PORTFOLIO CONSTRUCTION IN PORT<GO>

TRADE SIMULATION AND PORTFOLIO OPTIMIZATION USER GUIDE

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ABOUT BLOOMBERG PORTFOLIO & RISK ANALYTICS

This Trade Simulation and Portfolio Optimization functionality is implemented via the PORT<GO> function of the Bloomberg Professional® service. PORT provides a comprehensive set of investment portfolio analytics including performance attribution, characteristics, risk, scenario analysis and portfolio construction.

INTRODUCTION

Portfolio Construction is a process of incorporating trade ideas into a portfolio, with tailored risk, return or exposure characteristics. This can be done through either updating portfolio positions, or running a portfolio optimization process. Bloomberg's solution for Portfolio & Risk Analytics, PORT<GO> gives you ability to incorporate trade ideas into a portfolio and see how the portfolio analytics change after these trade ideas have been incorporated into the portfolio. To access the portfolio construction capabilities within the PORT <GO> application, from the 'Trade Simulation' menu item on the red toolbar, select the "Simulate Trades" checkbox or click on "Launch Optimizer".

PORTFOLIO TRADE SIMULATION

After enabling Trade Simulation mode by Clicking on Simulate Trades menu item under Trade Simulation on the red toolbar, the Simulated Weight column becomes editable and the Trade Simulation toolbar becomes visible. Note that Trade Simulation analysis can be performed on any tab in PORT<GO>.

- Change portfolio weight and hit <GO> to update portfolio analytics
- Turnover in the lower right hand corner gets updated based on the trade value of portfolio updates
- Add new positions to portfolio by clicking Add/ Edit Holdings button
- Rebalance by weight or by positions, trade against cash or portfolio holdings by setting your defaults under Settings option of the Trade Simulation toolbar

Figure 1. Trade Simulation Mode in PORT

You can change weights of existing positions, or add new positions to your portfolio. After you adjust portfolio holdings, hit <GO> to see portfolio analytics recalculate to reflect updated portfolio positions.

After you are satisfied with the changes made to the portfolio, you can save the revised portfolio by selecting the appropriate option under the Save/Trade menu item on Trade Simulation toolbar. There you can pick if you want to:

- override current portfolio holdings with your trade simulation updates (Save option)

- save trade simulation portfolio under a different name (Save As option)
- clear your trades to get back to the original portfolio (Clear option)

PORTFOLIO OPTIMIZER

In addition to updating your portfolio, you can run portfolio optimization in PORT<GO>. To invoke the optimizer from the 'Trade Simulation' button on the red toolbar you can select Launch Optimizer, or you can click the grey 'Optimize' button from the Trade Simulation toolbar when Trade Simulation mode is activated. If you are using the optimizer for the first time, for ease of use a list of available optimization tasks that are already defined on the system is displayed. Select a task that is closest to what you want to do. After the task is selected, you can update it and then click the Run button on the red toolbar to run portfolio optimization.

- Under Tasks on the red toolbar, select Global Tasks and choose one that is the closest to what you want to achieve. Make changes and from the 'Tasks' button choose 'Save Task As' to store it under a different name.
- Click Run to generate the optimal portfolio

Figure 2. Optimizer Setup page

To define how the optimizer will generate the optimal portfolio, set up an optimization task. Optimization tasks consist of four components:

1. Goals
2. Trade Universes
3. Constraints
4. Security Properties

Let's define these components one-by-one.

GOALS

In the goal definition step you need to select the fields you want to maximize or minimize. To select more than one indicator, click on the grey 'Add Goal Term' button. To customize the goal click on the pencil icon beside the goal value to display the Add Goal Term dialog.

Goal are grouped into the following categories:

1. Characteristics that include Equity Characteristics such as Financial Ratios, Growth Rates, Price Ratios and Profitability Ratios, as well as Fixed Income Characteristics such as Risk Measures and Yield/ Spread. This is the same list that is available on the Characteristics tab in PORT<GO>.
2. Execution that include Transaction Cost (Bloomberg), Transaction Cost (User-defined) and Turnover. Turnover is defined as the market value of buys and sells, excluding cash positions divided by portfolio market value. Transactions Cost (User-Defined) are linear transaction costs that are provided by the user. To provide these costs, enter transaction cost values under Security-level Properties section. You can also drag and drop values directly from Excel. Transaction Cost (Bloomberg) are based on Bloomberg transaction cost model (for equity securities) that is available in TCA<GO> application.
3. Risk including risk model factor exposures, as well as ex-ante estimates of portfolio Beta, Active Total Risk (Tracking Error) and Portfolio Total Risk (Portfolio Volatility). These estimates are based on the multifactor risk model that you have selected in PORT<GO>.
4. Security Level Data including Expected Return (User-Defined), Bloomberg Field Search data and My Custom Data. When Bloomberg Field Search/ Field ID is selected, you can provide the value of the Bloomberg indicator that you want to use in your Goal.

