When traders first start out with Technical Analysis they often give little thought to how they will exit their positions. Instead they spend most of their time historically testing entry strategies, hoping to buy every bottom and short every top. This one sided view often defeats the purpose of back testing, as the outcome of a series of trades is highly dependant on how the trade is exited. It is only when you close a position that the gains (or losses) are actually deposited into you account.

To further complicate things, consider the following: You can wait for the market to conform to whatever criteria you wish before you enter a position. However once a position has been taken, you are at the mercy of the market, and it can and will do whatever it pleases. For this reason, you need to have protection in place, in the form of a series of exit strategies.

There are five main categories of exit methods. They are the Time Stop, Profit Stop, Max Loss Stop, Trailing Stop and your Exit Method. The first for can be considered risk control, and the final is part of you system design. Briefly, here is a summary for each:

- **Time Stop** - *This method exits after N days have passed since a position was opened.* It is rarely used by itself; instead it is usually combined with another form of exit. This method ensures that if your target market isn't moving (consolidation), the position will be exited so you can use that money elsewhere.
- **Profit Stop –** *This method exits after a predetermined amount of profit has been made.* It runs contrary to the old maxim "Cut your losses and let you profits run", but it can be very useful in certain strategies. If you perform some form of Maximum Favorable Excursion (MFE) analysis, the stop can be set a predetermined amount away with an excellent probability of a good fill.
- **Max Loss Stop –** *This method exits after a predetermined amount has been lost.* It is often the first type of exit employed by new traders. A stop is placed N percent below (above) your long (short) position entry price. This can be a good exit if the percentage used in the stop level has been obtained using some form of volatility analysis or Maximum Adverse Excursion (MFE) analysis.
- **Trailing Stop –** *This method closely follows price during a trend, while remaining a short distance away. It is continuously moving in the direction of the trade, and only once price has reversed sufficiently to cross this stop, is the position exited.* This stop can often be considered interchangeable with your Exit Method. Used correctly this form of stop maximizes your gains by allowing your winning trades to run.
- **Exit Method –** *This method is the strategy you decide to use to exit your position.* This can be whatever technical criterion you wish to use. An example would be a reversal of your entry method.

The primary focus of my topic today is the trailing stop, although I do offer some ideas for other forms of exits at the end of this document. In an effort to expose you to a few different forms of trailing stops I have tested a number of strategies, using four different entry conditions. The entries were randomly picked from ideas I have tested in the past that were moderately successful. They have not be optimized whatsoever, and I'm sure that with a little effort you will be able to come up with something much better. I tried to make them as different as possible in order to thoroughly test the exits.

The four entries used are:

- **SPX Crossover –** Buy when the S&P 500 Index crosses over its 5 day moving average.

- **Donchian 20 Day Breakout –** Buy when price breaks out to a new 20 day high.
- **MACD Crossing 0 –** Buy when the MACD crosses from below 0 to above 0.
- **First Day of the Month –** Buy on the first trading day of the month.

All tests were performed under the following conditions:

- No Max Loss Stop
- No Time Stop
- No Profit Stop
- No Exit Method
- Entry price is next days Open
- Exit price is the Close
- Stocks tested belong to the S&P 500 index, with data spanning from 1992 to May 2002 (less for some issues)
- No commissions were included
- Software used was NOT Metastock. All tests were performed used AmiBroker RT (http://www.amibroker.com)

Here are the results of the tests:

Offset Moving Average of High/Low:

This method is probably one of the more popular forms of trailing stop, exiting after what can be considered a moving average envelope breakout. A moving average of the lows (highs) is calculated and then offset by N percent.

The code looks like this:

```
// Offset Moving Average of High/Low
MALength = 5; MAOffset = 2.5;  // 2.5% Offset
OffsetMA = HHV(MA(Low,MALength)*(1-(MAOffset/100)),MALength);
```

Overall performance summary – SPX Crossing Moving Average

Total net profit:	9488065.51	Total commissions paid:	0.00
Return on account:	190.52 %	Open position gain/loss	-8215854.72
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-56.51%
Annual system % return:	11.85%	Annual B&H % return:	19.32%
System drawdown:	-9466.23	B&H drawdown:	-9858.65
Max. system drawdown:	-1437153.67	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.66%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1309392.87		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1264022.55		
Total number of trades:	39635	Percent profitable:	44.9%

Number winning trades:	17790	Number losing trades:	21845
Profit of winners:	41098684.32	Loss of losers:	-23394764.09
Total # of bars in winners:	509527	Total # of bars in losers:	376682
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	439469.09	Largest losing trade:	-303597.73
# of bars in largest winner:	17	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	2310.21	Average losing trade:	-1070.94
Avg. # of bars in winners:	28.6	Avg. # bars in losers:	17.2
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	10	Max consec. losers:	17
Bars out of the market:	176344	Interest earned:	0.00
Exposure:	85.2%	Risk adjusted ann. return:	13.90%
Ratio avg win/avg loss:	2.16	Avg. trade (win & loss):	446.67
Profit factor:	1.76		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	3720458.50	Total commissions paid:	0.00
Return on account:	74.71 %	Open position gain/loss	-1637441.04
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-82.95%
Annual system % return:	6.03%	Annual B&H % return:	19.32%
System drawdown:	-9332.32	B&H drawdown:	-9858.65
Max. system drawdown:	-177493.79	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.66%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-106697.57		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-104721.69		
Total number of trades:	22692	Percent profitable:	46.2%
Number winning trades:	10480	Number losing trades:	12212
Profit of winners:	12895366.50	Loss of losers:	-7537466.96
Total # of bars in winners:	322279	Total # of bars in losers:	248137
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	74518.00	Largest losing trade:	-27662.33
# of bars in largest winner:	20	# bars in largest loser:	138
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1230.47	Average losing trade:	-617.22

Avg. # of bars in winners:	30.8	Avg. # bars in losers:	20.3
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	13	Max consec. losers:	14
Bars out of the market:	543226	Interest earned:	0.00
Exposure:	54.6%	Risk adjusted ann. return:	11.06%
Ratio avg win/avg loss:	1.99	Avg. trade (win & loss):	236.11
Profit factor:	1.71		

