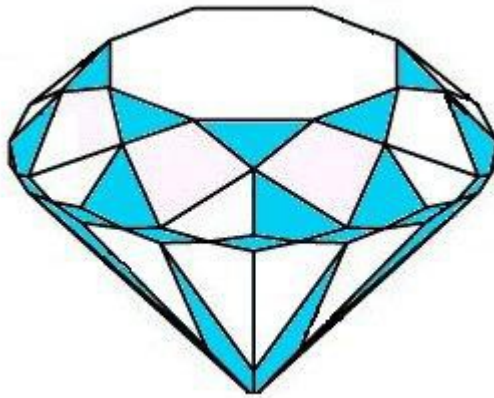


Diamond Backtesting with Walk Forward Manager (BTWFMgr)



the new cutting edge in Backtesting
sharp and clear like a diamond

by
Burkhard Eichberger
Professional Software Solutions
<http://www.ProfSoftware.com/bt>

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(BTWFMgr Version 3.X)

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Introduction to BTWFMgr

Developing a successful trading strategy is a craft - some might even say an art. You will need the right tools to be able to test, evaluate and optimize your trading strategies. To assist you in this task and adventure - we have developed a new powerful software tool:

“Diamond Backtesting with Walk Forward Manager” – or in short BTWFMgr.

For more current information and to download go to <http://www.ProfSoftware.com/bt>

We have grouped the BTWFMgr manual into the following chapters:

- **Overview**
Presents the main BTWFMgr functions with a brief description
- **BTWFMgr Basics**
Introduces you to some basic concepts of BTWFMgr and shows you how to get started and some basic BTWFMgr functions
- **Strategy Development**
Describes some basic concepts how strategies can be developed (using BTWFMgr)
- **Function Reference**
Here we show you each BTWFMgr function in greater detail
- **Licensing & Ordering**
Details about ordering BTWFMgr and licencing
- **Installation**
Step-by-step guide how to install BTWFMgr
- **Glossary**
Explains basic terms and abbreviations used in this BTWFMgr manual

We hope you will find BTWFMgr a valuable tool and invite your feedback at: pss@pobox.com

Check frequently for updates – as we continuously improve and expand BTWFMgr at:

www.profsoftware.com/bt/dl.htm

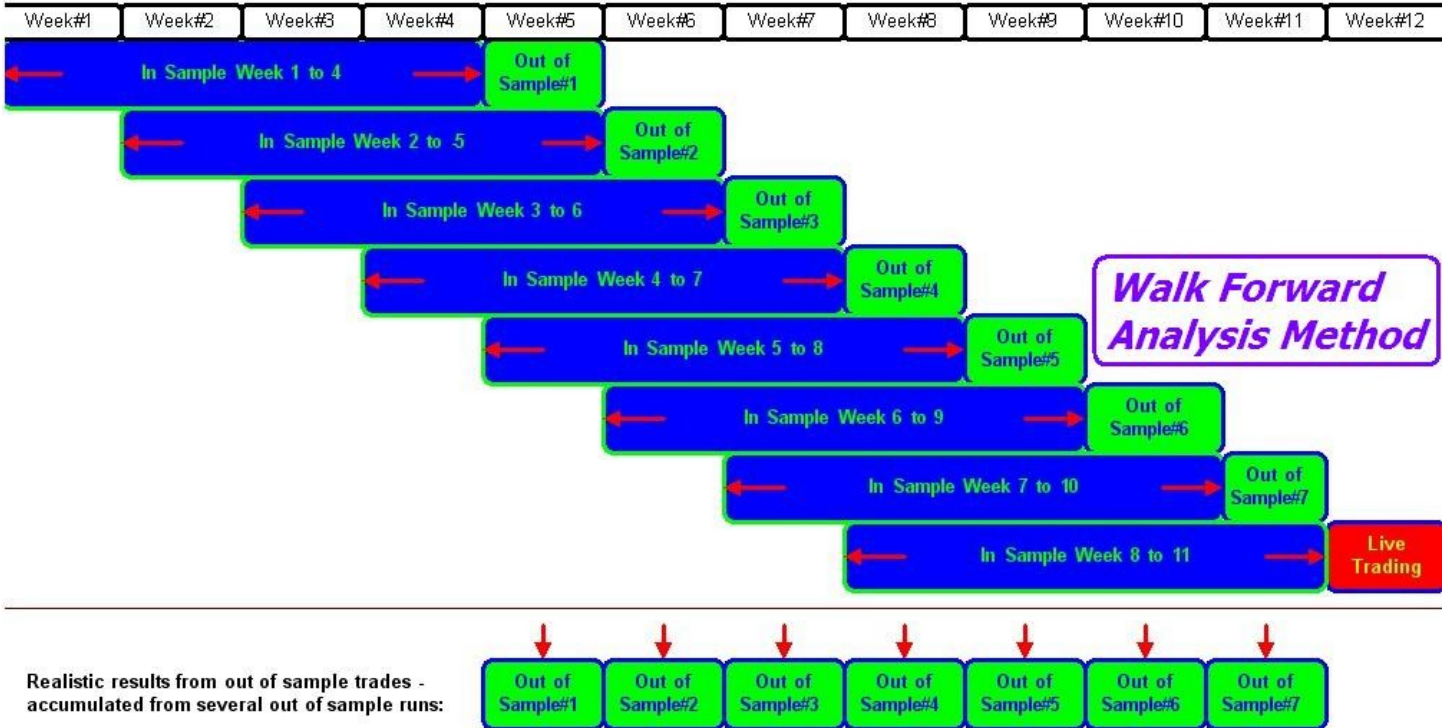
BTWFMgr works for example with the TradeStation Open Platform® (TradeStation.com) and enhances one of the most powerful trading and strategy research platforms available which seamlessly integrate the charts and strategy and fully automated executions.

Overview

Below we will introduce you to the main functions BTWFMgr is offering you, so you can analyze and improve your strategies. For more details on each function use the Reference Chapter

Fully automated advanced Walk Forward Analysis (WFA)

Provides you with a powerful, more realistic backtesting method, testing essentially the predictability/robustness, instead of the usual unrealistic curve fitting optimization, saving you hours or even days of cumbersome calculations. Below is a 4 week/1week example:

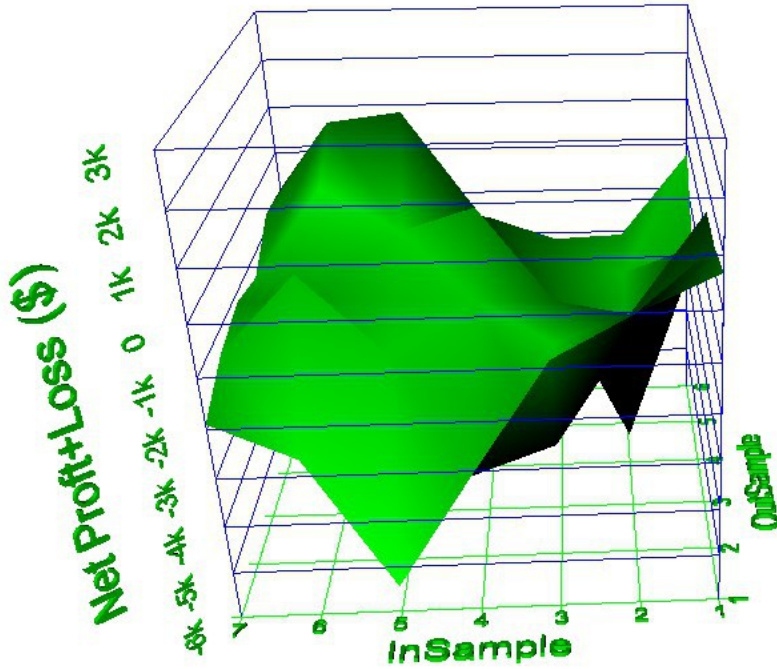


All aspects of the walk forward analysis can be customized:

Filter, Sort, In/OutSample Sequences/Clusters - using intuitive Filter/Sort and Period Manager interfaces.

Walk Forward Analysis Results can be shown even in a 3D cluster view

presenting in this example the correlations between in and out sample variations:

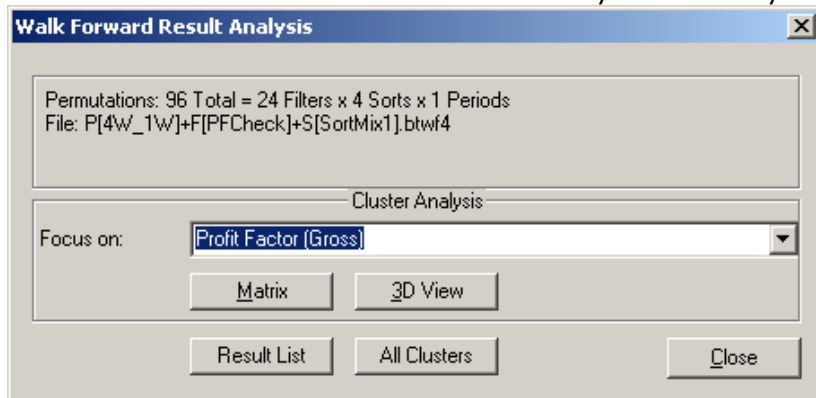


Also results can be viewed as a spreadsheet/2D view.

Below is an example showing the clusters (using 5 to 30 runs and 10 to 30% out of sample):

NET PROFIT+LOSS (\$)	10%	15%	20%	25%	30%	ALL
5 Runs	685.63	429.61	427.42	-942.34	-1770.47	-234.03
10 Runs	-20.78	-1176.09	-1641.67	-5310.83	-2263.31	-2082.54
15 Runs	-842.92	-3520.47	-2228.59	-2094.9	-2040.6	-2145.49
20 Runs	-3107.4	-2624.66	-1246.15	-39.24	-897.08	-1582.91
25 Runs	-5432.81	-1490.13	-1166.17	-497.14	1375.94	-1442.06
30 Runs	-2656.56	116.74	-1122.29	422.6	1188.7	-410.16
ALL	-1895.81	-1377.5	-1162.91	-1410.31	-734.47	-817.76

These Walk forward result views can use any of the many statistics available:



Smart/Hybrid Ranking

Finds you the best backtesting results by combining your most important (customizable) sort criteria into a hybrid. Below is an example using Equity(3x), Volatility(2x) and Drawdown(2x):

Smart Ranking Analysis Parameter 'EquRankDef1':

[3x\$RankEqu, 2x\$RankVolatility, 2x\$RankMaxDD

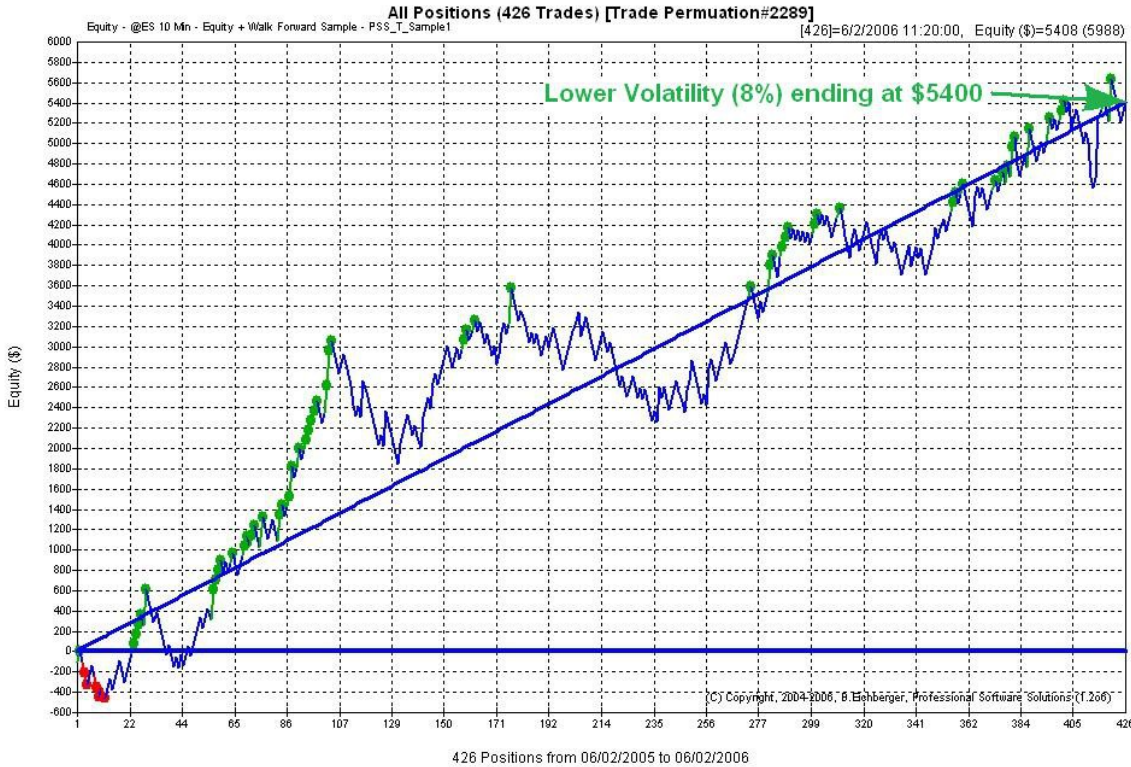
The ideal result would be at the top in all sort criterias = 100%,

below is an example, showing the smartranking, with the best hybrid result (99.44%) on top:

Sorted by SmartRanking1: 3 x \$RankEqu, 2 x \$RankVolatility, 2 x \$RankMaxDD (EquRankDef1)	
99.44%	(Equ=11645.00\$, Pos=446) - Perm1716 (RSILength=17, OverSold=44, OverBought=6)
99.37%	(Equ=11750.00\$, Pos=460) - Perm1236 (RSILength=16, OverSold=44, OverBought=6)
99.05%	(Equ=11567.50\$, Pos=479) - Perm756 (RSILength=15, OverSold=44, OverBought=62)
98.91%	(Equ=10972.50\$, Pos=488) - Perm276 (RSILength=14, OverSold=44, OverBought=62)
98.83%	(Equ=10892.50\$, Pos=434) - Perm2196 (RSILength=18, OverSold=44, OverBought=6)
98.65%	(Equ=10702.50\$, Pos=447) - Perm1252 (RSILength=16, OverSold=44, OverBought=6)
98.50%	(Equ=10222.50\$, Pos=428) - Perm1732 (RSILength=17, OverSold=44, OverBought=6)
98.47%	(Equ=9677.50\$, Pos=487) - Perm196 (RSILength=14, OverSold=42, OverBought=62)
98.30%	(Equ=10717.50\$, Pos=484) - Perm292 (RSILength=14, OverSold=44, OverBought=64)
98.19%	(Equ=11077.50\$, Pos=437) - Perm1876 (RSILength=17, OverSold=48, OverBought=6)
98.08%	(Equ=11095.00\$, Pos=456) - Perm1796 (RSILength=17, OverSold=46, OverBought=6)
98.05%	(Equ=10355.00\$, Pos=474) - Perm676 (RSILength=15, OverSold=42, OverBought=62)
97.84%	(Equ=10745.00\$, Pos=466) - Perm772 (RSILength=15, OverSold=44, OverBought=64)
97.80%	(Equ=10940.00\$, Pos=462) - Perm1316 (RSILength=16, OverSold=46, OverBought=6)
96.90%	(Equ=11102.50\$, Pos=472) - Perm836 (RSILength=15, OverSold=46, OverBought=62)
96.79%	(Equ=9167.50\$, Pos=489) - Perm740 (RSILength=15, OverSold=44, OverBought=60)
96.68%	(Equ=9885.00\$, Pos=478) - Perm308 (RSILength=14, OverSold=44, OverBought=66)
96.61%	(Equ=9130.00\$, Pos=404) - Perm520 (RSILength=15, OverSold=38, OverBought=62)
96.53%	(Equ=8647.50\$, Pos=478) - Perm212 (RSILength=14, OverSold=42, OverBought=64)
96.29%	(Equ=10580.00\$, Pos=449) - Perm2276 (RSILength=18, OverSold=46, OverBought=6)
Remaining 980 Results	
Sorted by SmartRanking2: 4 x \$RankProb, 2.5 x \$RankEqu, 3 x \$RankMaxDD (EquRankDef2)	
Sorted by SmartRanking3: 3 x \$RankEqu, 10 x \$RankVolatility, 2 x \$RankProb (EquRankDef3)	

Innovative Volatility Analysis

For most traders a fairly predictable, smooth equity graph is preferable to an equity graph with wider swings, but a higher ending equity. The innovative volatility analysis measures the "swing" around the smooth equity income line. Below is an example of the fairly smooth equity graph:

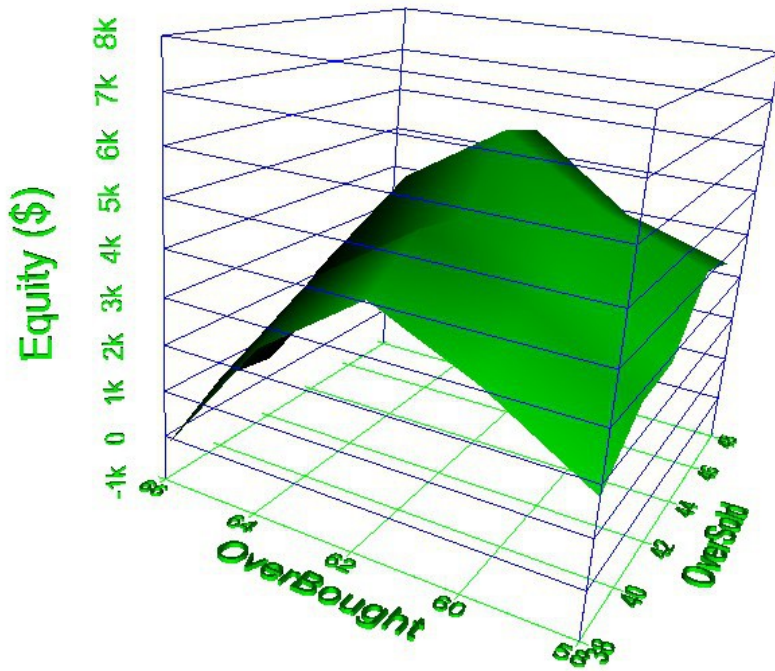


below we see the same ending equity(\$5400) but a much higher volatility(17%) and wider "swings":

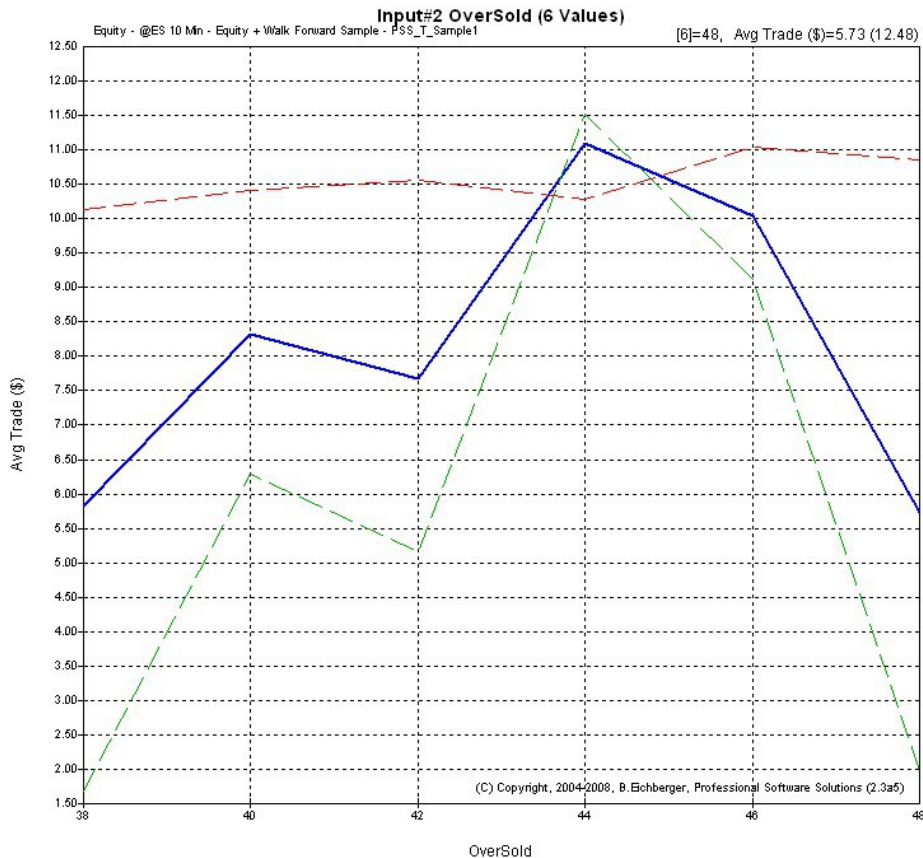


Advanced Strategy Input Parameter Analysis

Shows you a detailed visual analysis of the effect of EACH strategy input parameter variations on the overall result, below is an example in 3D view, combining RSI oversold and overbought parameter:

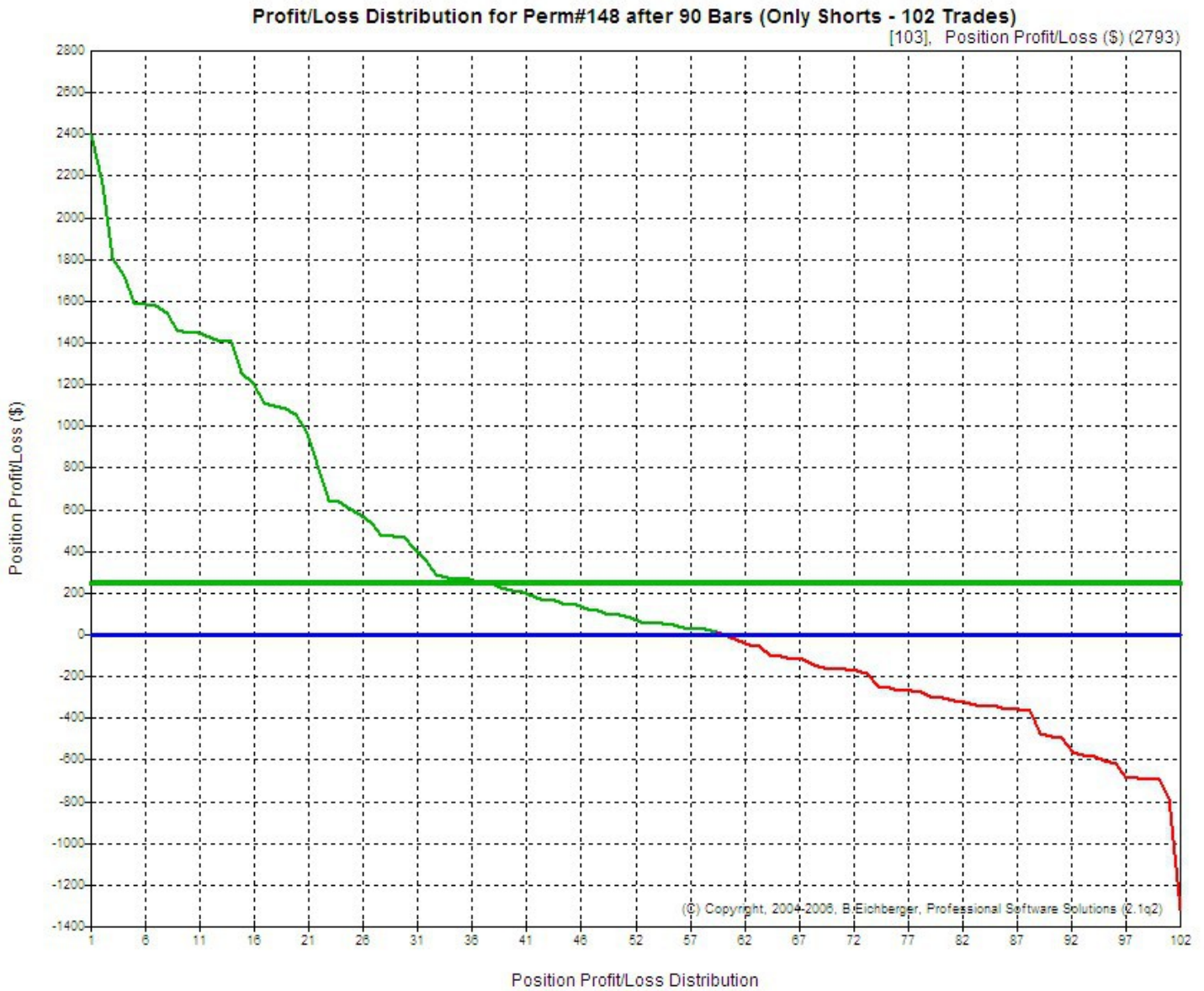


Also a 2D graph is available - showing the overall (blue), long (green) and short (red) effect of each parameter value on the overall result:



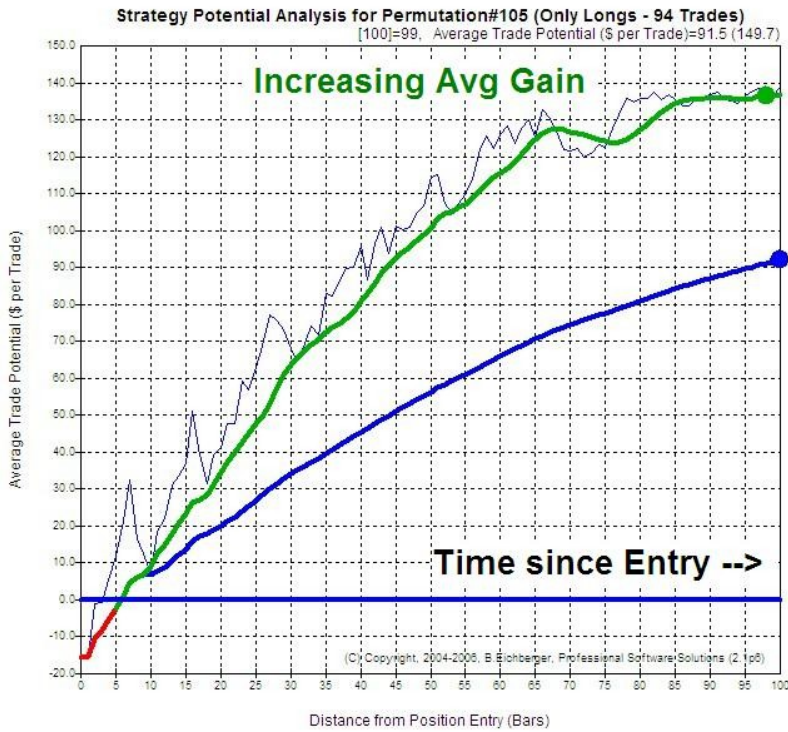
Position Profit/Loss Distribution Analysis

Helps you detecting misleading outliers in your equity graph:
 ranking winners(green) and losers(red) – and showing the overall average line at \$240:

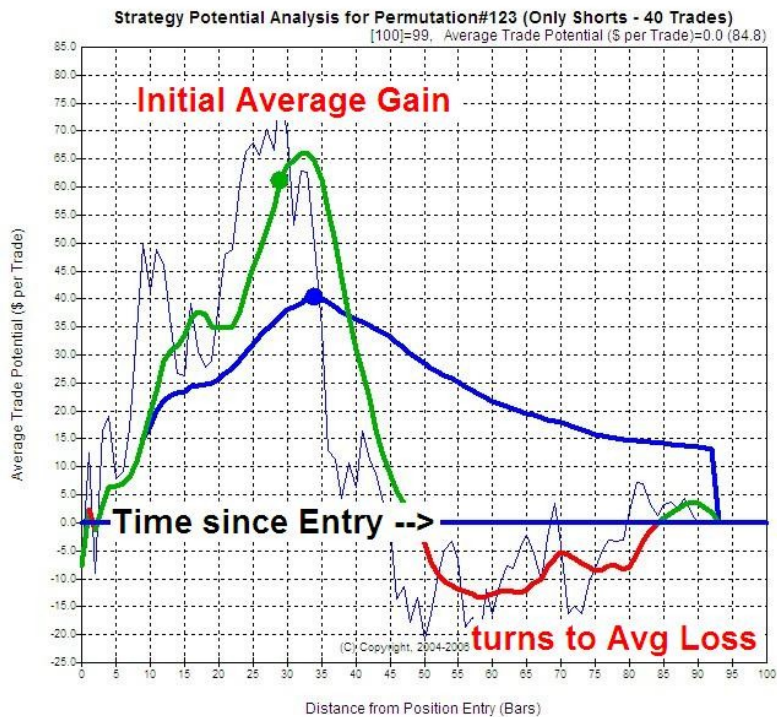


Innovative Trading Strategy Potential Analysis and Optimization

Track how the market response on average to your entries (Potential Analysis), helping you to detect the maximum trading opportunities and finding best entry points, using ONLY ENTRY POINTS, before you focus on develop the exit logic in your strategy. Below is an example of a stable gain:



and an example of a gain which expires after around 45 bars since entry:



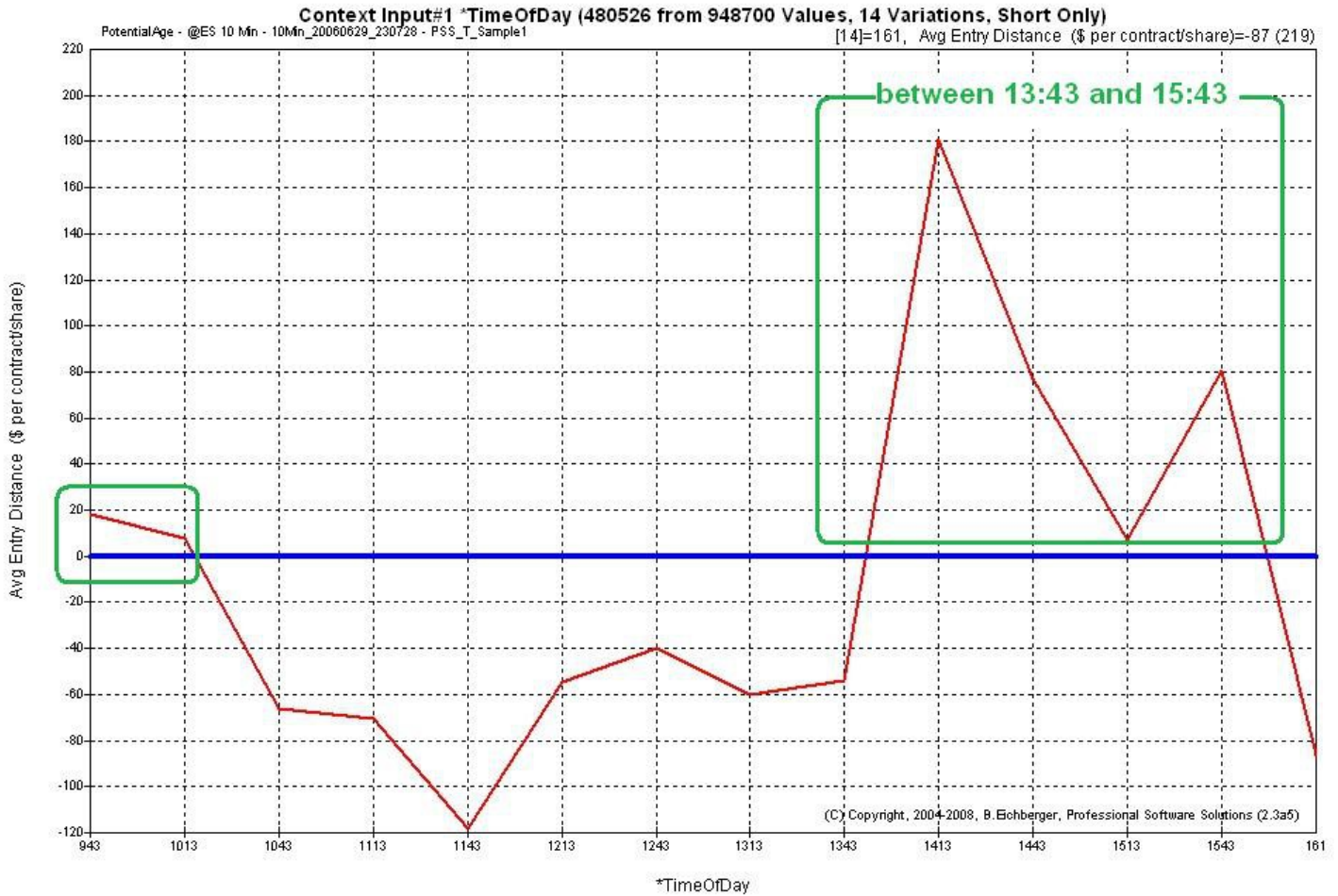
Equity Intraday Time Analysis

Identify the best intraday trading times of your strategies.