Some indicators, such as Active Total Risk (predicted Tracking Error), can only be minimized. While other indicators, like dividend yield, can be either minimized or maximized.

TRADE-OFF

If you have selected more than one indicator for the goal, you need to provide Trade-Off coefficients. Trade-Off coefficients allow the optimizer to combine multiple Goals together. Example: If you want to maximize dividend yield and minimize Active Total Risk and you set Trade-Off coefficients to 1 and 0.25 respectively, what you are saying is that for an extra 1% dividend yield in the optimal portfolio, you are willing to incur an additional 0.25% of Active Total Risk. Trade-Off coefficients are always specified in the same units as the corresponding fields. Trade-Off values have to be positive. Trade-Offs can also be applied to constraints. Specifying a Trade-Off value for a constraint will make this constraint 'soft'. Defining constraint as 'soft' means that optimizer will try to apply this constraint to the optimal portfolio, but if no portfolio exists that satisfies this constraint, optimizer will violate this constraint. The higher the Trade-Off value for a given constrain, the more latitude optimizer has to violate the constraint, provided that no portfolio exists that satisfies that constraint in the first place.

TRADE UNIVERSES

The next step after your optimization goal has been defined is to set your Trade Universe. Buy/ Sell Universe is a list of securities the optimizer will consider adding to the optimal portfolio. An optimization universe can be either a portfolio, a benchmark, or an index. In addition to Buy/ Sell universe, you can set up a list of securities that is a subset of your portfolio that you want to handle in a special way.

Example: If you want to keep weights of some securities in your portfolio constant, you need to create a portfolio made up of these securities and set No Trade list to that portfolio. Alternatively, you can set up

- No Sell list (for securities that you do not want to sell/ decrease weight)
- No Buy list (for securities that you do not want to buy/ increase weight),

- Liquidate list (for securities that you want to liquidate/ set weight to zero).

For Long / Short portfolios you can also set No Short list or No Long list.

CONSTRAINTS

The next step to set up an optimization task is to define portfolio constraints. Constraints are rules that the optimizer will follow in order to construct the optimal portfolio.

Example: You ask the optimizer to limit portfolio turnover from the initial to the optimal portfolio to 20%, limit weight in Information Technology sector to at most 5%, and to have the number of portfolio holdings in the optimal portfolio between 50 and 60. Constraints are specified in the following form:

- Constraint Field (the variable to be constrained)
- Constraint Level (group of securities to which you are applying a constraint. This can be either the whole portfolio, or a portfolio subset such as a particular sector or an industry)
- Relative (specifies whether minimum and maximum values provided are expressed relative to the initial portfolio, relative to the benchmark, or absolute values/ relative to None)
- Min, Max and Trade-Off (See Trade-Off section above).

Trade-Off value is optional. If Trade-Off is omitted, optimizer will treat a given constraint as 'hard' constraint, meaning that optimizer will either satisfy this constraint or return an error message. Alternatively, if Trade-Off value is specified, optimizer will consider a given constraint 'soft', meaning that optimizer will try to satisfy the constraint. However, if it cannot satisfy the constraint, it will violate it by the amount that depends of the value of the Trade-Off coefficient. If Trade-Off is specified for any of the optimization constraints, you also need to provide a Trade-Off coefficient for the Goal.

To add a constraint

Click on the grey 'Add Constraint' button. This will bring up Add Constraint dialog. In order to add a constraint, you need to select the following values:

Constraint Field – is the name of the field or indicator that you want to use. Fields are broken into the following categories:

1. Characteristics that include Equity and Fixed Income characteristics such as Financial Ratios, Growth Rates, Price Ratios, Yield/ Spread, etc.. This is the same list that is available on the Characteristics tab in PORT<GO>.
2. Execution that include Number of Buys, Number of Sells, Number of Positions, Number of Trades, Position and Trade Size, Transaction Cost and Turnover.
3. Risk including ex-ante portfolio Beta, Active Total Risk (Tracking Error) and Portfolio Total Risk (Portfolio Volatility), as well as factor exposures for the factors used in the factor model. These values are based on the multifactor risk model that you have selected in PORT<GO>.
4. Security Level Data including Expected Return (User-Defined), Bloomberg Field Search data and My Custom Data. When Bloomberg Field Search/ Field ID is selected, you can provide the value of the Bloomberg indicator that you want to use in your Goal.
5. Weight.

