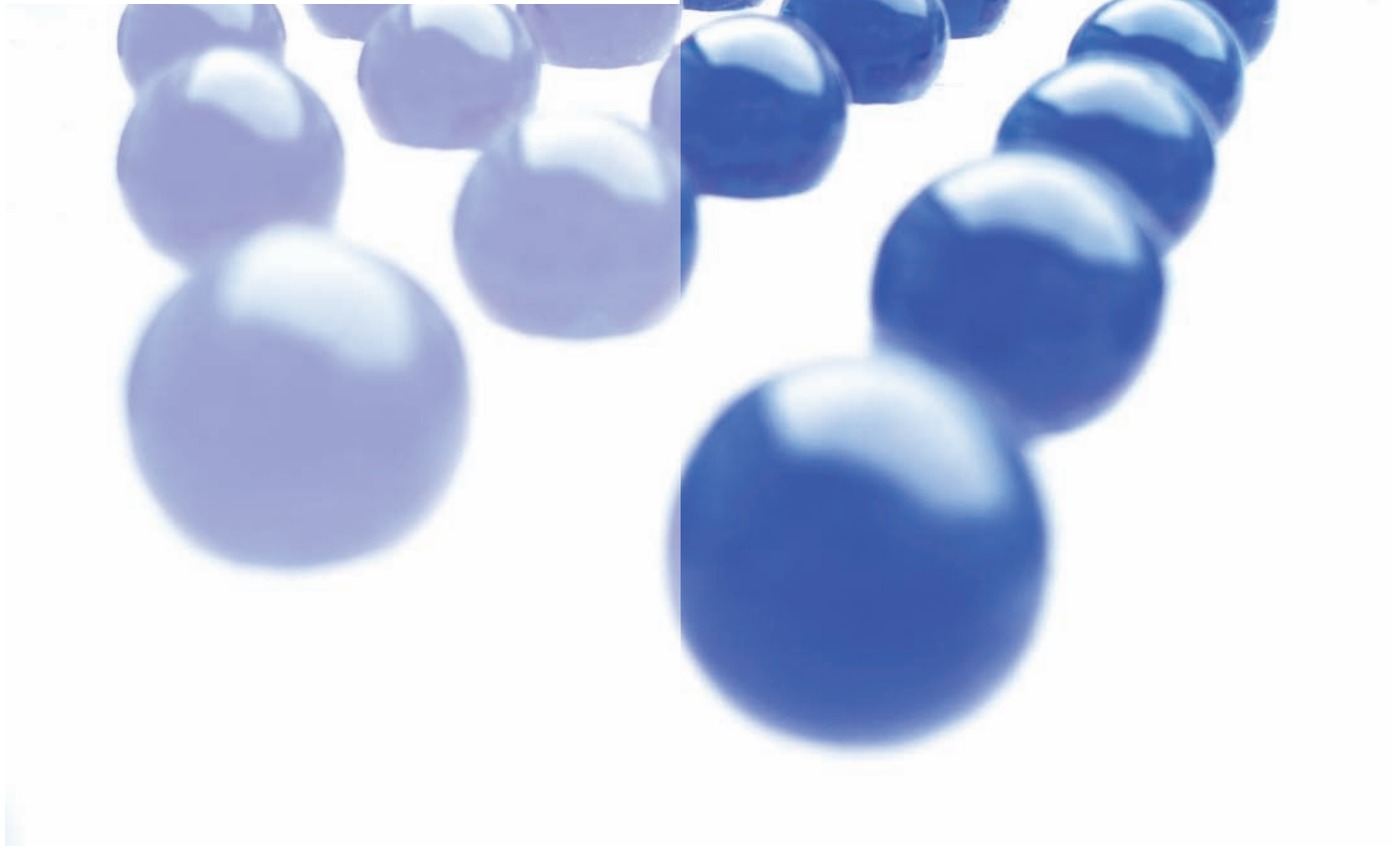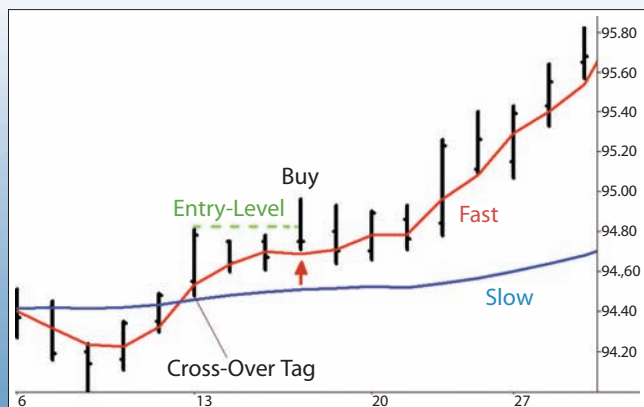# Trend Following in the Bond Markets- Part 1

