Abstract Of:

Buying Power – The Overlooked Success Factor

Why and how "buying power" affects simulated and real life trading results

– and how to deal with it.

March 7, 2011

Submitted for Review to the

National Association Of Active Investment Managers (NAAIM)

– Wagner Award 2011 –

by

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Abstract

This study is targeted at traders who are following a systematic approach with the expectation of achieving future results that are similar to historical performance. The conclusions are applicable over all time frames, although swing and day trading are discussed in particular. Besides offering new insights it is the goal of this paper to also provide the reader with three tools for hands-on application of the discussed results helping him to improve his individual interaction with the markets.

Practical experiences triggered this study when significant deviations in the performance of trading systems from their “theoretical expectation” were noticed whenever a backtest was carried out in conjunction with money management algorithms (these were applied on a virtual brokerage account simulating the daily changes of cash & open positions). Upon further examination it became clear that skipping of trades (at times when all available funds were already deployed) caused this effect to happen. This finding and further conclusions are detailed in the submitted study.

After laying the basic foundation regarding assumptions and definitions the paper examines the linkage between buying power (financial ability to start and maintain trades) and the maximum number of open positions. It is shown that the determining factors are driven by the system (initial stop placement), personal risk preferences (fraction of capital risked per trade,

buffer against margin calls) and financing abilities (leverage provided by the broker). Those interdependencies as well as possibilities to increase the number of parallel trades are discussed.

Swing and day traders are impacted differently regarding buying power limitations and possible measures for improvement. In particular the effect of using leverage, initial stop placement, position sizing and the system's profitability are discussed. This comparison shows that day traders have significant advantages over swing traders.

A deeper analysis follows that elaborates on the importance of being capable of financing a certain number of parallel positions. With limited buying power trades must be skipped that are originally signaled by the utilized trading system. The consequences are not only simply missing out on a potentially profitable opportunity, but also the introduction of a random element. Not a predetermined rule, but the momentary lack of buying power excludes a valid signal from being turned into a position. When "too many" trades are skipped then the impact of chance may significantly offset the inherent performance of the underlying trading system thereby rendering it virtually useless. This effect is both explained in theory and by a practical example.

An EXCEL tool is provided that can be used by the reader to examine systems that he is interested in. After entering some key figures on each

individual (simulated) trade for all signals that this system generates over a certain period of time, the performance differences with and without a buying power restriction can be studied. This should provide valuable insights regarding position sizing, drawdowns and attainable profits as well as the sensitivity in respect of skipping trades. As a guideline the author regards 5-10% as a generally tolerable threshold level.

Finally a “Quick Check” is presented that analyses the attainability of individual profit goals by the application of a specific trading system. Here the conclusions from the previous chapters are combined with factors that are determined by the trader himself. The input includes the given financial framework (funds, leverage), individual goals (profit target), personal risk preferences (buffer against margin calls, fraction of capital risked per position) and a few basic system parameters. Then the number of trades can be calculated that would provide the desired profit. This is put into perspective with the financing abilities resulting in a “trade load” factor that shows the utilization of the buying power. Although a high figure may seem favorable it is actually desirable to keep this number at a low level in order to be able to cope with signals that come in clusters without encountering the problem of skipping trades or to have the ability to catch up after a period with few positions (i.e., vacation, illness, unfavorable market conditions). In addition the required trades are compared with the number

of potential trading vehicles. This may serve as a check whether the necessary frequency of signals is unrealistically high (application of system on more markets may be necessary) or low (skipping of signals likely). The detailed discussion of the evaluation's main parameters, ways of influencing them and the consequences of doing so should serve as a guideline for interpreting the obtained results. The author hopes that this will enable the reader to improve his chances of success in the markets by finding and moving towards the "sweet spot" based on his individual framework and preferences.

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1. Introduction

The author's initial trigger for this study came from observing significant deviations in the performance of trading systems from their "theoretical expectation". This occurred when backtesting was performed in conjunction with money management algorithms that were applied on a virtual brokerage account simulating the daily changes of cash & open positions.

In the following text it will be shown that the given restriction of buying power causes this effect. The criteria that determine this limitation and the causalities of its impact will be discussed.

Depending on very individual factors like trading style, goals, risk preferences and financial parameters it will become clear that each trader must deal with this subject on his personal level. Three tools are provided to help him with this task.

2. Basic Assumptions and Calculations

In general this study assumes that stocks or ETFs are used as trading vehicles. Nevertheless the main conclusions are also valid for other instruments like futures, options, etc.

2.1. Risk per Trade

Two types of risk per trade are relevant in this paper:

- **stop loss risk** (R_S) is the difference between the entry price and the initial stop in percent of entry price,
- **position risk** (R_P) is the fraction of equity that the trader accepts to possibly lose.

This separation and transformation into relative figures makes performance results better comparable between systems and differently capitalized traders.

R_S is used to quantify the outcome of a trade in respect to its loss potential independently from the position value. The average profit of single or collections of trades can be expressed in R_S-multiples which emphasizes the relation of reward to risk. This factor depends on the trading system's initial stop placement procedure.

R_P on the other hand is a relative measure of how much trading capital is risked on a single trade. The main focus for this variable is to find a balance between portfolio drawdowns and capital gains through adequate position sizing[SM] and is mainly determined by the trader's personality and possibly external constraints (i.e., customer expectations, directions from superiors). In combination with R_S the absolute value of the position can be determined.

For ease of calculation it will be assumed that the trading systems use an initial stop based on a fixed percentage of price (R_S = const.) although the basic conclusions can also be drawn for different approaches (i.e., fixed money stops, volatility based stops, etc.). Furthermore the position risk R_P is also assumed to be constant to reflect a consistent risk tolerance over time.

The absolute amount of capital at risk equals the initial stop distance times the position value (assuming no gap beyond the stop loss):

R_P = R_S * (number of shares * share price) ***(Eq. 1)***

*Example: R_P = $300 = 3% * (1,000 shares @ $10)*

For any single trade the achieved profit can then be expressed either as a multiple of R_S or R_P giving the equal result. Therefore we will simply use **"R-multiple"** without further reference to initial stop or position risk throughout the text as a statistic to describe the profitability of a system or an individual trade in relation to risk.

2.2. Calculation of "Buying Power" and Maximum Number of Parallel Trades

In general the term **"buying power"** (BP) describes the financial ability to start (and maintain) trades and is expressed in monetary units (i.e., $). It constitutes the value of all parallel positions that the trader may initiate and

hold in his account over a certain period of time (typically intraday or overnight).

Buying power is calculated using the trader's **personal equity** (PE) and the **margin requirement** (MR) of his account over the time frame in question (intraday margin requirements may differ from holding overnight):

$$\mathbf{BP = \frac{PE}{MR}} \qquad \textbf{\textit{(Eq. 2)}}$$

Example: $BP = \$200{,}000 = \frac{\$100{,}000.-}{50\%}$

The **maximum number of parallel trades** (MPT) is determined by the typical (average) **initial position value** (IPV):

$$\mathbf{MPT = \frac{BP}{IPV}} \qquad \textbf{\textit{(Eq. 3)}}$$

Example: $MPT = 20 = \frac{\$200{,}000.-}{\$10{,}000.-}$

The IPV can be expressed in terms of the relative monetary **position risk** R_P [% of trader's equity] and the **initial stop risk** R_S [% of entry price]:

$$\mathbf{IPV = \frac{R_P * PE}{R_S}} \qquad \textbf{\textit{(Eq. 4)}}$$

Example: $IPV = \$10{,}000 = \frac{1\% * \$100{,}000.-}{10\%}$

Interestingly, when we combine equations 2. through 4. to calculate the maximum number of parallel trades we realize that the trader's equity is no longer relevant (neither is the price of the traded vehicle):

$$\mathbf{MPT = \frac{BP}{IPV} = \frac{PE / MR}{(R_P * PE) / R_S} = \frac{R_S}{R_P * MR}} \qquad \textit{(Eq. 5)}$$

$$\textit{Example: MPT = 20 = } \frac{\textit{10\%}}{\textit{1\% * 50\%}}$$

The maximum number of parallel trades is determined by:

- initial stop $\mathbf{R_S}$ [% of entry price],
- capital at risk $\mathbf{R_P}$ [% of personal equity],
- margin requirement by broker **MR** [% of account value].

This 3-dimensional definition can typically be reduced to two variables with the margin requirement being a constant that is set by the broker and thus not under the influence of the trader.

3. Effects of Limited Buying Power on Different Trader Types

3.1. How to Use the Tool "Parallel Trades Calculator"

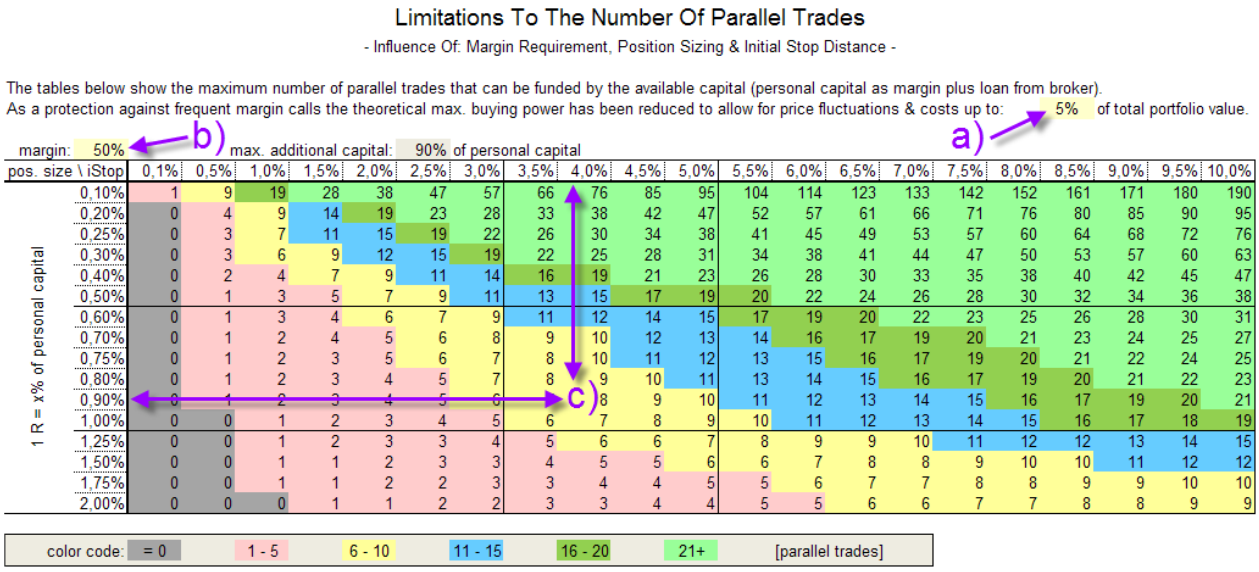
The tool **"Parallel Trades Calculator"** that is provided in this study allows to explore the effect of independently varying the three factors that define the maximum number of parallel trades. Each cell in the grid shows the limit that can be financed and is color coded accordingly.

Using the tool follows a three step process (see figure 3.1):

a) Selecting a **safety buffer level** against margin calls caused by variations of position value or other cash relevant actions (limits the additional capital that may be borrowed from the broker).

b) Selecting the **margin requirement** (either one of the predefined tables can be used or the percentage entered manually in the respective cell).

c) The **maximum number of parallel trades** is displayed at the intersection of the risk variables R_P and R_S (manual input in the headings is possible to allow for different values).