In the "Equity Time Analysis" sample below

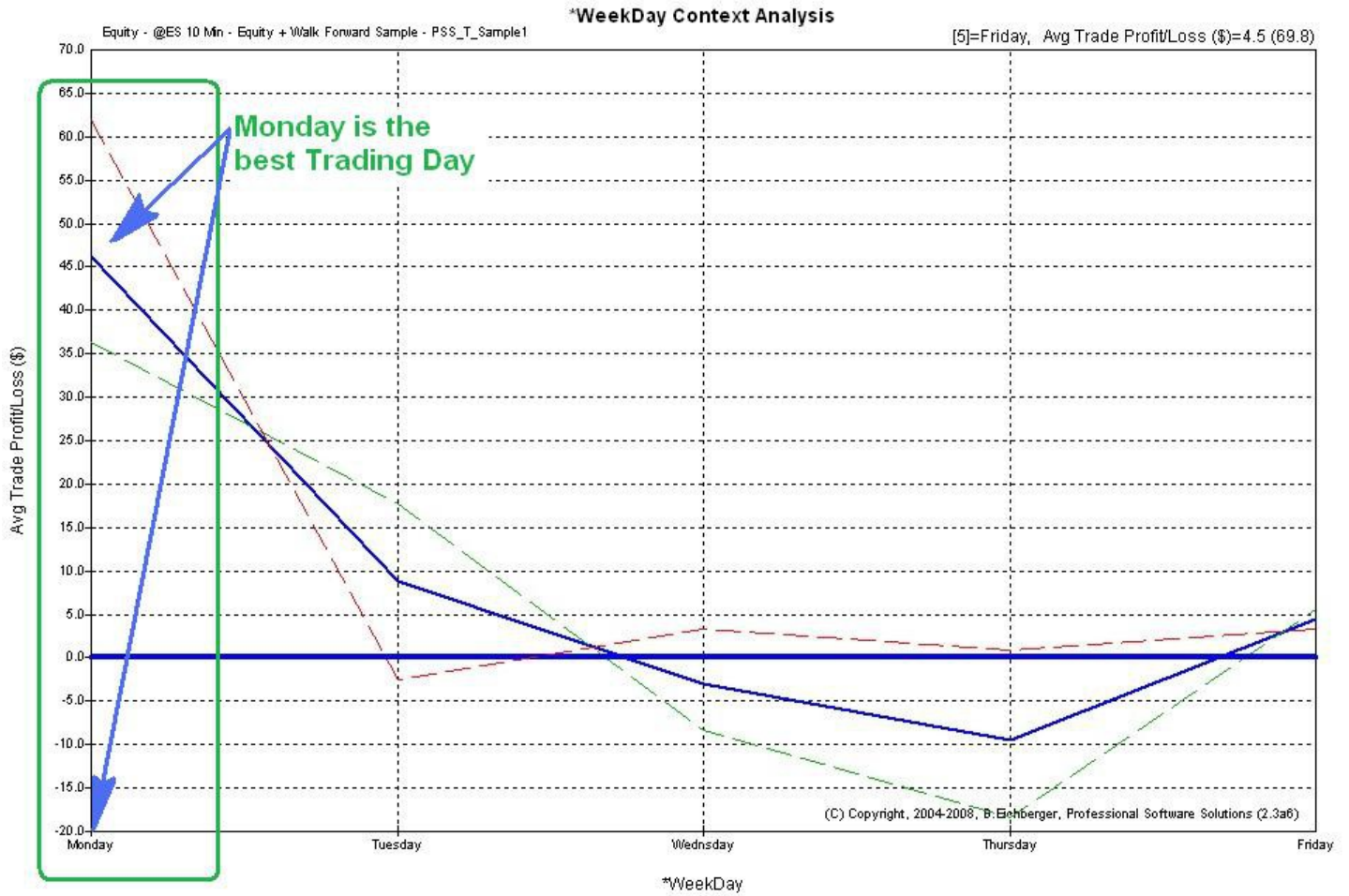
we see that 9:43 to 10:13 and 14:13 to 15:43 are the best trading times:

(You can adjust the time interval in the configuration: Treeview/EquTimeLength - the default is 30 minutes)



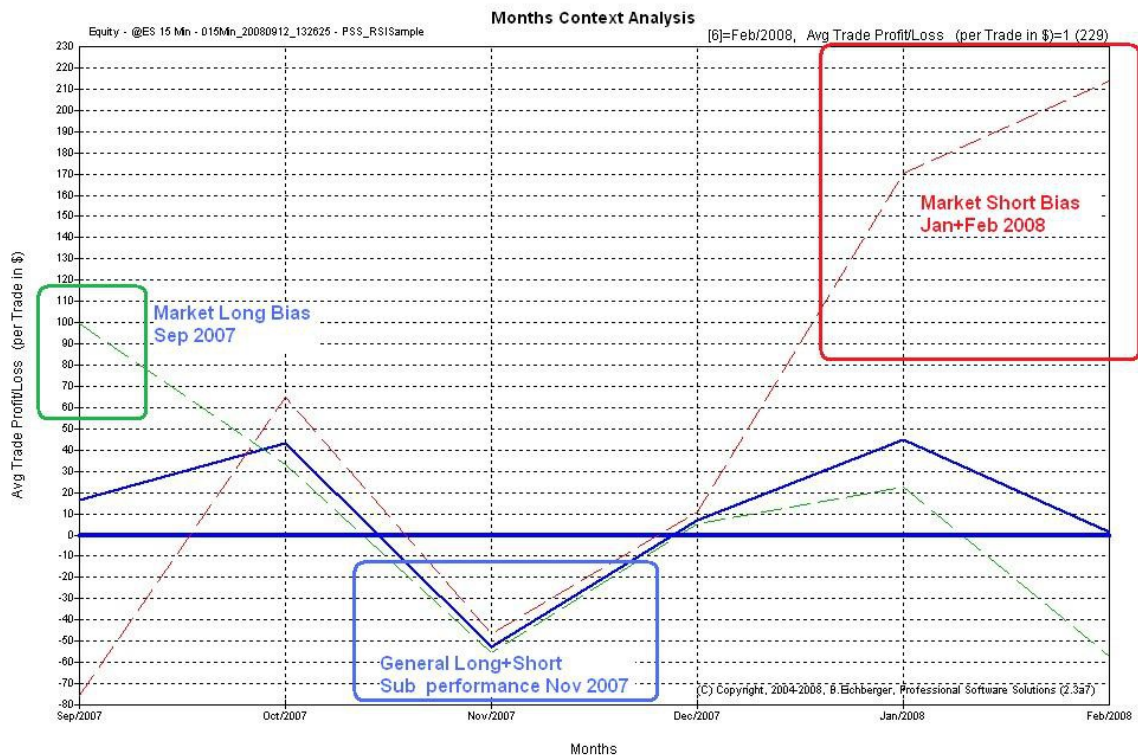
Identify the best Weekdays and Entry Intraday times

This function allows you identify the best weekday to trade - for **all**(blue), **long**(green) or **short**(red). In the sample below we can see that Monday is the best trading day:

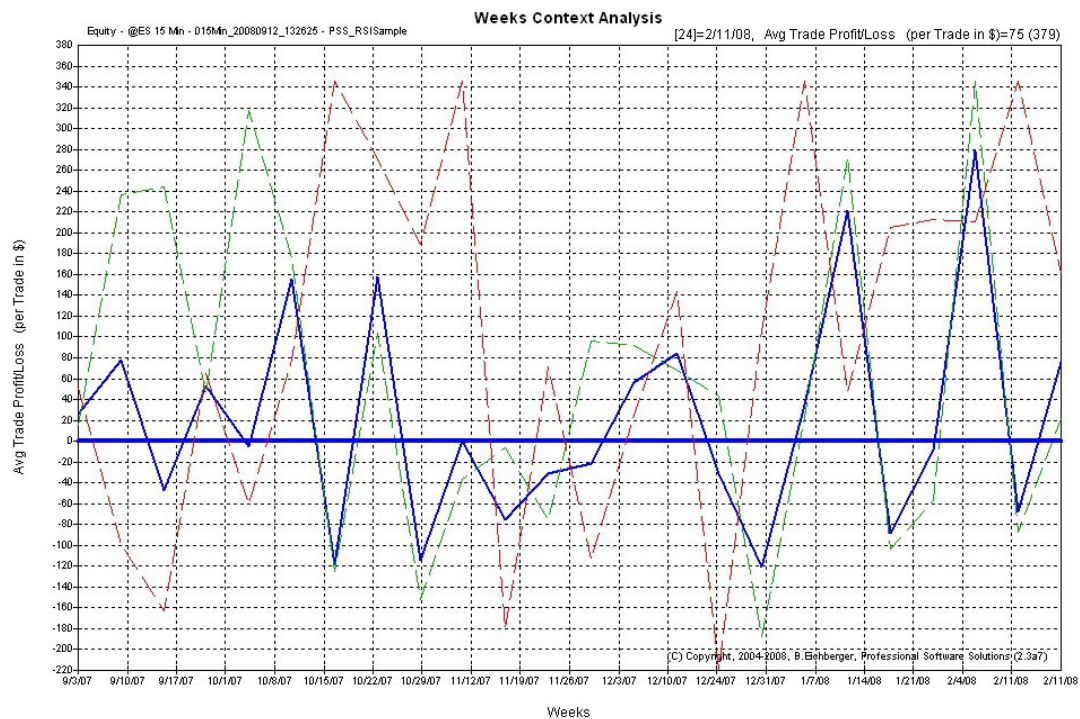


Detect the Market Long/Short Bias

This function allows you to detect the general long(green) or short(red) bias (if any) of your strategy performance. Also periods of strategy sub performances are shown:

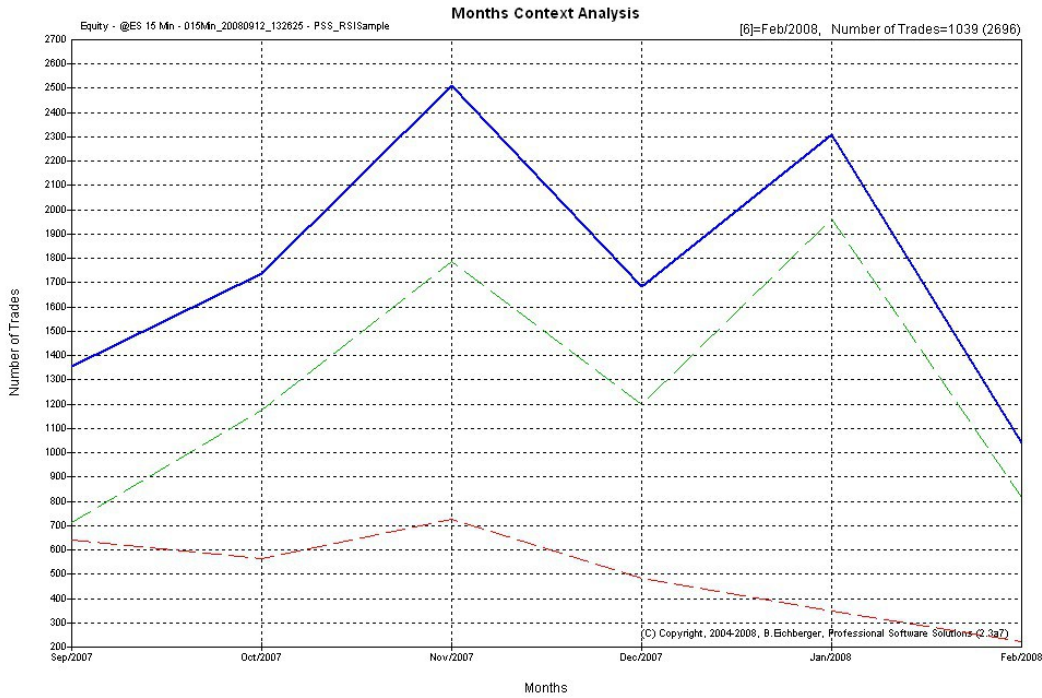


You can also use a more detailed weekly market long/short bias analysis:

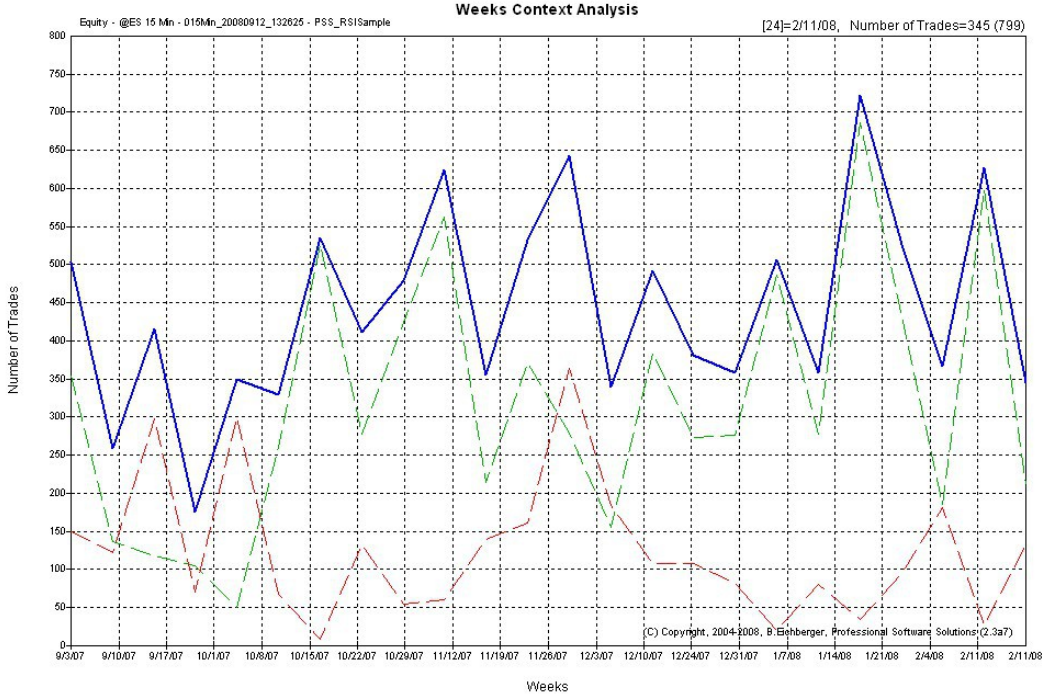


Detect the Strategy Trading Frequency

This function allows you to detect how frequently your strategy is trading over time, separated by **long(green)**, **short(red)** and **total trades(blue)**:



You can also see the more detailed weekly (and even daily) frequency analysis



Find the best exit logic - Position Exit Manager (PEM):

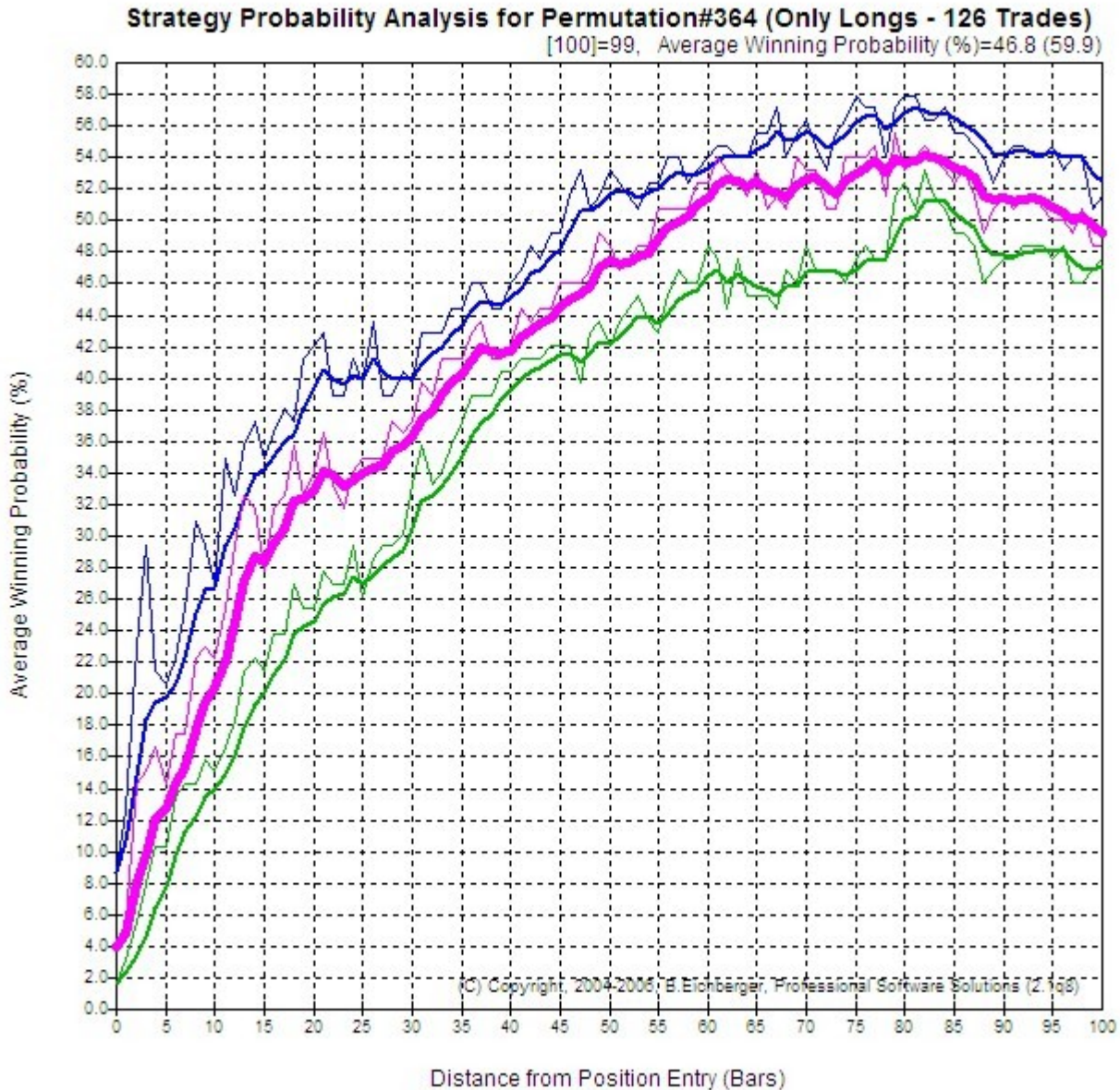
After you have identified the best strategy entries with the best potential, you can test millions of exit logic variations, using the integrated high speed (100,000/second) Position Exit Manager (PEM), to detect the best way to exit. You can use any combination of various exit functions: Exponential+Linear Target, Exponential+Linear StopOut, Trailing, breakeven, age etc. Below we see a visual example how PEM can manage your positions:



Strategy Probability Map

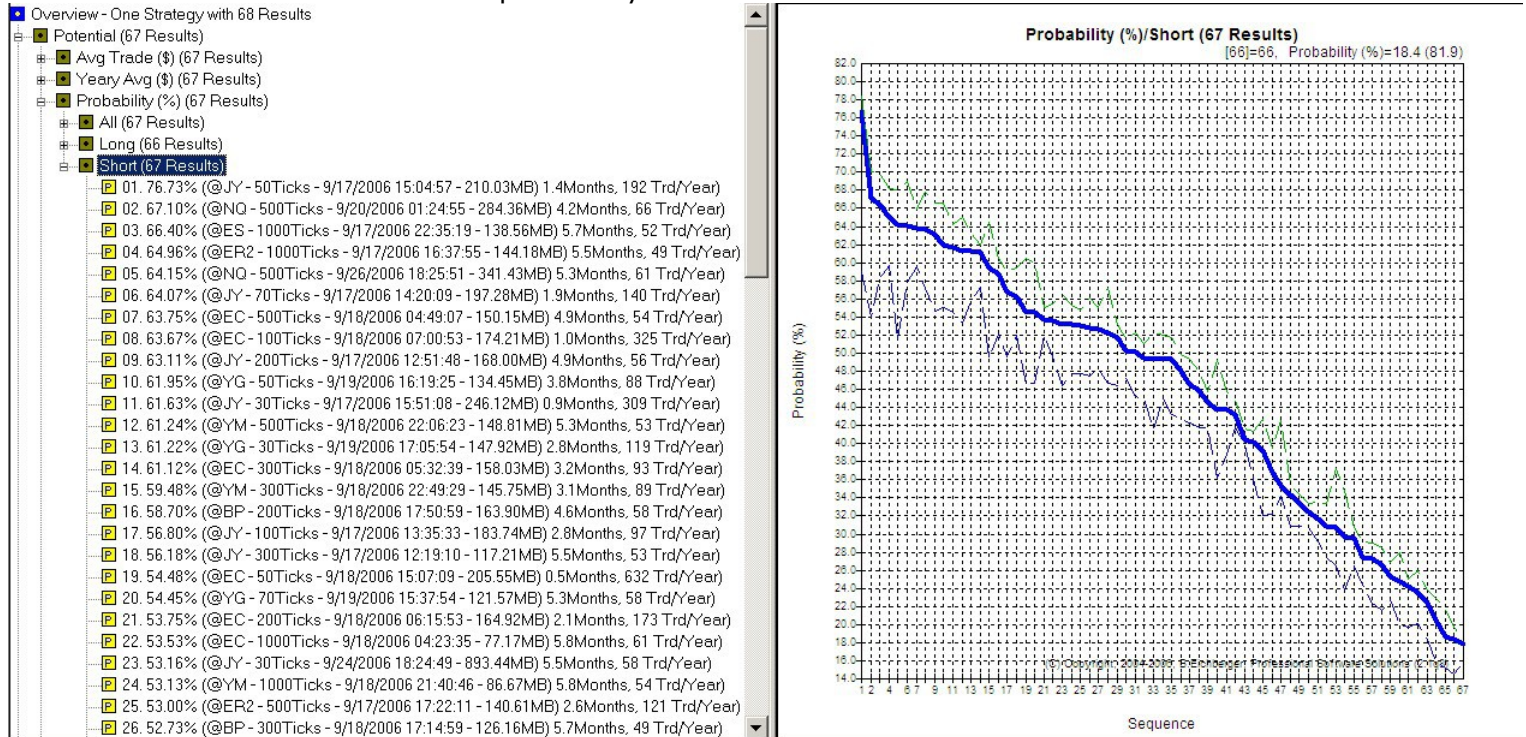
The "probability map" function, allows you to detect the best probability areas, in the time based market response (Potential) analysis.

Below we can see an the best probability is reached after 75 bars, for the three (customizable) target levels: \$50(green), \$100(magenta), \$150(blue):



Visual Multi Timeframe/Symbol Analysis - Result Overview Module

After you have run several backtests for a strategy across symbols and/or timeframes, you can quickly detect the best performance using Probability%, Yearly, PerTrdAvg or PeakAvg\$, calculated separately by long/short or merged trading, below is a screen shot with the best probability results for shorts:



In the chart three lines are shown:

- green thin line = single top result
- blue thick line = average of the top 10 results
- blue thin line = average of the top 100 results

Integrated In depth Performance Analyzer (PerfAna)

This additional module allows you to perform many in depth equity result operations and statistics and also export the trades to a spreadsheet – below is a statistic analysis view:

Description	Unit	All Trades	Longs only	Shorts only	ShortName
Ending Equity	\$	10257.50	7507.50	7750.00	\$Equ
Net PL	\$	5257.50	2507.50	2750.00	\$PL
Starting Equity	\$	5000.00	5000.00	5000.00	\$EquStart
Maximum Equity	\$	10467.50	7717.50	7750.00	\$MaxEqu
Date of highest Equity	Date	8/16/2005 09:40:00	8/15/2005 11:30:00	8/16/2005 09:40:00	\$DateMaxEqu
Minimum Equity	\$	4787.50	0.00	4895.00	\$MinEqu
Date of lowest Equity	Date	6/6/2005 09:40:00	---	6/2/2005 13:30:00	\$DateMinEqu
Gross Gain Amount	\$	11312.50	6090.00	5222.50	\$GrossGain
Gross Loss Amount	\$	-6055.00	-3582.50	-2472.50	\$GrossLoss
Return per Year (%)	%	504.70	244.03	268.30	\$RetYr
Profit Factor (Gross)	Ratio	1.87	1.70	2.11	\$PF
Sharpe Ratio	Ratio	38.195	17.134	21.865	\$Sharpe
MAR Ratio	Ratio	38.173	18.050	17.773	\$MAR
Average Trade PL	\$	52.05	44.78	61.11	\$AvgTrdAmt
Average Winner Amount	\$	251.39	276.82	227.07	\$AvgGainAmt
Average Loser Amount	\$	-108.13	-105.37	-112.39	\$AvgLossAmt
Profit Factor (AvgTrd)	Ratio	2.32	2.63	2.02	\$PFAvg
Maximum Winner Amount	\$	670.00	670.00	295.00	\$MaxGainAmt
Date of biggest Winner	Date	6/7/2005 09:40:00	6/7/2005 09:40:00	6/20/2005 09:40:00	\$DateMaxGain
Maximum Loser Amount	\$	-267.50	-117.50	-267.50	\$MaxLossAmt
Date of biggest Loser	Date	6/17/2005 09:40:00	6/6/2005 09:40:00	6/17/2005 09:40:00	\$DateMaxLoss
Median Trade PL	\$	-105.00	-105.00	-105.00	\$MedTrdAmt
Median Winner Amount	\$	220.00	220.00	220.00	\$MedGainAmt
Median Loser Amount	\$	-105.00	-105.00	-105.00	\$MedLossAmt
Profit Factor (Median)	Ratio	2.10	2.10	2.10	\$PFMed
Total Trades	#	101	56	45	\$CntTrd
Number of Winners	#	45	22	23	\$CntGain
Number of Losers	#	56	34	22	\$CntLoss
Probability	%	44.55	39.29	51.11	\$Prob
Maximum consecutive Winners	#	5	3	5	\$MaxGainCnt
Maximum consecutive Losers	#	6	6	4	\$MaxLossCnt
Maximum Drawdown Amount	\$	-905.00	-800.00	-905.00	\$MaxDDAmt
Maximum Drawdown Percent	%	-13.22	-13.52	-15.10	\$MaxDDPer
Date of maximum Drawdown	Date	6/21/2005 10:40:00	6/20/2005 14:10:00	6/15/2005 09:40:00	\$DateMaxDD
Maximum Drawup Amount	\$	1500.00	1097.50	1100.00	\$MaxDUAmt
Maximum Drawup Percent	%	15.85	11.87	16.72	\$MaxDUPer
Date of maximum Drawup	Date	8/11/2005 11:20:00	8/11/2005 09:40:00	6/15/2005 09:40:00	\$DateMaxDU
Total Commissions	\$	505.00	280.00	225.00	\$TotFee
Total Trading Period (Days)	Days	76.1	75.1	74.9	\$TrdRngDay
Total Trading Period (Years)	Years	0.208	0.206	0.205	\$TrdRngYr
Date of last Trade	Date	8/17/2005 15:00:00	8/17/2005 15:00:00	8/16/2005 09:40:00	\$DateMaxTrd
Date of first Trade	Date	6/2/2005 12:40:00	6/3/2005 13:30:00	6/2/2005 12:40:00	\$DateMinTrd
Average Trade Duration (Minutes)	Min	6.1	9.4	16.0	\$DurTrdAvg
Average Winner Duration (Minutes)	Min	22.8	43.8	47.2	\$DurGainAvg
Average Loser Duration (Minutes)	Min	5.0	7.2	15.3	\$DurLossAvg
Longest Trade Duration (Minutes)	Min	5450.0	5450.0	4110.0	\$DurMax
Shortest Trade Duration (Minutes)	Min	0.0	0.0	0.0	\$DurMin
Std Deviation Amount	\$	188.83	201.35	173.81	\$DevAmt
Std Deviation (% of Capital)	%	3.78	4.03	3.48	\$DevPer
Std Deviation Winner Amount	\$	84.60	115.19	19.52	\$DevGainAmt
Std Deviation Winner (% of Capital)	%	1.69	2.30	0.39	\$DevGainPer
Std Deviation Loser Amount	\$	21.75	2.14	34.65	\$DevLossAmt
Std Deviation Loser (% of Capital)	%	0.43	0.04	0.69	\$DevLossPer

You can merge results from different markets/symbols into one new comprehensive result/graph with the Performance Analyzer module.

