

Barclays Portfolio Optimizer

Round Lots User Guide

With the release of POINT 3.13.3 scheduled for March 22, 2013, POINT will allow the user to incorporate round lots into the optimization process. In this context, the optimal solution has trade amounts in multiples of the user-defined lot sizes (though POINT provides default numbers based on exchange rules). We describe how to use this feature in POINT and document the different alternatives available to clients.

Changxiu Li
+1 212 526 1745
changxiu.li@barclays.com

www.barclays.com

Round Lots in Practice

A round lot is the standard unit of trading for a given security. For example, stocks typically trade in multiples of 100. Portfolio managers, when planning trades to rebalance their current portfolio, may want to express them in terms of round lots. This is mainly because customers who wish to execute security transactions in non-standard lots are often penalized. This new feature allows them to have an exact understanding of how their portfolio looks once the rounded trades are executed. In addition, the round lot functionality can be useful for all-or-none type of trades.

POINT's Optimizer now allows the user to restrict any trade to round lots. It is incorporated as a constraint in the optimization process. Round lot conventions vary across and within exchanges. Therefore, POINT allows the user to define round lots with plenty of flexibility. We provide default lot sizes for typical stocks according to exchange conventions that then can be manipulated by the user. The default lot size for non-equity securities is currently set at one (for bonds, a round lot is usually a multiple of par value). The user can further specify the lot sizes through the POINT optimizer interface by partition level, or override this at the security level through CSV file uploads.

Optimization with Round Lots

The mechanism that handles round lots in the optimization engine is called mixed integer optimization. It is well known that within optimization, integer constraints are considered a difficult problem due to the non-linear (non-convex) risk term. POINT's Optimizer combines a heuristic algorithm with the integer optimization using an iterative approach.

We first solve the optimization without the round lot constraint. For each holding position h_i , we find the two closest round lot boundaries ($\underline{h}_i \leq h_i \leq \bar{h}_i$) with one above and one below the current position amount. The position is then expressed as the sum of the lower bound and the lot size multiplied by a binary variable that takes on a value of 0 or 1. In formula: $h_i = \underline{h}_i + LotSize_i * I_i$, $I_i = \{0,1\}$. With this mixed integer problem, a heuristic branching algorithm is developed to solve for the optimal position for I_i .

Application of Round Lots in Optimizer

This guide focuses on the application of round lots in POINT's Optimizer. We now discuss the scope of its coverage, how users enter custom lot size in POINT and the existence of potential conflicts with other optimization constraints.

Scope of the Support

We support round lots for almost all non-basket instruments in POINT, including cash fixed income securities (global treasuries, agencies, municipal bonds, corporate bonds and securitized products), cash equity securities, convertibles and derivatives (interest rate futures, interest rate swaps, bond futures, options on futures, commodity futures and equity options).

Input of the Lot Size

To specify a trading lot size, the option of "Use Round Lots" has to be selected (Figure 1). Without this option selected, the trade amount can be any number rounded to the closest integer when displayed in the trade list tab. In effect, this is similar to setting lot size equal to 1 share.

FIGURE 1

Use Round Lots in the Common Constraint

E...	Description	Measure	Bound	Unit	Realized Value
<input checked="" type="checkbox"/>	Budget: Final Portfolio Market Value	Change		0 USD	0
<input checked="" type="checkbox"/>	Final portfolio maximum gross size	Target		USD	99,909,177
<input checked="" type="checkbox"/>	Turnover: Maximum gross size of trades	Target		USD	97,452,397
<input checked="" type="checkbox"/>	Maximum number of securities in final portfolio				101
<input checked="" type="checkbox"/>	Maximum number of trades				101
<input checked="" type="checkbox"/>	Minimum trade size	Target		USD	221,531
<input checked="" type="checkbox"/>	Use Round Lots	Apply to Trading Only			

Source: Barclays Research

Once the check box for round lots is selected, the user has multiple ways to input lot sizes into POINT. POINT provides default lot sizes for stocks based on the listing exchanges. Users can overwrite the default lot size at two levels: at the partition level – to be applied to a user-defined set of securities – and at the individual security level.

POINT provides default lot sizes for global equity stocks. We collect the lot size data from stock exchanges around the world and use the most commonly quoted lot size as the default for all stocks in that exchange. The default lot sizes for bonds, commodities, ETFs and derivatives are set to one.

