
Equity Monaco

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Typographical Conventions

Before you start using this guide, it is important to understand the terms and typographical conventions used in the documentation.

For more information on specialized terms used in the documentation, see the Glossary at the end of this document.

The following kinds of formatting in the text identify special information.

<u>Formatting convention</u>	<u>Type of Information</u>
Special Bold	Items you must select, such as menu options, command buttons, or items in a list.
<i>Emphasis</i>	Use to emphasize the importance of a point or for variable expressions such as parameters.
TEXT	Strings that you enter, program listings, file names.
CAPITALS	Names of keys on the keyboard. for example, SHIFT, CTRL, or ALT.
KEY-KEY	Key combinations for which the user must press and hold down one key and then press another, for example, CTRL-P, or ALT-F4.

Disclaimer

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What's New

From version 1.1 to 2

- Supports Windows XP theme.
- Improves connection to NeoTicker®.
- Documentation revision.
- Bug fixed for calculation issues regarding wiped out positions.

From version 1.0 to 1.1

- Bug fixed for **Tool>Import NeoTicker Chart/System Positions Data** when NeoTicker® is not running.

CHAPTER 1

Introduction

Thank you for choosing Equity Monaco. You have just selected one of the most important analysis tool for your trading systems.

Equity Monaco lets you easily conduct Monte Carlo Simulation for a trading system. Monte Carlo Simulation performs trial runs using combination of positions from your trading system and collects statistics. You can use the statistics to analyze the characteristics of your trading systems.

Equity Monaco seamlessly integrates with TickQuest NeoTicker®. All you need to do is run your trading system in NeoTicker®, then let Equity Monaco retrieves the positions from NeoTicker® to conduct Monte Carlo Simulation.

You can use Equity Monaco with other trading programs as well. You need to save the position data from your trading program in a file that is compatible with Equity Monaco. Then you can tell Equity Monaco to read the positions from the file.

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The Good Trades Never Arrive

You just have your newly written trading system backtested on your favorite trading program. The system produces a good profit with the historical data you tested against. Everything looks good, right?

Not quite. Your system could be profitable because it is lucky. It just happens that the system enters the trades in the right order and some really bad trades have been masked out by the good trades. What happens when your trading system makes several bad trades in a row? In theory, the system will eventually recover when the good trades arrive, but the good trades may never arrive because the bad trades could have wiped out your capital and you are no longer trading.

A trading system that is profitable but carries a large risk is very similar to Martingale Betting. In Martingale Betting, a gambler bets on coin flipping. Initially, he bets \$1. If he wins, he takes the profit. If he loses, he doubles the bet to \$2. If the \$2 bet wins, the net profit is \$2 minus the \$1 he lost, which equals to \$1. If the \$2 bet loses, the gambler doubles the bet again to \$4, and so on. Eventually the gambler will win and take the \$1 profit.

The fallacy of Martingale Betting is the gambler does not have infinite capital. It wouldn't take long before a streak of bad bets for the gambler to lose all his capital. For example, if he loses ten times in row, the accumulated loss is \$1023. If the gambler does not have enough capital, he would be wiped out. In other words, the good trades never arrive.

Monte Carlo Simulation

There are three steps in a Monte Carlo Simulation:

- 1** Creating Sample Positions - Running the trading system on historical data produces positions. Each position in the trading system is a sample.
- 2** Creating Trial - Monte Carlo Simulation combines multiple samples to form a trial run. A trial run is a simulation on how the trading system would trade in a hypothetical scenario.
- 3** Collecting Statistics - Each trial run forms an equity curve. After multiple trials are run, the simulation will produce many equity curves. Statistics are collected on these equity curves. The statistics collected quantify the characteristics of the trading system.

The following sections talk about these steps in more details. In particular, the sections will discuss how Monte Carlo Simulation can detect trading system problems that are similar to Martingale Betting.

Sample Positions

Monte Carlo Simulation works because by taking sufficient samples (positions in a trading system), the samples approximate the underlying distribution of the trading system. The distribution reveals the characteristics of how the system would trade.

Classical statistics tell us that 30 samples will approximate a normal distribution. In practice, we find that it often requires about 100 samples for Monte Carlo Simulation to have an accurate count on data that are at the tail of the normal distribution (e.g. 2 standard deviation away).

The reason why more data than classical requirement is because the data at the tail often represent the extreme good/bad luck scenarios, and it is the bad luck scenarios that wipe out trading systems.

