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Optimizer Series

Iterative Transition

Fund managers may be confronted with the need to switch benchmarks to accommodate an investment allocation decision or a mandate update. The transition is generally completed through an iterative process to liquidate the legacy portfolio and construct the new one. We illustrate how to use POINT's optimizer to this effect. In particular, the optimizer is able to select trades at each step to optimally control the risk exposure during the portfolio transition. We also discuss potential trade-offs when transaction costs are considered.

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Iterative Transition in Practice

Portfolio transition is a common practice when a fund manager changes his tracking benchmark for strategic, tactical or regulatory reasons. For example, fund managers reallocated their European treasury exposure from peripheral to core countries after the sovereign crisis of 2010.

The transition cannot take place instantaneously. Both the size of the portfolio and the type of the securities affect the length of the process. For instance, transition with liquid securities such as equities and treasury futures requires much less effort than with corporate bonds or securitized products where an exchange is not available. The process can take days or even weeks.

Generally the transition process can be thought of as iterations of liquidation on the legacy portfolio and purchase from a target portfolio. The number of transition steps is generally determined ex ante by analyzing the trading capacity of the transition managers.

The trades at each transition step are mainly driven by risk considerations. For asset managers, the purpose of the transition is to reallocate the portfolio exposure from one set of risk factors to another. Because the risk of the legacy and target benchmark can be dramatically different, an inappropriate transition order can potentially expose the intermediate portfolio to substantial risks. Therefore, reducing the risk exposures in the most efficient way is the ultimate goal of this practice.

Besides controlling risk, transaction cost is another important consideration in the process. Given that, an over-purchase of a security followed by a sale (or an over-sell followed by a cover) is something to be avoided. For fixed income instruments, larger lots are traded with smaller bid-ask spread, therefore, multi-trades for one security in the transition iteration are generally discouraged.

We present how to use POINT Optimizer to solve an iterative transition problem. Given the number of iterations, POINT Optimizer is able to identify the trades at each step that align risk optimally against the target benchmark. We also evaluate the cost of the constraints where over purchases are disallowed. Those examples are easy to extend to areas other than transition, such as rebalancing or partial liquidation.

Iterative Transition – An Example

To illustrate how to use POINT Optimizer for portfolio transition, we construct an example that potentially caters to current market conditions. We assume the fund manager switches his legacy asset that is invested in EM Asian Credit to US IG Credit, based on a set of strategic view themes: liquidity concerns in Asia, expectation of currency appreciation in USD and general lackluster performance of Emerging Markets[1]. The legacy portfolio, worth USD 100mn, is composed of 100 bonds that track the Barclays EM Asia USD Credit index. The goal of the transition is to replenish it with approximately 100 bonds that track instead the Barclays US Credit index.

Without loss of generality, we assume that by assessing the daily trading capacity, the manager decides to proceed with the transition in three steps, in each of which one-third of the market value of the legacy portfolio is to be replaced. More steps in the iterative transition can be easily extended.

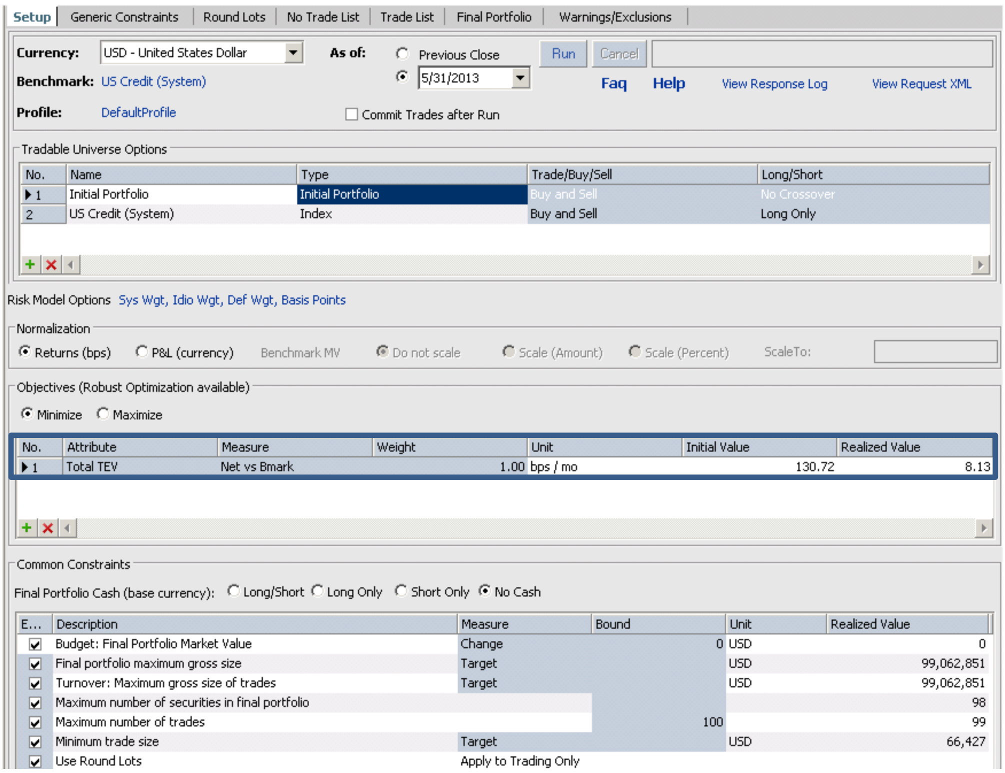
Before solving for the trades at each step, we need to construct the final target portfolio by replicating the US Credit index with USD 100mn. Index replication is a frequently used

