

TradeSim[®]

Advanced Trading Simulator and Back Tester



Application Note 8

Monte Carlo Sweep and Optimization Procedures

-
- ✓ TradeSim Standard, Professional, Enterprise Editions
 - ✓ Metastock Version 7.xx and above
 - ✓ TradeSim Version 6.7.1 and above
 - ✓ Metastock/TradeSim plugin to Metastock Version 8.4.0

Last Update 18 April 2010

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Introduction

The new Monte Carlo Parametric and Batch sweep facility has been incorporated into the Enterprise Edition of TradeSim as a means of further analyzing a portfolio trading system.

The new parametric sweep feature in the Enterprise Edition is similar to an optimization procedure where a parameter is stepped and a simulation is run and the result is plotted on a graph for each step. However unlike a typical optimization procedure, which only plots a single value performance metric for each step, TradeSim takes full advantage of the variance in a portfolio system and runs a full MonteCarlo analysis for each stepping of a trade parameter. It then plots the resulting histogram on the same chart for direct comparisons between steps. Without running a proper portfolio MonteCarlo analysis you lose vital information that is needed to objectively evaluate the systems capabilities as well as selecting the optimum trading parameter.

The new Monte Carlo batch sweep feature in the Enterprise Edition can be used for directly comparing portfolio-trading systems using advanced statistical process by overlaying the results of each Monte Carlo analysis on a common axis. Because of this ability it can also be used to do an advanced portfolio optimization procedure.

Monte Carlo Parametric Sweep

The new parametric sweep feature in the Enterprise Edition is similar to an optimization procedure where a parameter is stepped and a simulation is run and the result is plotted on a graph for each step. However unlike a typical optimization procedure, which only plots a single value performance metric for each step, TradeSim takes full advantage of the variance in a portfolio system and runs a full Monte Carlo analysis for each stepping of a trade parameter. It then plots the resulting histogram on the same chart for direct comparisons between steps. Without running a proper portfolio Monte Carlo analysis you lose vital information that is needed to objectively evaluate the systems capabilities as well as selecting the optimum trading parameter. Because of this a conventional portfolio optimisation procedure is prone to errors.

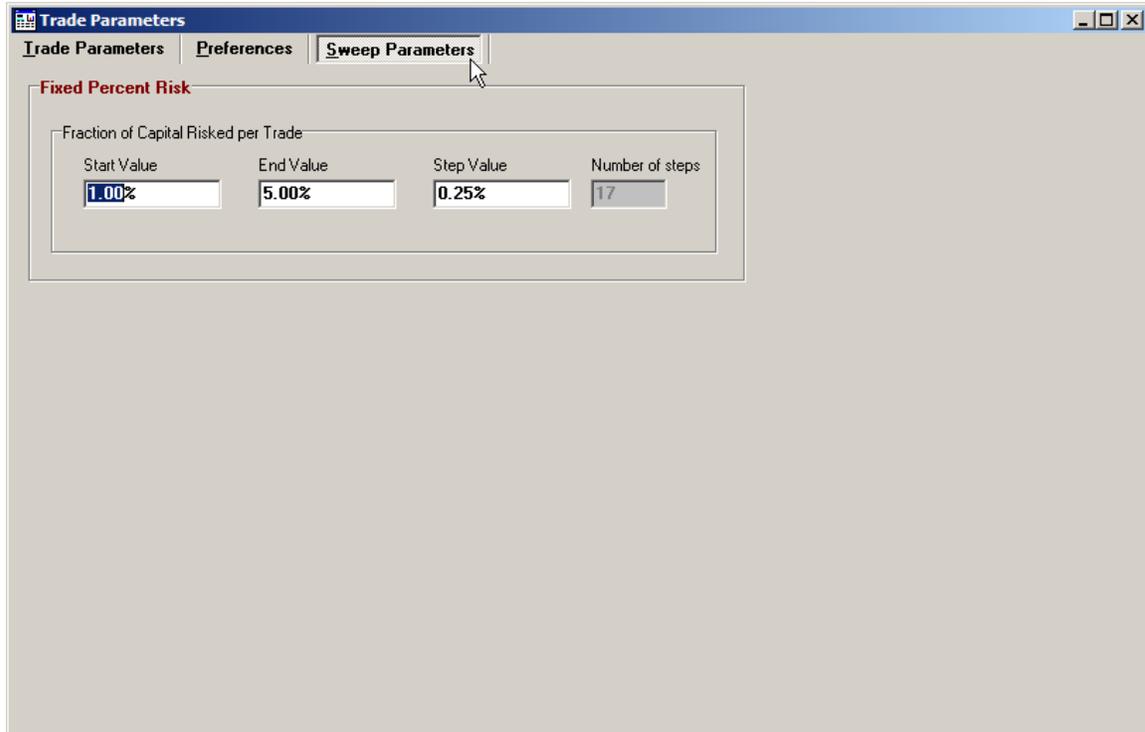
Parametric Sweep example

In this example we take a simple MACD crossover system and run a parametric sweep by simply stepping the risk per trade from 1% to 5% in 0.25% increments. To make things more objective we have applied survivorship bias filtering to the trade database when it was created with MetaStock.

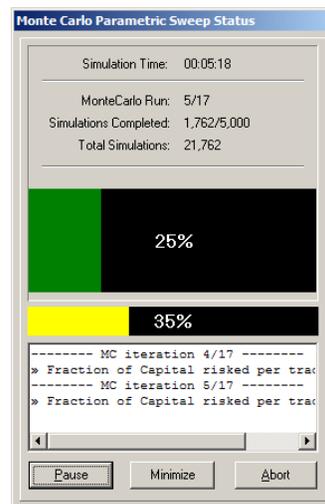
In the Trade Parameters window set the number of simulations per sweep to 5000 and select 'Parametric' for the sweep mode.

The screenshot shows the 'Trade Parameters' window with the 'Sweep Parameters' tab selected. The 'Simulation Options' section is highlighted with a red dashed border. The 'Number of Simulations' is set to 5000, and the 'Sweep Mode' is set to 'Parametric'. Other settings visible include 'Initial Trading Capital' at \$50,000.00, 'Portfolio Limit' at 100.00%, and 'Transaction Cost' at \$0.000. The 'Parameters - Fixed Percent Risk' section shows 'Fraction of Capital Risked per Trade' set to 1.00%.

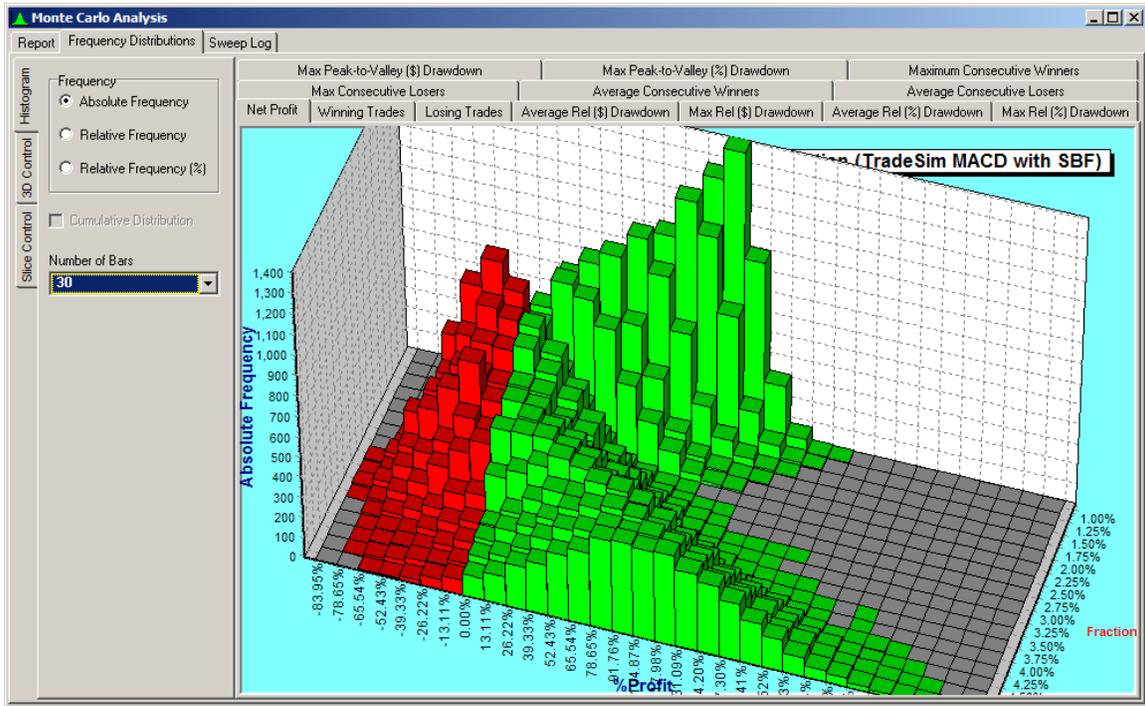
Click on the "Sweep Parameters" tab. Set the "Start Value" to 1% and "End Value" to 5% which will result in 17 steps.



Click on "Start Monte Carlo Simulation" and go and have a cup of coffee because there is a hell of a lot of simulations to work through so it may take some time depending on how slow your computer is and how many sweeps and simulations per sweep you have chosen. The good news is that it won't take days, weeks or even months to complete because of the way TradeSim runs simulations and uses minimal resources. The Sweep Status dialog box will show you the progress as it proceeds. The green status bar shows you the complete progress whereas the yellow status bar shows you the progress within each Monte Carlo sweep.



When you have finished your coffee hopefully it will have finished but the finished results will look something like the following. As you can see there are 17 Monte Carlo sweeps overlaid on the same chart for direct comparison. Unlike conventional optimization software, which only shows one simulation per stepping the TradeSim Parametric and Batch Sweep processing displays the results in terms of a comprehensive statistical profile or signature. Because all results are overlaid on a common chart it is easy to objectively compare the performance for each step and if possible to seek out an optimum value.



The following report shown on the next page was generated with the Composite Report Generator and directly copy and pasted into this document.

The complete report including all charts can be view at our website at the following address

[http://www.compuvision.com.au/Examples/SweepExampleAN-8/TradeSim_MACD_with_SBF\(Composite_Report\).HTM](http://www.compuvision.com.au/Examples/SweepExampleAN-8/TradeSim_MACD_with_SBF(Composite_Report).HTM)

Monte Carlo Report

Trade Database Filename

C:\TradeSimData\TradeSim MACD with SBF.trb

Simulation Summary

Simulation Date: 18/03/2010
Simulation Time: 4:52:10 PM
Simulation Duration: 991.47 seconds

Trade Parameters

Initial Capital: \$50,000.00
Portfolio Limit: 100.00%
Maximum number of open positions: 100
Maximum allowable daily orders: 20
Automatically Use Position Size Model from database: No
Default Position Size Model: Fixed Percent Risk
Parametric Sweep: Yes
Number of steps: 17
Percentage of capital risked per trade Start: 1.00%
Percentage of capital risked per trade End: 5.00%
Percentage of capital risked per trade Step: 0.25%
Position size limit: 100.00%
Portfolio Heat: 100.00%
Pyramid profits: No
Transaction cost (Trade Entry): \$0.00
Transaction cost (Trade Exit): \$0.00
Automatically use Margin Requirement from database: No
Margin Requirement: 100.00%
Magnify Position Size(& Risk) according to Margin Req: No
Automatically select Position Size Model from database: No
Enable Provisional Trades: No
Survivorship Bias Filer: Yes
Margin Requirement Daily Interest Rate (Long Trades): 0.0000%
Margin Requirement Yearly Interest Rate (Long Trades): 0.0000%
Margin Requirement Daily Interest Rate (Short Trades): 0.0000%
Margin Requirement Yearly Interest Rate (Short Trades): 0.0000%

Trade Preferences

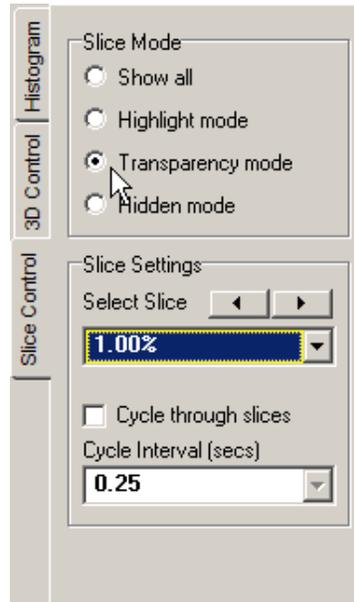
Trading Instrument: Stocks
Break Even Trades: Process separately
Trade Position Type: Process all trades
Entry Order Type: Default Order
Exit Order Type: Default Order
Minimum Trade Size: \$0.00
Accept Partial Trades: No
Volume Filter: Ignore Volume Information
Pyramid Trades: No
Use Level Zero trades only: Yes

Simulation Stats

Number of trade simulations: 5000
Trades processed per simulation: 5434

Further analysis

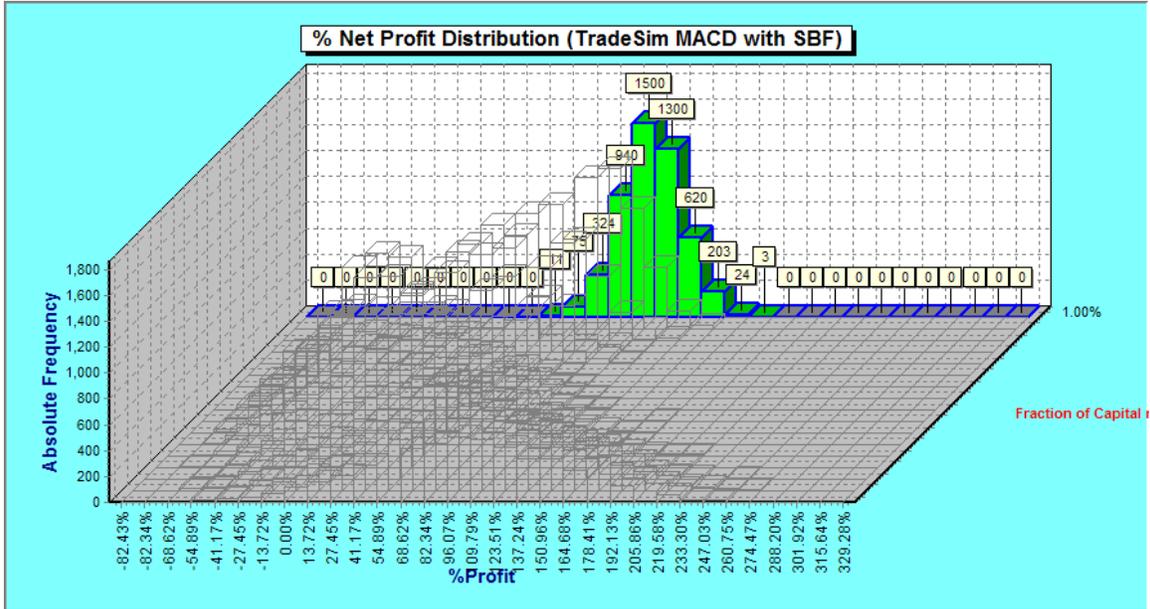
The histograms contain much detailed information, which allow you to compare the results of one sweep with another. The slice mode allows you to highlight and pickoff a particular sweep for further scrutiny and to help you better compare information. We have selected through each slice at a time and reproduced the screenshots in the following page along with a summary of the statistics associated with each histogram.



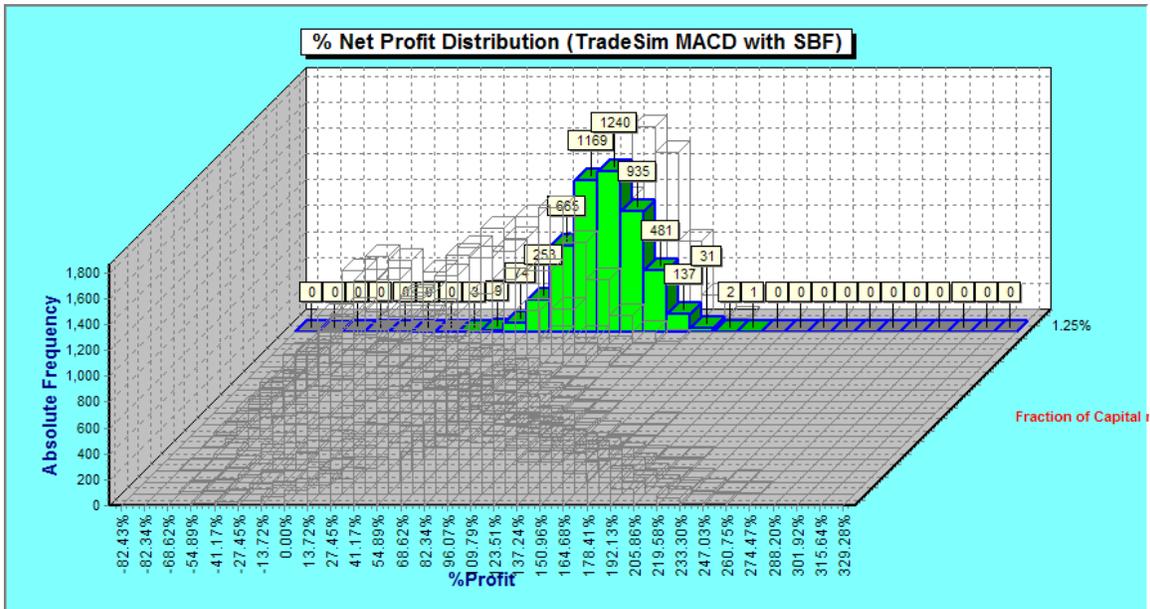
A sweep log is also created which contains a table of information related to the histograms such as the mean average, minimum, maximum and standard deviation.

