



Part 5: Money Management

Channel Breakouts

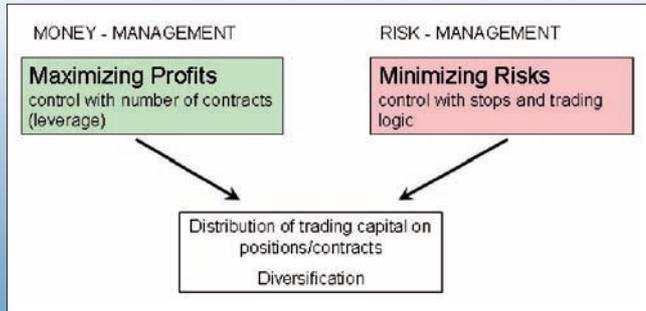
The big money is not made by mysterious super trading systems- it is made by proper money management of average trading systems! In the last article we applied the channel breakout system to one of today's hottest futures markets: light crude oil. Now we want to focus again on this market and show how you can dramatically change its performance results when applying money management. With the knowledge gained we are finally ready to combine five different markets into one big channel breakout system portfolio.

Money Management vs. Risk Management

Many people talk about it but only few of them know how to use it: Money Management. Since in many cases people don't even know

the difference between Risk Management and Money Management we want first of all to identify their meanings. In order to define the word "Risk Management" we need to know the exact meaning of the

F1) Money and Risk Management (Differentiation)



The goal of Money Management is to maximise your profits- the goal of Risk Management is to minimise your risks. These two different goals are connected to each other.

word "risk". Risk is defined as the measurable probability of a loss. On this basis the theory of Risk Management is a multi-level management process:

1. Definition and accomplishment of risk measurement.
2. Incorporation of the quantified risk values into your trading strategy.
3. Risk control through continuous measurement of risk during active trading.

Money Management describes how you can use your existing trading capital in the most efficient way. It addresses the following basic questions:

1. What total percentage of the available funds should be invested?
2. What percentage of the available funds can be subjected to risk in the next trade in a special market?
3. Which leverage and exposure should be chosen?

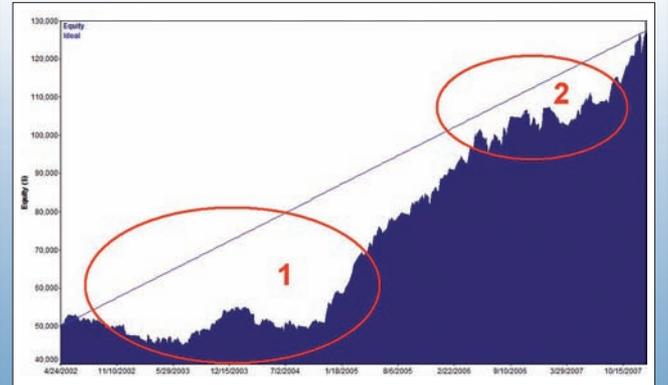
The success of a trading strategy is highly dependent on correct money management. With appropriate money management techniques the existing capital should not only be maintained but increased in an optimal way. It is not the big risk inherent in special individual speculations which leads to success in the long run but the appropriate allocation of your capital. With clever money management the loss of an individual speculation is limited in that if the speculation goes wrong, enough trading capital is always left to try many additional similar speculations.

From the above definitions of Risk and Money Management it is obvious that the two processes cannot be separated completely but are highly dependent on each other (Figure 1).

For example, the distance of your stops and therefore the risks of your trading logic are certainly important for the determination of the number of contracts you can trade. On the other hand, the distribution of your trading capital is highly relevant to how much you can risk in a special trade in a special market.

