HIGH YIELD INVESTING

Manager Performance Drag from Uncompensated Transaction Costs

This paper was originally published on 15 September 2011. However, that version assumed that newly issued bonds enter the Barclays Capital High Yield Index at the offer price, not the bid price. However, it is now known that these bonds enter at the bid price, which sharply increases the performance drag for passive HY managers. This revision reports the corrected performance drag numbers.

- High Yield Index managers incur transaction costs arising from index turnover and cash reinvestment, whereas the underlying index does not. These "uncompensated" transaction costs (UTCs) lead to a manager performance drag that, at times, can be significant.
- For example, passive High Yield Index managers must buy downgraded IG and newly issued HY bonds entering the High Yield Index at the offer price, whereas these bonds enter the index at the bid price. UTCs arise from other types of index turnover and reinvestment as well.
- The availability of bond-level Liquidity Cost Scores (LCS)™ allows us to quantify these UTCs and calculate the passive index manager's performance drag.
- Using data from January 2007 to December 2011, we show that the monthly performance drag averaged 7bp per month (or, 86bp per year). To put this number in perspective, it is more than 10% of the average monthly index total return (69bp) over the same period. HY managers face significant performance headwinds, and the magnitude of the performance drag could help explain why the average active high yield manager alpha (net of fees) was -16bp per annum over the period.
- For currency-hedged managers with a base currency other than the USD, there is an additional UTC arising from the reinvestment of cash generated from currency hedging gains whenever the USD depreciates versus the forward rate.
- Using data from January 2007 to December 2011, we show that the monthly performance drag averaged 12bp per month (or 149bp per year) for a currency-hedged EUR manager. This is approximately 20% of the averaged monthly index hedged return (62bp) over the same period.

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Cash Flows for a Passive USD High Yield Index Manager

While the constituents of the High Yield (HY) Index are constant during the course of a month, there is active turnover in the index's constituents at month-end when bonds enter and exit. Bonds enter the index because they either are newly issued or have just been downgraded from investment grade. They exit because they either no longer satisfy index rules (e.g., more than one year to maturity) or have been upgraded to investment grade.

A passive manager must sell bonds leaving the index and buy new ones entering it. In addition, the manager must reinvest coupon payments received by buying, *pro rata*, all index bonds. It is this selling and buying to mimic the changes in the index's composition that generates transaction costs for the portfolio manager, but not for the index. We label a transaction cost borne solely by the portfolio manager as "uncompensated" transaction cost (UTC). UTCs cause a passive portfolio manager's performance to lag that of the index (i.e., a performance drag).

Identifying UTCs

Uncompensated transaction costs arise from the HY Index pricing convention. Whereas investors purchase new bonds in their portfolio at the offer side,[1] bonds that enter the HY Index (new issues and downgrades[2]) are added at the bid side price. We can compute the UTC resulting from this index pricing convention by multiplying the market weight of new index bonds by their MV-weighted average bid-ask cost, which we can measure using bond-level Liquidity Cost Scores (LCS)™.[3]

The other source of UTCs for USD HY Index managers is the reinvestment of excess cash. For months in which sources of cash (i.e., selling bonds leaving the index (A) and coupon payments received (B)) exceed the uses of cash (i.e., buying new index bonds (C)), the manager has excess cash that he or she must use to purchase additional bonds in order to track the index. The manager will purchase these bonds at the offer price, while the index marks them at the bid.

Let us define the net cash flow balance that the passive portfolio manager must re-invest at month-end as:

$$BAL \equiv A + B - C$$

If BAL < 0, then internally generated cash flow (A + B) is inadequate to finance purchases of new index bonds (C).[4] In this case, the passive index manager must sell bonds, *pro rata*, to raise the needed BAL. However, doing so does *not* give rise to UTCs, as the manager receives the same (bid) price for these sales as the index uses to mark the bonds.

[1] We recognize that managers do not necessarily buy at the offer and sell at the bid. However, to measure the performance drag objectively, we assume a passive manager does so. Also, we assume that managers purchase new issues at month-end, not at the time of issuance.
[2] While newly issued and downgraded bonds are treated the same in the US HY Index, the US IG Corporate Index buys newly issued bonds at the offer price, while upgraded bonds entering the index do so at the bid price.
[3] Liquidity Cost Scores (LCS)™ is a bond-level measure of round-trip transaction costs, calculated based on trader-quoted bid-ask spreads and other bond attributes. See Dastidar & Phelps (2009). LCS, quoted in bp, measures the round-trip transaction cost as a proportion of the bond's price if a manager were to buy and sell a bond simultaneously. We use the entire value of the LCS to measure the uncompensated transaction cost because the difference between the index price and the manager's execution price is the entire bid-offer spread.
[4] As previously explained, the portfolio manager will purchase new index bonds at the offer price even while the index marks them at the bid. As such, to accurately measure the manager's cash need, we need to scale up C by its LCS. The values of C that we show include their LCS cost.