Trials

Each trial takes a number of positions. A position is taken by randomly picking a position from the sample positions. The number of positions to take determines how long in real-life time the trial is simulating. For example, if the trading system trades 100 times per year, then by setting the number of positions to 100, a single trial is a simulation on how the trading system would trade in a year.

There is a minimum capital requirement for a trial. If the equity level of a trial goes below the minimum capital, the system is considered to be wiped out. In this case, the simulation for this particular trial will stop and the equity level will flat out.

Minimum capital simulates the problem of Martingale Betting. The trading system does not have infinite capitals and when a streak of bad trades hits, the trading system cannot rely on good trades in the future to recover.

The probability of wipe out is quantified in Monte Carlo Simulation.

This brings us to next section, Statistics Collection.

Statistics Collection

Multiple trials are run to collect statistics about equity curves. Each trial produces one equity curve. So if you run many trials, you will have more accurate statistics about the trading system.

Typical statistics collected include terminal equity level, drawn downs, runs. With multiple trials, you can find out the percentile of trials that are high risk. For example, when a large percentile of trials have a terminal equity level at the minimum capital, it tells you that the combination of initial settings and the trading system has a high probability of being wiped out.

Computers are fast enough so running many trials is possible and desirable. We suggest running at least 1000 to 2000 trials for a trading system.

When Monte Carlo Simulation is Insufficient

Monte Carlo Simulation can identify problems in a trading system, but does not solve it for you. As a trading system writer, you must apply good trading system design principles to design and improve trading systems.

References

More Information on Monte Carlo Simulation

There is website that specializes in *Monte Carlo Simulation*
<http://www.montecarlosimulations.org>.

About NeoTicker®

We believe NeoTicker® is a wonderful tool to create rigorous trading systems. You will work faster and produce better quality trading systems with NeoTicker®.

If you are currently not using NeoTicker®, we strongly encourage you to give NeoTicker® a try. A free trial version is available. For more information, visit *NeoTicker*
<http://www.tickquest.com/NeoTicker> website.

About the Helmet Icon



The helmet icon of Equity Monaco is a replica of the helmet of Ayrton Senna, one of the most successful racing champion in Monte Carlo. The helmet resembles a Brazilian flag.

Auto racing is precision sport. A true champion must analyze the risk of every moves. We wish that by using Equity Monaco, you can also precisely analyze the risk involved with your trading systems.

CHAPTER 2

Tutorials

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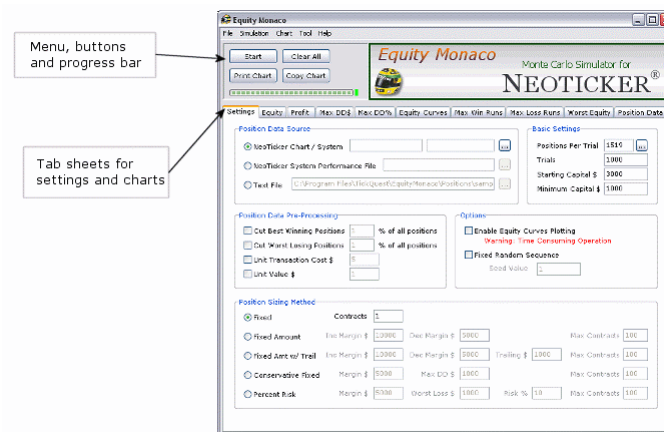
Tutorial 1: Standard Simulation Workflow

In this tutorial, we will go through the steps of setting up a simple simulation. The positions comes from a file Equity Monaco provides. So anyone can follow this tutorial easily.

Step 1: Setting the Position Data Source

This step tells Equity Monaco where to get data. We will use a file that comes with Equity Monaco.

Start Equity Monaco. Let's take a moment to look at how Equity Monaco is organized.



When you use Equity Monaco, mostly you will be doing one the three things:


- Use **Settings** tab to set up simulation;
- Use menu and button to carry out certain actions like starting a simulation; and
- Switch between tabs to look at different charts.

This tutorial centers around this workflow. So first first of all, let us set up a simulation. Make sure **Settings** tab is pressed.