Export Results to Microsoft Access Database

This function allows you export the permutation data to a standard microsoft access database.

Then you can apply any advanced SQL queries and/or reports to process and detect the best results:

	Symbol	Interval	File	Perml	Equity	Probability	CntTrd	Winners	Losers	TrdYear	EquYear
▶	@ES	10 Min	.btwf1	1	(\$1,255.00)	50.951	526	268	258	526.34	(\$1,255.81)
	@ES	10 Min	C:/BTWFMgr/Wal	2	\$822.50	42.589	533	227	306	533.345	\$823.03
	@ES	10 Min	C:/BTWFMgr/Wal	3	(\$32.50)	36.77	514	189	325	514.332	(\$32.52)
	@ES	10 Min	C:/BTWFMgr/Wal	4	(\$172.50)	33.13	492	163	329	492.318	(\$172.61)
	@ES	10 Min	C:/BTWFMgr/Wal	5	\$967.50	61.364	484	297	187	484.313	\$968.13
	@ES	10 Min	C:/BTWFMgr/Wal	6	\$1,540.00	51.782	477	247	230	477.309	\$1,541.00
	@ES	10 Min	C:/BTWFMgr/Wal	7	\$3,105.00	47.357	454	215	239	454.294	\$3,107.01
	@ES	10 Min	C:/BTWFMgr/Wal	8	\$2,302.50	42.857	427	183	244	427.276	\$2,303.99
	@ES	10 Min	C:/BTWFMgr/Wal	9	\$197.50	65.284	458	299	159	458.349	\$197.65
	@ES	10 Min	C:/BTWFMgr/Wal	10	\$2,317.50	57.343	429	246	183	429.326	\$2,319.26
	@ES	10 Min	C:/BTWFMgr/Wal	11	\$3,885.00	52.854	403	213	190	403.307	\$3,887.96
	@ES	10 Min	C:/BTWFMgr/Wal	12	\$3,640.00	48.806	377	184	193	377.287	\$3,642.77
	@ES	10 Min	C:/BTWFMgr/Wal	13	(\$7.50)	69.104	424	293	131	424.274	(\$7.50)

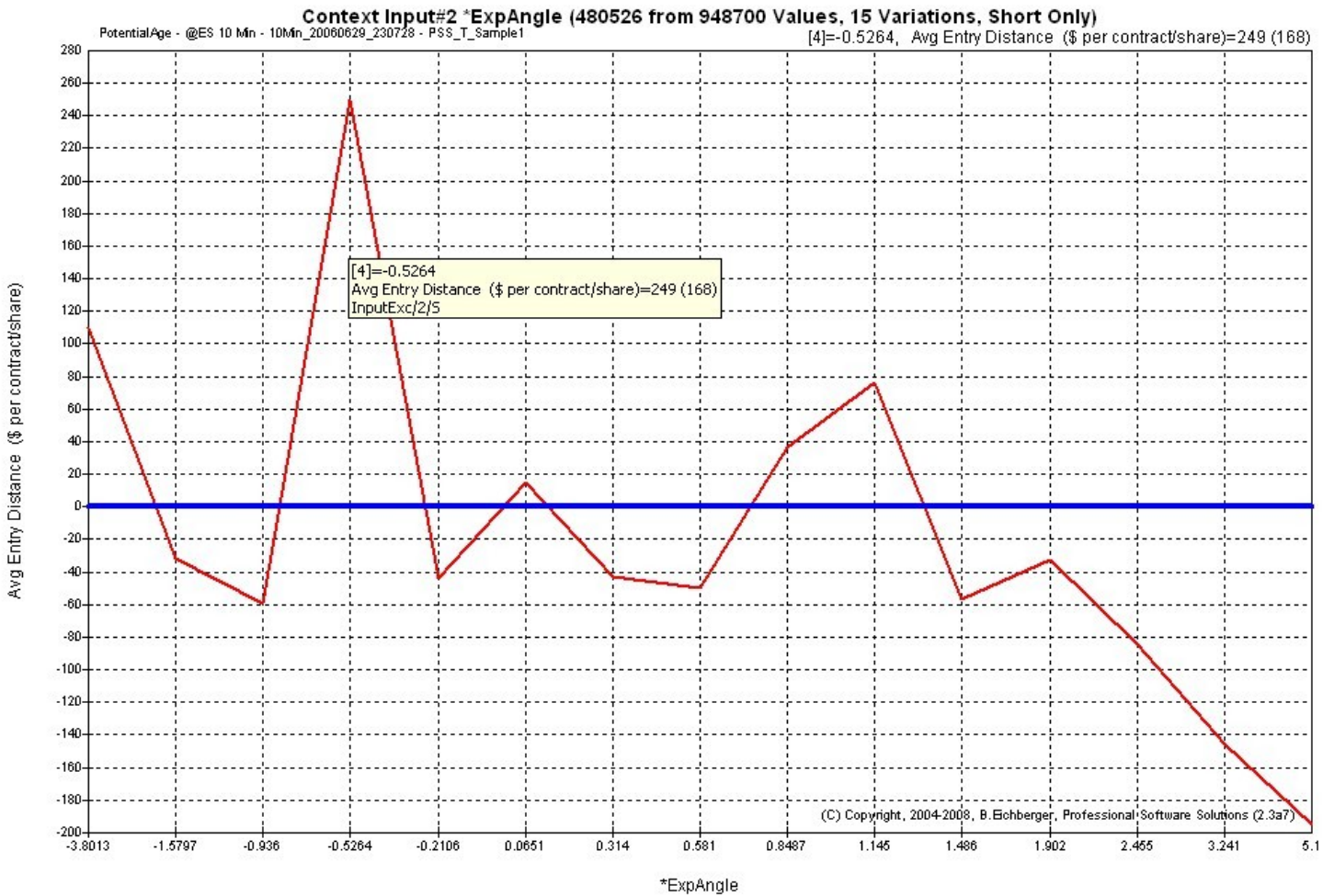
PSSVolatility	ProfitFactor	EquGain	EquLoss	MaxDDPercen	StartDate	EndDate	Months	▲
100	0.959	\$29,535.00	(\$30,790.00)	14.225	20050602	20060602	11.99	
95.236	1.023	\$36,915.00	(\$36,092.50)	18.3	20050602	20060602	11.99	
100	0.999	\$38,017.50	(\$38,050.00)	17.25	20050602	20060602	11.99	
100	0.996	\$38,760.00	(\$38,932.50)	14.825	20050602	20060602	11.99	
122.652	1.03	\$33,102.50	(\$32,135.00)	9.7	20050602	20060602	11.99	
46.054	1.04	\$40,490.00	(\$38,950.00)	13.775	20050602	20060602	11.99	
21.035	1.077	\$43,225.00	(\$40,120.00)	13.275	20050602	20060602	11.99	
34.87	1.056	\$43,460.00	(\$41,157.50)	15.15	20050602	20060602	11.99	
604.182	1.006	\$33,292.50	(\$33,095.00)	10.45	20050602	20060602	11.99	
35.167	1.061	\$40,070.00	(\$37,752.50)	12.925	20050602	20060602	11.99	
18.11	1.099	\$43,010.00	(\$39,125.00)	12.925	20050602	20060602	11.99	
18.078	1.091	\$43,555.00	(\$39,915.00)	15.475	20050602	20060602	11.99	
100	1	\$32,810.00	(\$32,817.50)	11.5	20050602	20060602	11.99	

(just enable the export by setting Setting System/ExportTrdPer to YES and the next time you open an equity result - all permutations will be exported)

Correlate Context Values with best Potential

You can add any variable in Potential Mode to the backtesting, so you can detect any correlation between context variable range(s) and favorable potential results.

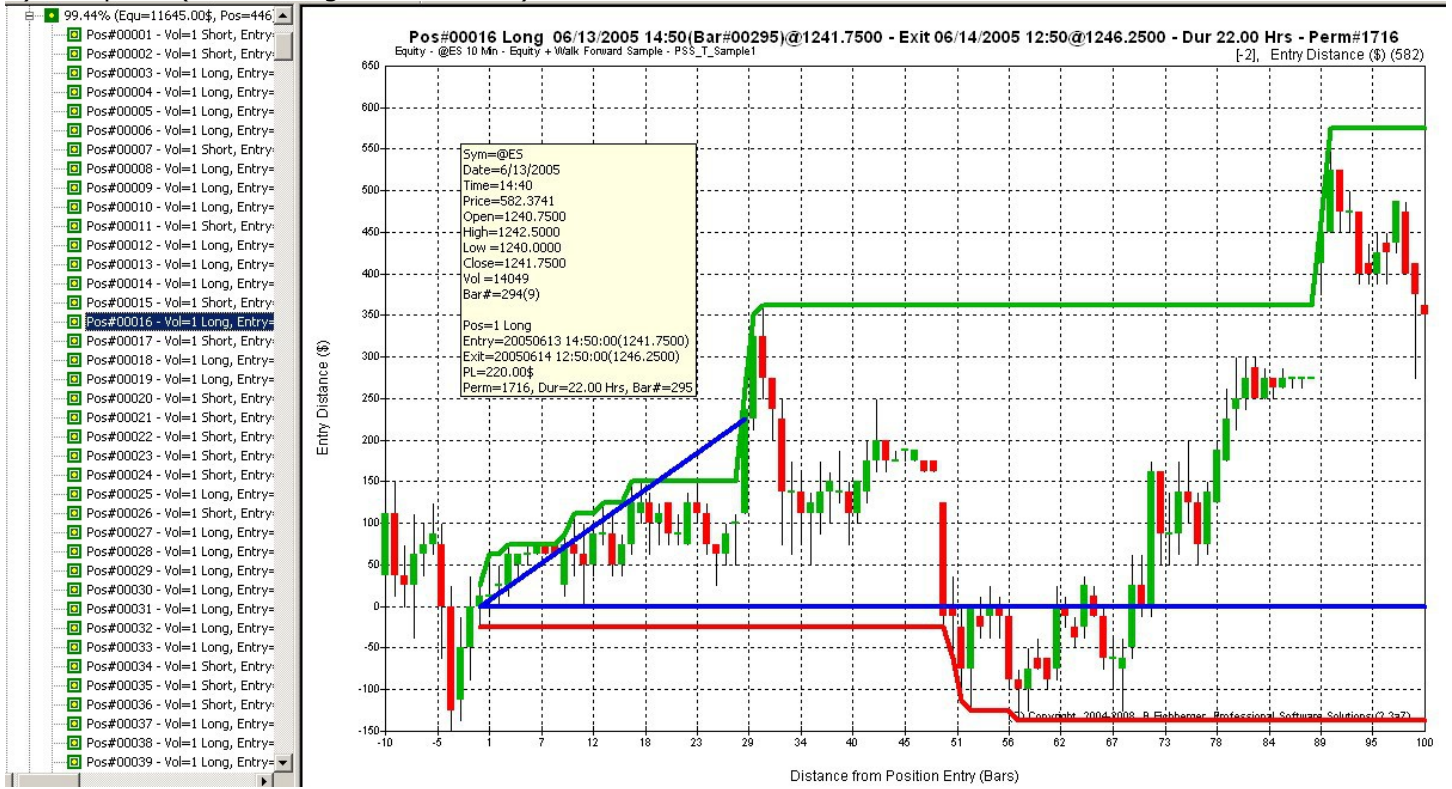
In the example below, we use the angle exponential average (see PSS_RSISample workspace), detecting that slightly downward angle (around minus 0.5264) offer the best returns for shorts(red):



Instant Position Viewing

Provides you - with a mouse click - with the actual charts of each Position Entry, Exit and Risk/Reward excursion instantly, so you can evaluate also visually all entries and their performance - instead of using the cumbersome scrolling in the charts - in the example below we see:

- a) the horizontal blue line (entry price)
- b) maximum favorable excursion (green line)
- c) maximum unfavorable excursion (red line)
- d) Exit price (end of diagonal blue line):



Automated modification of your EasyLanguage Strategy Code

This function completely automates the preparation of your strategy EasyLanguage code, so BTWFMgr can collect all the trades data during the optimization.

(you don't have to be familiar at all with EasyLanguage!)

Below is the interface through which you can modify your strategy code (PSS_RSISample):

Prepare your Strategy for Optimization

Strategy:

1. Modified + verified Strategy PSS_RSISample
2. 6 Input Parameters will be monitored for Optimization
3. We are now ready for the TradeStation Optimizations
4. then process the Backtesting Data here

Strategy Name:

Name	Value	Type	Optimize
RSILength	14	Int	X
OverSold	30	Int	X
OverBought	70	Int	X
EMALength	20	Int	X
LossAmt	400	Int	X
GainAmt	400	Int	X
Price	Close	Misc	
nBTWFMgrExport	0	Int	



Diamond Backtesting with Walk Forward Manager (BTWFMgr)

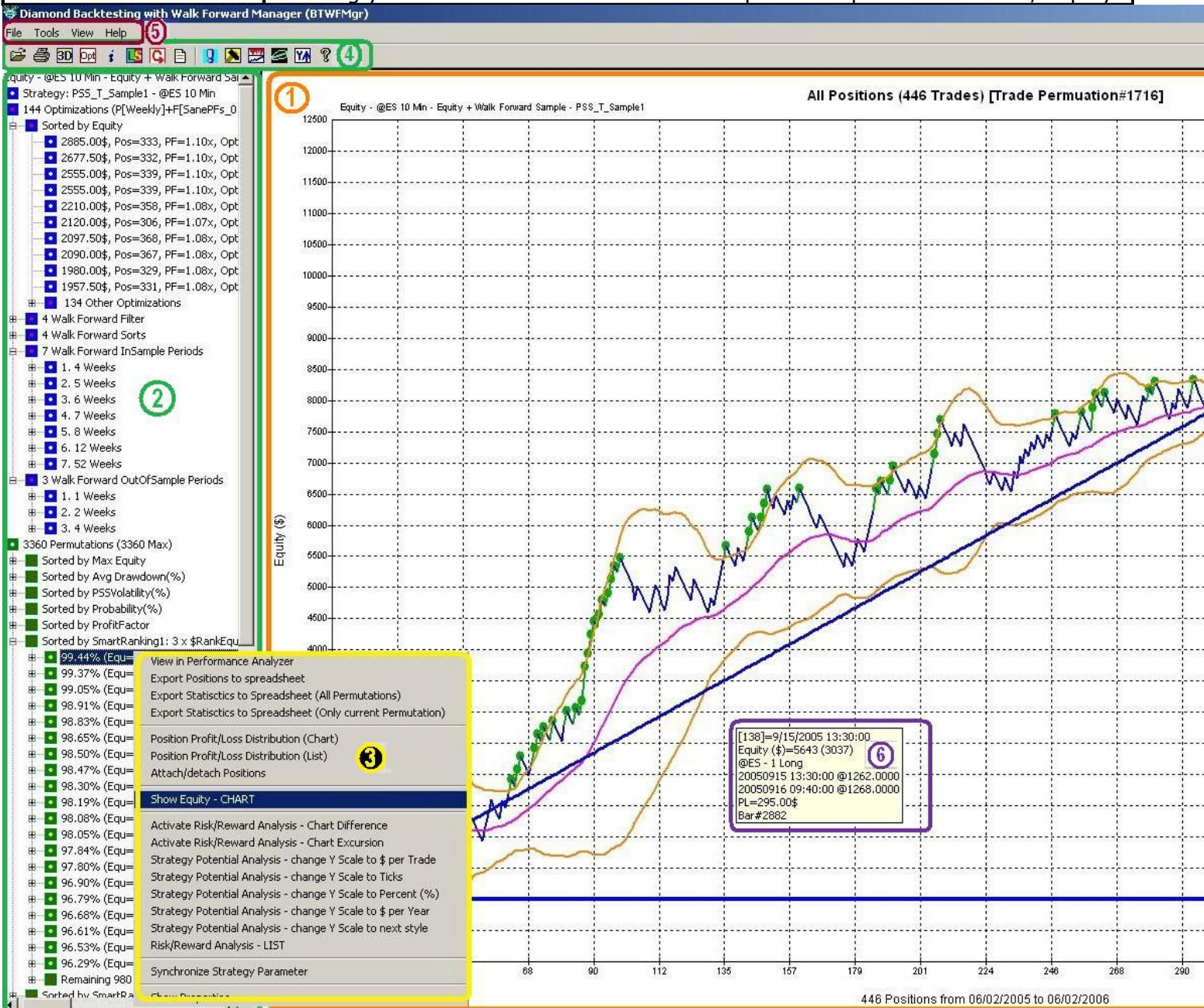
1. Modified + verified Strategy PSS_RSISample
2. 6 Input Parameters will be monitored for Optimization
3. We are now ready for the TradeStation Optimizations
4. then process the Backtesting Data here

BTWFMgr Basics

BTWFSMgr Software Layout

BTWFMgr is using a very visual approach, which (hopefully) makes working with BTWFMgr easy+intuitive. Similar to the windows explorer, all relevant items are shown in a window on the left side (treeview), were can "zoom" in or out any item. The "display" shows the current details as a chart or even 3D View.

Main Display (1)	shows the chart, list or 3D view for the current item from the treeview
Treeview Area (2)	Shows the items for the current backtest data in "branches" and subbranches. Zoom in/expand on any item by clicking on the small plus  , or zoom out/collapse a branch simply by clicking on the small minus 
Pop-up Menu(3)	The list of specific functions for the currently selected element/item. Simply right click on the item and select the function from the new pop-up menu
Toolbar(4)	List of the main functions - using icons - accessible via one mouse click
Menu(5)	All available functions - accessible via the standard Windows menu interface
Tooltip window(6)	A small white window popping up when you move the cursor in the main display showing you detailed information about that particular point in the chart/display



BTWFMgr Operating Modes

BTWFMgr operates in two main modes:

- a) Equity/Walk Forward Mode: entry and exit points are used for an equity graph for each permutation
- b) Potential Mode: only entry points are used to detect the best market response for each permutation

When running the optimization, simply set the "nBTWFMgrExport" strategy parameter to 2(Equ) or 1(Pot). See "[Strategy Preparation](#)" for details how to prepare your strategy for BTWFMgr.

Equity/Walk Forward Mode (nBTWFMgrExport=2)

This is the main mode, where the strategy generates entries AND exits automatically, applying the "[Strategy Entry+Exit Logic](#)" for trading decisions. In this "Equity(Equ)" mode, we are optimizing the Equity and overall Strategy results and can run the advanced walk forward analysis, testing predictive-ness.

BTWFMgr comes with an equity sample "out of the box", so you instantly can test drive BTWFMgr:

Start/Programs/Diamond Backtesting/Sample Equity + Walk Forward Analysis

Below are the main Treeview branches showing the results (more details in further chapters):

<u>Title</u>	@ES 15 Min - Equity + Walk Forward Sample	at the very top showing the symbol, time frame and the description. In this example: Symbol=@ES, Timeframe=15 Min Intraday
<u>Walk Forward Optimization Results</u>	<ul style="list-style-type: none"> Strategy: P55_T_Sample1 - @ES 10 Min 144 Optimizations (P[Weekly]+F[SanePFs_0]) Sorted by Equity <ul style="list-style-type: none"> 2885.00\$, Pos=333, PF=1.10x, Opt 2677.50\$, Pos=332, PF=1.10x, Opt 2555.00\$, Pos=339, PF=1.10x, Opt 2555.00\$, Pos=339, PF=1.10x, Opt 2210.00\$, Pos=358, PF=1.08x, Opt 2120.00\$, Pos=306, PF=1.07x, Opt 2097.50\$, Pos=368, PF=1.08x, Opt 2090.00\$, Pos=367, PF=1.08x, Opt 1980.00\$, Pos=329, PF=1.08x, Opt 1957.50\$, Pos=331, PF=1.08x, Opt 134 Other Optimizations 4 Walk Forward Filter 4 Walk Forward Sorts 7 Walk Forward InSample Periods <ul style="list-style-type: none"> 1. 4 Weeks 2. 5 Weeks 3. 6 Weeks 4. 7 Weeks 5. 8 Weeks 6. 12 Weeks 7. 52 Weeks 3 Walk Forward OutOfSample Periods <ul style="list-style-type: none"> 1. 1 Weeks 2. 2 Weeks 3. 4 Weeks 	<p>Showing the top 10 Walk Forward results; sorted by the accumulated Out-Of-Sample Equity total.</p> <p>The remaining Walk Forward results are attached under "134 Other Optimizations"</p>

<p>Strategy Overall Analysis</p>	<p>3360 Permutations (3360 Max)</p> <ul style="list-style-type: none"> Sorted by Max Equity Sorted by Avg Drawdown(%) Sorted by PSSVolatility(%) Sorted by Probability(%) Sorted by ProfitFactor Sorted by SmartRanking1: 3 x \$RankEqu <ul style="list-style-type: none"> 99.44% (Equ=11645.00\$, Pos=446) 99.37% (Equ=11750.00\$, Pos=460) 99.05% (Equ=11567.50\$, Pos=479) 98.91% (Equ=10972.50\$, Pos=488) 98.83% (Equ=10892.50\$, Pos=434) 98.65% (Equ=10702.50\$, Pos=447) 98.50% (Equ=10222.50\$, Pos=428) 98.47% (Equ=9677.50\$, Pos=487) 	<p>Showing the overall results or each permutation. Click on any permutation to see the equity graph. Organized in six branches:</p> <ul style="list-style-type: none"> Sorted by Max Equity Sorted by Average Drawdown (%) Sorted by PSSVolatility (%) Sorted by Probability (%) Sorted by ProfitFactor Sorted by SmartRanking1 (Custom Hybrid1) Sorted by SmartRanking2 (Custom Hybrid2) Sorted by SmartRanking3 (Custom Hybrid3) Sorted Permutation Sequence Number <p>Here you can find out the best overall results.</p>
<p>Strategy Input Parameter Analysis</p>	<p>5 Input Variables (3360 Permutations)</p> <ul style="list-style-type: none"> RSILength (7 Values) <ul style="list-style-type: none"> RSILength=14 (480 Permutations) RSILength=15 (480 Permutations) RSILength=16 (480 Permutations) <ul style="list-style-type: none"> SUB / OverSold (6 Values) SUB / OverBought (5 Values) SUB / LossAmt (4 Values) <ul style="list-style-type: none"> LossAmt=100 LossAmt=140 LossAmt=180 LossAmt=220 SUB / GainAmt (4 Values) <ul style="list-style-type: none"> 11750.00\$- Perm1236 (6 Inputs) 11507.50\$- Perm1240 (6 Inputs) 10940.00\$- Perm1316 (6 Inputs) 10702.50\$- Perm1252 (6 Inputs) RSILength=17 (480 Permutations) RSILength=18 (480 Permutations) RSILength=19 (480 Permutations) RSILength=20 (480 Permutations) OverSold (6 Values) OverBought (5 Values) LossAmt (4 Values) GainAmt (4 Values) Fixed Inputs below: <ul style="list-style-type: none"> (EMALength=20) 	<p>In depth Analysis of strategy input parameter:</p> <ol style="list-style-type: none"> each individual input parameter each input parameter value even their respective sub values <p>Here you can detect the optimal parameter range. In this example we tested 7 RSI Length values and focused in on the RSILength=16 value and the subsets of the other parameters, using RSILength=16: Oversold/bought, Loss+GainAmt. All permutations for each value are also attached.</p> <p>The strategy parameters which have not changed during the optimization, are shown at the end (EMALength)</p>

Context Parameter Analysis	<ul style="list-style-type: none"> WeekDays (1312691 Positions) <ul style="list-style-type: none"> Monday (234678 Positions) Tuesday (259606 Positions) Wednesday (285147 Positions) Thursday (286298 Positions) Friday (246962 Positions) 33 Intraday Entry Times 12 Months (1312691 Positions) <ul style="list-style-type: none"> *Jun/2005 (108443 Positions) *Jul/2005 (102426 Positions) *Aug/2005 (125827 Positions) *Sep/2005 (114847 Positions) *Oct/2005 (119265 Positions) *Nov/2005 (102244 Positions) *Dec/2005 (98504 Positions) *Jan/2006 (104859 Positions) *Feb/2006 (100463 Positions) *Mar/2006 (125117 Positions) *Apr/2006 (100842 Positions) *May/2006 (98891 Positions) *Jun/2006 (10963 Positions) 53 Weeks (1312691 Positions) 259 Dates (06/02/2005 to 06/02/2006) 	<p>In this section we track the overall effect of each category to detect a possible market long/short bias and different trading frequencies for:</p> <ul style="list-style-type: none"> Weekdays (Mon, Tue etc) Intraday Entry Times (9AM, 10AM etc) Month (Jun2005, Jul205 etc) Weeks and even single trading days
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Potential Mode (nBTWFMgrExport=1)

This is the initial mode in your strategy development – only the “Strategy Entry Logic” is used – which creates the entry points (buy/short) – the exit logic is not yet used.

BTWFMgr analyzes for you how the market responded – on average – to each series of entries – generated by each input parameter permutation. This response is shown in the “Strategy Potential Graph” – allowing you to see how far your strategy potential moved and how long the move lasted.

BTWFMgr comes with an potential sample “out of the box”, so you instantly can test drive BTWFMgr:

Start/Programs/Diamond Backtesting ...(BTWFMgr)/ Sample_Strategy_Potential_Analysis

Below are the main Treeview branches showing the results (more details in further chapters):

<u>Title</u>	PotentialAge - @ES 15 Min - P_015Min_20081110_220609 <ul style="list-style-type: none"> ■ Strategy: PSS_RSISample - @ES 15 Min 	Shows the details of the backtesting data: mode, symbol, time frame, strategy and the date of the backtest (2008/11/10 22:06:09)
<u>Exit Optimization Results</u>	<ul style="list-style-type: none"> ■ 180224 Position Exit Optimizations (TrdPerm#1335, { <ul style="list-style-type: none"> ■ Sorted by Equity <ul style="list-style-type: none"> ■ Equ=7825.00\$ (Pos=80(Skipped=176),Prob: ■ Equ=7825.00\$ (Pos=80(Skipped=176),Prob: ■ 1990 Other Exit Optimizations ■ Sorted by Probability ■ Sorted by ProfitFactor ■ Sorted by AvgTrdPL 	Showing the top 10 exit optimization results sorted by equity, the remaining results are attached under “1990 Other Exit Optimizations”. You can also check the results by probability, profitfactor or average profit/loss per trade.
<u>Exit Parameter Analysis</u>	<ul style="list-style-type: none"> ■ 7 Exit Definitions <ul style="list-style-type: none"> ■ Target (8 Values) ■ Stop (8 Values) ■ StopExp (22 Values) ■ Trail (8 Values) ■ StopAge (8 Values) ■ MaxBar (2 Values) <ul style="list-style-type: none"> ■ MaxBar=ON (-67.68\$, PF=0.29x, 22812860 Pos) ■ MaxBar=OFF (-67.68\$, PF=0.29x, 22812860 Pos) 	This section shows you the effect of each exit logic element on the overall result. It also lists each tested value.
<u>Strategy Potential Analysis</u>	<ul style="list-style-type: none"> ■ 1452 Permutations (1452 Max) <ul style="list-style-type: none"> ■ Avg Potential (All) <ul style="list-style-type: none"> ■ Avg=50.40\$(Peak=71.50\$,Loss=-16.63\$) ■ Avg=50.14\$(Peak=71.00\$,Loss=-18.37\$) ■ Avg=47.77\$(Peak=70.40\$,Loss=-8.91\$) (f ■ Remaining 980 Results ■ Avg Potential (Long) ■ Avg Potential (Short) ■ Yearly Peak Potential (All) ■ Yearly Peak Potential (Long) ■ Yearly Peak Potential (Short) ■ Probability Map (All) ■ Probability Map (Long) ■ Probability Map (Short) ■ Peak Potential (All) ■ Peak Potential (Long) ■ Peak Potential (Short) ■ Sequential 	This section allows you to find the best strategy potential and also the extend and duration of the market response on average(potential). The strategy potential for each permutation in the backtest is shown and organized in four categories: a) Average Potential b) Annualized yearly potential c) Probability d) Peak potential each category presents the results by 1. All trades 2. only long trades 3. only short trades

<p><u>Strategy Input Parameter Analysis</u></p>	<ul style="list-style-type: none"> 6 Input Variables (1452 Permutations) <ul style="list-style-type: none"> RSILength (12 Values) <ul style="list-style-type: none"> RSILength=8 (121 Permutations) RSILength=10 (121 Permutations) RSILength=12 (121 Permutations) RSILength=14 (121 Permutations) RSILength=16 (121 Permutations) <ul style="list-style-type: none"> SUB / OverSold (11 Values) SUB / OverBought (11 Values) 58.55\$ - Perm524 (6 Inputs, RSILength=16, 57.87\$ - Perm525 (6 Inputs, RSILength=16, 56.23\$ - Perm535 (6 Inputs, RSILength=16, RSILength=18 (121 Permutations) RSILength=20 (121 Permutations) RSILength=22 (121 Permutations) RSILength=24 (121 Permutations) RSILength=26 (121 Permutations) RSILength=28 (121 Permutations) RSILength=30 (121 Permutations) OverSold (11 Values) OverBought (11 Values) EMALength=20 LossAmt=350 GainAmt=350 	<p>This section allows you to track the effect of each strategy input parameter on the potential and detect the optimal parameter range.</p> <p>Each parameter (RSILength, Oversold ...) is listed, which the attached values used in the backtest (RSILength=8,10,12..) All associated permutations are attached to each value, sorted by the potential (Perm524, 525, 535 ...)</p> <p>Also the variations of the remaining inputs are shown and can be analyzed. (SUB/Oversold + OverBought)</p>
<p><u>Strategy Context Variables Analysis</u></p>	<ul style="list-style-type: none"> 2 Context Variables <ul style="list-style-type: none"> *TimeOfDay (All) (Range=0 to 2345) *TimeOfDay (Long Only) (Range=0 to 2345) *TimeOfDay (Short Only) (Range=0 to 2345) *WeekDay (All) (Range=1 to 7) *WeekDay (Long Only) (Range=1 to 7) *WeekDay (Short Only) (Range=1 to 7) 	<p>Here you can detect if certain ranges of additional context variables can filter out adverse results and improve the performance, Example:</p> <p>Avoid long trades between 12:00 and 13:15</p> <p>TimeOfDay and Weekday are available by default but you can add any number of additional variables (like price angle etc)</p>

Data Collection turned off (nBTWFMgrExport=0)

To turn of the data collection OFF, simply set nBTWFMgrExport to 0 in the strategy before running the backtest optimization. This might be useful when for example the BTWFMgr trial period has expired.