Limitations To The Number Of Parallel Trades

- Influence Of: Margin Requirement, Position Sizing & Initial Stop Distance -

The tables below show the maximum number of parallel trades that can be funded by the available capital (personal capital as margin plus loan from broker).
As a protection against frequent margin calls the theoretical max. buying power has been reduced to allow for price fluctuations & costs up to: 5% of total portfolio value.

margin: 50% b) max. additional capital: 90% of personal capital a)

1 R = x% of personal capital \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	1	9	19	28	38	47	57	66	76	85	95	104	114	123	133	142	152	161	171	180	190
0,20%	0	4	9	14	19	23	28	33	38	42	47	52	57	61	66	71	76	80	85	90	95
0,25%	0	3	7	11	15	19	22	26	30	34	38	41	45	49	53	57	60	64	68	72	76
0,30%	0	3	6	9	12	15	19	22	25	28	31	34	38	41	44	47	50	53	57	60	63
0,40%	0	2	4	7	9	11	14	16	19	21	23	26	28	30	33	35	38	40	42	45	47
0,50%	0	1	3	5	7	9	11	13	15	17	19	20	22	24	26	28	30	32	34	36	38
0,60%	0	1	3	4	6	7	9	11	12	14	15	17	19	20	22	23	25	26	28	30	31
0,70%	0	1	2	4	5	6	8	9	10	12	13	14	16	17	19	20	21	23	24	25	27
0,75%	0	1	2	3	5	6	7	8	10	11	12	13	15	16	17	19	20	21	22	24	25
0,80%	0	1	2	3	4	5	7	8	9	10	11	13	14	15	16	17	19	20	21	22	23
0,90%	0	1	2	3	4	5	6	8	c)	9	10	11	12	13	14	15	16	17	19	20	21
1,00%	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1,25%	0	0	1	2	3	3	4	5	6	6	7	8	9	9	10	11	12	12	13	14	15
1,50%	0	0	1	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10	11	12	12
1,75%	0	0	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10
2,00%	0	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9

color code: = 0 | 1 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | 21+ [parallel trades]

Figure 3.1: Using the tool “Parallel Trades Calculator”

3.2. Consequences for Swing Traders

The following figure 3.2 shows the typical situation for novice swing traders who are reluctant to use leverage although they may have a rather small trading account (i.e., <= $100,000). With the initial stop usually placed in a range from 3% to 5% (to prevent that an opening gap takes out the trade) it is impossible to finance more than 6 to 10 parallel trades without lowering the risk per position to less than 0.5% of the total capital.

As a protection against frequent margin calls the theoretical max. buying power has been reduced to allow for price fluctuations & costs up to: 0% of total portfolio value.

margin: 100% max. additional capital: 0% of personal capital

1 R = x% of personal capital \ pos. size \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
0,20%	0	2	5	7	10	12	15	17	20	22	25	27	30	32	35	37	40	42	45	47	50
0,25%	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
0,30%	0	1	3	5	6	8	10	11	13	15	16	18	20	21	23	25	26	28	30	31	33
0,40%	0	1	2	3	5	6	7	8	10	11	12	13	15	16	17	18	20	21	22	23	25
0,50%	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0,60%	0	0	1	2	3	4	5	5	6	7	8	9	10	10	11	12	13	14	15	15	16
0,70%	0	0	1	2	2	3	4	5	5	6	7	7	8	9	10	10	11	12	12	13	14
0,75%	0	0	1	2	2	3	4	4	5	6	6	7	8	8	9	10	10	11	12	12	13
0,80%	0	0	1	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10	11	11	12
0,90%	0	0	1	1	2	2	3	3	4	5	5	6	6	7	7	8	8	9	10	10	11
1,00%	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10
1,25%	0	0	0	1	1	2	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8
1,50%	0	0	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6
1,75%	0	0	0	0	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5
2,00%	0	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5

color code: = 0 | 1 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | 21+ [parallel trades]

Figure 3.2: Restrictions for an unleveraged swing trader

Attempting to increase the number of parallel trades will eventually bring the risk per position to a level that comes close to the transaction costs. The resulting effect on the reward to risk ratio can constitute a significant hurdle for a trading system to overcome.

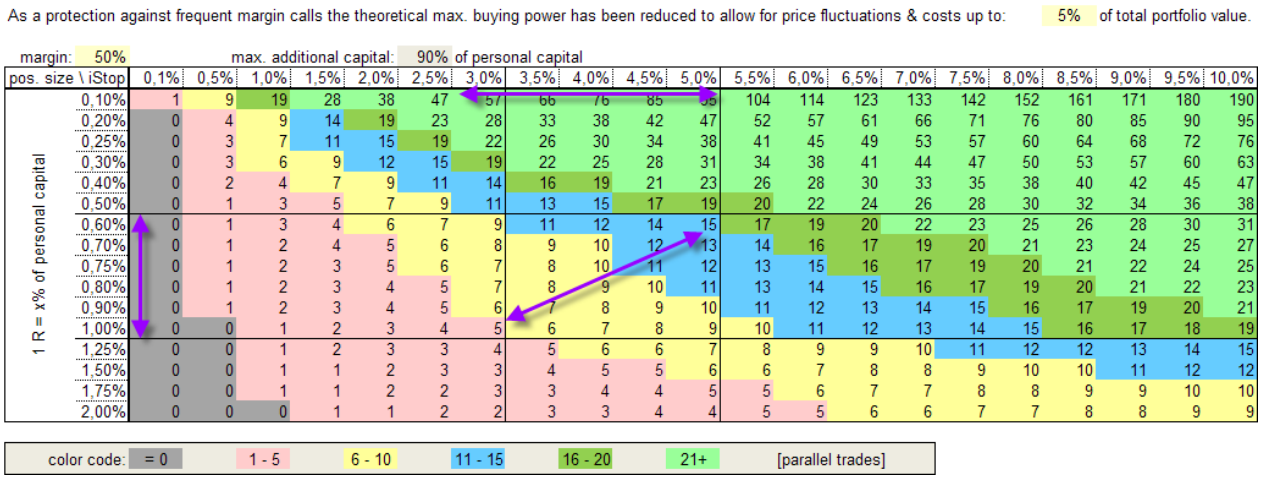
If for example we assume a trading capital of $50,000 and risk 0.2% of that amount per position (= $100) then $20 in total for fees and slippage for opening and exiting the position combined lead to a reduction of a trading system's expected profitability by 0.2R. For a trading system with an expectancy of +1R (average profit per trade) the negative effect of fees and slippage consumes 20% of the system's performance due to a relatively small position size. In addition the individual psychological setup may also make a trader reluctant to manage "insignificant" positions.

Increasing the initial stop in order to raise the number of parallel trades also has its disadvantages as it becomes more difficult to achieve "large" R-multiple trades. Assuming an initial stop of 10% that is trailed from the daily HIGH the vehicle needs to move 40% from the entry price to grant a 3R profit. Not only is the probability of achieving this kind of winner reduced, also the time it takes for such moves to play out is longer than for smaller gains. This puts the trader into a dilemma since an extended average holding period increases the overlap between positions thus decreasing the capacity to start new trades.

For a swing trader who is willing to use margin the situation looks a little better. In this example we assume a 50% margin requirement that is typical for holding stocks and ETFs overnight although short positions/ETFs and leveraged ETFs may in fact have an increased margin requirement.

Here the possibility of a 5% drop in account value is already incorporated into the buying power calculation as a safety measure against margin calls.

Again the tradeoff between tight stops and higher position risk is evident, keeping the number of parallel trades close to 10.



As a protection against frequent margin calls the theoretical max. buying power has been reduced to allow for price fluctuations & costs up to: 5% of total portfolio value.

margin: 50% max. additional capital: 90% of personal capital

1 R = x% of personal capital \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	1	9	19	28	38	47	57	66	76	85	95	104	114	123	133	142	152	161	171	180	190
0,20%	0	4	9	14	19	23	28	33	38	42	47	52	57	61	66	71	76	80	85	90	95
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0,50%	0	1	3	5	7	9	11	13	15	17	19	20	22	24	26	28	30	32	34	36	38
0,60%	0	1	3	4	6	7	9	11	12	14	15	17	19	20	22	23	25	26	28	30	31
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0,75%	0	1	2	3	5	6	7	8	10	11	12	13	15	16	17	19	20	21	22	24	25
0,80%	0	1	2	3	4	5	7	8	9	10	11	13	14	15	16	17	19	20	21	22	23
0,90%	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21
1,00%	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1,25%	0	0	1	2	3	3	4	5	6	6	7	8	9	9	10	11	12	12	13	14	15
1,50%	0	0	1	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10	11	12	12
1,75%	0	0	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10
2,00%	0	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9

color code: = 0 | 1 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | 21+ [parallel trades]

Figure 3.3: Restrictions for a leveraged swing trader

Even though the trader may use the additional buying power to increase the position value and keep the negative effect of transaction costs at a negligible level, now the effect of interest needs to be considered.

As in the example above we again assume a trading capital of $50,000 that may be extended by $45,000 (= 90% * $50,000). If the trader employs on average half of that buying power over the course of a year at a 6% rate the yearly interest sums up to $1,350 (= $\frac{6\% * \$45{,}000}{2}$). This equals to 2.7% of his personal capital and will decrease its expected build up by

approximately a fifth to a quarter (10%-15% equity gain p.a. was considered a reasonable reference).

3.3. Consequences for Day Traders

For trades that are closed by the end of the day brokers typically require substantially lower margins (i.e., 15% to 25%) than for longer holding periods. Especially when trades are managed manually and no more than a handful of positions are desired it becomes possible to apply tight stops in combination with a rather large position risk.

Limitations To The Number Of Parallel Trades

- Influence Of: Margin Requirement, Position Sizing & Initial Stop Distance -

The tables below show the maximum number of parallel trades that can be funded by the available capital (personal capital as margin plus loan from broker).
As a protection against frequent margin calls the theoretical max. buying power has been reduced to allow for price fluctuations & costs up to: 5% of total portfolio value.

margin: 25% max. additional capital: 248% of personal capital

1 R = x% of personal capital \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	3	17	34	52	69	86	104	121	139	156	173	191	208	226	243	260	278	295	313	330	347
0,20%	1	8	17	26	34	43	52	60	69	78	86	95	104	113	121	130	139	147	156	165	173
0,25%	1	6	13	20	27	34	41	48	55	62	69	76	83	90	97	104	111	118	125	132	139
0,30%	1	5	11	17	23	28	34	40	46	52	57	63	69	75	81	86	92	98	104	110	115
0,40%	0	4	8	13	17	21	26	30	34	39	43	47	52	56	60	65	69	73	78	82	86
0,50%	0	3	6	10	13	17	20	24	27	31	34	38	41	45	48	52	55	59	62	66	69
0,60%	0	2	5	8	11	14	17	20	23	26	28	31	34	37	40	43	46	49	52	55	57
0,70%	0	2	4	7	9	12	14	17	19	22	24	27	29	32	34	37	39	42	44	47	49
0,75%	0	2	4	6	9	11	13	16	18	20	23	25	27	30	32	34	37	39	41	44	46
0,80%	0	2	4	6	8	10	13	15	17	19	21	23	26	28	30	32	34	36	39	41	43
0,90%	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	28	30	32	34	36	38
1,00%	0	1	3	5	6	8	10	12	13	15	17	19	20	22	24	26	27	29	31	33	34
1,25%	0	1	2	4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25	26	27
1,50%	0	1	2	3	4	5	6	8	9	10	11	12	13	15	16	17	18	19	20	22	23
1,75%	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2,00%	0	0	1	2	3	4	5	6	6	7	8	9	10	11	12	13	13	14	15	16	17

color code: = 0 | 1 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | 21+ [parallel trades]

Figure 3.4: Restrictions for a leveraged day trader

3.4. Comparison of Both Approaches

The day trader has several decisive advantages over the swing trader:

- The large position risk reduces the relative impact of transaction costs.
- By not holding overnight interest cost can be avoided.
- The shorter the average holding period gets the more trades can be carried out during one day. In combination with a larger risk per position than a swing trader higher absolute daily profits are achievable.
- Consequently trading systems can be employed that have a significantly smaller average profit (in terms of [R]) than what is necessary for swing systems.