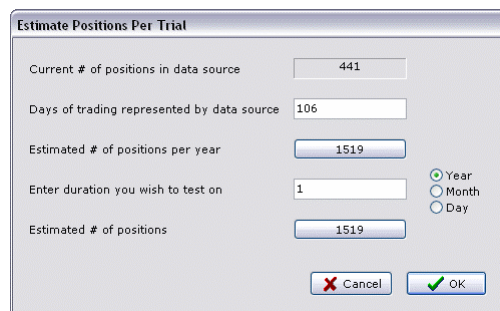
Select **Text File** under **Position Data Source**, and choose the file `sample_position_01`. This file is located under the `Positions` folder in your Equity Monaco installation.

Step 2: Setting the Basic Settings

The basic settings control how the simulation is run.

Set the value of **Positions Per Trail** to 1519. This is the number of positions taken by each trial. You can press the  button to open a dialog to help you estimate the **Positions Per Trail** value.

The file `sample_position_01` contains the positions in 106 days of trading. In the dialog, if you enter 106 to days of trading and 1 year for the duration, it will return 1516 for positions per trial.



Estimate Positions Per Trial

Current # of positions in data source	441
Days of trading represented by data source	106
Estimated # of positions per year	1519
Enter duration you wish to test on	1
Estimated # of positions	1519

Year
 Month
 Day

Set the value of **Trials** to 1000. This is the number of trials to run.

Set the value of **Starting Capital \$** to \$3000. This is how much money each trial starts with.

Set the value of **Minimum Capital \$** to \$1000. If the trial's capital goes below this value, the trial will stop.

The setting tab should look like:

Position Data Source		Basic Settings	
<input type="radio"/> NeoTicker Chart / System	<input type="text"/>	Positions Per Trial	1519
<input type="radio"/> NeoTicker System Performance File	<input type="text"/>	Trials	1000
<input checked="" type="radio"/> Text File	C:\Program Files\TickQuest\EquityMonaco\Positions\samp	Starting Capital \$	3000
		Minimum Capital \$	1000

Position Data Pre-Processing		Options	
<input type="checkbox"/> Cut Best Winning Positions	1 % of all positions	<input type="checkbox"/> Enable Equity Curves Plotting	Warning: Time Consuming Operation
<input type="checkbox"/> Cut Worst Losing Positions	1 % of all positions	<input type="checkbox"/> Fixed Random Sequence	Seed Value 1
<input type="checkbox"/> Unit Transaction Cost \$	5		
<input type="checkbox"/> Unit Value \$	1		

Position Sizing Method					
<input checked="" type="radio"/> Fixed	Contracts	1			
<input type="radio"/> Fixed Amount	Inc Margin \$	10000	Dec Margin \$	5000	Max Contracts 100
<input type="radio"/> Fixed Amt w/ Trail	Inc Margin \$	10000	Dec Margin \$	5000	Trailing \$ 1000 Max Contracts 100
<input type="radio"/> Conservative Fixed	Margin \$	5000	Max DD \$	1000	Max Contracts 100
<input type="radio"/> Percent Risk	Margin \$	5000	Worst Loss \$	1000	Risk % 10 Max Contracts 100

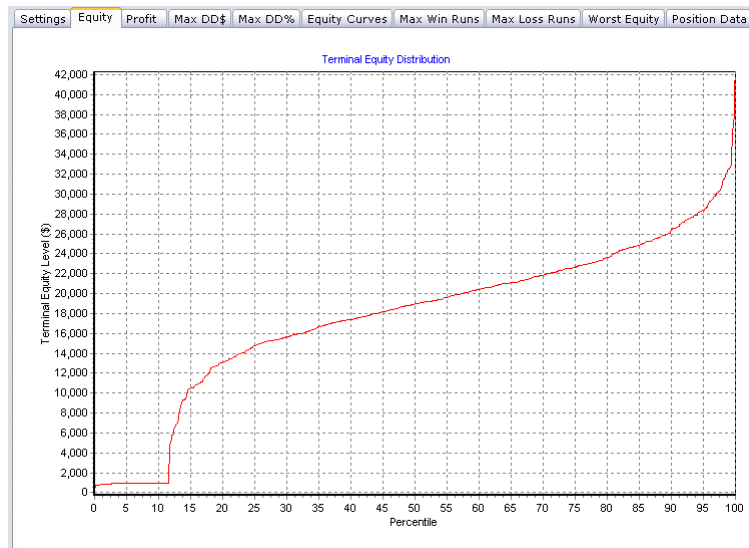
Step 3: Running the Simulation

Press the **Start** button to run the simulation. The progress bar below the start button will show the progress. A green dot will be shown besides the progress bar after the simulation is finished.