However, if BAL > 0, then the passive index manager has surplus cash left over after purchasing new index bonds. This positive BAL will have to be invested *pro rata* in all existing index bonds. Managers bear UTCs when reinvesting BAL because they must pay the offer price, whereas the index marks all bonds at the bid. We can compute the UTC resulting from BAL > 0 by multiplying the BAL by the average LCS across all bonds in the HY Index.

To summarize, in any month, the manager will bear UTCs (and suffer a performance drag) from either or both of the following:

$$C > 0$$

$$BAL = A + B - C > 0$$

The magnitude of the performance drag depends on the magnitude of the market value subject to UTCs and the relevant bid-ask cost (i.e., LCS).[5]

UTC (%MV) Source	Relevant Bid-Ask Cost
C > 0	Average LCS of New Index Bonds
MAX[BAL, 0]	Average Index LCS

Measuring a Passive USD HY Index Manager's Performance Drag

As noted above, the primary source of UTCs arises from buying new index bonds that enter the HY Index. Algebraically, if there are *n* new bonds in the HY index, and $\%MV_i$ and LCS_i are their index (beginning-of-the-month) market value weights (in bp) and LCS (in bp), respectively, the uncompensated transaction cost incurred by buying new index bonds is:[6]

$$UTC_{C>0} = \sum_{i=1}^{n} \%MV_i \times LCS_i \qquad (1)$$

Figure 1 shows the amount (in % MV of the index) of new bonds entering the HY index during January 2007-December 2011. In 2009, a period of market stress, there was a relatively large amount of downgraded bonds. The right panel of Figure 1 shows that the volume of downgraded bonds was sometimes relatively high when they were particularly costly to trade.

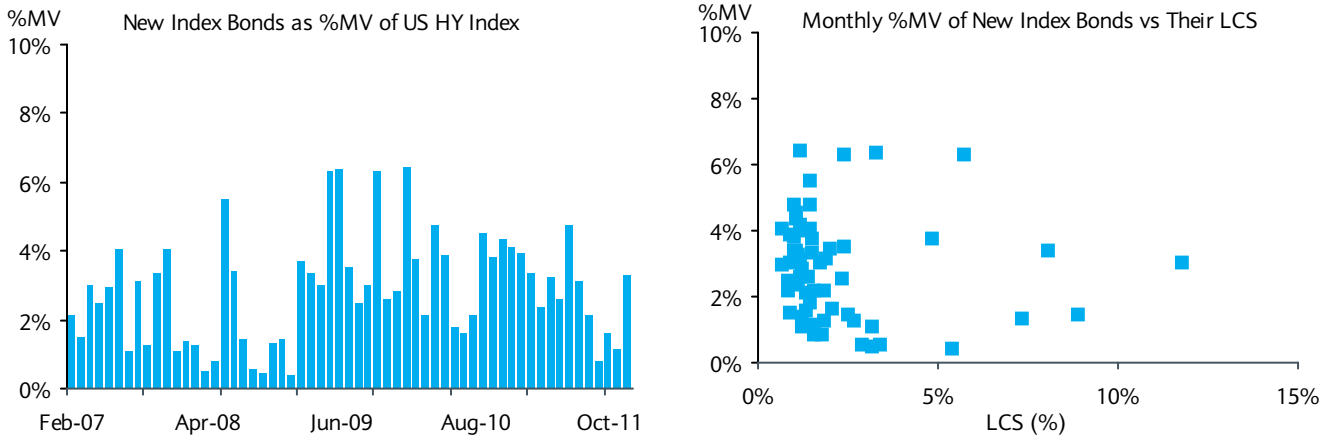
The other source of UTCs is the need, at times, to reinvest excess cash (i.e., MAX[BAL , 0]). Algebraically, the cost resulting from net cash reinvestment is:

$$UTC_{Domestic,BAL>0} = Max[Exits + Coupon - New\,Bonds, 0] \times LCS \qquad (2)$$

[5] There are some index rules that give the passive manager a performance *boost* relative to the index. Specifically, the index does not reinvest intra-month cash flows (and therefore earns a zero return) until the end of the month. In contrast, the manager can begin earning interest on these intra-month cash flows (e.g., coupon payments) as received. From 2007 to 2011, overnight Libor varied from over 5% per annum to almost zero. However, even if it were relatively high (e.g., 5%), the performance boost would likely be tiny. Assuming a HY Index coupon rate of about 0.667% per month, and that this is paid out uniformly over the month, we estimate the performance boost to be: 0.05 x 30/360 x 0.333% = 0.14bp per month, or approximately 2bp per year. Given this small size, we ignore it in our performance drag analysis.