Yet, using a higher leverage requires a stronger awareness of the possibility of (sharp) adverse moves that may lead to margin calls if no sufficient financial buffer was allowed for. The tool therefore explicitly calculates the maximum additional capital that may be employed to stay within limits that the trader personally regards as “safe”.

4. Skipping Trades Due to Lack of Buying Power

After having described the limitations on the number of parallel trades and the determining factors, the consequences of reaching this threshold

are discussed in the following chapter. It is assumed that the trader applies a consistent approach based on a trading system that “produces” individual trades (vehicle, entry, exit). On execution they consume buying power up to the point of depletion – then trades are skipped and negative effects arise.

4.1. Loss of Expectunity

Van Tharp defines **“expectunity”** as the product of expectancy per trade times trading opportunities. Whenever trades of a system with a positive expectancy are skipped those (theoretical) profits are missed. The result is a slower rise of the account value.

4.2. Increase in Volatility of a Trading System

Skipping a trade can be considered a random event as it is not part of the system’s rules but rather caused by unpredictable external conditions. This leads to erratically missing trades ranging from the best to the worst and may significantly alter the system’s performance compared to its “true” parameters (win rate, expectancy, etc.). Although the system itself may function exactly as expected, an individual trader with his restrictions in buying power may suffer severe differences.

Example: We assume a system's next 100 trades to conform precisely to its theoretical parameters (60 winners @ +2.0R; 40 losers @ -1.0R).

- win rate: 60%
- average winner; loser: +2.0R; -1.0R
- expectancy: +0.8R (= $\frac{+2.0R * 60 - 1.0R * 40}{100}$)

Due to restrictions in buying power we are forced to skip 15 trades.

a) skipping 15 winners:

This reduces the win rate to **53%** (= $\frac{45}{85}$) and the expectancy to **+0.6R** (= $\frac{+2.0R * 45 - 1.0R * 40}{85}$).

b) skipping 15 losers:

The effect is an increase of the win rate to **71%** (= $\frac{60}{85}$) and of the expectancy to **+1.1R** (= $\frac{+2.0R * 60 - 1.0R * 25}{85}$).

The exclusion of 15% of the trades generates a range of possible outcomes that differs significantly from the original system and is solely determined by random. Speaking in statistical terms, a random sample is taken from the population of trades as produced by the system. This introduces additional volatility on top of the inherent variance of the trading system itself – an undesirable consequence.

5. Impact of Buying Power Restrictions on System Testing

Typically backtesting of trading systems does not incorporate any effects that exclude valid trades so that the “true” characteristics can be obtained. This study suggests to complement those analyses with a simulation that reflects the trader’s individual buying power. An EXCEL tool is provided for this purpose and was used in the chapter below.

5.1. Example System – General Parameters

The example system used 10 liquid ETFs that represent broad indices of the U.S. and international markets. Over a time span of 16 years (Feb. 1994 to Jan. 2010) 572 “long” trades were generated and managed according to strictly mechanical rules. The initial stop was always placed 3.0% from the realized entry price.

The two following tests each started with $100,000 and evaluated the trades in their chronological order. No transaction costs, fees, slippage or taxes were included in the calculations.

5.2. Example System – Test Results Without Financial Restrictions

Each trade was evaluated separately and its profit/loss added back to the trading equity before the next trade was processed. The position risk

was then calculated based on the current capital prior to the entry. No leverage was applied (margin requirement = 100%).

total profit/loss:	199.55	[R]
winners:	344	#
losers:	228	#
win rate:	**60.1%**	
avg. win:	1.05	[R]
avg. loss:	-0.71	[R]
avg. per trade:	**0.35**	**[R]**
max. drawdown:	-16.90	[R]
position size:	1.30%	of trading capital
starting capital:	100,000.00	$
min. capital:	98,617.76	$
max. capital:	1,245,199.73	$
ending capital:	1,245,199.73	$
gain/loss from start:	**1,145.2%**	**of trading capital**
max. drawdown:	-95,070.41	$
	-20.08%	of prior peak
avg. trade duration:	12.1	calendar days
max. parallel trades:	**13**	**#**

Figure 5.1: System evaluation without financial restrictions

The high win rate in combination with bigger winners than losers keeps the maximum drawdown at a relatively low level of ~17R and allows to risk 1.3% of capital per trade without producing a drawdown of significantly more than 20% from any equity peak (arbitrary set comfort zone). At this risk level an average compounded return of 17% p.a. (less costs, slippage

& taxes) is achieved. There were no more than 13 trades active at any point in time.

5.3. Example System – Test Results Including Financial Restrictions

This test included the simulation of a virtual brokerage account that was set at 50% margin requirement. Factoring in a 5% safety buffer provided the trader with an additional buying power of ~90% on top of his capital. In order to reflect the money management practice of exposing **market money** and **core capital** to different levels of risk the position risk was split into two components accordingly. Profits were shifted from market money to core capital at the end of each (fiscal) year.

Trades were only started when sufficient buying power was available at the entry date to open the full position. The value of parallel trades was added back to the buying power by the end of the trading day that closed the position. As in the example before the position risk was set to 1.3% (both for core capital and market money).

min. free cash:	17,110.35	$
min. capital:	98,692.16	$
max. capital:	191,578.56	$
ending capital:	191,578.56	$
gain/loss from start:	**91.6%**	**of trading capital**
max. drawdown:	-30,314.09	$
max. drawdown:	-17.24%	of prior peak
skipped trades:	192	#
	33.57%	of total trades
skipped profit/loss:	144.17	R
	72.25%	of total R-multiples

Figure 5.2: System evaluation including financial restrictions

Compared to the simulation without financial restrictions the performance is reduced considerably by a factor of more than 12 even though the buying power was almost doubled through leverage!

This was caused by skipping ~34% of the trades that the system had generated and not being able to profit from them. Even worse is the fact that the missed trades accounted for 72% ($= \frac{144.17}{199.55}$) of the profit sum over all trades making them on average more profitable than the ones that were executed.

5.4. Optimization Limits of the Example System Set by Buying Power

The effect caused by skipping trades can be further demonstrated by attempting to optimize the system based on the ending equity. Both position risk factors were varied within certain ranges:

- % of core capital risked (0.1% to 1.0%)
- % of market money risked (0.0% to 30.0%)

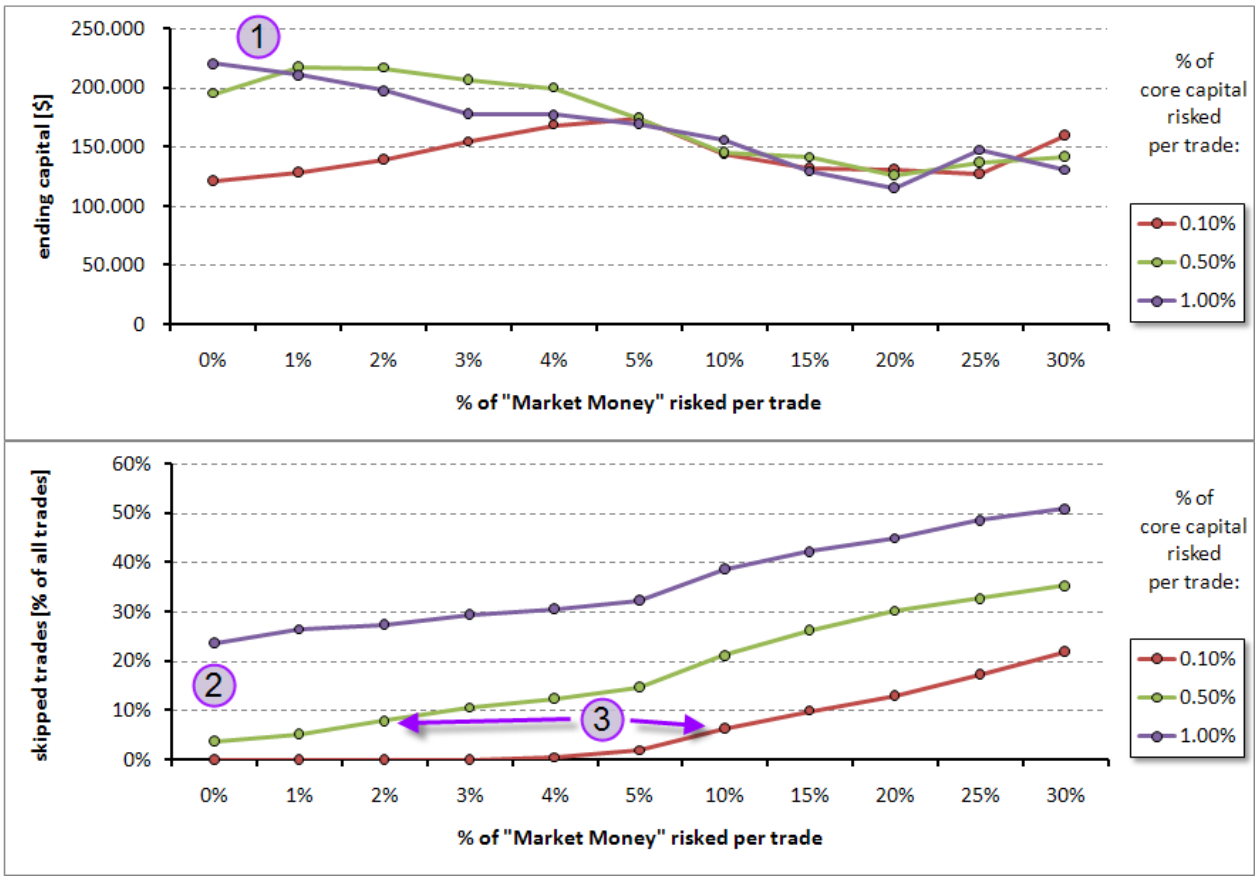


Figure 5.3: Optimization limits set by buying power (effect of skipping)

The following observations can be made:

① The maximum ending capital (~ $227,000) is reached when both risk levels are set to 1.1%.

② Even with half the optimal risk size trades are already skipped.

③ As soon as more than ~6% of the trades are missed the performance (ending capital) decreases.

5.5. Conclusions Regarding System Testing

Skipping trades can significantly influence the real life performance of systems. This is true even when the total population that was generated conforms to the system's expected parameters. Missing trades at a relatively low level of less than 10% of all trades can already cause a substantial effect and should be avoided.

Buying power as the driving factor for having to ignore trades that are presented by the system depends on the trader's individual situation. It is detached from the system itself. In this regard no information can be provided by the developer or vendor of a trading system. Instead it is up to the trader to test how a given system may respond under his specific conditions in order to assess if it enables him to reach his financial goals.

This study offers two tools for this evaluation. The EXCEL simulation that was utilized in this chapter is based on a sample of trades (real or

simulated) that may not be available for systems offered by third parties. The second tool requires only very basic system parameters and is presented in the next chapter.