Index	Trade Database File or Sweep Parameter	Session File	Minimum Profit(%)	Average Profit(%)	Maximum Profit(%)	Standard Deviation(%)	Min \ Trac
1	1.00% (Fraction of Capital risked per trade)	-	43.70%	106.79%	176.97%	17.70%	31.8
2	1.25% (Fraction of Capital risked per trade)	-	3.95%	86.00%	167.10%	20.84%	30.6
3	1.50% (Fraction of Capital risked per trade)	-	-30.43%	57.01%	143.54%	25.94%	30.3
4	1.75% (Fraction of Capital risked per trade)	-	-55.66%	35.86%	121.14%	26.77%	29.0
5	2.00% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.9
6	2.25% (Fraction of Capital risked per trade)	-	-70.60%	-9.73%	120.09%	28.14%	28.3
7	2.50% (Fraction of Capital risked per trade)	-	-76.54%	-1.39%	125.77%	31.16%	28.5
8	2.75% (Fraction of Capital risked per trade)	-	-77.49%	2.78%	131.48%	35.98%	28.5
9	3.00% (Fraction of Capital risked per trade)	-	-80.81%	5.12%	160.15%	40.67%	26.6
10	3.25% (Fraction of Capital risked per trade)	-	-82.43%	6.83%	172.98%	41.24%	26.9
11	3.50% (Fraction of Capital risked per trade)	-	-81.89%	25.82%	195.11%	47.12%	26.2
12	3.75% (Fraction of Capital risked per trade)	-	-77.45%	31.70%	199.85%	45.51%	27.5
13	4.00% (Fraction of Capital risked per trade)	-	-77.36%	54.39%	230.96%	50.06%	28.2
14	4.25% (Fraction of Capital risked per trade)	-	-75.49%	75.13%	239.97%	50.92%	29.1
15	4.50% (Fraction of Capital risked per trade)	-	-76.94%	86.99%	258.84%	54.95%	28.8
16	4.75% (Fraction of Capital risked per trade)	-	-68.47%	94.98%	319.52%	57.82%	30.0
17	5.00% (Fraction of Capital risked per trade)	-	-65.58%	105.40%	329.28%	56.71%	29.0

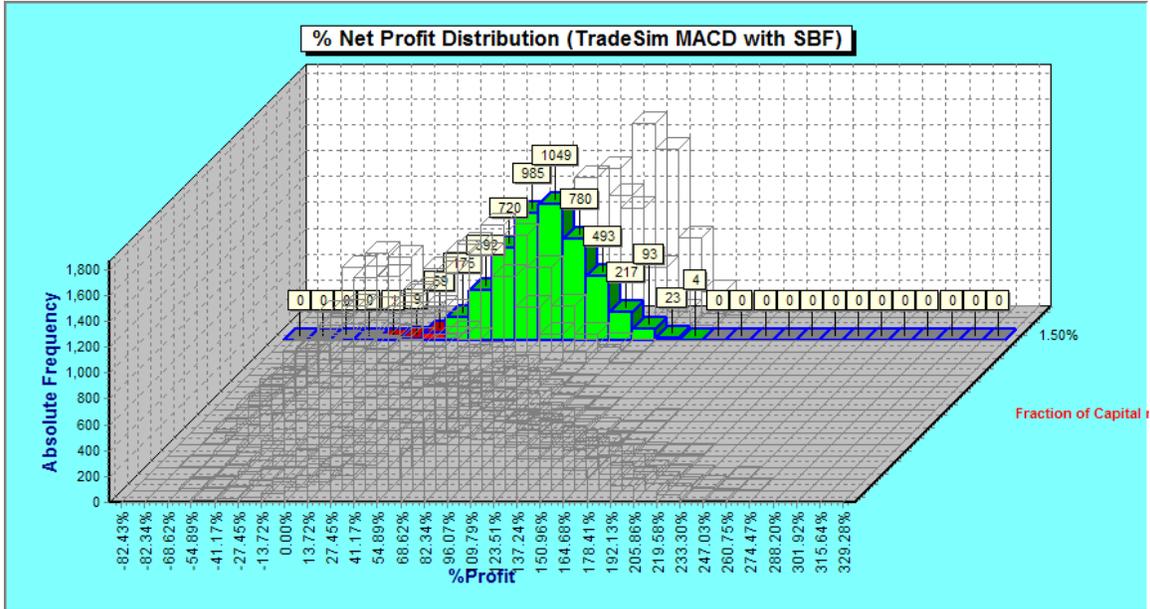
Risk Per Trade	1.00 %
Minimum Profit	43.70 %
Average Profit	106.79 %
Maximum Profit	176.97 %
Standard Deviation	17.70 %



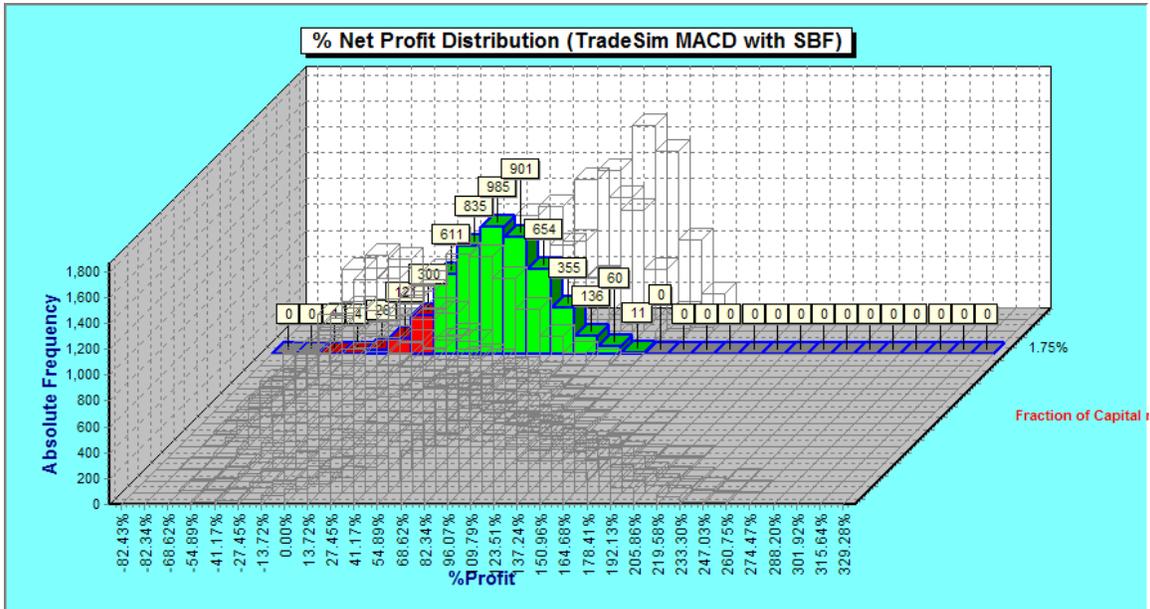
Risk Per Trade	1.25 %
Minimum Profit	3.95 %
Average Profit	86.00 %
Maximum Profit	167.10 %
Standard Deviation	17.70 %



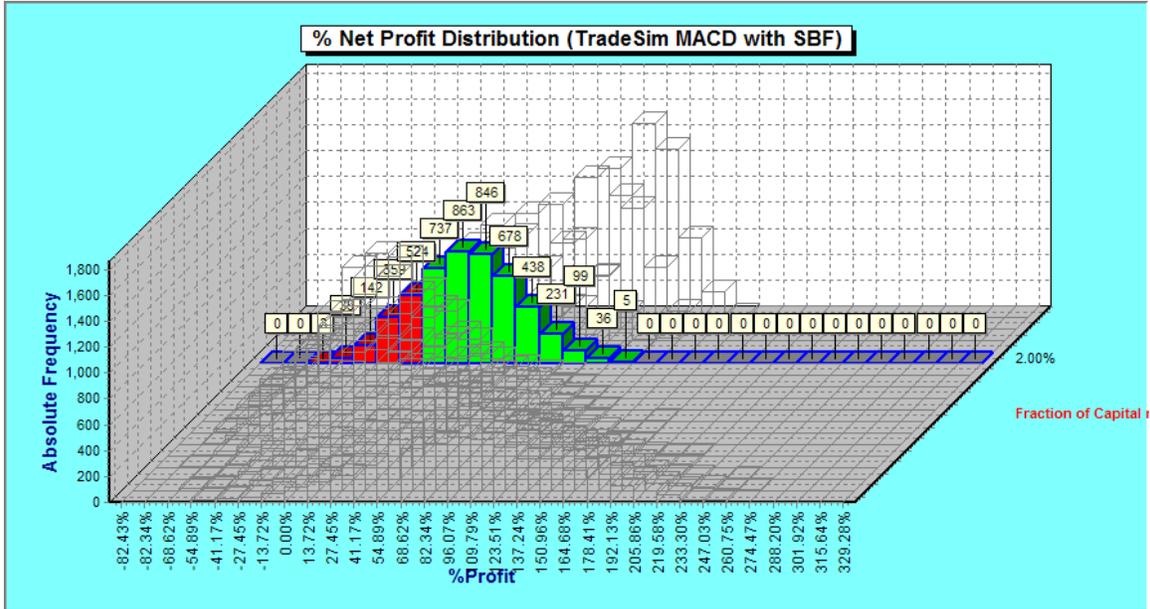
Risk Per Trade	1.50 %
Minimum Profit	-30.43 %
Average Profit	57.01 %
Maximum Profit	143.54 %
Standard Deviation	25.94 %



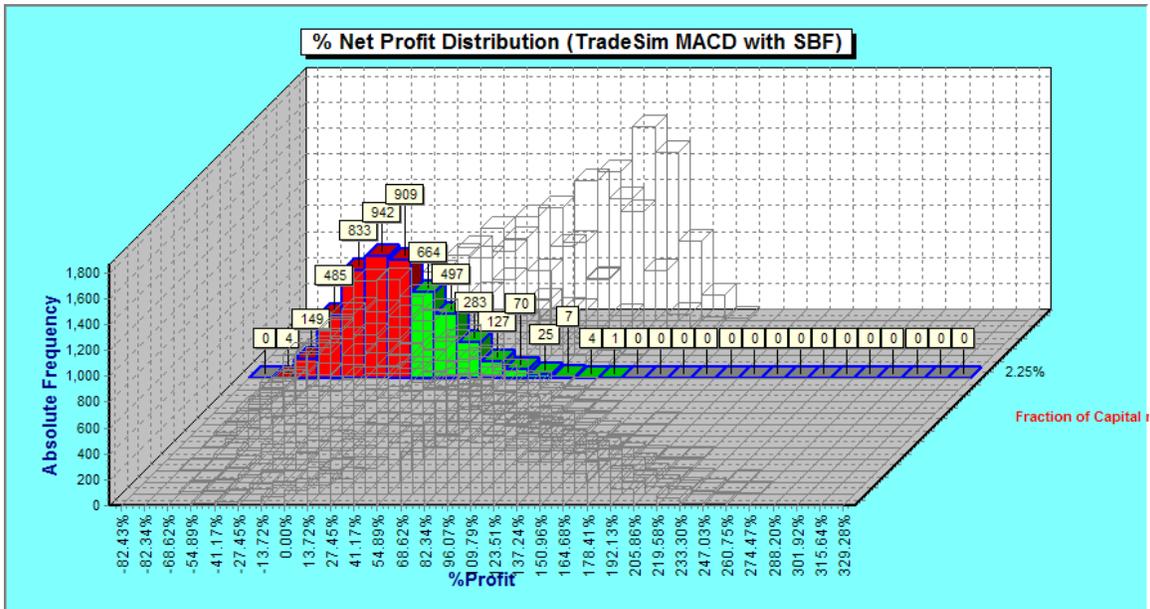
Risk Per Trade	1.75 %
Minimum Profit	-55.66 %
Average Profit	35.86 %
Maximum Profit	121.14 %
Standard Deviation	26.77 %



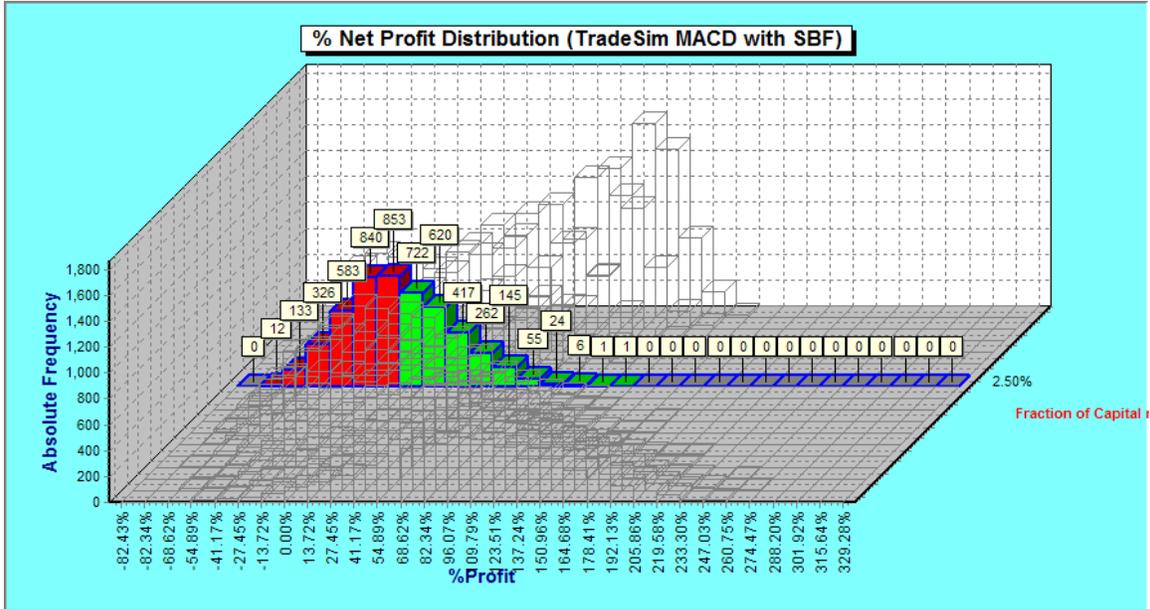
Risk Per Trade	2.00 %
Minimum Profit	-60.20 %
Average Profit	24.91 %
Maximum Profit	120.44 %
Standard Deviation	29.91 %



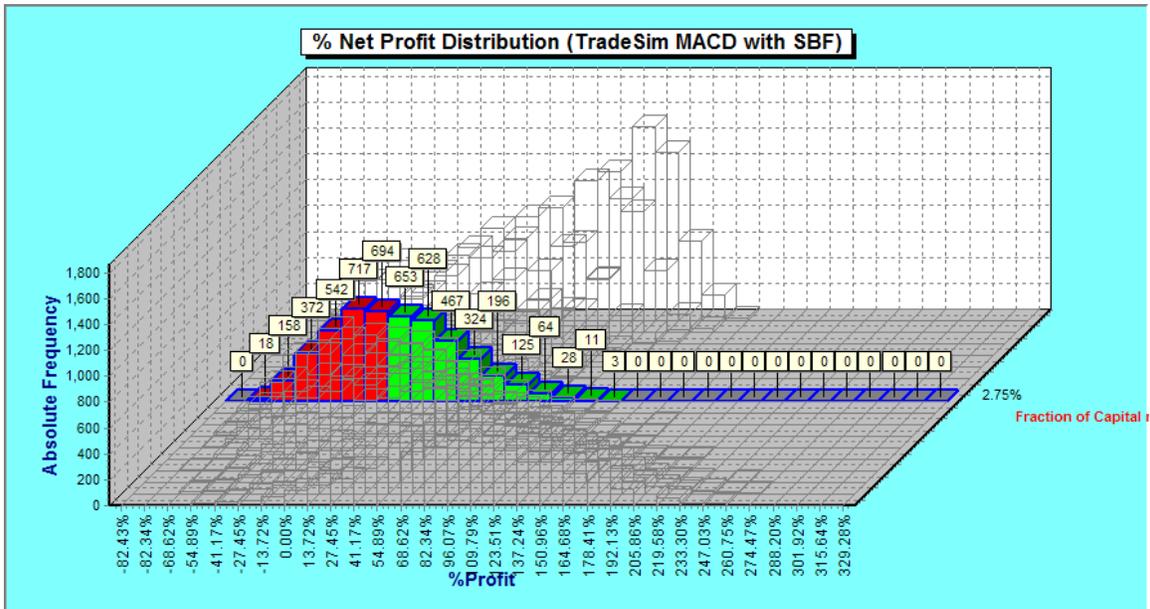
Risk Per Trade	2.25 %
Minimum Profit	-70.60 %
Average Profit	-9.73 %
Maximum Profit	120.09 %
Standard Deviation	28.14 %



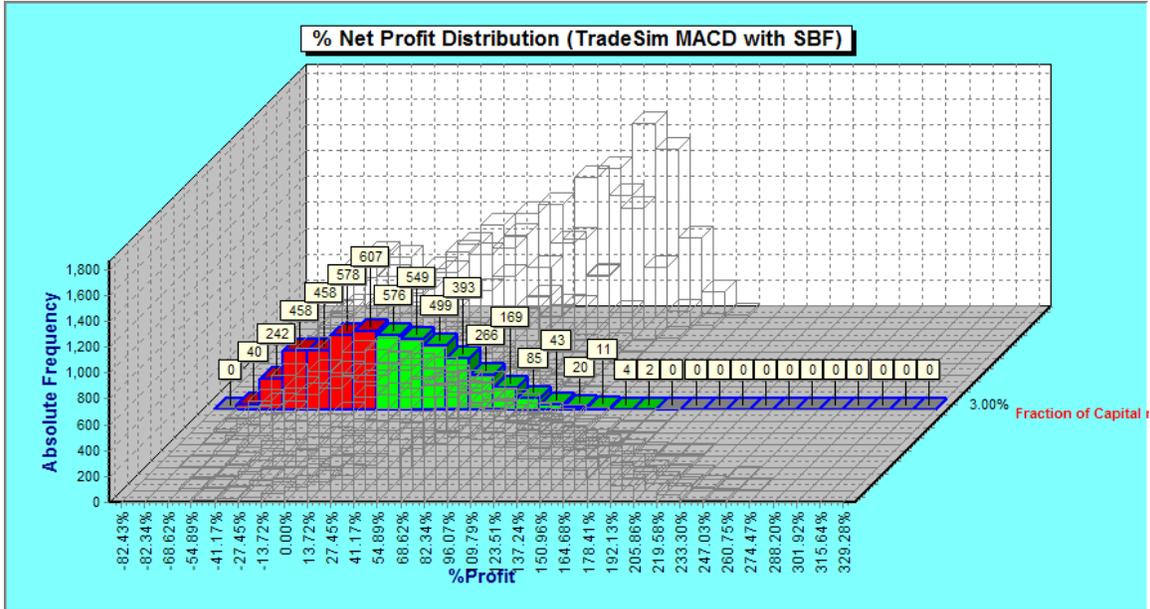
Risk Per Trade	2.50 %
Minimum Profit	-76.54 %
Average Profit	-1.39 %
Maximum Profit	125.77 %
Standard Deviation	31.16 %