Overall performance summary – MACD Crossing Above 0

Total net profit:	7774719.23	Total commissions paid:	0.00
Return on account:	156.12 %	Open position gain/loss	-5986917.62
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-64.36%
Annual system % return:	10.38%	Annual B&H % return:	19.32%
System drawdown:	-9465.81	B&H drawdown:	-9858.65
Max. system drawdown:	-2415710.32	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.94%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-2067839.90		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-2020217.82		
Total number of trades:	34900	Percent profitable:	45.4%
Number winning trades:	15830	Number losing trades:	19070
Profit of winners:	31521105.93	Loss of losers:	-17759469.07
Total # of bars in winners:	482157	Total # of bars in losers:	362820
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	840321.06	Largest losing trade:	-213419.08
# of bars in largest winner:	26	# bars in largest loser:	3
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1991.23	Average losing trade:	-931.28
Avg. # of bars in winners:	30.5	Avg. # bars in losers:	19.0
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	14	Max consec. losers:	14
Bars out of the market:	229783	Interest earned:	0.00
Exposure:	80.8%	Risk adjusted ann. return:	12.85%
Ratio avg win/avg loss:	2.14	Avg. trade (win & loss):	394.32
Profit factor:	1.77		

Overall performance summary - Buy First Trading Day Of Month			
Total net profit:	6175305.67	Total commissions paid:	0.00
Return on account:	124.00 %	Open position gain/loss	-4471823.86
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-71.69%
Annual system % return:	8.83%	Annual B&H % return:	19.32%
System drawdown:	-9410.93	B&H drawdown:	-9858.65
Max. system drawdown:	-951521.53	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.73%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-791528.23		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-790826.98		
Total number of trades:	31004	Percent profitable:	44.5%
Number winning trades:	13782	Number losing trades:	17222
Profit of winners:	22204415.18	Loss of losers:	-11557285.65
Total # of bars in winners:	394873	Total # of bars in losers:	317523
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	373696.67	Largest losing trade:	-175179.87
# of bars in largest winner:	28	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1611.12	Average losing trade:	-671.08
Avg. # of bars in winners:	28.7	Avg. # bars in losers:	18.4
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	11	Max consec. losers:	16
Bars out of the market:	375716	Interest earned:	0.00
Exposure:	68.6%	Risk adjusted ann. return:	12.89%
Ratio avg win/avg loss:	2.40	Avg. trade (win & loss):	343.41
Profit factor:	1.92		

Channel Breakout:

This method is also a popular one. The lows of the previous three days are compared and the greatest of the three, minus a small amount (12.5 cents, or 1/8 pre-decimal) is your stop.

The code looks like this:

```
// Channel Breakout
BPeriod = 3;  BOffset = .125;   // 12.5 cents fudge factor
Breakout = LLV(Low,BPeriod) - BOffset;
```

Overall performance summary – SPX Crossing Moving Average

Total net profit:	11771352.54	Total commissions paid:	0.00
Return on account:	236.37 %	Open position gain/loss	-10703815.32
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-46.04%
Annual system % return:	13.58%	Annual B&H % return:	19.32%
System drawdown:	-9658.35	B&H drawdown:	-9858.65
Max. system drawdown:	-2945558.58	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.03%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-2769655.49		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-2673687.23		
Total number of trades:	44302	Percent profitable:	48.5%
Number winning trades:	21479	Number losing trades:	22823
Profit of winners:	49311693.81	Loss of losers:	-26836525.95
Total # of bars in winners:	457633	Total # of bars in losers:	382445
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	767270.93	Largest losing trade:	-240661.37
# of bars in largest winner:	17	# bars in largest loser:	4
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	2295.81	Average losing trade:	-1175.85
Avg. # of bars in winners:	21.3	Avg. # bars in losers:	16.8
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	14
Bars out of the market:	200010	Interest earned:	0.00
Exposure:	83.3%	Risk adjusted ann. return:	16.31%
Ratio avg win/avg loss:	1.95	Avg. trade (win & loss):	507.32
Profit factor:	1.84		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	4341465.91	Total commissions paid:	0.00
Return on account:	87.18 %	Open position gain/loss	-2312587.90
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-80.10%
Annual system % return:	6.80%	Annual B&H % return:	19.32%

System drawdown:	-9203.08	B&H drawdown:	-9858.65
Max. system drawdown:	-331070.00	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.70%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-226494.17		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-222549.62		
Total number of trades:	26879	Percent profitable:	48.8%
Number winning trades:	13121	Number losing trades:	13758
Profit of winners:	14233694.31	Loss of losers:	-7579640.50
Total # of bars in winners:	287920	Total # of bars in losers:	246469
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	103424.39	Largest losing trade:	-53851.38
# of bars in largest winner:	21	# bars in largest loser:	4
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1084.80	Average losing trade:	-550.93
Avg. # of bars in winners:	21.9	Avg. # bars in losers:	17.9
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	14	Max consec. losers:	14
Bars out of the market:	556466	Interest earned:	0.00
Exposure:	53.4%	Risk adjusted ann. return:	12.73%
Ratio avg win/avg loss:	1.97	Avg. trade (win & loss):	247.56
Profit factor:	1.88		

Overall performance summary - MACD Crossing Above 0

Total net profit:	8374683.52	Total commissions paid:	0.00
Return on account:	168.17 %	Open position gain/loss	-7777304.72
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-61.61%
Annual system % return:	10.91%	Annual B&H % return:	19.32%
System drawdown:	-9437.10	B&H drawdown:	-9858.65
Max. system drawdown:	-3072963.94	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.89%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-2847731.23		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-2782148.36		
Total number of trades:	40394	Percent profitable:	49.0%
Number winning trades:	19810	Number losing trades:	20584