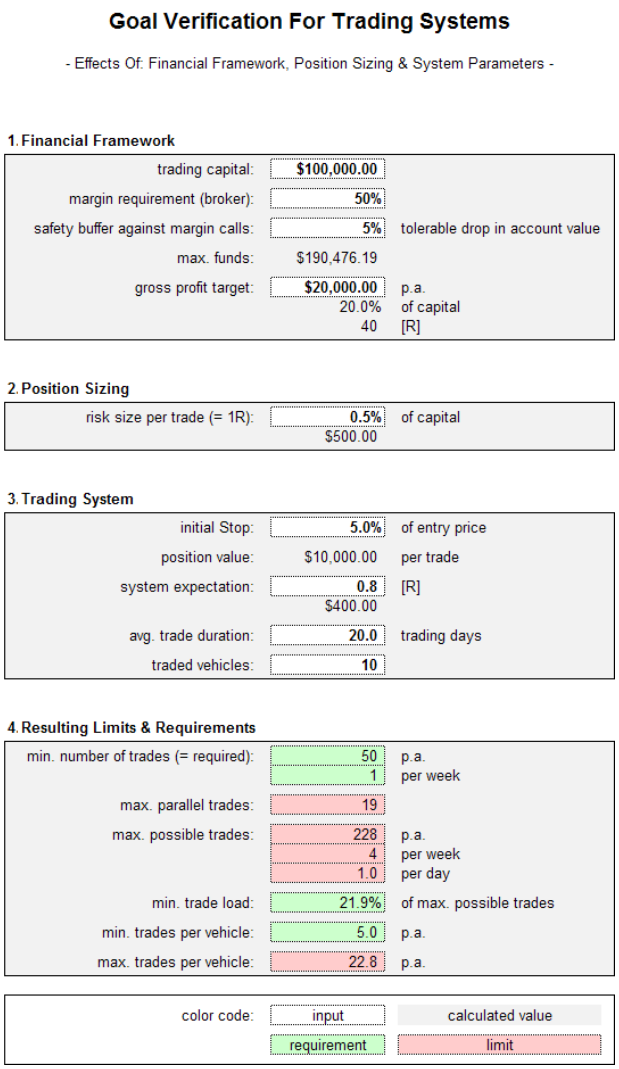
6. Matching Personal Goals and Constraints With Trading Systems by Using the “Quick Check”

The intent of the **“Quick Check”** that is included in the EXCEL file accompanying this text, is to give (swing) traders an easy to use tool that provides comprehensive feedback on the ability of a trading system to accomplish their individual profit goals given their personal buying power limitations. By varying the input parameters the trader can analyze which factors impact him the most. An exemplary discussion that may serve as a guideline follows in this chapter.

6.1. How to Use the Tool “Quick Check”

The layout is structured into 4 areas:

- **Financial Framework:** account data and profit goal
- **Position Sizing:** absolute monetary risk per trade
- **Trading System:** core data of the system in question
- **Resulting Limits & Requirements:** evaluation of input



Goal Verification For Trading Systems

- Effects Of: Financial Framework, Position Sizing & System Parameters -

1. Financial Framework

trading capital:	$100,000.00	
margin requirement (broker):	50%	
safety buffer against margin calls:	5%	tolerable drop in account value
max. funds:	$190,476.19	
gross profit target:	$20,000.00	p.a.
	20.0%	of capital
	40	[R]

2. Position Sizing

risk size per trade (= 1R):	0.5%	of capital
	$500.00	

3. Trading System

initial Stop:	5.0%	of entry price
position value:	$10,000.00	per trade
system expectation:	0.8	[R]
	$400.00	
avg. trade duration:	20.0	trading days
traded vehicles:	10	

4. Resulting Limits & Requirements

min. number of trades (= required):	50	p.a.
	1	per week
max. parallel trades:	19	
max. possible trades:	228	p.a.
	4	per week
	1.0	per day
min. trade load:	21.9%	of max. possible trades
min. trades per vehicle:	5.0	p.a.
max. trades per vehicle:	22.8	p.a.

color code:	input	calculated value
	requirement	limit

Figure 6.1: Using the tool “Quick Check”

In the result area feedback is given on the number of trades that need to be made in a certain time period and how many signals per vehicle must be generated by the system. It is up to the trader to assess whether those requirements can realistically be met.

The statistics **“trade load”** provides a measure for the likelihood that skipping of trades will occur due to lack of buying power. The smaller the

number, the better. A value of 100% requires to start a new trade every time one position was closed and to do that on the very next day.

$$\textbf{trade load} = \frac{\textbf{required trades p.a.}}{\textbf{max. possible trades p.a.}} \qquad \textit{(Eq. 6)}$$

Example: trade load = 21.9% = $\frac{50}{228}$

Typically trades are not distributed evenly over the course of a year, but rather appear in clusters during favorable market conditions. Therefore it is vital to be able to “catch up” to the necessary number of trades that one should have made at a certain point during a year. For example a trade load of 33% would theoretically allow to squeeze all required trades into the last month of a quarter after 2 months without any new positions.

On the following pages the impact of varying three different parameters is discussed by comparing the results against the same benchmark scenario.

6.2. Impact of Increased Trade Duration

When trades last longer they overlap more. With a given ability to finance parallel positions the maximum number of trades is reduced and the trade load increased.

The initial trade load of 21.9% changed to 65.8% leaving only a small buffer to compensate after falling behind the required number of trades.

Periods with few signals or personal time outs (vacation, sickness, etc.) can then easily prevent the trader from reaching his goals.

Figure 6.2: Impact of increased trade duration

6.3. Impact of Decreased Position Risk

Less risk per position consumes less buying power, but increases the number of required trades. If there is only a limited number of vehicles covered by the system, then it may become unlikely that a sufficient amount of signals will be generated.

In addition the sensitivity for changes in the cost structure rises. Minor increases in fees, commissions, interest rates, etc. lead to bigger impacts when compared to the system’s average expectation.

Figure 6.3: Impact of decreased position risk

6.4. Impact of Adding Trading Vehicles

At first sight, widening the system‘s scope offers more trading opportunities and appears to increase the profit potential (expectunity). But when financing limitations are considered, most of those additional signals cannot be taken and simply add to the percentage of skipped trades. As

discussed above the higher this value gets, the more random the system‘s performance is likely to become. As a consequence it may significantly deviate from the expected results.

Figure 6.4: Impact of adding trading vehicles

7. Conclusion

Buying power is essential for any trader, because it allows him to get exposure to the markets and achieve profits accordingly. Capitalization, traded time frame and choice of brokerage account are the key variables for a given type of trading vehicle. A lack of buying power limits the number of parallel positions and may constitute a severe obstacle for reaching the individual financial goals.

This matter is even more important for traders who base their decisions on mainly mechanical systems. They typically assume to obtain results similar to past performance. Being financially unable to execute all trades as they are generated by the system introduces a random element. This may lead to real life results that significantly differ from the trader's expectation. Beyond a rather low level of skipping trades (suggested threshold: 5%) the reliability that a system may in fact have can degrade heavily up to the point of being without value for its user.

The three tools that are included with this study allow any trader to analyze his individual situation, preferences and systems. The results should sensitize him for his personal key success factors and provide an orientation for further improvement.

8. References

Aronson, David R., 2007, Evidence-based Technical Analysis: Applying the Scientific Method and Statistical Inference to Trading Signals, 186ff.

Tharp, Van K., 2007, Trade Your Way to Financial Freedom, 2nd ed., 196ff.

Tharp, Van K., 2008, Van Tharp's Definite Guide to Position Sizing℠: How to Evaluate Your System and Use Position Sizing℠ to Meet Your Objectives, 25ff.

Limitations To The Number Of Parallel Trades

- Influence Of: Margin Requirement, Position Sizing & Initial Stop Distance -

The tables below show the maximum number of parallel trades that can be funded by the available capital (personal capital as margin plus loan from broker).
As a protection against frequent margin calls the theoretical max. buying power has been reduced to allow for price fluctuations & costs up to: 5% of total portfolio value.

margin: 100% max. additional capital: 0% of personal capital

pos. size \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
0,20%	0	2	5	7	10	12	15	17	20	22	25	27	30	32	35	37	40	42	45	47	50
0,25%	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
0,30%	0	1	3	5	6	8	10	11	13	15	16	18	20	21	23	25	26	28	30	31	33
0,40%	0	1	2	3	5	6	7	8	10	11	12	13	15	16	17	18	20	21	22	23	25
0,50%	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0,60%	0	0	1	2	3	4	5	5	6	7	8	9	10	10	11	12	13	14	15	15	16
0,70%	0	0	1	2	2	3	4	5	5	6	7	7	8	9	10	10	11	12	12	13	14
0,75%	0	0	1	2	2	3	4	4	5	6	6	7	8	8	9	10	10	11	12	12	13
0,80%	0	0	1	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10	11	11	12
0,90%	0	0	1	1	2	2	3	3	4	5	5	6	6	7	7	8	8	9	10	10	11
1,00%	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10
1,25%	0	0	0	1	1	2	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8
1,50%	0	0	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6
1,75%	0	0	0	0	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5
2,00%	0	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5

1 R = x% of personal capital

margin: 50% max. additional capital: 90% of personal capital

pos. size \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	1	9	19	28	38	47	57	66	76	85	95	104	114	123	133	142	152	161	171	180	190
0,20%	0	4	9	14	19	23	28	33	38	42	47	52	57	61	66	71	76	80	85	90	95
0,25%	0	3	7	11	15	19	22	26	30	34	38	41	45	49	53	57	60	64	68	72	76
0,30%	0	3	6	9	12	15	19	22	25	28	31	34	38	41	44	47	50	53	57	60	63
0,40%	0	2	4	7	9	11	14	16	19	21	23	26	28	30	33	35	38	40	42	45	47
0,50%	0	1	3	5	7	9	11	13	15	17	19	20	22	24	26	28	30	32	34	36	38
0,60%	0	1	3	4	6	7	9	11	12	14	15	17	19	20	22	23	25	26	28	30	31
0,70%	0	1	2	4	5	6	8	9	10	12	13	14	16	17	19	20	21	23	24	25	27
0,75%	0	1	2	3	5	6	7	8	10	11	12	13	15	16	17	19	20	21	22	24	25
0,80%	0	1	2	3	4	5	7	8	9	10	11	13	14	15	16	17	19	20	21	22	23
0,90%	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21
1,00%	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1,25%	0	0	1	2	3	3	4	5	6	6	7	8	9	9	10	11	12	12	13	14	15
1,50%	0	0	1	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10	11	12	12
1,75%	0	0	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10
2,00%	0	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9

1 R = x% of personal capital

margin: 25% max. additional capital: 248% of personal capital

pos. size \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	3	17	34	52	69	86	104	121	139	156	173	191	208	226	243	260	278	295	313	330	347
0,20%	1	8	17	26	34	43	52	60	69	78	86	95	104	113	121	130	139	147	156	165	173
0,25%	1	6	13	20	27	34	41	48	55	62	69	76	83	90	97	104	111	118	125	132	139
0,30%	1	5	11	17	23	28	34	40	46	52	57	63	69	75	81	86	92	98	104	110	115
0,40%	0	4	8	13	17	21	26	30	34	39	43	47	52	56	60	65	69	73	78	82	86
0,50%	0	3	6	10	13	17	20	24	27	31	34	38	41	45	48	52	55	59	62	66	69
0,60%	0	2	5	8	11	14	17	20	23	26	28	31	34	37	40	43	46	49	52	55	57
0,70%	0	2	4	7	9	12	14	17	19	22	24	27	29	32	34	37	39	42	44	47	49
0,75%	0	2	4	6	9	11	13	16	18	20	23	25	27	30	32	34	37	39	41	44	46
0,80%	0	2	4	6	8	10	13	15	17	19	21	23	26	28	30	32	34	36	39	41	43
0,90%	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	28	30	32	34	36	38
1,00%	0	1	3	5	6	8	10	12	13	15	17	19	20	22	24	26	27	29	31	33	34
1,25%	0	1	2	4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25	26	27
1,50%	0	1	2	3	4	5	6	8	9	10	11	12	13	15	16	17	18	19	20	22	23
1,75%	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2,00%	0	0	1	2	3	4	5	6	6	7	8	9	10	11	12	13	13	14	15	16	17

