Quantitative Portfolio Strategy
Research

Simon Polbennikov
+44 20 3134 0752
simon.polbennikov@barclays.com
Barclays, UK

Uncompensated rebalancing costs induced by currency-hedging

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PLEASE SEE ANALYST CERTIFICATIONS AND IMPORTANT DISCLOSURES BEGINNING ON PAGE 34.

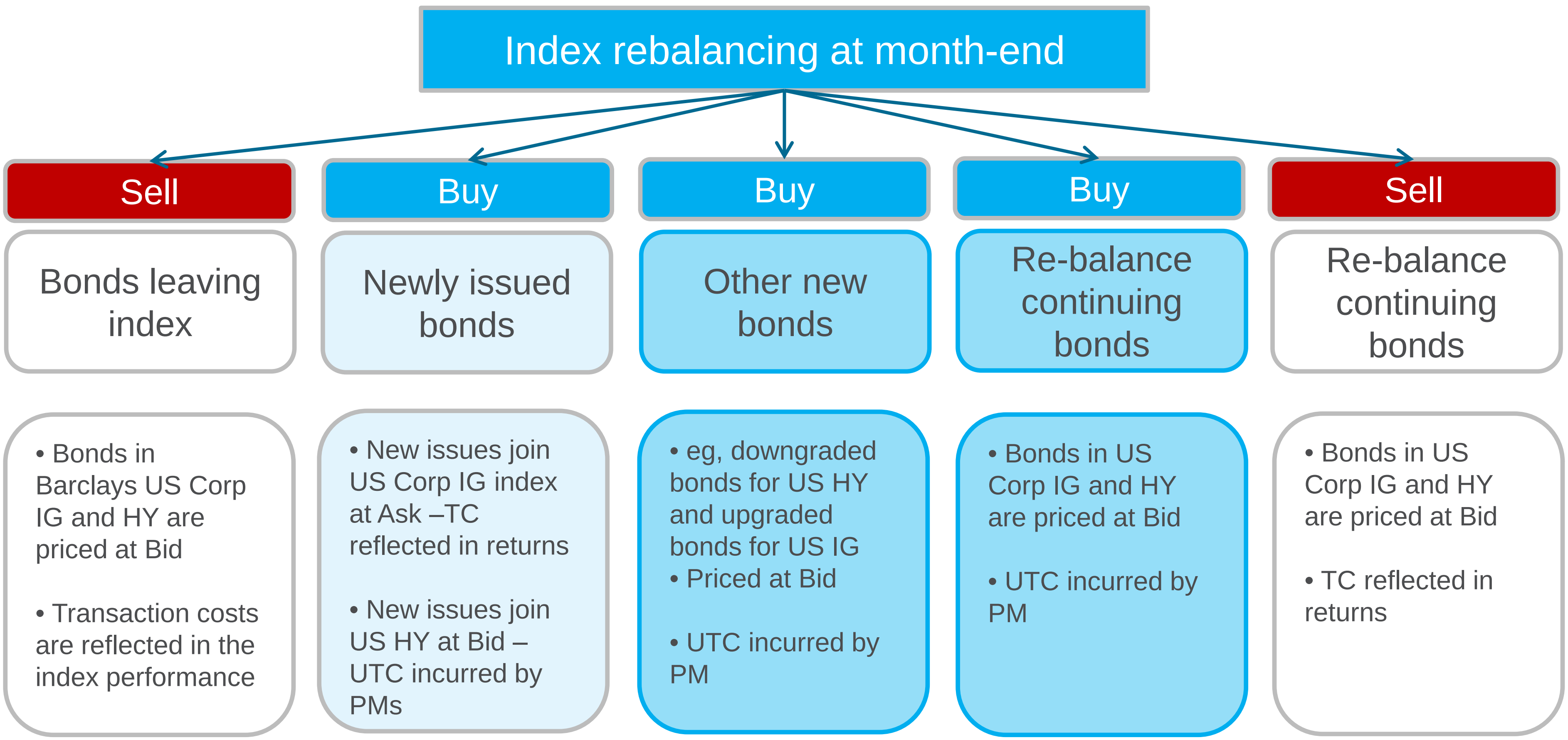
Executive summary

- Global investors in US fixed income mandates often prefer to hedge currency risk
- Overlay of currency forwards used to hedge FX exposure interacts with the underlying portfolio
- Currency-hedged benchmarks assume FX gains and losses to be reinvested cost-free
- However, reinvesting FX gains and losses in practice induces incremental turnover and transaction costs (TC)
- Importantly, TC induced by currency hedging are divided pro-rata among portfolio owners, including unhedged domestic investors
    - This unnecessarily penalises investors who do not require currency-hedging
- We quantify incremental TC induced by currency hedging in different US fixed income mandates
- We measure TC associated with hedging portfolio returns into G10 currencies
- We consider possible remedies to reduce induced TCs:
    - Asset managers can offer share classes hedged into different currencies in order to diversify gains and losses from respective FX overlays – rebalancing TC should decline due to reduced FX overlay volatility;