It is time to go from theory to reality and check how money management affects the results of the channel breakout system on the light crude oil market in the years between 2002 and 2008. We

F2) Detailed Equity Curve (Light Crude Oil Future)

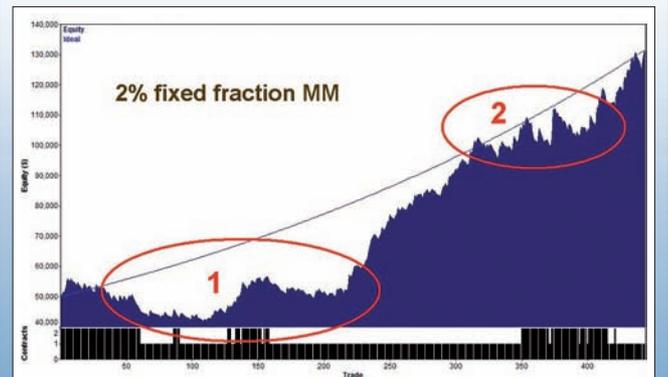


01/01/2002- 01/01/2008. This equity curve includes all trades of the channel breakout system with applied stop loss of 1.6% and no profit target in place. One futures contract is traded on a starting account of \$50,000. All results include \$30 slippage and commissions per round turn. Two critical areas are encircled where the trading system had difficulties.

again work with 60-minute data since we have found this time scale completely satisfactory and want to keep things comparable. For our quantitative analysis we take back-adjusted futures data from Tradestation 8 (www.tradestation.com). All computer tests in this article are calculated with \$30 slippage and commissions per round turn for all markets (except the DAX future which was calculated with \$75 slippage and commissions per round turn).

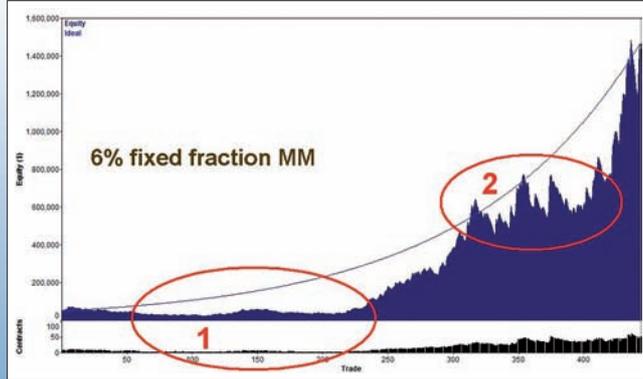
Let's start with the result of the trading system itself - calculated with one futures contract of light crude oil and a starting account equity of \$50,000 (Figure 2 and Table 1). The equity curve is the simplest method of position sizing. It can be called "Fixed- Size Money Management", which means in other words that you simply choose the number of shares or contracts which are used for each trade. The main purpose of this approach is to provide a good baseline for a

F3) Equity Line and Number of Traded Contracts



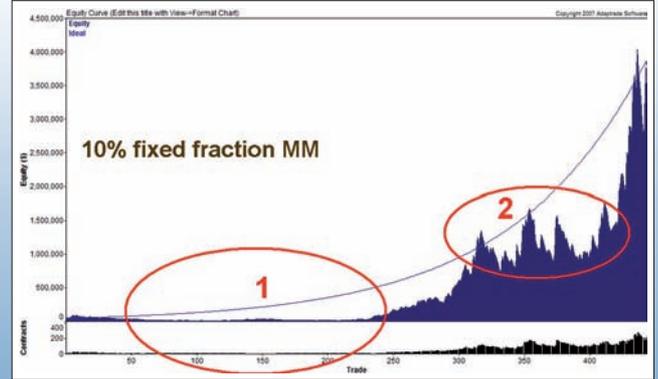
(2% Fixed Fractional MM). Upper blue area: Equity line with MM applied to the Channel Breakout System for the Light Crude Oil future. Lower black bars: Number of traded contracts per transaction in order to keep the risk below 2%. Test period: 01/01/2002- 01/01/2008, starting account of \$50,000, stop loss of 1.6% in place. In the critical phase 1 the MM reduced the number of contracts and was able to survive.

F4) Equity Line and Number of Traded Contracts



(6% Fixed Fractional MM) Upper blue area: Equity line with MM applied to the Channel Breakout System for the Light Crude Oil future. Lower black bars: Number of traded contracts per transaction in order to keep the risk below 6%. Test period: 01/01/2002- 01/01/2008, starting account of \$50,000, stop loss of 1.6% in place. In the critical phase 1 the MM again reduced the number of contracts and was able to survive (lowest equity in phase 1: \$22,710).

