



An Introduction to WebSim™ A Briefing Guide

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1. INTRODUCTION TO ALPHA

Alpha Definitions and Explanations Relative to WebSim

- Alpha

An alpha is a mathematical, predictive model of the performance of financial instruments

- Statistical Arbitrage

Alphas and strategies are called “statistical arbitrage”, or “quantitative trading”, or “systematic trading”, or “relative value”. A good StatArb model usually involves a large number of securities and has very short holding periods, with positive returns expected in the long run.

- Long/Short Strategy: Market Neutral

Hold long/short positions and maintain neutral exposure to the market

1. INTRODUCTION TO ALPHA

Alpha Definitions and Explanations Relative to WebSim

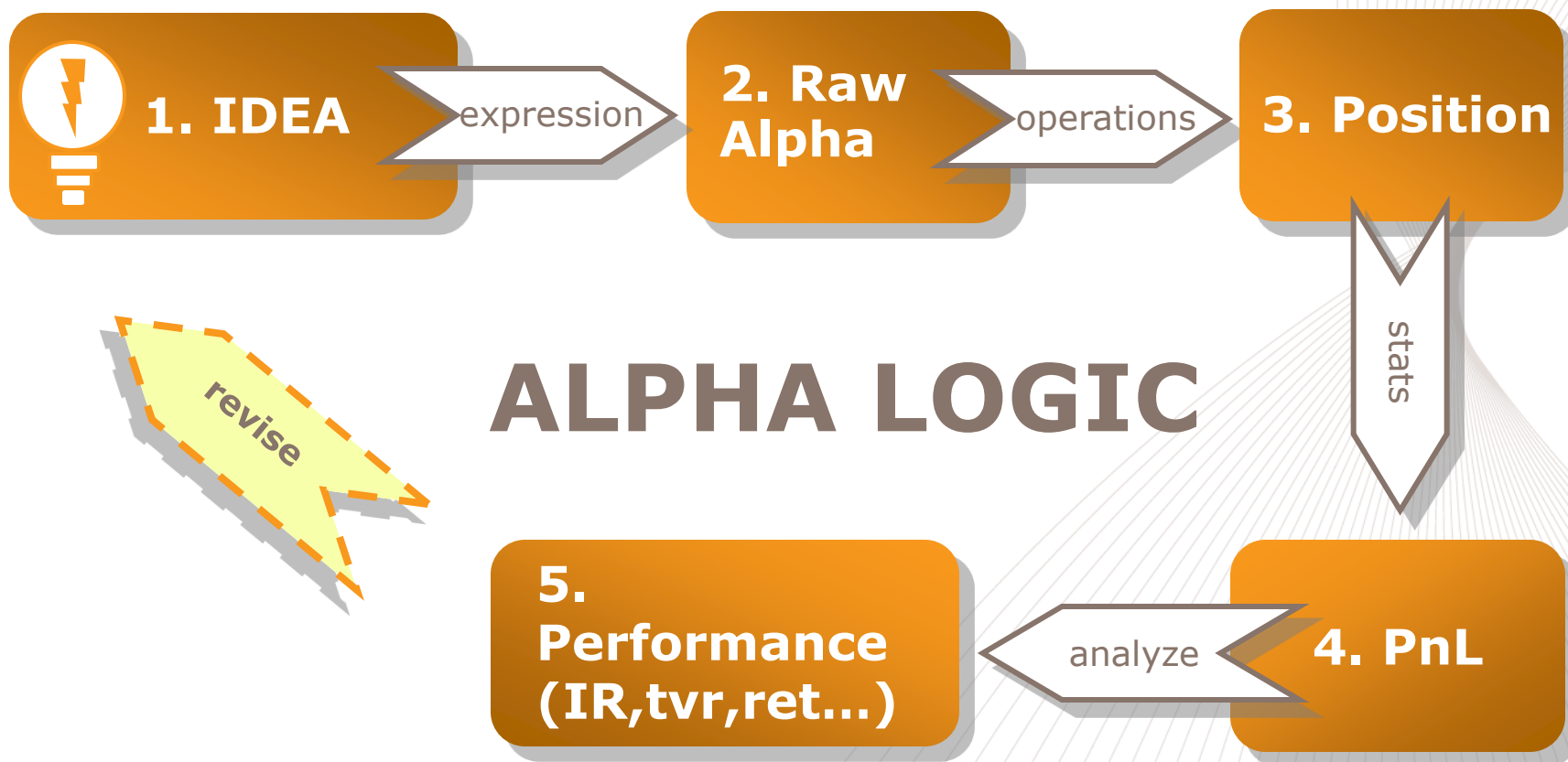
- Universe

A set of instruments that an investor is interested in trading

- Weight

A risk-adjusted measure of the so-called active return on an investment. These weights are not constants, they change over time - based on the current information and the history of the changes of some variables (such as prices, volumes, etc.)