[1] Please see *Summary of Asset Allocation Themes* for detailed allocation suggestions along some of these views.

application of the POINT Optimizer[2]. Figure 1 shows the outcome of this exercise. The optimal target portfolio contains 99 credit bonds and achieves a total TEV of 8.13bp/month with respect to the US Credit index. In our example, we call this target portfolio "Iteration – IG". If the transition period is short, it is reasonable to assume the target portfolio remains fixed until the end of the transition. The target portfolio will serve now as the benchmark in the transition optimization set-up. Therefore our optimized TEVs will converge to zero upon completion of transition, although the actual portfolio versus benchmark TEV will drift from 8.13bp and will need to be monitored as well.

FIGURE 1

Barclays US Credit Index Replication



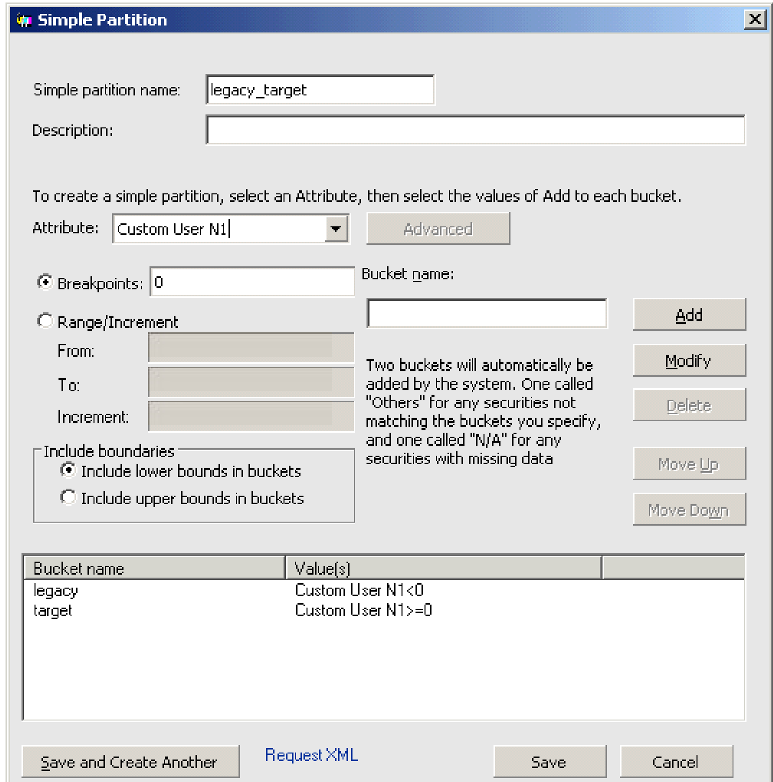
Source: Barclays Research

A very convenient feature to simplify the transition in the optimizer is to create a user defined data field[3] (UDDF). In our example, we assign this field to be -1 for all securities in the legacy and 0 for the target. We also construct a simple partition based on this field (Figure 2). The partition allows us to differentiate legacy versus target securities in the intermediate portfolios.