F5) Equity Line and Number of Traded Contracts



(10% Fixed Fractional MM) Upper blue area: Equity line with MM applied to the Channel Breakout System for the Light Crude Oil future. Lower black bars: Number of traded contracts per transaction in order to keep the risk below 10%. Test period: 01/01/2002- 01/01/2008, starting account of \$50,000, stop loss of 1.6% in place. In the critical phase 1 the MM again reduced the number of contracts and was able to survive. But the lowest equity value of this aggressive MM was only \$8,750, before the equity recovered.

comparison to more sophisticated money management methods which will now follow. In the following discussion we want to focus especially on the two areas 1 and 2 encircled red. Area 1 is very interesting since until 1st Jan 2005 the performance of the trading system was very poor. The system had a sideways movement with a biggest drawdown of \$7,420 which took place in March 2003. Phase 2 is interesting since it is an area of bigger fluctuations in a strong upward phase of the equity curve. It will be especially interesting how different money management strategies work in these two critical areas.

Fixed Dollar Amount of Equity Money Management (MM)

In this position sizing method, you choose the dollar amount of account equity to trade one contract. For example, if the dollar amount is \$50,000 and you trade futures, you would trade one contract for every \$50,000 in the account. If the account equity is currently \$250,000, you would trade 5 contracts on the next trade. The advantage of this MM method is that its calculation is simple. However, the biggest disadvantage is that it completely ignores changes of the underlying market concerning point value and volatility. Think again of our light crude oil future. The market had a point value of \$30 and an average true range of < 1 point some years ago. Now it's trading at 105 USD and its average true range is >2.5 points.

It's obvious that a good money management should adjust the position size to these changes, otherwise it ignores the fact that the risk increases dramatically. The Fixed Dollar Amount of Equity MM is convenient for traders who want to keep things simple by trading a fixed lot size, but it does not take into account changing market conditions. Since our goal is to adjust the current position size to current market conditions, we must use another type of MM:

Fixed Fractional MM

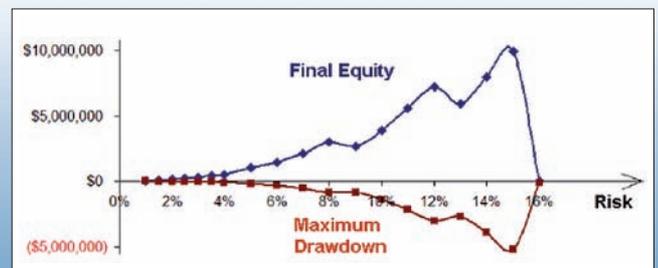
Fixed fractional MM has been written about extensively by Ralph Vince [3]. It's also known as fixed-risk position sizing because it risks the same

percentage or fraction of account equity on each trade. Let's check this method with our channel breakout system. For example, you want to risk 2% of your account equity on each trade in the year 2002 with light crude oil trading at \$25. If your starting account equity is \$10,000, this means that you may risk \$200 per trade (2% of \$10,000). But how do you set this risk of \$200 in real trading? To answer this question we must go back to our above findings, the strong interaction between risk and money management. For light crude oil we found in our last article an optimal stop loss value of 1.6% (see [1]). But with the light crude oil future trading at \$25 this already means a risk per contract of \$400!

So obviously you cannot trade the light crude oil future with a \$10,000 account equity with that stop loss and a risk of 2%. What is the way out of this dilemma? You have the following two possibilities. You can make changes to your Money or to your Risk Management:

A: Change of Risk Management: You set a tighter stop to lower your risk per trade.

F6) Finally Reached Equity and Maximum Drawdown



Finally Reached Equity (blue) and Maximum Drawdown (red) as a Function of Varied Risk per Transaction. The bigger the final equity gets, the higher were the drawdowns. Risk values of more than 16% lead to ruin of the MM.