Trend-following is among the oldest strategies which exist in technical analysis. They have probably been used in the stock markets from the very beginning. Surprisingly enough there are still markets, and even whole market groups, where they continue to work. In this and Part 2 of this article we present a trend-following system and apply it to the major world bond markets. Here in the first part we will describe the logic of the system and work out its key features on the example of the Bund-Future. In the second part we will then apply our strategy to further bond markets and build a portfolio.

■ Bond futures markets are different from equity futures markets because the logic itself which underlies them is different. Bond markets react to changes in interest rates and macroeconomic environment. Equity futures markets react more to psychology than to a changing market environment. A change in interest rates is a clear cut action; a change in psychological attitude towards the future is something more subtle and difficult to understand. It is why a trend in a stock index is more likely to be sudden and prompt, with a violent reversal, and on the contrary a change in bond markets is slow but tends to last longer in time. If you take a simple moving average and then you build a system on it and you apply it to the BUND you will see it returns more profit than the same system on the Dax. Let us say that you can trade mechanically the BUND even if you are not so skilled in trading systems. The Dax is a different story.

Secondly you should consider that bond markets have an upward bias, that is they favour long positions and they are not very profitable on short trades. That is why we will take the system we introduce here and check the long and the short trades separately. You will see that the results are much more interesting when we move away from the short side of the Bond-markets.

F1) System Logic

The entry is not triggered by the crossing of the two moving averages. Instead, at the crossover day the high is kept and used as a long entry level.

System Logic

Trend following systems are profitable in trendy markets, but usually fail in markets which move sideways without any direction (e.g. see [1]). All trend following systems react to the market with a delay. This handicap is however more than compensated if, at least from time to time, stronger trends exist.

As a trend-follower you will never be the first who is in the market but you will catch a good piece of a bigger movement in the middle. If you stay in such a market for a long time, on the right side, this is one of the most profitable situations which exist. Trend following systems usually have a small amount of winning trades (30-40%), but a high ratio of average winner/average loser above 2. In other words: The gains of trend following systems are rare, but if they occur, they can be large.

Our presented system is based on simple moving averages. The entry into a usual moving average system works as following: You enter the market long if a fast moving average crosses above a slow moving average. You enter the market short if the fast moving average crosses below the slower moving average. We used this basic logic but modified it in the following way: To enter a trade, confirmation by the price itself is needed.

The crossing of the moving average alone is not enough to initiate a market position. In the case of a long entry we want the current price to exceed a recent high to enter a trade (figure 1). (Analogue; the price must go below a recent low to trigger a short entry). The trading logic can be best explained with the system code. (Here we just describe the parts of the code which you need to fully understand the logic.

You can get the complete system code on the *TRADERS'* website *www.traders-mag.com*). Only the long side of the trades is explained here. Please note that the short entries and exits are built completely symmetrical.

The system has the following two input parameters which can be varied and optimised:

Inputs: FastLength(7), SlowLength(26);

These two input parameters are used to build a fast and slow moving average:
Fast = Average(Close, FastLength);
Slow = Average(Close, SlowLength);

Entry:
Important filter: At the day when the fast moving average crosses above the slow moving average, the trade is not directly initiated. At this day ("Crossover Day") the high is taken and kept as the entry stop point as long as the fast moving average stays above the slow moving average. This additional filter confirms the moving average and avoids some false breakouts:
If Fast crosses above Slow Then EntryLevel = High + 1 point;
If Fast > Slow then Buy ("Long") next bar at BuyStop Stop;

Exit:
In contrast to the entry, the exit is taken immediately when the current price crosses intraday below the slow moving average.