Step 4: Viewing the Result

Press the **Equity** tab. The chart should look like:



This is a chart of terminal equity level (the equity of a trial when it finishes) by percentile. For example, at 50% percentile, the terminal equity level is \$19,000. This means 50% of the trials end up with \$19,000 or less, and 50% of the trials end up with \$19,000 or more.

Another interesting point is at around 12%. Here, the equity level is at the minimum capital level. This means 12% of trials have been wiped out in the simulation, resulting in a flat equity curve at the minimum capital level.

Your chart may look somewhat different. This is due to the randomness of the simulation. You can reproduce the chart shown here by using a random seed of 2 under the **Settings** tab.

While this trading system shows promise at making money, we can do better by reducing the wipe out probability.

Step 5: Running the Simulation with More Capital

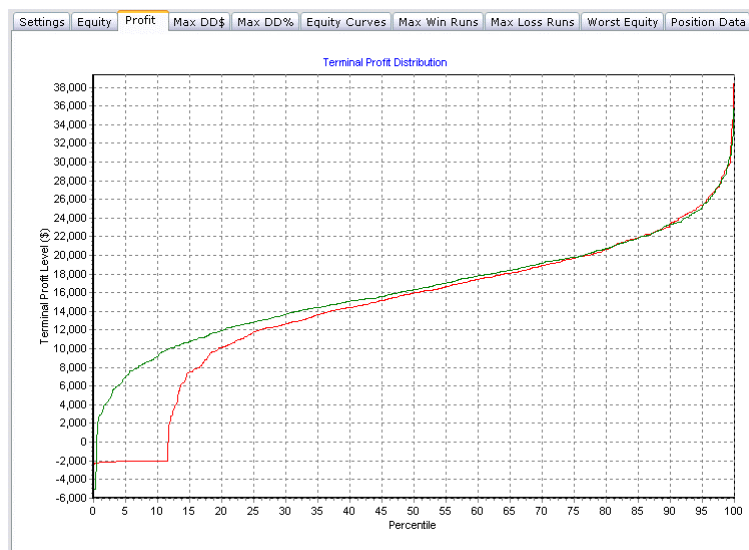
It is reasonable to expect with extra capital, the chance of being wiped out is lower. Equity Monaco lets you quantify the improvement.

Press the **Settings** tab. Change the **Starting Capital** to \$6000 and run the simulation again by pressing the **Start** button.

Press the **Profit** tab. This will show the profit level curve for the first and second run. We use the **Profit** tab because the starting capital for the first and second run are different and in the **Equity** tab the two curves will look different. So we want to take the starting capital out of the curves by looking at profits only.

You can choose **Chart>Show Legend** to display the legends to help you distinguish the two curves.

The chart should look like:



In the second run, the wipe out percentile has been reduced from 12% in the first run to 1% in the second run.

We can see that the second run is slightly more profitable than the first run at 50%. The profitability increases at lower percentile because trials that were wiped out in the first run could survive in the second run and returns a profit.

CHAPTER 3

User Guide

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Selecting Different Data Source for Positions


To select the data source for positions:

- 1 Press the **Settings** tab.
- 2 Select one of the options under **Position Data Source** group.

This setting tells Equity Monaco where to retrieve positions.

NeoTicker Chart/System

NeoTicker® must be running if you choose this option.

Equity Monaco can retrieve positions directly from a NeoTicker® chart. If you select the **NeoTicker Chart/System** option, all you need to do is to enter the chart name and system name. You can use the  button to help you select. This button opens a dialog to let you select charts and systems.

NeoTicker® positions coming into Equity Monaco are in dollar values. So there is no need for you to set a multiple for futures contracts.

NeoTicker System Performance File

If you save a system performance file in NeoTicker®, you can read it using this option. This ensures you can re-run the simulation with consistency.

Because you can save performance file in NeoTicker®'s Trade Simulator, you can apply Monte Carlo Simulation with positions generated from trading entries of a discretionary trader.

NeoTicker® positions coming into Equity Monaco are in dollar values. So there is no need for you to set a multiple for futures contracts.

Text File

Equity Monaco can read plain text position file. The file must be in a format compatible to Equity Monaco. For information, refer to the section *Creating Position File* (on page 19).

Creating Position File

Most trading programs allow you to save the positions of a trading system as text file. If your trading program can save in a format that is compatible with Equity Monaco. You can input the positions to Equity Monaco by choosing the **Text File** option as the position data source.

