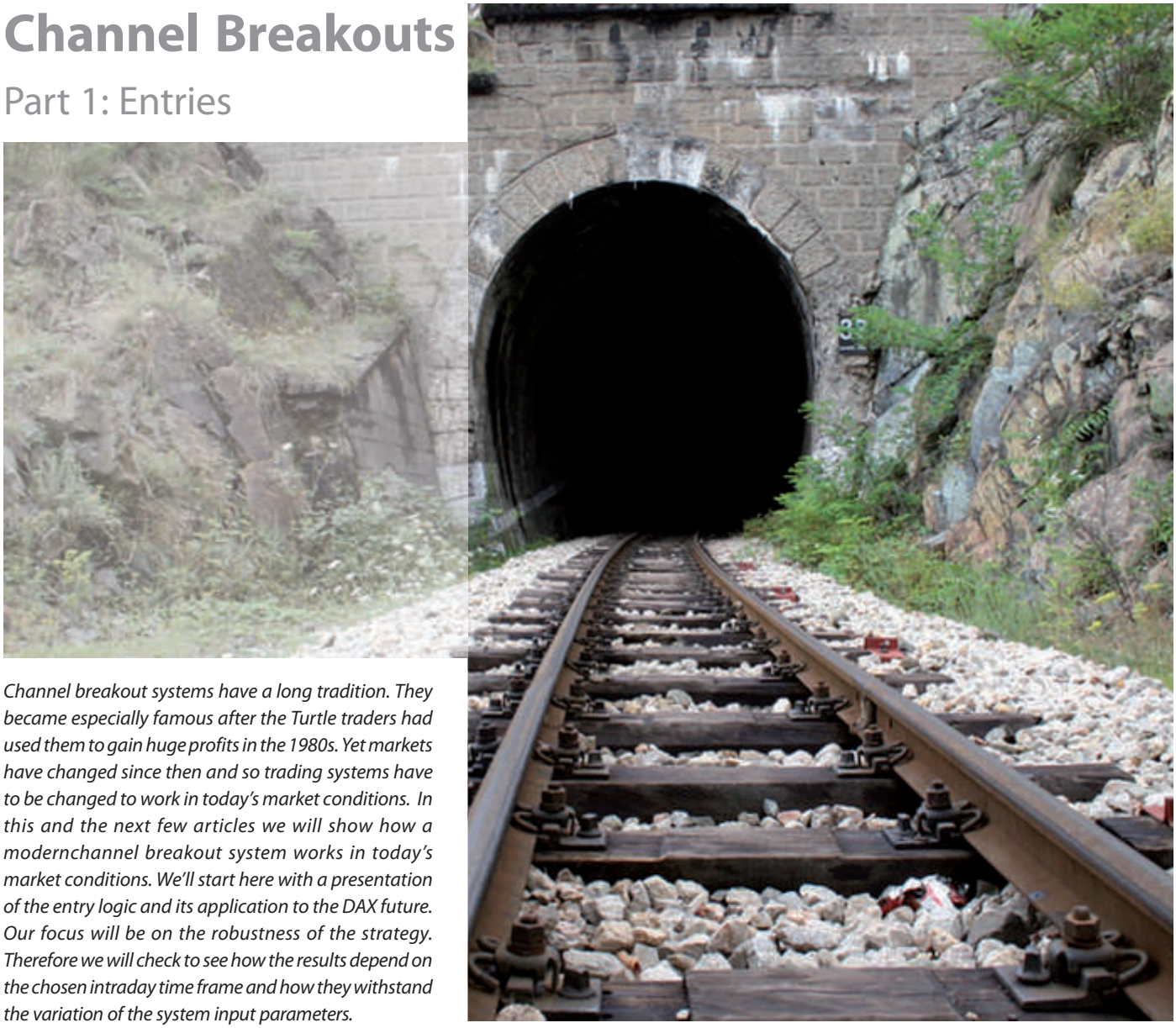
Channel Breakouts

Part 1: Entries



Channel breakout systems have a long tradition. They became especially famous after the Turtle traders had used them to gain huge profits in the 1980s. Yet markets have changed since then and so trading systems have to be changed to work in today's market conditions. In this and the next few articles we will show how a modernchannel breakout system works in today's market conditions. We'll start here with a presentation of the entry logic and its application to the DAX future. Our focus will be on the robustness of the strategy. Therefore we will check to see how the results depend on the chosen intraday time frame and how they withstand the variation of the system input parameters.