[6] If at the end of month 1 the index will be adding the n new bonds, this will be recorded as a UTC for month 2. Similarly, for the UTC arising from net cash investment: if the index has net cash to reinvest at the end of month 1, this will be recorded as a UTC for month 2.

Figure 1: %MV and LCS of New HY Index Bonds and Their LCS

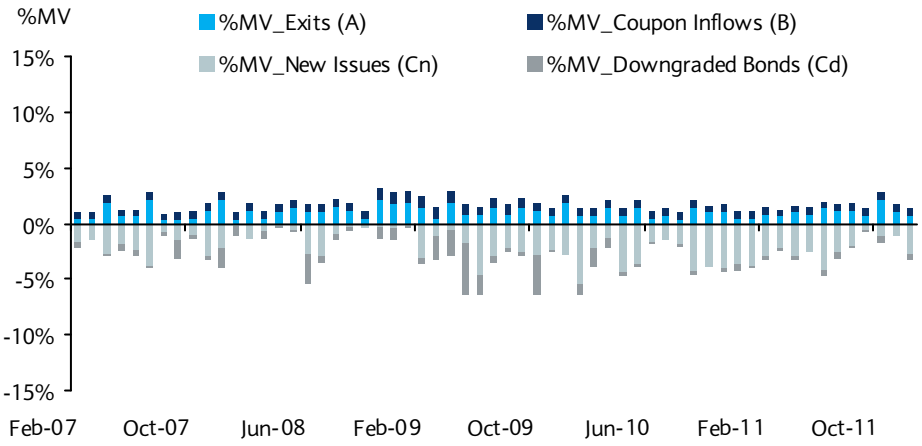


Source: Barclays Capital

From January 2007 to December 2011, UTC from reinvesting net cash was incurred only during 12 months, as BAL was greater than zero for only these months. In other months, all internally generated cash could be reinvested by buying new index bonds with no incremental performance drag beyond the UTC arising from new bonds.

Figure 2 shows the index %MV of the various BAL elements. Transaction costs are incurred in any month if the bar above the x-axis is longer than the bar below it.

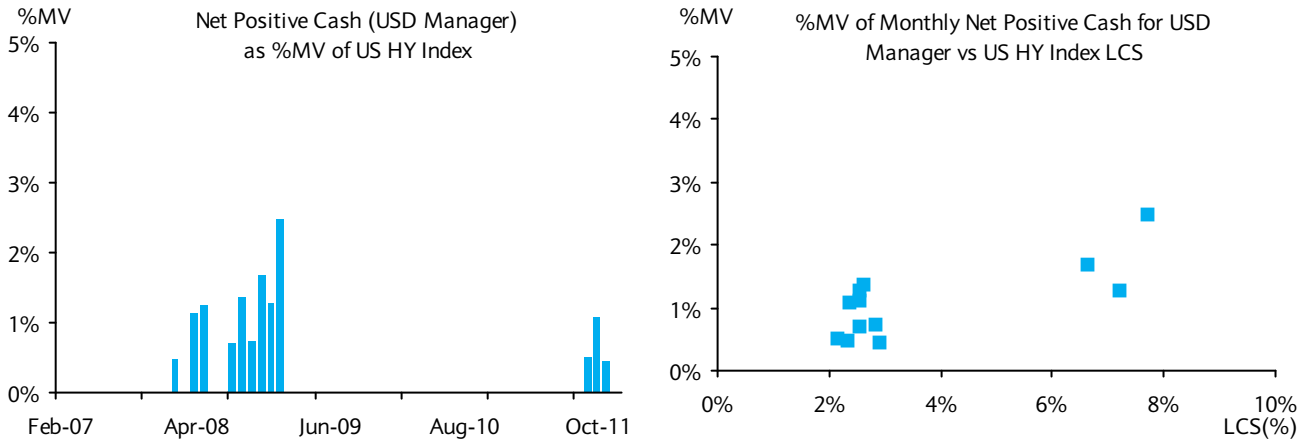
Figure 2: Monthly BAL Components for a USD Manager



Note: There are two sources of new bonds entering the HY Index (C): newly issued HY bonds (Cn) and downgraded IG bonds (Cd). Source: Barclays Capital

The bars in the left panel of Figure 3 show any net positive cash flows from the elements depicted in Figure 2 (i.e., Max[BAL, 0]). The right panel shows that a passive manager sometimes had net cash to reinvest when LCS was high. This is because new issuance can dry up during distressed times, leaving the manager with excess cash to invest *pro rata* across all the bonds in the index when it is relatively expensive to do so.