Round lots can be set at the partition level for each optimizer report, or as a generic user preference (and therefore applied to all optimizer reports). For example, an investor who focuses on global fixed income and determines his lot sizes based on country can enter the lot size preference by a country partition in the round lots tab of the optimizer (Figure 2).

FIGURE 2

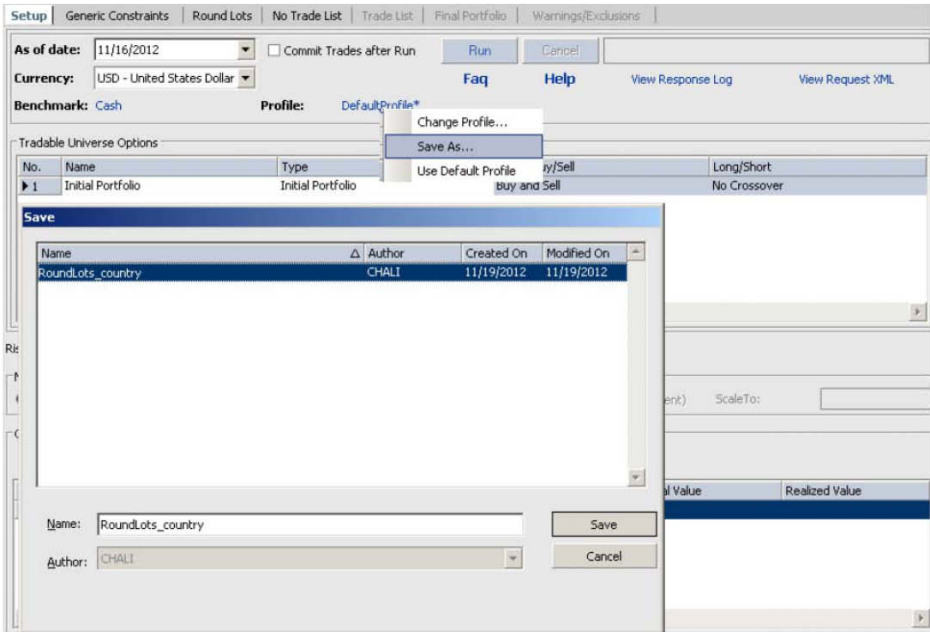
Define Round Lots by Partition in the Optimizer

Partition Bucket	Lot Size
United States	1000
Canada	1000
France	1000
Germany	1000
Italy	1000
Japan	1000000
United Kingdom	1000
Other	1000
N/A	1000

Source: Barclays Research

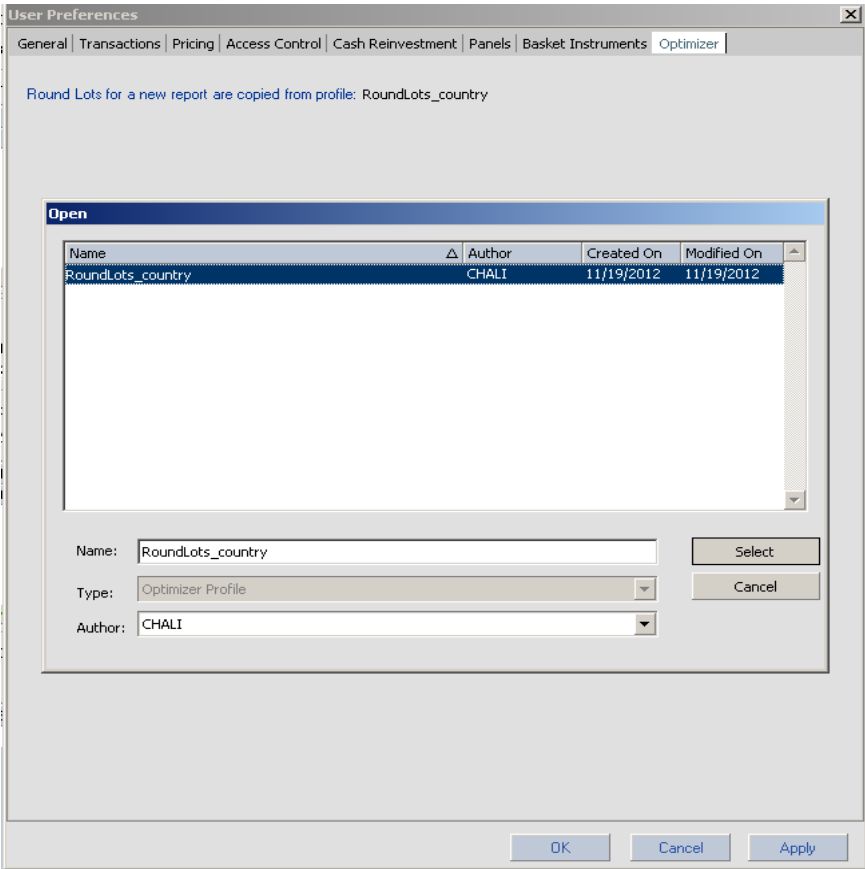
Additionally, if he would like to apply the lot size automatically to all of his portfolios, he can save the optimizer profile (Figure 3) and select it in the optimizer tab in the user preference window (Figure 4). By doing that, the lot size defined in Figure 2 is set as the default lot size template.

