

Channel Breakouts

Part 3: US-Bond-Markets



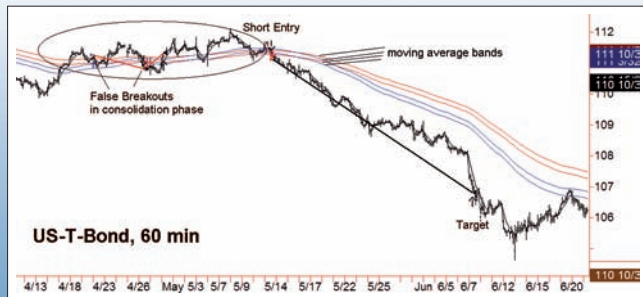
In the first two parts of this series of articles we presented a modern channel breakout system and tested it on the DAX future [1, 2]. In this article we will apply our strategy to a completely different market group: the 10-year U.S. T-Note and its big brother, the U.S. T-Bond future- two of the most important bond markets in the world.

In this article we'll first briefly repeat the entry logic of the channel breakout system with a current example from the T-Bond future. After that, we'll compare the two different U.S. bond markets, U.S. Treasury Bond and 10-year U.S. Treasury Note future, within our trading logic in different intraday time frames.

You can see the principle of the channel breakout trading logic at

work when we look at a current example of the U.S. T-Bond future (Figure 1). The chart shows 60-minute intraday data from 13th April until 22nd June 2007. You will doubtless remember the fundamental reasons for the sharp decline of the Bond futures in May and June – the U.S. housing market and liquidity crisis. We are, however, not interested in any reasons for any specific movements but are just

F1) Typical signals of a Channel Breakout System



Entry signals are generated by breakouts out of four exponential moving average bands. Chart: Adjusted T-Bond-Future, 60 Minutes, 04/13/2007-06/22/2007.

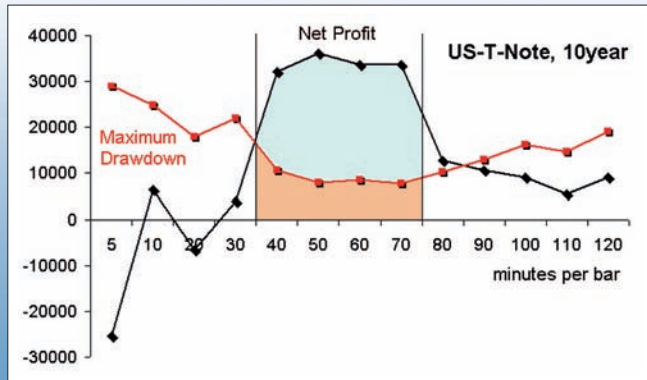
going to focus on the markets themselves with their technical issues. Technically, we can state that the market in April has been trading in a sideways range. During that period two false breakout signals occurred. Such losses cannot be avoided, not even with the best trading system. The good thing was that this consolidation phase was a so-called „equilibrium phase“ and formed the psychological basis for the subsequent long and steady downward movement. Our entry logic was able to catch the beginning of that movement because it started as a breakout from the four exponential moving average bands. The short signal occurred on 11th May and this short trade was exited at the profit target at the beginning of June. The exact date and exact

profit depend on how far the target is placed. This will be discussed in detail in the next part of series of articles when we treat the exits in detail. Here we just note that this was a typical winning trade. Its profit is 3-5 points, depending on the target distance, which is \$3,000- \$5,000 for one traded contract.