Constraint Level – Setting Constraint Level allows you to specify a constraint for a particular subgroup of the portfolio.

Example: Setting maximum portfolio weight in Information Technology GICS Sector to 5%. In this case Information Technology GICS sector is the Constraint Level. Constraint Level is only applicable for some Fields groups such as

- Characteristics
- Security Level Data
- Weight
- Risk factor exposures

Other Fields like Execution apply to the whole portfolio. When you apply Constraint Level to a linear Field, the Constraint is calculated as sum of the products of the Field values and weights within a given Constraint Level.

Example: Specify the maximum value of the dividend yield within Information Technology to be greater than 0.5. What that means is that the weight in Information Technology times the dividend yield of Information Technology sector should be greater than 0.5%.

NOTE: One can select more than one Constraint Level by using Shift Click or Ctrl Click.

Relative – Constraint values can be specified as Relative to 'None' or absolute (Example: portfolio dividend yield is greater than 1%), Relative to 'Benchmark' (Example: portfolio dividend yield is greater than benchmark dividend yield by 1%), or Relative to 'Initial Portfolio' (Example: portfolio dividend yield is greater than initial portfolio dividend yield by 1%)

Min/ Max – Minimum and Maximum values used in a given constraint. For example specifying Minimum value of 1% for portfolio dividend yield means that the optimal portfolio dividend yield will be at least 1%

Trade-Off – This is an optional parameter that tells the optimizer that this constraint can be violated. See Trade-Off section above.

SECURITY PROPERTIES

The optimizer allows you to specify properties that apply to all securities. These properties include:

- Relative that determines if weight bounds are expressed relative to the benchmark, relative to the initial portfolio, or as absolute values (relative to 'None')
- Minimum and Maximum weight bounds
- Max Trade that specifies the maximum amount of shares that could be traded for a given security
- Lot Size
- Transaction Costs (only visible if User-Defined Transaction Cost field is selected as either a Goal, or a Constraint)
- Borrow Costs (Borrow Costs are only applicable for short positions. In order to see Borrow Cost column, enable Allow Short Positions options under Settings).

Security-level Properties can be specified as a Default that applies to all securities in the optimal portfolio (these values can be specified in the first raw of Security-level Properties section). Default values could be overwritten by typing a security id in the new row and providing security-level values that are only applicable to this security.

One can either type in security level properties and constraints, or drag and drop these values from Excel. To see Excel template that can be used to provide these values, click on Export button. Update resulting file with security properties and constraint values and drag and drop it back into the optimizer.

SETTINGS

Portfolio Optimization Settings can be invoked by clicking the Settings button on the red toolbar in the optimizer. The following is the list of available settings:

- Long-Short Settings – Check Allow Short Portfolio Position checkbox to allow short positions into the optimal portfolio. If Allow Short Portfolio Positions checkbox is unchecked, the optimizer will only allow long positions into the optimal portfolio. If Allow Short Portfolio Position checkbox is checked, you can also check No Long/ Short Crossover. If it is checked, the optimizer will not short a security if it is a long position in the initial portfolio, and will not go long a security that is a short position in the initial portfolio. If Long/ Short optimization is specified, user needs to provide the values for Long and Short Leverage. Long and Short Leverage will show up in the list of constraints after Allow Short Portfolio Positions checkbox is checked.
- Override N/A values – Fields that can be used in either Goals or Constraints can be N/As. Optimizer will replace N/As with the N/A Override value that can be specified either during setting up of the respective Goal or Constraint, or on the Override N/A values dialog. By default N/As are overridden with 0 values. However, you can change the override to be any numerical value.
- Transaction Cost and Lot Size Properties – Specify whether Lot Size settings under Security-level Properties and Constraints apply to either Trade Lots, or Position Lots. In addition to that, if Transaction Cost (User-Defined) options is selected as either a Goal or a Constraint, one can specify these Transaction Costs in either Percent of Portfolio Market Value (%) or Absolute Cost (cents/ share).

EFFICIENT FRONTIER

Portfolio Optimizer allows you to generate the efficient frontier for your portfolio. To generate efficient frontier you need to add an efficient frontier constraint by clicking on Add Frontier button. Frontier constraint lets you specify a range for minimum or maximum values. Example: Maximum value for turnover ranges between 10% and 50%. When you run efficient frontier optimization, optimizer generates a series of optimal portfolios and plots these portfolios on the efficient frontier chart. You can select any of the portfolios on the chart by clicking on the portfolio on the Frontier tab.