1 R = x% of personal capital

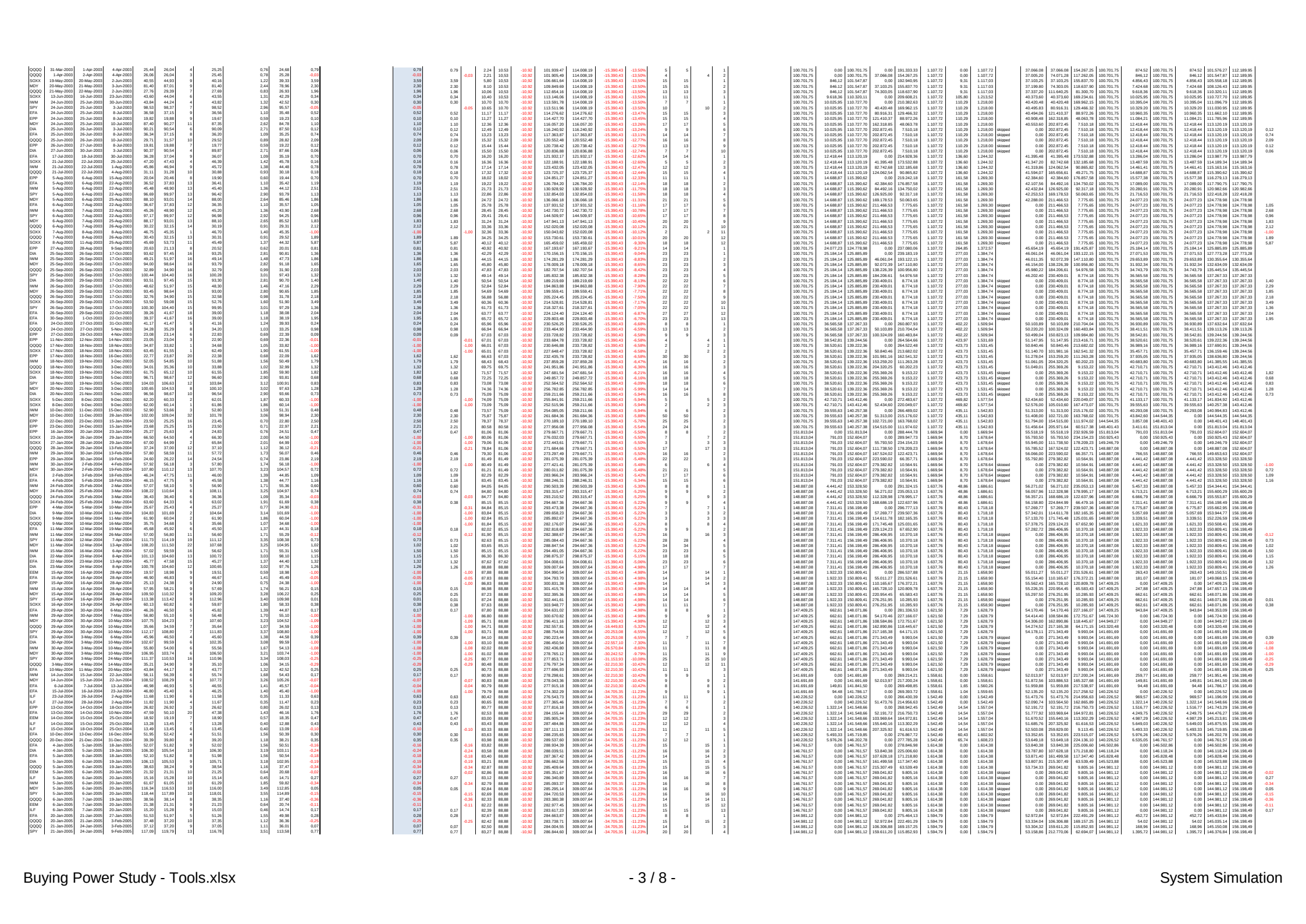
margin: 10% max. additional capital: 590% of personal capital

pos. size \ iStop	0,1%	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%	4,5%	5,0%	5,5%	6,0%	6,5%	7,0%	7,5%	8,0%	8,5%	9,0%	9,5%	10,0%
0,10%	6	34	68	103	137	172	206	241	275	310	344	379	413	448	482	517	551	586	620	655	689
0,20%	3	17	34	51	68	86	103	120	137	155	172	189	206	224	241	258	275	293	310	327	344
0,25%	2	13	27	41	55	68	82	96	110	124	137	151	165	179	193	206	220	234	248	262	275
0,30%	2	11	22	34	45	57	68	80	91	103	114	126	137	149	160	172	183	195	206	218	229
0,40%	1	8	17	25	34	43	51	60	68	77	86	94	103	112	120	129	137	146	155	163	172
0,50%	1	6	13	20	27	34	41	48	55	62	68	75	82	89	96	103	110	117	124	131	137
0,60%	1	5	11	17	22	28	34	40	45	51	57	63	68	74	80	86	91	97	103	109	114
0,70%	0	4	9	14	19	24	29	34	39	44	49	54	59	64	68	73	78	83	88	93	98
0,75%	0	4	9	13	18	22	27	32	36	41	45	50	55	59	64	68	73	78	82	87	91
0,80%	0	4	8	12	17	21	25	30	34	38	43	47	51	56	60	64	68	73	77	81	86
0,90%	0	3	7	11	15	19	22	26	30	34	38	42	45	49	53	57	61	65	68	72	76
1,00%	0	3	6	10	13	17	20	24	27	31	34	37	41	44	48	51	55	58	62	65	68
1,25%	0	2	5	8	11	13	16	19	22	24	27	30	33	35	38	41	44	46	49	52	55
1,50%	0	2	4	6	9	11	13	16	18	20	22	25	27	29	32	34	36	39	41	43	45
1,75%	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39
2,00%	0	1	3	5	6	8	10	12	13	15	17	18	20	22	24	25	27	29	31	32	34

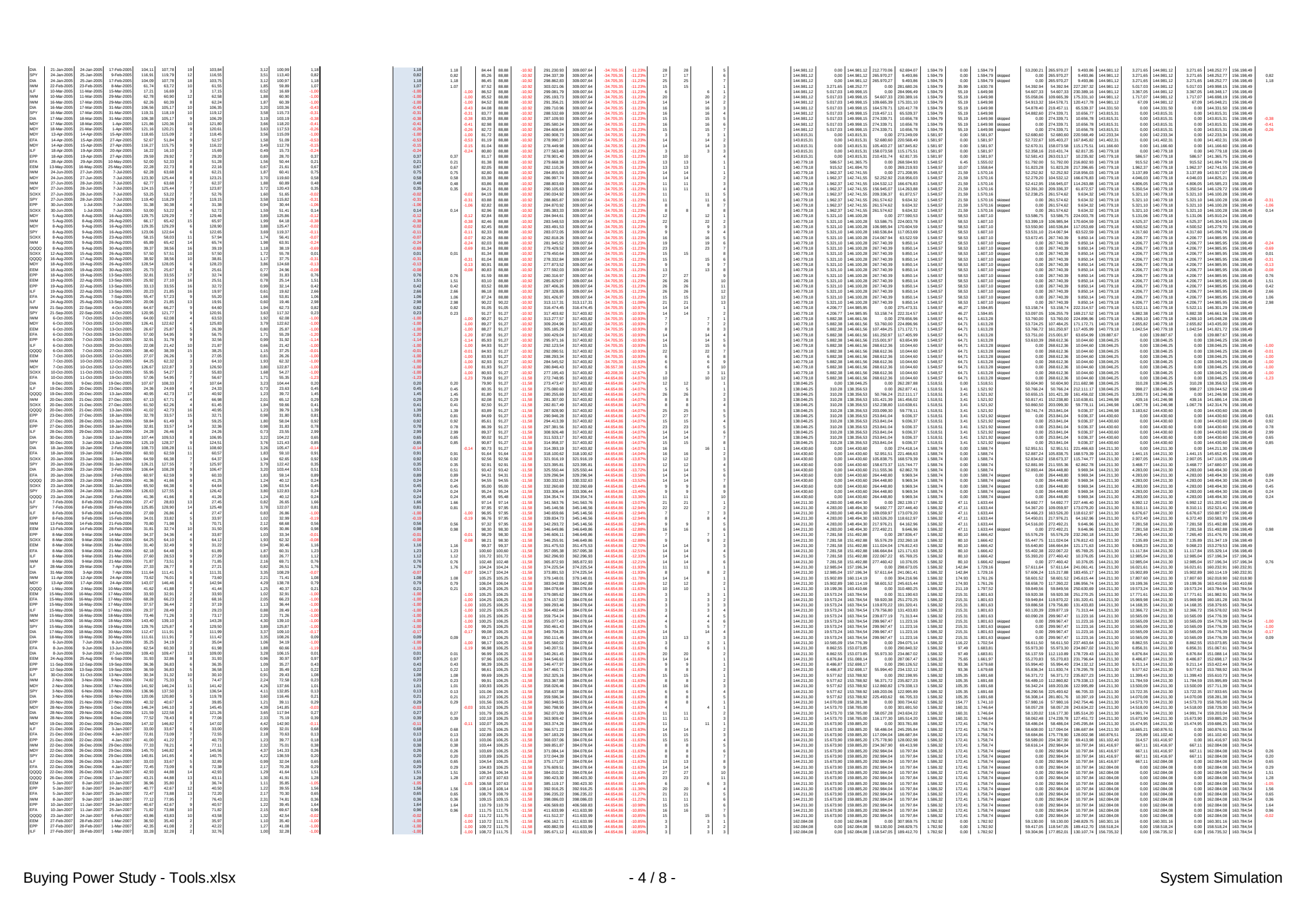
1 R = x% of personal capital

color code: = 0 | 1 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | 21+ [parallel trades]