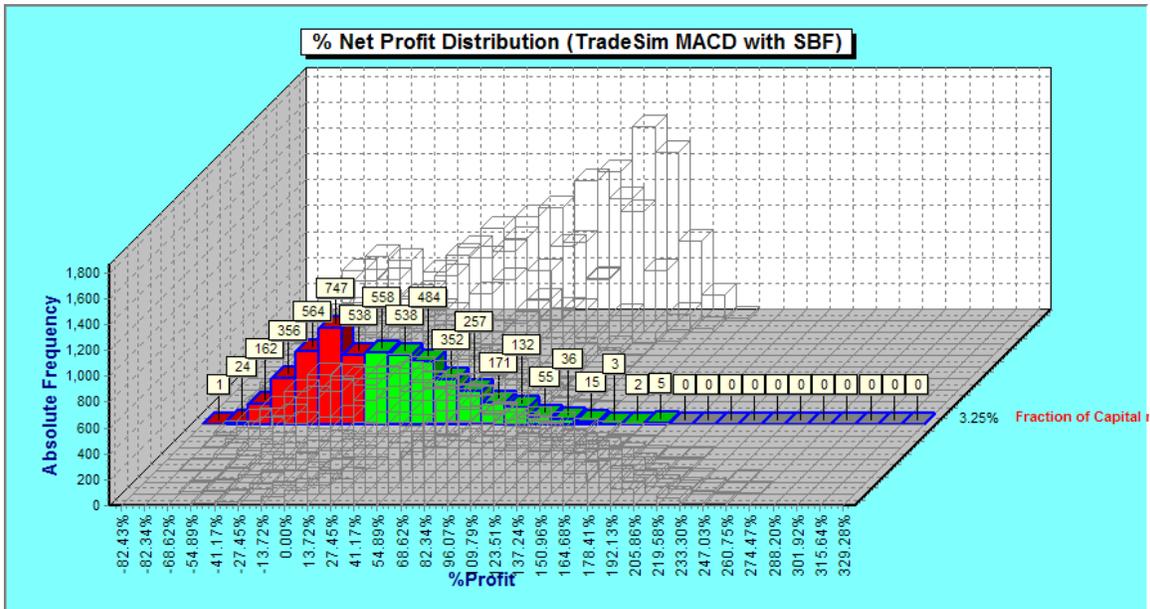
Risk Per Trade	2.75 %
Minimum Profit	-77.49 %
Average Profit	2.78 %
Maximum Profit	131.48 %
Standard Deviation	35.98 %



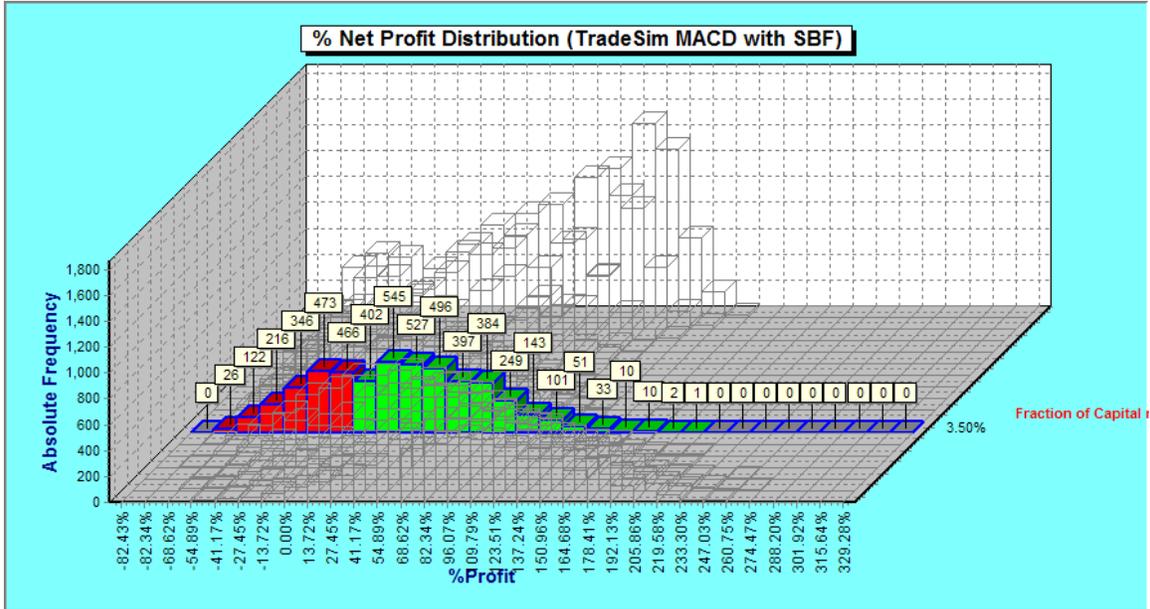
Risk Per Trade	3.00 %
Minimum Profit	-80.81 %
Average Profit	-5.12 %
Maximum Profit	160.15 %
Standard Deviation	40.67 %



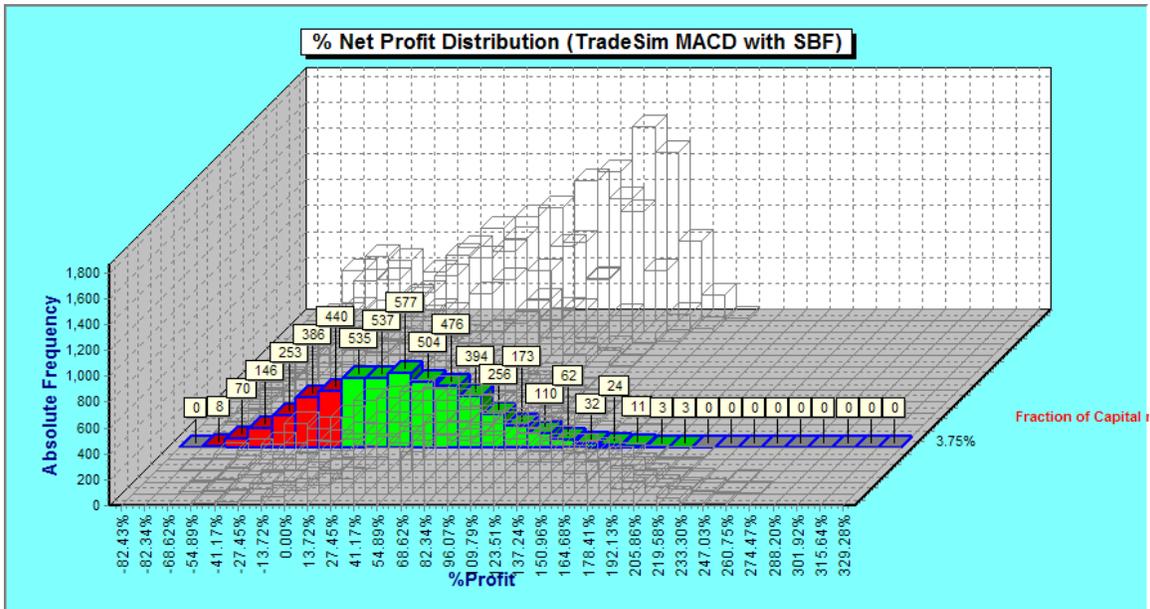
Risk Per Trade	3.25 %
Minimum Profit	-82.43 %
Average Profit	-6.83 %
Maximum Profit	172.98 %
Standard Deviation	41.24 %



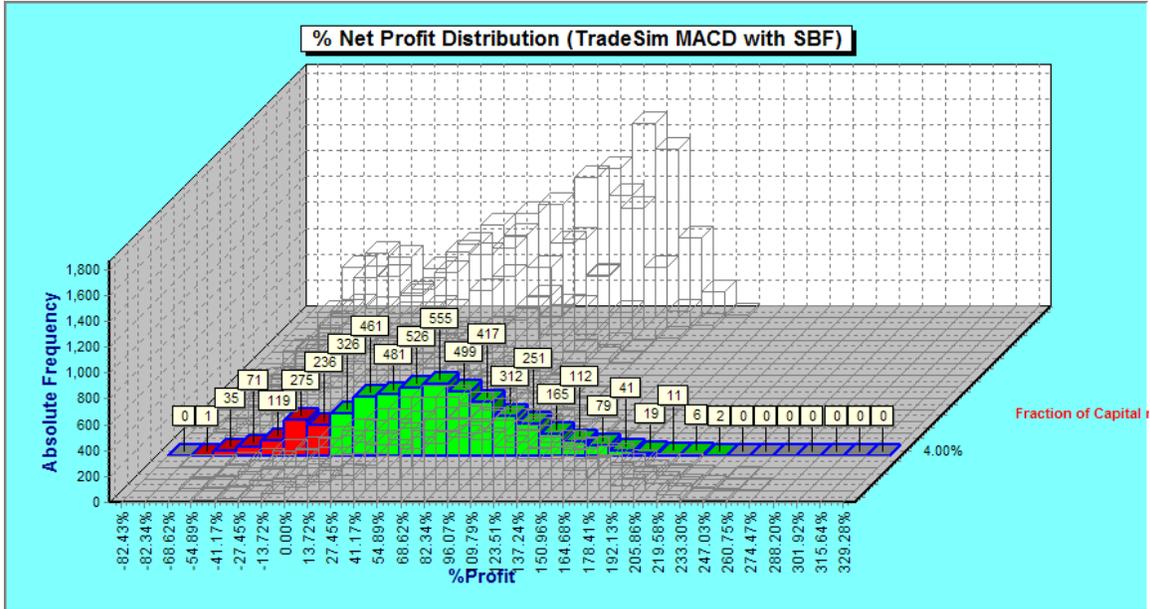
Risk Per Trade	3.50 %
Minimum Profit	-81.89 %
Average Profit	-25.82 %
Maximum Profit	195.11 %
Standard Deviation	47.12 %



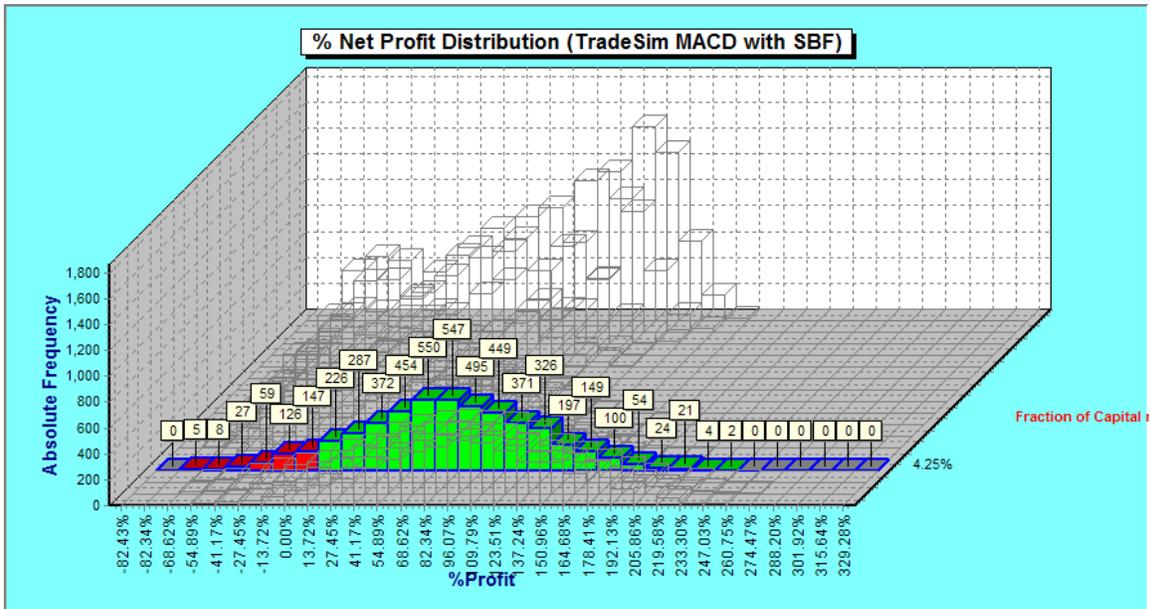
Risk Per Trade	3.75 %
Minimum Profit	-77.45 %
Average Profit	31.70 %
Maximum Profit	199.85 %
Standard Deviation	45.51 %



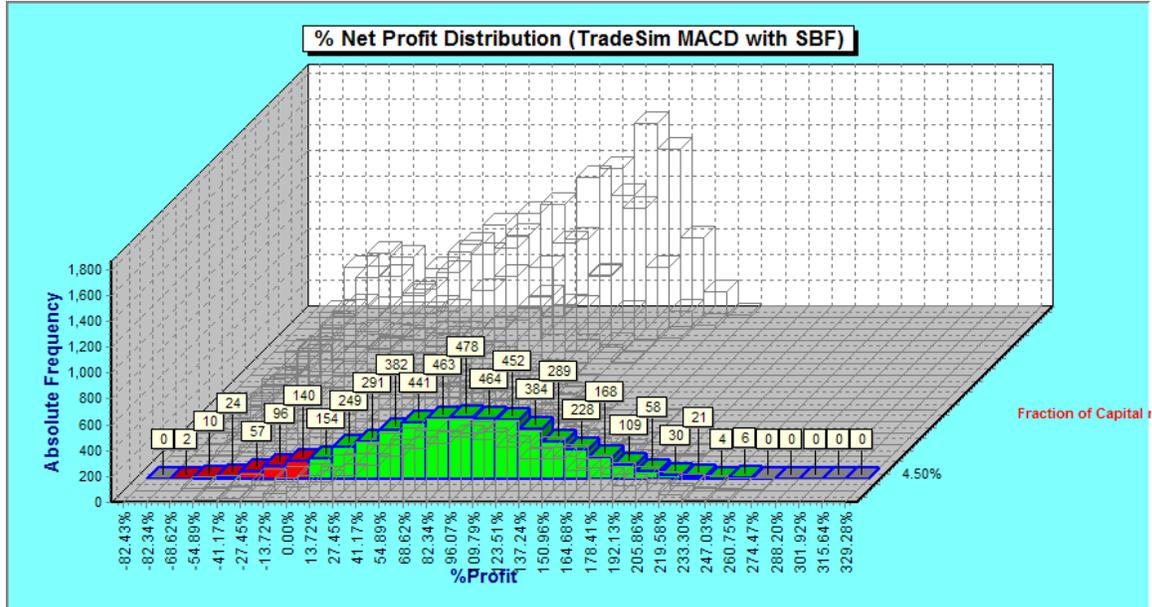
Risk Per Trade	4.00 %
Minimum Profit	-77.36 %
Average Profit	-54.39 %
Maximum Profit	230.96 %
Standard Deviation	50.06 %



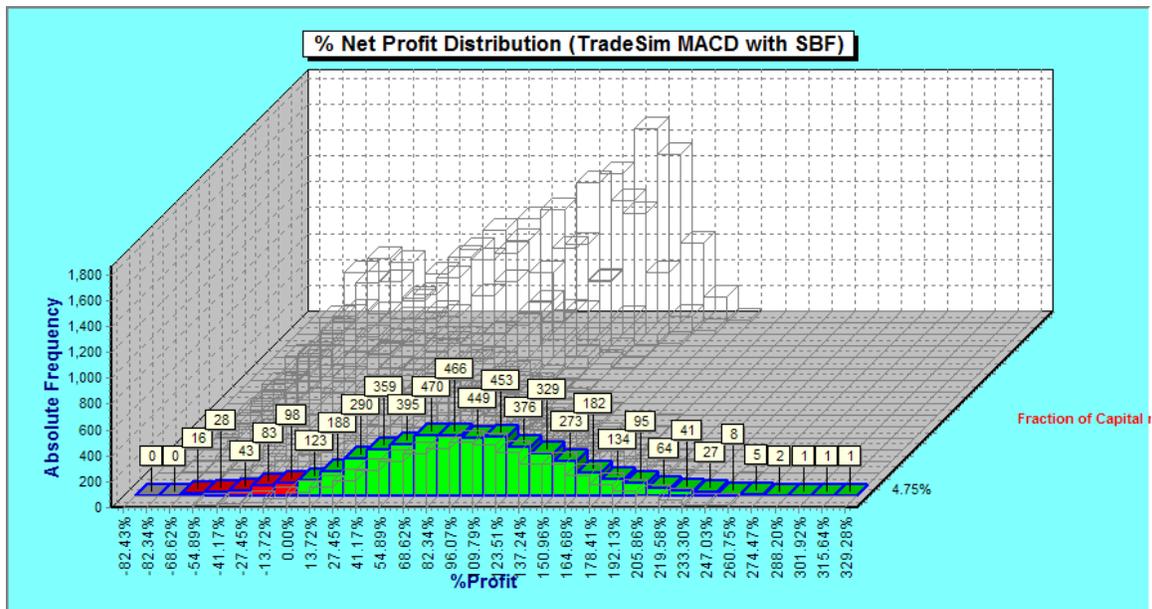
Risk Per Trade	4.25 %
Minimum Profit	-75.49 %
Average Profit	75.13 %
Maximum Profit	239.97 %
Standard Deviation	50.92 %



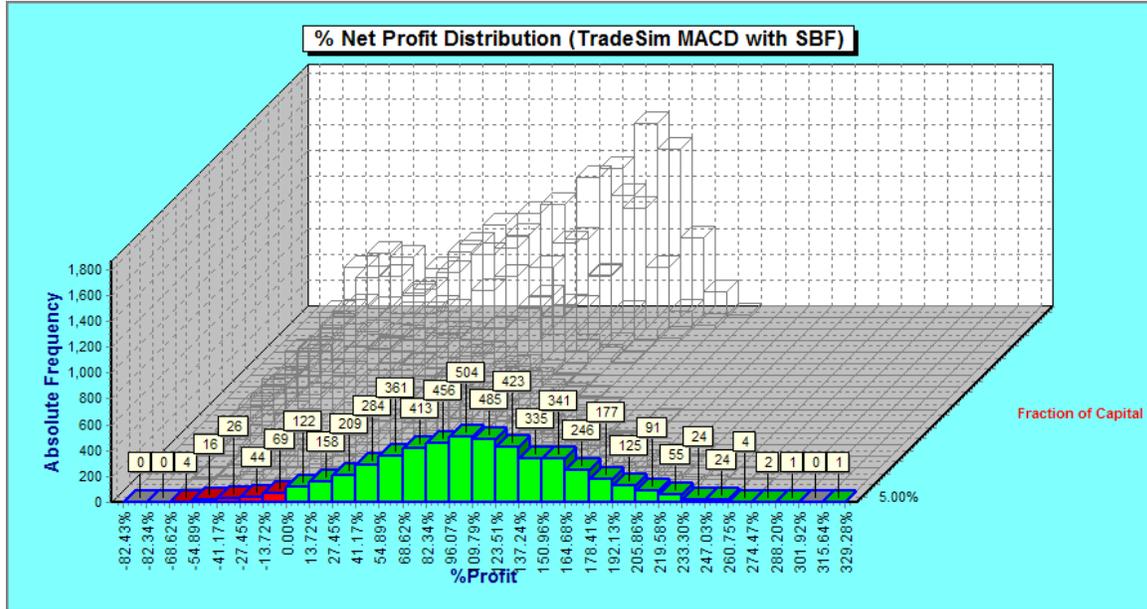
Risk Per Trade	4.50 %
Minimum Profit	-76.94 %
Average Profit	86.99 %
Maximum Profit	258.84 %
Standard Deviation	54.95 %