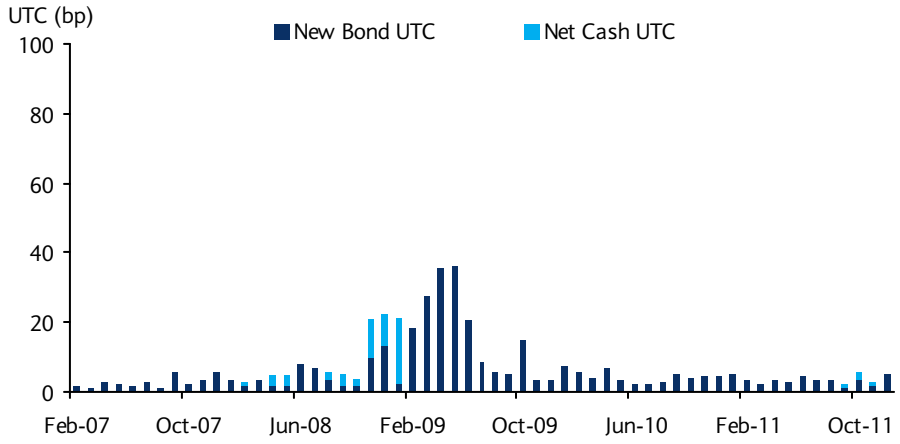
Figure 3: Index Net Positive Cash Flow for a USD Manager and HY Index LCS



Source: Barclays Capital

Figure 4 sums the two components of monthly UTCs. As expected, the total UTC was mostly the cost from buying new index bonds, except for some months when there was positive net cash reinvestment cost (the light bars). The average UTC from January 2007 to December 2011 was 7bp per month, or approximately 86bp per year. The total in 2008 was 91bp, of which 35bp resulted from net cash reinvestment. The total in 2009 was 201bp, of which 19bp resulted from net cash reinvestment. The annual UTC was relatively low in 2007,[7] 2010 and 2011, at 31bp, 53bp and 46bp, respectively, all but 5bp of which was from buying new index bonds. To put the magnitude of the performance drag in perspective, over the 5-year period, reported index compounded returns were 42.3%, while a passive manager would have returned 36.5% net of the performance drag. This 5.8 point reduction is approximately 14% of index total returns over the period.

Figure 4: UTC for USD HY Index Manager



Source: Barclays Capital

[7] With LCS first available at the end of January 2007, February 2007 is the first month for which we can calculate the performance drag. As such, the 2007 numbers represent the performance drag for only 11 months.

Compared with active HY manager alpha, the magnitude of UTC is even more meaningful. Over 2007-11, the average annual active HY manager alpha (net of fees) was -16bp.[8] Although active managers are not, by definition, slaves to index rules, all managers must deal with cash reinvestment and consider whether to buy new index bonds. The magnitude of UTCs reflects, to some degree, the performance headwinds faced by all HY managers, and may help explain some of the underperformance of the average HY manager.

Figure 5: UTC Summary for a Passive High Yield Index Manager (in bp)

	UTC New Bonds	UTC Net Cash	Total UTC
2007	31.4bp	0.0bp	31.4bp
2008	56.2	35.0	91.2
2009	181.8	19.2	201.0
2010	53.3	0.0	53.3
2011	41.2	5.0	46.2
2/2007 - 12/2011			
Monthly avg	6.2bp	1.0bp	7.2bp
Annual avg	74.0	12.0	86.1

Source: Barclays Capital

Additional Performance Drag for Currency-Hedged HY Manager

So far, we have examined the UTCs incurred by a USD-based HY Index manager. However, passive managers based outside the US usually hedge their USD currency exposure. For these managers, another major source of net cash inflow (that must be reinvested) is the cash mark-to-market gain from the currency hedge when the USD depreciates. These hedge gains, HedgePL, can be large relative to the other sources. When there is currency hedging, BAL is now defined as: BAL ≡ A + B – C + HedgePL. The UTC arising from new index bonds remains unchanged.

To quantify the UTC from currency hedging, we consider a EUR-based manager, passively invested in US HY Index exposure with an FX overlay. The passive manager uses the same currency hedging rules as does the hedged index. If the index value is IV, the index assumes that this value will earn the index yield and grow to $IV(1+y/2)^{1/6}$ next month, where y is the index yield-to-worst. This is the notional amount of the currency hedge. The index uses 1-month currency forwards to execute this hedge.[9]

The manager sells USD and buys EUR one-month forward. If the future spot EUR were to appreciate (depreciate) relative to the forward rate at the time of hedging, the hedge would produce a cash inflow (outflow) that must be reinvested (raised). These hedging cash flows need to be added to the earlier net cash inflows (A + B – C). Unlike the other components of BAL, HedgePL can be both positive and negative, depending on exchange rate movements.

[8] Active manager alpha is measured over 16 managers with self-reported monthly active returns from January 2007 to March 2011. The average monthly alpha was -1.4bp, with a standard deviation of 18bp. Source: *eVestment Alliance*.
[9] *A Guide to the Barclays Capital Global Family of Indices*, Barclays Capital, 2008, pages 123-126.