Figure 3. Efficient Frontier

TASKS

To save your optimization task parameters click on Tasks on the red toolbar and select either Save Task, or Save Task As. Your tasks will be saved under the 'My Tasks' section of the Tasks red toolbar. Global Tasks are optimization tasks that are defined by Bloomberg and are available to all portfolio optimization users. In order for the optimizer to always load your saved optimization task on start up, select the option to 'Make This Task Default' under Tasks.

BACKTESTING

Portfolio Optimizer allows you to backtest a portfolio to see how a particular portfolio construction strategy performed historically. To run optimization backtest, click on Backtest Enabled checkbox in the upper right hand corner of the optimizer Setup page. Once Backtest Enabled checkbox has been checked, you need to set optimization backtest parameters such as optimization frequency, number of time periods over which you want to backtest your strategy, or start and end dates. You also need to specify the output name of the resulting backtest portfolio. Once the backtest parameters have been saved, you can always change it by clicking on the pencil icon next to Backtest Enabled checkbox. To run backtest after you've set your backtest parameters, click on Run Backtest (1<GO>) button on the red toolbar.

Optimizer backtest will use your portfolio, benchmark and risk model selected in the optimizer. Backtest starts by running portfolio optimization on the first day of the backtest. Then optimized portfolio gets adjusted for the corporate actions that happened between the first and the second periods of the backtest. That corporate action adjusted portfolio becomes the initial portfolio for the next rebalance date of the backtest. This process is repeated multiple times until the end of the backtest has been reached. Backtest results get saved into a historical portfolio. You can then use full power of PORT<GO> application to analyze that optimal historical portfolio and see its fundamental characteristics, risk and return profile, performance attribution, etc. Note that optimization backtest is a batch process. You can monitor it using the status bar at the bottom of the optimizer (click on the triangle icon at the bottom of the optimizer to make sure that the status bar is visible). You can also leave the optimizer while the backtest is running. An email message will be send to your Bloomberg email address when optimizer backtest is finished.

OPTIMIZATION RESULTS

After you've defined the portfolio optimization task, you can run the optimization by clicking the Run button on the red toolbar or typing 1<GO>. Once optimization is complete, you can see optimization results screen. The screen is split into three sections: Optimization Summary, Proposed Trades and Constraint Results.

- See portfolio Turnover, Goal and Constraint values for both initial and optimal portfolios, as well as trade list
- Click the red button 'Analyze in PORT' to load the optimal portfolio into PORT<GO> and see additional portfolio analytics.

Figure 4: Optimization Results

OPTIMIZATION SUMMARY

This section shows a high level optimization summary including an optimization status message such as Success, Failure or Warning. The Goal Summary shows initial and final values for each goal that was part of the optimization task. The Turnover section shows Turnover (round-trip turnover from the initial portfolio to the optimal portfolio), Number of Buys and Sells and Traded Values.

PROPOSED TRADES

This section lists all the trades that need to be implemented in order to get from the initial portfolio to the optimal portfolio. For each trade the following information is shown: Ticker, Name, Trade Side such as BUY or SELL, Quantity, Initial Weight (instrument weight in the initial portfolio), Optimal Weight (instrument weight in the optimal portfolio) and Weight Difference (Optimal Weight minus Initial Weight).

CONSTRAINT RESULTS

For each Portfolio and Group Constraint that was part of the optimization task, optimizer displays the name of the constraint, minimum and maximum constraint values, as well as the constraint value for the initial and the optimal portfolios.

In order to do further analysis of the optimal portfolio you can click on Analyze in PORT button on the toolbar. This will load optimal portfolio into PORT.

ANALYZE IN PORT

Click on Analyze in PORT on the red toolbar (99 <GO>) in order to load your optimal portfolio into PORT<GO>. There you can see additional portfolio analytics, make further changes to your portfolio, or save the optimal portfolio as either your existing portfolio, or a new portfolio.

APPENDIX 1 - OPTIMIZING PORTFOLIO WITH USER EXPECTED RETURNS IN PORT<GO>

A common way of using the optimizer is to maximize user supplied expected returns, while setting an upper bound on the portfolio Tracking Error. A variation of the above problem is to maximize expected return while simultaneously minimizing portfolio risk. Let's illustrate how the above problem can be solved with Bloomberg portfolio optimizer. To invoke portfolio optimizer, launch PORT <GO>, select portfolio and benchmark and click on Actions/ Launch Optimizer on the red toolbar.