Risk Per Trade	4.75 %
Minimum Profit	-68.47 %
Average Profit	94.98 %
Maximum Profit	319.52 %
Standard Deviation	57.82 %



Risk Per Trade	5.00 %
Minimum Profit	-65.58 %
Average Profit	105.40 %
Maximum Profit	329.28 %
Standard Deviation	56.71 %



Index	Trade Database File or Sweep Parameter	Minimum Profit(%)	Average Profit(%)	Maximum Profit(%)	Standard Deviation(%)
1	1.00% (Fraction of Capital risked per trade)	43.70%	106.79%	176.97%	17.70%
2	1.25% (Fraction of Capital risked per trade)	3.95%	86.00%	167.10%	20.84%
3	1.50% (Fraction of Capital risked per trade)	-30.43%	57.01%	143.54%	25.94%
4	1.75% (Fraction of Capital risked per trade)	-55.66%	35.86%	121.14%	26.77%
5	2.00% (Fraction of Capital risked per trade)	-60.20%	24.91%	120.44%	29.91%
6	2.25% (Fraction of Capital risked per trade)	-70.60%	-9.73%	120.09%	28.14%
7	2.50% (Fraction of Capital risked per trade)	-76.54%	-1.39%	125.77%	31.16%
8	2.75% (Fraction of Capital risked per trade)	-77.49%	2.78%	131.48%	35.98%
9	3.00% (Fraction of Capital risked per trade)	-80.81%	5.12%	160.15%	40.67%
10	3.25% (Fraction of Capital risked per trade)	-82.43%	6.83%	172.98%	41.24%
11	3.50% (Fraction of Capital risked per trade)	-81.89%	25.82%	195.11%	47.12%
12	3.75% (Fraction of Capital risked per trade)	-77.45%	31.70%	199.85%	45.51%
13	4.00% (Fraction of Capital risked per trade)	-77.36%	54.39%	230.96%	50.06%
14	4.25% (Fraction of Capital risked per trade)	-75.49%	75.13%	239.97%	50.92%
15	4.50% (Fraction of Capital risked per trade)	-76.94%	86.99%	258.84%	54.95%
16	4.75% (Fraction of Capital risked per trade)	-68.47%	94.98%	319.52%	57.82%
17	5.00% (Fraction of Capital risked per trade)	-65.58%	105.40%	329.28%	56.71%

Comments and Analysis

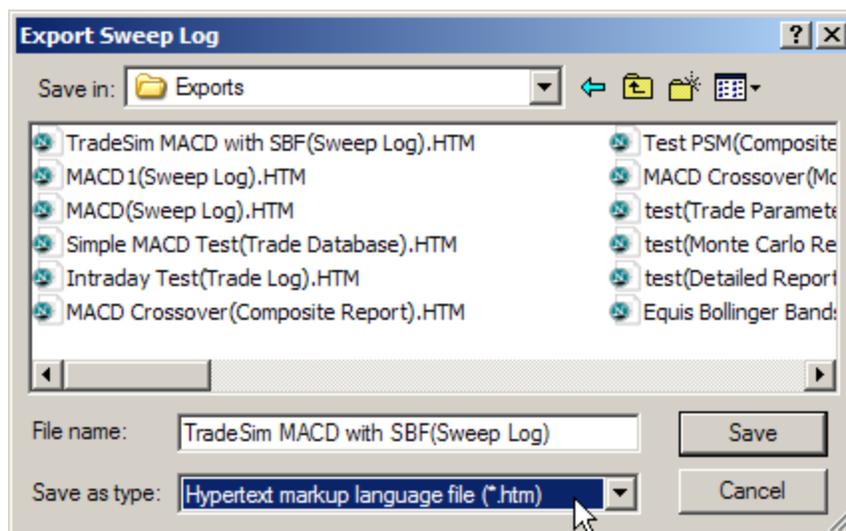
Looking at the Profit Histograms and Sweep Log you can observe that the 1% and 5% risk per trade produce the highest average profit but the 1% risk per trade has a lower standard deviation(17.70%) and

minimum profit of 43.70%, which means that none of the simulations produce a loss. However the 5% risk produces a similar average profit of 105.40% but also produces a broader standard deviation(56.71%) this pushes or skews the histogram into negative profit territory (minimum -65.58%) so the 1% risk per trade is a much preferable risk profile.

As an exercise it would be interesting to plot the average net profit to see if there are any trends in the data as well as can see an optimum risk value. To do this we shall export the Sweep Log and import it into Excel. You can easily export this table for further analysis in Excel etc. To do this, right click on the table and select “Export Sweep Log” from the popup menu.

des	Trade Database File or Sweep Parameter	Session File	Minimum Profit(%)	Average Profit(%)	Maximum Profit(%)	Standard Deviation(%)	Min Winning Trades(%)	Ave Winning Trades(%)	Max Winning Trades(%)
	1.00% (Fraction of Capital risked per trade)	-	43.70%	106.79%	176.97%	17.70%	31.87%	33.55%	35.50%
	1.25% (Fraction of Capital risked per trade)	-	3.95%	86.00%	167.10%	20.84%	30.62%	32.71%	34.68%
	1.50% (Fraction of Capital risked per trade)	-	-30.43%	57.01%	143.54%	25.94%	30.34%	32.71%	35.18%
	1.75% (Fraction of Capital risked per trade)	-	-55.66%	35.86%	121.14%	26.77%	29.01%	31.51%	34.44%
	2.00% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	2.25% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	2.50% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	2.75% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	3.00% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	3.25% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	3.50% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	3.75% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	4.00% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	32.01%	35.07%
	4.25% (Fraction of Capital risked per trade)	-	-75.49%	75.13%	239.97%	50.92%	29.12%	34.33%	40.28%
	4.50% (Fraction of Capital risked per trade)	-	-76.94%	86.99%	258.84%	54.95%	28.85%	33.90%	38.66%
	4.75% (Fraction of Capital risked per trade)	-	-68.47%	94.98%	319.52%	57.82%	30.09%	34.64%	39.67%
	5.00% (Fraction of Capital risked per trade)	-	-65.58%	105.40%	329.28%	56.71%	29.08%	34.39%	40.20%

Note: You can export in a variety of other formats such as CSV and XLS, which can also be directly imported into Excel but the HTM format, allows the column headers to be imported into Excel in the same way that they are displayed within TradeSim.



When asked to view the file in the default editor click on 'No'. Run Excel and load up the htm file from the \tradesimdata\exports directory. Excel will automatically convert it into a spreadsheet.

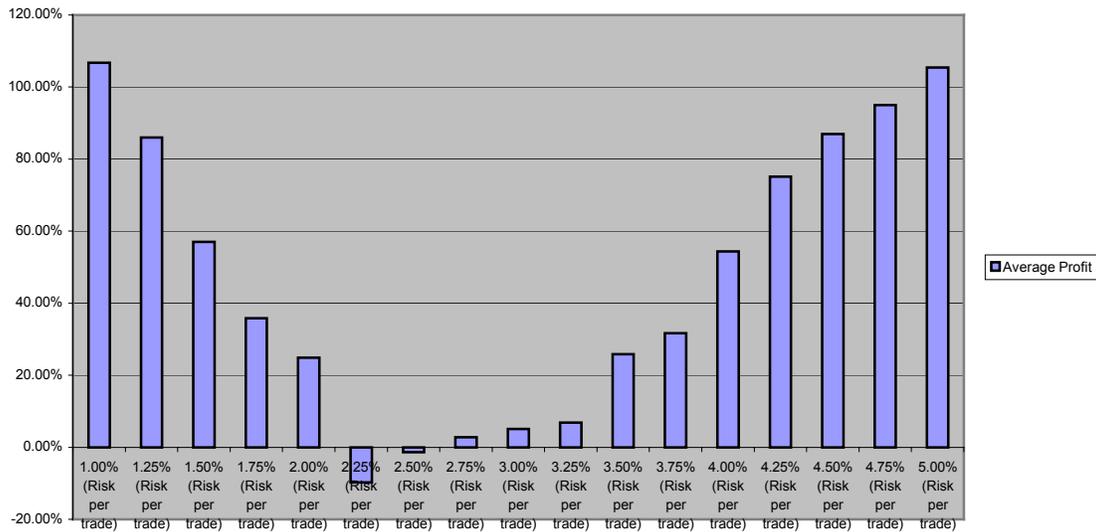
1	A	B	C	D	E	F	G	Min V
2	Index	Trade Database File or Sweep Parameter	Session File	Minimum Profit(%)	Average Profit(%)	Maximum Profit(%)	Standard Deviation(%)	Trac
3	1	1.00% (Fraction of Capital risked per trade)	-	43.70%	106.79%	176.97%	17.70%	
4	2	1.25% (Fraction of Capital risked per trade)	-	3.95%	86.00%	167.10%	20.84%	
5	3	1.50% (Fraction of Capital risked per trade)	-	-30.43%	57.01%	143.54%	25.94%	
6	4	1.75% (Fraction of Capital risked per trade)	-	-55.66%	35.86%	121.14%	26.77%	
7	5	2.00% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	
8	6	2.25% (Fraction of Capital risked per trade)	-	-70.60%	-9.73%	120.09%	28.14%	
9	7	2.50% (Fraction of Capital risked per trade)	-	-76.54%	-1.39%	125.77%	31.16%	
10	8	2.75% (Fraction of Capital risked per trade)	-	-77.49%	2.78%	131.48%	35.98%	
11	9	3.00% (Fraction of Capital risked per trade)	-	-80.81%	5.12%	160.15%	40.67%	
12	10	3.25% (Fraction of Capital risked per trade)	-	-82.43%	6.83%	172.98%	41.24%	
13	11	3.50% (Fraction of Capital risked per trade)	-	-81.89%	25.82%	195.11%	47.12%	
14	12	3.75% (Fraction of Capital risked per trade)	-	-77.45%	31.70%	199.85%	45.51%	
15	13	4.00% (Fraction of Capital risked per trade)	-	-77.36%	54.39%	230.96%	50.06%	
16	14	4.25% (Fraction of Capital risked per trade)	-	-75.49%	75.13%	239.97%	50.92%	
17	15	4.50% (Fraction of Capital risked per trade)	-	-76.94%	86.99%	258.84%	54.95%	
18	16	4.75% (Fraction of Capital risked per trade)	-	-68.47%	94.98%	319.52%	57.82%	
19	17	5.00% (Fraction of Capital risked per trade)	-	-65.58%	105.40%	329.28%	56.71%	
20								

Now we shall plot the average profit versus the trade database file. To do this, highlight the two columns in Excel and click on the Chart Wizard tool button.

Index	Trade Database File or Sweep Parameter	Session File	Minimum Profit(%)	Average Profit(%)	Maximum Profit(%)	Standard Deviation(%)	Min V
1	1.00% (Fraction of Capital risked per trade)	-	43.70%	106.79%	176.97%	17.70%	
2	1.25% (Fraction of Capital risked per trade)	-	3.95%	86.00%	167.10%	20.84%	
3	1.50% (Fraction of Capital risked per trade)	-	-30.43%	57.01%	143.54%	25.94%	
4	1.75% (Fraction of Capital risked per trade)	-	-55.66%	35.86%	121.14%	26.77%	
5	2.00% (Fraction of Capital risked per trade)	-	-60.20%	24.91%	120.44%	29.91%	
6	2.25% (Fraction of Capital risked per trade)	-	-70.60%	-9.73%	120.09%	28.14%	
7	2.50% (Fraction of Capital risked per trade)	-	-76.54%	-1.39%	125.77%	31.16%	
8	2.75% (Fraction of Capital risked per trade)	-	-77.49%	2.78%	131.48%	35.98%	
9	3.00% (Fraction of Capital risked per trade)	-	-80.81%	5.12%	160.15%	40.67%	
10	3.25% (Fraction of Capital risked per trade)	-	-82.43%	6.83%	172.98%	41.24%	
11	3.50% (Fraction of Capital risked per trade)	-	-81.89%	25.82%	195.11%	47.12%	
12	3.75% (Fraction of Capital risked per trade)	-	-77.45%	31.70%	199.85%	45.51%	
13	4.00% (Fraction of Capital risked per trade)	-	-77.36%	54.39%	230.96%	50.06%	
14	4.25% (Fraction of Capital risked per trade)	-	-75.49%	75.13%	239.97%	50.92%	
15	4.50% (Fraction of Capital risked per trade)	-	-76.94%	86.99%	258.84%	54.95%	
16	4.75% (Fraction of Capital risked per trade)	-	-68.47%	94.98%	319.52%	57.82%	
17	5.00% (Fraction of Capital risked per trade)	-	-65.58%	105.40%	329.28%	56.71%	

Go through the chart wizard and produce a basic bar chart of average profits versus risk. As you can see in the graph, at first glance it appears that the 1% and 5% risk profiles produce similar profit but from previous analysis this graph does not tell the whole story.

Average Profit

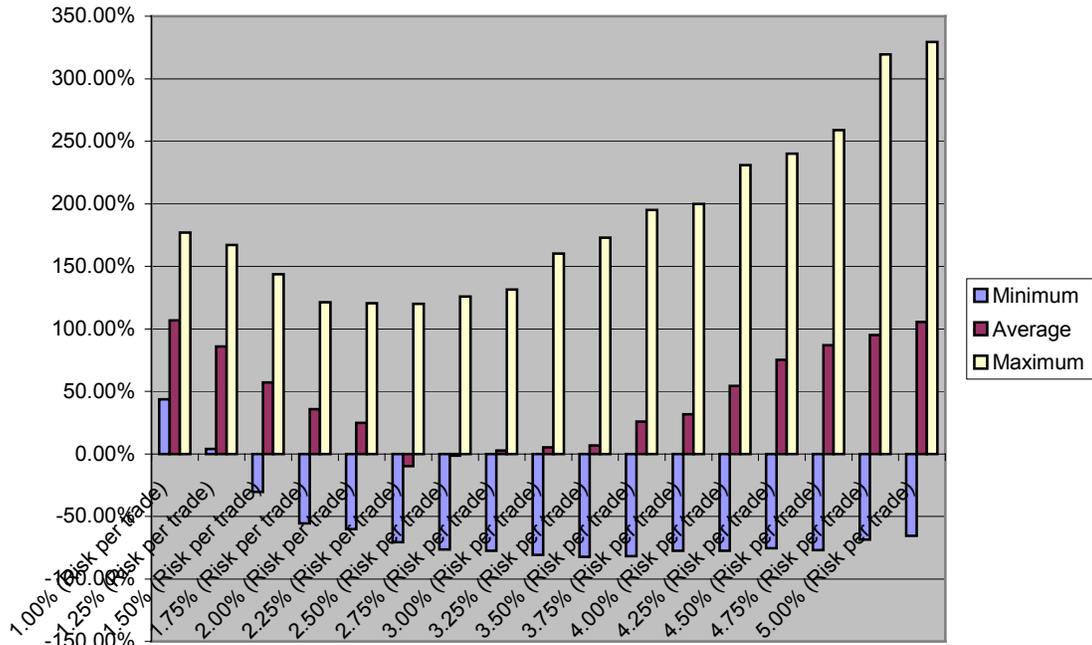


Lets try adding the minimum and maximum profits to the graph.

1	A	B	C	D	E	F	G	H	I
2	Index	Trade Database File or Sweep Parameter	Session File	Minimum Profit(%)	Average Profit(%)	Maximum Profit(%)	Standard Deviation(%)	Min Winning Trades(%)	Ave W Trad
3	1	1.00% (Risk per trade)	-	43.70%	106.79%	176.97%	17.70%	31.87%	
4	2	1.25% (Risk per trade)	-	3.95%	86.00%	167.10%	20.84%	30.62%	
5	3	1.50% (Risk per trade)	-	-30.43%	57.01%	143.54%	25.94%	30.34%	
6	4	1.75% (Risk per trade)	-	-55.66%	35.86%	121.14%	26.77%	29.01%	
7	5	2.00% (Risk per trade)	-	-60.20%	24.91%	120.44%	29.91%	28.97%	
8	6	2.25% (Risk per trade)	-	-70.60%	-9.73%	120.09%	28.14%	28.34%	
9	7	2.50% (Risk per trade)	-	-76.54%	-1.39%	125.77%	31.16%	28.59%	
10	8	2.75% (Risk per trade)	-	-77.49%	2.78%	131.48%	35.98%	28.59%	
11	9	3.00% (Risk per trade)	-	-80.81%	5.12%	160.15%	40.67%	26.68%	
12	10	3.25% (Risk per trade)	-	-82.43%	6.83%	172.98%	41.24%	26.98%	
13	11	3.50% (Risk per trade)	-	-81.89%	25.82%	195.11%	47.12%	26.22%	
14	12	3.75% (Risk per trade)	-	-77.45%	31.70%	199.85%	45.51%	27.53%	
15	13	4.00% (Risk per trade)	-	-77.36%	54.39%	230.96%	50.06%	28.27%	
16	14	4.25% (Risk per trade)	-	-75.49%	75.13%	239.97%	50.92%	29.12%	
17	15	4.50% (Risk per trade)	-	-76.94%	86.99%	258.84%	54.95%	28.85%	
18	16	4.75% (Risk per trade)	-	-68.47%	94.98%	319.52%	57.82%	30.09%	
19	17	5.00% (Risk per trade)	-	-65.58%	105.40%	329.28%	56.71%	29.08%	

As you can see in the chart below the 1% risk profile gives the same average net profit as the 5% risk profit but the variation between the minimum and maximum net profits is much narrower so much so that it never produces a negative net profit.

Net Profit vs Risk per Trade



Comparison with conventional optimization process.