If your trading program cannot save in a compatible format, you can use Microsoft Excel as a middle-ware. Simply cut and paste the position list into Excel and use Excel to modify and save the positions in a text file.

Position File Format

A position file is simply a text file. Each line is the win/loss of a single position. The position data are assumed to be in dollar amount, with commission included.

If the position data is in points, refer to ***Multiples*** (on page 22) to set the multiple.

If the position data does not include commission, refer to ***Commission*** (on page 22) to set unit transaction cost.

You should not size the positions when creating sample data. If your trading system depends on position sizing, refer to ***Position Sizing*** (on page 25).

For example, a position file that contain 6 positions may look like:

```
-35.80  
40.50  
120.50  
-50.00  
-75.60  
12.30
```

In the example above, the first position has a loss of \$35.80, the second position has a gain of \$40.50. Notice that there is no time stamp for the positions because Monte Carlo Simulation does not directly require time stamps.

Converting Positions from NeoTicker

You can import positions from NeoTicker® and convert the positions to a text file for use in Equity Monaco. This allows separate management of positions in NeoTicker® and in Equity Monaco.

To convert:

- 1 Choose **Tool>Import NeoTicker System Performance File** or **Tool>Import NeoTicker Chart/System Position Data**, depending on whether you want to read from a performance file or from NeoTicker® directly.
- 2 Equity Monaco will ask you to fill in input settings.
- 3 You will be prompt for a text file to save the positions to.


Once the position file is saved, it can be used in Equity Monaco as a text file input.

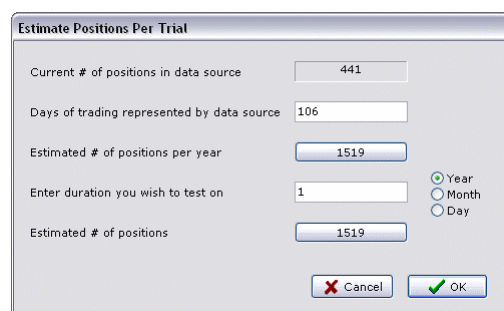
Trial Duration

Each trial simulates a duration of trading. This duration is indirectly controlled by **Positions per Trial**.

To set positions per trials:

- 1 Press the **Settings** tab.
- 2 Change the **Positions Per Trial** value.

You can use the  button to open a dialog to help you estimate the duration.



Current # of positions in data source	441
Days of trading represented by data source	106
Estimated # of positions per year	1519
Enter duration you wish to test on	1
Estimated # of positions	1519

Year
 Month
 Day

Simply enter the duration you wish to test, the estimate will be shown in **Estimated # of positions**. Press the **OK** button to accept it as a value for **Position Per Trial**.

If you use position list text file as the source of position, you will need to enter a value for **Days of trading represented by data source** because the text file does not have time stamps in it. If you retrieve the positions from NeoTicker™, this value is filled in automatically for you.

Number of Trials

To set number of trials:

- 1 Press the **Settings** tab.
- 2 Change value of the **Trials** setting.

When Equity Monaco runs a simulation, this setting controls the number of trials that will be created and run.

Capital

To change capital settings:

- 1 Press the **Settings** tab.
- 2 Change the values of **Starting Capital \$** and/or **Minimum Capital \$** settings.

Each trial starts trading with the **Starting Capital \$** amount. If the trial's equity goes below **Minimum Capital \$**, this particular trial will stop and it is considered as being wiped out. The final equity curve will flat out.

Position Trimming

A common statistics technique is to trim extreme data from the samples. The assumption is the extreme case are rare and they skew statistics such as mean.

You can set the options to trim the extreme positions:

1. Press the **Settings** tab.
2. Enable and change the values of **Cut Best Winning Positions** and **Cut Worst Losing Positions** settings.

When trimming is enabled, extreme positions are removed from the sample space before the trials are constructed.

Multiples

Equity Monaco by default assumes the position list data is in dollar amount.

If the position list is in points (usually for options and futures contracts only), you can set the multiple by changing the unit value:

- 1 Press the **Settings** tab.
- 2 Enable and change the value of **Unit Value \$** setting.

Commission

Equity Monaco by default assumes the positions already has commission cost included.

If the positions does not include commission, you can estimate the commission by setting the unit transaction cost:

- 1 Press the **Settings** tab.
- 2 Enable and change the value of **Unit Transaction Cost \$** setting.