The two markets to investigate: U.S. T-Bond and U.S. T-Note

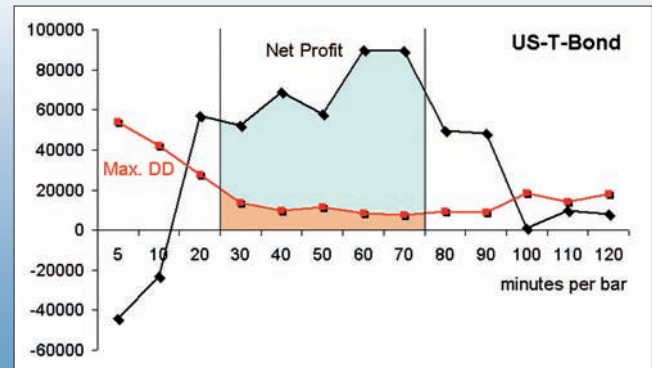
The U.S. T-Bond and U.S. T-Note (10 years) have many things in common. Both have a long history on the CBOT. Futures on U.S. T-Bonds have been traded there since 1977, whereas futures on the shorter-term U.S. T-Notes were introduced just five years later in 1982. For both one full-point value means a \$1,000 change on your futures account and both contracts stop trading if the daily limit of a 3% change (= \$3,000/Contract) is hit. Both contracts were originally traded on the CBOT floor between 7:20 am and 2.00 pm Chicago time and for both electronic trading has caused trading times to be extended round the clock nowadays. The two contracts usually move in parallel and are highly correlated, not only end of day but even intraday. Despite all these similarities the two contracts also have crucial differences. The most important one for you as a trader is that the U.S. T-Bond usually is more volatile. Its daily trading range is bigger, especially if fundamental changes like interest-rate cuts etc. happen, since its basis is bonds with a much longer duration. And secondly, the smallest bid/ask spread in the T-Bond Future is twice as big as for the U.S. T-Note. For the T-Bond it's 1/32 of \$1,000, which means \$31.25, whereas for the U.S. T-Note it's only half of a 1/64 of \$1,000, which means \$15.625.

F2a) US-T-Note (10 year) future



Total net profit (black line) and Maximum Drawdown (red line) as a function of time frame; each 10/11/1985-10/14/2007; Results are calculated with slippage and commission of 60\$ per Round turn.

F2b) US-T-Bond future



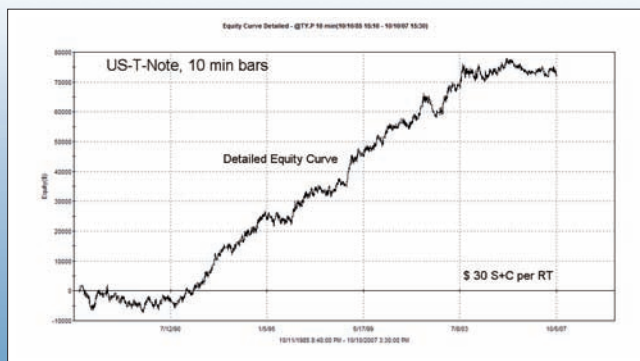
Keeping all these facts in mind, it's time to take a look at the practical side and see how our channel breakout system performs in the two markets on different time scales. So we take our channel breakout strategy and insert a „good“ profit target and a „good“ risk stop loss. „Good“ means that we already tested these markets before conducting such a time analysis, of course. How these exits have been found and how to use different exits will be the main topic of the next article. Here we just want to explain the two exits that have been taken.

As with the DAX future, we use adaptive exits that adjust to current market conditions. To keep things simple, we work only with percentage-based exits. Just to remind you what a percentage-based exit means: a stop loss of 1% with the T-Bond future trading at 107 12/32 points means 1.07 points, which means 0.8 points if the future trades at 80 points etc. You can see that a percentage-based exit adapts itself to the current point value of the market. We used the following percentage-based exits for the T-Bond future: Risk stop loss = 0.42% and profit target = 5.1%. In other words, if we enter a long position at 107 12/32 points, the initial risk stop loss is placed 0.42% below the entry point at 106 30/32 (since 0.42% means 0.45 points, which is about 14/32 points). The target would be placed 5.47 points (= 5 15/32) above

the entry point at 112 27/32. For the T-Note future we used a closer risk stop loss of 0.3% and a closer target of 3%. The reason why closer exits make sense in the T-Note future is its smaller volatility and smaller daily trading range.