Figure 6 provides an example. Assume that the one-month forward rate is equal to the current spot rate. The market conditions in the first month (say, January), when the manager enters into the hedge, are shown in the first row.[10]

Figure 6: Currency Hedging Example: Exchange Rates and Index Market Values

	USD/EUR	US HY Market Value (in USD)	US HY Market Value (in EUR)
January	1.3500	100	74.074
February	1.4445	105	72.690

Source: Barclays Capital

At January month-end, the manager sells USD100 forward at the forward rate of 1.3500. The manager will owe USD100 and receive EUR74.074 in one month. During the next month (February), suppose the Index's USD market value increases to 105 and the USD loses 7% versus the EUR. The manager receives EUR74.074 from the hedge, which is converted to USD107 at the February exchange rate of 1.4445, of which USD100 is paid out in the hedge, and USD7 (or EUR4.846) is left over. The manager now has USD105 of index bonds in the same proportion as the index, and also has USD7 available in cash. This cash (HedgePL = 6.67% of the latest MV (i.e., 7/105)) needs to be reinvested, *pro rata*, into index bonds.

If the USD had appreciated instead, the manager would have had a cash outflow on the hedge. He would obtain this cash by selling, *pro rata*, a portion of his portfolio. Since he receives the bid price, which is also the index mark for the bonds, he does not bear UTC from USD appreciation.

More formally, let us define the following notation:

- IV_0 is the beginning-of-month index market value in USD
- IV_1 is the index market value in USD one month later
- y is the annual index yield-to-worst in USD at end-of-month *0*
- $E_{S,0}$ is the spot exchange rate (USD/EUR) at the end of month *0*
- $E_{S,1}$ is the spot exchange rate (USD/EUR) one month later
- $E_{f,0}$ is the 1-month forward exchange rate (USD/EUR) at the end of month *0,* which is the rate at which the manager can lock in to the next month.

The index value in the manager's (base) currency at the end of month *0* is $IV_0/E_{S,0}$. Following the index's hedging convention, the manager hedges USD $IV_0 \times (1+y/2)^{(1/6)}$. So the manager has contracted to receive EUR $[IV_0 \times (1+y/2)^{(1/6)}]/E_{f,0}$ one month forward.

At the end of the next month, the manager converts this amount into USD at the prevalent spot rate, $E_{S,1}$ to get USD $IV_0 \times (1+y/2)^{(1/6)} \times [E_{S,1}/E_{f,0}]$, which is used to pay out USD $IV_0 \times (1+y/2)^{(1/6)}$ due on the currency hedge. Therefore, the net cash inflow is USD $IV_0 \times (1+y/2)^{(1/6)} \times [E_{S,1}/E_{f,0} - 1]$, which is positive if the next month's USD depreciation is more than what was priced in by the forward rate at the beginning of the month. To express this quantity in %MV terms, we divide by next month's index market value, IV_1:

[10] This simple example ignores the bid-ask spread in the currency spot and forward markets. Also, it assumes the manager hedges only the entire amount of the current index value, without making any adjustments to the notional for expected growth (i.e., yield) of the index. These simplifications are removed when we compute UTCs for a currency-hedged EUR manager.

$$\%MV_{HedgePL} = \frac{IV_0}{IV_1} \times (1 + y/2)^{(1/6)} [\frac{E_{S,1}}{E_{f,0}} - 1] \quad (3)$$

The monthly uncompensated transaction cost is:

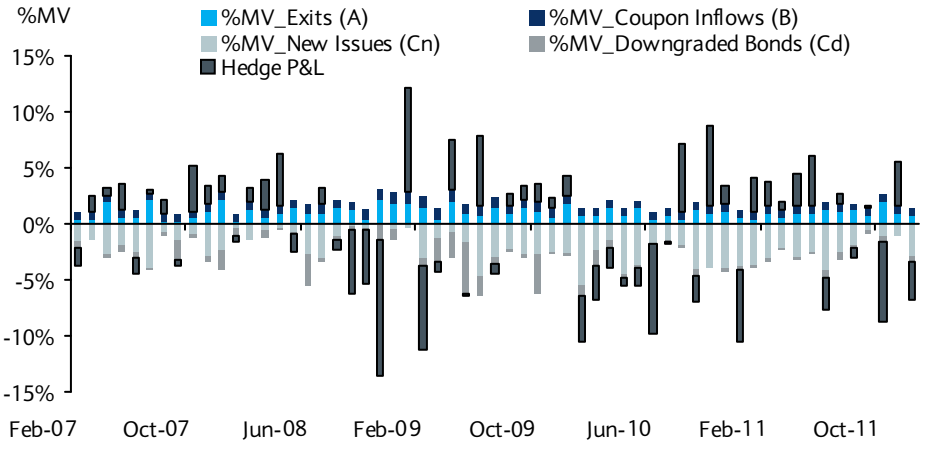
$$UTC_{Foreign,BAL>0} = \text{Max}\{\text{Exits} + \text{Coupon} - \text{New Bonds} + \text{HedgePL}, 0\} \times \text{LCS} \quad (4)$$