The original Turtle Trading system is very simple and easy to understand [1]. It is an asymmetric channel breakout with the following rules: Enter long above the highest high of the previous X days and exit with a stop based on the lowest low of the Y previous days with Y < X. Enter short below the lowest low of the previous X days and exit with a stop based on the highest high of the Y previous days with Y < X. While this simple strategy had been very successful and very well-known, it does not function in today's markets as it did 20 years ago. Today's markets, especially liquid stock index futures like the DAX (or even more so the Mini S&P500 and the Eurostoxx) include lots of false breakouts and reversals. It is not that easy, especially when trading futures to just buy the highs in an uptrend and the lows in a downtrend. Sharp reversals are very expensive and often traders cannot deal with them. Therefore, we will design our trading system differently from the original Turtle system, although we will embrace their idea of the channel breakout. First, we will add two filter conditions to our trading logic that allow entry into trades only in special market phases. We will call them equilibrium phases defining a market phase as an equilibrium phase when the current market price moves within the upper and the lower bands of 90 and 150-bar exponential moving averages (Figure 1) and the volatility in the previous two days is small compared to the previous 30 days. Entries are only allowed when the market has just traded within the bands and daily volatility is low enough. These two conditions improve trading results because of the logic that is behind them: Once the market moves into these bands and volatility has decreased, it often

means that the market is directionless or sideways. Market participants are indecisive about market direction. Such a phase of uncertainty leads to a contraction of the market and to decreasing interest among market participants. However, this decreasing trader interest forms the base for the subsequent movement. At a certain point, when consolidation has continued for a longer time while many market participants are unsure about future developments, any distortion of the equilibrium, e..g. a news event, can create a strong breakout. Many traders who had been standing on the sidelines before are now in a hurry to jump on the bandwagon, amplifying the emerging trend. This is now the right moment for our channel breakout system to enter the market in the direction of the emerging trend. This principle of indecisiveness and subsequent breakout seems to be inherently human and functions quite well (cf. [2]).

Now let us have a closer look at the logic of the trading system (Figure 2). Here you see the price data of the DAX future with 60-minute bars and six different exponential moving averages added. The first four of these six moving averages form the price channels, which are the deciding factor for market equilibrium as discussed in Figure 1: The upper two blue lines are exponential moving averages of the last 150 highs and lows (Exp(150,Highs) and Exp(150,Lows)). Below, the two red lines show exponential moving averages of a shorter period of 90 days, also of highs and lows (Exp(90,Highs) and Exp(90,Lows)). Entry signals are then triggered by the crossover of the two very fast reacting moving averages of Pivot points (Exp(5,Pivots) and Exp(1,Pivots)) out of these slower reacting price bands (see entry logic in Figure 3; a pivot point is simply the arithmetic mean of high, low and close: Pivot=(High+Low+Close)/3).

Figure 2 illustrates three examples of channel breakout signals. They are all triggered by short-term moving average crossovers while at the same time the filter conditions discussed above (equilibrium with market trading within the bands and low daily volatility) remain unchanged. Entry number 1 and number 2 are examples of long signals that are triggered as follows: The fast moving average "Exp(1,Pivots)" crosses above the slow 150 bar moving average of highs " (Exp(150,Highs)" while at the same time the moving average "Exp(5,Pivots)" is higher than the "Exp(90,Highs)". After this crossover, the strategy enters on the next bar on open. However, the two long signals soon turn out to be false breakouts and therefore are stopped out with small losses by the initial stop loss, which is taken 600 euros (=24 DAX points) away from the entry point.

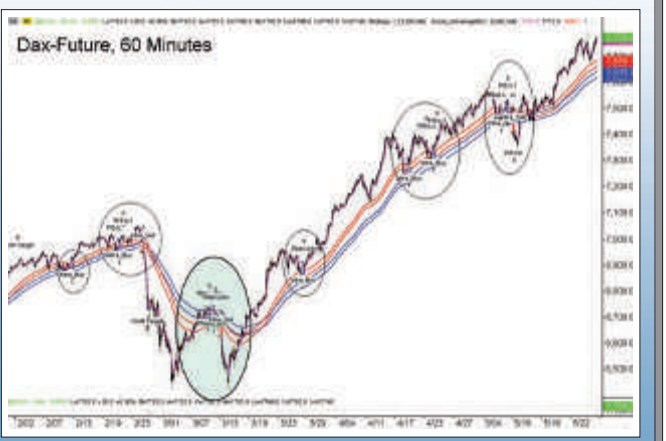
The system logic, which is built symmetrically in both the long and short perspective, then produces a short entry signal (number 3), which is triggered as follows:

The fast moving average "Exp(5,Pivots)" crosses below the average of lows " (Exp(90,Lows)" while at the same time the moving average "Exp(1,Pivots)" is lower than the "Exp(150,Lows)".