    - Asset managers can reinvest gains and losses resulting from the FX overlay less frequently – as positive and negative currency returns offset each other over time, rebalancing TCs should decline;
    - Portfolio managers can adopt currency-hedged indices that do not require frequent rebalancing of FX gains and losses

- This analysis is related to our previous study on uncompensated transaction costs in US HY portfolios:
    - *HY Investing: Manager Performance Drag from Uncompensated Transaction Costs*, 17 February 2012 (Bruce Phelps and Ariel Edelstein)

Index monthly rebalancing

- We split index turnover, caused by monthly rebalancing, into five separate parts
- Depending on index conventions, some rebalancing transactions can induce uncompensated TC (UTC)
- In this analysis we use Barclays index pricing conventions (see the diagram below)



Source: Barclays Research

Turnover calculation

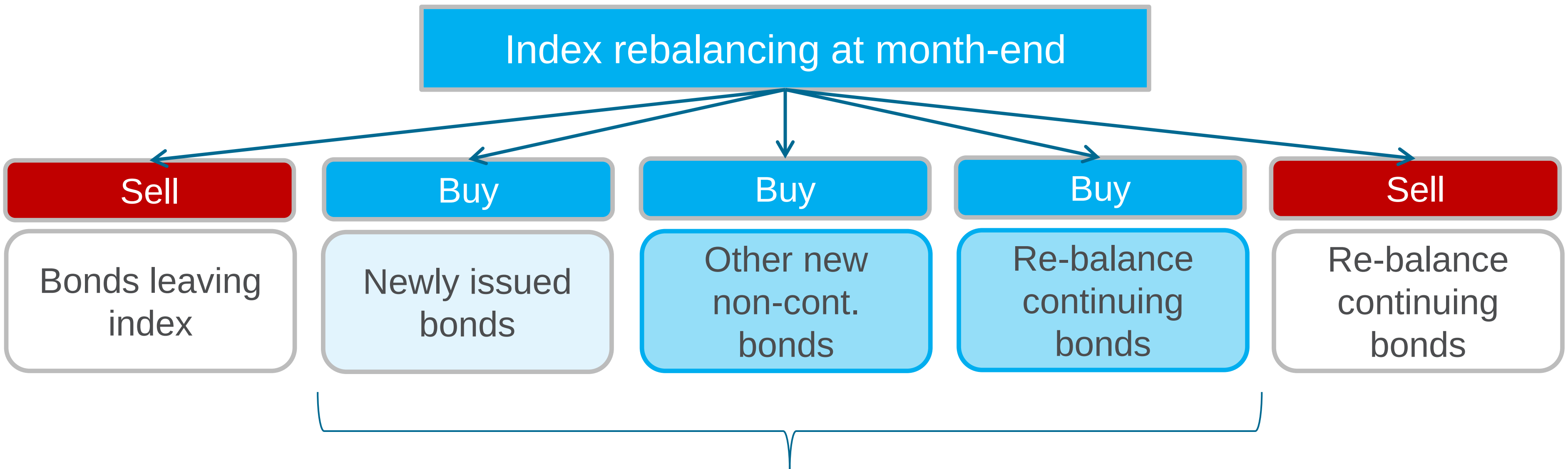
- Portfolio turnover is calculated by comparing portfolio weights in the end of month *t* with benchmark weights in the beginning of month *t+1*
  - Portfolio is rebalanced monthly to match index weights
  - Different components of portfolio turnover are calculated for sold and purchased bonds
  - UTC are usually incurred for purchased bonds only (given Barclays index conventions)