To finish the simple example, assume that the monthly coupons are 0.7%, the monthly exits from the index are 1%, and the new issuance this month is 2%. There is a BAL of 6.37% of MV (= 6.67% + 0.7% + 1.0% - 2.0%) that needs to be reinvested. The UTC resulting from this, based on the Index LCS at the end of February (assume 5.000%), would produce a performance drag of 31.85bp (= 6.37% x 5.000%). Had there been no currency effects, there would have been no UTC in February, as the BAL would have been negative. The UTC from purchasing new index bonds remains the same as (1) earlier and is in addition to (4).

To determine the transaction-cost effect of putting on a currency hedge, we repeat the above exercise for every month from January 2007 to December 2011. Over this period, there are some large swings in the USD/EUR exchange rate.

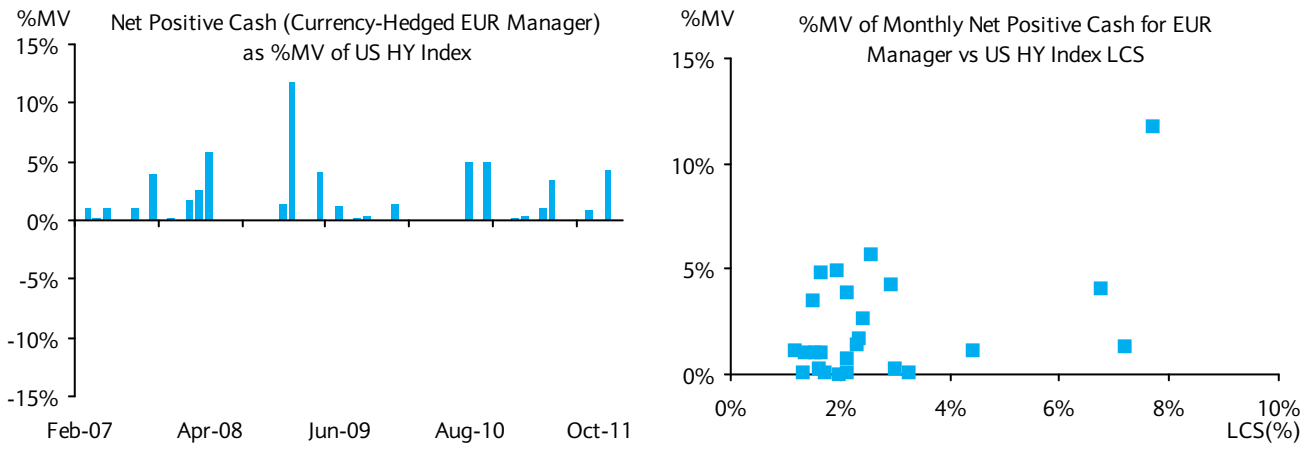
HedgePL cash flows can be large, as the entire index value is hedged. As a result, unlike for a USD manager, there are many more months in which the %MV of sources of cash inflows exceeds that of new issues, leading to UTCs. Figure 7 shows the month-by-month %MV of various cash flow sources. This is similar to Figure 2, but now includes HedgePL. The currency hedge flows, which show up as positive values when EUR appreciates relative to the forward rate and negative when USD appreciates, often dominate the cash flows.

Figure 7: Monthly BAL Components for a Currency-Hedged EUR Manager



Source: Barclays Capital

Figure 8: Net Positive Cash Flow for a EUR Manager and HY Index LCS



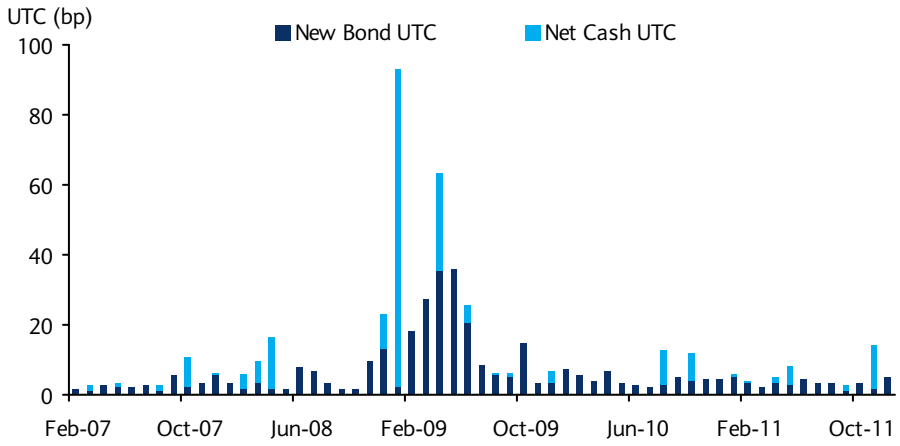
Source: Barclays Capital

Figure 8 (left panel) shows the monthly net positive cash flows for a currency-hedged EUR manager by netting the monthly BAL components in Figure 7. The manger must re-invest this cash at the offer price. The right panel shows the relationship between the amount of net positive cash and the level of market liquidity. During the US credit crisis, the EUR appreciated strongly and LCS increased sharply. Consequently, hedged HY managers faced very high UTC from cash reinvestment.