Profit of winners:	33765999.33	Loss of losers:	-17614011.09
Total # of bars in winners:	430389	Total # of bars in losers:	362521
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	520071.83	Largest losing trade:	-219790.82
# of bars in largest winner:	14	# bars in largest loser:	8
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1704.49	Average losing trade:	-855.71
Avg. # of bars in winners:	21.7	Avg. # bars in losers:	17.6
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	16	Max consec. losers:	12
Bars out of the market:	263571	Interest earned:	0.00
Exposure:	77.9%	Risk adjusted ann. return:	14.00%
Ratio avg win/avg loss:	1.99	Avg. trade (win & loss):	399.86
Profit factor:	1.92		

Overall performance summary - Buy First Trading Day Of Month

Total net profit:	6654843.30	Total commissions paid:	0.00
Return on account:	133.63 %	Open position gain/loss	-5561740.36
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-69.49%
Annual system % return:	9.32%	Annual B&H % return:	19.32%
System drawdown:	-9154.37	B&H drawdown:	-9858.65
Max. system drawdown:	-481309.05	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.07%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-446031.54		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-435759.49		
Total number of trades:	34361	Percent profitable:	48.6%
Number winning trades:	16691	Number losing trades:	17670
Profit of winners:	24414097.99	Loss of losers:	-12197514.34
Total # of bars in winners:	359268	Total # of bars in losers:	306574
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	134907.14	Largest losing trade:	-63017.76
# of bars in largest winner:	20	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1462.71	Average losing trade:	-690.30
Avg. # of bars in winners:	21.5	Avg. # bars in losers:	17.3

Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	13
Bars out of the market:	417908	Interest eamed:	0.00
Exposure:	65.0%	Risk adjusted ann. return:	14.33%
Ratio avg win/avg loss:	2.12	Avg. trade (win & loss):	355.54
Profit factor:	2.00		

Chandelier Exit:

This method used by Chuck Le Beau of the System Traders Club (http://www.traderclub.com). The Average True Range (ATR) is calculated for a range of days. This is multiplied by a coefficient and then subtracted from the highest High of the last N days. It is called the Chandelier because the trailing stop dangles from the previous high.

The code looks like this:

```
// Chandalier Exit
CATRMultiplier = 2.5;  CATRRange =  5;  CHolding = 10;
Chandelier = HHV(High - CATRMultiplier * ATR(CATRRange), CHolding);
```

Overall performance summary – SPX Crossing Moving Average			
Total net profit:	9116650.98	Total commissions paid:	0.00
Return on account:	183.07 %	Open position gain/loss	-7130923.58
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-58.21%
Annual system % return:	11.54%	Annual B&H % return:	19.32%
System drawdown:	-9727.08	B&H drawdown:	-9858.65
Max. system drawdown:	-2471687.04	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.86%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1088066.97		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1088066.97		
Total number of trades:	40229	Percent profitable:	46.8%
Number winning trades:	18817	Number losing trades:	21412
Profit of winners:	43325667.26	Loss of losers:	-27078092.71
Total # of bars in winners:	499835	Total # of bars in losers:	377479
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	1081802.17	Largest losing trade:	-337313.28
# of bars in largest winner:	38	# bars in largest loser:	9
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00

Average winning trade:	2302.47	Average losing trade:	-1264.62
Avg. # of bars in winners:	26.6	Avg. # bars in losers:	17.6
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	11	Max consec. losers:	13
Bars out of the market:	187531	Interest earned:	0.00
Exposure:	84.3%	Risk adjusted ann. return:	13.69%
Ratio avg win/avg loss:	1.82	Avg. trade (win & loss):	403.88
Profit factor:	1.60		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	4202023.46	Total commissions paid:	0.00
Return on account:	84.38 %	Open position gain/loss	-1513891.33
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-80.74%
Annual system % return:	6.63%	Annual B&H % return:	19.32%
System drawdown:	-9306.37	B&H drawdown:	-9858.65
Max. system drawdown:	-170803.82	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.66%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-96935.39		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-95247.20		
Total number of trades:	22257	Percent profitable:	46.9%
Number winning trades:	10428	Number losing trades:	11829
Profit of winners:	13906237.70	Loss of losers:	-8190322.92
Total # of bars in winners:	325915	Total # of bars in losers:	250965
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	87476.99	Largest losing trade:	-25488.44
# of bars in largest winner:	69	# bars in largest loser:	7
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1333.55	Average losing trade:	-692.39
Avg. # of bars in winners:	31.3	Avg. # bars in losers:	21.2
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	13	Max consec. losers:	14
Bars out of the market:	542511	Interest earned:	0.00
Exposure:	54.6%	Risk adjusted ann. return:	12.15%
Ratio avg win/avg loss:	1.93	Avg. trade (win & loss):	256.81

Profit factor:	1.70

Overall performance summary - MACD Crossing Above 0

Total net profit:	7104202.89	Total commissions paid:	0.00
Return on account:	142.65 %	Open position gain/loss	-5350306.76
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-67.43%
Annual system % return:	9.75%	Annual B&H % return:	19.32%
System drawdown:	-9475.64	B&H drawdown:	-9858.65
Max. system drawdown:	-1975892.51	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.06%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1518288.87		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1483322.88		
Total number of trades:	34751	Percent profitable:	45.2%
Number winning trades:	15722	Number losing trades:	19029
Profit of winners:	31325523.00	Loss of losers:	-18871013.34
Total # of bars in winners:	479247	Total # of bars in losers:	371236
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	734009.16	Largest losing trade:	-331364.09
# of bars in largest winner:	37	# bars in largest loser:	10
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1992.46	Average losing trade:	-991.70
Avg. # of bars in winners:	30.5	Avg. # bars in losers:	19.5
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	14	Max consec. losers:	15
Bars out of the market:	232572	Interest earned:	0.00
Exposure:	80.5%	Risk adjusted ann. return:	12.11%
Ratio avg win/avg loss:	2.01	Avg. trade (win & loss):	358.39
Profit factor:	1.66		