BTWFMgr Location+Files

By default BTWFMgr is installed to the C: drive into the C:/BTWFMgr folder.

All sub folders are created underneath this BTWFMgr "home" directory.

Each strategy has its own sub folder, with another subfolder for each symbol:

Example: C:\BTWFMgr\PSS_RSISample\@ES

Each backtest generates its own data files:

Examples:

C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080912_132625.btwf1+2 (Equity data)

C:\BTWFMgr\PSS_RSISample\@ES\P_015Min_20081110_135126.btwf1+2 (Potential data)

{Result} is used below for the basic folder and name of a backtest result - Example:

C:\BTWFMgr\PSS_RSISample\@ES\P_015Min_20081110_135126

Basic BTWFMGR files

Each backtest generates the following files:

- a) BTWFMgr Backtesting Definition File (btwf1)
contains general backtest information
- b) BTWFMgr Backtesting Event Data File (btwf2)
contains the raw trading events, like buy/sell
- c) BTWFMgr Backtesting Position Data File (btwf3)
contains the compacted trading information derived from the btwf2 file
- d) BTWFMgr top results File ({Result}-Best.CSV)
contains the result overview as a small spreadsheet,
which is used by the BTWFMgr overview module
to compare the various markets and timeframe results

BTWFMgr additional Files

In addition the following files are generated by various functions:

- BTWFMgr Result Distribution File ({Result}-Equ.CSV)
Listing all permutations for the selected sort criteria
- BTWFMgr Permutation Database ({Result}.MDB)
Exporting the statistics for each permutation to a Microsoft access database for further processing
and even advanced SQL queries on your results
- BTWFMgr "long only" Position Data File ({Result}-L.btwf3)
Extracted all the long positions from the {Result}, to identify the best results for the long side
- BTWFMgr "short only" Position Data File ({Result}-S.btwf3)
Extracted all the short positions from the {Result}m to identify the best results for the short side

BTWFMgr Walk Forward Files

The Walk Forward Analysis(WFA) generates its own folder and files within/underneath it:

- BTWFMgr Backtesting WFA Data File (btwf4)
contains the details of the Walk Forward Analysis(WFA)
Example: {Result}\P[Daily]+F[PFCheck3]+S[SortMix1].btwf4
- BTWFMgr Backtesting WFA equity overview File (CSV)
contains the WFA results sorted by ending OSA equity:
Example: {Result}\P[Daily]+F[PFCheck3]+S[SortMix1].csv
- BTWFMgr Backtesting WFA Result overview File (-Results.CSV)
contains the details for each WFA result:
Example: {Result}\P[Daily]+F[PFCheck3]+S[SortMix1]-Results.csv
- BTWFMgr WFA log files (CSV)
contains the various log file for each Walk Forward Analysis(WFA).
A new subfolder is generated:
Example: {Result}\P[Daily]+F[PFCheck3]+S[SortMix1]\XXX

A special process allows you to migrate the BTWFMgr "home" directory to another drive (see the "General/DRIVE" Configuration setting).



BTWFMgr Configuration and Preferences

BTWFMgr allows you to easily change almost all of its internal parameters, so you can tailor the behavior to your needs.

To start the configuration, simply click on the  icon in the toolbar –or- Ctrl+C –or- select or from the in the Menu: File/Backtesting Configuration and Preferences (Ctrl+C)

All parameters are organized by topics:


- TreeView
- Smart Ranking Analysis
- Best Trade Permutation Analysis
- Walk Forward Optimization
- Strategy Potential & Probability Analysis
- Initial Data Conversion
- Position Exit Manager (PEM)
- General
- Chart

Below each topic the associated parameters are attached. You can expand and collapse each topic, by clicking on the plus or minus mark ( and ) in front of the topic.

To see a more detailed description - click on the parameter,

and the right window section will show the description and current setting - You can now:

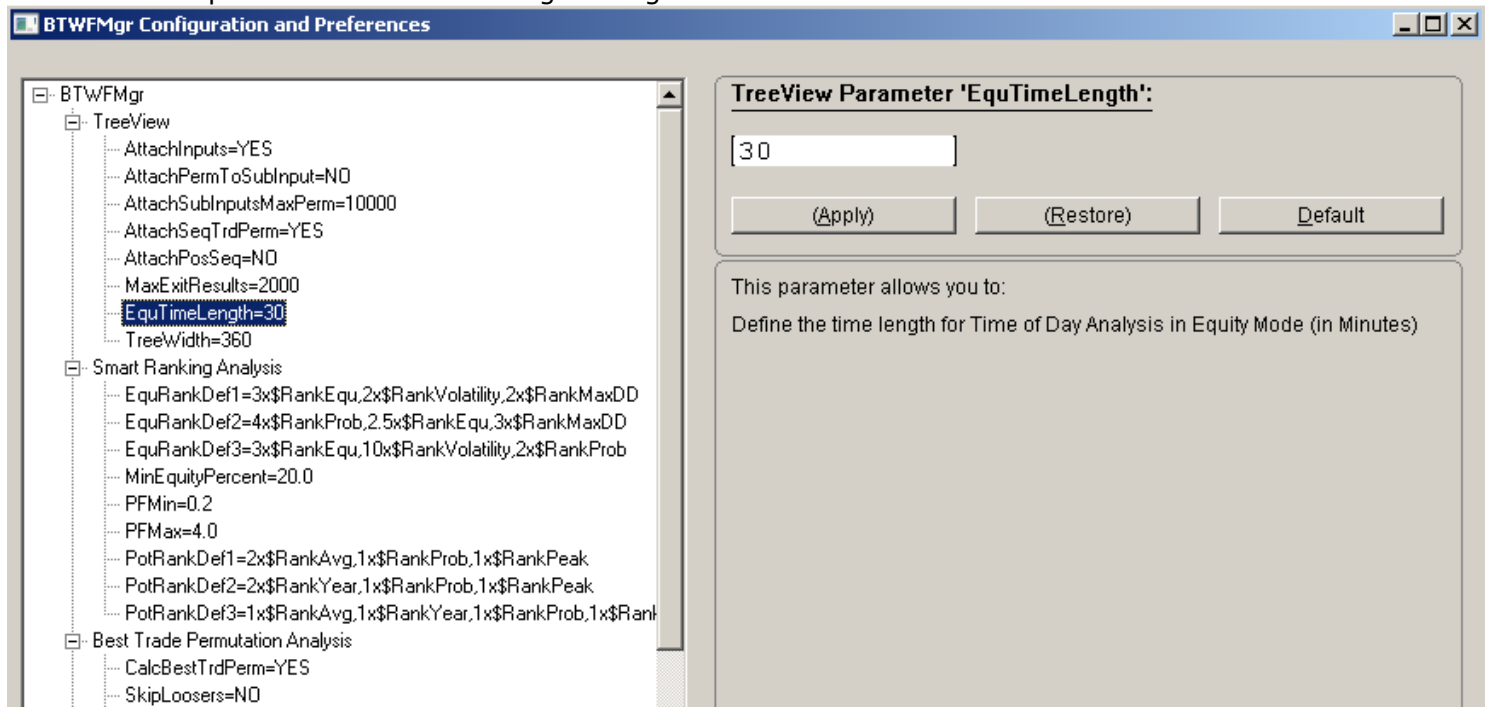
- Change the parameter value (simply enter/select the new value and click on "Apply")
- Restore to the previous setting - after an erroneous change for example - click on "Restore"
- Switch to the parameter default value - click on "Default"

Close the Configuration Window via the "Close" button, the ESC key or the  window button.

The new parameter settings is shown with a star and activated next time you open BTWFMgr again.

A detailed description of each parameter is below in the "reference section".

Below is a sample screen of the BTWFMgr Configuration and Preference Window:


















(You can also edit the configuration parameters directly in the C:/BTWFMgr/BTWFMgr.ini file)

BTWFMgr Toolbar

BTWFMgr offers many functions directly from the toolbar:



Below is a list of each function available from the toolbar:

ICON	Shortcut	Description
	Ctrl+O File/Open Backtesting Data	Open a new BTWFMgr data file (btwf1)
	File/Print	Print current view
	Ctrl+3 Function/3D Result Analysis	Shows Results in 3D View
	Ctrl+R Function/Run Optimization	Runs the Walk Forward Analysis(WFA) in Equity Mode or Exit Optimization in Potential Mode
	Function/Show Data Properties	Shows the properties for the current data set
	Function/Split into Long/Short	Creates new data sets for longs/shorts only
	Function/Recalculate data set	Recalculates the current data set with changed parameters
	Function/Result Distribution	Activates the Result Distribution function
	Function/Create Overview	Activates the BTWFMgr overview module to creates an overview for this Strategy across symbols/timeframes
	Function/Prepare your strategy	Activates the module to prepare your strategy for BTWFMgr
	Function/Configuration and Preferences	Set Configuration and Preference parameter
		Switch between Equity and Draw Down Chart Style
		Switch Bollinger Band Display on/off
		Change the Y Scale display to the next available style
	Help	Activate the BTWFMgr Help Module + License Manager

BTWFMgr Licensing

BTWFMgr comes with a free 15 days trial period – offering full functionality. Check your BTWFMgr license status via: Help/BTWFMgr License Manager –or- Start/Programs/Diamond Backtesting .../License Manager

After the trail period expires - order your BTWFMgr subscription online at:

<http://www.profsoftware.com/bt/order.htm>

BTWFMgr is available at a minimal cost in convenient 3, 6, 12 and 24 month subscriptions or unlimited. We offer discounts for longer subscriptions and grouping orders together for other users or computers. Over the long run the most economical is the outright/unlimited mode. Each BTWFMgr license is on a per computer basis and not transferable.

Registered: 9717 Days left until 7/23/2035 - Backtesting with Walk Forward Manager (BTWFMgr) Exit

Version 2.1c

Registration Step1: Enter your current email address
 Enter full your email address. Then go to Registration Step2 ...

Registration Step2: Receive your Personal Code
 This is your Personal Code - submit with your order! (Copied to the Clipboard - use Paste Ctrl+V to retrieve)

Registration Step3: Submit your online Order
 Always submit the Personal Code with your order Allow 2 days to receive your matching registration key!

Registration Step4: Enter your Registration Key
 Paste the registration you received via email from us here with Ctrl+V after you highlight and copy the key from the email text with Ctrl+C

You can request a trial extension – send us via email us the personal code:

Example: bw:c9hg0o+1djc8vd+pss@pobox.com

During the trial period - you have 10 free data conversions available.

Before the next of the 10 conversions is used up - a confirm box will appear:

Diamond Backtesting with Walk Forward Manager (BTWFMgr)

? You have 9 backtesting data conversion runs left (1 conversions have been used already!) Do you want to run a trial conversion now?

click YES to use the next of the 10 trail data conversions - otherwise click NO.

Machine Replacement or Upgrade

While BTWFMgr registration keys are purchased specifically for a single computer, PSS may, at our discretion, allow you to transfer a serial number to a new or upgraded computer. Such transfers will not be allowed at a rate of more than once per 6-month period, and proof of ownership of a new or upgraded computer (such as an invoice or receipt) will be required along with a signed statement requesting the transfer. Contact us at pss@pobox.com if you would like to request a BTWFMgr license. This transfer option does not in any way alter or override the End User License Agreement (EULA) stating that a registration key is purchased for one machine only.

Strategy Development

Below we are presenting to you briefly the key concepts used in the BTWFMgr. In few basic steps we show you how to quickly develop and test your strategy with BTWFMgr.

Each Trading Strategy has two major elements:

- Strategy Entry Logic – when to enter a position (buy/short)
- Strategy Exit Logic – when to exit/reverse a position (sell/cover)

Strategy development starts in most cases with defining just the entry condition(s) and then translating those rules into the "Strategy Entry Logic" (i.e. EasyLanguage® from TradeStation®).

BTWFMgr allows you to optimize initially only the entry logic, without any exit logic yet, so you can identify initially the best entry points which yield the best "Strategy Potential" (see below). Once the best "Strategy Potential" has been identified you can then move on to the other "wing" of your strategy, which defines the most profitable way to exit the entries: the "Strategy Exit Logic".

Only when both "wings" of your strategy – entry AND exit - are independently strong and healthy, can your strategy "take flight" and can give you consistent profitable results.



BTWFMgr, unlike all other backtesting software tools, does not force you to prematurely include the exit logic, but allows you to first test only the entry logic (Potential Mode) and then later the entry AND exit (Equity Mode), so you can optimize each element individually.

BTWFMgr is collecting its backtesting data in the background while the Backtesting Optimization is processing the data (designed to work currently with the TradeStation®) 8.X platform).

When the backtest process completes, BTWFMgr is automatically activated, and will immediately convert and analyze and save the collected data, and then present to you the results in several interactive graph, so you can quickly identify the best results and apply the various functions to analyze the results.

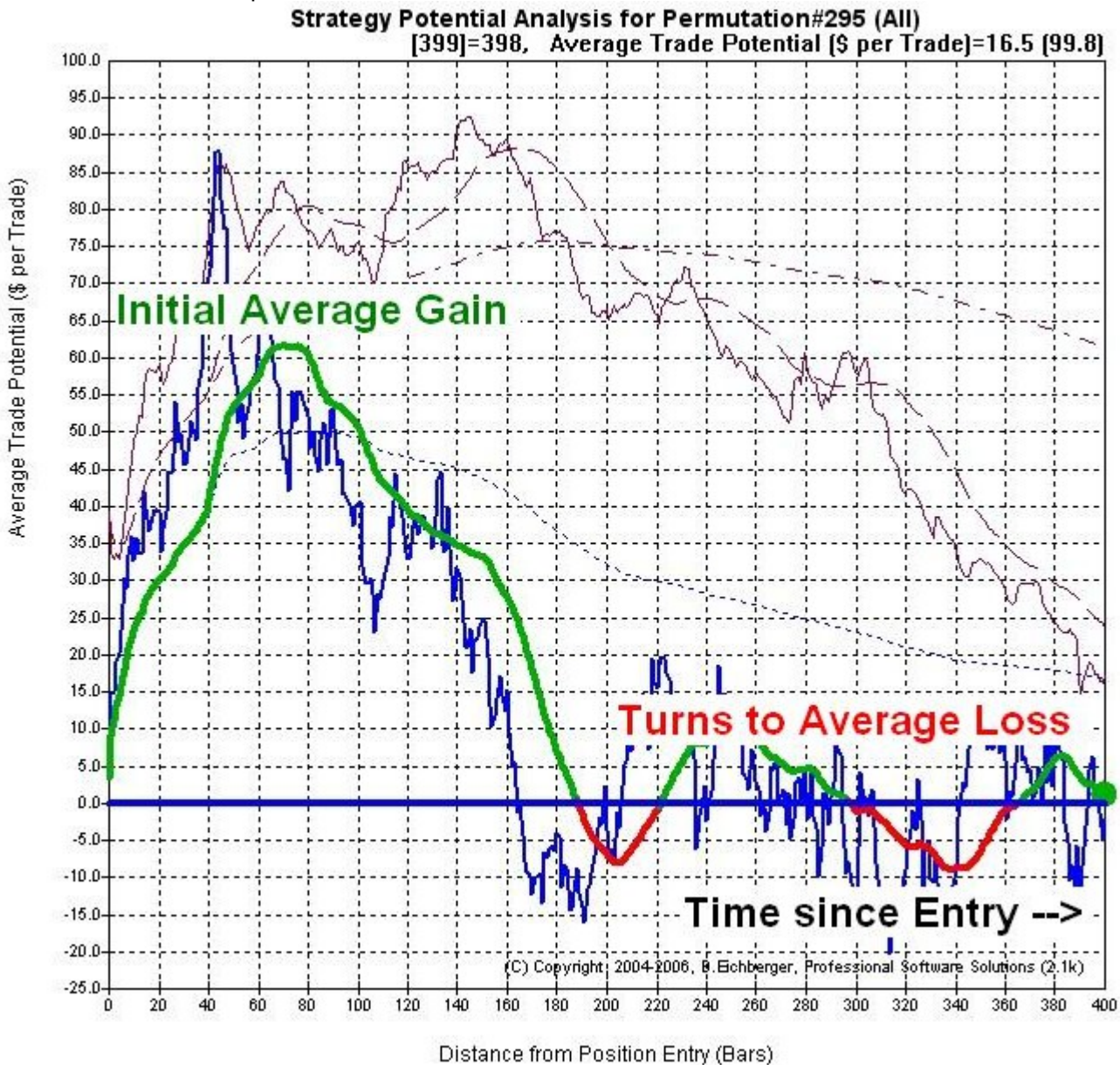
Step1 – Strategy Preparation & TradeStation® Optimization

In the quick strategy preparation – we will add a small section at the end of your strategy code, which will perform the data collection in the background for you. BTWFMgr can do this one time modification of your strategy automatically, so you do not have to be an EasyLanguage expert! (More details below in the "Strategy Preparation" chapter)

Step2 – Detecting the optimal Strategy Potential/Parameters

The only reason for your strategy to enter a new position (buy/short) at the various entry points, is, that you expect – on average – that the market will move in the anticipated direction, allowing you to realize a profit. This assumption can now be precisely tested and verified using BTWFMgr's powerful and innovative approach – detecting the best Trading Strategy Potential.

Lets look at one example:



In this example the market moves initially in the anticipated direction (green line) and reaches after 60 bars and average gain of \$60 (on each trade). Then the market moves – on average - against you.

The "Strategy Potential Graph" shows you clearly:

- How much maximum profit you can expect (highest point of green line)
- When that maximum profit is reached
- How the strategy potential develops over time and if the market turns against you.
- Calculates also a separate Potential for longs and shorts only
- Show the optimal ranges for each strategy input parameter

BTWFMgr is calculating – for each strategy input permutation – the most best and worst strategy potential excursion and then presenting you a list of the best results.

Step3 – Detecting the optimal Strategy Exit Method

Initially the optimal "Strategy Exit Logic" method is not yet known, only the "Strategy Entry Logic". After we have identified the best strategy profit potentials, we can now detect the best exit methods. BTWFMgr come with an integrated "Position Exit Manager (PEM)" which can evaluate 100,000 different exit method variations per second, once all variations are tested BTWFMgr will then show you a list with the best results. Then you can add the corresponding "Strategy Exit Logic" to your strategy. In Potential Mode click on the OPT toolbar button and then initially create a default Exit Definition: Click on "Create Exit Definition". You can then "Modify Exit Definition" or directly "Run Exit Optimization".

Step4 – Detecting the optimal Strategy Result

Now with both the exit and entry logic - you are ready to re-run the TradeStation® Optimization. Set the nBTWFMGrExport strategy input parameter to 2 (Strategy Equity mode).

BTWFMgr will show you the best results in several different lists:

- Sorted by Max Equity
- Sorted by Drawdown(%)
- Sorted by PSSVolatility(%)
- Sorted by Probability(%)
- Sorted by ProfitFactor
- Sorted by Smart Ranking1 – a custom hybrid of above elements
- Sorted by Smart Ranking2 – a custom hybrid of above elements
- Sorted by Smart Ranking3 – a custom hybrid of above elements

BTWFMgr also shows you the optimal ranges for each strategy input parameter and even individual results for each specific strategy input parameter value!

Step5 – Walk Forward Analysis/Optimization (WFA)

In this final step – to verify also using the powerful Walk Forward backtesting method, that your strategy has a realistic profit potential.

In many cases the curve fitted (fantastic) results in step4 are not likely to repeat, Which leads usually to costly and discouraging trading results.

The new "Walk Forward backtesting method" can give you a much more realistic preview and test of the true results your strategy can produce.

BTWFMgr allows you to:

- Use any filter formula you devise
- Use any sort formula you want to test
- Sort all walk forward results identifying the best filter and sort method
- Use any in-sample and out-of-sample period setup
- See the out-of-sample results in one comprehensive equity graph or spreadsheet or even 3D View
- Show the last period input parameter – which are then used in the actual live trading

See more information in a separate chapter "Walk Forward Analysis(WFA)" below.

Walk Forward Analysis (WFA)

BTWFMgr contains also the advanced Walk Forward Analysis (WFA), which allows you essentially to “fire-test” your strategy performance, using historical data, and to find the most robust and predictive approach and parameters. Walk Forward Analysis (WFA) is available in BTWFMgr Equity mode.

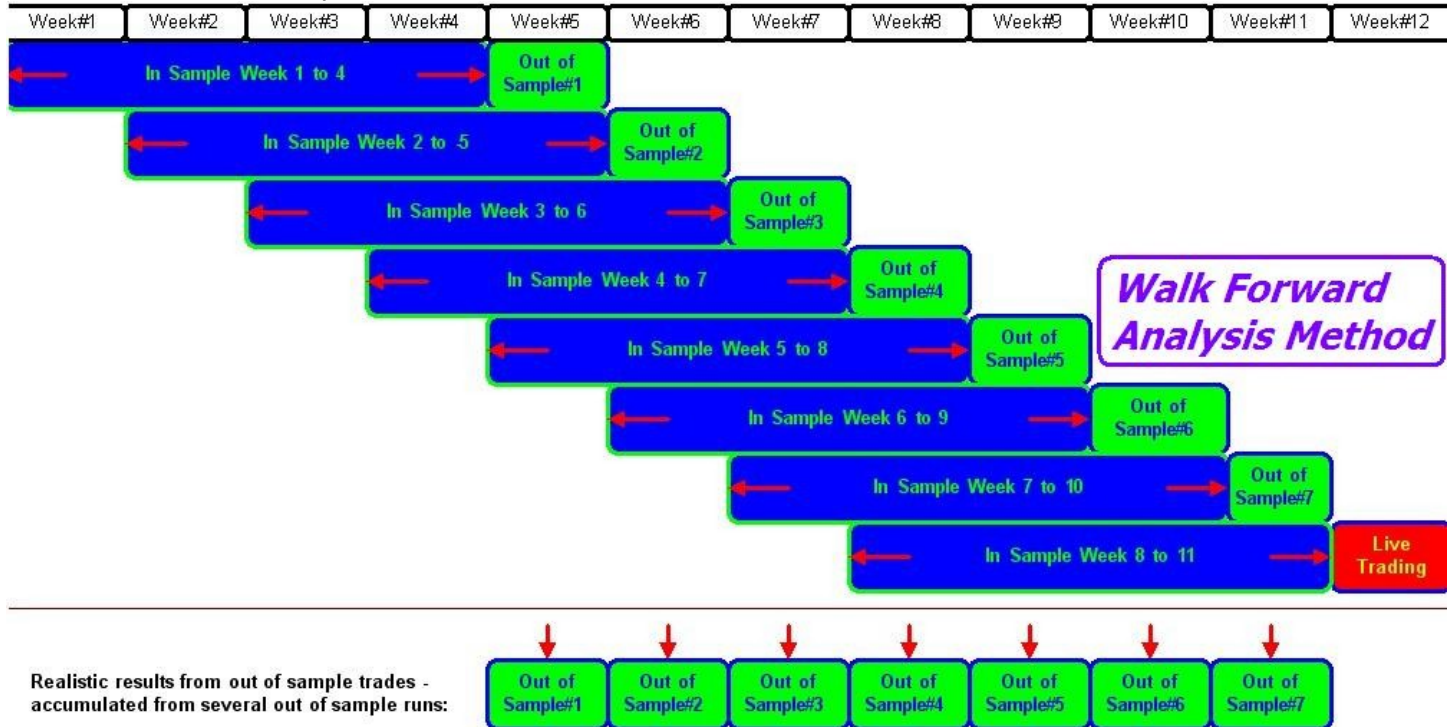
Walk Forward Analysis Overview

Walk Forward Analysis (WFA) is a powerful automated process – saving you hours or days of manual error-prone calculations. The following WFA steps are performed:

- Identify the customizable “In-Sample” period (blue section below)
- Extract all candidates from the “In-Sample” period using the WFA Filter and eliminate all undesired results. In some case ALL candidates are eliminated.
- Find the “best” “In-Sample” permutation based on your WFA Sort specifications
- Shift the focus to the next customizable “Out-of-sample” period (green sections below) which follows directly the “In-Sample” period
- Apply this “best” permutation to the “Out-of-sample” period, thereby “fire-testing” and checking if the “In-Sample” performance actually continued.
- Append this “Out-of-sample” result to the overall WFA result.
- Move to the next “In-Sample” period until all data has been processed.
- Show the “best” strategy parameter for the future period (next “Out-of-sample” period) (red below)

This WFA approach avoids the usual costly “curve-fitting” phenomenon, when a stellar performance, does in many case NOT continue in the future live trading!

Below is an example using a 4 week “In-Sample” period and one week “Out-of-sample” period with 7 walk forward steps:

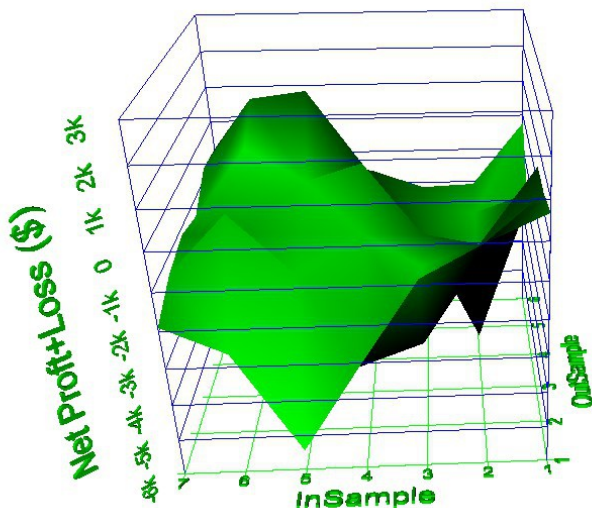


Below is a BTWFMgr example of a 4 week "In-Sample" period and one week "Out-of-sample" period:
 (WFA Optimization#3 of the WalkFwd.btwf1 sample data set)

Period#	ISA-From	ISA-To	PermID	ISA-PL	ISA-Hits	ISA-PF	OSA-From	OSA-To	OSA-PL	Equity	OSA-Hits	OSA-PF	RSILength	OverSold	OverBought	EMALength	LossAmt	GainAmt
1	20050606	20050703	2831	1555.00	24	1.8	20050704	20050710	135.00	135.00	3	1.6	19	48	60	20	220	180
2	20050613	20050710	3197	1102.50	27	1.8	20050711	20050717	380.00	515.00	4	0.0	20	44	66	20	220	100
3	20050620	20050717	334	1307.50	26	1.8	20050718	20050724	307.50	822.50	11	1.3	14	46	58	20	220	140
4	20050627	20050724	1839	1467.50	24	1.8	20050725	20050731	87.50	910.00	5	1.2	17	46	66	20	220	180
5	20050704	20050731	1902	1460.00	28	1.8	20050801	20050807	292.50	1202.50	4	2.3	17	48	64	20	220	140
6	20050711	20050807	783	1797.50	28	1.8	20050808	20050814	1640.00	2842.50	12	4.6	15	44	64	20	220	180
7	20050718	20050814	254	1977.50	37	1.8	20050815	20050821	1432.50	4275.00	11	6.9	14	44	58	20	220	140
8	20050725	20050821	128	1845.00	26	1.8	20050822	20050828	200.00	4475.00	5	1.4	14	40	62	20	220	220
9	20050801	20050828	266	2240.00	42	1.8	20050829	20050904	100.00	4575.00	10	1.1	14	44	60	20	180	140
10	20050808	20050904	2668	2115.00	32	1.8	20050905	20050911	300.00	4875.00	5	1.8	19	44	60	20	180	220
11	20050815	20050911	1642	1415.00	27	1.8	20050912	20050918	-380.00	4495.00	6	0.5	17	42	62	20	180	140
12	20050822	20050918	633	1217.50	29	1.8	20050919	20050925	-390.00	4105.00	8	0.5	15	40	66	20	180	100
13	20050829	20050925	317	1460.00	33	1.8	20050926	20051002	340.00	4445.00	7	2.5	14	44	66	20	220	100
14	20050905	20051002	773	1312.50	35	1.8	20051003	20051009	-120.00	4325.00	4	0.6	15	44	64	20	140	100
15	20050912	20051009	3328	1077.50	17	1.8	20051010	20051016	-490.00	3835.00	8	0.6	20	48	62	20	220	220
16	20050919	20051016	1517	880.00	24	1.8	20051017	20051023	-595.00	3240.00	4	0.1	17	38	66	20	220	100
17	20050926	20051023	1889	1005.00	34	1.7	20051024	20051030	255.00	3495.00	9	1.8	17	48	64	20	100	100
18	20051003	20051030	273	920.00	31	1.7	20051031	20051106	45.00	3540.00	11	1.1	14	44	62	20	100	100
19	20051010	20051106	273	985.00	38	1.6	20051107	20051113	-92.50	3447.50	11	0.9	14	44	62	20	100	100
20	20051017	20051113	3209	1112.50	30	1.8	20051114	20051120	282.50	3730.00	6	2.5	20	46	58	20	180	100
21	20051024	20051120	3289	970.00	31	1.7	20051121	20051127	-92.50	3637.50	6	0.8	20	48	58	20	180	100
22	20051031	20051127	3296	1032.50	16	1.7	20051128	20051204	-30.00	3607.50	6	1.0	20	48	58	20	220	220

Column	Example	Description
Period#	1	Walk Forward period, starting at 1
ISA-From	20050606	"In-Sample" starting date (Jun 6 th , 2005)
ISA-To	20050703	"In-Sample" ending date (Jul 3 rd , 2005)
PermID	2831	"Best" permutation ID for this ISA period parameters representing this permutations are shows at the end (RSILength=19, Oversold=48, OverBought=60 etc.)
ISA-PL	\$1555.00	Profit/Loss within the "In-Sample" period (using PermID 2831)
ISA-Hits	24	Number of positions the "In-Sample" period
ISA-PF	1.8	ProfitFactor within the "In-Sample" period
OSA-From	20050704	"Out-of-Sample" starting date (Jul 4 th , 2005)
OSA-To	20050710	"Out-of-Sample" ending date (Jul 10 th , 2005)
OSA-PL	\$135.00	"Out-of-Sample" profit/loss within current period
Equity	\$135.00	Overall OSA equity total
OSA-Hits	3	Number of positions the "Out-of-Sample" period
OSA-PF	1.6	ProfitFactor within the "Out-of-Sample" period
RSILength	19	Strategy Parameters representing the "best" Permutation ID 2831 as you can see each Period# usually selects its own "best" parameter settings!