Figure 9 computes the total (and shows the components) of UTC for a currency-hedged EUR-based HY manager. There is a distinct increase in the transaction cost from deploying net cash. The average annual net cash reinvestment cost over the period is 43bp, compared with 12bp for the domestic HY manager.

The average UTC from January 2007 to December 2011 was approximately 10bp per month, or 117bp per year. The total uncompensated cost in 2009 was 310bp (compared with 201bp for the domestic manager), of which 129bp resulted from net cash reinvestment.

Figure 9: UTC for a Currency-Hedged EUR-Based HY Index Manager

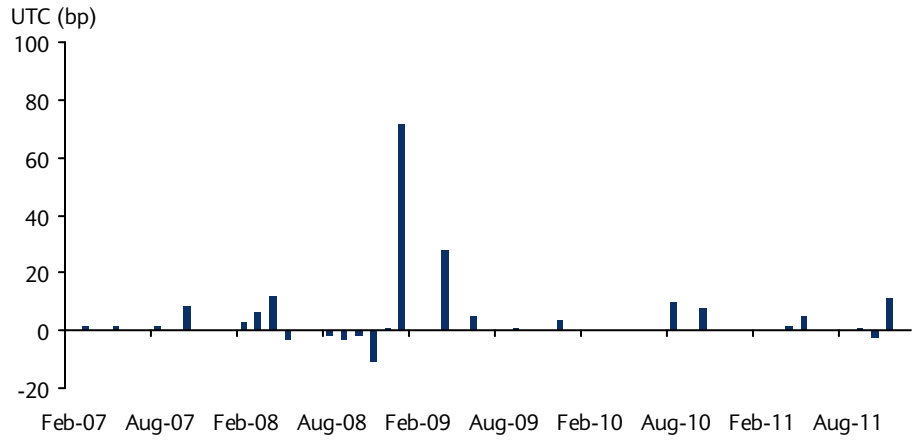


Source: Barclays Capital

Figure 10 isolates the transaction costs that foreign managers incur because of cash flows generated from passive currency hedges. There are a few months in which transaction cost

declines (e.g., September 2008) because a large dollar appreciation (i.e., negative HedgePL) offsets some significant positive cash flows from coupons or index exits. However, in most months during our sample period, currency movements were a significant source of cash inflows, which had to be re-invested in the index, producing UTC that managers must bear.

Figure 10: Currency Component of UTC for a Currency-Hedged EUR-Based HY Manager



Source: Barclays Capital

Additional Drag: UTC from FX Bid-Ask Spreads

So far, we have ignored another source of UTC for currency-hedged, non-USD managers: bid-ask spreads in the foreign exchange market. The index executes FX transactions at the reported "mid" price, whereas managers transact at the bid when selling USD forward and at the offer when unwinding the trade at spot one month later. While the FX bid-mid and mid-ask spreads are not large, the FX hedge must be on the entire value of the index and is a persistent uncompensated cost that accumulates every month. While the average annual UTC from FX costs (31bp) is half the UTC arising from new index bonds (73bp), it is still a source of significant performance drag.

Incorporating FX bid-ask spreads affects the UTC calculation analysis in two ways. The first is that the manager's FX transactions are executed on either the bid or the offer side, whereas the index executes at mid. This unambiguously reduces the manager's HedgePL (and reduces the value of BAL), since the net currency return will be less than that of the index, as the manager always executes on less favourable terms. Specifically, the manager sells USD forward, so the forward transaction will be executed on the offer side $E_{f,0}^{offer}$ (i.e., if mid is USD1.5/EUR, the manager will be selling USD and buying EUR at a higher rate). A month later, the EUR is converted to USD at the spot bid rate, $E_{S,1}^{bid}$. So if $E_{f,0}^{offer}$ is the offer rate in the 1-month forward market at the end of month 0 and $E_{S,1}^{bid}$ is the spot bid rate at the end of month 1, the HedgePL is modified as follows (5):

$$\%MV_{HedgePL} = \frac{IV_0}{IV_1} \times (1 + y/2)^{(1/6)} [\frac{E_{S,1}^{bid}}{E_{f,0}^{offer}} - 1] \quad (5)$$

With $E_{S,1}^{bid} < E_{S,1}^{mid}$ and $E_{f,0}^{offer} > E_{f,0}^{mid}$, the new BAL will always be less than or equal to the BAL in (4). This reduction helps *lower* UTC, as less net cash will need to be reinvested and incur the LCS cost. However, this BAL reduction is relatively small. For January 2007 to December 2011, the difference between $\{E_{S,1}^{bid}/E_{f,0}^{offer}\}$ and $\{E_{S,1}^{mid}/E_{f,0}^{mid}\}$ averaged only

2.6bp, which, when multiplied by the LCS, suggests an extremely small effect on UTC from the reduction in net cash.