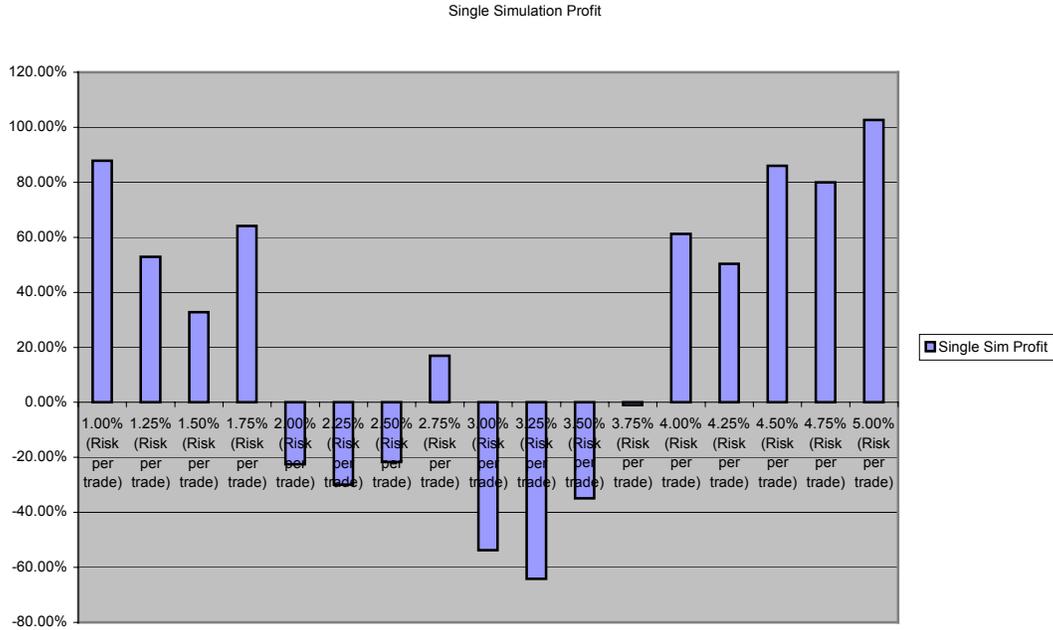
Typically a conventional portfolio optimizer works the same way as a single security optimizer and that is it runs a series of simulations and steps a parameter for each simulation. It then plots a performance metric such as profit versus each stepping. For a single security this is all that can be done because the sequence of trades is always the same no matter how many times you run a simulation. However with a portfolio, the variance in the system due to permutations and combinations of trades requires a much more detailed analysis which is why the sweep facility in TradeSim is so important. To prove the point we shall compare the average net profit of a 5,000-simulation sweep versus the net profit for a single portfolio simulation.

By rerunning single portfolio simulations for all of the risk values and adding this data to a new column in the spreadsheet next to the average values it is possible to do a comparison between the two methodologies.

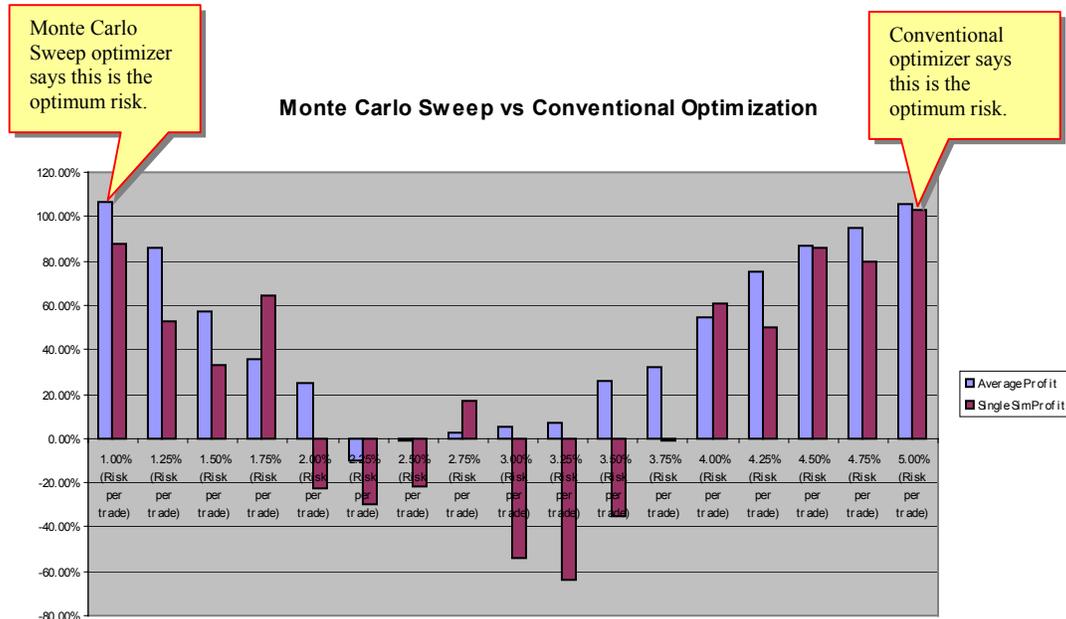
	A	B	C	D	E	F	G	H
1		Trade Database File		Minimum	Average		Maximum	Sta
2	Index	or Sweep Parameter	Session File	Profit(%)	Profit(%)		Profit(%)	Devi
3	1	1.00% (Risk per trade)	-	43.70%	106.79%	87.86%	176.97%	
4	2	1.25% (Risk per trade)	-	3.95%	86.00%	52.88%	167.10%	
5	3	1.50% (Risk per trade)	-	-30.43%	57.01%	32.73%	143.54%	
6	4	1.75% (Risk per trade)	-	-55.66%	35.86%	64.18%	121.14%	
7	5	2.00% (Risk per trade)	-	-60.20%	24.91%	-22.55%	120.44%	
8	6	2.25% (Risk per trade)	-	-70.60%	-9.73%	-29.88%	120.09%	
9	7	2.50% (Risk per trade)	-	-76.54%	-1.39%	-21.69%	125.77%	
10	8	2.75% (Risk per trade)	-	-77.49%	2.78%	16.94%	131.48%	
11	9	3.00% (Risk per trade)	-	-80.81%	5.12%	-53.75%	160.15%	
12	10	3.25% (Risk per trade)	-	-82.43%	6.83%	-64.10%	172.98%	
13	11	3.50% (Risk per trade)	-	-81.89%	25.82%	-34.90%	195.11%	
14	12	3.75% (Risk per trade)	-	-77.45%	31.70%	-0.98%	199.85%	
15	13	4.00% (Risk per trade)	-	-77.36%	54.39%	61.22%	230.96%	
16	14	4.25% (Risk per trade)	-	-75.49%	75.13%	50.41%	239.97%	
17	15	4.50% (Risk per trade)	-	-76.94%	86.99%	86.04%	258.84%	
18	16	4.75% (Risk per trade)	-	-68.47%	94.98%	79.98%	319.52%	
19	17	5.00% (Risk per trade)	-	-65.58%	105.40%	102.70%	329.28%	
20								
21								
22								

Looking at the chart below we see that if we relied on the results of the single portfolio simulation we would probably pick the 5% risk profile because it results in the highest net profit, but we know from the previous extensive analysis that this is not the optimum risk profile simply because it has a large standard deviation and can result in negative net profits for this system. It just happens that the first simulation run produced an outlier profit which was close to its maximum deviation according to statistical analysis, and so we were fooled into thinking that by picking the maximum profit this resulted in the most optimum value for the risk profile which from extensive statistical analysis we know that the 1% risk profile is the most optimum value.

Note: Although for this example we have limited the analysis by concentrating on profits alone it would prudent to take into other performance aspects such as draw down, consecutive losses etc.



Stacking the data side by side in a bar chart shows up discrepancies between the in depth statistical analysis and the one off single portfolio simulation. This is to be expected because each single simulation is 1 of the 5,000 possible simulations that is run for each Monte Carlo Sweep. Basing the performance of the system on this one metric alone is like sampling one apple out of 5,000 apples and assuming that all of the other apples all look and taste identical to this one sample. As this example illustrates this is not the case. Other portfolio optimization software that runs a single simulation for each step has to force a single outcome by using artificial ranking criteria. Using trade ranking to force the system to always yield the same result for a given stepping does not change anything. It just hides the reality of the situation and falsely makes you believe that all apples are the same ! It is not until you can do a direct comparison between different sweeps using Monte Carlo analysis and single portfolio simulations does this whole issue become blatantly obvious !



Monte Carlo Batch Sweep

The new Monte Carlo batch sweep feature in the Enterprise Edition can be used for directly comparing portfolio-trading systems using an advanced statistical process by overlaying the results of each Monte Carlo analysis on a common axis. For example we can take two or more trading systems and do an objective comparison between the two. We must emphasize that this is not just comparison between the results from single simulations, this is the direct comparisons between the results from an exhaustive Monte Carlo analysis !

For the first time it is possible to directly compare system performance on the screen at the same time. Previously you would have to run one analysis, save or print out the results and then run another analysis save and print the results and then later compare the systems. Even then the chart axis would not be normalized relative to each other so it still is not easy to do a direct comparison between systems. With the Monte Carlo Batch sweep facility you can directly see and compare the performance of many systems on the screen at the same time simply because everything has been normalized to a common chart axis.

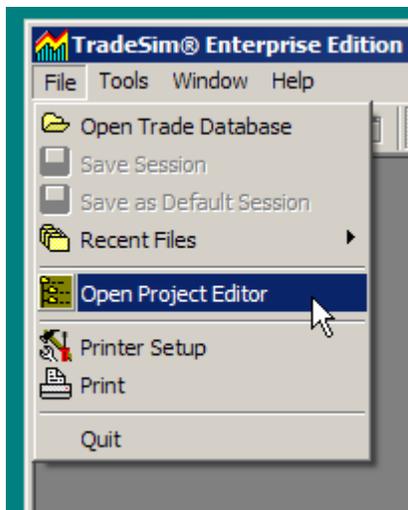
Before we can run a batch sweep we need to tell TradeSim what trade database files and session files it needs to use. This is done by using the Project Editor, which is used to create a list of trade database files, and optional session files. You can include any number of trade database files each with its own session file if need be. For example you may want to compare the same trade database file run with several different position size models. You just create the number of different sessions files that you need and then add the same trade database file along with each the different session files to the project.

You can also assign a global session file to the project. This session file will apply to any trade database file that has not been assigned it's own session file. If no global session file is assigned to the project then the most current session file will be used as the global session.

After you have created the project you can save it. All project files have an extension of .pja

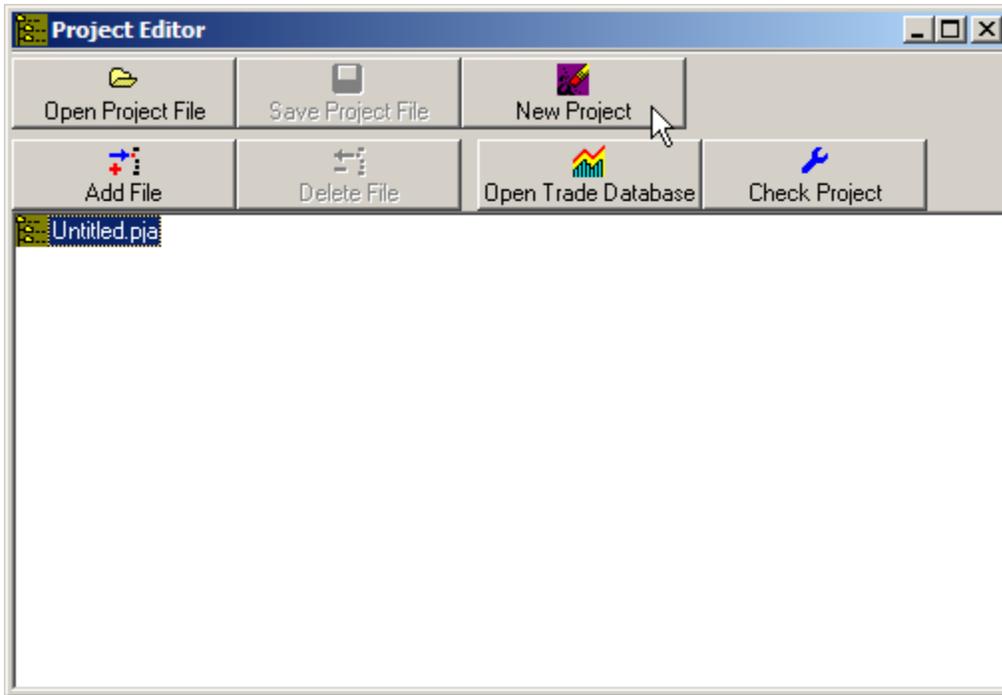
You cannot run a batch sweep unless you have loaded a project into the project editor.

Lets illustrate the concepts by way of an example. First open up the project editor from the File Menu..

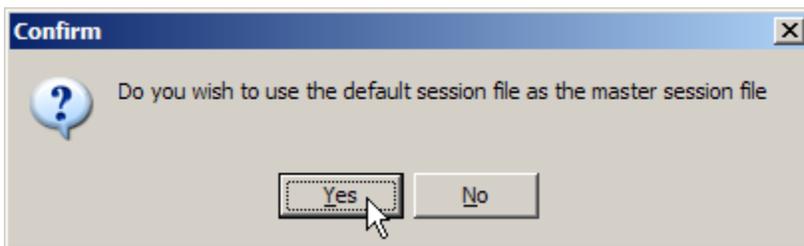


You should be greeted with the Project Editor window. A project called Untitled.pja is automatically created but not saved. You can later save this under a name of your choosing.

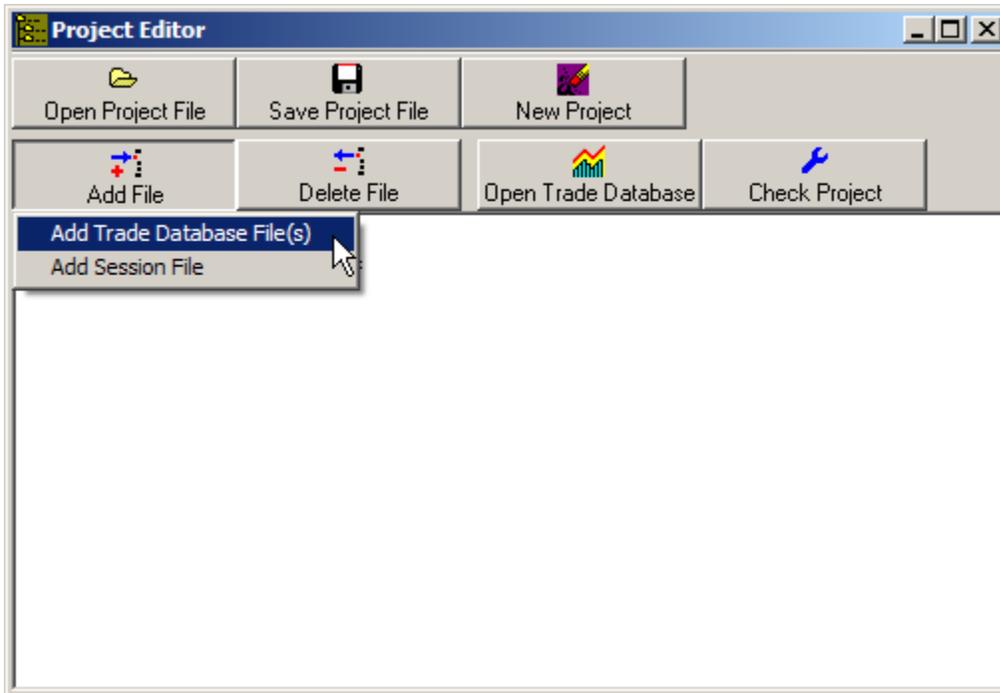
Click on “New Project”.



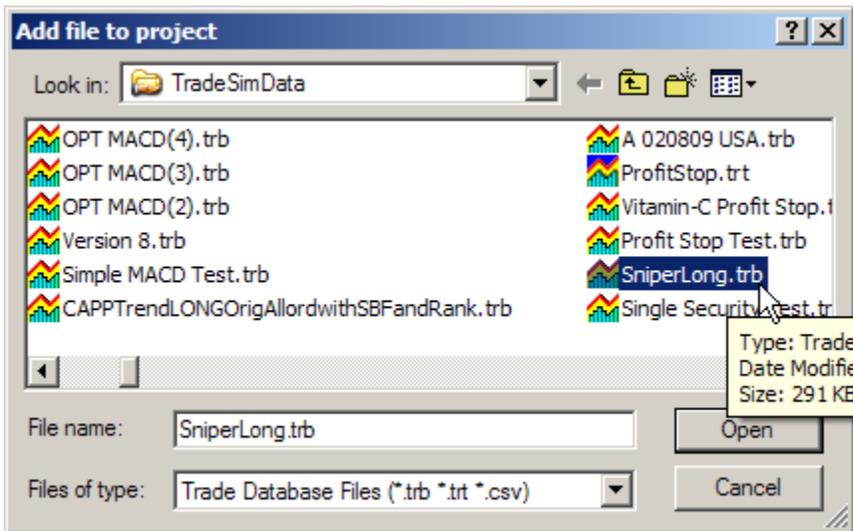
Click on ‘Yes’ to accept the default session file. You can change this file later by deleting it and adding another file.



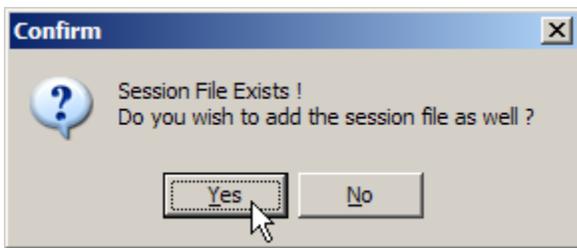
Click on ‘Add File’ and select ‘Add Trade Database File(s)’.



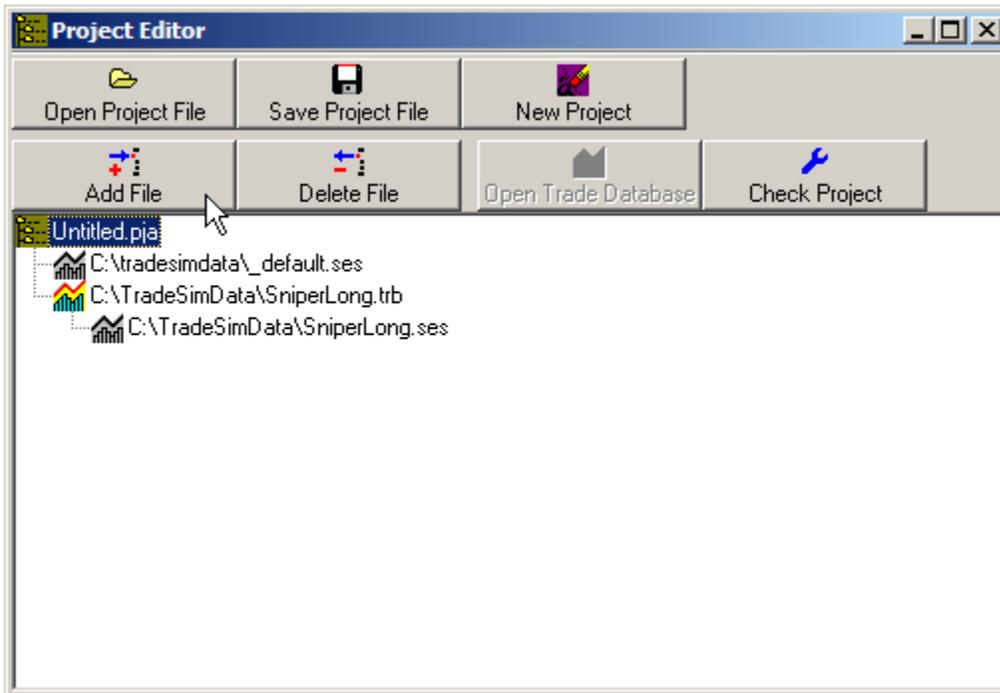
Select a trade database file.