1.1 ALPHA LOGIC CHART



1.2 INTRODUCTION TO ALPHA

Alpha Types

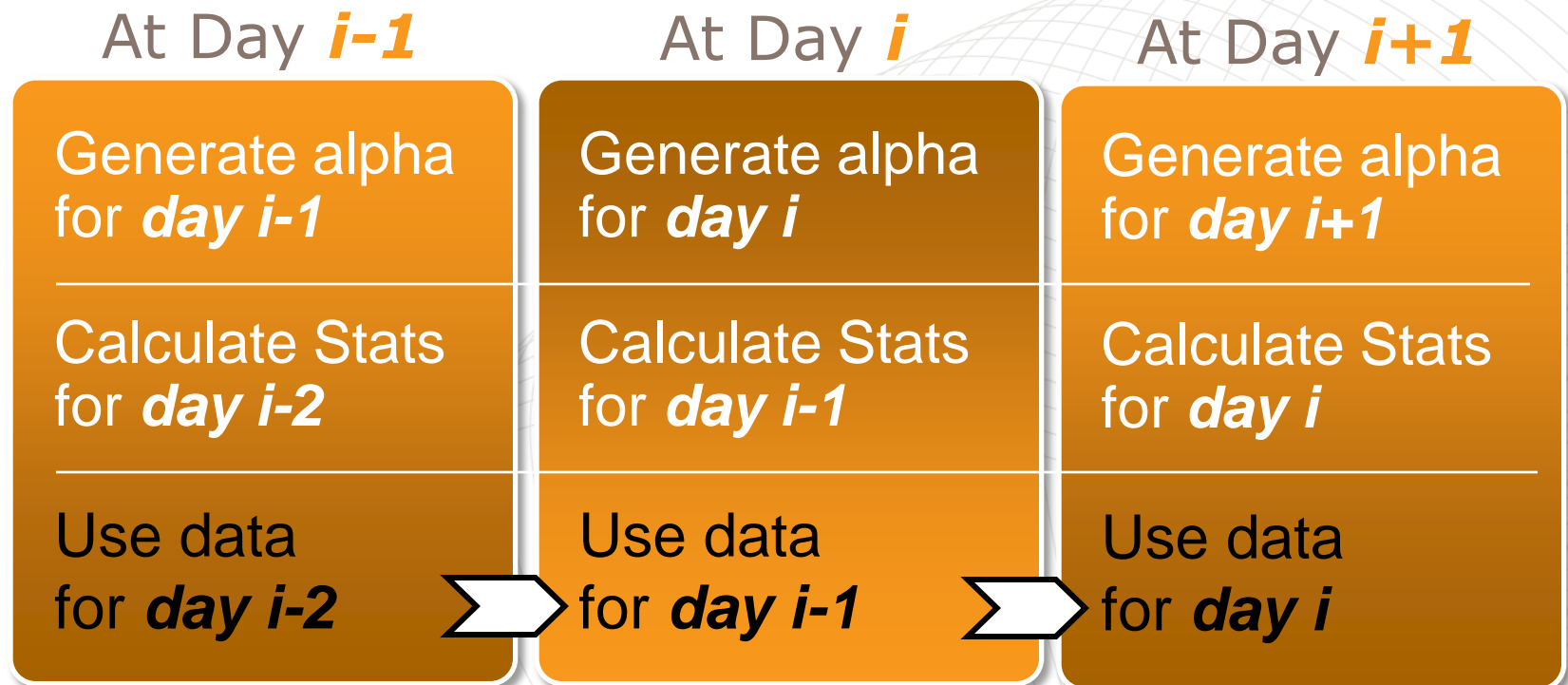
Type:

- Delay (delay-1, delay-0, intraday)
- Universe (Top3000, Top 2000, Top1000, Top500)

Please start with US delay-1, Top 2000

1.3 INTRODUCTION TO ALPHA

Simulation Logic for delay-1 alpha



1.4 INTRODUCTION TO ALPHA

Performance Measurements: Definitions

- PnL

*daily_pnl = sum of (position * daily_return)*

(the daily return is per instrument (today's close / yesterday's close) - 1.0)

- Information Ratio (IR)

Prediction ability of a model: mean(daily_pnl)/std(daily_pnl).