After the market has proved the two long breakout signals to be false, it then changes its direction and the subsequent downward move after the short entry has a lot of power. This very typical situation reflects the psychology of the market participants. Many traders having taken their long positions after the market had reached new highs, the latter has not had enough power to continue its increase. When it then changed its direction and went down, the wrongly positioned traders had to liquidate their long positions and amplified the developing downward movement.

This short trade is exited at the profit target that is placed 4,000 euros away (160 DAX points). The exits are chosen in accordance with statistical tests of an earlier article that showed that in the stock index futures wide profit targets and small stops are a good choice [3]. Please note that trading positions for our channel breakout system are not closed with an end-of-day exit. Instead, all positions are kept overnight until a profit target is finally hit or the position is stopped out.

F1) Principle of the Channel Breakout System



Entries can only be made during market equilibrium phases (encircled) after the price has just traded in moving average price bands. Breakouts from these equilibrium regions have a higher probability of being profitable. The area coloured green is enlarged in Figure 2.
Adjusted Dax Future, 60 Minutes, 02/02/2007-25/05/2007.

Application to the DAX Future on Different Time Frames

Now it is time to apply the channel breakout system we have developed to intraday data of the DAX future. As data supplier we used the data feed of Tradestation 8 (*www.tradestation.com*). The

F2) Entry Logic of the Channel Breakout System

This figure highlights the green encircled area of Figure 1. Signals are generated by breakouts from four exponential moving average bands by moving average crossovers of Pivot points. Pivot=(High+Low+Close/3).
Adjusted Dax Future, 60 Minutes, 06/03/2007-16/03/2007.

T1) Key Figures of the System Tests Based on 60-Minute Intraday Data

	All Trades	Long Trades	Short Trades
Total Net Profit	85,025	70,863	14,163
Gross Profit	237,388	143,063	94,325
Gross Loss	(152,363)	(72,200)	(80,163)
Profit Factor	1.56	1.98	1.18
Total Number of Trades	515	263	252
Percent Profitable	56.70%	61.60%	51.59%
Winning Trades	292	162	130
Losing Trades	222	101	121
Even Trades	1	0	1
Avg. Trade Net Profit	165	269	56
Avg. Winning Trade	813	883	726
Avg. Losing Trade	(686)	(715)	(663)
Ratio Avg. Win:Avg. Loss	1.18	1.24	1.1
Largest Winning Trade	4,550	4,550	3,950
Largest Losing Trade	(2,725)	(2,725)	(1,325)
Max. Consecutive Winning Trades	7	7	7
Max. Consecutive Losing Trades	7	5	6
Avg. Bars in Total Trades	10.92	14.23	7.46
Avg. Bars in Winning Trades	16.1	20.48	10.64
Avg. Bars in Losing Trades	4.15	4.22	4.09
Max. Shares/Contracts Held	1	1	1
Total Slippage and Commission	25,750	13,150	12,600
Slippage and Commission per Trade	50		
Trading Period	8 Yrs, 4 Mths, 12 Dys, 9 Hrs		
Percent of Time in the Market	20.97%		
Longest Flat Period	91 Dys, 7 Hrs		
Max. Drawdown (Intra-day Peak to Valley)			
Value	(9,575)		
Date	28.08.2002 15:00		

Table 1 shows the main figures of the Daytrading System for the DAX future, 04/01/1999-25/05/2007. Results include slippage and commission of €50 (=2 points) per Roundturn.