[2] Detailed discussion can be found in *Optimizer User Guide*

[3] Please refer to Barclays *POINT User-Defined Data Fields*.

FIGURE 2
Partition to Differentiate Legacy and Target Securities



Source: Barclays Research

Base Case: Three-step Transition

In our base case transition, the single objective is to minimize the total TEV with respect to the benchmark, which is the target portfolio. Neither over-purchase nor short-selling is allowed. We aim to transform the EM Asia credit portfolio into the US credit portfolio in three steps. On each, we will trade one-third of the portfolio's market value (USD 100mn).

Step 1 of the Iterative Transition

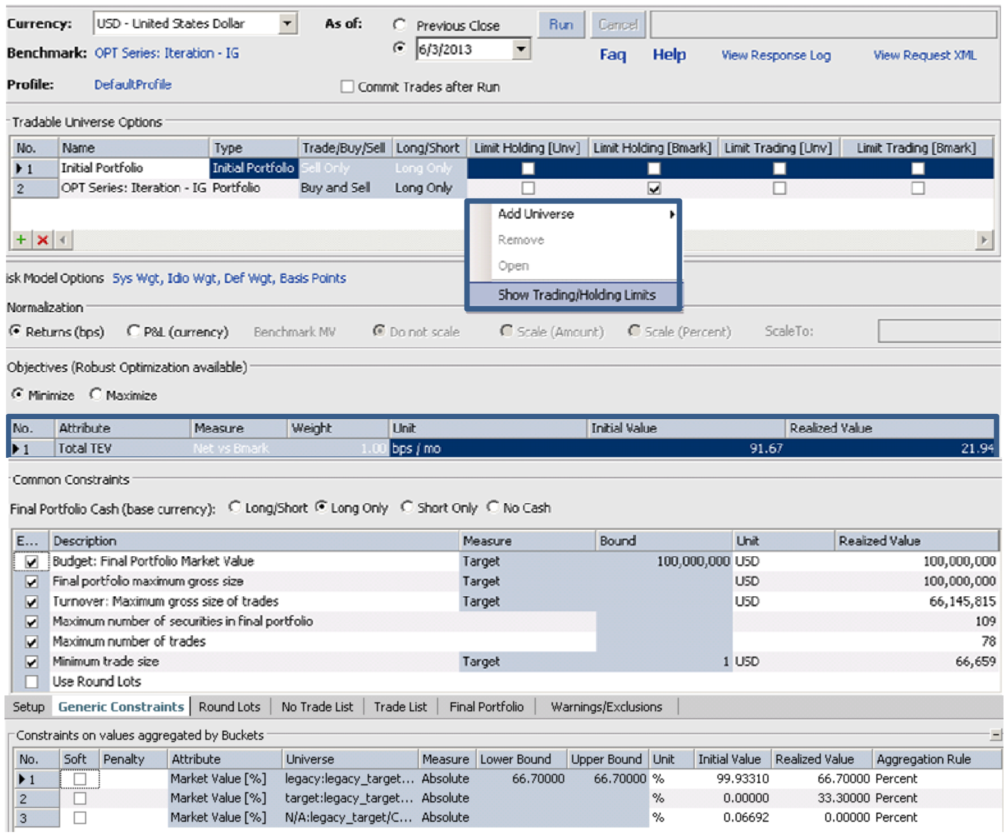
Figure 3 presents the setup of the first step. The initial portfolio – which is the legacy portfolio – is "sell only" and "long only" to avoid short selling. The no over-purchase condition is controlled by the "Limit Holding [Bmark]" function in the optimizer. The four restrictions on "Limit Holding" and "Limit Trading" can be prompted by a right click on the tradable universe section. "Limit Holding" means the position amount in the final portfolio cannot exceed the holdings in the selected tradable universe or benchmark, while "Limit Trading" means the trade positions cannot exceed the holdings in the selected tradable universe or benchmark. In our example, we force the upper bound of the holdings of the final portfolio to be the same as the benchmark – which is the target portfolio – so that over-purchased is ruled out. In the constraint section, we set the portion of the legacy securities in the final portfolio to be 66.7% of the total portfolio so that one-third of the legacy portfolio is replaced in the first step. This is done using the UDDF.