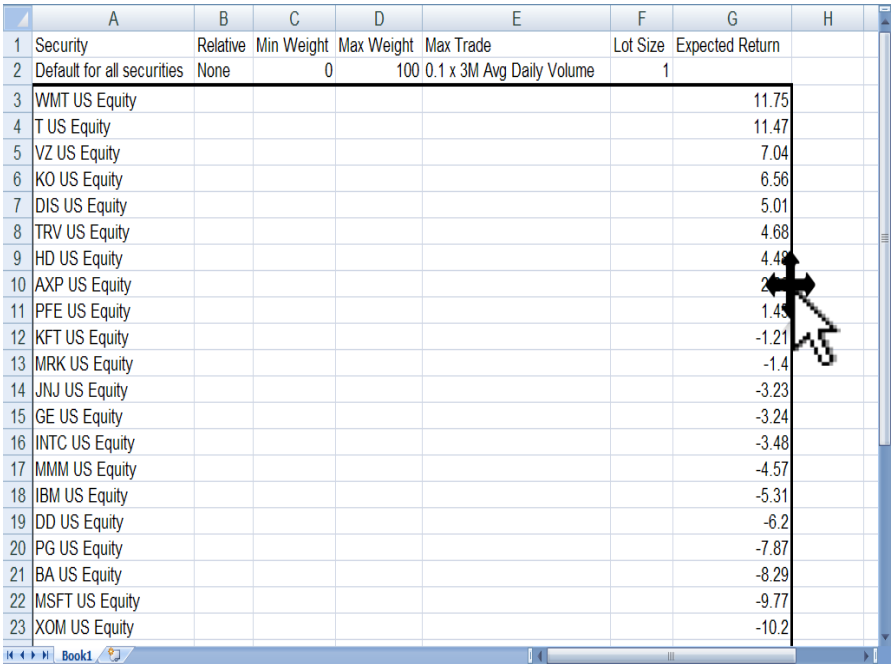
Let's add a Goal to Maximize Expected Return. This Goal is available under Security Level Data section of Add Goal Term dialog (click on the pencil icon next to the Goal name under Goal Definition section), see Figure 4 below.

- Click on the Pencil icon under Goal Definitions section of the optimizer Setup screen
- Select Expected Return (User-defined) under Security Level Data section of Add Goal Term dialog

Figure 5: Incorporating user-defined Expected Returns into the optimizer

After the goal is selected, Expected Return column is added to the Security-level Properties section at the bottom of the Optimization Setup screen. The next step is to populate Expected Return column by dragging and dropping Expected Return values from Excel. To generate Excel template that can be dragged and dropped into the optimizer, click on Export button under Security-level Properties section, see Figure 5. Once the file is open in Excel, populate column A (left-most column) with security identifiers and column G (titled Expected Return) with expected returns. Then select values in columns A through G, move the mouse to the selected border in Excel until the mouse cursor looks like a cross with the arrow at the end, and then drag and drop selected section into Security-level Properties section of the optimizer.

- Click on the Export button in the Security section of the optimizer to download Excel template
- Populate Security ids and Expected Return values
- Select the section in Excel that contains Security ids and Expected Returns and drag and drop it into the Security section at the bottom of the optimizer



	A	B	C	D	E	F	G	H
1	Security	Relative	Min Weight	Max Weight	Max Trade	Lot Size	Expected Return	
2	Default for all securities	None	0	100	0.1 x 3M Avg Daily Volume	1		
3	WMT US Equity						11.75	
4	T US Equity						11.47	
5	VZ US Equity						7.04	
6	KO US Equity						6.56	
7	DIS US Equity						5.01	
8	TRV US Equity						4.68	
9	HD US Equity						4.48	
10	AXP US Equity						2	
11	PFE US Equity						1.45	
12	KFT US Equity						-1.21	
13	MRK US Equity						-1.4	
14	JNJ US Equity						-3.23	
15	GE US Equity						-3.24	
16	INTC US Equity						-3.48	
17	MMM US Equity						-4.57	
18	IBM US Equity						-5.31	
19	DD US Equity						-6.2	
20	PG US Equity						-7.87	
21	BA US Equity						-8.29	
22	MSFT US Equity						-9.77	
23	XOM US Equity						-10.2	

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Figure 6: Example of Excel spreadsheet that can be used to drag and drop Expected Returns into the optimizer

Once the optimization task is defined, click on Run button (1<GO>) to see optimization results.

- On the red toolbar in PORT<GO> click on Actions/ Launch Optimizer
- Drag and drop user-defined Expected Returns into the optimizer from Excel
- Run optimization
- For further analysis of the optimal portfolio, click 99) Analyze in PORT

Figure 7: Optimization problem Setup screen that contains user-defined Expected Returns

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