T1) Light Crude Oil Future

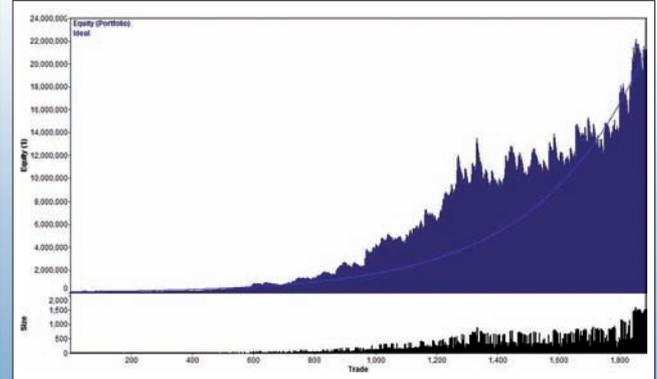
Total Number of Trades	447
Total Net Profit	\$83,650
Gross Profit	\$215,910
Gross Loss	(\$132,260)
Profit Factor	1.63
Return on Starting Equity	416.95%
Total Number of Trades	447
Number of Winning Trades	185
Number of Losing Trades	262
Percent Profitable	41.39%
Largest Winning Trade	\$5,750
/Percent of Equity	5.89%
Largest Winning Trade (%)	14.90%
/Trade Value	\$3,380
Average Winning Trade	\$1,172
Average Winning Trade (%)	2.98%
Average Length of Wins	2 days 16 hours
Max Number Consecutive Wins	8
Largest Losing Trade	(\$1,870)
/Percent of Equity	-2.36%
Largest Losing Trade (%)	-6.82
/Trade Value	(\$1,300)
Average Losing Trade	(\$505)
Average Losing Trade (%)	-1.39%
Average Length of Losses	23 hours 49 min
Max Number Consecutive Losses	13
Average Win/Average Loss	2.32
Average Trade	\$186.97
Return/Drawdown Ratio	11.27
Sharpe Ratio	0.38
Longest Drawdown	1 year 126 days
Start of Drawdown	5th Mar 2003
End of Drawdown	10th Oct 2003
Worst Case Drawdown (%)	31.67%
/Equity Value	(\$7,420)
Date at Trough	27.03.2003
Trade Number at Trough	78

Market: Light Crude Oil (NYMEX); Tradestation Symbol: CLC; Time scale: 60 minutes; Trading Period: 1st Jan 2002 to 1st Jan 2008; Number of Contracts per Trade: 1; Slippage and Commissions per Roundturn: \$30. With applied stop loss of 1.6% and no profit target in place. One futures contract is traded on a starting account of \$50,000.

B: Change of MM: You increase the account equity or you increase the risk.

Possibility A directly affects the trading logic. From all our findings about stops and profit targets we know that the trading system performance suffers with too tight stops (e.g. see [2]). Trades need enough room to develop. Too tight stops remove this room and can turn a profitable strategy into a losing strategy. Since we do not want to change this risk management, it means we must change our MM (Possibility B) and set the initial account value higher. Let's calculate how high the minimum account must be set. We want to risk 2% of our account with the next transaction. Since our risk with one contract is 1.6% of \$25 (x 1000) = \$400, this means that the account must be at least \$20,000 in the year 2002. Bear in mind that this corresponds to an account value of \$80,000 if you want to keep the same risk per

F7) Equity Line and Number of Traded Contracts



(2% Fixed Fractional MM of a Portfolio) Upper blue area: Equity line with MM applied to the channel breakout portfolio including the following 5 markets: Light Crude Oil, Euro/Dollar, Mini Russell, DAX, US T-Bond. Lower black bars: Number of traded contracts per transaction in order to keep the risk below 2% for each market. This size fluctuates since it changes with the different signals of the markets. Test period: 01/01/2002- 01/01/2008, starting account of \$100,000. Slippage and Commissions: \$75 per RT for DAX, \$30\$ for the other 4 markets.

trade at current market conditions with Light Crude Oil trading at more than \$100!