The optimizer-proposed 78 trades for the first step consist of the following: 37 sells, 40 buys and one transaction on cash. Although we did not restrict the size of the trades, most securities traded are transacted in the full amount. In particular, only 6 out of 37 of the sales are not liquidated in full, and 5 out of 40 are not purchased to the full amount as the target portfolio. Generally, for fixed income instruments, transactions with larger lots incur less unit transaction cost, so this is a welcome outcome[4].

The optimizer is able to reduce the TEV from an initial value of 91.67bp/month to 21.94bp/month on the first step of the iteration.

FIGURE 3

Transition Step 1



Source: Barclays Research

Step 2 of the Iterative Transition

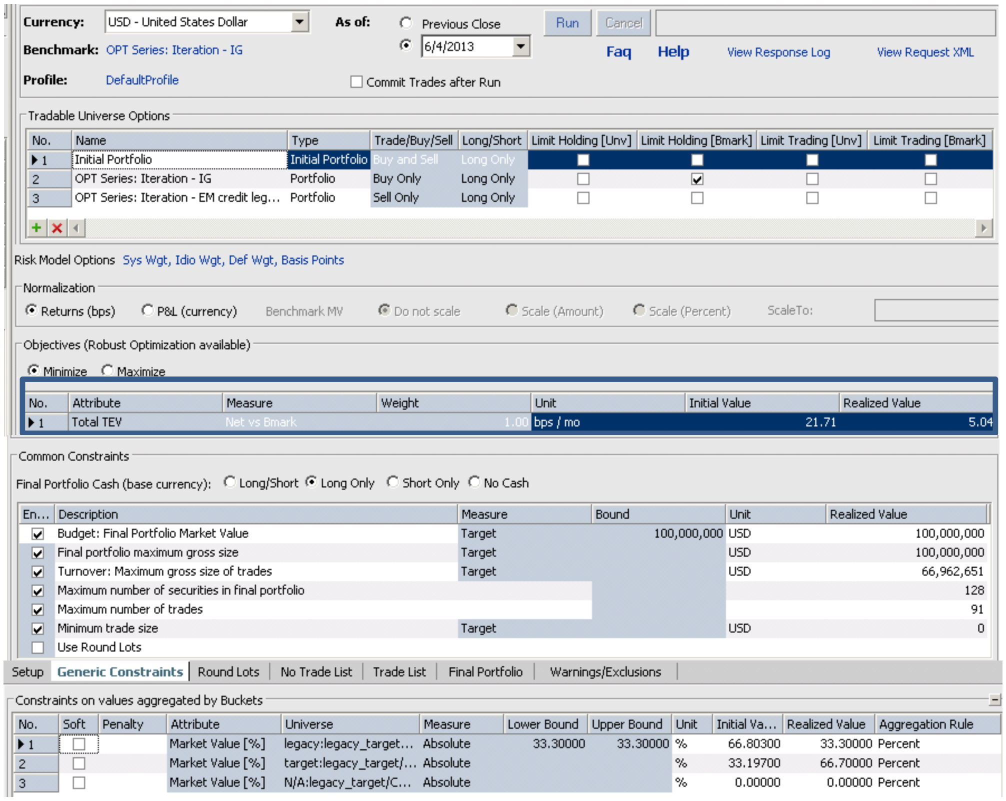
Figure 4 shows the setup for the second iteration as of June 4, 2013. The initial TEV with the target portfolio is 21.71bp/month[5]. In this step, we aim to sell another third of the legacy securities and use the proceeds to purchase the targeted securities. The optimizer operates on the security level; therefore, in order to differentiate the securities, we need to add both the initial legacy and target portfolio in the tradable universe, with the former set to "sell only" and the latter set to "buy only." The optimizer proposed 91 trades, with 42 buys and 49 sells. The TEV is further reduced from 21.71bp/month to 5.04bp/month.

[4] A round lot transaction that sets the lot size equal to the full position amount can guarantee the full amount transaction.

[5] Note this is slightly different from the realized TEV at 21.94 shown in Figure3. This is the risk drift in one business day mentioned earlier.