FIGURE 3
Save the Optimizer Profile with the Round Lots Information



Source: Barclays Research

FIGURE 4
Select the Saved Profile as the Round Lots Preference



Source: Barclays Research

Users can further override the lot size for each security by uploading a user-defined data field (UDDF) named “User_Lot_Size.” Users can paste the custom data using the paste wizard, or import it from the CSV file (Figure 5). For details, please see POINT’s documentation on *User Defined Data Fields*.

Aside from fine-tuning the security lot size, this feature is especially useful when an all-or-none trade is desired. All-or-none transactions are a common practice for portfolio managers who intend to sell securities. This can be achieved with the round lots functionality: set the trade universe as “Sell Only” and “Long Only” and lot size as the current position amount. As a result, the liquidation amount in the optimization will either be 0 or the entire position of that security.

FIGURE 5

Override the Lot Size by Security

Import User Defined Data Fields

User-Defined Data Fields: File: Browse... Portfolio:

Security_Identifier	User_Lot_Size
03512TAC	1000
496902AJ	1000
05958AAF	1000
05968LAG	1000
05968LAE	1000
05968LAB	1000
66285WFS	1000
105756BS	1000
84265VAD	1000
71645WVJ	1000
05946NAD	1000
91311QAE	1000
541624AA	1000
958254AB	1000
345397WD	1000
345397WC	1000
030274AA	1000
156700AT	1000
156700AS	1000
460630BH	1000
03938LAX	1000
03938LAW	1000
03938LAV	1000
345397VX	1000
67059TAC	1000
345397VZ	1000
345397VY	1000
345397VW	1000

Delimiter: Paste Clear

Copy data from another source such as Excel or Notepad: then click the Paste button or use Ctrl-V to paste the data into the white box above.

Duplicate Identifiers
Instrument Search Priority: Barclays, User

☒ Show log file OK Cancel

Source: Barclays Research

Interaction with Other Combinatorial Constraints

The application of round lots can conflict with other combinatorial constraints if the constraints are not properly set. Currently there are three other combinatorial constraints in POINT’s Optimizer: Maximum number of securities in final portfolio, maximum number of trades and minimum trade size. POINT’s Optimizer uses heuristic algorithms to solve the optimization problems involving these constraints for a fast and stable performance. The heuristics work on each constraint separately; therefore conflicts may arise that lead to infeasible solutions. Following are some examples.

For a portfolio starting with odd lots, setting a round lot and maximum number of final securities at the same time can easily lead to infeasible solutions. Assume an initial portfolio with 100 odd lot securities. After the trade in round lots, the final portfolio will end up with an odd lot leftover for each of the 100 securities. Therefore, imposing a maximum number of final securities of less than 100 will result in infeasibility. Under that circumstance, the POINT’s Optimizer ignores the broken constraint on the maximum number of securities.

Round lots constraints also implicitly set the minimum trade size equal to the lot size. The final constraint set is the intersection of the individual constraints; thus, the more restrictive constraint overrides the less restrictive ones. Therefore, the larger bound of minimum trade size and lot size will be the effective minimum trade size in the optimization.

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