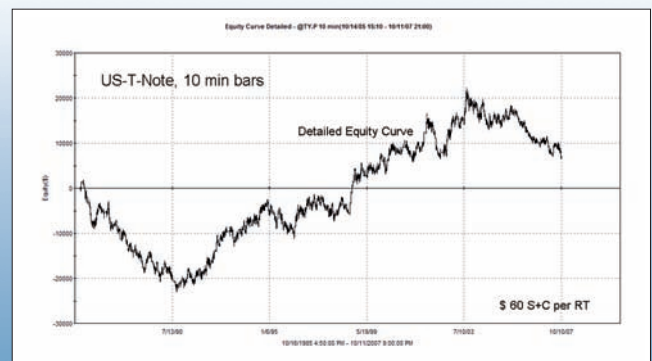
Let's apply the system code gained, consisting of Channel breakout entry logic, risk stop loss and profit target to 22 years' (Oct 1985- Oct 2007) market data of the U.S. T-Bond and U.S. T-Note Future. We keep our input parameters fixed and vary the bars used in the charts between 5-minute, 10-minute etc. up to 120-minute ones (Figures 2a and 2b). For our quantitative analysis we took intraday market data from Tradestation 8 (www.tradestation.com). The data was back-adjusted to avoid artificial gaps between different contract months. All computer tests are calculated on a one-contract basis with \$60 slippage and commissions per round turn, unless specifically stated otherwise. 22 years of intraday market data from October 1985 until October 2007 mean, in other words, over 40,000 of 60-minute bars and over 500,000 of 5-minute bars for each of the two markets tested. This sounds like a lot, but is just enough to generate about 500-1000 signals in each of the two markets. This amount of signals is a number which is just high enough to be statistically significant.

F3a) Detailed Equity Curve



Detailed Equity Curve of the Channel Break System for the T-Note (10year) future; 10 minute time scale; 10/10/1985-10/10/2007; Results are calculated with slippage and commission of 30\$ per Round turn.

F3b) Detailed Equity Curve



Detailed Equity Curve of the Channel Break System for the T-Note (10year) future; 10 minute time scale; 10/14/1985-10/11/2007; Results are calculated with slippage and commission of 60\$ per Round turn.

You can see from the figures obtained that in both bond markets tested for very small time scales like 5-minute bars the total net profit is negative and the maximum drawdown is huge (Figures 2a and 2b). This confirms the findings that we arrived at with our system in the DAX: when using too small a time frame it is difficult to achieve good trading results. The reasons for that are first of all slippage and commissions which are higher since more trades are generated. Additionally, on the very small time scales you have more market noise, which means more movements that happen by accident and worsen your performance. If, however, you stay with the used bar length above this small time scale, the results look promising in both bond markets. In the T-Bond future from 30-minute up to 80-minute bars the system produces a good ratio of net profit vs. maximum equity drawdown. On the 10-year T-Note future results are not that good, but still you find a good time window between 40 and 70 minutes where this market seems tradable with the channel breakout logic. In both bond markets the higher time scales become unprofitable as in the DAX future since too few trades are generated there.

Equity line is not equity line...

After these general findings and this overview of different time scales let's have a closer look at the system results. We'll be discussing trading figures, but first of all have a look at graphs which say more than 100 numbers, the equity lines. Here we use so-called "detailed" equity lines which show summations of all trades taken. In contrast to usual equity lines such detailed equity lines not only count the final outcomes of the trades but also track all intraday movements and drawdowns that happened as long as the position was open.