FIGURE 4

Transition Step 2



Source: Barclays Research

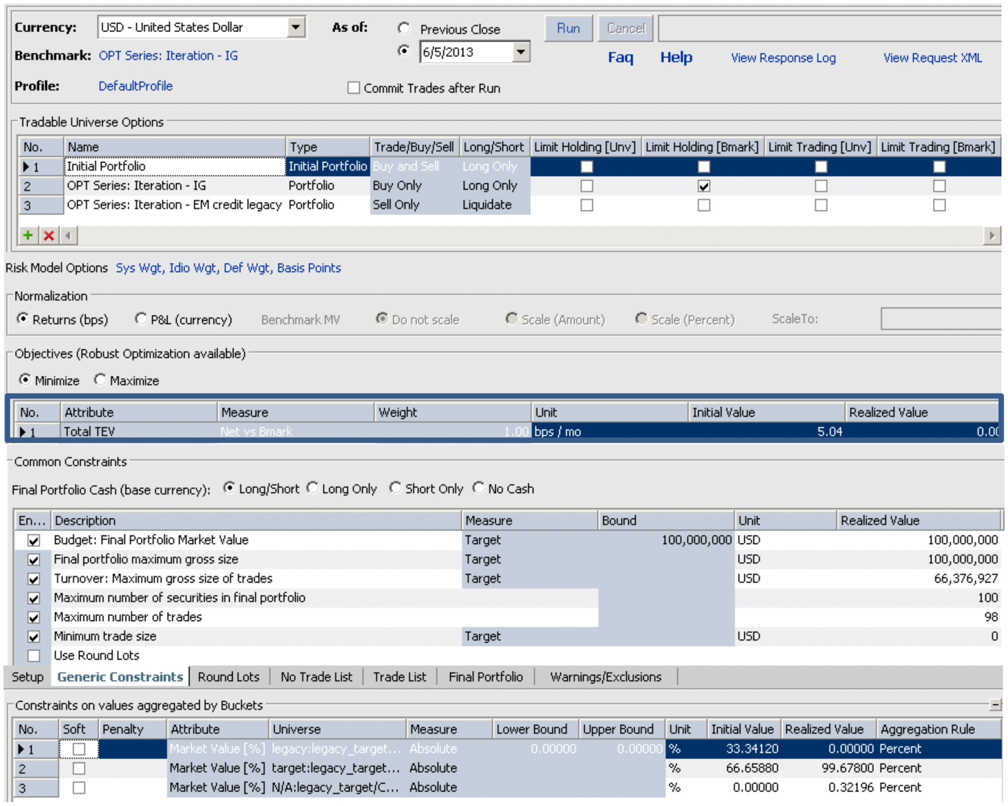
Step 3 of the Iterative Transition

The setup of the last step is similar to the previous step, except that we can set the legacy portfolio with "liquidate" in the tradable universe (Figure 5). "Liquidate" requires that if the initial portfolio has a position in any of the securities present in the constrained universe, all such positions are liquidated. By the end of this step, the final portfolio is turned into the target portfolio completely.

Figure 6 presents the risk of the target portfolio partitioned by factors at the end of the transition process. The idiosyncratic risk accounts for the majority of the total TEV with respect to the US Credit index. This is related with the final number of securities held in the portfolio: the larger the portfolio, the easier it is to diversify their idiosyncratic risk.

FIGURE 5

Transition Step 3



Source: Barclays Research

FIGURE 6

TEV of the Transitioned Portfolio with Respect to the US Credit Index

	Contribution to TEV	Isolated TEV
Total	9.2	9.2
Systematic	1.6	3.8
Curve	0.3	2.7
Swap Spreads	0.0	0.5
Volatility	0.0	0.3
Spread Gov-Related	0.0	0.6
Spread Credit and EMG	1.3	4.3
Idiosyncratic	7.4	8.2
Credit default	0.3	1.6

Source: Barclays Research

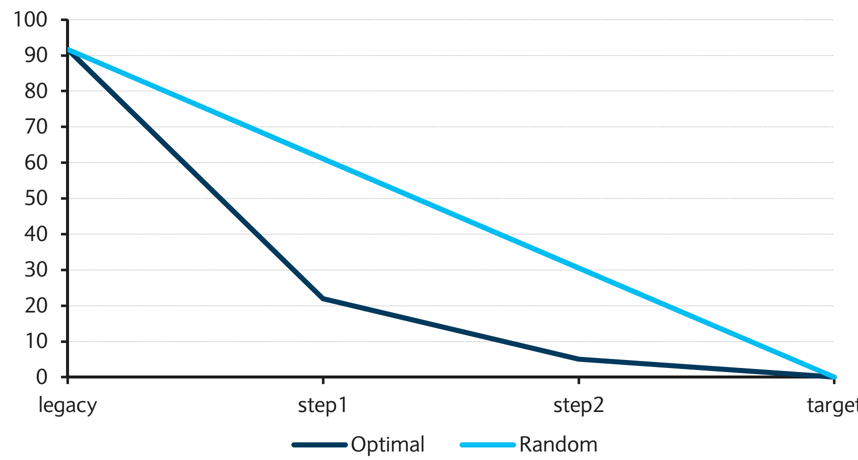
The Profile of the Portfolio during the Iterative Transition