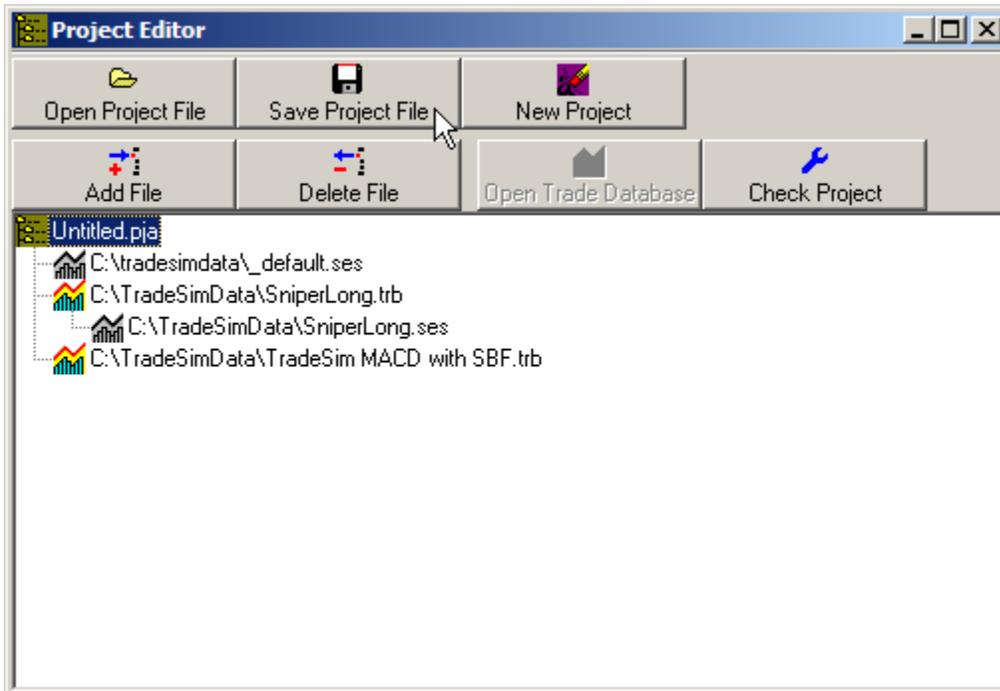
If there is an associated session file it will ask you if you want to add that. Click 'Yes' for this example.

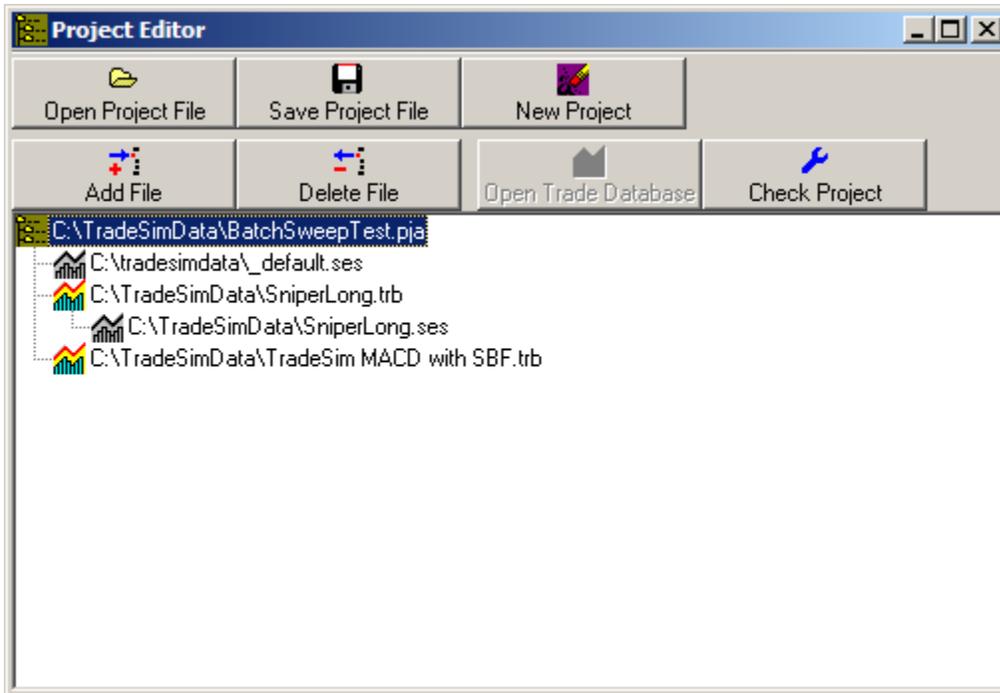


Now add another file by clicking on the Add File button.



Save the project file and call it BatchSweepTest.





The table below illustrates which session files match up with trade database files in this project.

Trade Database File	Session File
C:\TradeSimData\SniperLong.trb	C:\TradeSimData\SniperLong.ses
C:\TradeSimData\TradeSim MACD with SBF.trb	C:\tradesimdata_default.ses

If we deleted the master session file (_default.ses) from the project then how would that change the corresponding session files. The following table illustrates the changes'

Trade Database File	Session File
C:\TradeSimData\SniperLong.trb	C:\TradeSimData\SniperLong.ses
C:\TradeSimData\TradeSim MACD with SBF.trb	current session or the SniperLong session above

The current session refers to the session of the last open trade database file. When a batch sweep is run the current session is saved to memory. When a trade database file does not have its corresponding session file and/or there is no master session file then the current session is used in place so be careful when you set up the trade parameters and preferences. It is recommended to create a master session file and then add this to the project.

Running a Monte Carlo Batch Sweep

To run a batch sweep double click on any of the Trade Database files or select any Trade Database file and click on 'Open Trade Database' to open up the Trade Database so you can activate the batch sweep.

Note: To run a Monte Carlo Batch or Parametric Sweep a Trade Database file needs to be loaded up so the sweep feature can be enabled.

Click on the Trade Parameters tab. In the Simulation Type select Monte Carlo Analysis and in the Simulation Options select the 'Batch' Sweep Mode and select the appropriate number of simulations per sweep.

Simulation Type

Portfolio Simulation
 Portfolio Simulation (Ignore Dates)
 Basket test
 Monte Carlo Analysis

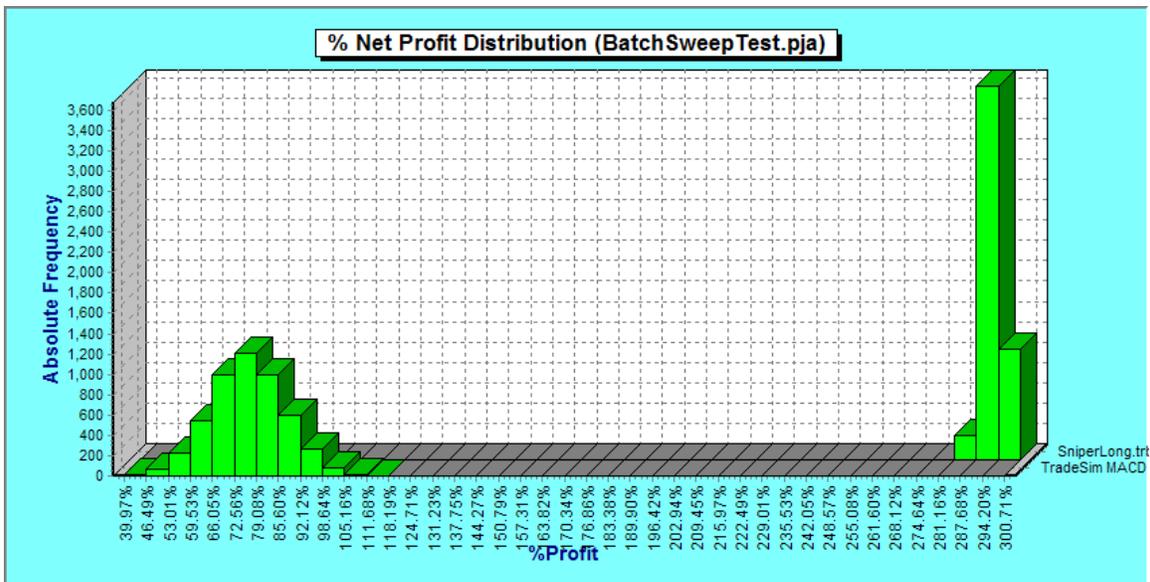
Simulation Options

Number of Simulations
 5000 Reset Ordering

Sweep Mode

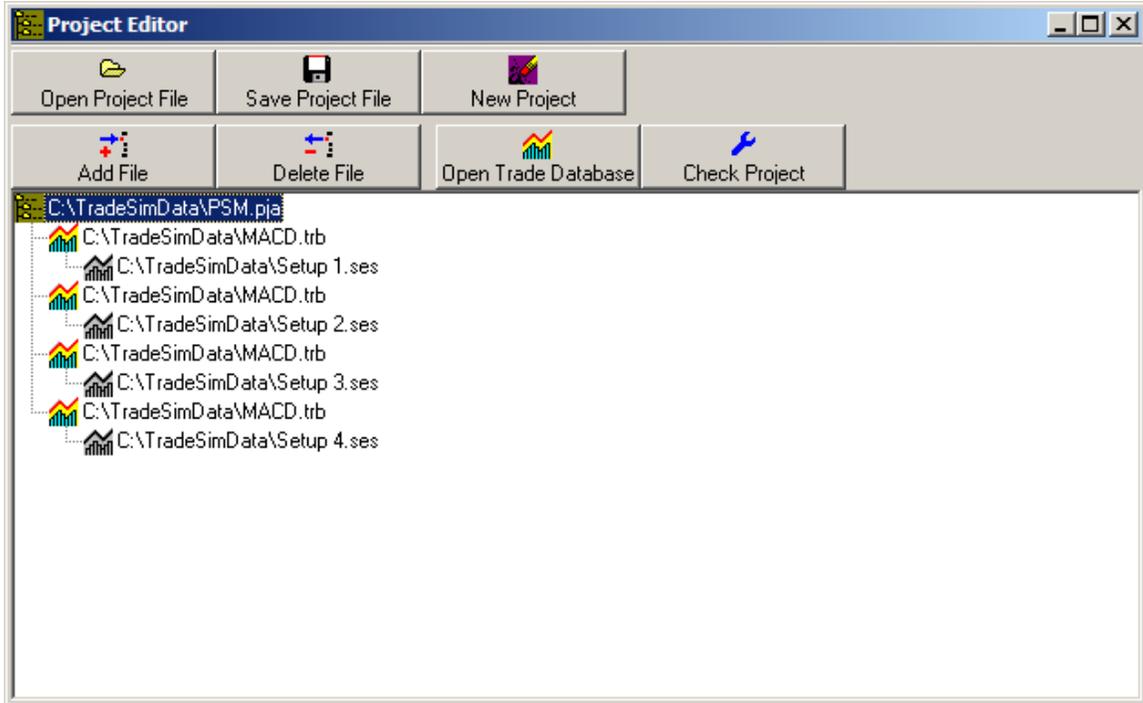
None Batch
 Parametric

Click on ‘Start Monte Carlo Simulation’ and it will run through two Monte Carlo sweeps each with 5,000 simulations. A screen grab of the Net Profit Distribution is shown below. As can be see the Sniper system has a more consistent profit and is a lot higher than the MACD which has a lower and a broader profit distribution.



Running a batch sweep using different session files

You can compare the effects of different sets of trade parameters or preference on the performance of a trade database file by setting up a project with the same trade database file linked with different session files. For example the following project shows the same trade database file added four times each with a different session file. You create and name these session files by setting your trade parameters and preferences and then using the “Save Session” command from the File menu using a unique session file name. You then add the trade database file and corresponding session file to the project.



Monte Carlo Optimization Procedure

As demonstrated in the previous section the new Monte Carlo batch sweep feature in the Enterprise Edition can be used for directly comparing portfolio-trading systems using advanced statistical processes, by overlaying the results of each Monte Carlo analysis on a common axis. Because of this ability it can also be used to do an advanced portfolio optimization procedure.

Although the optimization procedure is not a single button procedure the amount of processing that TradeSim does, makes the whole process far more comprehensive compared to other single simulation portfolio optimization strategies, which are essentially useless for portfolio system testing. For example a 20 step optimization procedure using a conventional optimization process would only run 20 simulations. However using the batch sweep feature you might run a 5000 simulation Monte Carlo analysis for each step or 100,000 simulations in total for the whole procedure. If this procedure was done using conventional charting software this could take anywhere from a few days to weeks or even months but with TradeSim it does it within minutes because it is not resource intensive.

The following steps outline the procedure for running an advanced portfolio optimization procedure. We will use a simple MACD example where we are trying to find an optimum value of the signal averaging factor if there is one at all ! The following code is used to create a trade database for a signal smoothing factor of 2. If we are going to step the signal averaging factor from say 2 to 20 in increments of 1 then we will need to do this 19 times. Each time we use a different signal average factor we need to create a new trade database file so we then end up with 19 trade database explorations. These explorations could be run as a batch process in MetaStock or run individually if you like. This extra ground work may put you off but bear in mind the amount of work TradeSim has to do with this data, which no other optimization software even attempts! In fact it is the only way to perform an optimization procedure on a portfolio trading system !

The MetaStock trade database exploration code is written as follows:-

```
sigavg := 2;

ExitTrigger := Ref(Cross(MACD(),Mov(MACD(),sigavg,E)),-1);
EntryPrice := OPEN;
EntryTrigger := Ref(Cross(Mov(MACD(),sigavg,E),MACD()),-1);
ExitPrice := OPEN;
InitialStop:=0;      { No Initial Stop used }

ExtFml("TradeSim.Initialize");

ExtFml("TradeSim.RecordTrades",
"OPT MACD(2)",      { Trade Database Filename }
LONG,              { Trade Position Type }
EntryTrigger,      { Entry Trigger }
EntryPrice,        { Entry Price }
InitialStop,       { Optional Initial Stop }
ExitTrigger,       { Exit Trigger }
ExitPrice,         { Exit Price }
START);            { Recorder Control }
```

When creating the other trade database explorations for this example only the text in red should be changed. For example when creating the trade database exploration for a signal average of 10 the code exploration code would be:-

```
sigavg := 10;

ExitTrigger := Ref(Cross(MACD(),Mov(MACD(),sigavg,E)),-1);
EntryPrice := OPEN;
EntryTrigger := Ref(Cross(Mov(MACD(),sigavg,E),MACD()),-1);
```

```

ExitPrice := OPEN;
InitialStop:=0;      { No Initial Stop used }

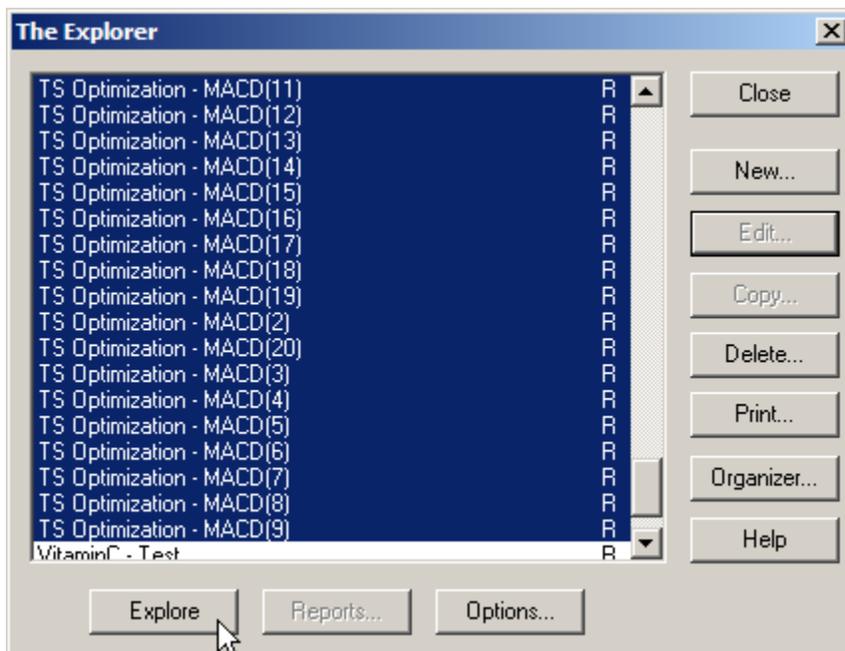
ExtFml( "TradeSim.Initialize");

ExtFml( "TradeSim.RecordTrades",
"OPT MACD(10)",      { Trade Database Filename }
LONG,                { Trade Position Type }
EntryTrigger,        { Entry Trigger }
EntryPrice,           { Entry Price }
InitialStop,         { Optional Initial Stop }
ExitTrigger,         { Exit Trigger }
ExitPrice,           { Exit Price }
START);              { Recorder Control }

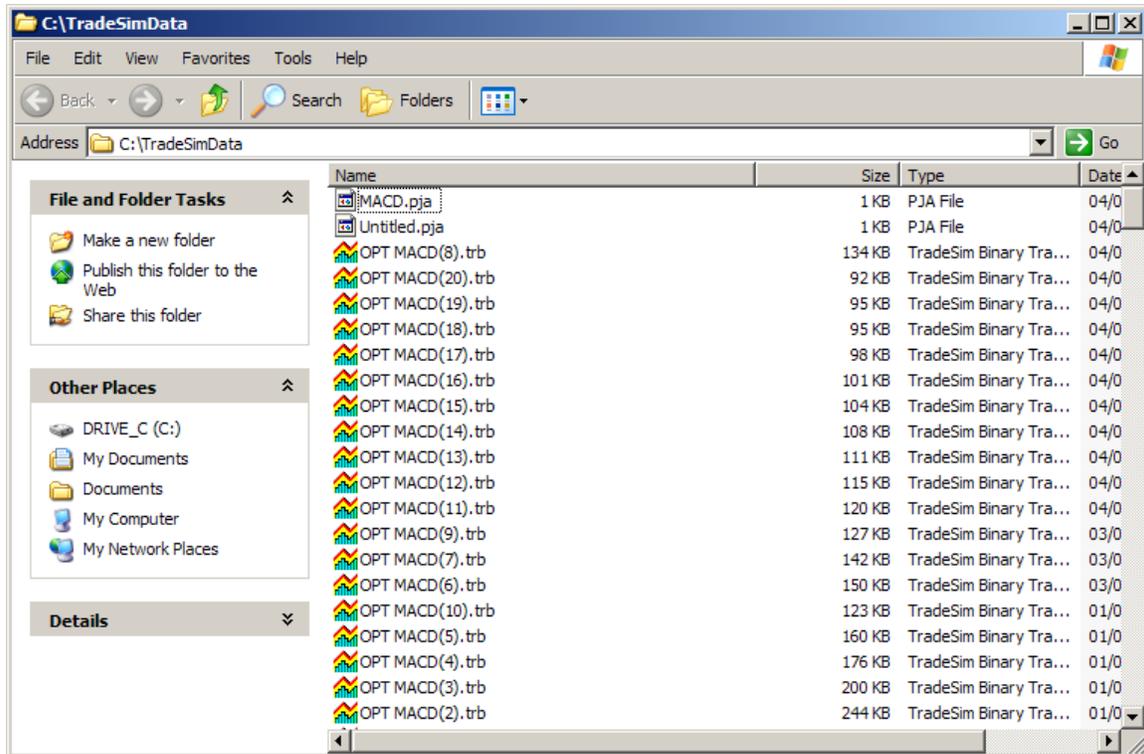
```

If you have a system where you have more than one variable that needs to be changed then you will have to change it for each trade database exploration. The important thing is that the trade database file name needs to be changed otherwise you will over write the file each time you run a trade database exploration. At the end you should have 19 trade database files in your trade database file directory.