After the Walk Forward Analysis (WFA) you can then use the WFA Cluster Analysis and 3D View to detect the best WFA trading parameters (more details below):






Walk Forward Analysis Setup Module

First load the Equity result you would like to work with or click File/Open WalkForward Sample File.

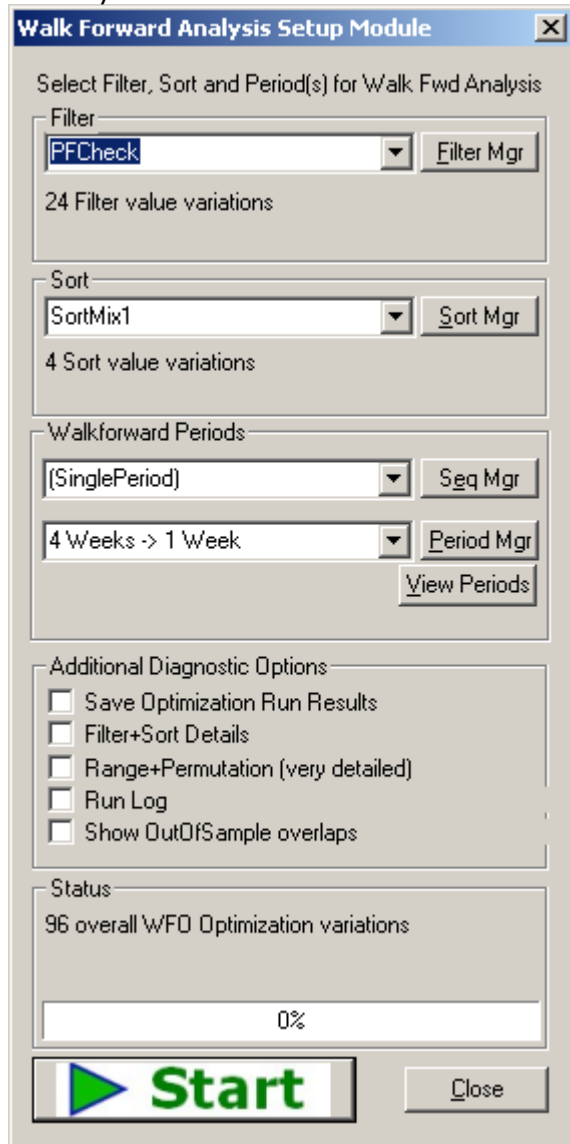
To activate the WFA Module:

- click on the  (Optimize) icon in the toolbar –or–
- Ctrl+R –or–
- select from the menu: Functions/Run Optimization (Ctrl+R)

Follow the simple steps below to run your Walk Forward Analysis(WFA) (explained in more details below):

- Select/Define your WFA Filter
- Select/Define your WFA Sort
- Select/Define your WFA Period Setup
- Select any "Additional Diagnostic Options" – usually all are unchecked for faster performance
- Click on the  button and confirm
- Wait for the WFA to complete – BTWFMgr shows you the overall and individual progress in %
- While WFA is running you can click on the  button to pause or abort.
to continue the WFA press the  button
- When WFA has completed BTWFMgr will prompt you and display the new WFA result branch in the treeview.

Below you can see the Walk Forward Setup module:



Walk Forward Analysis – Filter Definition (Step1)

The first step in the Walk forward Analysis(WFA), is to eliminate unwanted candidates from the complete list of all trade permutations within each "In-Sample" range. This process is repeated for each WFA period. Select the Filter to be used in the WFA from the list of Filters in the Walk Forward Setup module:

With the "Filter Manager" you can create and manage your own filter(s).

You can also select "NoFilter" from the list – if you do NOT want to filter any permutations.

Filter Manager

BTWFMgr contains the easy "Filter Manager" interface– assisting you in creating/modifying your WFA filters.

Simply click on the **Filter Mgr** button in the Walk Forward Setup module to activate the "Filter Manager":

Name	Test Range	Value List
PFMin	1.0 to 1.2 step 0.2	1, 1.2
PFMax	1.8 to 2.2 step 0.2	1.8, 2, 2.2
MaxGainCntMin	6,5	6, 5
MaxLossCntMax	6,5	6, 5

BTWFMgr will show the number of filter variations next to the selected Filter:

"24 Filter variations in 4 variables"

which is the product of: 2xPFMin, 3xPFMax, 2x MaxGainCntMin, 2x MaxLossCntMin.

Filter Formula

BTWFMgr allows you to specify a formula, a simple logical expression, with a TRUE/FALSE result. TRUE=keep the permutation as a candidate, FALSE=discard the permutation in this "In-Sample" range.

Below is a simple formula, which tests if the ProfitFactor (\$PF) is at or above 1.0 (breakeven point):
(\$PF >= 1.0)

In other words, we discard any permutations with a ProfitFactor below 1.0 (total loss > total gains).

BTWFMgr allows you even to go one step further and introduce "filter variables", so you can test several different filter variable values and determine which value(s) yield the best overall results.

In the example below we replace the fixed "1.0" value with a new "PMin" variable (case sensitive):

(\$PF >= PMin)

BTWFMgr allows you to define the values for "PMin":

PMin=0.9 to 1.3 step 0.1

BTWFMgr will run 5 tests with the following "PMin" values:

0.9, 1.0, 1.1, 1.2, 1.3 (0.9 and 1.3 in 0.1 steps)

To see a list of available "Filter Statistics Variables" click on

Show available Statistics Variables

or select from the list below:

Filter System Variables

Below is a table of all system variables available for the Filter and Sort Formula:

\$Equ	Ending Equity
\$CntGain	Number of Winning Trades
\$CntLoss	Number of Losing Trades
\$CntTrd	Number of all Trades
\$GrossGain	Total of all Gains
\$GrossLoss	Total of all Losses
\$AvgGainAmt	Average Winner Amount
\$AvgLossAmt	Average Loser Amount
\$MaxGainAmt	Max Winner Amount
\$MaxLossAmt	Max Loser Amount
\$MaxGainCnt	Max Winner in a row
\$MaxLossCnt	Max Losers in a row
\$PF	ProfitFactor (\$GrossGain / \$GrossLoss)
\$PFAvg	ProfitFactor (\$AvgGainAmt / \$AvgLossAmt)
\$Prob	Probability(%)\$CntGain/\$CntTrd
\$MaxDDAmt	Max Drawdown Amount (negative)
\$MaxDDPer	Max Drawdown (% of Starting Capital)
\$DDAvg	Drawdown average (% of ending Equity)
\$StdDevAmt	Standard Deviation Amount
\$StdDevPer	Standard Deviation (% of Starting Capital)
\$VolatilityAmt	Volatility Amount (Avg distance from straight Income line)
\$VolatilityNet	Volatility (% of Starting Capital)
\$RankEqu	Equity Rank (100%=best/highest, 0%=worst/lowest)
\$RankMaxDD	Drawdown Rank (100%=best/smallest, 0%=lowest/highest)
\$RankVolatility	Volatility Rank (100%=best/smallest, 0%=lowest/highest)
\$RankProb	Probability Rank (100%=best/highest, 0%=worst/lowest)
\$RankPFGross	ProfitFactor (\$PF) Rank (100%=best/highest, 0%=worst/lowest)
\$RankCombo1	Smart Ranking Result1(%) (100%=best/highest, 0%=worst/lowest)
\$RankCombo2	Smart Ranking Result2(%) (100%=best/highest, 0%=worst/lowest)
\$RankCombo3	Smart Ranking Result3(%) (100%=best/highest, 0%=worst/lowest)

To check the ranges and see actual values for each of these system variables, right click on any permutation in the treeview and select "Export Statistics to Spreadsheet (All Permutations)".

Filter Math Functions

BTWFMgr offers even the use of math functions in your WFA Filter formula, here is the "PROM: filter formula:
 $((\$AvgGainAmt*(\$CntGain-sqrt(\$CntGain)))/(\$AvgLossAmt*(\$CntLoss-sqrt(\$CntLoss)))) > PROMMin$

Below is a table of available math function in the WFA Filter Formula:

abs(x)	Absolute Value: $abs(-5) = 5$
floor(x)	largest integer that is less than or equal to x: $floor(2.8)=2$, $floor(-2.8)=3$
sqrt(x)	Square root(x)
sign(x)	Sign: $sign(-3)=-1$, $sign(0)=0$, $sign(6)=+1$
exp(x)	Exponential: $exp(2.302585) = 10.000000$
pow(x,y)	Power of: $pow(2,3) = 8.00000000$
ln(x)	Natural logarithms: $ln(9000) = 9.104980$
log(x)	Decimal logarithms: $log(9000) = 3.954243$
log2(x)	Binary logarithms : $log2(4) = 2.000$
sin(x)	Sinus: $sin(1.570796) = 1.000000$
cos(x)	Cosinus: $cos(1.570796) = 0.000000$
cmple(x,y)	Compare if less or equal: $cmple(2,3)=1$, $cmple(2,2)=1$, $cmple(2,1)=0$
cmplt(x,y)	Compare if less: $cmplt(2,3)=1$, $cmplt(2,2)=0$, $cmplt(2,1)=0$
cmpge(x,y)	Compare if greater or equal: $cmpge(2,3)=0$, $cmpge(2,2)=1$, $cmpge(2,1)=1$
cmpgt(x,y)	Compare if greater: $cmpgt(2,3)=0$, $cmpgt(2,2)=0$, $cmpgt(2,1)=1$

Creating a new Filter

To create a new filter click on "Create a New Filter":

- Choose if you want to clone the current filter or create a blank new filter
- Enter the new formula
- Click on **Show available Statistics Variables** to see available statistics variables.
- If you are using variables - click on "Add Variable"
- Enter the new variable name
- A new variable with a single "0" value will be added
- Click on the "0" value in the "Test Range" column
- BTWFMgr will switch to edit cell mode
- Enter the new list of values, you have two formats available:
1.0 to 2.0 step 0.2 -or-
1, 1.3, 1.5, 2
- When you have added all variables and the formula click on "VERIFY"
- Enter any comment or description for the new filter
- Correct any errors
- Finally click on "SAVE" to actually save the new filter to the file
- From now on the new Filter will appear in the pull down menu.
- If you want to view the actual filter file content – click on "Edit Filter directly"

Deleting an exiting Filter

Select the filter to be deleted and click on "Delete Filter" – confirm the deleting.

Filter File Format

BTWFMgr stores each WFA filter in a separate text file.

Here is an example of the "PFCheck:" filter file – located at C:/BTWFMgr/PFCheck.btfff":

```
Formula=($PF >= PFMin) AND ($PF <= PFMax) AND ($MaxGainCnt > MaxGainCntMin) AND ($MaxLossCnt < MaxLossCntMax)
```

```
PFMin=1.0 to 1.2 step 0.2
```

```
PFMax=1.8 to 2.2 step 0.2
```

```
MaxGainCntMin=6,5
```

```
MaxLossCntMax=6,5
```

```
;===== SAMPLE FILTER FILE =====
```

```
;===== THIS WILL FILTER BASED ON:
```

```
; ProfitFactor ($PF) and
```

```
; Consecutive Win/lose runs ($MaxGainCnt/$MaxLossCnt)
```

The first line is always the Formula

```
Formula=($PF >= PFMin) AND ($PF <= PFMax) AND ($MaxGainCnt > MaxGainCntMin) AND ($MaxLossCnt < MaxLossCntMax)
```

Then follow all the Filter Variables with their ranges

```
PFMin=1.0 to 1.2 step 0.2
```

```
PFMax=1.8 to 2.2 step 0.2
```

```
MaxGainCntMin=6,5
```

```
MaxLossCntMax=6,5
```

At the end is your description/comment – always starting with a semicolon:

```
;===== SAMPLE FILTER FILE =====
```

```
;===== THIS WILL FILTER BASED ON:
```

```
; ProfitFactor ($PF) and
```

```
; Consecutive Win/lose runs ($MaxGainCnt/$MaxLossCnt)
```

If you are confident enough you could directly create and edit these filter file (C:/BTWFMgr/*.btfff)

Walk Forward Analysis – Sort Definition (Step2)

After the WFA has selected all viable candidates and discarded the rest in the Filter Step1, We still have usually many candidates left.

In this WFA sorting step, BTWFMgr will re-arrange the candidates in a customizable sort order. The permutation/candidate showing up at the TOP is the ONE winner, which is then used in for the “Out-of –sample” calculation.

Each Sort Definition can contain one or several sort methods.

Below is an example of 4 different sorts:

Sort1=\$MaxTrdLoss/5 DESC,\$Equity,\$MaxDDAmt

Sort2=\$Equity,\$MaxDDAmt,\$MaxTrdLoss DESC

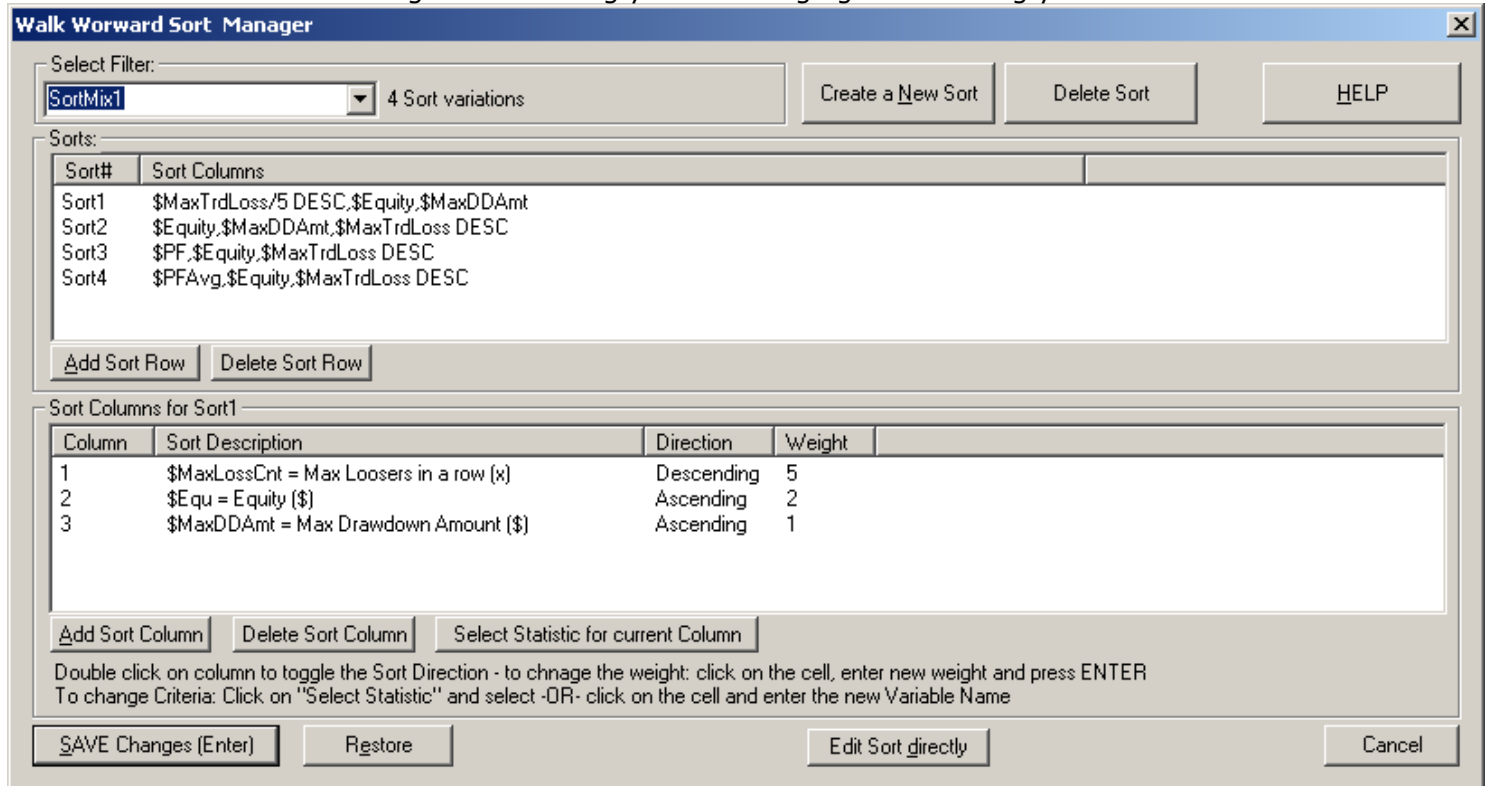
Sort3=\$PF,\$Equity,\$MaxTrdLoss DESC

Sort4=\$PFAvg,\$Equity,\$MaxTrdLoss DESC

Sort4=\$PFAvg,\$Equity,\$MaxTrdLoss DESC

Each WFA-Sort Definition is defined in a text file (Example C:/BTWFMgr/SortMix1.btwfs).

The “Walk Forward Sort Manager” is assisting you in managing and defining your sort criterias:



Walk Forward Analysis – Defining the Period Setup/Sequence

BTWFMgr allows you several different ways to design the various in-sample(ISA) and out-of sample(OSA) testing periods. BTWFMgr comes with many predefined period setups, but you can define and add any custom period setup!

To view the actual WFA period – click on [View Periods \(for current data\)](#) (see examples below)
 You can even specify your own custom shift (in days) in the configuration:
 Walk Forward Optimization/WFODayShift=0

a) Number of Walk Forward Runs and OSA Percent

You specify the number of Runs and the percent of out-of-sample days

Example: 10 Runs with 10% out-of-sample

Period:	10 Runs -> 10 %					
Data:	C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080829_123503.btwf1					
Range:	1/2/2008 to 8/15/2008					
Duration:	226 calendar days - with 182 actual trading days					
Period#	In-Sample(ISA)			Out-of-Sample(OSA)		
	StartDate	EndDate	Days	StartDate	EndDate	Days
1	1/2/2008 (Wed)	4/20/2008 (Sun)	110	4/21/2008 (Mon)	5/1/2008 (Thu)	11
2	1/13/2008 (Sun)	5/1/2008 (Thu)	110	5/2/2008 (Fri)	5/12/2008 (Mon)	11
3	1/24/2008 (Thu)	5/12/2008 (Mon)	110	5/13/2008 (Tue)	5/23/2008 (Fri)	11
4	2/4/2008 (Mon)	5/23/2008 (Fri)	110	5/24/2008 (Sat)	6/3/2008 (Tue)	11
5	2/15/2008 (Fri)	6/3/2008 (Tue)	110	6/4/2008 (Wed)	6/14/2008 (Sat)	11
6	2/26/2008 (Tue)	6/14/2008 (Sat)	110	6/15/2008 (Sun)	6/25/2008 (Wed)	11
7	3/8/2008 (Sat)	6/25/2008 (Wed)	110	6/26/2008 (Thu)	7/6/2008 (Sun)	11
8	3/19/2008 (Wed)	7/6/2008 (Sun)	110	7/7/2008 (Mon)	7/17/2008 (Thu)	11
9	3/30/2008 (Sun)	7/17/2008 (Thu)	110	7/18/2008 (Fri)	7/28/2008 (Mon)	11
10	4/10/2008 (Thu)	7/28/2008 (Mon)	110	7/29/2008 (Tue)	8/8/2008 (Fri)	11
11	4/21/2008 (Mon)	8/8/2008 (Fri)	110	8/9/2008 (Sat)	8/19/2008 (Tue)	11

b) Number of ISA/OSA Days

Example: 100 days ISA periods with 20 day out-of-sample periods

c) Number of ISA/OSA Weeks

ISA periods always start on a Monday.

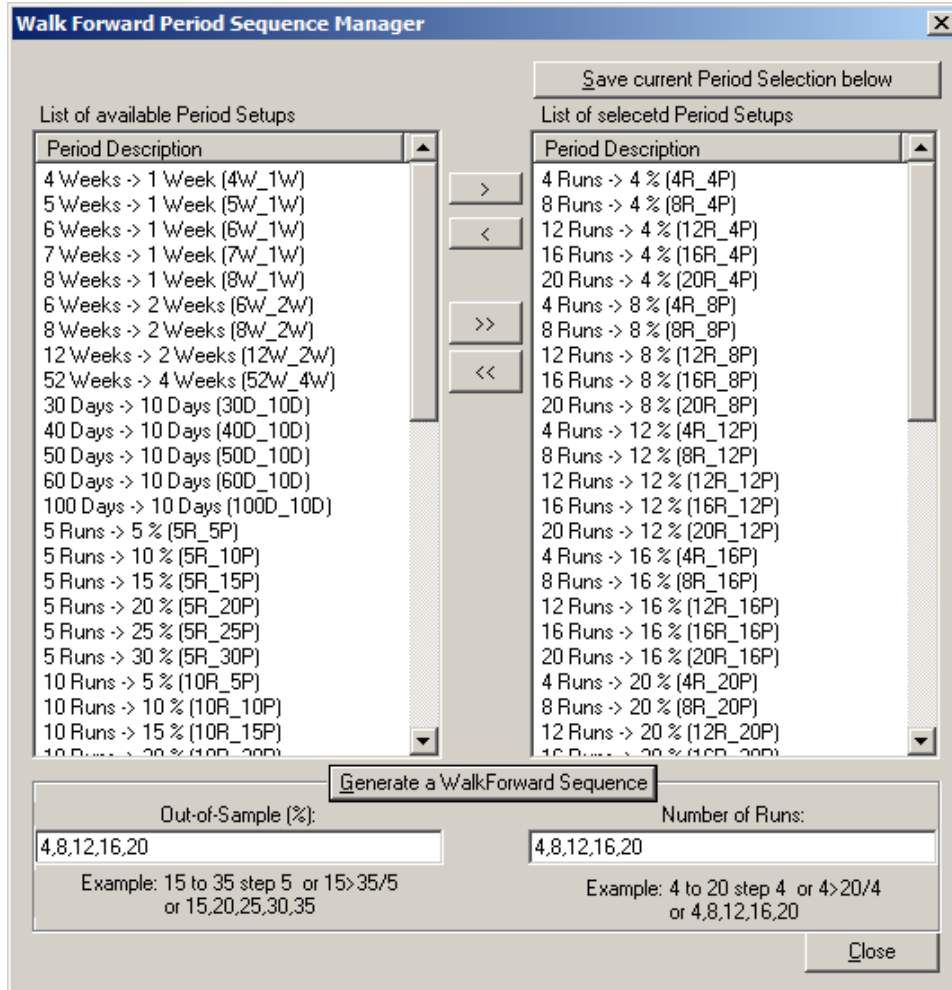
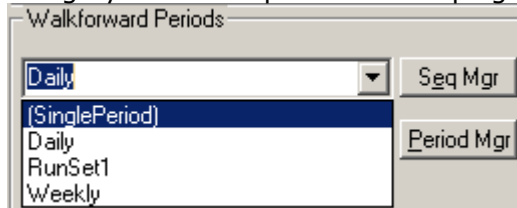
Example: 8 weeks ISA periods with 2 weeks out-of-sample periods

Period:	8 Weeks -> 2 Weeks					
Data:	C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080829_123503.btwf1					
Range:	1/2/2008 to 8/15/2008					
Duration:	226 calendar days - with 182 actual trading days					
Period#	In-Sample(ISA)			Out-of-Sample(OSA)		
	StartDate	EndDate	Days	StartDate	EndDate	Days
1	1/7/2008 (Mon)	3/2/2008 (Sun)	56	3/3/2008 (Mon)	3/16/2008 (Sun)	14
2	1/21/2008 (Mon)	3/16/2008 (Sun)	56	3/17/2008 (Mon)	3/30/2008 (Sun)	14
3	2/4/2008 (Mon)	3/30/2008 (Sun)	56	3/31/2008 (Mon)	4/13/2008 (Sun)	14
4	2/18/2008 (Mon)	4/13/2008 (Sun)	56	4/14/2008 (Mon)	4/27/2008 (Sun)	14
5	3/3/2008 (Mon)	4/27/2008 (Sun)	56	4/28/2008 (Mon)	5/11/2008 (Sun)	14
6	3/17/2008 (Mon)	5/11/2008 (Sun)	56	5/12/2008 (Mon)	5/25/2008 (Sun)	14
7	3/31/2008 (Mon)	5/25/2008 (Sun)	56	5/26/2008 (Mon)	6/8/2008 (Sun)	14
8	4/14/2008 (Mon)	6/8/2008 (Sun)	56	6/9/2008 (Mon)	6/22/2008 (Sun)	14
9	4/28/2008 (Mon)	6/22/2008 (Sun)	56	6/23/2008 (Mon)	7/6/2008 (Sun)	14
10	5/12/2008 (Mon)	7/6/2008 (Sun)	56	7/7/2008 (Mon)	7/20/2008 (Sun)	14
11	5/26/2008 (Mon)	7/20/2008 (Sun)	56	7/21/2008 (Mon)	8/3/2008 (Sun)	14
12	6/9/2008 (Mon)	8/3/2008 (Sun)	56	8/4/2008 (Mon)	8/17/2008 (Sun)	14
13	6/23/2008 (Mon)	8/17/2008 (Sun)	56	8/18/2008 (Mon)	8/31/2008 (Sun)	14






Defining a sequence of walk forward Period setups

BTWFMgr allows you even to select a sequence of period setups, so you can test which period setup performs the best for your strategies!

You can either select one of the predefined Period Sequences (Daily, Weekly etc) –or– design your own – press the “Seq Mgr” button – and the “Walk Forward Period Sequence Manager” will open!



The following functions are available:

- a) Single Add: click one period on left – then click the Add button 
- b) Group Add: click your selection on the left – then click the Add button 
- c) All Add: click on the Add All button 
- d) Generate custom Sequence: enter the “Out-of-Sample(%)” and “Nbr of Runs” list; then click the “Generate a Walk Forward Sequence”
- e) Single Delete: click one period on right– then click the Delete button 
- f) All Delete: click on the Delete All button 

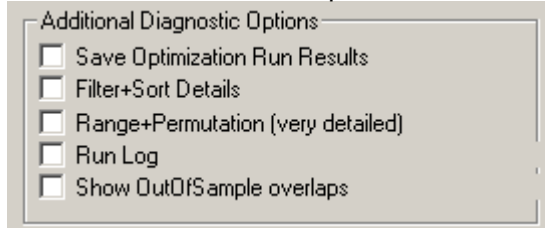
Remember to save any newly created Period selection – press the Save button:



- then enter the new Period Sequence Name.

Walk Forward Analysis – Check your Save Result Options

Usually all check boxes in the “Additional Diagnostic Options” section are left unchecked to achieved maximum speed for the Walk Forward Analysis:



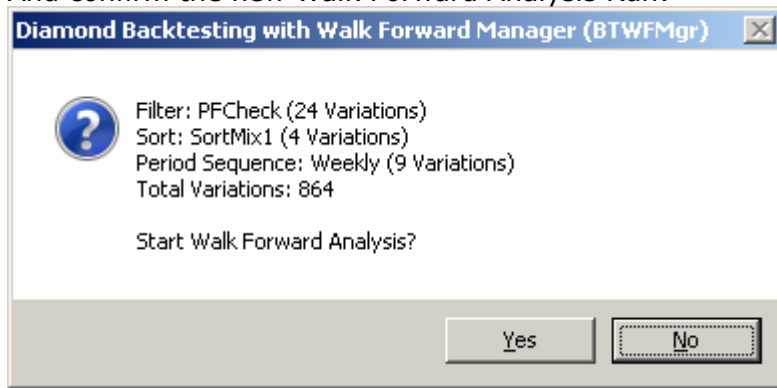
In some cases you might want to review and track internal WFA calculations and enable some diagnostic options, which are also saved to the new WFA sub folder.