DAX futures data that we used were back-adjusted to avoid artificial gaps between different contract months. All computer tests in this article are calculated with two DAX points' slippage and commissions per Roundturn (€ 50 S&C per RT). The equity curve based on 60-minute data looks like a good starting point for a viable trading system (Figure 4). The total net profit is relatively high (€85,025) compared to the maximum intraday drawdown (€9,575). Since the DAX had a nice upward move within the last few years most profits were gained by the long trades (€70,863). However, the symmetry of the trading logic makes sure that the number of short trades (252) is nearly as high as the number of long trades (263). This symmetrical trade distribution and the fact that the equity curve looks nearly as steady during the bear market of 2000-2003 as it does in the subsequent bull market gives you confidence that the trading system will keep its performance in real trading in the future under different market conditions. The trend-following character of our channel breakout is revealed by the fact that the average number of bars in winning trades (16) is four times the average number of bars in losing trades. The system cuts losses at an early stage and does not interfere with profits. Furthermore, you see that the time in the market is only 20%, which shows that our filters do a good job in removing uninteresting market phases in which the breakout system would have difficulty making profits. Finally, we want to answer the question why the biggest losing trades of €2,725 are so much higher than the amount of the initial stop loss of 600 euros. The answer is not slippage but just the fact that we keep positions overnight and that in some cases the market turns its direction during the night against our positions. Such opening gaps in the "wrong" direction lead to far larger and uncontrollable losses than the stop loss would have allowed. We found, however, that the overall results of our strategy are much better by keeping positions overnight and not interfering with profits. Therefore, we keep things as they are.

F3) Entry Logic in Pseudo-Code

Conditions for long entry:

Equilibrium Conditions:

A) The Price of the last bar has traded within the price bands (Exp(150,Highs) and Exp(150,Lows)) (Exp(90,Highs) and Exp(90,Lows)).

B) Daily AvgTrueRange(2)< 1.2* Daily AvgTrueRange(30);

Entry Trigger:

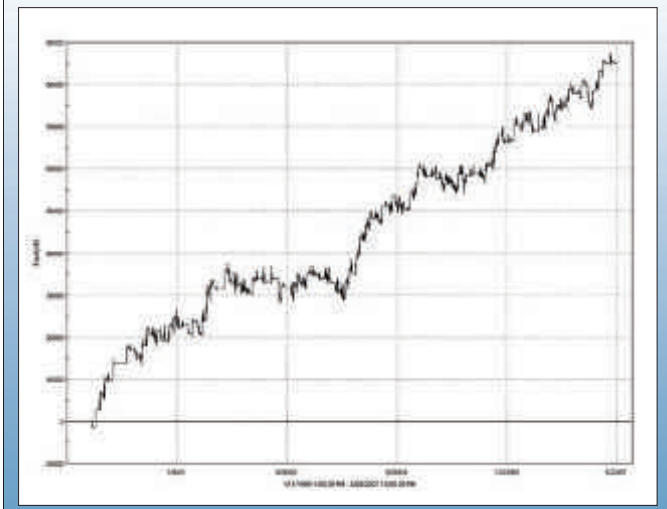
Exp(5,Pivots) crosses above Exp(90,Highs) and Exp(1,Pivots) > (Exp(150,Highs) or Exp(1,Pivots) crosses above (Exp(150,Highs) and Exp(5,Pivots) > Exp(90,Highs));

The short entry is taken symmetrically to the long entry.

Now, let us check how the total net profit and maximum drawdown of our channel breakout system vary when the strategy is applied to different intraday time frames (Figure 5). Such tests are very useful since they give you a hint of a) whether the system logic you have developed can withstand different time scales and b) which are the best time scales to work with in reality.

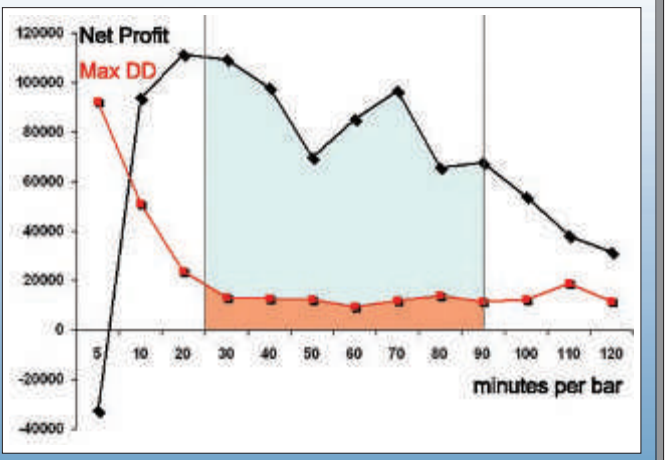
You can see from the results that for very short time scales like 5-minute bars, the total net profit is negative and the maximum drawdown is huge. This confirms our findings from an earlier article that when using time scales that are too small, such as tick bars, 1-minute bars or 5-minute bars, it is more difficult to achieve good trading results than on larger time scales [4]. The reason for poorer

F4) Equity Curve of the Daytrading System



Detailed Equity Curve of the Daytrading System for the DAX future, 04/01/1999-25/05/2007. Results include slippage and commission of €50 (=2 points) per Roundturn.