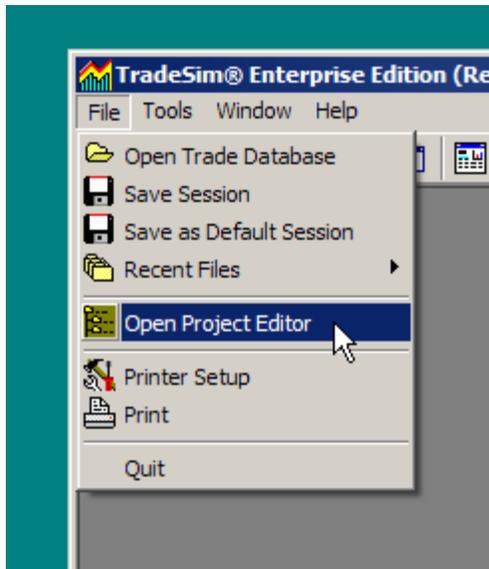
You need to setup all of the trade database explorations or alternatively you could setup one and then run it and change the parameters and then re-run it again until you have gone through all of the different variables. In this example I created 19 explorations and set the exploration options to use using the S&P ASX20 for the last 1000 records or bars. This covers the last 4 years of which there was major turbulence in the market. MetaStock allows you to run a batch of explorations in the one hit. I decided to run them one at a time to see if there weren't any errors or major warnings when creating the trade database files.



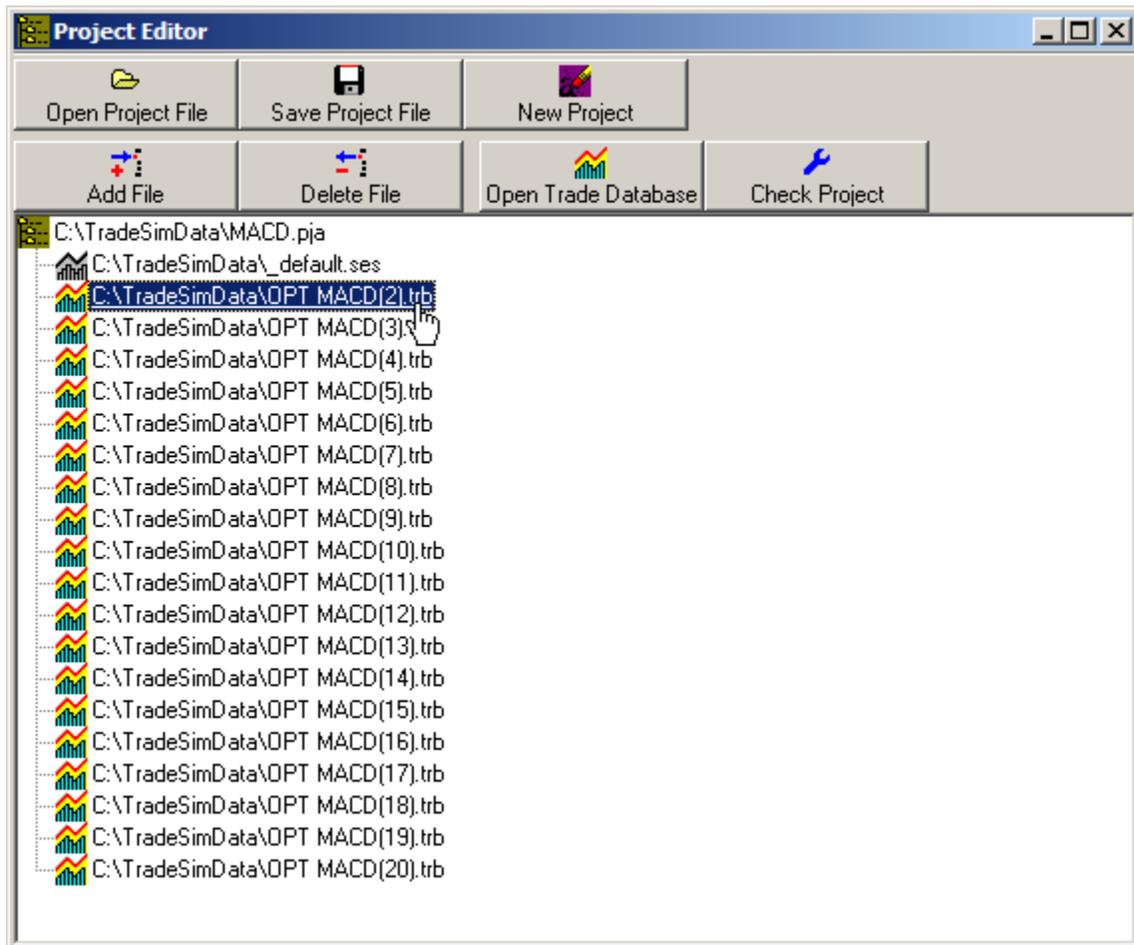
Once all of the trade database explorations have been run the trb files should be available in the \tradesimdata directory as shown in the following screen grab of the file explorer.



Next we run TradeSim and invoke the new Project Editor from the Files Menu



We create a new project called MACD and add all of the relevant files to the project. When a batch sweep is run these files will be loaded one at a time and a Monte Carlo analysis will be run each time. Because no more than one trade database is loaded into memory at any one-time, resources are kept to a minimum.

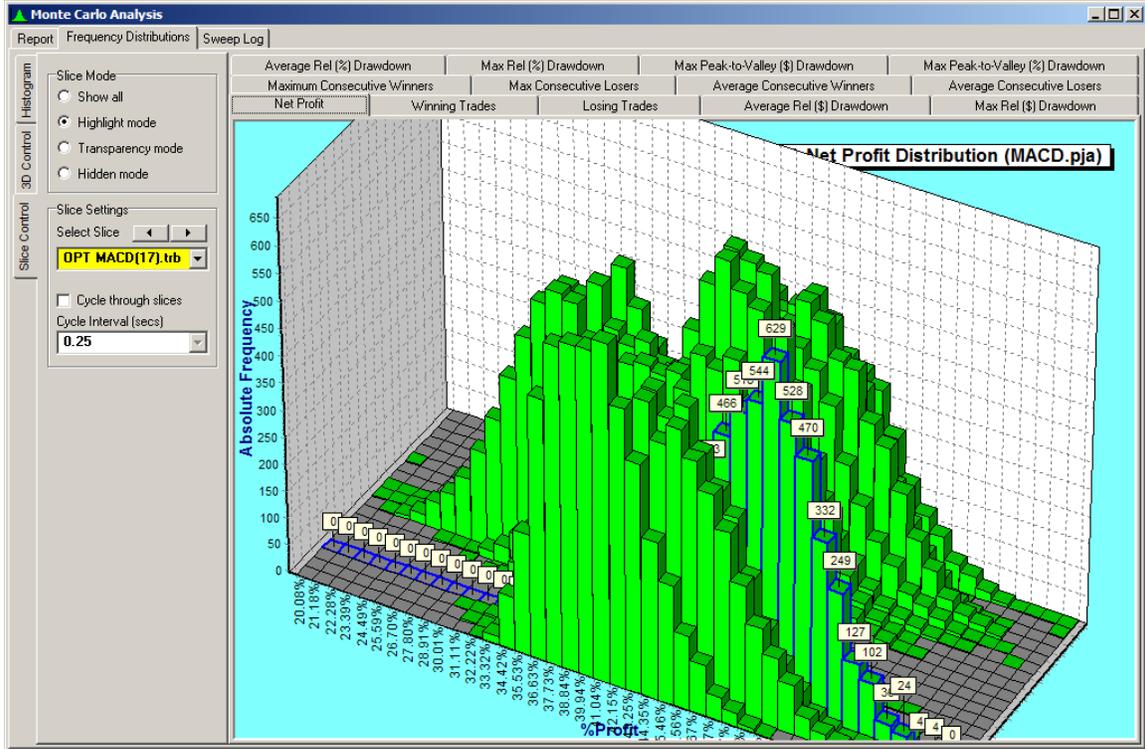


Now select any file from the project editor and open it up by clicking on the "Open Trade Database" button on the tools menu or double click on its name. In this example I will just use the default trade parameters. You could setup your own set of parameters that apply to all of the trade database files in the project or assign a different set of parameters by attaching a session file to any file in the project. In this case I want to use the same set of parameters or session for each trade database file.

Select Monte Carlo Simulation Type and number of simulations per sweep, which is 5,000 in this example. Now select Batch Sweep from the Simulation Options.

Click on "Start Monte Carlo Simulation" and go and have a cup of coffee because it may take some time depending on how slow your computer is and how many sweeps and simulations per sweep you have chosen.

When you have finished your coffee hopefully it will have finished but the finished results will look something like the following. As you can see there are 19 Monte Carlo sweeps overlaid on the same chart for direct comparison. Unlike conventional optimization software, which only shows one simulation per stepping the TradeSim Batch Sweep, processing displays the results in terms of a statistical profile or signature. Because all results are overlaid on a common chart it is easy to objectively compare the performance for each step and if possible draw a valid conclusion.



Further analysis

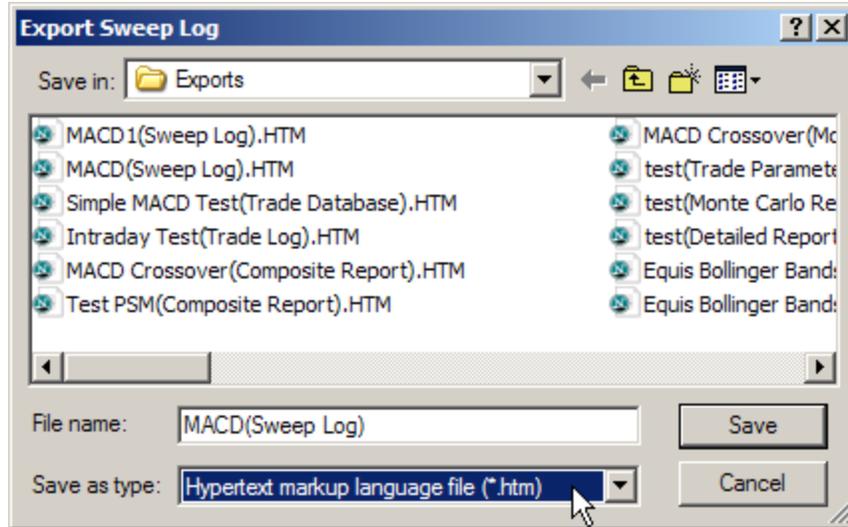
The histograms contain much detailed information that allows you to compare the results of one sweep with another. The slice mode allows you to highlight and pickoff a particular sweep for further scrutiny and to help you better compare information.

For further analysis a sweep log is created which contains a table of information related to the histograms such as the mean average, minimum, maximum and standard deviation.

Index	Trade Database File or Sweep Parameter	Session File	Maximum Profit(%)	Average Profit(%)	Minimum Profit(%)	Standard Deviation(%)	Max Winning Trades(%)	Ave Winning Trades(%)	Min V Trad
1	OPT MACD(2).trb	current session	63.06%	45.89%	28.24%	4.90%	65.27%	63.85%	62.1
2	OPT MACD(3).trb	current session	58.09%	42.64%	26.49%	4.58%	67.14%	65.39%	63.7
3	OPT MACD(4).trb	current session	61.55%	46.19%	31.61%	4.57%	67.92%	66.43%	64.6
4	OPT MACD(5).trb	current session	61.95%	47.54%	32.58%	4.39%	65.87%	64.28%	62.7
5	OPT MACD(6).trb	current session	60.85%	45.25%	28.59%	4.60%	66.32%	64.54%	62.7
6	OPT MACD(7).trb	current session	59.24%	42.58%	25.65%	5.06%	67.03%	65.04%	63.1
7	OPT MACD(8).trb	current session	55.69%	44.86%	32.61%	3.45%	66.89%	65.02%	63.4
8	OPT MACD(9).trb	current session	59.50%	43.94%	31.50%	3.59%	67.59%	65.70%	63.9
9	OPT MACD(10).trb	current session	50.10%	36.66%	21.64%	4.21%	67.33%	65.40%	63.3
10	OPT MACD(11).trb	current session	49.23%	35.35%	21.59%	4.22%	66.06%	64.07%	62.0
11	OPT MACD(12).trb	current session	50.50%	34.58%	21.67%	4.38%	66.60%	64.75%	62.8
12	OPT MACD(13).trb	current session	55.31%	40.68%	26.55%	4.28%	67.79%	65.82%	63.8
13	OPT MACD(14).trb	current session	59.09%	44.32%	28.96%	4.32%	68.05%	66.33%	64.3
14	OPT MACD(15).trb	current session	56.86%	42.19%	28.12%	4.35%	68.75%	66.90%	65.2
15	OPT MACD(16).trb	current session	62.08%	47.19%	35.05%	3.62%	68.07%	66.50%	64.9
16	OPT MACD(17).trb	current session	64.25%	50.93%	39.91%	3.67%	68.01%	66.47%	64.8
17	OPT MACD(18).trb	current session	58.92%	45.01%	30.34%	4.11%	68.43%	66.75%	64.7
18	OPT MACD(19).trb	current session	60.33%	45.14%	33.22%	4.31%	69.46%	67.89%	66.3
19	OPT MACD(20).trb	current session	52.28%	41.06%	32.64%	3.29%	68.67%	67.45%	66.1

You can easily export this table for further analysis in Excel etc. To do this, right click on the table and select “Export Sweep Log” from the popup menu.

Index	Trade Database File or Sweep Parameter	Session File	Maximum Profit(%)	Average Profit(%)	Minimum Profit(%)	Standard Deviation(%)	Max Winning Trades(%)	Ave Winning Trades(%)	Min V Trad
1	OPT MACD(2).trb	current session	63.06%	45.89%	28.24%	4.90%	65.27%	63.85%	62.1
2	OPT MACD(3).trb	current session	58.09%	42.64%	26.49%	4.58%	67.14%	65.39%	63.7
3	OPT MACD(4).trb	current session	61.55%	46.19%	31.61%	4.57%	67.92%	66.43%	64.6
4	OPT MACD(5).trb	current session	61.95%	47.54%	32.58%	4.39%	65.87%	64.28%	62.7
5	OPT MACD(6).trb	current session	60.85%	45.25%	28.59%	4.60%	66.32%	64.54%	62.7
6	OPT MACD(7).trb	current session	59.24%	42.58%	25.65%	5.06%	67.03%	65.04%	63.1
7	OPT MACD(8).trb	current session	55.69%	44.86%	32.61%	3.45%	66.89%	65.02%	63.4
8	OPT MACD(9).trb	current session	59.50%	43.94%	31.50%	3.59%	67.59%	65.70%	63.9
9	OPT MACD(10).trb	current session	50.10%	36.66%	21.64%	4.21%	67.33%	65.40%	63.3
10	OPT MACD(11).trb	current session	49.23%	35.35%	21.59%	4.22%	66.06%	64.07%	62.0
11	OPT MACD(12).trb	current session	50.50%	34.58%	21.67%	4.38%	66.60%	64.75%	62.8
12	OPT MACD(13).trb	current session	55.31%	40.68%	26.55%	4.28%	67.79%	65.82%	63.8
13	OPT MACD(14).trb	current session	59.09%	44.32%	28.96%	4.32%	68.05%	66.33%	64.3
14	OPT MACD(15).trb	current session	56.86%	42.19%	28.12%	4.35%	68.75%	66.90%	65.2
15	OPT MACD(16).trb	current session	62.08%	47.19%	35.05%	3.62%	68.07%	66.50%	64.9
16	OPT MACD(17).trb	current session	64.25%	50.93%	39.91%	3.67%	68.01%	66.47%	64.8
17	OPT MACD(18).trb	current session	58.92%	45.01%	30.34%	4.11%	68.43%	66.75%	64.7
18	OPT MACD(19).trb	current session	60.33%	45.14%	33.22%	4.31%	69.46%	67.89%	66.3
19	OPT MACD(20).trb	current session	52.28%	41.06%	32.64%	3.29%	68.67%	67.45%	66.1



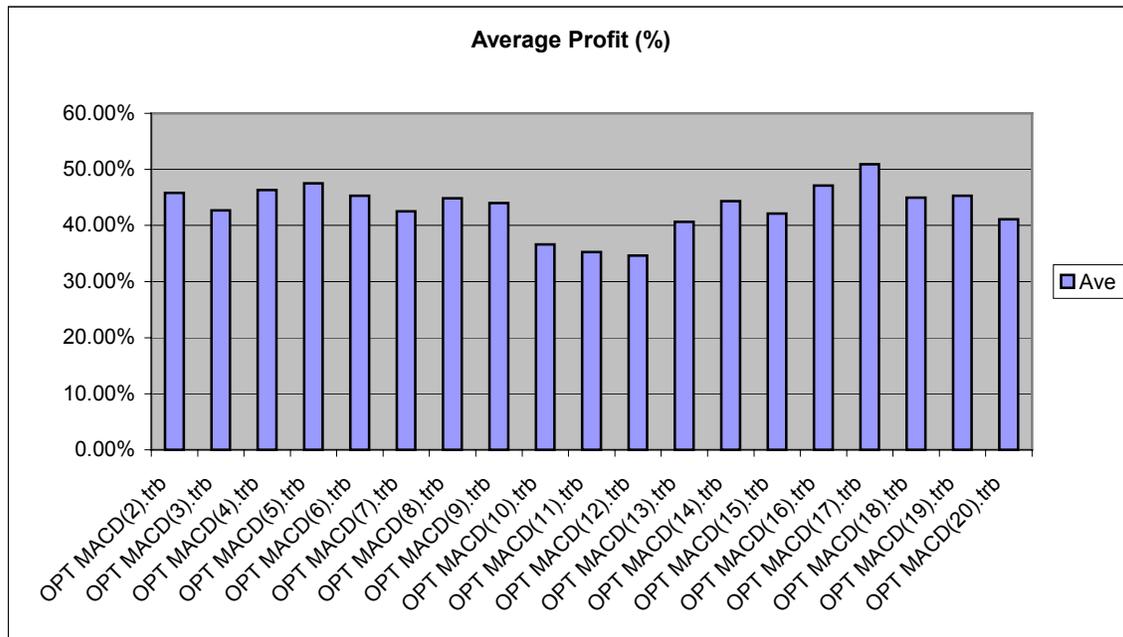
When asked to view the file in the default editor click on 'No'. Run Excel and load up the htm file from the \tradesimdata\exports directory.