Walk Forward Analysis – Starting Walk Forward Analysis

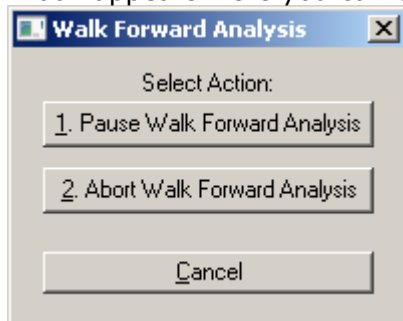
To finally start the Walk Forward Analysis (WFA) – simply press the green “Start Run” button:



And confirm the new Walk Forward Analysis Run:



You can now abort or pause the WFA run by pressing the button. A box appears were you can choose:

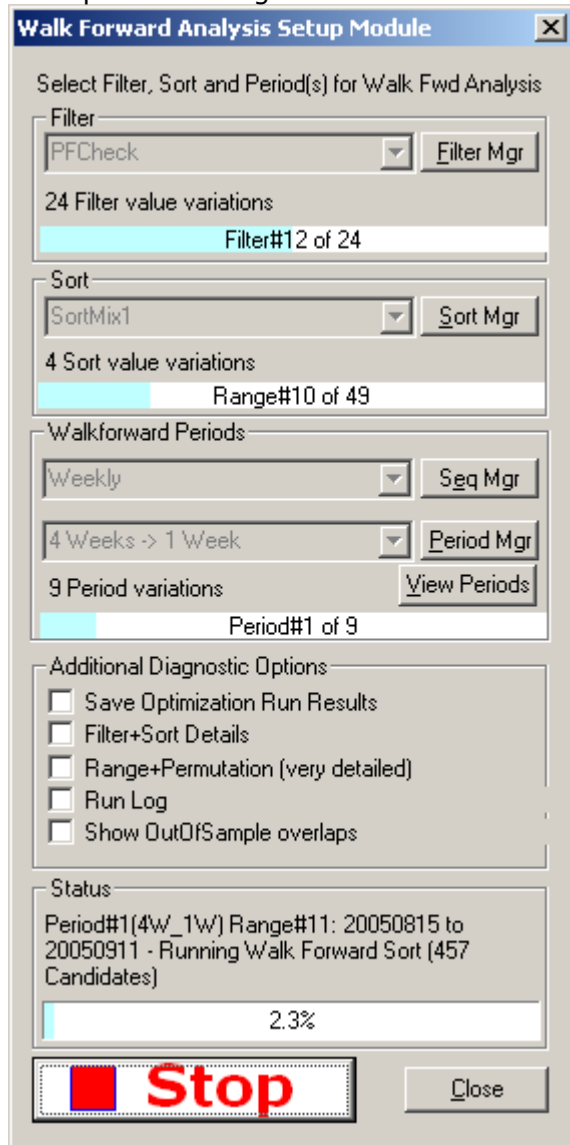


As BTWFMgr calculates the many WFA permutations - the progress is shown to you in the cyan bars

For each level:

- Filter (current filter processed with in the current Date Range)
- Range (current Date Range within the current period)
Each period definition creates several date ranges for the In-Sample/Out-of-Sample periods.
Click on "View Periods" to see the date ranges being created for the WFA
- Period (current Period as defined in the Period Sequence, unless a single period has been selected)
- Overall progress at the bottom

Example of running WFA:



Walk Forward Analysis – Treeview Display

When the WFA has completed, BTWFMgr automatically add a new tree branch, with blue squares, at the top. The WFA results are shown first sorted by 6 different criteria (Equity, Drawdown, Volatility, Probability, ProfitFactor and Robustness). Then follow the Filter and Sort Variations used in this WFA and the In/OutSample periods calculated – Below is an example:

- 144 Optimizations (P[Weekly]+F[SanePFs_01]+S[SortMix1])
 - Sorted by Equity
 - Equ=2885.00\$, PF=1.10x Pos=333, Opt#44, Per#3=6W_
 - Equ=2677.50\$, PF=1.10x Pos=332, Opt#59, Per#4=6W_
 - Equ=2555.00\$, PF=1.10x Pos=339, Opt#61, Per#4=6W_
 - Equ=2555.00\$, PF=1.10x Pos=339, Opt#53, Per#4=6W_
 - Equ=2210.00\$, PF=1.08x Pos=358, Opt#49, Per#4=6W_
 - Equ=2120.00\$, PF=1.07x Pos=306, Opt#112, Per#7=8W
 - Equ=2097.50\$, PF=1.08x Pos=368, Opt#33, Per#3=6W_
 - Equ=2090.00\$, PF=1.08x Pos=367, Opt#41, Per#3=6W_
 - Equ=1980.00\$, PF=1.08x Pos=329, Opt#105, Per#7=8W
 - Equ=1957.50\$, PF=1.08x Pos=331, Opt#97, Per#7=8W_
 - 134 Other Optimizations
 - Sorted by Drawdown(%)
 - Sorted by PSSVolatility(%)
 - Sorted by Probability(%)
 - Sorted by ProfitFactor
 - Sorted by Robustness
 - 4 Walk Forward Filter
 - 4 Walk Forward Sorts
 - 7 Walk Forward InSample Periods
 - 1. 4 Weeks
 - 2. 5 Weeks
 - 3. 6 Weeks
 - 4. 7 Weeks
 - 5. 8 Weeks
 - 6. 12 Weeks
 - 7. 52 Weeks
 - 3 Walk Forward OutOfSample Periods
 - 1. 1 Weeks
 - 2. 2 Weeks
 - 3. 4 Weeks

Walk Forward Analysis – Result Viewing

BTWFMgr offers many ways to view the WFA results and identify the best WFA logic:

View best WFA Equity

BTWFMgr is showing by default the top 10 WFA results, just click on any of the results to view the equity. The remaining results are shown in the “XXX Other Optimizations” branch.

If you want to see more than 10 top results – changed the configuration parameter “MaxWFOOpt”.

View best WFA Probability

Click on the (+) in front of the “Sorted by Probability” branch and BTWFMgr will expand the branch and show the list of the top 10 results:

Prob(%)	Equ(\$)	PF	Pos	Opt#
65.689%	1945.00	1.08x	341	Opt#
65.385%	1735.00	1.07x	338	Opt#
65.192%	2555.00	1.10x	339	Opt#
65.192%	2555.00	1.10x	339	Opt#
64.438%	1980.00	1.08x	329	Opt#
64.35%	1745.00	1.07x	331	Opt#
64.048%	1957.50	1.08x	331	Opt#
63.939%	1825.00	1.07x	330	Opt#
63.76%	2090.00	1.08x	367	Opt#
63.408%	2210.00	1.08x	358	Opt#
134 Other Optimizations				

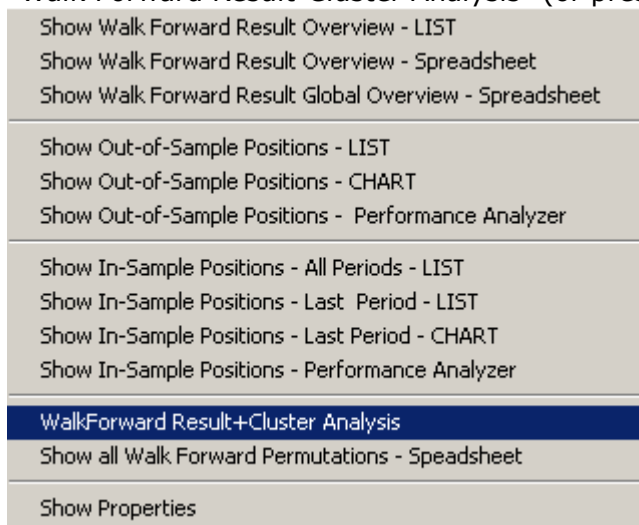
If you want to see more than 10 top results – changed the configuration parameter “MaxWFOOpt”

View best WFA Drawdown, Volatility, ProfitFactor and Robustness

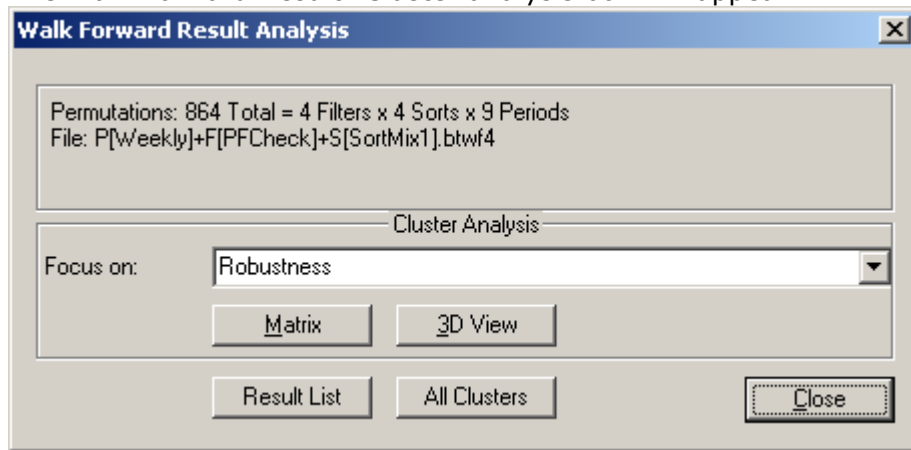
Click on the (+) in front of the “Sorted by XXX” branch and BTWFMgr will expand the branch and show the list of the top 10 results – similar to Equity and Probability.

WFA 3D Cluster View

Right click on any WFA results and you will see the WFA popup menu – then click on “Walk Forward Result-Cluster Analysis” (or press Ctrl+A) or from the Menu Function/Cluster Analysis:

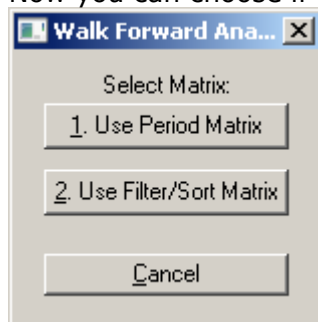


The Walk Forward Result+Cluster analysis box will appear:



Select the criteria you would like to view (i.e. Net PL\$) and click on "3D View".

Now you can choose if you want to plot the Filter and Sort variations –OR- In/OutSample variations:



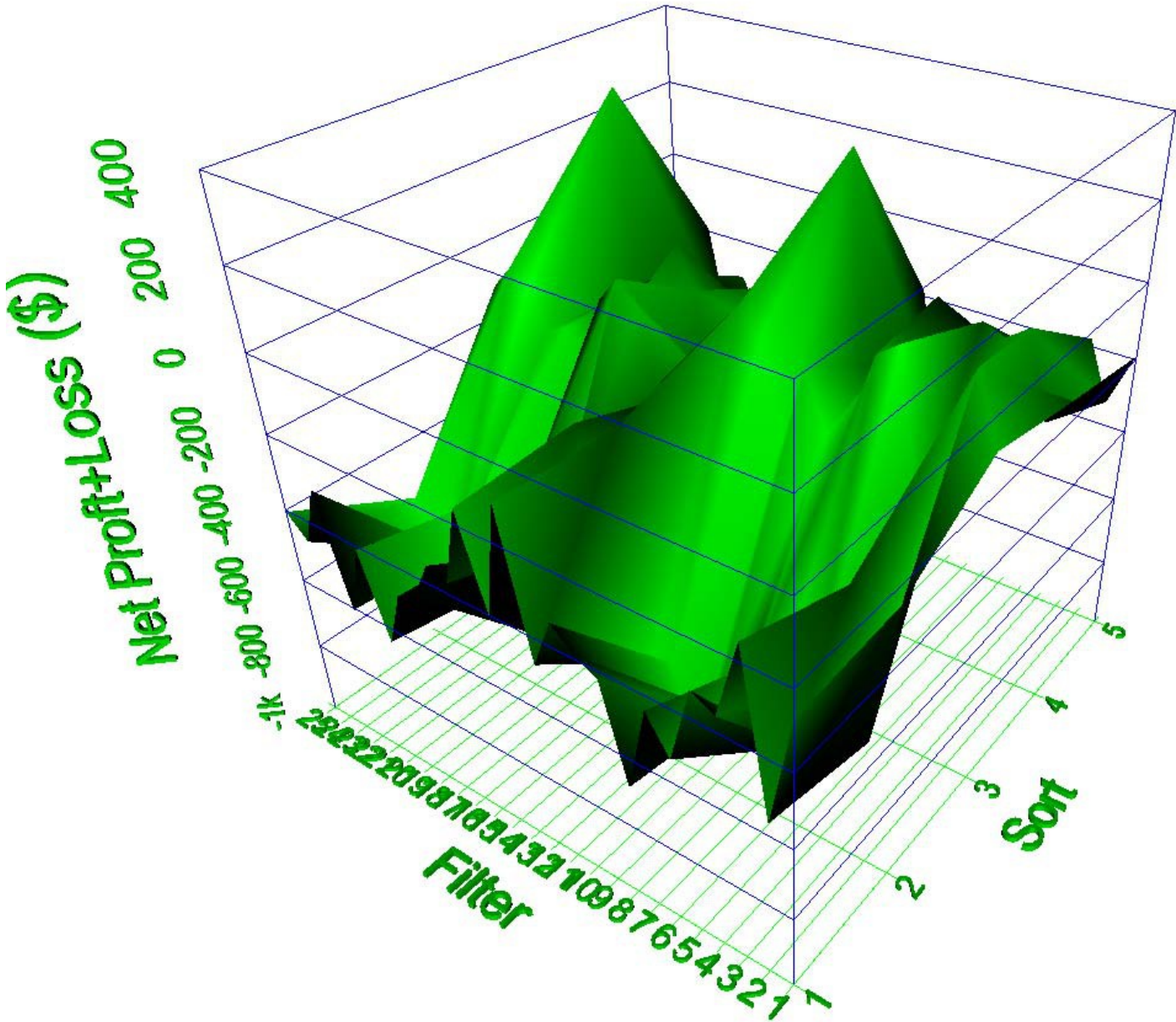
The "Filter/Sort Matrix" will use the Filter and Sort variations for the X and Z axis.

The "Period Matrix" will use the In/OutSample variations for the X and Z axis.

The Y Axis is defined by your selected criteria above.

Below is an 3D WFA Result example, showing:

- X Axis: 4 sort variations plus the 5th Sort Average results
- Z Axis: 24 filter variations plus the 25th Sort Average results
- Y Axis: The Net Profit+Loss(\$) (or whichever criteria you selected)



Navigating the 3D View

- To Zoom in – rotate the mouse wheel away from you
- To Zoom out– rotate the mouse wheel towards you
- To Rotate to the left – click and hold left mouse button and move slowly to the right
- To Rotate to the right– click and hold left mouse button and move slowly to the left
- To Rotate to the top– click and hold left mouse button and move slowly down
- To Rotate to the bottom– click and hold left mouse button and move slowly up
- To move the center – click on hold the right mouse button and move in the desired direction
- To capture/print the view – click on the print button in the toolbar

WFA Processing Details

Here we give you a more detailed look at the actual steps the WalkForwardAnalysis (WFA) process.

WFA will first create a new folder where all results are saved with the input filename:

Example: Results for Input file: "C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080829_123503.btwf1" are all saved to folder "C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080829_123503"

The general WFAVerbose level determines the processing diagnostic details level;

Which all off for highest WFA Speed!

The following abbreviations are used:

WFA=Walk Forward Analysis, ISA=In Sample Range, OSA=Out of Sample Range

The following steps occur when for each WFA process:

- Main1: Load the period sequence definitions (from selected *.btwfl file, i.e. Daily.btwfl)
- Main2: Check if for each period sequence definition enough data is present
- Main3: Create a matrix for each filter/sort and period variation
 - Period1: Load next period sequence definition (i.e. 10 Runs OSA 5%)
 - Period2: Create the In/OutSample date ranges – as shown in "View Periods" function (i.e. create 10 date ranges for current data an OSA portion of 5%)
 - Period3: Process the first/next period definition
 - Range1: Process first/net date range - create the subfolder for results:
Example: P001[30D_10D]+F[PFCheckTest]+S[SortMix1] = {PeriodFolder}
 - Calculate the statistics for each Trade Permutation in the current ISA date range
 - Range2: Calculate the relative ranking values
 - Range3: If requested (SaveTrdPerm switch) export the statistics of each Trade Permutation to the range result file in a sub folder for this period def, Example:
{PeriodFolder}/TradePermutations/ Rng0001_20080109_20080207.csv
 - Range4: Calculate the specified filter condition to pass/fail each trade permutation
 - Range5: Sort the remaining filtered candidates (unless ALL permutations filtered out)
 - Range6: If requested (SaveOptPerm switch) exports the
{PeriodFolder}/Hits/OPT0000001_P001_F0001_S0001_20080109.csv
 - Range6: Establish the final trade permutation ID
 - Range7: If requested (SaveRunLog switch) exports the best result to:
{PeriodFolder}/Rng0001_20080109_20080207.csv
 - Repeat Range1-Range7 for all remaining date ranges for this period
 - Period4: Accumulate the OSA Results and calculate the OSA statistics
 - Period5: If requested (SaveRunLog switch) exports the best result to:
{PeriodFolder}/ OPT0000008_P001_F0002_S0004.csv
 - Repeat Period1- Period5 for all remaining Period Definitions
- Main4: Save all WFA calculations to a binary file (*.btwf4)
- Main5: Post Process overall WFA Results
-

Results are saved in a newly created folder – using the filename – Example:

WFA Results for: C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080829_123503.btwf1

will be saved in new folder: "C:\BTWFMgr\PSS_RSISample\@ES\015Min_20080829_123503"

Within that folder the following sub folder are generated:

TradePermutations\P001_XXX – Results for Period Sequence #1

TradePermutations\P001_XXX\R0001_20080109_20080207_0000084Permutations.csv -

R0001=Range#1, 20080109=ISA Start Date, 20080207=ISA End Date

P[30D_10D]+F[PFCheckTest]+S[SortMix1] – WFA Results for:

Period "30D_10D" Filter "PFCheckTest" and Sort "SortMix1"

"SaveOptPerm" switch:

P[30D_10D]+F[PFCheckTest]+S[SortMix1]\Hits - WFA Filter Results

P[30D_10D]+F[PFCheckTest]+S[SortMix1]\Hits\SEQ0000001_P001_F0001_S0001_20080208.csv

SEQ0000001=Overall Sequence, P001=Period#1, F0001=Filter#1, S0001=Sort#1 20080208=ISA Start

"SaveRunLog" switch:

SaveRunLog

BTWFMgr Functions Reference

In this section we illustrate in more detail how to use the various powerful BTWFMgr functions. Some functions might only apply only to Equity Mode (Equ) and/or Potential Mode (Pot)

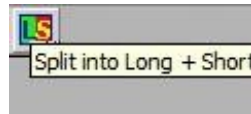
Long/Short Splitting (Equ)

- 2880 Permutations (3000 Max)
 - Sorted by Max Equity
 - Sorted by Avg Drawdown(%)
 - Sorted by PSSVolatility(%)
 - Sorted by Probability(%)
 - Sorted by ProfitFactor
 - Sorted by Smart Ranking1: 3 x \$RankEq
 - 97.72% (Equ=6400.00\$, Pos=340)
 - 96.27% (Equ=8180.00\$, Pos=334)
 - Remaining 980 Results
 - Sorted by Smart Ranking2: 4 x \$RankPrc
 - Sorted by Smart Ranking3: 2 x \$RankMa
 - Sequential

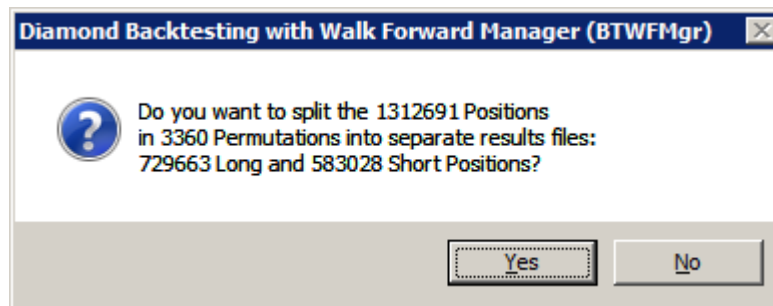
After you run an optimization, the results contains usually long and short trades in the many permutations. BTWFMgr will detect the overall best Equity, Drawdown etc using long and short and show them in the "Sort by XXX" green square branches:

In many cases you might need to split the long and short results into separate files, Thereby creating their own Backtesting context with new "Sorted by XXX" lists!

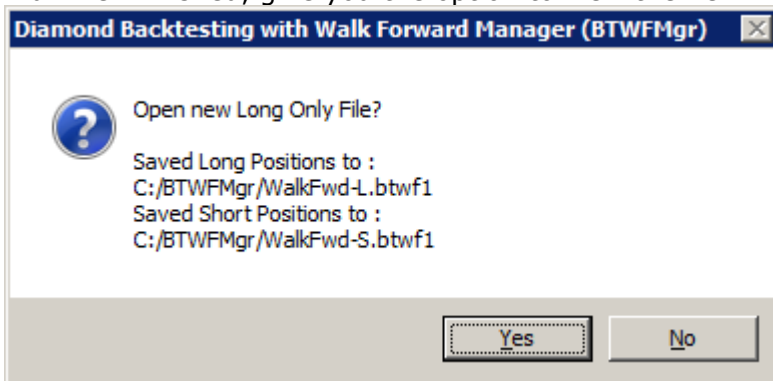
You can do the L/S Split by simply clicking on the LS icon in the toolbar:



Next BTWFMgr will confirm click YES to continue:



Next BTWFMgr will proceed to generate two new BTWFMgr result files, And when finished, give you the option to view the new "Long Only" (WalkFwd-L) result:

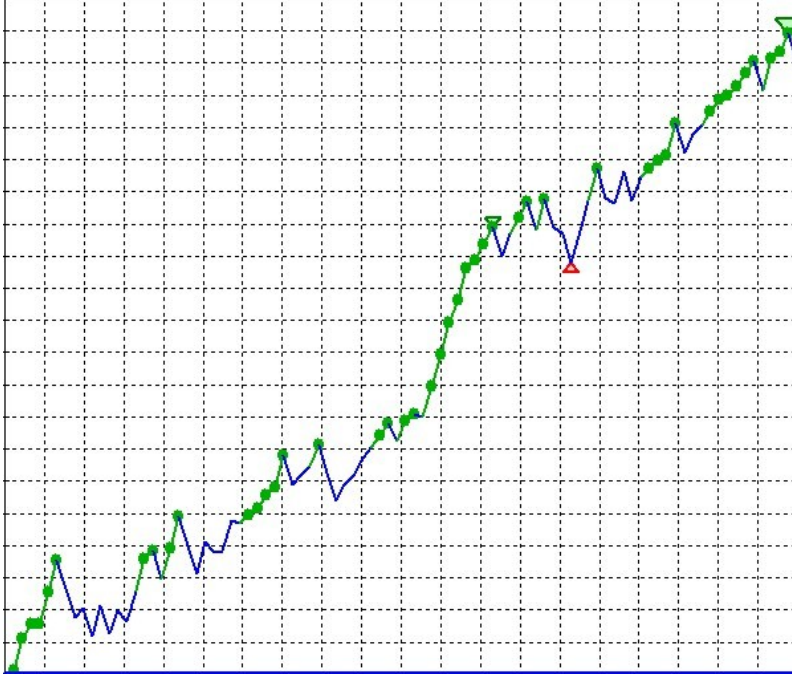


To view the "Short only" result – click on the new C:\BTWFMgr\WalkFwd-S.btwf1 file.

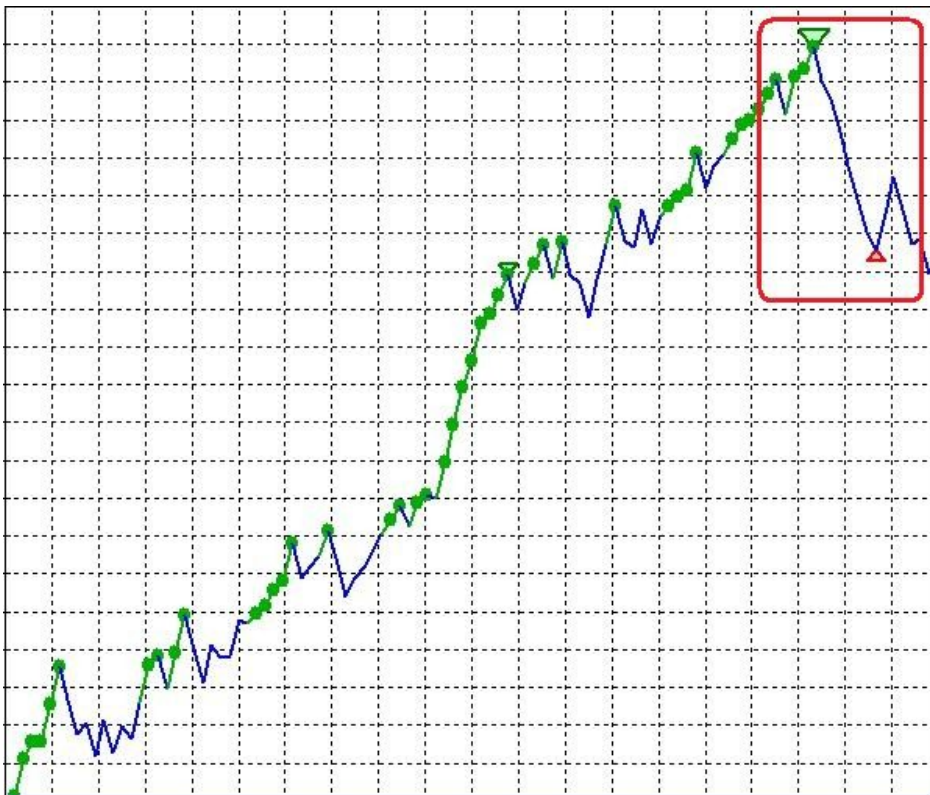
Equity Curve Cutoff (Equ)

BTWFMgr (as most other software tools) sort all results by the ENDING Equity,
Which is considered the best performance.

But as you might have noticed, many times the best performance, is not always continuing that previous performance – below is an example how a stellar performance:



can turn into a big drawdown

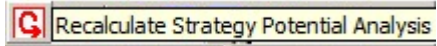


With BTWFMgr you can now to double-check and research this phenomenon using your own results.
Just define an earlier reference point within the equity curve – which is used to sort the results,
instead of the usual 100% ENDING equity point.

In effect you virtually “cut off” a portion of last trades – just for the sorting, the data is not really lost.

(This "cutoff" function only applies to the Equity Mode)

Simply click on the Recalculate Icon:



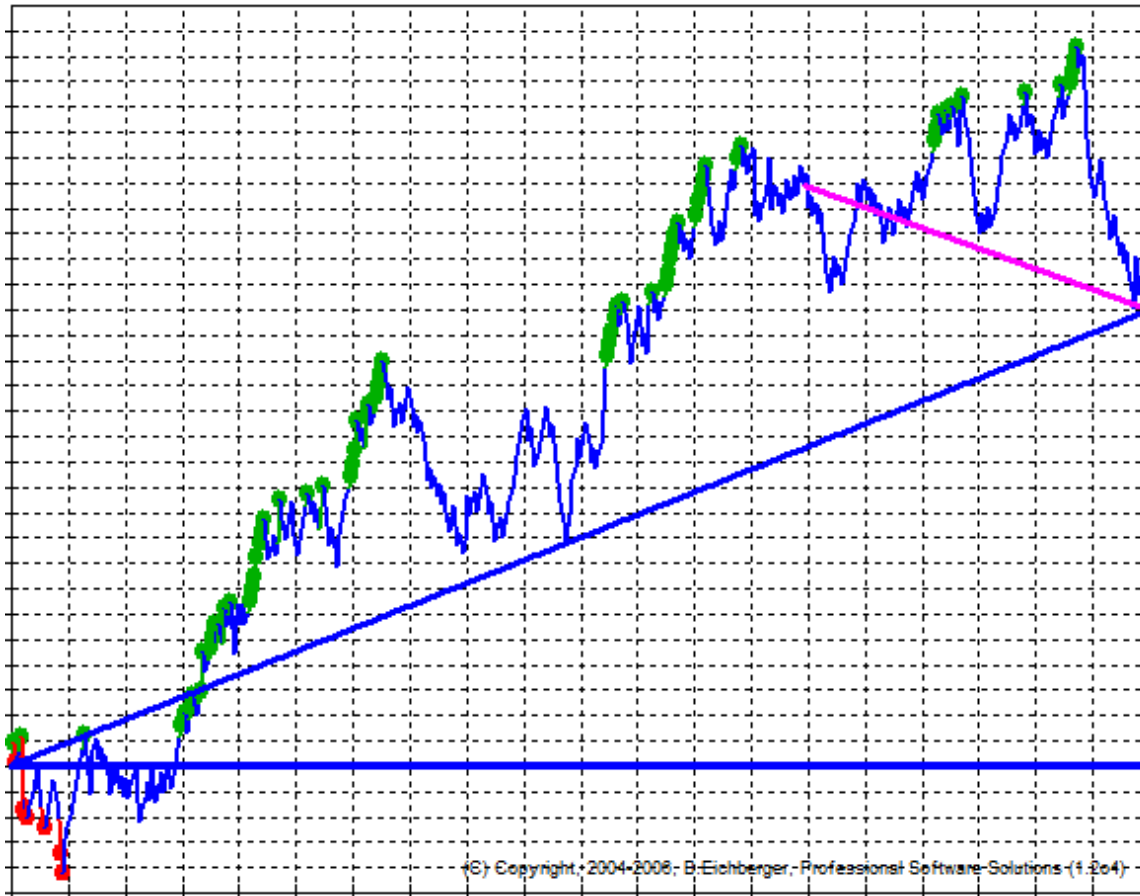
Then enter the new point of reference (instead of the usual 100% at the end):

Enter new Date Cutoff Percentage

Cutoff (5-90%%):

To start the conversion click "Recalculate".

The new equity curves will show a new magenta line; connecting the cutoff point with the ending result:



Click on any performance result and you can easily check visually – if the previous performance actually continued.