In Figure 3a you can see such a detailed equity curve of the channel breakout system in the T-Note future with 10-minute bars. You will notice that the equity curve looks OK with relatively small drawdowns. An annoying point on this equity curve is that it has deteriorated in the last 4 years. However, this can be a normal drawdown phase of a still working system. And you might

consider trading this system on that time frame. But the trading figures are a cause for concern. The average net profit per trade is quite low – only \$33. Furthermore, the poor quality of the 10-minute time frame is expressed in a small profit factor (= ratio of net profit/gross profit) of 1.24. To investigate the 10-minute time scale more thoroughly, let's have a look at the same trading system and market if \$60 instead of \$30 slippage and commissions (S+C) per round turn are used for the calculations. The result is disappointing. The equity line which was nicely growing before with 30 S+C looks useless now with 60 S+C and has big drawdowns (Figure 3b). Would you still trade this? We guess not. This example of the small 10-minute time frame shows the importance of slippage and commissions- an important factor that is often underestimated by novice system developers.

Let's change to a time scale in which the system in T-Note future has produced a good ratio of net profit vs. maximum equity drawdown, the 60-minute bars. On this time scale the system looks much better, even if you take \$60 S+C in your calculations (Figure 3c). But is this result good enough to trade? You must have a closer look at the trading system figures to answer this question (Table 1).The

T1) TradeStation Performance Summary – US-T-Note (10/14/1985-10/11/2007)

	All Trades	Long Trades	Short Trades
Total Net Profit	\$33.620	\$29.196	\$4.424
Gross Profit	\$147.908	\$84.819	\$63.089
Gross Loss	(\$114.288)	(\$55.623)	(\$58.666)
Profit Factor	1,29	1,52	1,08
Total Number of Trades	523	266	257
Percent Profitable	20,46%	24,44%	16,34%
Winning Trades	107	65	42
Losing Trades	416	201	215
Avg. Trade Net Profit	\$64,28	\$109,76	\$17,21
Avg. Winning Trade	\$1.382,32	\$1.304,90	\$1.502,13
Avg. Losing Trade	(\$274,73)	(\$276,73)	(\$272,86)
Ratio Avg. Win:Avg. Loss	5,03	4,72	5,51
Largest Winning Trade	\$3.362	\$3.362	\$3.190
Largest Losing Trade	(\$966)	(\$966)	(\$748)
Max. Consecutive Winning Trades	4	3	3
Max. Consecutive Losing Trades	26	12	33
Avg. Bars in Total Trades	25,36	30,7	19,83
Avg. Bars in Winning Trades	77,42	84,32	66,74
Avg. Bars in Losing Trades	11,96	13,35	10,67
Total Slippage and Commission	\$31.380	\$15.960	\$15.420
Trading Period	21 Yrs, 11 Mths, 18 Dys, 2 Hrs		
Percent of Time in the Market	33,90%		
Time in the Market	7 Yrs, 5 Mths, 10 Dys, 9 Hrs, 20 Mins		
Longest Flat Period	111 Dys, 2 Hrs		
Max. Drawdown (Intra-day Peak to Valley)			
Value	(\$8.637)	(\$7.026)	(\$13.138)
Date	20.02.2004		
Max. Trade Drawdown	(\$1.125)	(\$906)	(\$1.125)
Market	US-T-Note, 10 year, Future, CBOT		
Tradestation Symbol	@TY.P		
Time Scale	60 min		
Slippage and Commission per Roundturn	\$60		

average trade is high enough at \$64 and the overall net profit at \$33,600 is high compared to the biggest intraday drawdown of \$8,637. On the other hand, the profit factor, which expresses the ratio of Net Profit/Gross Profit, is still relatively poor (1.29). So, to come to a conclusion with the T-Note future on the 60-minute scale is difficult. We'd say that the channel breakout system is not tradable here as a stand-alone market/system pair. As a part of a bigger trading system portfolio it can, however, be useful. This is another interesting topic which we will also discuss in more detail in a later article.