Saving and Loading Simulation Settings

To save your current simulation settings, choose **File>Save** or **File>Save As**. Then enter a file name. Your current simulation settings will be saved as a setting file.

To open a simulation settings, choose **File>Open**. Then select the setting file.

Random Number Generation Control

By default, the random number generator in Equity Monaco will vary every time you run it. This gives you different trials every time the simulation is run.

If you want to reproduce results exactly, you have the option to supply a random seed. A random seed is any integer number chosen by you. The same random seed value will generate the same set of random numbers. By setting the same random seed, you can ensure the trials are always created in the same way, allowing you to reproduce the same simulation result.

To set random seed:

- 1 Press the **Settings** tab.
- 2 Enable **Fixed Random Sequence**.
- 3 Set the seed value (the seed value should be an integer).

Starting Simulation

To start a simulation, either:

- Press the **Start** button, or
- Choose **Simulation>Start** from the main menu

When the simulation is running, the progress bar below the **Start** button will show the progress of the simulation. After the simulation finishes, a green dot is displayed.

As a minimum, you need to specify positions in **Position Data Source** and adjust the settings under **Basic Settings** for your simulation.

Clearing Simulation Result

By default, old simulation results stay in the charts. So you can compare different simulation results easily.

To clear old simulation results, either:

- Press the **Clear All** button, or
- Choose **Simulation>Clear All** from the main menu.

Exporting Charts

You can copy a chart to the clipboard and then paste the chart to the other application. The chart is saved in BMP format in the clipboard. To copy to clipboard:

- 1 Press the tab of the chart you want to copy.
- 2 Press the **Copy Chart** button.

You can save a chart in a file to be read by another application later. To save:

1. Press the tab of the chart you want to save.
2. Choose **File>Save Chart As**.

You can save in BMP, GIF, or PNG format.

Printing

For printer setup, choose **File>Printer Setup**.

To print a chart:

- 1 Press the tab of the chart you want to print.
- 2 Choose **File>Print Chart**.

Legend and Chart Titles

Settings are available to help you read charts.

For charts that have multiple simulation results (Equity, Profit, etc), you can choose **Chart>Show Legend** to display the legend. The legend shows information on which curve corresponds to which simulation in the chart.

If you intend to archive the charts for later reading, you may want to turn on chart title by choosing **Chart>Show Title**. This way, you can tell the difference between equity and profit chart, for example.

Position Sizing

Position sizing allows you to vary the position size as the trial goes on. The sizing depends on the current equity level of the trial and can be used to simulate trading systems that vary its position size.

To set position sizing options:

- 1 Press the **Settings** tab.
- 2 Choose one of the options under **Position Sizing Method**.

All position sizing methods except **Fixed** support a **Max Contract** setting. This setting limits the maximum number of contracts traded per position.

Fixed

Positions are not sized. Each position will trade the number of contracts specified. This is the default.

Fixed Amount

Number of contracts is determined by margin. When margin allows, an extra contract is traded. Similarly, number of contracts is reduced when the equity decreases.

For example, if the **Inc Margin \$** is \$10,000 and the starting capital is \$10,000, one contract is traded. When the equity goes above \$20,000, two contracts are traded. If **Dec Margin \$** is \$5,000, then two contracts will be traded until the equity level goes below \$10,000 (2 contracts x \$5,000).

Fixed Amt w/Trial

Fixed Amt w/Trial is identical to **Fixed Amount** except **Fixed Amt w/Trial** has the extra **Trailing \$** setting for profit protection.

The **Trailing \$** setting is used to reduce number of contracts when the equity goes below **Trailing \$**. Unlike **Dec Margin \$**, the contract reduction by **Trailing \$** kicks in only when the equity is increasing (the system is making a profit).

For example, if **Inc Margin \$** is \$10,000 and the starting capital is \$10,000, one contract is traded. When the equity goes above \$20,000, two contracts are traded. If **Trailing \$** is \$1000, when the equity goes below \$18,000 (2 contracts * \$1000), the number of contracts traded is reduced to 1.

Consider a similar but different scenario. Suppose the **Inc Margin \$** value is \$10,000, starting capital is \$20,000 and **Trailing \$** is \$1000, two contracts are traded. When the equity goes below \$18,000, the number of contracts is not reduced because the system is not profitable. The number of contract will reduce only when equity goes below what is determined by **Dec Margin \$** value.