symbol	signal day	trade start	trade end	price start ($)	price end ($)	duration (bars)	last CLOSE ($) (prior to start)	planned R ($) (based on last CLOSE)	initial stop ($)	P/L [R]	winners	losers	cum. P/L [R]	peak	drawdown	capital after trade ($)	$ peak	drawdown ($)	drawdown (%)	capital DD (%)	duration (cal. days)	dur. win (cal.days)	dur. lose (cal.days)	parallel trades
SPY	7-Feb-1994	8-Feb-1994	17-Feb-1994	47.28	47.21	8	47.19	1.42	45.86	-0.05			-0.05	-0.05	0.00	99.935.92	100.000.00	-64.08	-0.06%	11			11	1
SPY	8-Feb-1994	9-Feb-1994	17-Feb-1994	47.25	47.21	7	47.22	1.42	45.83	-0.03			-0.03	-0.08	0.00	-0.08	99.899.32	100.000.00	-100.68	-0.10%	10			10	2
SPY	24-Feb-1994	25-Feb-1994	8-Mar-1994	46.66	46.76	8	46.59	1.40	45.26	0.07			0.07	-0.01	0.00	-0.08	99.992.08	100.000.00	-100.68	-0.10%	13	13		1
SPY	24-Mar-1994	28-Mar-1994	30-Mar-1994	46.41	45.02	4	46.38	1.39	45.02	-1.00			-1.00	-1.01	0.00	-1.01	98.692.19	100.000.00	-1.307.81	-1.31%	7		7	1
SPY	9-Sep-1994	12-Sep-1994	16-Sep-1994	47.00	47.00	5	47.00	1.41	45.59	0.00			0.00	-1.01	0.00	-1.01	98.692.19	100.000.00	-1.307.81	-1.31%	8		8	1
SPY	12-Sep-1994	13-Sep-1994	16-Sep-1994	46.95	47.00	4	46.86	1.41	45.54	0.04			0.04	-0.97	0.00	-1.01	98.737.68	100.000.00	-1.307.81	-1.31%	5	5		2
SPY	25-Oct-1994	26-Oct-1994	2-Nov-1994	46.39	46.74	6	46.22	1.39	45.00	0.25			0.25	-0.72	0.00	-1.01	98.960.89	100.000.00	-1.307.81	-1.31%	9	9		1
SPY	7-Mar-1995	8-Mar-1995	22-Mar-1995	48.52	49.35	11	48.44	1.46	47.06	0.57			0.57	-0.15	0.00	-1.01	99.792.99	100.000.00	-1.307.81	-1.31%	16	16		1
SPY	19-May-1995	22-May-1995	26-May-1995	52.27	52.60	5	52.09	1.57	50.70	0.21			0.21	0.06	0.06	-1.01	100.065.67	100.065.67	-1.307.81	-1.31%	8	8		1
SPY	19-Jul-1995	20-Jul-1995	28-Jul-1995	55.33	55.27	6	55.27	1.66	53.67	0.66			0.66	0.66	0.66	0.00	100.849.32	100.849.32	-1.307.81	-1.30%	10	10		1
SPY	18-Dec-1995	19-Dec-1995	4-Jan-1996	60.66	61.72	11	60.63	1.82	58.84	0.58			0.58	1.24	1.24	-1.01	101.612.89	101.612.89	-1.307.81	-1.29%	18	18		1
SPY	19-Dec-1995	20-Dec-1995	4-Jan-1996	61.45	61.72	10	61.27	1.84	59.61	0.15			0.15	1.39	1.39	-1.01	101.806.73	101.806.73	-1.307.81	-1.28%	17	17		2
SPY	31-Jan-1996	1-Feb-1996	14-Feb-1996	65.77	65.77	9	59.97	1.80	58.26	3.17			3.17	4.56	4.56	-1.01	106.005.13	106.005.13	-1.307.81	-1.27%	36	36		1
SPY	11-Jan-1996	12-Jan-1996	14-Feb-1996	60.48	65.77	24	60.33	1.81	58.67	2.92			2.92	7.49	7.49	-1.01	110.032.74	110.032.74	-1.307.81	-1.19%	35	35		2
SPY	20-Feb-1996	21-Feb-1996	26-Feb-1996	64.42	65.28	4	64.30	1.93	62.49	0.45			0.45	7.93	7.93	-1.01	110.670.13	110.670.13	-1.307.81	-1.18%	7	7		1
SPY	29-Feb-1996	1-Mar-1996	8-Mar-1996	64.94	64.19	6	63.88	1.94	62.70	-0.23			-0.23	7.70	7.93	-1.23	110.447.90	110.670.13	-1.307.81	-1.18%	9	9		1
SPY	8-Apr-1996	9-Apr-1996	11-Apr-1996	64.64	62.70	3	64.64	1.94	62.70	-1.00			-1.00	6.70	7.93	-1.23	108.902.03	110.670.13	-1.768.10	-1.60%	4		4	1
SPY	3-May-1996	6-May-1996	16-May-1996	64.56	66.31	9	64.31	1.94	62.92	0.90			0.90	7.60	7.93	-1.23	110.179.10	110.670.13	-1.768.10	-1.60%	14	14		2
SPY	6-May-1996	7-May-1996	28-Jul-1995	64.25	64.31	3	64.25	1.93	62.92	1.07			1.07	8.67	8.67	-1.23	111.707.91	111.707.91	-1.768.10	-1.58%	11	11		2
SPY	18-Jun-1996	19-Jun-1996	26-Jun-1996	66.66	66.70	6	66.34	2.00	64.66	0.02			0.02	8.69	8.69	-1.23	111.736.96	111.736.96	-1.768.10	-1.58%	9	9		1
SPY	5-Jul-1996	8-Jul-1996	15-Jul-1996	65.62	63.65	6	65.58	1.97	63.65	-1.00			-1.00	7.69	8.69	-1.23	110.284.37	111.736.96	-1.768.10	-1.58%	11		11	1
SPY	8-Jul-1996	9-Jul-1996	15-Jul-1996	65.21	63.65	5	65.31	1.97	63.64	-1.00			-1.00	6.69	8.69	-2.00	108.650.68	111.736.96	-2.886.28	-2.58%	8	8		2
MDY	5-Sep-1996	6-Sep-1996	17-Sep-1996	45.94	47.33	8	45.42	1.38	44.56	1.01			1.01	7.70	8.69	-2.00	110.275.99	111.736.96	-2.886.28	-2.58%	13	13		1
MDY	28-Oct-1996	29-Oct-1996	18-Nov-1996	48.27	50.04	15	47.81	1.45	46.82	1.22			1.22	8.92	8.92	-2.00	112.025.96	112.025.96	-2.886.28	-2.58%	22	22		1
MDY	30-Oct-1996	31-Oct-1996	18-Nov-1996	48.01	50.04	13	47.83	1.44	46.64	1.36			1.36	10.28	10.28	-2.00	114.048.19	114.048.19	-2.886.28	-2.53%	20	20		2
MDY	6-Dec-1996	9-Dec-1996	11-Dec-1996	50.67	50.63	3	50.42	1.52	49.15	-0.03			-0.03	10.25	10.28	-2.00	113.969.19	114.048.19	-2.886.28	-2.53%	6		6	1
SPY	6-Dec-1996	9-Dec-1996	11-Dec-1996	74.69	73.62	3	74.31	2.24	72.45	-0.48			-0.48	9.77	10.28	-2.00	113.261.46	114.048.19	-2.886.28	-2.53%	6		6	2
MDY	11-Dec-1996	12-Dec-1996	15-Jan-1997	50.96	51.46	4	50.25	1.52	49.14	-1.00			-1.00	8.77	10.28	-2.00	111.789.06	114.048.19	-2.886.28	-2.53%	6		6	1
MDY	12-Dec-1996	13-Dec-1996	20-Dec-1996	49.81	49.45	6	49.81	1.49	48.32	-0.24			-0.24	8.53	10.28	-2.00	111.437.94	114.048.19	-2.886.28	-2.53%	9		9	2
SPY	13-Dec-1996	16-Dec-1996	30-Dec-1996	73.50	75.20	10	73.31	2.20	71.30	0.77			0.77	9.31	10.28	-2.00	112.557.39	114.048.19	-2.886.28	-2.53%	18	18		3
MDY	27-Jan-1997	28-Jan-1997	3-Feb-1997	54.25	51.69	5	55.75	1.55	50.14	-0.04			-0.04	9.27	10.28	-2.00	112.500.74	114.048.19	-2.886.28	-2.53%	8		8	1
MDY	18-Mar-1997	19-Mar-1997	27-Mar-1997	50.95	50.33	7	50.83	1.53	49.42	-0.41			-0.41	8.86	10.28	-2.00	111.908.09	114.048.19	-2.886.28	-2.53%	10		10	1
MDY	19-Mar-1997	20-Mar-1997	27-Mar-1997	50.50	50.33	6	50.45	1.52	48.98	-0.11			-0.11	8.75	10.28	-2.00	111.745.38	114.048.19	-2.886.28	-2.53%	9		9	2
MDY	1-Apr-1997	2-Apr-1997	10-Apr-1997	48.75	48.75	6	48.49	1.46	47.29	0.50			0.50	9.25	10.28	-2.00	112.471.73	114.048.19	-2.886.28	-2.53%	10	10		1
SPY	11-Apr-1997	14-Apr-1997	21-Apr-1997	73.73	75.75	6	73.37	2.21	71.52	0.91			0.91	10.16	10.28	-2.00	113.808.16	114.048.19	-2.886.28	-2.53%	11	11		1
SPY	8-Aug-1997	11-Aug-1997	15-Aug-1997	93.75	90.94	5	93.37	2.81	90.94	-1.00			-1.00	9.16	10.28	-2.00	112.328.65	114.048.19	-2.886.28	-2.53%	8		8	1
SPY	12-Aug-1997	13-Aug-1997	15-Aug-1997	93.69	90.88	3	92.56	2.81	90.88	-1.00			-1.00	8.16	10.28	-2.11	110.868.38	114.048.19	-3.139.81	-2.75%	4		4	2
MDY	15-Aug-1997	18-Aug-1997	21-Aug-1997	60.19	60.74	4	60.09	1.81	58.38	0.30			0.30	8.47	10.28	-2.11	111.306.34	114.048.19	-3.139.81	-2.75%	7	7		1
MDY	17-Oct-1997	20-Oct-1997	23-Oct-1997	64.37	64.00	4	64.25	1.93	62.44	-0.19			-0.19	8.28	10.28	-2.11	111.028.94	114.048.19	-3.139.81	-2.75%	7	7		1
MDY	17-Oct-1997	20-Oct-1997	28-Jan-1997	73.75	74.94	6	74.69	2.85	71.99	0.04			0.04	8.31	10.28	-2.11	111.509.54	114.048.19	-3.139.81	-2.75%	7	7		2
SPY	30-Oct-1997	31-Oct-1997	7-Nov-1997	91.81	92.37	6	89.94	2.75	89.06	0.20			0.20	8.51	10.28	-2.11	111.373.64	114.048.19	-3.139.81	-2.75%	9	9		1
MDY	12-Nov-1997	13-Nov-1997	18-Nov-1997	61.14	62.38	4	60.50	1.83	59.31	0.68			0.68	9.19	10.28	-2.11	112.354.70	114.048.19	-3.139.81	-2.75%	7	7		1
MDY	12-Dec-1997	15-Dec-1997	19-Dec-1997	62.86	64.44	5	62.52	1.89	61.33	-1.00			-1.00	8.19	10.28	-2.11	111.894.04	114.048.19	-3.139.81	-2.75%	9	9		2
MDY	12-Dec-1997	15-Dec-1997	19-Dec-1997	62.86	60.97	5	62.52	1.89	61.33	-1.00			-1.00	7.19	10.28	-3.09	109.452.47	114.048.19	-4.555.72	-4.00%	8	8		2
MDY	5-Dec-1997	15-Dec-1997	19-Dec-1997	96.25	93.35	5	95.75	2.89	93.36	-1.00			-1.00	6.19	10.28	-4.09	108.029.59	114.048.19	-5.978.61	-5.24%	8	8		3
MDY	5-Dec-1997	15-Dec-1997	19-Dec-1997	62.86	60.97	5	62.52	1.89	61.33	-1.00			-1.00	5.19	10.28	-5.09	106.505.20	114.048.19	-7.382.00	-6.45%	8	8		4
MDY	8-Jan-1998	9-Jan-1998	9-Jan-1998	61.86	60.00	1	61.81	1.86	60.00	-1.00			-1.00	4.19	10.28	-6.09	105.239.08	114.048.19	-8.769.12	-7.69%	2	2		1
SPY	12-Jan-1998	13-Jan-1998	21-Jan-1998	94.00	96.31	6	94.00	2.84	91.19	0.60			0.60	4.79	10.28	-6.09	106.053.20	114.048.19	-8.769.12	-7.69%	10	10		1
MDY	27-Apr-1998	28-Apr-1998	5-May-1998	70.67	72.25	5	69.67	2.12	68.55	0.75			0.75	5.53	10.28	-6.09	106.804.70	114.048.19	-8.769.12	-7.69%	9	9		1
SPY	27-Apr-1998	28-Apr-1998	5-May-1998	109.78	111.57	5	108.72	3.29	106.49	0.54			0.54	6.08	10.28	-6.09	107.838.09	114.048.19	-8.769.12	-7.69%	9	9		2
MDY	28-Apr-1998	29-Apr-1998	5-May-1998	70.87	72.25	5	70.52	2.13	68.46	0.65			0.65	6.72	10.28	-6.09	108.746.36	114.048.19	-8.769.12	-7.69%	8	8		3
SPY	28-Apr-1998	29-Apr-1998	5-May-1998	109.08	111.57	5	108.56	3.27	105.76	0.78			0.78	7.50	10.28	-6.09	107.944.46	114.048.19	-8.769.12	-7.69%	8	8		4
MDY	18-May-1998	19-May-1998	26-May-1998	71.20	69.06	5	70.67	2.14	69.06	-1.00			-1.00	6.50	10.28	-6.09	108.416.49	114.048.19	-8.769.12	-7.69%	9	9		1