Now let's see what a fixed fraction money management does with an account of \$50,000 from the year 2002 until 2008. If we allow a fixed risk of 2% per transaction, we start with two contracts (Figure 3). In the years 2002-2004 the system performs quite badly (red encircled 1). As a consequence, the MM reduces the contract size from 2 contracts to 1. The contract number stays at 1 even a long time after the system has made nice gains because the market risks have become bigger because of the increasing market value of light crude oil. The final result is similar to trading only one fixed contract and the intermediate drawdown was even bigger. But bear in mind that the MM scheme did a good job in keeping your trading risks at the same level for each transaction during the whole trading period while the fixed-size system becomes more and more risky without noticing it.

It is now very interesting to find out what happens when we increase the risk per transaction more and more, to 6% and then even to 10% (Figures 4 and 5). As you can see, the final equity will be dramatically higher and higher with increasing risk. Whereas the fixed fractional MM with 2% risk had a final account equity of \$130,000, the MM with 6% risk finally made more than \$1m and the MM with 10% even more than \$3m! But as you can see when you compare Figures 2-5, the more aggressive MM has a high price. Let's focus on the two critical market phases 1 and 2. In market phase 2 with the huge fluctuations the MM more or less could not change the basic behaviour of the trading system. It acted as an amplifier but not as a moderator. What is more interesting is the bad market phase 1 from the year 2002 to 2004. There the more aggressive the chosen MM was, the lower the equity curve was moving in this phase. Whereas the original One-Contract system and the 2% Fixed Fractional MM had their equity low above \$40,000, the 6% Fixed Fractional MM had a trough at \$22,910 and the 10% Fixed Fractional MM even at \$8,750! I guess none of us would have continued to trade that trading system with this aggres-

T2) Final Equity, Max. Drawdown and Equity Low as a Function of Fixed Fractional Risk Percentage

Start Acc. Equity	\$50,000				
Market Value 2002	\$26.67			Initial Risk per Contract (1.6%, 2002)	\$427
Market Value 2008	\$105.00			Final Risk per Contract (1.6%, 2008)	\$1,680
Fixed Fractional (Percent Risk of Equity)	Final Account Equity	Biggest DD	Equity Low	Number of Contracts at Start (2002)	Number of Contracts at Finish (2008)
1,0%	\$49.440	(\$6.130)	\$46.870	1	0
1,5%	\$123.360	(\$8.390)	\$44.610	2	1
2,0%	\$131.390	(\$14.210)	\$41.790	2	2
2,5%	\$208.080	(\$18.300)	\$39.390	3	3
3,0%	\$297.910	(\$23.570)	\$35.430	4	5
3,5%	\$424.800	(\$53.440)	\$33.860	4	9
4,0%	\$517.850	(\$75.170)	\$29.560	5	12
5,0%	\$1.038.310	(\$191.510)	\$27.620	6	31
6,0%	\$1.463.720	(\$321.440)	\$22.710	7	52
7,0%	\$2.145.910	(\$544.930)	\$17.390	8	89
8,0%	\$2.985.800	(\$859.650)	\$14.460	9	142
9,0%	\$2.691.930	(\$865.240)	\$10.530	11	144
10,0%	\$3.870.250	(\$1.372.670)	\$8.750	12	230
11,0%	\$5.554.810	(\$2.160.890)	\$7.990	13	364
12,0%	\$7.186.710	(\$3.037.600)	\$7.390	14	513
13,0%	\$5.920.580	(\$2.701.530)	\$4.840	15	458
14,0%	\$7.926.970	(\$3.885.910)	\$3.600	16	661
15,0%	\$9.907.590	(\$5.199.660)	\$3.300	18	885
16,0%	\$2.460	(\$123.450)	\$2.460	19	0
Trade Number at Trough	78				

Market: Light Crude Oil (NYMEX); Tradestation Symbol: CL.C; Time scale: 60 minutes; Trading Period: 1st Jan 2002 to 1st Jan 2008; Number of Contracts per Trade: 1; Slippage and Commissions per Roundturn: \$30.