Overall performance summary - Buy First Trading Day Of Month

Total net profit:	6424826.10	Total commissions paid:	0.00
Return on account:	129.01 %	Open position gain/loss	-4232754.19
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-70.55%

Annual system % return:	9.09%	Annual B&H % return:	19.32%
System drawdown:	-8964.79	B&H drawdown:	-9858.65
Max. system drawdown:	-958487.52	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.58%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-632835.96		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-609742.10		
Total number of trades:	31471	Percent profitable:	45.8%
Number winning trades:	14420	Number losing trades:	17051
Profit of winners:	24434137.50	Loss of losers:	-13776557.21
Total # of bars in winners:	407292	Total # of bars in losers:	309360
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	399440.74	Largest losing trade:	-325141.25
# of bars in largest winner:	29	# bars in largest loser:	6
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1694.46	Average losing trade:	-807.96
Avg. # of bars in winners:	28.2	Avg. # bars in losers:	18.1
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	11	Max consec. losers:	15
Bars out of the market:	382401	Interest earned:	0.00
Exposure:	68.0%	Risk adjusted ann. return:	13.36%
Ratio avg win/avg loss:	2.10	Avg. trade (win & loss):	338.65
Profit factor:	1.77		

Keltner Channel:

The Keltner Channel is a volatility based envelope technique based on the range of High to Low daily. It Multiples ATR(N) by a coefficient and then subtracts this from a moving average. The results is a smooth envelop. For this test we are only using the bottom band of the envelope.

The code looks like this:

```
// Keltner Channel
KLength  = 20; KNumATRs = 2;
KMovAvg  = MA(C,KLength);
Keltner  = KMovAvg - KNumATRs * ATR(KLength);
```

Overall performance summary – SPX Crossing Moving Average

Total net profit:	9205904.94	Total commissions paid:	0.00
Return on account:	184.86 %	Open position gain/loss	-4714045.57
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-57.80%

Annual system % return:	11.62%	Annual B&H % return:	19.32%

System drawdown:	-9870.97	B&H drawdown:	-9858.65
Max. system drawdown:	-2728380.50	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-99.16%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1101649.77		
Max. trade % drawdown:	-95.99%		
Trade drawdown:	-679502.98		

Total number of trades:	28139	Percent profitable:	40.7%
Number winning trades:	11446	Number losing trades:	16693
Profit of winners:	42369935.06	Loss of losers:	-28449984.55
Total # of bars in winners:	616170	Total # of bars in losers:	354831
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00

Largest winning trade:	1589585.20	Largest losing trade:	-408030.85
# of bars in largest winner:	130	# bars in largest loser:	67
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00

Average winning trade:	3701.72	Average losing trade:	-1704.31
Avg. # of bars in winners:	53.8	Avg. # bars in losers:	21.3
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	10	Max consec. losers:	17

Bars out of the market:	133667	Interest earned:	0.00

Exposure:	88.8%	Risk adjusted ann. return:	13.08%
Ratio avg win/avg loss:	2.17	Avg. trade (win & loss):	494.69
Profit factor:	1.49		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	8434423.12	Total commissions paid:	0.00
Return on account:	169.37 %	Open position gain/loss	-1972900.04
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-61.34%

Annual system % return:	10.96%	Annual B&H % return:	19.32%

System drawdown:	-9465.96	B&H drawdown:	-9858.65
Max. system drawdown:	-1399292.24	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.64%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-863839.25		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-848794.93		

Total number of trades:	14874	Percent profitable:	46.6%
Number winning trades:	6938	Number losing trades:	7936
Profit of winners:	21996323.84	Loss of losers:	-11589000.68
Total # of bars in winners:	454824	Total # of bars in losers:	253252
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	579617.19	Largest losing trade:	-169640.77
# of bars in largest winner:	100	# bars in largest loser:	18
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	3170.41	Average losing trade:	-1460.31
Avg. # of bars in winners:	65.6	Avg. # bars in losers:	31.9
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	13	Max consec. losers:	10
Bars out of the market:	430489	Interest earned:	0.00
Exposure:	64.0%	Risk adjusted ann. return:	17.13%
Ratio avg win/avg loss:	2.17	Avg. trade (win & loss):	699.70
Profit factor:	1.90		

Overall performance summary - MACD Crossing Above 0

Total net profit:	8941064.42	Total commissions paid:	0.00
Return on account:	179.54 %	Open position gain/loss	-3865420.96
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-59.01%
Annual system % return:	11.39%	Annual B&H % return:	19.32%
System drawdown:	-9663.41	B&H drawdown:	-9858.65
Max. system drawdown:	-2026703.73	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.25%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1155711.09		
Max. trade % drawdown:	-96.76%		
Trade drawdown:	-1129095.22		
Total number of trades:	24262	Percent profitable:	40.0%
Number winning trades:	9698	Number losing trades:	14564
Profit of winners:	36034031.32	Loss of losers:	-23227545.94
Total # of bars in winners:	605663	Total # of bars in losers:	346237
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	1217667.64	Largest losing trade:	-344198.95
# of bars in largest winner:	127	# bars in largest loser:	11
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00

Average winning trade:	3715.61	Average losing trade:	-1594.86
Avg. # of bars in winners:	62.5	Avg. # bars in losers:	23.8
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	15
Bars out of the market:	158762	Interest earned:	0.00
Exposure:	86.7%	Risk adjusted ann. return:	13.14%
Ratio avg win/avg loss:	2.33	Avg. trade (win & loss):	527.84
Profit factor:	1.55		

Overall performance summary - Buy First Trading Day Of Month

Total net profit:	9105064.88	Total commissions paid:	0.00
Return on account:	182.83 %	Open position gain/loss	-3266528.72
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-58.26%
Annual system % return:	11.53%	Annual B&H % return:	19.32%
System drawdown:	-9642.78	B&H drawdown:	-9858.65
Max. system drawdown:	-2042216.20	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.81%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1151794.86		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-1123817.40		
Total number of trades:	22174	Percent profitable:	41.3%
Number winning trades:	9149	Number losing trades:	13025
Profit of winners:	30523666.15	Loss of losers:	-18152072.55
Total # of bars in winners:	540476	Total # of bars in losers:	318823
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	1150620.53	Largest losing trade:	-669965.96
# of bars in largest winner:	115	# bars in largest loser:	15
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	3336.28	Average losing trade:	-1393.63
Avg. # of bars in winners:	59.1	Avg. # bars in losers:	24.5
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	17
Bars out of the market:	260438	Interest earned:	0.00
Exposure:	78.2%	Risk adjusted ann. return:	14.74%
Ratio avg win/avg loss:	2.39	Avg. trade (win & loss):	557.93

Profit factor:	1.68

Bollinger Band Exit:

Bollinger Bands are bands that envelope price. They are based on the standard deviation of price from its exponential moving average over the last N periods. For these tests we are looking for the close to cross to lower Bollinger Band.