T1) Performance Summary

Performance Summary: All Trades

Total Net Profit	€52,120.00	Open position P/L	€3,020.00
Gross Profit	€117,820.00	Gross Loss	(€65,700.00)
Total # of trades	300	Percent profitable	42.00%
Number winning trades	126	Number losing trades	174
Largest winning trade	€6,910.00	Largest losing trade	(€2,040.00)
Average winning trade	€935.08	Average losing trade	(€377.59)
Ratio avg win/avg loss	2.48	Avg trade (win & loss)	€173.73
Max consec. Winners	7	Max consec. losers	9
Avg # bars in winners	18	Avg # bars in losers	4
Max intraday drawdown	(€7,010.00)		
Profit Factor	1.79	Max # contracts held	1
Account size required	€7,010.00	Return on account	743.51%

Performance Summary: Long Trades

Total Net Profit	€53,670.00	Open position P/L	€0.00
Gross Profit	€87,530.00	Gross Loss	(€33,860.00)
Total # of trades	185	Percent profitable	44.32%
Number winning trades	82	Number losing trades	103
Largest winning trade	€6,910.00	Largest losing trade	(€1,660.00)
Average winning trade	€1,067.44	Average losing trade	(€328.74)
Ratio avg win/avg loss	3.25	Avg trade (win & loss)	€290.11
Max consec. Winners	7	Max consec. losers	8
Avg # bars in winners	20	Avg # bars in losers	3
Max intraday drawdown	(€3,940.00)		
Profit Factor	2.59	Max # contracts held	1
Account size required	€3,940.00	Return on account	1362.18%

Performance Summary: Short Trades

Total Net Profit	(€1,550.00)	Open position P/L	€3,020.00
Gross Profit	€30,290.00	Gross Loss	(€31,840.00)
Total # of trades	115	Percent profitable	38.26%
Number winning trades	44	Number losing trades	71
Largest winning trade	€3,680.00	Largest losing trade	(€2,040.00)
Average winning trade	€688.41	Average losing trade	(€448.45)
Ratio avg win/avg loss	1.54	Avg trade (win & loss)	(€13.48)
Max consec. Winners	4	Max consec. losers	8
Avg # bars in winners	15	Avg # bars in losers	4
Max intraday drawdown	(€7,490.00)		
Profit Factor	0.95	Max # contracts held	1
Account size required	€7,490.00	Return on account	-20.69%

F2) Detailed Equity Line for all Trades
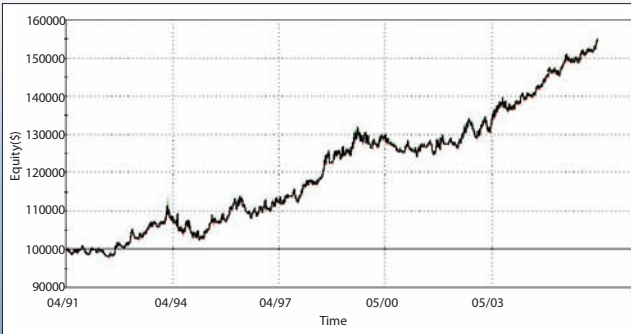
Bund-Future, daily, 11/23/1990-04/13/2006, with a subtraction of 30 Euro for slippage and commissions. The detailed equity line offers greater insight into trading performance than a general equity curve graph. It displays net profit on a bar-by-bar basis revealing equity run-ups and draw-downs.

F3) Detailed Equity Line for Only Long Trades

Bund-Future, daily, 11/23/1990-04/13/2006, with subtraction of 30 Euro for slippage and commissions. The equity line looks better than the equity of all trades and it's 50% less time in the market.

ExitLong next bar at Slow - 1 point Stop;

Although many different exits may be added to the system [2] we only keep this exit as it works quite efficiently. All the following tests are based on a one contract basis and are performed with the standard input parameters of the system (Fast Moving Average Length= 7, Slow Moving Average Length=26). The strategy is applied to the daily Bund-future from 11/23/1990-4/13/2006. The futures data was point-based back adjusted to get rid of artificial gaps between different contract months. All results in the figures and tables are calculated with 30 Euro of slippage and commissions per trade.

Results for Long and Short Trades

The system figures which we get, when considering all long and all short trades, are typical for a trend-following system (table 1). From 300 performed trades, 126 have been profitable whereas 174 ended with a loss. Thus we only have a low percentage of profitable trades (42%). The overall big gains of the system result from the high ratio of average win/ average losing trade. The average winning trade is with 935 Euro a factor 2.5 bigger than the average losing trade (378 Euro). This results in an overall average trade of 173 Euro. An interesting fact of the system is also that the average time in winning trades is more than four times longer than the average time which the system stays in losing trades (18 versus 4 days). This shows the maybe most important rule in trading which everybody knows but which is yet so difficult to follow: Cut the losses short and let the profits run.

