

A Short Introduction to Trading System Back Testing

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Back testing is an integral part of trading system development. It also goes by the names historical testing or historical simulation. The term simulation refers to the process of driving a model with input and observing its output. The term back testing can be misleading because it is not actually a process of testing the actual performance of a trading system but only provides a simulation of the performance that is likely to have been achieved had it been used in actual trading during the past. But even the use of the term historical simulation is not very appropriate. Simulation implies a much broader range of tests based on different types of inputs not restricted to historical data, like a random input for example. At the same time, the use of the term historical testing can also be misleading since it could imply that the system was actually used to trade in the past. I suggest using the term *hypothetical historical performance testing* as more accurate.

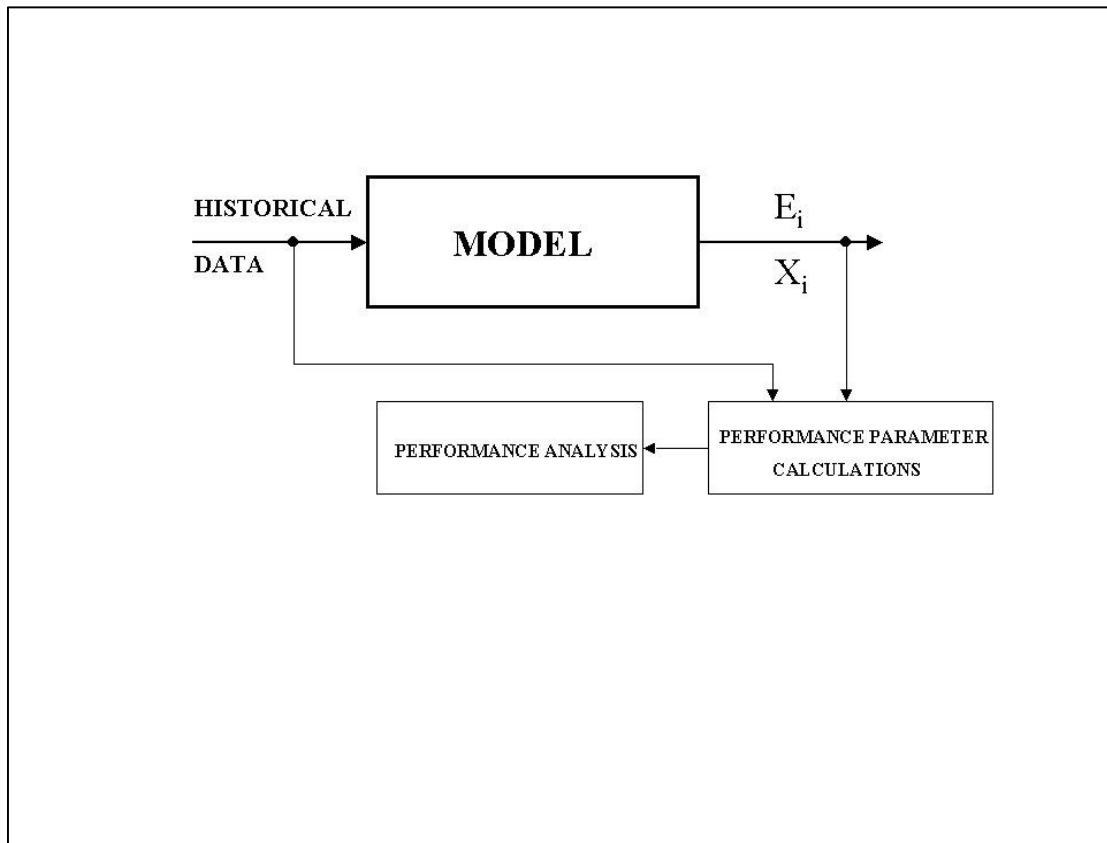


Figure 1. The Process of Trading System Back Testing

Figure 1 shows a block diagram of how the process of back testing is used in trading system development. The mathematical model of the trading system is driven with historical data input and the output is a set of market entry (E_i) and corresponding exit (X_i) signals. The output in conjunction with the input are used to calculate a set of performance parameters that are in turn analyzed to decide whether the model should be used in a trading system and employed in actual trading.

Table 1 provides a list of some of the most important parameters calculated during back testing.

Parameter	Symbol	Type and Values
Profitability (Success rate)	P	Real: 0 to 1
Total Trades	N	Integer: 0 – N
Number of winning trades	N_W	Integer: 0 - N
Number of losing trades	N_L	Integer: 0 - N
Sum of winning trades	ΣW	Real
Sum of losing trades	ΣL	Real
Profit factor	P_f	Real
Average winning trade	avgW	Real
Average losing trade	avgL	Real
Ratio of avg. win to avg. loss	R_{WL}	Real
Maximum consecutive losers	C_L	Integer: 0 – N
Maximum consecutive winners	C_W	Integer: 0 - N
Average bars in winners	B_W	Integer
Average bars in losers	B_L	Integer
Maximum open drawdown	D_O	Real
Maximum equity drawdown	D_R	Real

Table 1. A partial list of parameters calculated during back testing.

Below are formulas used to calculate some of the parameters in Table 1.

$$P = \frac{N_w}{N} = \frac{N - N_L}{N}$$

$$P_f = \frac{\sum W}{\sum L}$$

$$\bar{W} = \frac{\sum W}{N_w}$$

$$\bar{L} = \frac{\sum L}{N_L}$$

$$R_{wl} = \frac{\bar{W}}{\bar{L}}$$

Why is back testing important?

Back testing is one of the most important steps in a complete methodology for trading system development. Many inexperienced traders think that back testing is a process of finding a system that will be profitable in the future but that is a gross misconception. All one can achieve with backtesting is to determine historical profitability and thus reject potentially unprofitable ideas. This does not imply by any means that historically profitable systems will maintain their profitability in the future. There is a lot more to profitability than historical backtesting but the process is of great value because it acts as a filter of potentially harmful ideas.

Parts of this short introduction are excerpts from Chapter 6 of the book *Profitability and Systematic Trading* (Wiley, 2009). For more details see:

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-047022908X.html>

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