Calculation is based on Channel Breakout System for the Light Crude Oil future, 60 minutes, 01/01/2002- 01/01/2008, starting account of \$50,000. With applied stop loss of 1.6% and no profit target in place. Results include \$30 slippage and commissions per round turn.

sive MM. The interesting thing is that the trading system survived and the aggressive MM finally made millions of dollars. How could it survive? When the equity curve had a meltdown the MM reduced the number of contracts traded and it was still alive when the trading system started to have its best phase after 2005. Of course, this is only true of the MM which did not take too high a risk. From our findings we can state that the fixed fraction value should be set in the 2-5% range, not higher. Table 2 systematically shows the key figures of the fixed fractional MM with varied Percent Risk of Equity. There you can see very clearly that the high final account equity always has the price of a high's biggest drawdown and an increasing equity low in the bad market phase 1. If the risk was taken higher than 16%, the system was knocked out by the drawdown and never came back. The conclusion for you as a trader is obviously that you must carefully adjust the risk level of your money management approach. The more aggressive you are, the higher gains you can expect, but the bigger the drawdowns will be. And even the best money management will not turn a losing trading system into a winning one (e.g. as in market phase 1). But if the MM is well adjusted and not too aggressive, you will be rewarded. The MM will lower the position size in drawdown phases in order to survive. And when your system recovers again the MM helps to make big gains even bigger by increasing the contract number.

Finally, we build a portfolio of 5 different markets which were all tested with the channel breakout system. We add them to a portfolio of a starting account value of \$100,000 and apply to each market its

own 2% fixed fractional Money Management. From the above findings you know that a 2% value is relatively conservative. For the different markets we used the same entries but set an appropriate special stop loss percentage for each market as follows: Light Crude Oil 1.6% stop, Euro: 0.4% stop, Mini Russell: 0.4% stop, DAX: 0.7% stop, US T-Bond: 0.42% stop. In the starting account of \$100,000 in the year 2002 these stops combined with the 2% maximum risk allowed per transaction lead to the following numbers of traded futures contracts: Light Crude Oil = 4 contracts; Euro/Dollar Currency: 4 contracts, Mini Russell = 11 contracts, DAX = 2 contracts, US T-Bond= 4 contracts (Figure 7).

You can see that even this portfolio has fluctuations in the years 2005 and 2006. But overall, the equity line is growing nearly exponentially and it does not have any of the critical drawdown phases which the system had when trading only one market.

Conclusion

The topic of Money management is too big to be discussed fully in one article. We have not discussed the aspect of increased slippage when trading many contracts (e.g. 1000) and we have not discussed what happens when our channel breakout system keeps overnight positions, which leads to higher risks than those posed by the predefined stop-loss.

Furthermore, besides the Money management techniques presented here, there exist many more with mysterious names like Optimal f, Secure f, Kelly formula etc. which we haven't had the time

References

- [1] Urban Jaekle, Emilio Tomasini: „Channel Breakout, Part 4- Light Crude Oil“, TRADERS' February 2008
- [2] Urban Jaekle, Emilio Tomasini: „Channel Breakout, Part 2- Exits on the DAX“, TRADERS' September 2007
- [3] Ralph Vince „Portfolio Management Formulas“, John Wiley & Sons, New York, 1990

to discuss here. However, we can reassure you that most of these methods are very similar to or even based on the fixed fractional MM discussed here which is certainly the most important one. All money management schemes have one thing in common: They only work on the basis of a trading system (or rather - as we have seen - a portfolio of systems/markets) with a positive expectancy. Although good MM decreases the contract size in bad phases, it can only make gains if the system comes back and in the long run shows results of a profit factor higher than 1. Whether the profit factor is 5 or 1.001 is not that important!

As long as it is higher than 1 and the system makes steady profits, a good MM can improve the results of your trading system. So you need not have a super trading system to make money. In the long term it's enough to have a stable strategy with a positive expectancy and a proper money management.

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