	A	B	C	D	E	F	G	H	I
1	Index	Trade Database File or Sweep Parameter	Session File	Maximum Profit(%)	Average Profit(%)	Minimum Profit(%)	Standard Deviation(%)	Max Winning Trades(%)	Ave Winning Trades(%)
2	1	OPT MACD(2).trb	current session	63.06%	45.89%	28.24%	4.90%	65.27%	63.85%
3	2	OPT MACD(3).trb	current session	58.09%	42.64%	26.49%	4.58%	67.14%	65.39%
4	3	OPT MACD(4).trb	current session	61.55%	46.19%	31.61%	4.57%	67.92%	66.43%
5	4	OPT MACD(5).trb	current session	61.95%	47.54%	32.58%	4.39%	65.87%	64.28%
6	5	OPT MACD(6).trb	current session	60.85%	45.25%	28.59%	4.60%	66.32%	64.54%
7	6	OPT MACD(7).trb	current session	59.24%	42.58%	25.65%	5.06%	67.03%	65.04%
8	7	OPT MACD(8).trb	current session	55.69%	44.86%	32.61%	3.45%	66.89%	65.02%
9	8	OPT MACD(9).trb	current session	59.50%	43.94%	31.50%	3.59%	67.59%	65.70%
10	9	OPT MACD(10).trb	current session	50.10%	36.66%	21.64%	4.21%	67.33%	65.40%
11	10	OPT MACD(11).trb	current session	49.23%	35.35%	21.59%	4.22%	66.06%	64.07%
12	11	OPT MACD(12).trb	current session	50.50%	34.58%	21.67%	4.38%	66.60%	64.75%
13	12	OPT MACD(13).trb	current session	55.31%	40.68%	26.55%	4.28%	67.79%	65.82%
14	13	OPT MACD(14).trb	current session	59.09%	44.32%	28.96%	4.32%	68.05%	66.33%
15	14	OPT MACD(15).trb	current session	56.86%	42.19%	28.12%	4.35%	68.75%	66.90%
16	15	OPT MACD(16).trb	current session	62.08%	47.19%	35.05%	3.62%	68.07%	66.50%
17	16	OPT MACD(17).trb	current session	64.25%	50.93%	39.91%	3.67%	68.01%	66.47%
18	17	OPT MACD(18).trb	current session	58.92%	45.01%	30.34%	4.11%	68.43%	66.75%
19	18	OPT MACD(19).trb	current session	60.33%	45.14%	33.22%	4.31%	69.46%	67.89%
20	19	OPT MACD(20).trb	current session	52.28%	41.06%	32.64%	3.29%	68.67%	67.45%

Now we shall plot the average profit versus the trade database file. To do this, highlight the two columns in Excel and click on the Chart Wizard tool button.

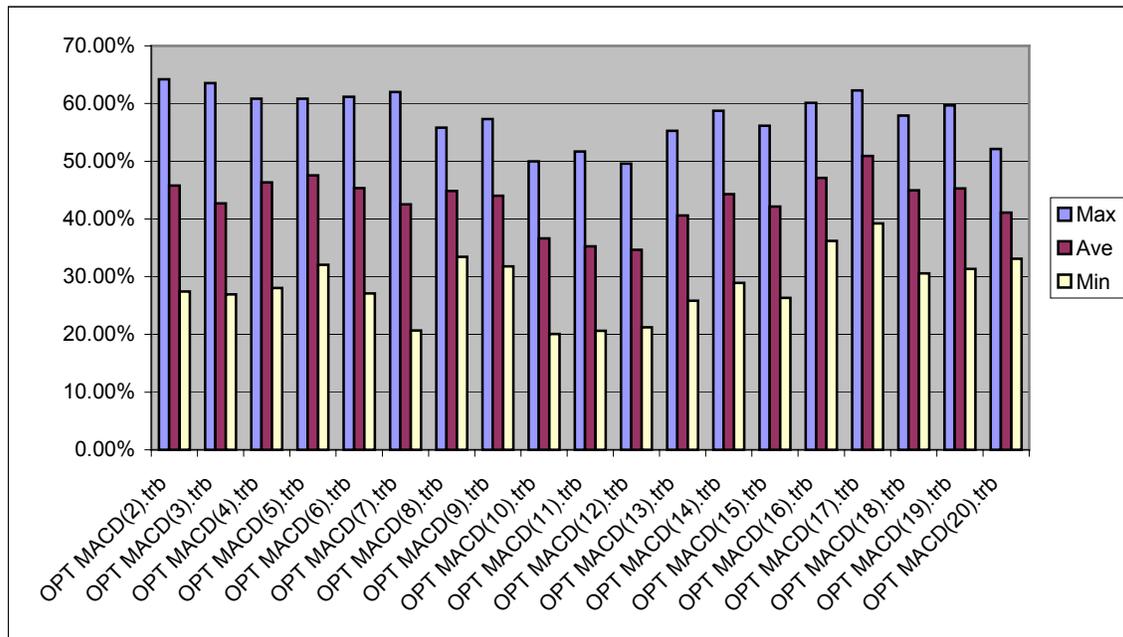
1	A	B	C	D	E	F	G	H	I	Min W
2	Index	Trade Database File or Sweep Parameter	Session File	Maximum Profit(%)	Average Profit(%)	Minimum Profit(%)	Standard Deviation(%)	Max Winning Trades(%)	Ave Winning Trades(%)	Trades
3	1	OPT MACD(2).trb	current session	63.06%	45.89%	28.24%	4.90%	65.27%	63.85%	
4	2	OPT MACD(3).trb	current session	58.09%	42.64%	26.49%	4.58%	67.14%	65.39%	
5	3	OPT MACD(4).trb	current session	61.55%	46.19%	31.61%	4.57%	67.92%	66.43%	
6	4	OPT MACD(5).trb	current session	61.95%	47.54%	32.58%	4.39%	65.87%	64.28%	
7	5	OPT MACD(6).trb	current session	60.85%	45.25%	28.59%	4.60%	66.32%	64.54%	
8	6	OPT MACD(7).trb	current session	59.24%	42.58%	25.65%	5.06%	67.03%	65.04%	
9	7	OPT MACD(8).trb	current session	55.69%	44.86%	32.61%	3.45%	66.89%	65.02%	
10	8	OPT MACD(9).trb	current session	59.50%	43.94%	31.50%	3.59%	67.59%	65.70%	
11	9	OPT MACD(10).trb	current session	50.10%	36.66%	21.64%	4.21%	67.33%	65.40%	
12	10	OPT MACD(11).trb	current session	49.23%	35.35%	21.59%	4.22%	66.06%	64.07%	
13	11	OPT MACD(12).trb	current session	50.50%	34.58%	21.67%	4.38%	66.60%	64.75%	
14	12	OPT MACD(13).trb	current session	55.31%	40.68%	26.55%	4.28%	67.79%	65.82%	
15	13	OPT MACD(14).trb	current session	59.09%	44.32%	28.96%	4.32%	68.05%	66.33%	
16	14	OPT MACD(15).trb	current session	56.86%	42.19%	28.12%	4.35%	68.75%	66.90%	
17	15	OPT MACD(16).trb	current session	62.08%	47.19%	35.05%	3.62%	68.07%	66.50%	
18	16	OPT MACD(17).trb	current session	64.25%	50.93%	39.91%	3.67%	68.01%	66.47%	
19	17	OPT MACD(18).trb	current session	58.92%	45.01%	30.34%	4.11%	68.43%	66.75%	
20	18	OPT MACD(19).trb	current session	60.33%	45.14%	33.22%	4.31%	69.46%	67.89%	
21	19	OPT MACD(20).trb	current session	52.28%	41.06%	32.64%	3.29%	68.67%	67.45%	
22										
23										
24										

Go through the chart wizard and produce a basic bar chart of average profits versus trade database.



It would be interesting to plot the minimum, average and maximum profit on the same chart. It can be easily done in Excel by highlighting the appropriate columns.

1	A	B	C	D	E	F	G	H	I	Min W
2	Index	Trade Database File or Sweep Parameter	Session File	Maximum Profit(%)	Average Profit(%)	Minimum Profit(%)	Standard Deviation(%)	Max Winning Trades(%)	Ave Winning Trades(%)	Trad
3	1	OPT MACD(2).trb	current session	63.06%	45.89%	28.24%	4.90%	65.27%	63.85%	
4	2	OPT MACD(3).trb	current session	58.09%	42.64%	26.49%	4.58%	67.14%	65.39%	
5	3	OPT MACD(4).trb	current session	61.55%	46.19%	31.61%	4.57%	67.92%	66.43%	
6	4	OPT MACD(5).trb	current session	61.95%	47.54%	32.58%	4.39%	65.87%	64.28%	
7	5	OPT MACD(6).trb	current session	60.85%	45.25%	28.59%	4.60%	66.32%	64.54%	
8	6	OPT MACD(7).trb	current session	59.24%	42.58%	25.65%	5.06%	67.03%	65.04%	
9	7	OPT MACD(8).trb	current session	55.69%	44.86%	32.61%	3.45%	66.89%	65.02%	
10	8	OPT MACD(9).trb	current session	59.50%	43.94%	31.50%	3.59%	67.59%	65.70%	
11	9	OPT MACD(10).trb	current session	50.10%	36.66%	21.64%	4.21%	67.33%	65.40%	
12	10	OPT MACD(11).trb	current session	49.23%	35.35%	21.59%	4.22%	66.06%	64.07%	
13	11	OPT MACD(12).trb	current session	50.50%	34.58%	21.67%	4.38%	66.60%	64.75%	
14	12	OPT MACD(13).trb	current session	55.31%	40.68%	26.55%	4.28%	67.79%	65.82%	
15	13	OPT MACD(14).trb	current session	59.09%	44.32%	28.96%	4.32%	68.05%	66.33%	
16	14	OPT MACD(15).trb	current session	56.86%	42.19%	28.12%	4.35%	68.75%	66.90%	
17	15	OPT MACD(16).trb	current session	62.08%	47.19%	35.05%	3.62%	68.07%	66.50%	
18	16	OPT MACD(17).trb	current session	64.25%	50.93%	39.91%	3.67%	68.01%	66.47%	
19	17	OPT MACD(18).trb	current session	58.92%	45.01%	30.34%	4.11%	68.43%	66.75%	
20	18	OPT MACD(19).trb	current session	60.33%	45.14%	33.22%	4.31%	69.46%	67.89%	
21	19	OPT MACD(20).trb	current session	52.28%	41.06%	32.64%	3.29%	68.67%	67.45%	



Comparison with a conventional optimization process.

Typically a standard portfolio optimizer works the same way as a single security optimizer and that is it runs a series of simulations and steps a parameter for each simulation. It then plots a performance metric such as profit versus each stepping. For a single security system this is all that can be done, however with a portfolio system the variance in the system due to permutations and combinations of trades requires a much more detailed analysis which is why the batch sweep facility in TradeSim is so important. To prove the point we shall compare the average net profit versus the profit for a single portfolio simulation.

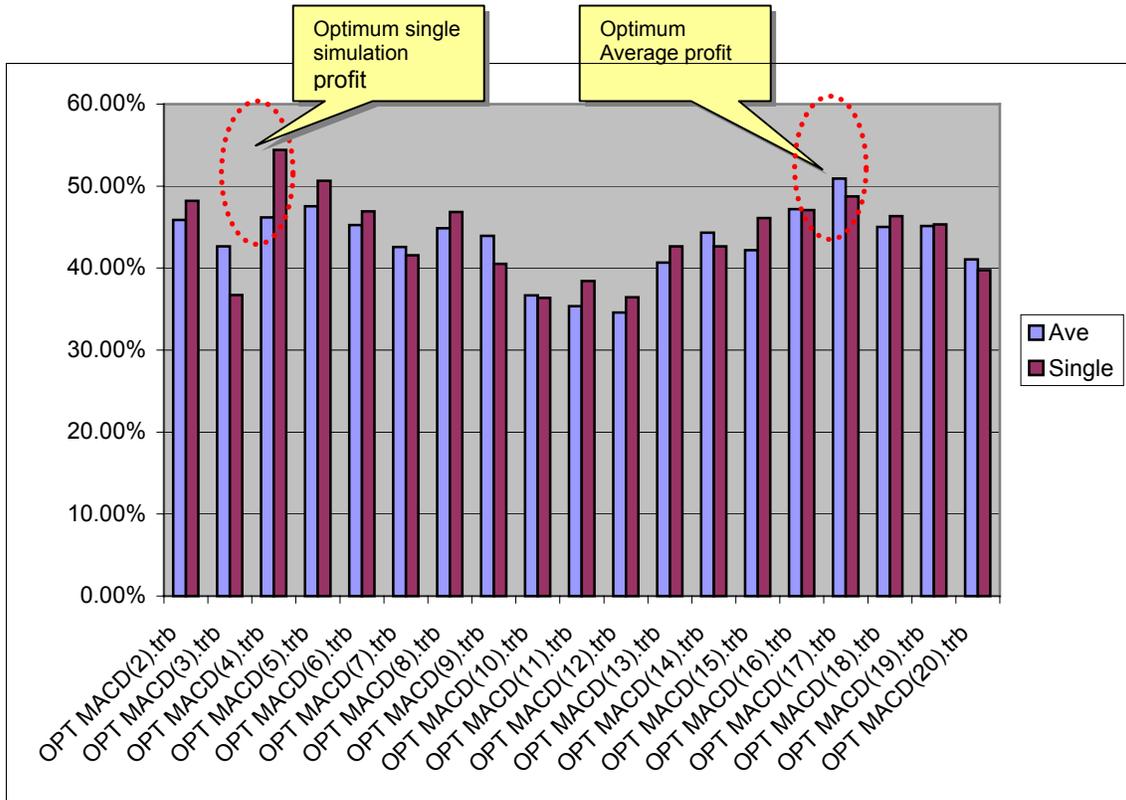
We do this by loading up each trade database and running a single simulation and noting the net profit. We then add the profit to the spreadsheet for a direct comparison. By inserting another column in the spreadsheet as shown below by the red dotted line we can add the profit values for each single simulation and construct a graph.

	A	B	C	D	E	F	G	H	I
1	Index	Trade Database File or Sweep Parameter	Session File	Maximum Profit(%)	Average Profit(%)	Minimum Profit(%)	Profit Single sim	Standard Deviation(%)	Max Win Trades
3	1	OPT MACD(2).trb	current session	63.06%	45.89%	28.24%	48.19%	4.90%	65.
4	2	OPT MACD(3).trb	current session	58.09%	42.64%	26.49%	36.70%	4.58%	67.
5	3	OPT MACD(4).trb	current session	61.55%	46.19%	31.61%	54.40%	4.57%	67.
6	4	OPT MACD(5).trb	current session	61.95%	47.54%	32.58%	50.65%	4.39%	65.
7	5	OPT MACD(6).trb	current session	60.85%	45.25%	28.59%	46.94%	4.60%	66.
8	6	OPT MACD(7).trb	current session	59.24%	42.58%	25.65%	41.55%	5.06%	67.
9	7	OPT MACD(8).trb	current session	55.69%	44.86%	32.61%	46.85%	3.45%	66.
10	8	OPT MACD(9).trb	current session	59.50%	43.94%	31.50%	40.52%	3.59%	67.
11	9	OPT MACD(10).trb	current session	50.10%	36.66%	21.64%	36.36%	4.21%	67.
12	10	OPT MACD(11).trb	current session	49.23%	35.35%	21.59%	38.43%	4.22%	66.
13	11	OPT MACD(12).trb	current session	50.50%	34.58%	21.67%	36.45%	4.38%	66.
14	12	OPT MACD(13).trb	current session	55.31%	40.68%	26.55%	42.66%	4.28%	67.
15	13	OPT MACD(14).trb	current session	59.09%	44.32%	28.96%	42.66%	4.32%	68.
16	14	OPT MACD(15).trb	current session	56.86%	42.19%	28.12%	46.11%	4.35%	68.
17	15	OPT MACD(16).trb	current session	62.08%	47.19%	35.05%	47.09%	3.62%	68.
18	16	OPT MACD(17).trb	current session	64.25%	50.93%	39.91%	48.74%	3.67%	68.
19	17	OPT MACD(18).trb	current session	58.92%	45.01%	30.34%	46.33%	4.11%	68.
20	18	OPT MACD(19).trb	current session	60.33%	45.14%	33.22%	45.33%	4.31%	69.
21	19	OPT MACD(20).trb	current session	52.28%	41.06%	32.64%	39.75%	3.29%	68.
22									
23									
24									
25									

From the graph below it can be seen that the optimum average profit and maximum single simulation profit do not correlate. The optimum single simulation profit occurs with a signal average of 4 and the optimum average profit from the sweep analysis occurs with a signal average value of 17.

This discrepancy proves that a conventional portfolio optimization process can be totally misleading. Even if you can produce fancy 3-D charts to impress your friends it is still useless and misleading. A simple course in probability and statistics would tell you why but essentially the average of many simulations as provided by a detailed Monte Carlo analysis provides a much better estimator of the optimum profit than does a single simulation used in a standard portfolio optimization process. The following graph produced from Excel illustrates this point very well !

AN-8 Monte Carlo Sweep and Optimization Procedures



Reference Literature

This list of references is by no means exhaustive but represents material, which is either recommended, or for general reading.

- 1) Compuvision Australia. TradeSim User Manual.
- 2) [AN5 - Survivorship Bias Free Back Testing using TradeSim](#)
- 3) Equis. *Metastock for Windows 95/98 & NT*. This is the user manual that comes with Metastock Version 7.0 and is a prerequisite for using TradeSim.