The code looks like this:

```
// Lower Bollinger Band Cross
BBLength = 18; BStdDev = 2;
Bollinger = BBandBot(C, BBLength, BStdDev);
```

Overall performance summary – SPX Crossing Moving Average

Total net profit:	10539120.42	Total commissions paid:	0.00
Return on account:	211.63 %	Open position gain/loss	-6360453.58
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-51.69%
Annual system % return:	12.67%	Annual B&H % return:	19.32%
System drawdown:	-9751.69	B&H drawdown:	-9858.65
Max. system drawdown:	-3727710.92	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.61%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1526669.88		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1153482.34		
Total number of trades:	30476	Percent profitable:	40.6%
Number winning trades:	12387	Number losing trades:	18089
Profit of winners:	47857888.78	Loss of losers:	-30958314.78
Total # of bars in winners:	595953	Total # of bars in losers:	361953
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	1477201.22	Largest losing trade:	-448921.39
# of bars in largest winner:	161	# bars in largest loser:	66
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	3863.56	Average losing trade:	-1711.44
Avg. # of bars in winners:	48.1	Avg. # bars in losers:	20.0
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	9	Max consec. losers:	16
Bars out of the market:	141069	Interest earned:	0.00
Exposure:	88.2%	Risk adjusted ann. return:	14.37%

Ratio avg win/avg loss:	2.26	Avg. trade (win & loss):	554.52
Profit factor:	1.55		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	7201278.20	Total commissions paid:	0.00
Return on account:	144.60 %	Open position gain/loss	-2003794.66
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-66.99%
Annual system % return:	9.84%	Annual B&H % return:	19.32%
System drawdown:	-9374.16	B&H drawdown:	-9858.65
Max. system drawdown:	-559067.64	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.64%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-407778.62		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-404966.35		
Total number of trades:	17281	Percent profitable:	47.1%
Number winning trades:	8144	Number losing trades:	9137
Profit of winners:	20113690.59	Loss of losers:	-10908617.72
Total # of bars in winners:	417560	Total # of bars in losers:	247587
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	350312.40	Largest losing trade:	-137356.94
# of bars in largest winner:	153	# bars in largest loser:	13
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	2469.76	Average losing trade:	-1193.89
Avg. # of bars in winners:	51.3	Avg. # bars in losers:	27.1
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	10	Max consec. losers:	12
Bars out of the market:	464423	Interest earned:	0.00
Exposure:	61.1%	Risk adjusted ann. return:	16.10%
Ratio avg win/avg loss:	2.07	Avg. trade (win & loss):	532.67
Profit factor:	1.84		

Overall performance summary – MACD Crossing Above 0

Total net profit:	8911845.01	Total commissions paid:	0.00
Return on account:	178.95 %	Open position gain/loss	-5480030.16
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-59.15%

Annual system % return:	11.37%	Annual B&H % return:	19.32%
System drawdown:	-9591.81	B&H drawdown:	-9858.65
Max. system drawdown:	-2111725.52	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.44%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1274535.87		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1245183.48		
Total number of trades:	27131	Percent profitable:	42.1%
Number winning trades:	11433	Number losing trades:	15698
Profit of winners:	38131754.83	Loss of losers:	-23739879.67
Total # of bars in winners:	578468	Total # of bars in losers:	348188
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	725763.37	Largest losing trade:	-252448.66
# of bars in largest winner:	68	# bars in largest loser:	10
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	3335.24	Average losing trade:	-1512.29
Avg. # of bars in winners:	50.6	Avg. # bars in losers:	22.2
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	18
Bars out of the market:	173286	Interest earned:	0.00
Exposure:	85.5%	Risk adjusted ann. return:	13.30%
Ratio avg win/avg loss:	2.21	Avg. trade (win & loss):	530.46
Profit factor:	1.61		

Overall performance summary - Buy First Trading Day Of Month

Total net profit:	8280215.58	Total commissions paid:	0.00
Return on account:	166.27 %	Open position gain/loss	-4551691.08
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-62.04%
Annual system % return:	10.83%	Annual B&H % return:	19.32%
System drawdown:	-9320.14	B&H drawdown:	-9858.65
Max. system drawdown:	-824608.10	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.75%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-658795.48		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-634754.28		

Total number of trades:	24921	Percent profitable:	40.9%
Number winning trades:	10203	Number losing trades:	14718
Profit of winners:	30296536.51	Loss of losers:	-17464629.85
Total # of bars in winners:	505027	Total # of bars in losers:	327341
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	544261.41	Largest losing trade:	-225480.41
# of bars in largest winner:	52	# bars in largest loser:	3
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	2969.38	Average losing trade:	-1186.62
Avg. # of bars in winners:	49.5	Avg. # bars in losers:	22.2
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	11	Max consec. losers:	15
Bars out of the market:	281908	Interest earned:	0.00
Exposure:	76.4%	Risk adjusted ann. return:	14.17%
Ratio avg win/avg loss:	2.50	Avg. trade (win & loss):	514.90
Profit factor:	1.73		

Volatility Trailing Stop:

The volatility stop is a self-adjusting stop that uses a multiple of ATR(N) to offset itself from price. By using the highest high value of the stop over the last N days it only moves in one direction.