This is similar to the the "In-Sample" and "OutSample" segments used in the Walk Forward Analysis(WFA),

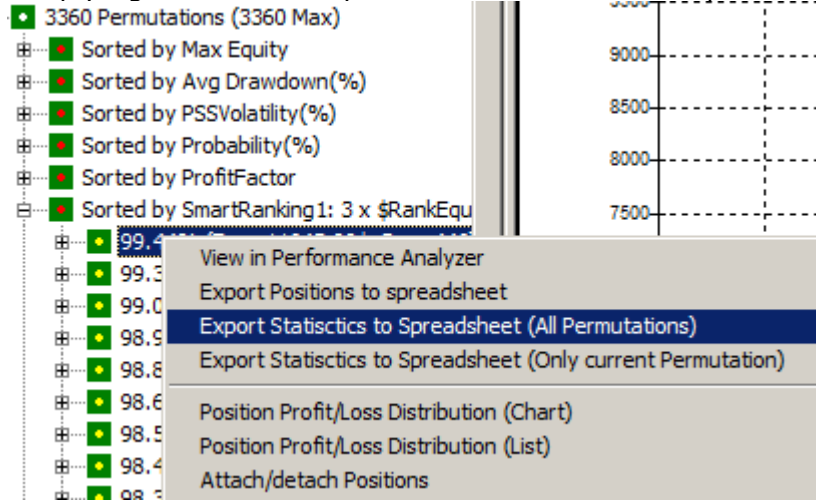
If the Equity results are using an early "cutoff" point BTWFMgr will show the cutoff percentage in the header:

Equity/70% - @ES 10 Min - Equity + Walk Forward Sample

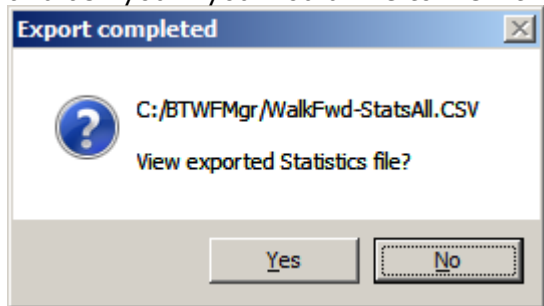
Export Statistics (Equ)

In some cases you might want to use a custom spreadsheet, to identify and analyze the backtesting trade permutations. BTWFMgr allows you to export all the relevant statistical values for each permutation (or just the current one) to a spreadsheet.

Simply right click on the permutation and select "Export Statistics":



BTWFMgr will generate a new spreadsheet file for the current file – with StatsALL appended - and ask you if you would like to view the new spreadsheet file (CSV format):



Click YES to see the new spreadsheet, were you can now apply your custom analysis/sort etc:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	PermlD	\$Equ	\$PF	\$PFAvg	\$MaxDDA	\$AvgGain	\$AvgLoss	\$MaxGain	\$MaxLoss	\$Prob	\$CntTrd	\$CntGain	\$CntLoss
2	1	-1255	0.96	0.92	-1422.5	110.21	-119.34	420	-542.5	50.95	526	268	258
3	2	822.5	1.02	1.38	-1830	162.62	-117.95	420	-542.5	42.59	533	227	306
4	3	-32.5	1	1.72	-1725	201.15	-117.08	445	-542.5	36.77	514	189	325
5	4	-172.5	1	2.01	-1482.5	237.79	-118.34	445	-542.5	33.13	492	163	329
6	5	967.5	1.03	0.65	-970	111.46	-171.84	420	-580	61.36	484	297	187
7	6	1540	1.04	0.97	-1377.5	163.93	-169.35	432.5	-580	51.78	477	247	230
8	7	3105	1.08	1.2	-1327.5	201.05	-167.87	445	-580	47.36	454	215	239
9	8	2302.5	1.06	1.41	-1515	237.49	-168.68	445	-542.5	42.86	427	183	244

This Statistic Export can also assist you in designing custom WFA filter formulas!

Instead of all permutations you can also select the single export –for just the current permutation.

Strategy Preparation

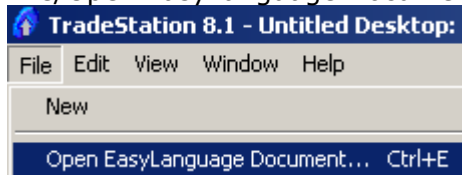
In order for BTWFMgr to analyze your strategy – BTWFMgr has to collect the relevant data generated during your TradeStation® Optimization runs.

To accomplish this BTWFMgr adds a small section to the end of your EasyLanguage® strategy code.

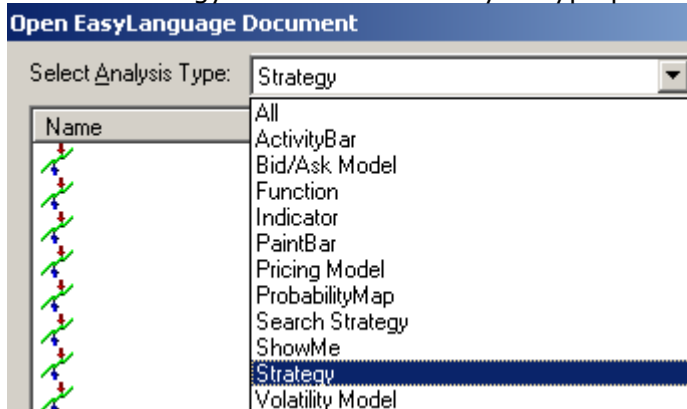
Preparing TradeStation® - Opening your Strategy Code

Before BTWFMgr can automatically add the data collection section – open the strategy code:

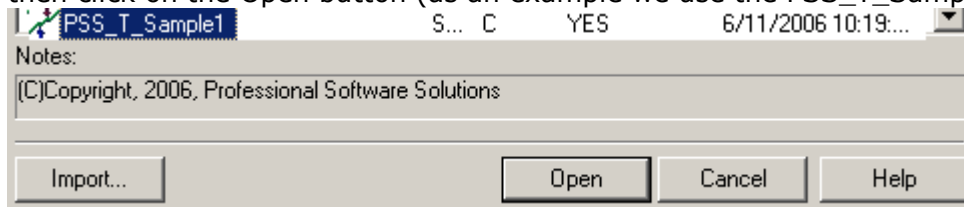
- Open TradeStation®:
Start/Programs/TradeStation 8.1 (Build XXX)
- Close all workspaces
- Open the strategy EasyLanguage Code
File/Open EasyLanguage Document (or Ctrl+E)



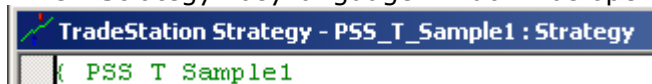
- Select "Strategy" in the Select Analysis type pull down list (at the top)



- In the new list scroll down to your Strategy and click the Strategy Name then click on the Open button (as an example we use the PSS_T_Sample1 strategy here ...)




- You might need to enter a protective password to open the Strategy Code
- A new Strategy EasyLanguage window has opened:



Now we have prepared TradeStation® for BTWFMgr to automatically modify your strategy.

Adding the BTWFMgr Data Collection Section

- Open BTWFMgr:
Start/Programs/Diamond Backtesting with Walk Forward Manager (BTWFMgr)/Backtesting with Walk Forward Manager (BTWFMgr)

- Once BTWFMgr has opened – click on the cyan exclamation mark  in the tool bar:

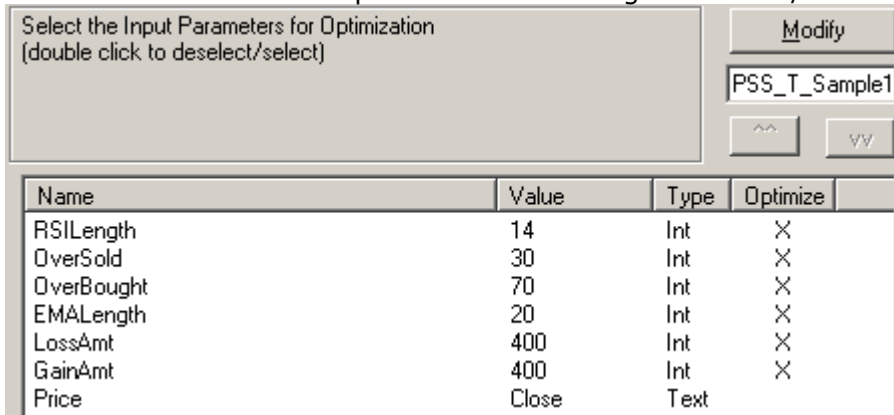


(or select File/Strategy Preparation from the Main Menu)

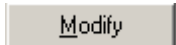
- A new window will open – showing your strategy name – click on Prepare:



- BTWFMgr is now presenting you with all numeric strategy input parameter, which can be included in the data collection during the TradeStation® optimization: (indicated by the X in the Optimization column)
Select ALL inputs you might use in any TradeStation® optimization (usually all).
Just double click on the input row and BTWFMgr will select/deselect it.



- You can change the sequence of an input with the up  and down  button
- Now click on the modify button to let BTWFMgr add the new data collection section



- Now BTWFMgr will automatically modify the strategy code for you and after a few seconds show the confirmation box – click on OK:



- Now you are ready to run the regular TradeStation® Optimization on your strategy, which will now collect the relevant data for you, so you can then analyze it in BTWFMgr. The initial Strategy Potential mode (nBTWFMgrExport=1) is automatically pre-selected for you. Below is a sample of the BTWFMgr data collection section.

Adding Context Variables

When you develop your strategy, you usually want to research also the effect of additional context input values on the overall results. With BTWFMgr you can now check if certain ranges or values will improve the overall strategy results and by filtering out bad entries.

BTWFMgr adds for you automatically already the TimeOfDay context value.

Example:

Research of a certain range of the moving average angles might be connected to better results.

Below are the steps to add an additional context variable:

- **Add Context Variable Name**

Add one line for each new context variable after the line

```
WalkForwardVar = WalkForwardVar + "/*TimeOfDay";
```

Here is one example - adding an angle:

```
WalkForwardVar = WalkForwardVar + "/ExpAngle";
```

(the * indicates the first context variable name):

- **Increase Argument Counter**

Increase the input counter by the number of newly added context values, below the line:

```
arrPSSBTVal[0] = 6; // Number of tracked Strategy Inputs
```

```
if nBTWFMgrExport = 1 OR (nBTWFMgrExport = 3 AND CurrentShares = 1818) then
```

```
    arrPSSBTVal[0] = 7; // add Number of Context Variables
```

In our example: we increase by one - from 7 to 8

- **Add Context Variables to Function Call**

Add the actual context values to the BTWFMgr data capture function argument list, after the line:

```
arrPSSBTInp[6] = Time; // Context Input#01
```

Here is one example - adding an angle:

```
arrPSSBTInp[7] = AnglePercent; // Context Input#02
```

- **Verify the EasyLanguage**

After modifying the strategy code verify the EasyLanguage code (Tools/Verify)

- **Re-Run TradeStation® optimization**

Now you can re-run the TradeStation® Optimization,

which will now collect also the data at each entry also the added context variable values.

More information at: <http://www.profsoftware.com/bt/eldmode.htm>

BTWFMgr will show the result for each context variable in the "Context Variables" section.

```

3 Context Variables
├── *TimeOfDay (All) (Range=
├── *TimeOfDay (Long Only) {
└── *TimeOfDay (Short Only)

```

Sample of Data Collection Section

Below is a sample of the BTWFMgr data collection section – with the two added context variables:

```

Time, // Context Input#01
AnglePercent, // Context Input#02

//===== BTWFMGR_F2D83D3A_BBDB_447E_B0FE_209ED95E4E3F =====
//===== WALK-FORMWARD-OPTIMIZATION DATA COLLECTION SECTION =====
Vars: nRetWFO(0),WalkForwardVar("");
if nBTWFMgrExport > 0 then begin
if GetAppInfo(aiOptimizing) = 1 then begin
    if WalkForwardVar = "" then begin
        WalkForwardVar = "RSILength";
        WalkForwardVar = WalkForwardVar + "/OverSold";
        WalkForwardVar = WalkForwardVar + "/OverBought";
        WalkForwardVar = WalkForwardVar + "/EMALength";
        WalkForwardVar = WalkForwardVar + "/LossAmt";
        WalkForwardVar = WalkForwardVar + "/GainAmt";
        if nBTWFMgrExport = 1 then begin
            WalkForwardVar = WalkForwardVar + "/*TimeOfDay";
            WalkForwardVar = WalkForwardVar + "/ExpAngle";
        end;
    end;
end;
if nBTWFMgrExport = 2 then begin
    nRetWFO = PSS_F_WFO10("PSS_T_Sample1", //Strategy
    WalkForwardVar, // Names of Inputs
    6, // each selected Input Variable below
    RSILength, // Strategy Input#01
    OverSold, // Strategy Input#02
    OverBought, // Strategy Input#03
    EMALength, // Strategy Input#04
    LossAmt, // Strategy Input#05
    GainAmt // Strategy Input#06
    ,0,0,0,0);
end;
if nBTWFMgrExport = 1 then begin
    nRetWFO = PSS_F_WFO10("PSS_T_Sample1", //Strategy
    WalkForwardVar, // Names of Inputs
    -8, // each selected Input Variable below
    RSILength, // Strategy Input#01
    OverSold, // Strategy Input#02
    OverBought, // Strategy Input#03
    EMALength, // Strategy Input#04
    LossAmt, // Strategy Input#05
    GainAmt, // Strategy Input#06
    Time, // Context Input#01
    AnglePercent, // Context Input#02
    0,0);
end;
end;
If nBTWFMgrExport = 1 then begin
    If marketposition = 1 then
        Sell ("Lbt") next bar Market;
    If marketposition = -1 then
        Buy to Cover ("Sbt") next bar Market;
end;
end;
//===== BTWFMGR_F2D83D3A_BBDB_447E_B0FE_209ED95E4E3F =====

```

Detecting the optimal Strategy Potential/Parameters

After you have prepared your strategy and the TradeStation Optimization has completed, BTWFMgr will automatically starts and perform automatically the initial data conversion and then present to you the Strategy Potential Analysis. (make sure you have nBTWFMGrExport set to 1).

Analyzing the Strategy Per Trade Potential

Analyzing the Strategy Per Trade Potential

Analyzing the Strategy Yearly Potential

Analyzing the Strategy Yearly Potential

Analyzing the Strategy Parameter Potentials

Analyzing the Strategy Parameter Potentials

Analyzing the Strategy Context Variables

Analyzing the Strategy Context Variables

(under construction ...)

- **Exit Optimization Results**

Showing the top 10 results - sorted by the best average return per trade:

- 235200 Position Exit Optimizations (Perm.
 - 115.71\$ (Equ=13075.00\$,Pos=113(
 - 115.71\$ (Equ=13075.00\$,Pos=113(

- The remaining results are collected behind the "Other Exit Optimizations" item:

- 1990 Other Exit Optimizations

How many exit optimizations are shown is defined in the "MaxExitResults" configuration parameter (2000) in the TreeView section.

- **Exit Parameter Analysis**


Showing for each exit parameter the individual results

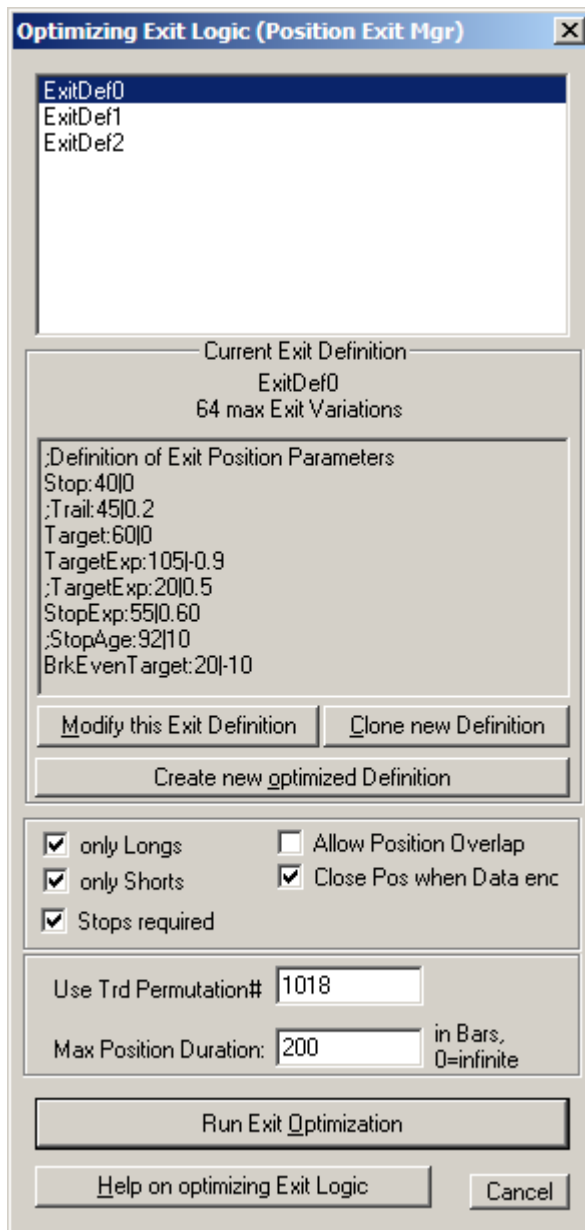
- 10 Exit Definitions
 - Stop (4 Values)
 - Stop=10/0 (-9.57\$, PF=0.87x,
 - Stop=20/0 (8.68\$, PF=1.10x,
 - Stop=30/0 (7.50\$, PF=1.09x,
 - Stop=OFF (12.15\$, PF=1.15x,

Detecting the optimal Strategy Exit Method

After you have identified the best Strategy Potential for Long and Short trades, you can now let the "Position Exit Manager (PEM)" calculate many different exit scenarios, so you can identify the best "Strategy Exit Logic". Usually Longs and Shorts have different optimal exit parameters. Since the integrated "Position Exit Manager (PEM)" is using fast object oriented C++ code, it can process 100,000 exit variations per second (~1000 time faster than the regular backtesting)!

First click on the result with the best potential, which actualizes the permutation ID.


Then Click on the  button in the toolbar, which brings up the Optimization box:



The current permutation ID (1018) is shown in:

Use Trd Permutation#

which determines all the positions to be tested.

Then click on  to create a new default template tailored to the current potential.

This will create a new exit definition:

```
PSS_T_Sample1_01018
Current Exit Definition
PSS_T_Sample1_01018
180224 max Exit Variations
Target:$100>$250/$25
Stop:$100>$250/$25
StopExp:$100>$250/$25|0.5,1,1.5
Trail:$100>$250/$25
StopAge:162>192/5|-9999
```

Each line defines a type of exit with a testing range (see details about exit types below).

You can select various processing parameters:

only Longs Allow Position Overlap
 only Shorts Close Pos when Data enc
 Stops required

Finally you start the processing – click on:



Which will process the 180,224 exit permutations for each of the 579 positions in Trade Perm ID 1018

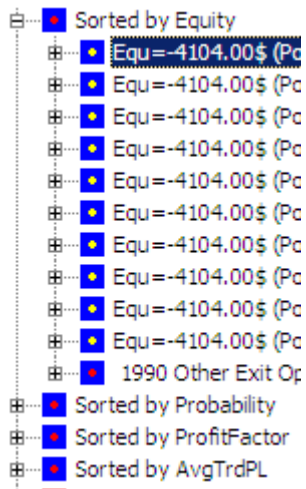
92 of 579 - Analyzing Position#93 (180224 Exit Variations)...

In only a few minutes all 88.4 million scenarios are completed:

Created 180224 Results between 10999.00\$ and 0.00\$ Equity !
 88408380 Entries processed

Analyzing the Strategy Exit Results

After the optimization is complete a new exit result branch will appear in the treeview:



Analyzing the Strategy Exit Parameters

Analyzing the Strategy Per Trade Potential



BTWFMgr Configuration and Preferences

BTWFMgr allows you to easily change and almost all of its internal parameters, so you can tailor the behavior to your needs.

To start the configuration, simply click on the  icon in the toolbar –or- Ctrl+C –or- select or from the in the Menu: File/Backtesting Configuration and Preferences (Ctrl+C)

All parameters are organized by topics:


- TreeView
- Smart Ranking Analysis
- Best Trade Permutation Analysis
- Walk Forward Optimization
- Strategy Potential & Probability Analysis
- Initial Data Conversion
- Position Exit Manager (PEM)
- General
- Chart

Below each topic the associated parameters are attached. You can expand and collapse each topic, by clicking on the plus or minus mark ( and ) in front of the topic.

To see a more detailed description - click on the parameter,

and the right window section will show the description and current setting - You can now:

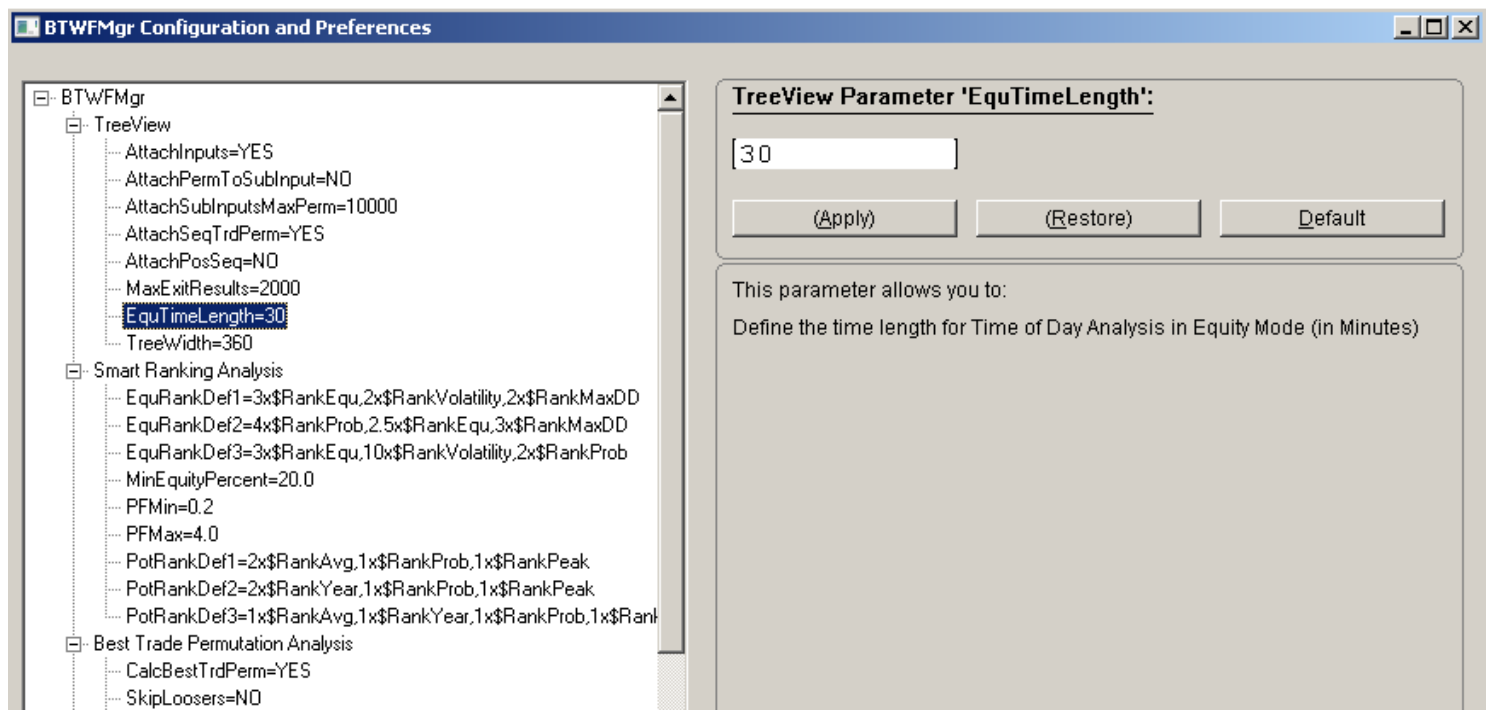
- Change the parameter value (simply enter/select the new value and click on "Apply")
- Restore to the previous setting – after an erroneous change for example – click on "Restore"
- Switch to the parameter default value – click on "Default"

Close the Configuration Window via the "Close" button, the ESC key or the  window button.

The new parameter settings is shown with a star and activated next time you open BTWFMgr again.

A detailed description of each parameter section is presented below.

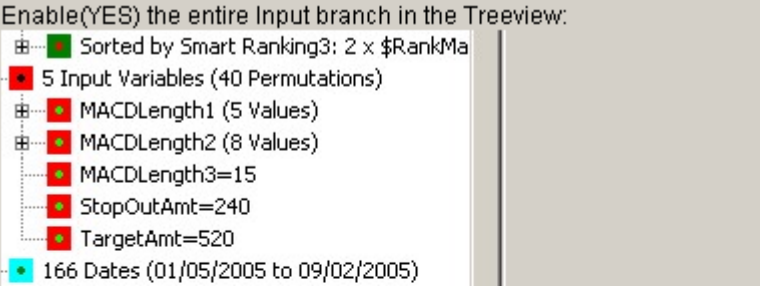
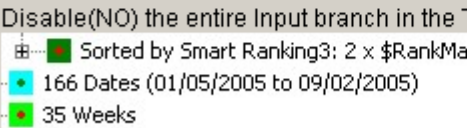
Below is a sample screen of the BTWFMgr Configuration and Preference Window Below is a list of all the available BTWFMgr Configuration settings you can adjust to your needs.



(You can also edit the configuration parameters directly in the C:/BTWFMgr/BTWFMgr.ini file)

TreeView Settings

In this section you can adjust settings related to the BTWFMgr treeview window:

Name	Default	Description
AttachInputs	YES	<p>Enable(YES) the entire Input branch in the Treeview:</p>  <p>Enable(YES) allows you to analyze the effect of each input parameter.</p> <p>- OR -</p> <p>Disable(NO) the entire Input branch in the Treeview:</p>  <p>Disable(NO) reduces the memory requirement for large data sets.</p> <p>"AttachInputs" should always be set to YES, unless you do not use the input optimization and want to save some loading time.</p>
AttachPermToSubInput	NO	Attach automatically all relevant Trade Permutations to each Sub Input variation. You can of cause still attach/detach the permutations manually, NO is recommended for large Permutation sets (30,000+)
AttachSubInputsMaxPerm	10000	Maximum number of Trade permutations before the automatic attachment of Trade Permutations to inputs is turned off You can of cause still attach/detach permutations manually
AttachSeqTrdPerm	YES	Automatically attach ALL Trade Permutations in Sequential order after the Best Results display (set to NO for large 30000+ permutations)
AttachPosSeq	NO	Automatically attach the positions to each Trade Permutation in the Sequential Permutation List. Warning: YES can consume a lot of memory with large Permutation sets (30000+) (Only relevant of AttachSeqTrdPerm=YES)
MaxExitResults	2000	Maximum number of Position Exit(PEM) Results shown in the TreeView or potential results
EquTimeLength	30	Define the time length for automatic Time of Day Analysis in Equity Mode (in Minutes)
TreeWidth	360	Define the default width in pixels of the treeview window (360=default)

Smart Ranking Analysis Settings

In this section you can adjust settings related to the BTWFMgr Smart Ranking Analysis:

Name Default		Description
EquRankDef1 3x\$RankEqu,	2x\$RankVolatility, 2x\$RankMaxDD	Define the Equity Smart Ranking#1 Analysis formula The following Ranking columns are available: Equity (\$RankEqu), ProfitFactor (\$RankPFGross) Volatility (\$RankVolatility), Max Drawdown(\$RankMaxDD) Probability (\$RankProb)
EquRankDef2 4x\$RankProb	2.5x\$RankEqu 3x\$RankMaxDD	Define the Equity Smart Ranking#2 Analysis formula The following Ranking columns are available: Equity (\$RankEqu), ProfitFactor (\$RankPFGross) Volatility (\$RankVolatility), Max Drawdown(\$RankMaxDD) Probability (\$RankProb)
EquRankDef3 2x\$RankMaxDD	3x\$RankEqu 1x\$RankProb	Define the Equity Smart Ranking#3 Analysis formula The following Ranking columns are available: Equity (\$RankEqu), ProfitFactor (\$RankPFGross) Volatility (\$RankVolatility), Max Drawdown(\$RankMaxDD) Probability (\$RankProb)
MinEquityPercent	20.0	Cutoff percentage in the Equity Ranking for the Smart Ranking Candidates (Trade Permutations below cutoff are not considered)
PFMin	0.2	Define the minimum ProfitFactor(PF) used the filter out Trade Permutation results for the Smart Ranking Analysis
PFMax	4.0	Define the maximum ProfitFactor(PF) used the filter out Trade Permutation results for the Smart Ranking Analysis
PotRankDef1 2x\$RankAvg	1x\$RankProb 1x\$RankPeak	Define the Potential Smart Ranking#1 Analysis formula (not yet implemented): The following Ranking columns will be available: Potential Average (\$RankAvg), Peak Potential (\$RankPeak) Probability (\$RankProb, Yearly Average (\$RankYrAvg)
PotRankDef2 2x\$RankYrAvg	1x\$RankProb 1x\$RankPeak	Define the Potential Smart Ranking#2 Analysis formula (not yet implemented): The following Ranking columns will be available: Potential Average (\$RankAvg), Peak Potential (\$RankPeak) Probability (\$RankProb, Yearly Average (\$RankYrAvg)
PotRankDef3 1x\$RankAvg	1x\$RankYear 1x\$RankProb 1x\$RankPeak	Define the Potential Smart Ranking#3 Analysis formula (not yet implemented): The following Ranking columns will be available: Potential Average (\$RankAvg), Peak Potential (\$RankPeak) Probability (\$RankProb, Yearly Average (\$RankYrAvg)

Best Trade Permutation Analysis Settings

In this section you can adjust settings related to the BTWFMgr Best Trade Permutation Analysis:

Name	Default	Description
CalcBestTrdPerm	YES	Enable or disable Best & Smart Trade Result display The following categories will be calculated in Equity Mode: Max Equity, Avg Drawdown(%),PSSVolatility(%),Probability(%), ProfitFactor The following categories will be calculated in Potential Mode: a) Average Potential b) Annualized yearly potential c) Probability d) Peak potential each category presents the results by 1. All trades 2. only long trades 3. only short trades
SkipLoosers	NO	Skip loosing Equity Permutations (Default=include them)
CacheBestTrdPerm	YES	Enable or disable Best Trade Result caching to speedup the load
AttachBestPos	NO	Automatically attach the positions to each Trade Permutation in the Best Result display. Warning: YES can consume a lot of memory with large Permutation sets (30000+)
MaxPermBest	20	Number of Trade Permutations shown in the Best Result List (remaining results are shown in the "Remaining XXX results" branch)
MaxPermBest2	1000	Total number of Trade Permutations shown in the remaining Best Result section
MaxPermBestExport	100	Total number of exported best Trade Permutations to CSV Spreadsheet file for the BTWFMgr Overview module
MakeBestUnique	YES	Eliminate Duplicate Results (YES) in the Best Trade Result display
CompareMaxDiffMinutes	30	When Comparing Position Lists define the\nmaximum Number of entry time differences (in Minutes)