Portfolio EoM: *t*		Benchmark BoM: *t+1*	Turnover
Leaving Bonds $w^p_{1\ldots k} > 0$	sell	$w^b_{1\ldots k} = 0$	$\sum_{i=1}^{k} w_i^p$
Continuing Bonds $w^p_{k+1\ldots m} < w^b_{k+1\ldots m}$	buy	$w^b_{k+1\ldots m} > w^p_{k+1\ldots m}$	$\sum_{i=k+1}^{m} \left(w_i^b - w_i^p\right)$
Continuing Bonds $w^p_{m+1\ldots l} > w^b_{m+1\ldots l}$	sell	$w^b_{m+1\ldots l} < w^p_{m+1\ldots l}$	$\sum_{i=m+1}^{l} \left(w_i^p - w_i^b\right)$
New Issues $w^p_{l+1\ldots N} = 0$	buy	$w^b_{l+1\ldots N} > 0$	$\sum_{i=l+1}^{N} w_i^b$

Source: Barclays Research

Effect of currency-hedging

- When portfolio is currency-hedged, gains and losses of the FX-overlay have to be reinvested
- This is likely to increase UTC associated with monthly rebalancing



- Gains of the FX-overly in a currency-hedged portfolio increases UTC through an increase in the amount of purchased bonds
- Losses of the FX-overly can reduce transaction costs by reducing the amount of purchased bonds (or can also have no effect if the prior portfolio net balance was already negative)

Barclays Research

Induced rebalancing costs and index cash balances

- Effect of FX gains and losses on UTC depends on the EoM cash balance of an unhedged index:
  - **Net Balance = Received Coupons + Leaving Bonds – New Issues – New Joiners**
- Positive balance is reinvested => UTC are incurred
- Negative balance requires selling bonds => no additional UTC (bonds are priced at Bid, so TC are internalised)
- P&L of the FX overlay can change the net cash balance and affect UTC as a result
  - The table below explains possible outcomes for incremental UTC
  - If FX P&L increases the balance, UTC typically rise
  - If the FX P&L reduces the balance, UTC decline or remain unchanged

Effect of the net cash balance on UTC

Net Balance ex FX P&L	FX P&L	Net Balance with FX P&L	Effect on UTC
Positive	Positive	Positive	Increase
Positive	Negative	Positive/Negative	Decrease
Negative	Positive	Positive	Increase
Negative	Positive	Negative	=
Negative	Negative	Negative	=

Source: Barclays Research

Uncompensated rebalancing costs induced by currency-hedging of the US Corporate IG Index

Turnover and UTC of Barclays US Corporate IG

- We attribute annual turnover for Barclays US Corp IG hedged into G10 currencies
- Turnover components contributing to UTC are
  - Re-balancing buy of continuing bonds (reinvested cash balances)
  - Purchase of "old" bonds joining the index (eg, upgraded bonds from HY)
- Note: turnover is calculated as % MV of the unhedged index (monthly FX P&L is NOT included)
- Note: transaction costs are calculated using on Liquidity Cost Scores wrt. the overall MV (including FX P&L)

Incremental Turnover and UTC Induced by FX-hedging of US Corp IG, Feb 2007 – Dec 2015