The code looks like this:

```
// Volatility Trailing Stop
VATRMultiplier = 2;  VATRRange =  5;  VHolding = 5;
Volatility = HHV(C - VATRMultiplier*ATR(VATRRange), VHolding);
```

Overall performance summary – SPX Crossing Moving Average

Total net profit:	10082108.63	Total commissions paid:	0.00
Return on account:	202.45 %	Open position gain/loss	-7123492.59
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-53.78%
Annual system % return:	12.32%	Annual B&H % return:	19.32%
System drawdown:	-9681.38	B&H drawdown:	-9858.65
Max. system drawdown:	-1881156.87	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.65%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1586025.45		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1531069.84		

Total number of trades:	38726	Percent profitable:	46.4%
Number winning trades:	17986	Number losing trades:	20740
Profit of winners:	46724144.03	Loss of losers:	-29518542.80
Total # of bars in winners:	517846	Total # of bars in losers:	382556
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	496085.52	Largest losing trade:	-379530.85
# of bars in largest winner:	28	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	2597.81	Average losing trade:	-1423.27
Avg. # of bars in winners:	28.8	Avg. # bars in losers:	18.4
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	16
Bars out of the market:	170304	Interest earned:	0.00
Exposure:	85.8%	Risk adjusted ann. return:	14.37%
Ratio avg win/avg loss:	1.83	Avg. trade (win & loss):	444.29
Profit factor:	1.58		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	4187943.15	Total commissions paid:	0.00
Return on account:	84.10 %	Open position gain/loss	-1604405.14
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-80.80%
Annual system % return:	6.62%	Annual B&H % return:	19.32%
System drawdown:	-9735.47	B&H drawdown:	-9858.65
Max. system drawdown:	-156311.52	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.40%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-104163.36		
Max. trade % drawdown:	-97.96%		
Trade drawdown:	-103445.00		
Total number of trades:	23489	Percent profitable:	47.3%
Number winning trades:	11114	Number losing trades:	12375
Profit of winners:	14056174.39	Loss of losers:	-8263826.10
Total # of bars in winners:	314914	Total # of bars in losers:	249777
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	131041.87	Largest losing trade:	-40458.59
# of bars in largest winner:	51	# bars in largest loser:	8
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00

Average winning trade:	1264.73	Average losing trade:	-667.78
Avg. # of bars in winners:	28.3	Avg. # bars in losers:	20.2
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	12
Bars out of the market:	548295	Interest earned:	0.00
Exposure:	54.1%	Risk adjusted ann. return:	12.22%
Ratio avg win/avg loss:	1.89	Avg. trade (win & loss):	246.60
Profit factor:	1.70		

Overall performance summary – MACD Crossing Above 0

Total net profit:	7386659.47	Total commissions paid:	0.00
Return on account:	148.33 %	Open position gain/loss	-5557771.32
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-66.14%
Annual system % return:	10.02%	Annual B&H % return:	19.32%
System drawdown:	-9410.27	B&H drawdown:	-9858.65
Max. system drawdown:	-2064269.46	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.41%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1767007.71		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1726313.76		
Total number of trades:	35247	Percent profitable:	46.9%
Number winning trades:	16547	Number losing trades:	18700
Profit of winners:	32391922.70	Loss of losers:	-19447491.90
Total # of bars in winners:	478533	Total # of bars in losers:	366879
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	465644.73	Largest losing trade:	-350649.69
# of bars in largest winner:	9	# bars in largest loser:	10
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1957.57	Average losing trade:	-1039.97
Avg. # of bars in winners:	28.9	Avg. # bars in losers:	19.6
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	13
Bars out of the market:	236065	Interest earned:	0.00
Exposure:	80.2%	Risk adjusted ann. return:	12.48%
Ratio avg win/avg loss:	1.88	Avg. trade (win & loss):	367.25

Profit factor:	1.67

Overall performance summary - Buy First Trading Day Of Month

Total net profit:	6501491.01	Total commissions paid:	0.00
Return on account:	130.55 %	Open position gain/loss	-3983743.98
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-70.20%
Annual system % return:	9.16%	Annual B&H % return:	19.32%
System drawdown:	-8809.48	B&H drawdown:	-9858.65
Max. system drawdown:	-625639.09	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.78%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-463063.45		
Max. trade % drawdown:	-97.24%		
Trade drawdown:	-462653.20		
Total number of trades:	31807	Percent profitable:	45.7%
Number winning trades:	14532	Number losing trades:	17275
Profit of winners:	25508909.49	Loss of losers:	-15023674.50
Total # of bars in winners:	423109	Total # of bars in losers:	313334
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	208991.86	Largest losing trade:	-100091.65
# of bars in largest winner:	29	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1755.36	Average losing trade:	-869.68
Avg. # of bars in winners:	29.1	Avg. # bars in losers:	18.1
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	14
Bars out of the market:	359955	Interest earned:	0.00
Exposure:	69.9%	Risk adjusted ann. return:	13.11%
Ratio avg win/avg loss:	2.02	Avg. trade (win & loss):	329.65
Profit factor:	1.70		

SafeZone Exit:

The SafeZone exit has been developed by Dr. Alexander Elder and is detailed in his new book titled "Come into my Trading Room". It is a favorite of mine as it is very similar to Larry Williams Greatest Swing Value. It measures the average amount that price has swung from the Open to the Low over the *previous N days. Then the average is multiplied by a coefficient to offset it from price. Finally the highest high value of the stop over the previous N days is used to ensure it move only in one direction.*

The code looks like this:

```
// SafeZone Stop
SPeriod = 10; SCoeff = 2; SHolding = 5;
ADP = Sum(IIf(L>Ref(L,-1),L-Ref(L,-1),0),SPeriod)/Sum(IIf(L>Ref(L,-1),1,0),SPeriod);
SFLongStop = Low - (SCoeff * Ref(ADP,-1));
SafeZone = HHV(SFLongStop, SHolding);
```