MDY	22-May-1998	26-May-1998	26-May-1998	70.59	68.47	1	69.84	2.12	68.46	-1.00			-1.00	5.50	10.28	-6.09	107.007.07	114.048.19	-8.769.12	-7.69%	5	5		2
SPY	15-Jun-1998	16-Jun-1998	30-Jun-1998	100.00	109.72	10	107.53	3.25	105.16	0.40			0.40	5.90	10.28	-6.09	107.567.76	114.048.19	-8.769.12	-7.69%	14	14		3
MDY	22-Jul-1998	23-Jul-1998	24-Jul-1998	70.27	68.16	2	70.16	2.11	68.46	-1.00			-1.00	4.90	10.28	-6.09	106.169.41	114.048.19	-8.769.12	-7.69%	3	3		1
MDY	23-Jul-1998	24-Jul-1998	27-Jul-1998	68.80	67.43	2	68.80	2.09	67.43	-1.00			-1.00	3.90	10.28	-6.37	104.789.20	114.048.19	-9.218.90	-8.09%	5	5		2
SPY	23-Jul-1998	24-Jul-1998	24-Jul-1998	114.97	111.52	1	114.19	3.45	111.52	-1.00			-1.00	2.90	10.28	-7.37	103.426.94	114.048.19	-10.581.25	-9.28%	4	4		3
SPY	14-Dec-1998	15-Dec-1998	4-Jan-1999	114.69	121.85	13	113.75	3.44	111.25	2.08			2.08	4.99	10.28	-7.37	106.225.49	114.048.19	-10.581.25	-9.28%	22	22		1
SPY	14-Jan-1999	15-Jan-1999	21-Jan-1999	122.25	124.15	4	121.22	3.67	118.70	0.49			0.49	5.47	10.28	-7.37	106.895.26	114.048.19	-10.581.25	-9.28%	8	8		1
MDY	14-Jan-1999	15-Jan-1999	19-Jan-1999	72.03	69.72	4	71.25	2.16	69.87	-1.00			-1.00	4.47	10.28	-7.37	106.447.08	114.048.19	-10.581.25	-9.28%	20	20		2
DIA	22-Jan-1999	25-Jan-1999	27-Jan-1999	91.39	91.65	3	91.31	2.74	88.65	0.09			0.09	4.57	10.28	-7.37	105.635.77	114.048.19	-10.581.25	-9.28%	6	6		2
SPY	5-Feb-1999	8-Feb-1999	10-Feb-1999	94.00	96.31	4	94.00	2.84	91.19	0.60			0.60	4.79	10.28	-7.37	106.053.20	114.048.19	-10.581.25	-9.28%	9	9		1
MDY	9-Feb-1999	10-Feb-1999	25-Feb-1999	68.02	67.48	11	68.00	2.04	65.98	-0.26			-0.26	3.34	10.28	-7.37	103.955.38	114.048.19	-10.581.25	-9.28%	17		17	3
SPY	10-Feb-1999	11-Feb-1999	17-Feb-1999	123.06	122.26	4	122.31	3.69	119.37	-0.22			-0.22	3.12	10.28	-7.37	104.662.90	114.048.19	-10.581.25	-9.28%	8	8		2
SPY	23-Mar-1999	24-Mar-1999	31-Mar-1999	126.84	128.90	6	126.19	3.81	123.03	0.54			0.54	3.66	10.28	-7.37	104.391.02	114.048.19	-10.581.25	-9.28%	9	9		1
DIA	24-Mar-1999	25-Mar-1999	30-Mar-1999	97.83	98.80	4	96.84	2.93	94.90	0.33			0.33	3.99	10.28	-7.37	104.840.30	114.048.19	-10.581.25	-9.28%	7	7		2
SPY	24-Mar-1999	25-Mar-1999	31-Mar-1999	128.06	128.90	5	126.91	3.84	124.22	0.22			0.22	3.82	10.28	-7.37	104.662.68	114.048.19	-10.581.25	-9.28%	8	8		3
SPY	24-May-1999	25-May-1999	8-Jun-1999	131.38	131.75	10	131.13	3.94	127.44	0.09			0.09	4.31	10.28	-7.37	105.266.79	114.048.19	-10.581.25	-9.28%	16	16		1
DIA	25-May-1999	26-May-1999	8-Jun-1999	105.97	107.90	13	105.06	3.18	102.79	0.61			0.61	4.91	10.28	-7.37	106.097.34	114.048.19	-10.581.25	-9.28%	15	15		2
SPY	25-May-1999	26-May-1999	8-Jun-1999	74.94	76.12	9	73.75	2.23	72.11	0.80			0.80	5.71	10.28	-7.37	106.898.08	114.048.19	-10.581.25	-9.28%	15	15		3
SPY	25-May-1999	26-May-1999	8-Jun-1999	129.31	131.75	9	129.00	3.88	125.43	0.63			0.63	6.34	10.28	-7.37	108.074.65	114.048.19	-10.581.25	-9.28%	15	15		4
DIA	22-Jul-1999	23-Jul-1999	30-Jul-1999	110.00	106.70	6	109.44	3.30	106.70	-1.00			-1.00	5.34	10.28	-7.37	106.669.68	114.048.19	-10.581.25	-9.28%	9		9	1
SPY	22-Jul-1999	23-Jul-1999	30-Jul-1999	136.06	132.56	6	135.40	4.10	132.56	-1.00			-1.00	4.34	10.28	-7.37	104.662.90	114.048.19	-10.581.25	-9.28%	9		9	2
DIA	26-Jul-1999	27-Jul-1999	3-Aug-1999	77.75	75.42	6	76.87	2.33	75.42	-1.00			-1.00	3.34	10.28	-7.37	103.914.30	114.048.19	-10.581.25	-9.28%	9	9		3
DIA	30-Aug-1999	31-Aug-1999	8-Sep-1999	109.16	109.75	6	109.06	3.27	105.89	0.18			0.18	3.52	10.28	-7.37	104.158.03	114.048.19	-10.581.25	-9.28%	10	10		1
SPY	30-Aug-1999	31-Aug-1999	8-Sep-1999	74.14	75.81	6	74.00	2.22	71.92	0.75			0.75	4.27	10.28	-7.37	105.176.62	114.048.19	-10.581.25	-9.28%	10	10		2
DIA	31-Aug-1999	1-Sep-1999	8-Sep-1999	108.94	109.75	5	108.25	3.27	105.67	0.25			0.25	4.52	10.28	-7.37	105.515.31	114.048.19	-10.581.25	-9.28%	9	9		3
MDY	31-Aug-1999	1-Sep-1999	8-Sep-1999	74.50	75.81	5	74.00	2.24	72.26	0.58			0.58	5.11	10.28	-7.37	106.317.51	114.048.19	-10.581.25	-9.28%	9	9		4
SPY	31-Aug-1999	1-Sep-1999	8-Sep-1999	132.94	134.42	5	132.06	3.99	128.95	0.37			0.37	5.48	10.28	-7.37	104.930.16	114.048.19	-10.581.25	-9.28%	9	9		5
SPY	2-Sep-1999	3-Sep-1999	8-Sep-1999	134.88	134.42	3	132.11	4.05	130.83	-0.11			-0.11	5.36	10.28	-7.37	106.672.44	114.048.19	-10.581.25	-9.28%	7	7		6
DIA	16-Sep-1999	17-Sep-1999	22-Sep-1999	108.31	105.06	4	107.53	3.25	105.06	-1.00			-1.00	4.36	10.28	-7.37	105.285.70	114.048.19	-10.581.25	-9.28%	7		7	1
DIA	21-Sep-1999	22-Sep-1999	24-Sep-1999	105.94	102.94	2	105.94	3.18	102.94	-1.00			-1.00	3.36	10.28	-7.37	104.816.98	114.048.19	-10.581.25	-9.28%	4		4	2
MDY	21-Sep-1999	22-Sep-1999	24-Sep-1999	74.00	71.78	3	73.98	2.22	71.78	-1.00			-1.00	2.36	10.28	-7.37	102.566.06	114.048.19	-11.442.13	-10.04%	4		4	3
SPY	21-Sep-1999	22-Sep-1999	24-Sep-1999	131.25	127.31	3	130.75	3.94	127.31	-1.00			-1.00	1.36	10.28	-8.92	101.232.70	114.048.19	-12.775.49	-11.21%	4		4	4
SPY	22-Sep-1999	23-Sep-1999	23-Sep-1999	74.12	72.51	1	74.00	2.24	72.51	-1.00			-1.00	0.36	10.28	-8.92	100.236.14	114.048.19	-14.091.57	-12.36%	1		1	4
SPY	22-Sep-1999	23-Sep-1999	23-Sep-1999	131.81	127.86	1	130.61	3.95	127.86	-1.00			-1.00	-0.64	10.28	-10.92	98.617.76	114.048.19	-15.390.43	-13.50%	2	2		5
MDY	29-Nov-1999	30-Nov-1999	6-Dec-1999	79.00	81.28	5	78.97	2.37	76.63	0.96			0.96	0.33	10.28	-10.92	99.851.11	114.048.19	-15.390.43	-13.50%	8	8		1
MDY	15-Dec-1999	16-Dec-1999	20-Dec-1999	76.62	78.82	3	78.19	2.36	76.26	0.30			0.30	0.62	10.28	-10.92	100.236.10	114.048.19	-15.390.43	-13.50%	14	14		2
MDY	4-Jan-2000	5-Jan-2000	11-Jan-2000	77.41	80.90	5	77.37	2.32	75.09	1.50			1.50	2.13	10.28	-10.92	102.196.35	114.048.19	-15.390.43	-13.50%	8	8		1
DIA	4-Jan-2000	5-Jan-2000	18-Jan-2000	139.94	145.34	9	139.75	4.20	135.74	1.29			1.29	3.41	10.28	-10.92	103.904.49	114.048.19	-15.390.43	-13.50%	15	15		2
DIA	4-Jan-2000	5-Jan-2000	18-Jan-2000	114.00	115.45	9	109.77	3.30	106.70	1.65			1.65	5.06	10.28	-10.92	105.135.26	114.048.19	-15.390.43	-13.50%	16	16		3
DIA	5-Jan-2000	6-Jan-2000	19-Jan-2000	111.41	115.45	9	111.34	3.34	108.07	1.21			1.21	6.27	10.28	-10.92	107.804.22	114.048.19	-15.390.43	-13.50%	15	15		4
MDY	6-Jan-2000	7-Jan-2000	11-Jan-2000	78.00	80.90	3	77.44	2.34	75.66	1.24			1.24	7.51	10.28	-10.92	109.541.06	114.048.19	-15.390.43	-13.50%	6	6		5
DIA	21-Jan-2000	24-Jan-2000	28-Jan-2000	113.25	109.85	3	112.81	3.40	109.85	-1.00			-1.00	5.51	10.28	-10.92	104.117.02	114.048.19	-15.390.43	-13.50%	4		4	4
DIA	24-Jan-2000	25-Jan-2000	28-Jan-2000	110.59	107.27	4	110.00	3.32	107.27	-1.00			-1.00	5.51	10.28	-10.92	106.711.51	114.048.19	-15.390.43	-13.50%	5	5		5
DIA	26-Jan-2000	27-Jan-2000	28-Jan-2000	141.84	137.58	2	140.81	4.26	137.58	-1.00			-1.00	4.51	10.28	-10.92	105.324.26	114.048.19	-15.390.43	-13.50%	3	3		6
MDY	28-Jan-2000	31-Jan-2000	8-Feb-2000	79.19	81.95	4	78.69	2.38	76.81	1.16			1.16	5.67	10.28	-10.92	106.083.68	114.048.19	-15.390.43	-13.50%	13	13		1
MDY	31-Jan-2000	1-Feb-2000	9-Feb-2000	79.56	81.95	7	79.31	2.39	77.17	1.00			1.00	6.67	10.28	-10.92	108.301.94	114.048.19	-15.390.43	-13.50%	10	10		2
QQQQ	15-Mar-2000	16-Mar-2000	16-Mar-2000	105.38	102.22	1	102.88	3.16	102.22	-1.00			-1.00	5.67	10.28	-10.92	106.894.02	114.048.19	-15.390.43	-13.50%	2	2		1
MDY	15-Mar-2000	16-Mar-2000	20-Mar-2000	85.22	88.38	3	84.72	2.54	82.66	1.23			1.23	6.91	10.28	-10.92	108.063.06	114.048.19	-15.390.43	-13.50%	6	6		2
QQQQ	3-Apr-2000	4-Apr-2000	4-Apr-2000	103.62	100.51	1	102.94	3.11	100.51	-1.00			-1.00	5.91	10.28	-10.92	107.197.41	114.048.19	-15.390.43	-13.50%	2	2		1
MDY	17-Apr-2000	18-Apr-2000	27-Apr-2000	82.25	84.58	7	82.00	2.47	79.78	0.94			0.94	6.85	10.28	-10.92	108.511.99	114.048.19	-15.390.43	-13.50%	11	11		1
DIA	20-Apr-2000	21-Apr-2000	24-Apr-2000	84.94	82.39	2	84.94	2.55	82.39	-1.00			-1.00	5.85	10.28	-10.92	107.101.32	114.048.19	-15.390.43	-13.50%	3		3	2
MDY	23-May-2000	24-May-2000	5-Jun-2000	83.87	91.53	8	83.62	2.52	81.35	3.04			3.04	8.89	10.28	-10.92	111.333.54	114.048.19	-15.390.43	-13.50%	14	14		2
SPY	23-Jun-2000	26-Jun-2000	5-Jul-2000	145.38	144.65	7	144.38	4.36	141.02	-0.17			-0.17	8.72	10.28	-10.92	111.091.21	114.048.19	-15.390.43	-13.50%	13		13	1
DIA	27-Jun-2000	28-Jun-2000	18-Jul-2000	93.06	93.89	14	88.81	2.67	86.39	1.81			1.81	10.53	10.53	-10.92	113.624.34	114.048.19	-15.390.