Walk Forward Analysis+Optimization Settings

In this section you can adjust settings related to the BTWFMgr Walk Forward Optimization and Analysis:

Name Default		Description
MaxWFOpt	10	Maximum number of Walk Forward Optimizations to show directly in the Treeview. The remaining results are shown in the Other results branch
OSASyle	0	Define how Walk Forward Out Of Sample Positions are handled which cross/overlap across the begin or end of the OSA Period: 0 = include all overlapped positions in OSA Period 1 = Exclude ending/last overlapped position from OSA period 2 = Exclude the starting/first overlapped position from OSA period 3 = Exclude the starting/first and ending/last overlapped position from OSA period
OSASyleVerbose	YES	Switch OSA Overlap Check verbose mode ON/OFF
SaveRunSet	NO	Save each Walk Forward Period Result
SaveTrdPerm	NO	Save the Trade Permutations of each Walk Forward Period
SaveOptPerm	NO	Save the each filtered Trade Permutations of each Walk Forward Period
SaveRunLog	NO	Total number of exported best Trade Permutations to CSV Spreadsheet file for the BTWFMgr Overview module
WFODayShift	0	Number of Days to shift from the calculated default dates: negative=backwards shift, positive=forward shift, Zero=no additional date shift
WFOAddPeriod	1	Number of periods to append without historical data Default = one(1) period for the first future period
AUTOSTART	1	Enable the automatic conversion of backtesting data when the TradeStation optimization has completed (set to 1) (To disable - set to 0)
AUTOEXIT	0	Enable the automatic exit after conversions (set to 1) (To disable - set to 0)
AUTOWFO	0	Enable the automatic WalkForward Optimization with the last used WFA parameters after the data is converted/loaded (set to 1) (To disable - set to 0)

Strategy Potential & Probability Analysis Settings

In this section you can adjust settings related to the BTWFMgr Potential Analysis:

Name Default		Description
CommissionAndSlippage	15.00\$ Set	the amount of the commission (incl. slippage) per position to get more realistic results
PotentialMaxLoss	400\$	Define the maximum loss during potential scanning (0=no loss maximum) - if it is reached the potential stops there
RRScope	200	Define the maximum scope (number of bars) available for the Strategy Potential analysis
RREOD	0	Define the End of Day Exit Time for Intraday strategies to avoid holding overnight (0= no exit, 1615=4:15PM)
RREOW	0	Define the End of Week Exit Time for Intraday strategies to avoid holding over a Weekend (0= no exit, 1615=4:15PM exit on Friday/Saturday)
RRNetPotential	YES	Use Net Best Potential (Best minus worst potential up to that point)
RRMinPos	20	Minimum number of Positions required for a Trade Permutation in order to qualify for the Best Trade Result display
RRMinDistPos	10	If positions entries are too close - skip during Strategy Potential calculations - minimum distance is defined here
MinRRCnt	8	Minimum number of Position samples needed for Result display
RAvgPer	10	Number of bars used for the Strategy Potential Average calculation
RRPercentFactor	100	Factor to magnify the Percent display in the Y Scale in the Strategy Potential Chart
MaxContextVariations	15	Maximum number of different Context Input Values for direct display of the averages for each Input Value Beyond this trigger the Input Values will be are grouped Example: If you have 1000 different Context Input Values but want to display only 20 averages - set this value to 20
MaxVirtualVariations	15	Number of different virtual Context Input Values
ProbLevels	50,100,150\$	Probability Analysis trigger levels as Amount in \$
ProbLevel	2	Probability Level to be used for global Probability Average (2=middle level = \$100)
ProbAvgPer	5	Number of bars used for the Strategy Probability Average calculation
ChkRRScope	NO	Check if current RRScope matches the selected refresh filelist YES will eliminate all matching results

Initial Data Conversion Settings

In this section you can adjust settings related to the one time initial dataconversion from the btwf2(Trade events) to the final btwf3(Positions) data file:

Name Default		Description
PreSortData	NO	Sort raw event data (btwf2) by input values first for multi threaded/parallel backtesting (TS 8.5 or MultiCharts)
StockTradeAmount	100000\$	For Stocks: Standard Trading Size in \$
WaitSec	30	Number of seconds to wait before the Automated Conversion starts after the TS Optimization has finished
EventScan	YES	Perform a quick scan thru all events to determine the type of position change which can occur
MaxPosKillLookback	100	Maximum number of positions per permutation to lookback during the initial data Conversion
MaxPosShow	10000	Maximum number of positions allowed per Trade Permutation If more then discard these Trade Permutations!
MaxPosEqualCheck	100000	Maximum number of positions when the CPU intensive position duplication check is turned OFF
MaxEvtLoad	20000000	Maximum number of Events to load (more will be truncated)
SizeConfirm 100000000		Filesize (in bytes) to confirm loading (0=no confirm)
StockUseTrdAmt	YES	For Stocks: Ignore input volume and calculate size for fixed standard trading size (see StockTradeAmount)
ExportEvents	NO	During the initial conversion (Event -> Position) Export the Events to a CSV file - see EvtExportMin+Cnt below
EvtExportMin	0	Starting Event Sequence Number (0=first Event) if ExportEvents = YES
EvtExportCnt	1000	Number of Events to be exported (from EvtExportMin) if ExportEvents = YES
SkipInp	0	Number of Input Parameters to be skipped (rarely used)

Position Exit Manager (PEM) Settings

In this section you can adjust settings related to the Position Exit Manager (PEM), which is used in Potential Mode during the exit optimization:

Name Default		Description
MaxPEMOpt	10	Maximum number of Position Exit Manager Optimizations to show directly in the Treeview The remaining results are shown in the "Other results" branch
MaxExitResults 5000		Maximum number of Position Exit Results shown in the TreeView
MinimumExitPosCount	2	Set the minimum number of positions required for the Position Exit Mgr Result List
PEMUpDownSteps	3	Number of up and down steps in creating a definition around the optimum
PEMVerbose	0	Set the level of diagnostic messages from the Position ExitMgr in the log file

General Settings

In this section you can adjust settings related to the general BTWFMgr behavior:

Name	Default	Description
OpenLastFile	YES	YES=On startup open the last BTWFMgr data file (default) NO= Open BTWFMgr with no data, then use File/Open
CsvViewer	CsvViewer.exe	Designate the default CSV File Viewer program location (Enter 'CsvViewer.exe' for the simple default viewer (Enter 'Default' for the window default program to be used)
DRIVE	C:	Designate the main drive (with colon!) where all BTWFMgr data and programs resides. Before you change this parameter copy ALL C:\BTWFMgr data and subfolder to the new location (i.e X:\BTWFMgr). Then set RefreshFileAssociations to YES and start BTWFMgr
StartingCapital	10000\$	Define the initial Equity/Capital for the DrawDown Percent calculations (Min \$10000)
ExportTrdPerm	NO	YES=Export all Trading/Potential Permutations to a tabbed text file (*.TAB) and them imports to a MS Access Database (.MDB). You have initially 30 days to use the BTWFMgr database module. Check the licenses via: Start/Programs/Diamond Backtesting .../ BTWFMgr_Database_Module_License_Manager When it expires email us your database personal code to receive the matching registration key Example: DT:c9q144+1djc8uo+pss@pobox.com MDB allows you to perform advanced SQL queries on your results
MinFreeRAM	50.0MB	Minimum free Virtual Memory while processing the initial data - if less abort the conversion and continue with the available data
ShowProgress	YES	Display the progress bar window while a processes is running
ShowProgressLog	NO	Write each progress bar window message also to the log (great for diagnostics)
LogFileAppend	YES	Append new message to existing daily log file
LogFileFlushOnEach	NO	Write each log message physically to disk (for diagnostic purposes - slower performance)
RefreshFileAssociations	NO	Reinitialize(YES) the connection between the BTWFMgr files and BTWFMgr
WelcomePend	NO	Show Welcome and initially import the EasyLanguage Logic into TradeStation
FileMode	0	File Caching Mode (0=in RAM(recommended), 1=on Disk, 2=no caching(slow)
FastExit	YES	Use fast exit method (dont free each allocated memory fragment)

Chart Settings

In this section you can adjust settings related to the Chart settings:

Name Default		Description
ShowOneDay	NO	Stop the Position Bar Chart display when the day ends
LineWidth	2	Thickness of lines in the chart (in pixels)
MaxGridLines	20	Max Number of X Grid Lines in Equity and Potential Graphs
AxisMarkX	4	Horizontal Axis (X) grid marker length in pixels
ZeroWidth	4	Width of zero line in pixels
BBWidth	2	Width of the Bollinger Line in pixels
BBStdDev	2.0	In the Bollinger Band, set the Standard Deviations
BBAvgLen	10	Bollinger Moving Average Length
BBColorDev	Orange	Bollinger Line Color
BBColorAvg	Magenta	Bollinger Average Line Color
EquMedColor	Blue	Straight Medium Equity Line Color
EquMedWidth	3	Straight Medium Equity Line width in pixels
BarsBeforeEntry	10	Number of bars to show BEFORE the position entry bar in the Position View Chart
BarsAfterEntry	100	Number of bars to show AFTER the position entry bar in the Position View Chart
InitBarDisplay D1/30	15:20	In the Bar Data Display Mode define the Starting point for the Chart display - Two formats are available: D1/30 15:20 = Jan 30th on 15:20 -OR- 10500 = Bar Number 10500

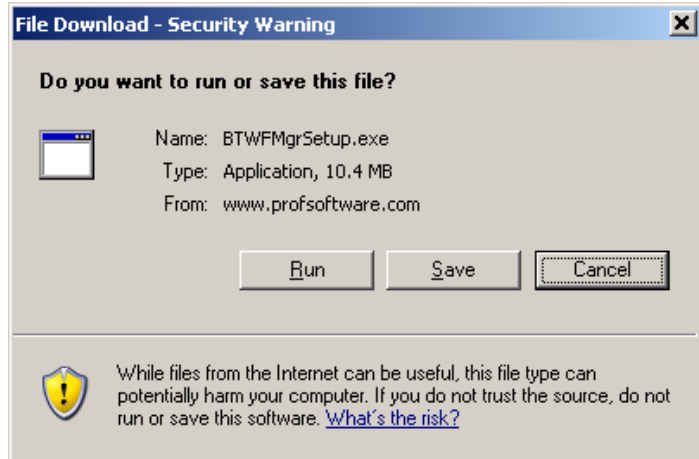
Installing BTWFMgr

Download the current free BTWFMgr trial copy from:

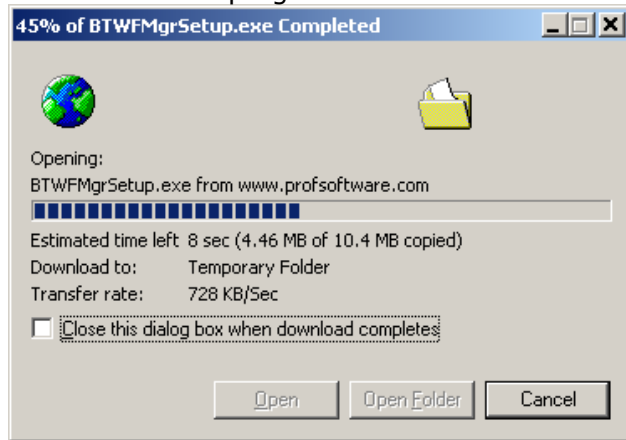
www.profsoftware.com/bt/dl.htm

The internet browser will show the download box:

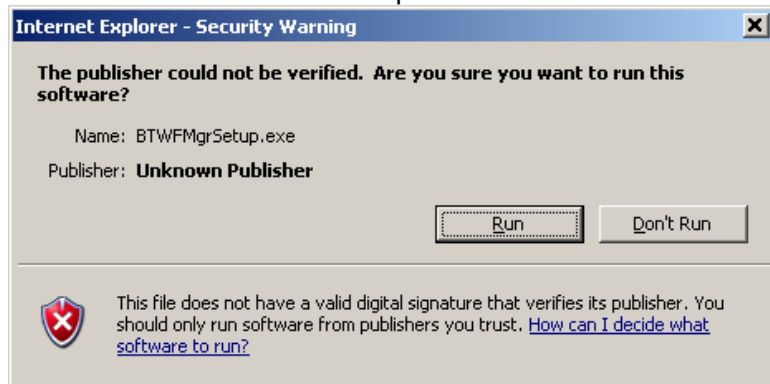
Click on the RUN button



You will see the progress of the download ...

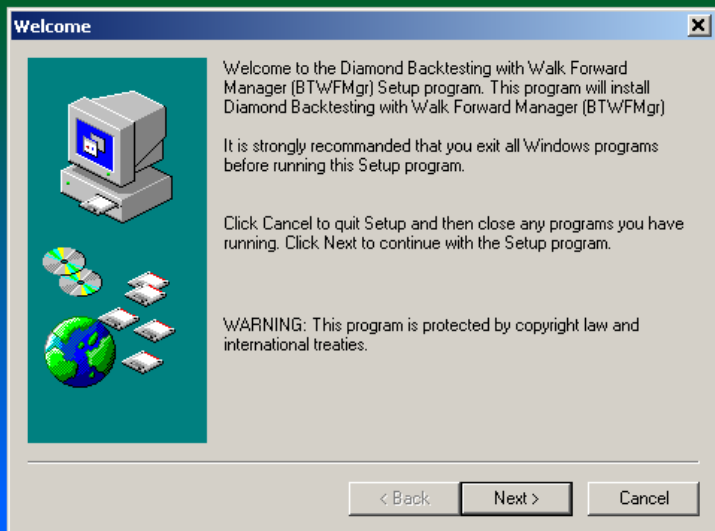


When the download has completed – confirm the BTWFMgr installation: Click on the RUN button

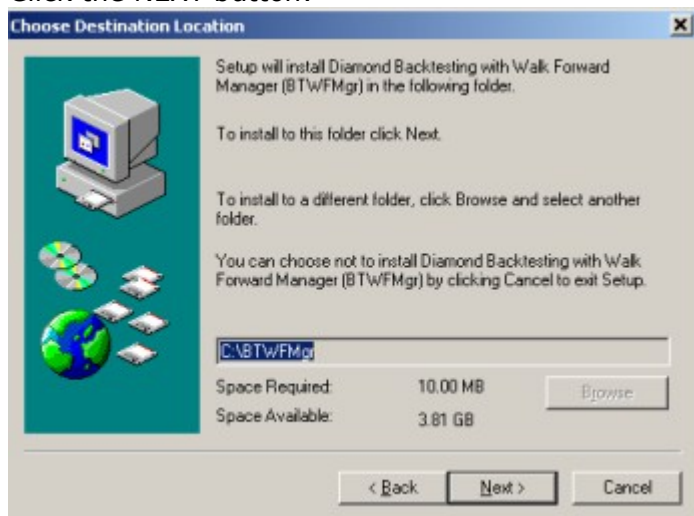


After a few seconds the actual BTWFMgr installation will start: Click on the NEXT button

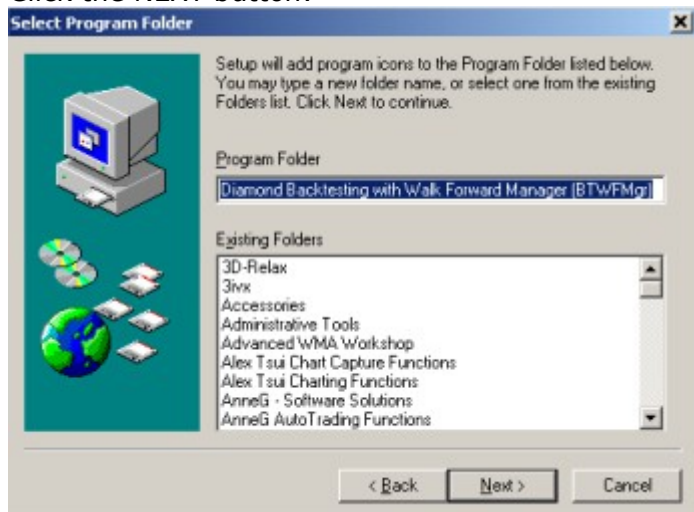
Diamond Backtesting with Walk Forward Manager (BTWFMgr)



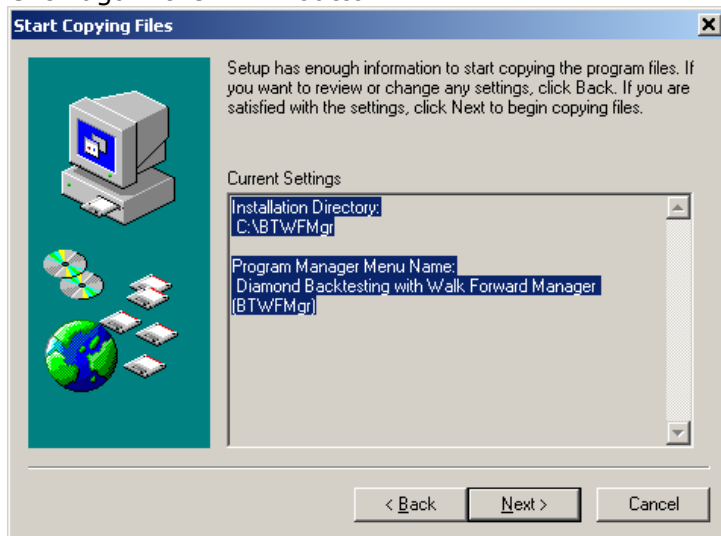
Click the NEXT button:



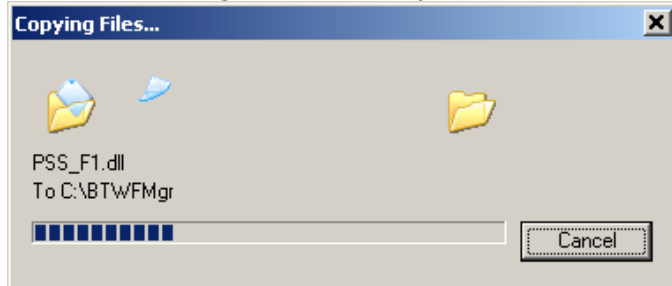
Click the NEXT button:



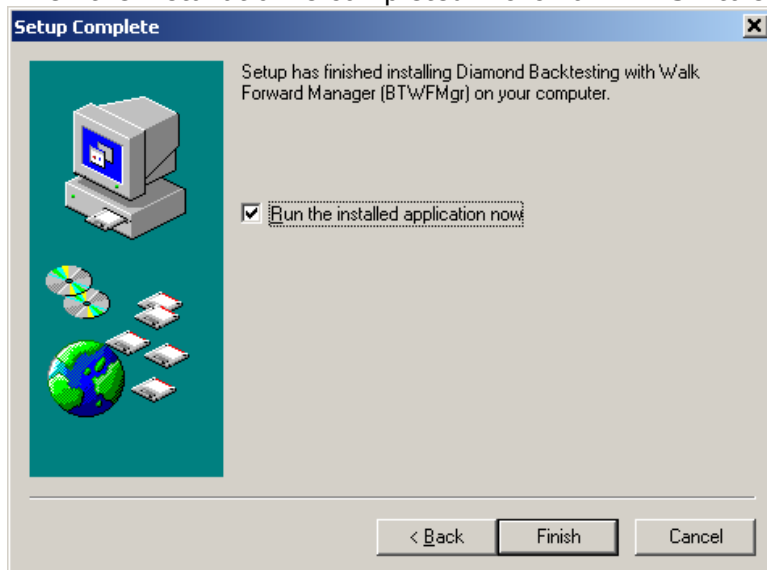
Click again the NEXT button



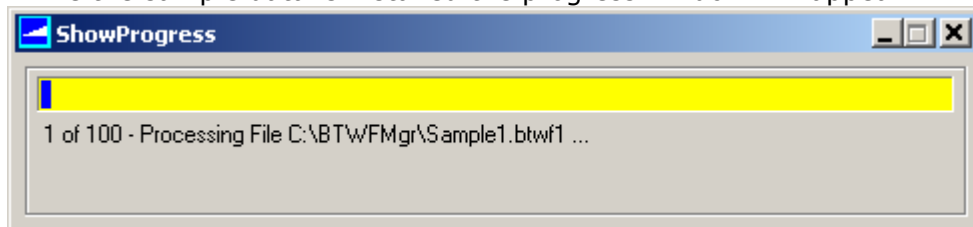
and the BTWFMgr will be finally installed ... showing you the progress



when the installation is completed – click on FINISH to start the BTWFMgr with the sample data



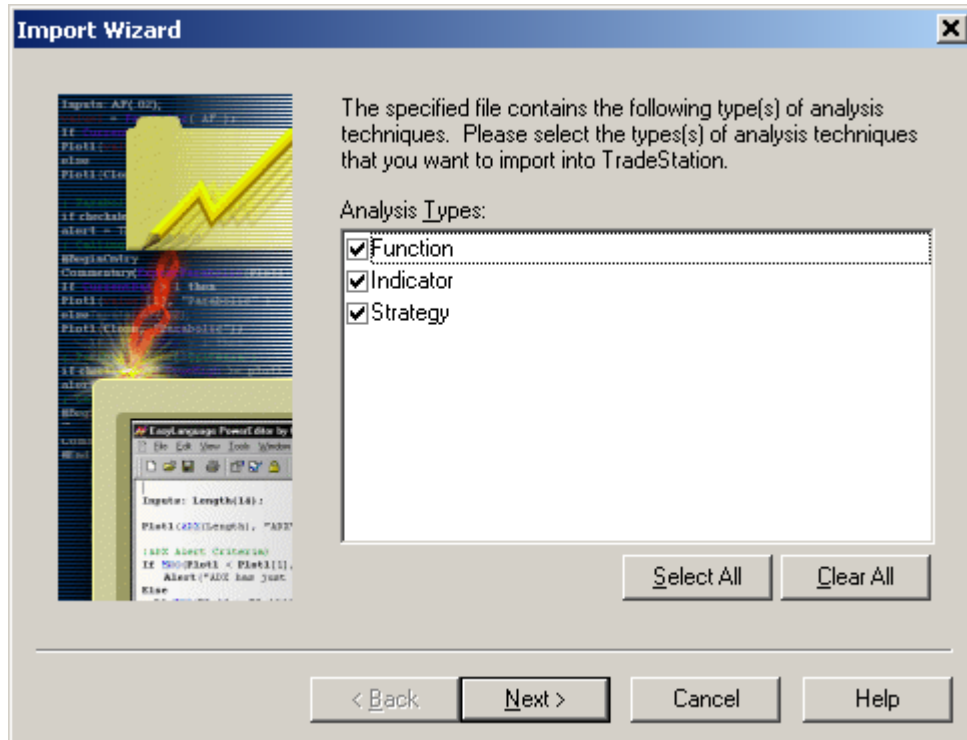
While the sample data is installed the progress window will appear:



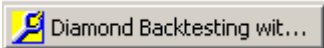
And after a few more progress messages you will see:
click OK to start the import of the BTWFMgr function into TradeStation:



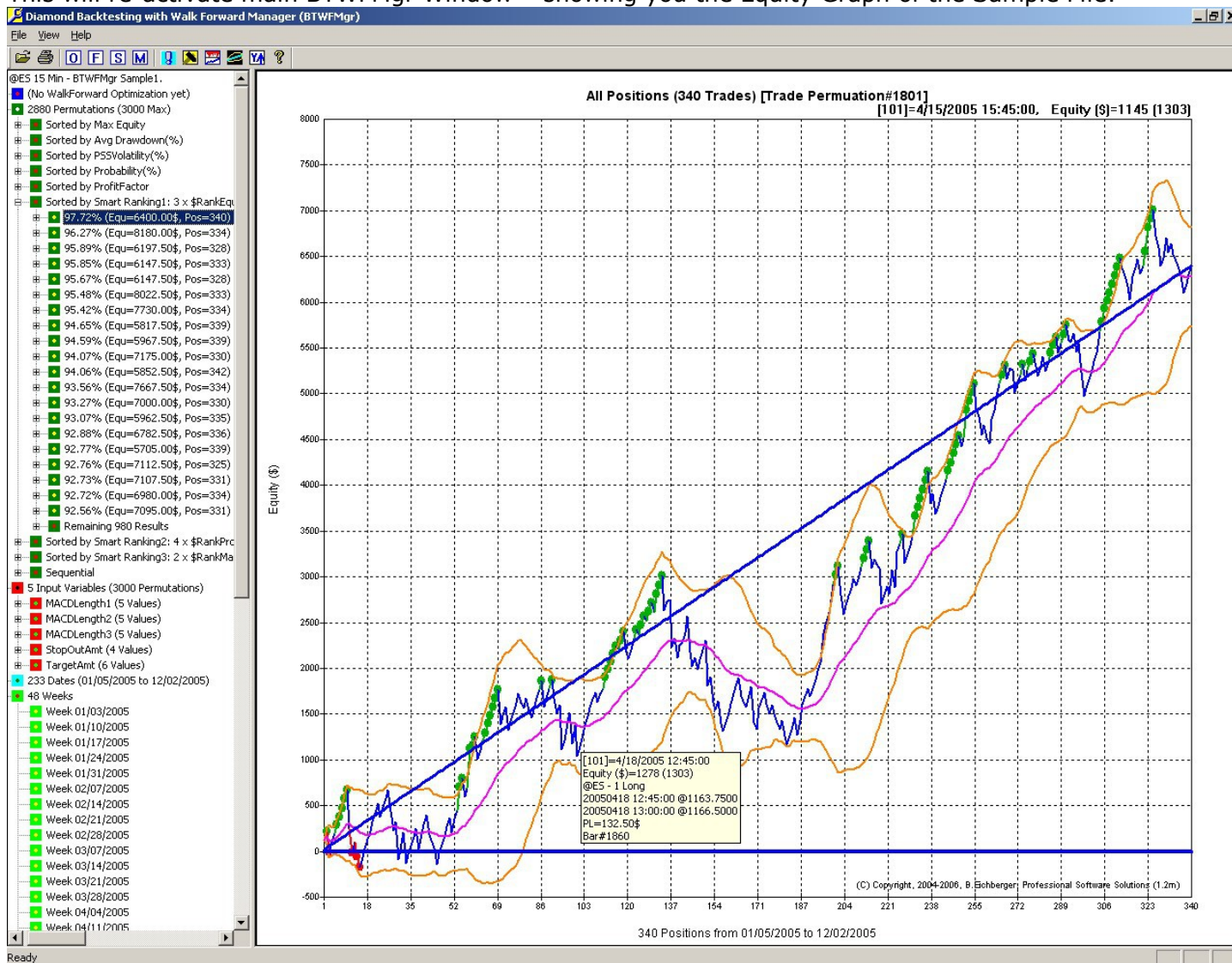
While you see the initial main BTWFMgr window – TradeStation will start the Import Wizard; you might have to login to TradeStation first.
Click on NEXT and follow the instructions:



After the BTWFMgr function have been imported into TradeStation– return to the main BTWFMgr display
 Clicking on the yellow icon at the bottom of your desktop – in the task list:



This will re-activate main BTWFMgr Window – showing you the Equity Graph of the Sample File:



Now you are ready to use BTWFMgr.

Glossary

BTWFMgr	Diamond Backtest and Walk Forward Manager
Equ(Equity)	BTWFMgr "Equity" mode to detect the best performance for a strategy using the entries AND exits generated by the strategy.
Entry Point	The point in time (i.e. a bar on the chart) were a new "Position" starts (buy/short)
Equity Graph/Curve	A graph showing the accumulated equity of a sequence of positions
Exit Point	The point in time (like a bar on the chart) were an existing "Position" ends (sell/cover)
Gross Profit/Loss	The raw profit or loss of a position before the commissions/fees are deducted
Net Profit/Loss	The actual profit or loss of a position after the fees/fees are deducted
PL Profit/Loss	
Position	A position is a completed buy/sell pair(Long Position) or short/cover pair (Short Position), which results in a specific "gross profit/loss" and "net profit/loss" minus the commission/fees. A sequence of position generates the <u>Equity graph</u> .
Potential/Pot	BTWFMgr "Potential" mode to detect the best entry point for a strategy for more details see " <u>Strategy Potential</u> "
Strategy Entry Logic	Logic which determines when the strategy starts/reverses a position(buy/short)
Strategy Exit Logic	Logic which determines when the strategy is closing a position (sell/cover)
Strategy Input Graph	A chart showing the average " <u>Strategy Potential</u> " for each input value
Strategy Input Parameter	A list of variables which define the current actual values of parameters used in the strategy in calculations, conditions etc Example: <i>RSILength, OverSold, OverBought;</i>
Strategy Input Permutation	A specific combination of strategy input parameters <i>RSILength=14, OverSold=30, OverBought=70</i> in the search for the best performance - thousands if different permutations can be calculated – each producing a different result.
Strategy Potential	The average profit/loss of all entry points the strategy produced for a given permutation, symbol and timeframe – plotted with elapsed time from entry
Strategy Potential Graph	A chart showing how the " <u>Strategy Potential</u> " develops over time/bars
Strategy Preparation	The automated process of adding a small piece of code at the end of your strategy logic for the BTWFMgr data collection. See " <u>Strategy Preparation</u> " chapter for more information
Trade Frequency Graph	A chart showing the number of trades(long/short/all) for each parameter
Trading Strategy	logical steps which produce "Entry Points"(Buy/Short) and "Exit points" (Sell/Cover or Reverse)
WFA	WFA = Walk Forward Analysis a step by step verification how predictive/robust the strategy performance is
Walk Forward Analysis	a step by step verification how predictive/robust the strategy performance is

(Last Update Dec 15th, 2008)