*Sharpe ratio is the annual IR: IR * sqrt(252)*

(the 252 represents the estimated number of trading days in a year)

- Turnover (tvr)

Value traded / value held

- Drawdown

Percentage of the largest loss

1.5 RESOURCES

Books

Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk by Richard Grinold and Ronald Kahn

Wiki

Market efficiency; Technical indicators; Stat-arb

Paper

Fama, G. and French, K. (1992) 'The cross-section of expected stock return', *Journal of Finance*, 47, June, pp. 427-65

AGENDA

- 1 Introduction to Alpha
- 2 Introduction to WebSim



2.1 INTRODUCTION TO WEBSIM

Definitions: WebSim

- What is WebSim

*WebSim is a **web-based tool for back-testing trading ideas**. An alpha in WebSim is defined by an expression.*

2.1 INTRODUCTION TO WEBSIM

Definitions: WebSim

- How is an alpha simulated?

After user enters an alpha expression that consists of data & operators (refer to 'Alpha definition'), and constants. The input code is evaluated for each instrument to construct a portfolio.

Then WebSim simulates an investment in each stock for a one-day period in proportion to the values of the expression. The process repeats each day. If the user specifies Neutralization, the "raw" values (i.e., the values of the expression) are not used directly, and that operation is applied to calculate the final values.

*With the final values, negative numbers would result in short positions, and positive numbers long positions. Based on those daily positions, **PnL** is then calculated and displayed to user. **NaN** means no positions and thus no PnL.*

2.1 INTRODUCTION TO WEBSIM

Definitions: Alpha Expression

- Expression

An alpha expression consists of data, operators, and constants. The following tables list the data and operators available for use. Concrete example alpha expressions will be generated by clicking button 'Example' on the main page.

2.1 INTRODUCTION TO WEBSIM

Definitions: Simulation

Simulation Settings:

Simulation environment can be set by clicking the gear icon on the top right of web page after logged in.

- **Region and Universe**

The number of most-liquid stocks to trade

- **Delay**

The timing data used to generate positions: delay-1 uses yesterday's prices while delay-0 uses today's prices

- **Decay**

Combine today's value with previous days' decayed value

- **Neutralization**

Apply market normalization to the results

- **Max stock fraction**

Limit each stock's exposure to a portion of the overall portfolio

- **Unit check**

Make sure the units (dollars, etc.) match in the expression

- **Simulation timeframe**

How much history to back-check

2.1 INTRODUCTION TO WEBSIM

Definitions: Simulation

Summary of Results:

A tabular representation of results

- **Booksize:** *Amount of capital used, long and short*
- **PnL:** Profit or loss
- **Annual return:** *Return on capital used*
- **Sharpe:** *Average return divided by standard deviation of returns*
- **Max drawdown:** *Absolute value of maximum peak to trough return*
- **% profitable days:** *positive pnl days divided by number of days*
- **Daily turnover:** *Dollars traded divided by half of booksize*
- **Profit per \$ traded:** *PnL divided by dollars traded*

2.2 INTRODUCTION TO WEBSIM

Results Analysis (for illustrative purposes only)

Expression

```
-returns
```

Region and Universe

Delay

Decay

Neutralization

Max Stock Fraction

Unit Check

Simulation Timeframe



2.3 INTRODUCTION TO WEBSIM

Getting Started

WebSim is a web-based simulator of global financial markets that was created to explore Alpha. Go to:

<https://websim.worldquant.com>

- **After agreeing with the terms and logging in:**

- Type **expressions** in the box

- Set the **Alpha Type**: Region, Universe, Delay

- Set the **Alpha Operation**: decay, neutralization

- Click **SUBMIT**

2.3 INTRODUCTION TO WEBSIM

Getting Started: Available Market Data

DATA NAME	DESCRIPTION
open	Daily open price
close	Daily close price
high	Daily high price
low	Daily low price
vwap	Daily volume weighted price
volume	Daily volume
returns	Daily returns
adv20	Average daily volume in the past 20 days
sharesout	Daily outstanding shares