Let's have a look at its bigger brother in terms of volatility and trading range: the U.S.T-Bond future. From the time frame overview (Figure 2b) discussed above we know that for this market too, the small time scales are useless. So we directly concentrate on the 60-minute time scale (Figure 3d). The equity line looks smoother than for the U.S.T-Note. And except for the longer sideways phase from 1985-1994 it was just going up nicely. If you look at the trading figures your good impression is confirmed (Table 2). With \$60 slippage and commissions the channel breakout reaches a good average trade of \$164 and a high profit factor of 1.65. The total net profit of \$89,000 is

achieved with a small (Intra-day Peak to Valley) drawdown of \$8,200. If you look more closely at the trading figures you might be surprised that even with this good equity line and good trading figures fewer than 20% of all trades end as a winner (19.63% profitable the trades). And what is even more surprising, trading system allows 29 (!) consecutive losing trades. Which of you will continue to trade a system if he loses five times or ten times in a row? But this system lost 29 times, and look at the nice equity line! But where does the good result come from? If you look again at the trading figures, you see the very high ratio of average win/average loss of 6.7. In other words, with this system you get very small losses but very large gains. Look again at the example which occurred this year in the U.S. T-Bond from April to June. After two smaller losses (typically about \$300) you had the huge short trade when the T-Bond market broke down (profit of \$3,000-\$5,000). Another very important trading figure which is often not taken into account is the percentage of time which the system stays in the market. Here we get 34%, which means that 1/3 of the time we are in the market. Be careful with systems which are more than 50% of the time in the market. Systems which are much of the time in the

market are more sensitive to unexpected movements and lose more money in useless sideways movements. For your risk/return ratio it is better to trade combinations of many systems with less market exposure than to trade one system which is in the market 100% of the time. For those reasons we'd like to reduce the 34% market exposure for our trading logic. But if we did this we would have to solve different tasks, e.g. we could try to change the input parameters of the system code. However, this would entail doing more curve fitting and losing comparability with other markets. Or we could try to use closer profit targets and add further exits in order to produce more, but smaller profitable trades. That way we'd directly move into the topic of our next article, the exits.

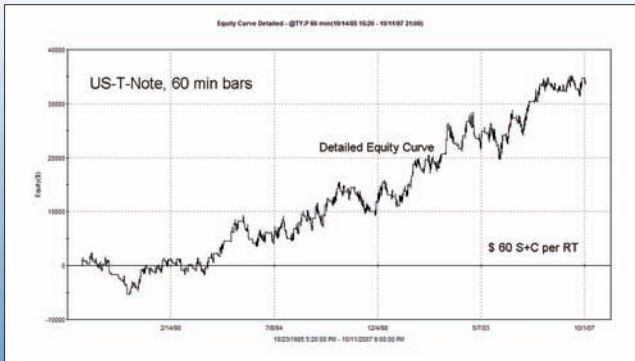
Another feature of the trading result on the T-Bond future is the symmetrical results in long and short trades. You have similar profits, similar net profits, similar drawdowns and a

T2) TradeStation Performance Summary – US-T-Bond (10/14/1985-10/11/2007)

	All Trades	Long Trades	Short Trades
Total Net Profit	\$89,706	\$47,001	\$42,705
Gross Profit	\$227,674	\$120,770	\$106,904
Gross Loss	(\$137,968)	(\$73,769)	(\$64,199)
Profit Factor	1,65	1,64	1,67
Total Number of Trades	545	288	257
Percent Profitable	19,63%	20,14%	19,07%
Winning Trades	107	58	49
Losing Trades	438	230	208
Avg. Trade Net Profit	\$164,60	\$163,20	\$166,17
Avg. Winning Trade	\$2,127,79	\$2,082,24	\$2,181,71
Avg. Losing Trade	(\$314,99)	(\$320,73)	(\$308,65)
Ratio Avg. Win:Avg. Loss	6,76	6,49	7,07
Largest Winning Trade	\$5,878	\$5,878	\$5,503
Largest Losing Trade	(\$1,154)	(\$1,154)	(\$716)
Max. Consecutive Winning Trades	4	4	3
Max. Consecutive Losing Trades	29	31	20
Avg. Bars in Total Trades	24,32	27,39	20,89
Avg. Bars in Winning Trades	83,84	95,64	69,88
Avg. Bars in Losing Trades	9,78	10,17	9,35
Total Slippage and Commission	\$32,700	\$17,280	\$15,420
Trading Period	21 Yrs, 11 Mths, 18 Dys, 2 Hrs		
Percent of Time in the Market	34,36%		
Time in the Market	7 Yrs, 6 Mths, 17 Dys, 5 Hrs, 20 Mins		
Longest Flat Period	123 Dys, 2 Hrs		
Max. Drawdown (Intra-day Peak to Valley)			
Value	(\$8,186)	(\$9,741)	(\$12,263)
Date	22.04.2003		
Max. Trade Drawdown	(\$1,094)	(\$1,094)	(\$656)