Conservative Fixed

Conservative Fixed is similar to **Fixed Amount** but with **Conservative Fixed**, the number of contracts increases in a slower pace.

Let $R(N)$ be the required equity level for N contracts, M be the value specified by **Margin \$**, D be the value specified by **Max DD \$**. Then the required equity level for N contracts is defined by:

$$R(1) = M + D$$
$$R(N) = R(N-1) + M + D * N$$

For example, if **Margin \$** is 3000 and **Max DD \$** is 500, then the required equity level for the first contract is:

$$R(1) = 3000 + 500 = 3500$$

The required equity level for the second contract is:

$$R(2) = 3500 + 3000 + 500 * 2 = 7500$$

Percent Risk

Percent Risk calculates the number of contracts based on amount of risk you want to take on the capital.

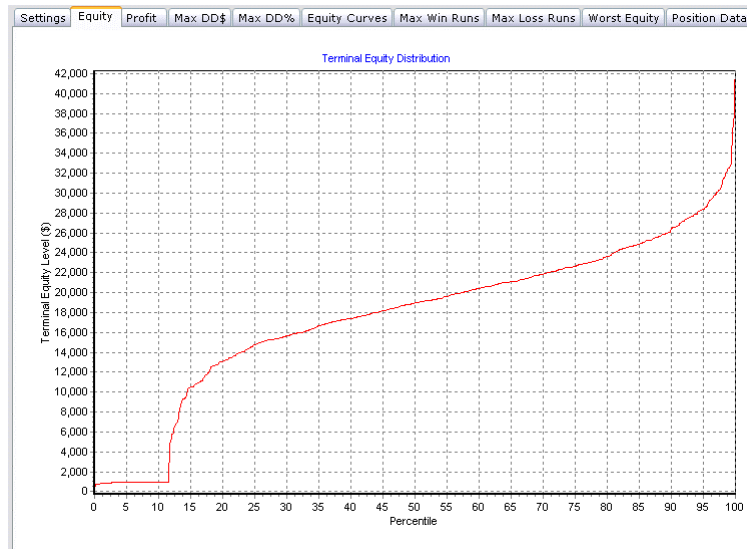
If the current equity level is \$20,000, **Risk %** is 20, **Worst Loss \$** is \$1000, then:

$$\begin{aligned} \text{number of contracts} &= \$20,000 * 20\% / \$1000 / 2 \\ &= 2 \text{ contracts} \end{aligned}$$

The number of contracts is then checked against margin requirement. The number of contracts allowed by margin is used to limit the number of contracts determined by **Percent Risk**.

Percent Risk gives you high degree of control over the number of contracts. If you increase **Risk %**, it will also size up/down the number of contracts rapidly when capital increases/decreases.

Equity Tab



This chart shows the terminal equity level percentile. You can find out for a specific equity level, the percentile of trials that are above/below the level.

Terminal equity level is the final equity value after a trial is run.

Profit Tab



This chart shows the terminal profit level percentile. You can find out for a specific profit, the percentile of trials that are above/below the level.

Profit is the final equity value subtracted by the starting capital.

Max DD \$ Tab

This chart shows the maximum drawn down (in \$ amount) percentile. You can find out for a specific drawn down, the percentile of trials that are above/below the level.

Max DD % Tab

This chart shows the maximum drawn down (in percentage) percentile. You can find out for a specific drawn down, the percentile of trials that are above/below the level.

The drawn down percentage is calculated by the drawn down divided by the equity level when the drawn down starts.

Equity Curves Tab

This chart displays the equity curves of all trials.

To plot equity curves, you must turn on **Enable Equity Curves Plotting** in **Options** under the **Settings** tab before the simulation is run.

Avoid turning on equity curves plotting for large number of trials.

Max Win Runs Tab

This chart displays the maximum winning run percentile. You can find out for a winning run, the percentile of trials that are above/below the level.

A winning run is a consecutive streak of winning positions.

Max Loss Runs Tab

This chart displays the maximum losing run percentile. You can find out for a losing run, the percentile of trials that are above/below the level.

A losing run is a consecutive streak of losing positions.

Worst Equity Tab

This chart displays the worst equity level percentile.

Worst equity level is the lowest equity level a trial has seen during the simulation.

Position Data Tab

Position Data is unrelated to the trials.

This chart plots the source position's profit/loss after adjustments by pre-processing. This is a handy tool to visually inspect the positions to see if they have any bias.

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