Buying Power Study - Tools.xlsx - 3 / 8 - System Simulation



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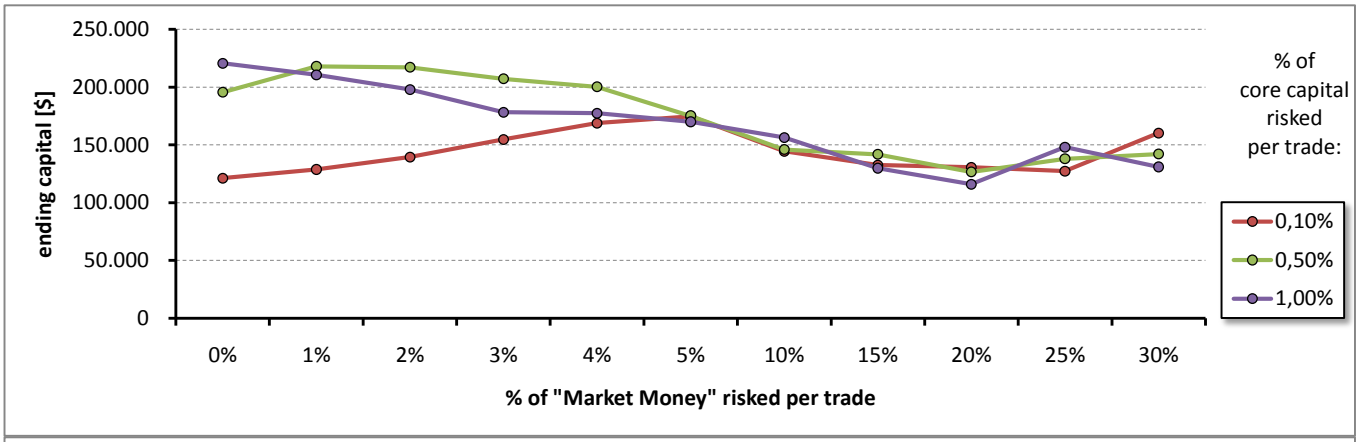
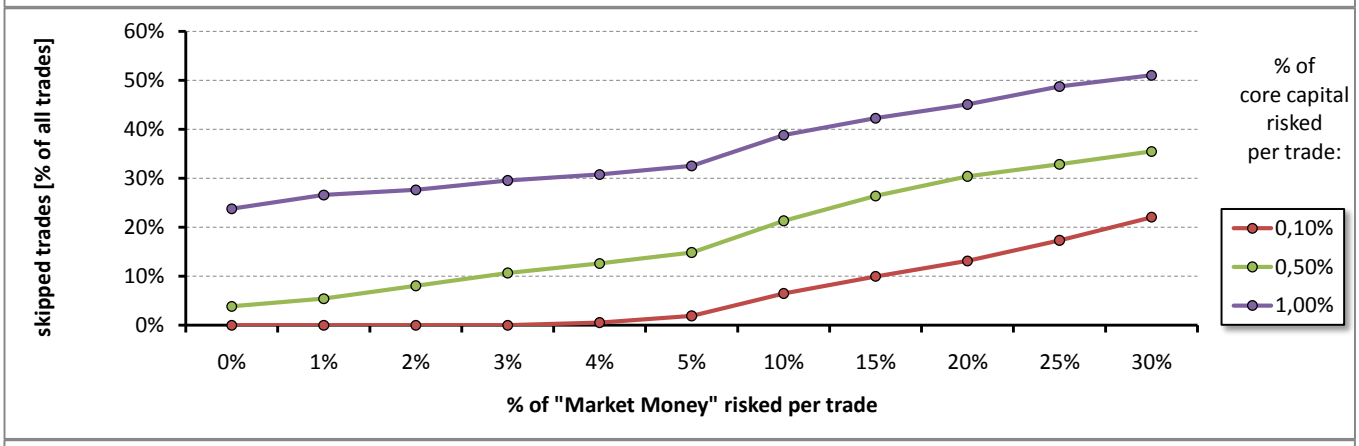
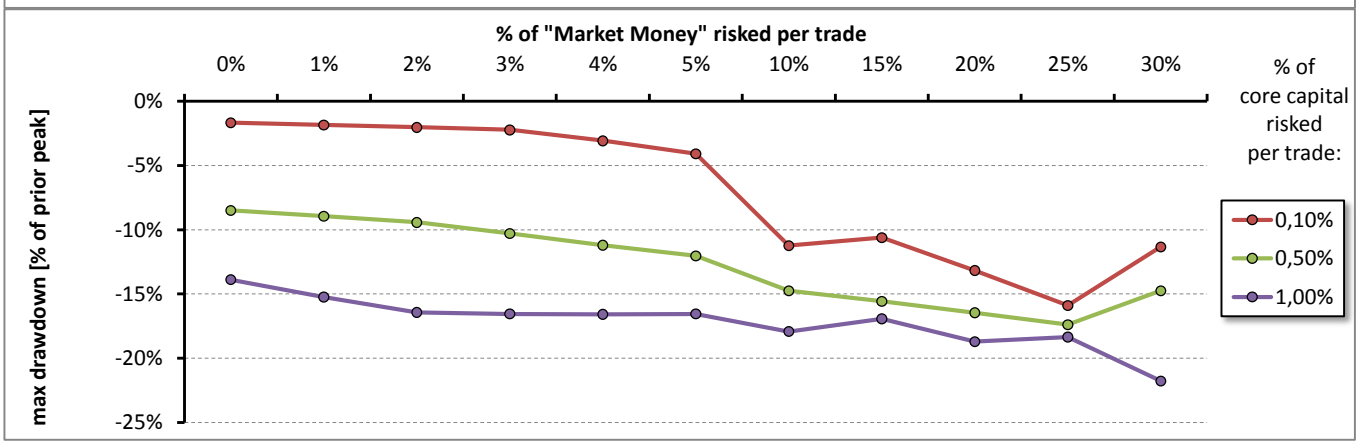

ending capital [$]
250.000
200.000
150.000
100.000
50.000
0
0%
1%
2%
3%
4%
5%
10%
15%
20%
25%
30%
% of "Market Money" risked per trade
% of core capital risked per trade:
0,10%
0,50%
1,00%


skipped trades [% of all trades]
60%
50%
40%
30%
20%
10%
0%
0%
1%
2%
3%
4%
5%
10%
15%
20%
25%
30%
% of "Market Money" risked per trade
% of core capital risked per trade:
0,10%
0,50%
1,00%


% of "Market Money" risked per trade
0%
1%
2%
3%
4%
5%
10%
15%
20%
25%
30%
max drawdown [% of prior peak]
0%
-5%
-10%
-15%
-20%
-25%
% of core capital risked per trade:
0,10%
0,50%
1,00%

Goal Verification For Trading Systems

- Effects Of: Financial Framework, Position Sizing & System Parameters -

1. Financial Framework

trading capital:	**$100.000,00**	
margin requirement (broker):	**50%**	
safety buffer against margin calls:	**5%**	tolerable drop in account value
max. funds:	$190.476,19	
gross profit target:	**$20.000,00**	p.a.
	20,0%	of capital
	40	[R]

2. Position Sizing

risk size per trade (= 1R):	**0,5%**	of capital
	$500,00	

3. Trading System

initial Stop:	**5,0%**	of entry price
position value:	$10.000,00	per trade
system expectation:	**0,8**	[R]
	$400,00	
avg. trade duration:	**20,0**	trading days
traded vehicles:	**10**	

4. Resulting Limits & Requirements

min. number of trades (= required):	50	p.a.
	1	per week
max. parallel trades:	19	
max. possible trades:	228	p.a.
	4	per week
	1,0	per day
min. trade load:	21,9%	of max. possible trades
min. trades per vehicle:	5,0	p.a.
max. trades per vehicle:	22,8	p.a.

color code:	input	calculated value
	requirement	limit