F5) Total Net Profit and Maximum Drawdown



Total net profit (black line) and maximum drawdown (red line) as a function of time frame.
Best results are obtained when using bar lengths between 25 and 90 minutes. Data used : DAX future, 04/01/1999-25/05/2007. Results include slippage and commission of €50 (=2 points) per Roundturn.

trading results on too short time frames, are on the one hand, slippage and commissions, which are higher since more trades are generated. Additionally, our experience has shown that that the market noise seems to be higher on very short time scales than on longer bars. However, if you stay with your bar length above this short time scale the results look promising.

From 25-minute up to 90-minute bars, the system produces a good ratio of profit vs. maximum equity drawdown. Only if you trade our system on very large bars like 120-minute bars, is the net profit decreasing since too few trades are generated. Our 60-minute time frame that we discussed above is right in the middle of the area of high profit and small drawdown, and the most profitable time scale is around the 30-minute bar.

Stability Tests

The functioning of our trading strategy on different time frames is one good test for the stability of the trading system logic. Another one is the variation of system input parameters - in our case, the lengths of the different exponential moving averages. We want to check if our channel breakout system gives us similar results when these parameters are varied. If so, we can be sure that the results are not just a special adaptation to past market conditions but have a higher chance to stand the test of real trading.

To keep an overview of what we are doing we do not present the variations of all the input parameters of all moving averages but focus here on the robustness tests on the variation of two parameters only:

The first parameter that we changed is the length of the exponential average of the pivot points (called Exp(5,Pivots) in Figure 1). This parameter (5) is varied from 2 to 8 in increments of 1. The second parameter which we changed is the length of two of the exponential moving averages of highs and lows (called Exp(90,Highs) and Exp(90,Lows)).

This parameter (90) was varied from 45 to 130 in increments of 8. A normal PC computes the necessary 84 system tests in less than 1 minute.

With special software, you can get three-dimensional graphs from these tests that show any system figure dependent on the two varied input parameters. Here, we show the stability graphs for the total net profit, maximum intraday drawdown and number of trades dependent on varied parameters (Figure 6 A-C).

From all these graphs, you can see that the system logic is largely immune from parameter variation. Although the total net profit varies in a relatively wide range (between 40,000 and 120,000 euros) the main fact is that it stays clearly positive for all chosen input parameters. The maximum intraday drawdown, another important figure, also stays quite stable during parameter variation.

It varies between 8,000 and 18,000 euros. If you watch the total number of trades of the system, you can see that they are directly dependent on the system parameter 1, which is the length of the fast moving average of the Pivot points. The slower you make that average, the fewer trades you get.

Thus, you have a nice tool to affect the trading figures, one that fits your strategy into a larger system portfolio, into a money management scheme or just adapts it better to your trading style.