If you have a closer look at the results you find the following: Most of the profit is generated only by the long trades, the short trades don't contribute to the overall profit! The equity line of only the long trades is even better than the equity curve of all added trades long and short (figure 2
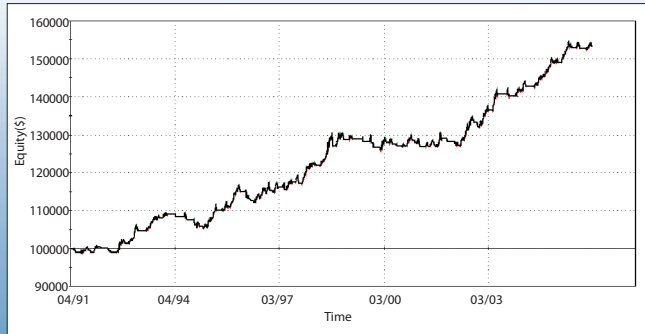
and figure3). This is also revealed by the system figures of only the long trades vs. short trades (table 1). You can see here that just trading the long side improves the total net profit from 52120 to 53670 Euro. Leaving out the short trades leads to a good profit factor of 2.59 and a high average trade of 290 Euro. Even more important: You can lower the maximum intraday drawdown significantly from 7010 to 3940 Euro if you just trade the long side. Last, but not least, when only trading the long side you just spend about 50% of the time in the market whereas when trading long and short this time is about 90%. This reduces your risk of market exposure and makes the strategy more suitable for money management schemes.

Having a look at only the short trades, the unsymmetrical behaviour of our system seems to be bad at the first glance. But on the other hand it shows the robustness of the strategy: It does not crash on the short side in a market with upward bias. Although the short side is not profitable, its result with a small loss is not destructive

F4) Total Net Profit
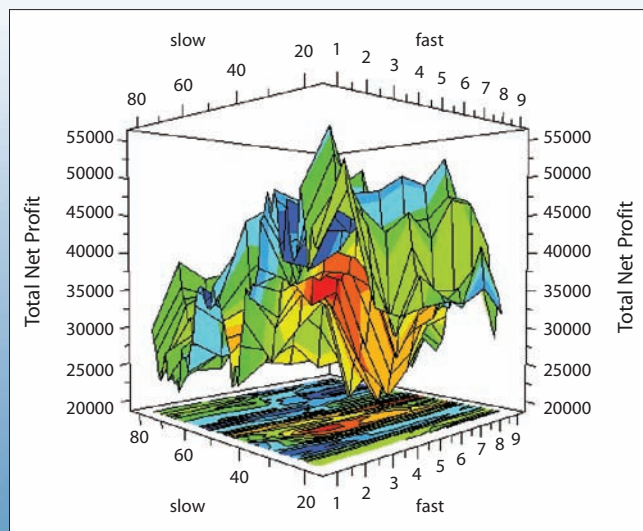
Total Net Profit as a function of the two input parameters slow and fast moving average. Tested on Bund-Future, daily, 11/23/1990-04/13/2006, with a subtraction of 30 Euro for slippage and commissions.

F5) Maximum Intraday Drawdown
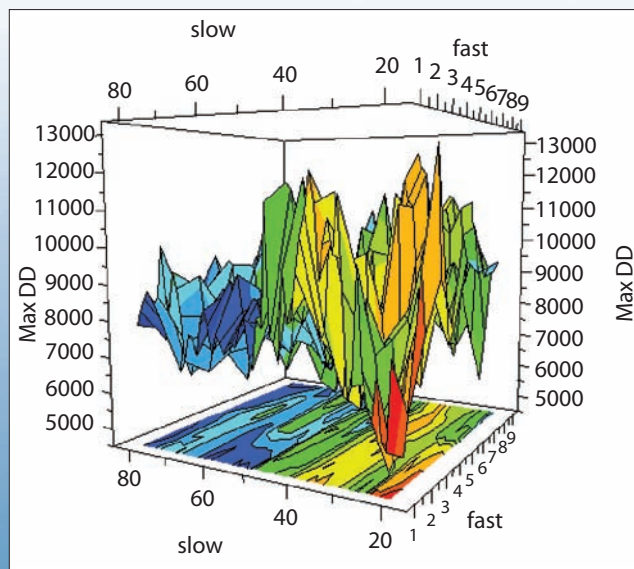
Maximum Intraday Drawdown as a function of the two input parameters slow and fast moving average. Tested on Bund-Future, daily, 11/23/1990-04/13/2006, with a subtraction of 30 Euro for slippage and commissions.

for the trading system. You as a trader, investor or system developer must however take a decision. Is it better to leave out the short signals since they have been that useless in the past or should you still include them since markets can change in future? The answer to this question is not easy.

To include the short signals or not can be dependant on your

trading style or on your overall market portfolio. A general answer is difficult to find. As a compromise you may build a system which is unsymmetrical, e.g. gives the long entries a higher probability for execution than the short trades.