Overall performance summary – SPX Crossing Movi ng Average

Total net profit:	9037628.58	Total commissions paid:	0.00
Return on account:	181.48 %	Open position gain/loss	-8016110.48
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-58.57%
Annual system % return:	11.48%	Annual B&H % return:	19.32%
System drawdown:	-9463.26	B&H drawdown:	-9858.65
Max. system drawdown:	-2113571.51	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-97.93%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-1987353.09		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-1918491.52		
Total number of trades:	43804	Percent profitable:	47.0%
Number winning trades:	20571	Number losing trades:	23233
Profit of winners:	41395804.73	Loss of losers:	-24342065.67
Total # of bars in winners:	466966	Total # of bars in losers:	378395
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	1010220.92	Largest losing trade:	-320185.99
# of bars in largest winner:	38	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	2012.34	Average losing trade:	-1047.74
Avg. # of bars in winners:	22.7	Avg. # bars in losers:	16.3
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	14	Max consec. losers:	13
Bars out of the market:	204889	Interest earned:	0.00
Exposure:	82.9%	Risk adjusted ann. return:	13.85%
Ratio avg win/avg loss:	1.92	Avg. trade (win & loss):	389.32
Profit factor:	1.70		

Overall performance summary – Donchian 20 Day Channel Breakout

Total net profit:	3914678.22	Total commissions paid:	0.00
Return on account:	78.61 %	Open position gain/loss	-1815532.96
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-82.06%
Annual system % return:	6.28%	Annual B&H % return:	19.32%
System drawdown:	-9735.47	B&H drawdown:	-9858.65
Max. system drawdown:	-236529.69	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.40%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-142031.33		
Max. trade % drawdown:	-97.96%		
Trade drawdown:	-139401.12		
Total number of trades:	25690	Percent profitable:	47.8%
Number winning trades:	12278	Number losing trades:	13412
Profit of winners:	13081115.46	Loss of losers:	-7350904.28
Total # of bars in winners:	291020	Total # of bars in losers:	244987
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	105329.76	Largest losing trade:	-27662.81
# of bars in largest winner:	51	# bars in largest loser:	3
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1065.41	Average losing trade:	-548.08
Avg. # of bars in winners:	23.7	Avg. # bars in losers:	18.3
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	12	Max consec. losers:	13
Bars out of the market:	567537	Interest earned:	0.00
Exposure:	52.5%	Risk adjusted ann. return:	11.95%
Ratio avg win/avg loss:	1.94	Avg. trade (win & loss):	223.05
Profit factor:	1.78		

Overall performance summary – MACD Crossing Above 0

Total net profit:	8082369.34	Total commissions paid:	0.00
Return on account:	162.30 %	Open position gain/loss	-7456773.05
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-62.95%
Annual system % return:	10.65%	Annual B&H % return:	19.32%
System drawdown:	-9286.95	B&H drawdown:	-9858.65

Max. system drawdown:	-3707671.41	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.02%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-3435917.86		
Max. trade % drawdown:	-97.31%		
Trade drawdown:	-3356789.13		
Total number of trades:	39746	Percent profitable:	47.4%
Number winning trades:	18843	Number losing trades:	20903
Profit of winners:	33712380.01	Loss of losers:	-18173237.63
Total # of bars in winners:	439414	Total # of bars in losers:	369281
Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	1524738.78	Largest losing trade:	-368249.00
# of bars in largest winner:	32	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1789.12	Average losing trade:	-869.41
Avg. # of bars in winners:	23.3	Avg. # bars in losers:	17.7
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	13	Max consec. losers:	15
Bars out of the market:	259977	Interest earned:	0.00
Exposure:	78.2%	Risk adjusted ann. return:	13.61%
Ratio avg win/avg loss:	2.06	Avg. trade (win & loss):	390.96
Profit factor:	1.86		

Overall performance summary - Buy First Trading Day Of Month

Total net profit:	6258423.64	Total commissions paid:	0.00
Return on account:	125.67 %	Open position gain/loss	-4766568.30
Buy&Hold profit:	21815025.06	Bars (avg. days) in test:	1195262 (3477)
Buy&Hold % return:	438.05%	System to Buy&Hold index:	-71.31%
Annual system % return:	8.92%	Annual B&H % return:	19.32%
System drawdown:	-9204.09	B&H drawdown:	-9858.65
Max. system drawdown:	-561030.48	B&H max. drawdown:	-6850847.46
Max. system % drawdown:	-98.12%	B&H max. % drawdown:	-99.19%
Max. trade drawdown:	-451491.56		
Max. trade % drawdown:	-97.25%		
Trade drawdown:	-451091.57		
Total number of trades:	34078	Percent profitable:	47.2%
Number winning trades:	16086	Number losing trades:	17992
Profit of winners:	23284109.34	Loss of losers:	-12259117.40
Total # of bars in winners:	365005	Total # of bars in losers:	298385

Commissions paid in winners:	0.00	Commissions paid in losers:	0.00
Largest winning trade:	180790.08	Largest losing trade:	-87297.79
# of bars in largest winner:	18	# bars in largest loser:	5
Commission paid in largest winner:	0.00	Commission paid in largest loser:	0.00
Average winning trade:	1447.48	Average losing trade:	-681.36
Avg. # of bars in winners:	22.7	Avg. # bars in losers:	16.6
Avg. commission paid in winner:	0.00	Avg. commission paid in loser:	0.00
Max consec. winners:	13	Max consec. losers:	15
Bars out of the market:	422363	Interest earned:	0.00
Exposure:	64.7%	Risk adjusted ann. return:	13.79%
Ratio avg win/avg loss:	2.12	Avg. trade (win & loss):	323.52
Profit factor:	1.90		

Other Exit Methods:

These are other methods of closing a position that you may wish to experiment with. They are listed in no particular order and I have given references where available.

Bailout Exit – exit on first profitable opening. Larry Williams and Ralph Vince conceived the concept while doing research on money management methods in the late 1970's. The advantages to this exit include a high winning ratio and a good profit/loss ratio. See "Long-Term Secrets to Short-Term Trading", Larry Williams.