The second effect of FX bid-ask spreads on UTC is that it produces a separate, outright UTC borne by the manager. Since the manager always executes at less favorable FX rates than the index, the manager suffers a performance drag independent of the effect on BAL. This additional UTC component, a *currency-hedge execution cost*, captures the return difference arising from the difference in FX execution prices. Given that the P&L from the hedge for the manager and the index are $IV_0(1+y/2)^{1/6}$ $[(E_{S,1}^{bid}/E_{f,0}^{offer}) - 1]$ and $IV_0(1+y/2)^{1/6}[(E_{S,1}^{mid}/E_{f,0}^{mid}) - 1]$, respectively, the currency-hedge execution UTC is:

$$UTC_{Currency\ Hedge\ Execution} = \frac{IV_o(1+\frac{y}{2})^{(1/6)}}{IV_1}[\frac{E_{S,1}^{mid}}{E_{f,0}^{mid}} - \frac{E_{S,1}^{bid}}{E_{f,0}^{offer}}] \quad (6)$$

Over January 2007-May 2011, the monthly $UTC_{Foreign,\ Currency\ Hedge\ Execution}$ was relatively constant, averaging 2.5bp (or approximately 30bp per year), with a monthly maximum and minimum UTC of 2.9bp and 2.2bp, respectively.

The average UTC, including the drag from FX bid-ask spreads, from January 2007 to December 2011 was 12bp per month, or approximately 149bp per year. The total in 2009 was 341bp (compared with 201bp for the USD-based manager). The annual UTC in all years were quite a bit higher than for a USD-based manager. To put the magnitude of the performance drag in perspective, over the 5-year period, reported hedged index compounded returns were 36.6%, while a passive manager would have returned 27.2% net of the performance drag. This 9.4 point reduction is more than 25% of hedged index total returns.

Figure 11: Summary UTC for a Passive Currency-hedged EUR-based HY Index Manager (bp)

	UTC New Bonds	UTC Net Cash (EUR Investor)	HedgePL impact on UTC Net Cash	UTC FX Bid-Ask Spread	Total UTC
2007	31.4bp	13.0bp	*13.0bp*	25.0bp	69.4bp
2008	56.2	34.3	*-0.7*	31.7	122.1
2009	181.8	127.7	*108.5*	31.3	340.8
2010	53.3	17.6	*17.6*	32.9	103.7
2011	41.2	21.3	*16.3*	33.8	96.3
2/2007 - 12/2011					
monthly avg	6.2bp	3.6bp	*2.6bp*	2.6bp	12.4bp
annual avg	74.0	43.5	*31.5*	31.4	149.0

Source: Barclays Capital

Conclusion

The dynamic nature of an index requires a passive manager to make portfolio adjustments as bonds enter and exit the index. As most managers are undoubtedly aware, these bond flows generate transaction costs that their portfolios pay but the index usually does not.

Given the availability of LCS, we can now quantify the magnitude of the performance drag arising from UTCs. For a USD-based manager, the UTC performance drag averaged 86bp per year, ranging from 31bp in 2007 to 201bp in 2009. Much of this arose from the requirement of buying new index bonds at the offer while the index buys them at the bid.

For currency-hedged non-USD based HY managers, the UTC is larger due to the P&L from FX hedging, which can generate large amounts of cash that need to be reinvested in the index. This requires the manager to buy index bonds at the offer, whereas the index implicitly reinvests cash at the bid. In addition, the currency-hedged manager must bear the UTC of executing FX transactions at the bid/offer, whereas the index executes all FX transactions at the mid.

For a currency-hedged EUR-based manager, the UTC performance drag averaged 149bp per year, ranging from 69bp in 2007 to 341bp in 2009, substantially larger than for a USD-based manager.

HY managers face significant performance headwinds, and the magnitude of the performance drag could help explain why the average active high-yield manager alpha (net of fees) was -16bp per annum over the period.

References

Dastidar, S. and B. Phelps, October 2009, *Introducing LCS – Liquidity Cost Scores for US Credit Bonds,* Barclays Capital.

A Guide to the Barclays Capital Global Family of Indices, Barclays Capital, 2008.

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