Stability

Finally we want to check how the gained results are dependant on the system's two input parameters, the lengths of the fast and slow moving averages. We want to check if our trend-following system gives us similar results when these parameters are varied. If so, we can be more sure that the results are not just a special adaptation to past market conditions but have a higher chance to stand real trading.

We do the stability analysis here for all trades, the long and the short signals. We vary the parameters for the slow and fast moving averages in a wide range: The fast average from 1-9 days, the slow average from 20-80 days in steps of one day each. A fast 3 GHz PC computes the necessary 549 system tests in about two minutes.

With the right software you can get from these tests in three dimensional graphs which show any system figure dependant on the two varied input parameters. We show here graphs for Total Net Profit, Maximum Intraday Drawdown and Average Trade dependant on the chosen fast and slow moving average.

From all these graphs you can see that the system logic is very stable against parameter variation. Although the total net profit varies in a relatively big range (between 25000 and 55000 Euro, incl. slippage and commissions of 30 Euro per trade) the main fact is that it stays clearly positive for all (!) chosen input parameters (figure 4). The Maximum Intraday Drawdown, another important figure, also stays quite stable during parameter variation. It varies between 5000 and 13000 Euro (figure 5). If you watch the average profit per trade of the system (figure 6) you can see another interesting fact of trend

F6) Average Trade
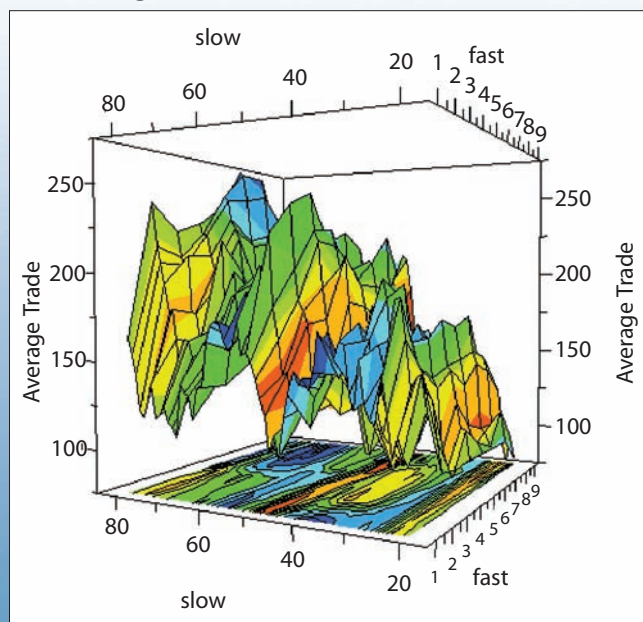
Average Trade as a function of the two input parameters slow and fast moving average. Tested on Bund-Future, daily, 11/23/1990-04/13/2006, with a subtraction of 30 Euro for slippage and commissions.

References

[1] Michael Covel:
"Gains with Trend following", Interview in TRADERS' March 2006

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

following systems: The slower you make them react (in our case the higher the look back period of the slow moving average) the higher profits per trade you get. However, you do not get overall higher net profits since the system generates less trades. But by changing the input parameters you have the possibility to affect some key figures of the system and adapt them better to your trading style.

Conclusion

With the Bund we have identified a market which shows strong enough trends to exploit with our method. It was shown on this market that a trend-following strategy can not only produce a good risk/reward ratio but keeps stable even during variations of the strategies input parameters. Our tests showed a dramatic difference in the results between the long and the short side of the trades since the Bund shows an upward bias. Why does this happen? Why is an upward bias typical for the Bund and generally for the bond markets, but not of the equity futures markets? It is because corporate and bank treasury departments are continuously buying bonds even during downward movement of the markets since they are "investing" the money they get from day to day real business operations. What they can do if they are bearish is not to short cash bonds but simply to stop investing money if they believe the downward movement will continue. When the market sentiment shifts to the upside they start again to buy huge quantities of cash bonds. All this buying power makes long entries particularly good in respect to the short trades. Corporations do not have the possibility to short cash bonds. Downward movements in the cash bond markets are commanded by futures markets by speculators. Cash investors do not care and go ahead in "investing" the money they get from their business. What they can do is to stop buying bonds and putting their money on variable interest short term bonds. But when the cash market decides to go up this is a really powerful signal since it is commanded by huge bid quantities in the markets.

In the second part of this article we will verify our findings on the other major world bond futures. You will see that although all the bond markets are based on similar fundamental principles, they have some inherently different attributes.

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