Figure 7 shows the TEV profile of the portfolio with respect to the target portfolio during the iterative transition process. If the transition manager randomly trades the portfolio at each step, liquidating one-third of the positions of each security in the legacy portfolio and purchasing one-third of the positions of each security in the target, the expected TEV is a straight line connecting 91.67bp/month of TEV for the legacy portfolio and the 0bp/month of TEV at target. The optimal solution significantly reduced the risk exposure during the transition process, our primary goal for the transition period.

Figure 8 decomposes the risks into curve, spread, idiosyncratic and default factors. We see that the systematic risks (including curve and EM spread factors) decrease sharply in the first steps. This is better explained by looking at the risk metrics of the transition portfolios listed in Figure 9: The OAD (curve risk loadings), OASD and DTS (spread risk loadings) matched quickly in the transition process. The idiosyncratic risk, on the other hand, shrinks at a later stage. Constructed as uncorrelated across different issuers, the idiosyncratic risks cannot be eliminated unless the final portfolio's exposure to issuer names matches the benchmark.

FIGURE 7

TEV Profile



Source: Barclays Research

FIGURE 8

Risk Decomposition

Portfolio	Contribution to TEV (bp/month) w.r.t. target			
	Curve	Spread & EMG	Idio	Default
legacy	16.50	71.60	2.50	2.10
step1	0.50	18.40	2.50	0.20
step2	0.50	2.40	1.90	0.20
target	0	0	0	0

Source: Barclays Research

FIGURE 9

Key Risk Metrics

	OAD		OASD		DTS	
	Transition	Target	Transition	Target	Transition	Target
legacy	5.79	6.90	5.73	6.66	12.52	8.80
step1	6.94	6.90	6.76	6.66	10.20	8.87
step2	6.87	6.87	6.64	6.63	9.03	8.87
target	6.86	6.86	6.62	6.62	9.20	9.20

Source: Barclays Research

Taking transaction cost into consideration

It is natural to challenge the "no over-purchase" requirement we imposed up to this point: though with extra transaction cost, one can argue that a faster reduction on the TEV may be achieved with, for instance, an over purchase following by a sell. In this section, we quantify the effect on the transition portfolio of loosening that condition. In particular, in the POINT optimizer setup, we uncheck the "Limit Holding [Bmark]" option and allow for "buy and sell" on the target portfolio in the tradable universe.

To construct realistic transaction cost, we use the liquidity cost score (LCS)[6] that is available in POINT. We divide the score by two and adjust the unit from percent to basis point to calculate the one-way transaction cost and upload them through the user defined data field "Transaction_Cost."

Figure 10 summarizes the comparison between the base case and the one allowing over-purchase. The TEV marginally improves with the over purchase (less than a basis point/month at each stage) but the transaction cost almost doubled, from $1.2mn to $2.2mn. With this cost-benefit analysis, our example justifies the constraints disallowing the over-purchase. Different views on actual transaction costs may change this conclusion.

FIGURE 10

Cost and Benefit Analysis on Over Purchase

	TEV w.r.t. Target (bp/mo)		Transaction Cost (1000USD)	
	Base Case	**Over Purchase**	**Base Case**	**Over Purchase**
legacy	91.67	91.67		
step1	21.94	20.89	445.00	441.00
step2	5.04	4.66	401.00	728.00
target	0	0	350.00	985.00

Source: Barclays Research

References

Dstidar, S. and Phelps, B. (2009) *Liquidity Cost Score for US Credit Bonds*. Barclays Publication.

Summary of Asset Allocation Themes. Barclays Publication.

Kumar, A. and Lasanas, A. (2009) *Barclays Portfolio Optimizer – User Guide*. Barclays Publication

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[6] Please refer to *Liquidity Cost Scores for US Credit Bonds*

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