N Days Against You – exit after price close N opposite your position for each of the last N days. See "Cybernetic Trading Strategies: Developing a Profitable Trading System with State-of-the-Art Technologies", Murray A. Ruggiero

Greatest Swing Value (GSV) Exit – measure the distance from Open to Low on Up days and Open to High on down days. Take an average of this and use as exit/stop. See "Long-Term Secrets to Short-Term Trading", Larry Williams.

Kase DevStop – The Metastock code follows this one. See "Trading with the Odds", Cynthia Kase

```
AVTR:=Mov(HHV(H,2) - LLV(L,2),20, S);
SD:=Stdev(HHV(H,2) - LLV(L,2),20);
HHV(H-AVTR-3.6*SD, 20);
HHV(H-AVTR-2.2*SD,20);
HHV(H-AVTR-SD,20);
HHV(H-AVTR,20);
```

Parabolic SAR – A popular formula that is included with Metastock.

Finally, for thos wishing to conduct their own tests using AmiBroker, I have enclosed the code use to conduct all these tests:

```
// Displays title when plotted as indicator
Title = Name() + " White - Trailing, Yellow - Profit, Red - MaxLoss, Blue - Entry";

// Custom indicator formulas
TDM = BarsSince( Month() != Ref(Month(),-1) ) + 1;

/////////////// External data series used in testing
SPX = Foreign("!SPX","A",1);     // S&P 500 Index Average Price

/////////////// Optional Optimizer parameters
Periods = Optimize("Periods",5,1,51,5);       // Default 5 bars

///////////////////////////////////////////////////////////////////////////////

////////////// Entry Method 1 - Intermarket - S&P500 Moving Average Cross
//Entry = Cross(SPX,MA(SPX,Periods));

////////////// Entry Method 2 - Donchian 20 Day Channel Breakout
//Entry = Cross(H,Ref(HHV(H,19),-1));

////////////// Entry Method 3 - MACD Crossing 0
//Entry = Cross(MACD(),Ref(MACD(),-1));

////////////// Entry Method 4 - TDM Seasonal Entry
Entry = TDM == 1;

// Do not alter these
Buy = Ref(Entry,-1);
EntryPrice = Open;

///////////////////////////////////////////////////////////////////////////////

////////////// Maximum Stop Loss   (0 to disable) //////////////
LossPercent = 4;
MaxLossStop = 0;//EntryPrice*(1-(LossPercent/100));

////////////// Timed Bar Stop   (0 to disable)
TimeStop = 0;

////////////// Profit Stop
ProfitStop = EntryPrice;//(2*EntryPrice-1*MaxLossStop) * 10;

////////////// Trailing Stop Loss //////////////

// Offset Moving Average of High/Low
MALength = 5; MAOffset = 2.5;  // 2.5% Offset
OffsetMA = HHV(MA(Low,MALength)*(1-(MAOffset/100)),MALength);

// Channel Breakout
BPeriod = 3;  BOffset = .125;   // 12.5 cents fudge factor
Breakout = LLV(Low,BPeriod) - BOffset;

// Chandalier Exit
CATRMultiplier = 2.5;  CATRRange =  5;  CHolding = 10;
Chandelier = HHV(High - CATRMultiplier * ATR(CATRRange), CHolding);

// Keltner Channel
KLength  = 20; KNumATRs = 2;
KMovAvg  = MA(C,KLength);
Keltner  = KMovAvg - KNumATRs * ATR(KLength);

// Lower Bollinger Band Cross
BBLength = 18; BStdDev = 2;
Bollinger = BBandBot(C, BBLength, BStdDev);

// Volatility Trailing Stop
VATRMultiplier = 2;  VATRRange =  5;  VHolding = 5;
Volatility = HHV(C - VATRMultiplier*ATR(VATRRange), VHolding);
```

```
// SafeZone Stop
SPeriod = 10; SCoeff = 2; SHolding = 5;
ADP = Sum(IIf(L>Ref(L,-1),L-Ref(L,-1),0),SPeriod)/Sum(IIf(L>Ref(L,-1),1,0),SPeriod);
SFLongStop = Low - (SCoeff * Ref(ADP,-1));
SafeZone = HHV(SFLongStop, SHolding);

////////////// Set this next line to the stop you wish to use
TrailingStop = Breakout;//OffsetMA;//SafeZone;//Volatility;//Bollinger;//Keltner;//Chandelier;//

//////////////////////////////////////////////////////////////////////////////

// 3 Consecutive Up Days
ConsecUp = IIf(C>Ref(C,-1) AND Ref(C,-1)>Ref(C,-2) AND Ref(C,-2)>Ref(C,-3), 1, 0);

// 2 Consecutive Down Days
ConsecDn = IIf(C<Ref(C,-1) AND Ref(C,-1)<Ref(C,-2), 1, 0);

// Bailout Exit
Bailout = IIf(O>EntryPrice, C, 0);   // If used, change sell price to Open

// RSI Crosses below 50
RSIPeriods = 21;
RSICross = Cross(50,RSI(RSIPeriods));

////////////// Set this next line to the exit you wish to use
OtherSell = False;

//////////////////////////////////////////////////////////////////////////////
scRemBuyInit(Buy, EntryPrice, MaxLossStop, ProfitStop, TrailingStop, 1000000);

EntryPrice = ValueWhen(Buy, EntryPrice);
MaxLossStop = ValueWhen(Buy, MaxLossStop);


Buy=Buy;
Sell=Sell OR OtherSell;
BuyPrice=EntryPrice;
SellPrice=Close;

MaxGraph=14;
Plot(Close,"close",IIf( Buy, 6, IIf(Sell , 4 ,0 )),128);
Plot(EntryPrice,"Ep",3,1);
Plot(MaxLossStop,"LL",4,1);
//Plot(ProfitStop,"Profit",7,1);
Plot(TrailingStop,"Trail",2,1);
```