2.3 INTRODUCTION TO WEBSIM

Getting Started: Operators/Functions

OPERATOR	DESCRIPTION
+, -, *, /, ^	Add, Subtract, Multiply, Divide, Power
<, <=, >, >=, ==, !=	Logic comparison operators
, &&, !	Logical OR, AND, Negation
cond ? expr1 : expr2	If cond is true, expr1; else expr2. For example, close < open ? close : open
Rank(x)	Rank the values in vector x and the return values are between 0.0 and 1.0
Min (x, y)	Parallel minimum of vectors x and y (similar to the pmin function in R)
Max(x, y)	Parallel maximum of vectors x and y (similar to the pmax function in R)
StdDev(x, n)	Standard deviation of the values in vector x for the past n days. Note that n must be less than *256
Correlation(x, y, n)	Correlation of the values in vectors x and y for the past n days. Note that n must be less than 256
Sum(x, n)	Sum of the values in vector x for the past n days. Note that n must be less than 256
Covariance(x, y, n)	Covariance of the values in vectors x and y for the past n days. Note that n must be less than 256

*** 256 is the maximum number of days prior to the first simulation day for which we have data**

2.3 INTRODUCTION TO WEBSIM

Getting Started: Operators/Functions (continued)

OPERATOR	DESCRIPTION
CountNans(x, n)	Number of NaN values in vector x for the past n days. Note that n must be less than 256
Abs(x)	Absolute value
Delay(x, n)	Value of x at n days ago. Note that n must be less than 256
Step(x)	For all stocks, current day is x, yesterday is x-1, and so on
Delta(x, n)	$x[\text{date}] - x[\text{date} - n]$. Note that n must be less than 256
Decay_linear (x, n)	Linear decay over the last n days
Decay_exp(x, f, n)	Exponential decay. f is the smoothing factor, and the process starts from n days ago. For example, Decay_exp(close, 0.1, 20)
Product(x, n)	Product of the values in vector x for the past n days
Tail(x, lower, upper, Newval)	Set the values of x to newval if they are between lower and upper
Ts_Min(x, n)	Minimum value of x over the last n days. Note that this is different than Min.

2.2 INTRODUCTION TO WEBSIM

Getting Started: Operators/Functions (continued)

OPERATOR	DESCRIPTION
Ts_Max(x, n)	Maximum value of x over the last n days. Note that this is different than Max.
Sum_i(expr, var, start, stop, step)	Loop over var (from start to stop with step) and calculate expr at every iteration (presumably expr would contain var), then sum over all the values. For example, Sum_i(Delay(close, i)*i, i, 2, 4, 1) would be equivalent to Delay(close, 2)*2 + Delay(close, 3)*3 + Delay(close, 4)*4
Call_i(expr, var, subexpr)	Substitute subexpr for var in expr, and then evaluate expr. For example, Call_i(x + 4, x, 2 + 3) would be equivalent to (2 + 3) + 4
Sign(x)	1 if $x > 0$, -1 if $x < 0$, 0 if $x == 0$
SignedPower(x, e)	$\text{Sign}(x) * (\text{Abs}(x)^e)$
Pasteurize(x)	Pasteurize the signals. Set to NaN if it is INF or if the underlying instrument is not in the universe
Log(x)	Natural logarithm
Ts_Rank(x, n)	Rank the values of x over the past n days, then return the rank of the current value. For example, if the current value is the max of the past n days, Ts_Rank is 1. If it's a min, Ts_Rank is 0. With all other values in between

2.3 INTRODUCTION TO WEBSIM

Getting Started: Operators/Functions(continued)

OPERATOR	DESCRIPTION
Ts_Skewness(x, n)	Compute the skewness of x on the last n days
Ts_Kurtosis(x, n)	Compute the kurtosis of x on the last n days
Ts_Movement(x, k, n)	Compute the kth central moment of x on the last n days
IndNeutralize(x, y)	Neutralize alpha x against groupings specified by y. For example, IndNeutralize(x, industry). To neutralize against market, use IndNeutralize(x, 1)
Scale(x)	Scale alpha x so that its booksize is 1. To scale to a different book size, say 1000, use Scale(x) * 1000

2.4 INTRODUCTION TO WEBSIM

Achieving Good Results: Tips for Maximizing Your Score

- **Think differently** and dig deeper
- Think ideas in arbitrage view
- Try different operations
- Try new formulas instead of changing one formula
- Do not **over-fit** parameters

2.4 INTRODUCTION TO WEBSIM

Achieving Good Results: Find ideas

- Price movement and technical indicator
- Volatility measures
- Volume interaction with price
- Short term and Long term trend
- Find ideas from the newspaper or online

2.4 INTRODUCTION TO WEBSIM

Achieving Good Results: Improve your ideas

- **Adjust cross-sectional** distribution
- Think of **factors** to help signal
- Do not use much **conditional** operation
- Use more **recent information**

Thank You.
We hope you enjoy using WebSim!

WORLDQUANT™

*With intellect, technology and effort,
WorldQuant is creating the **future of trading***