References

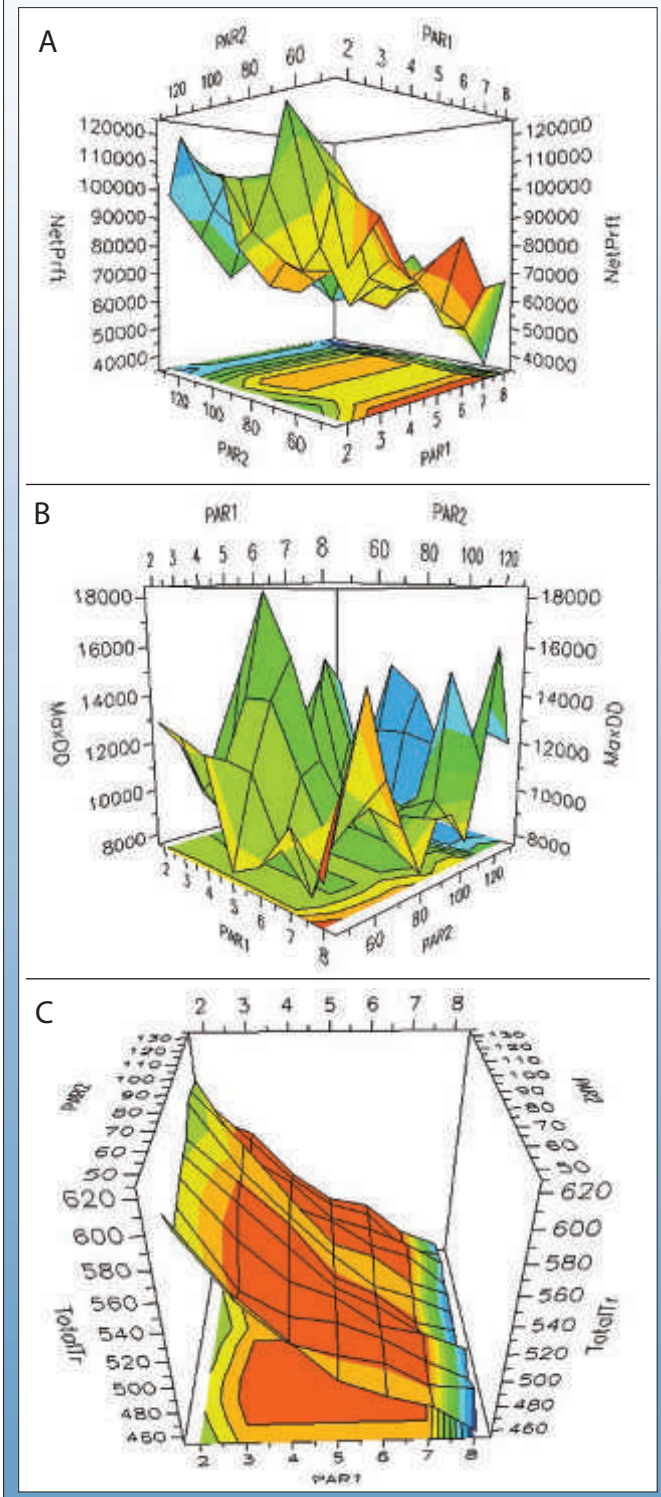
[1] Curtis Faith: "Way of the Turtle: The Secret Methods that Turned Ordinary People into Legendary Traders ";
Original Turtle, Class of 1983

[2] Emilio Tomasini, Urban Jaekle: "Systematic Triangle Trading – a new approach", TRADERS' April 2007

[3] Emilio Tomasini, Urban Jaekle: "Developing Exit Strategies" , Part 2, TRADERS', June 2006

[4] Emilio Tomasini, Urban Jaekle: "Fast or Slow Trading", TRADERS' February 2007

F6) Three-Dimensional Area Diagrams



Three-dimensional area diagrams for A: Net Profit, B: Maximum Drawdown , C: Number of Trades The diagrams show key system figures as a function of two system input parameters: PAR1: Exponential Average of Pivots "Exp(5,Pivots)". PAR2: Exponential Average Length of Highs and Lows "Exp(90,Highs)" and "Exp(90,Lows)". Data used for tests: 60-minute bars of the DAX future, 04/01/1999-25/05/2007. Results include slippage and commission of €50 (=2 points) per Roundturn.

Conclusion

With all the different entry conditions like the equilibrium filter and the use of six exponential moving averages the channel breakout strategy presented by us is much more complex than the original Turtle trading system. It takes a bit of time and effort to understand it completely. However, to encourage you to work with this strategy we wish to quote Einstein who said, "You should make things as easy as possible, but not any easier". The main point for him was that his theories worked, and similarly, the main point for a trader is that well developed trading strategies are making steady profits.

Our channel breakout system works in the DAX Future on a wide range of intraday time frames with the same input parameters. Best results are achieved between 25 and 90-minute bars. Furthermore, the strategy proved to be very robust within parameter variations and showed good results in different market phases.

Having worked a great deal with the entries of our system, we'll shift our focus to the exits in Part 2 of this series of articles. We'll check these strategies first on the DAX future, then we'll apply our trading logic to a completely different market- the 10-year US Treasury Bond Future. It will be interesting to find out in the second part of this series what the two markets have in common and what their main differences are.

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