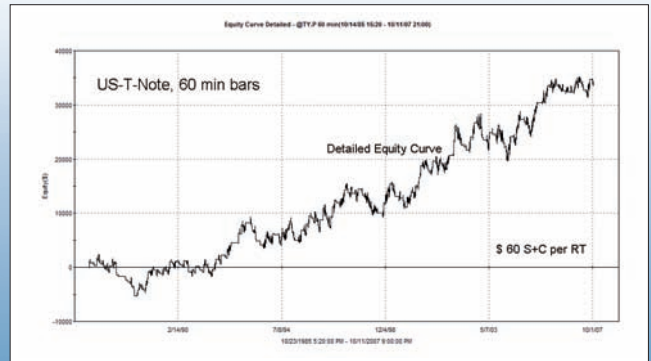
Market US-T-Bond, Future, CBOT
 Tradestation Symbol @US.P
 Time Scale 60 min
 Slippage and Commission per Roundturn \$60

F3c) Detailed Equity Curve



Detailed Equity Curve of the Channel Break System for the T-Note (10year) future; 60 minute time scale; 10/14/1985-10/11/2007; Results include slippage and commission of 60\$ per Round turn.

F3d) Detailed Equity Curve



Detailed Equity Curve of the Channel Break System for the T-Bond future; 60 minute time scale; 10/14/1985-10/11/2007; Results include slippage and commission of 60\$ per Round turn.

similar percentage of profitable trades in long and short trades. This, in particular, deserves to be mentioned since it's something untypical of the bond markets. Since bond markets have been in an uptrend since the 1980s most trend-following systems make their profits only with the long trades, whereas the short signals you can often leave out. (Look, for example, at a trend-following system which was based on MACDs and moving averages which we had presented in earlier TRADERS' articles [3,4]). This means that the channel breakout system seems to work a bit differently from normal trend-following systems. It has the quality to capture profits during sharp breakouts which happen contrary to longer trends. Likewise, it is able to gain profits with short trades in a bull market or with long trades in a bear market. Thus this system is interesting for funds which use portfolios of only trend-following systems. By adding such a system they can partially reduce the risk of their trend-following portfolio in the inevitable corrections which are liable to happen.

Conclusion

The „DAX-proven“ channel breakout system also showed promising results on the bond markets, especially on the U.S. T-Bond future. The higher volatility and larger daily trading range of the T-Bond compared to the T-Note help to obtain better trade figures like higher average profit per trade and smoother equity line there. Furthermore, you have seen that the chosen time frame can make a big difference for your trading logic. We found for the T-Note and T-Bond that it's best to work with bars between 30 and 70 minutes.

In the next few articles we want to investigate an aspect which we have not been able to dwell on much here: the influence of exits on the trading results. We'll check in detail different profit targets, stop losses and trailing stops. And we finally want to introduce money

management - trading more than one contract and trading different markets. This will lead us directly to the question of how to build successful trading system portfolios.

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- [3, 4] Urban Jaekle, Emilio Tomasini: „Trend following in the bond markets“, Part 1 and 2, TRADERS' August and October 2006