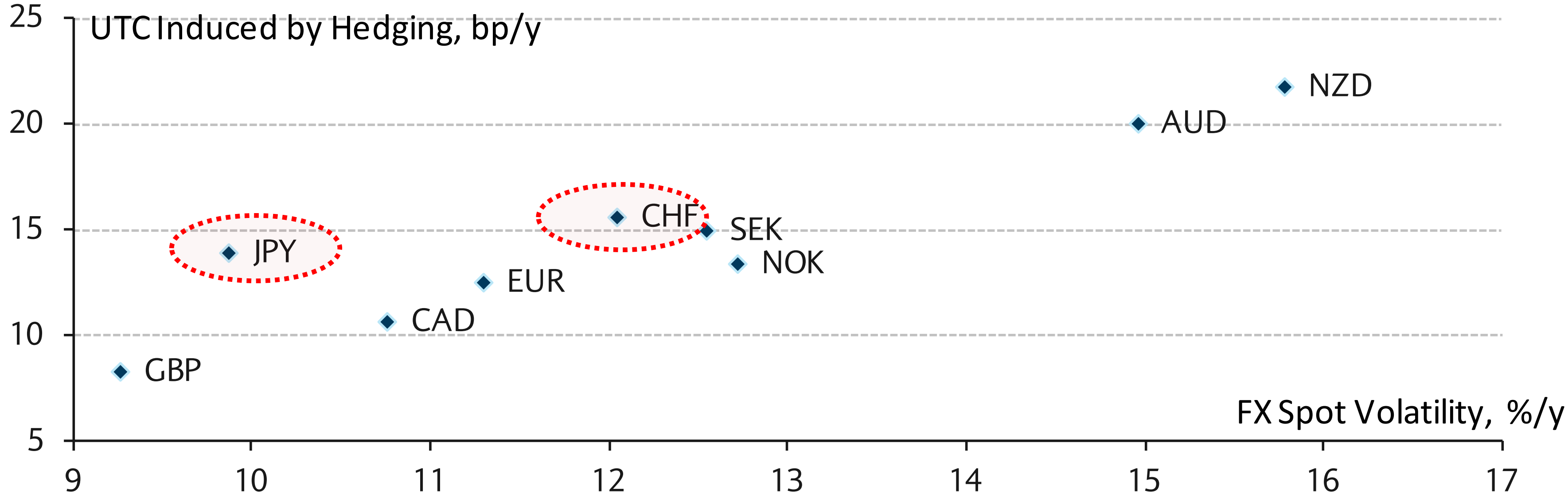
	Received Coupons & FX P&L (% MV of UH / yr)	Leaving Bonds (% MV of UH / yr)	Rebalancing Sell (% MV of UH / yr)	New Issues (% MV of UH / yr)	Other Joining Index (% MV of UH / yr)	Rebalancing Buy (% MV of UH / yr)	Incremental Transaction Cost (bp/yr)
USD	**4.9**	**11.1**	**7.2**	**19.8**	**1.9**	**1.5**	**3.7**
In Excess of the UH Index							
Hedged NZD	3.9	0.0	14.3	0.1	0.0	18.2	21.8
Hedged AUD	3.1	0.0	13.3	0.1	0.0	16.3	20.1
Hedged CHF	2.0	0.0	10.5	0.0	0.0	12.5	15.7
Hedged SEK	-1.2	0.0	13.4	0.0	0.0	12.2	15.0
Hedged NOK	-1.9	0.0	14.0	0.0	0.0	12.0	13.5
Hedged JPY	-0.6	0.0	11.0	-0.1	0.0	10.4	14.0
Hedged EUR	-1.7	0.0	11.4	0.0	0.0	9.8	12.6
Hedged CAD	-1.1	0.0	10.6	0.0	0.0	9.5	10.7
Hedged GBP	-2.5	0.0	10.1	0.0	0.0	7.6	8.4

Source: Barclays Research

UTC induced by FX-hedging versus FX volatility

- UTC induced by currency-hedging are positively related to FX volatility
- We plot incremental UTC (in excess over UTC of unhedged US Corp IG) versus FX volatility
  - Lower UTC are associated with less volatile currencies
  - “Safe haven” currencies (JPY, CHF) seem to have slightly higher UTC for their volatility levels as they tend to appreciate in volatile periods, when liquidity of corporate bonds declines

UTC Induced by FX-Hedging vs. FX Volatility, Feb 2007 – Dec 2015

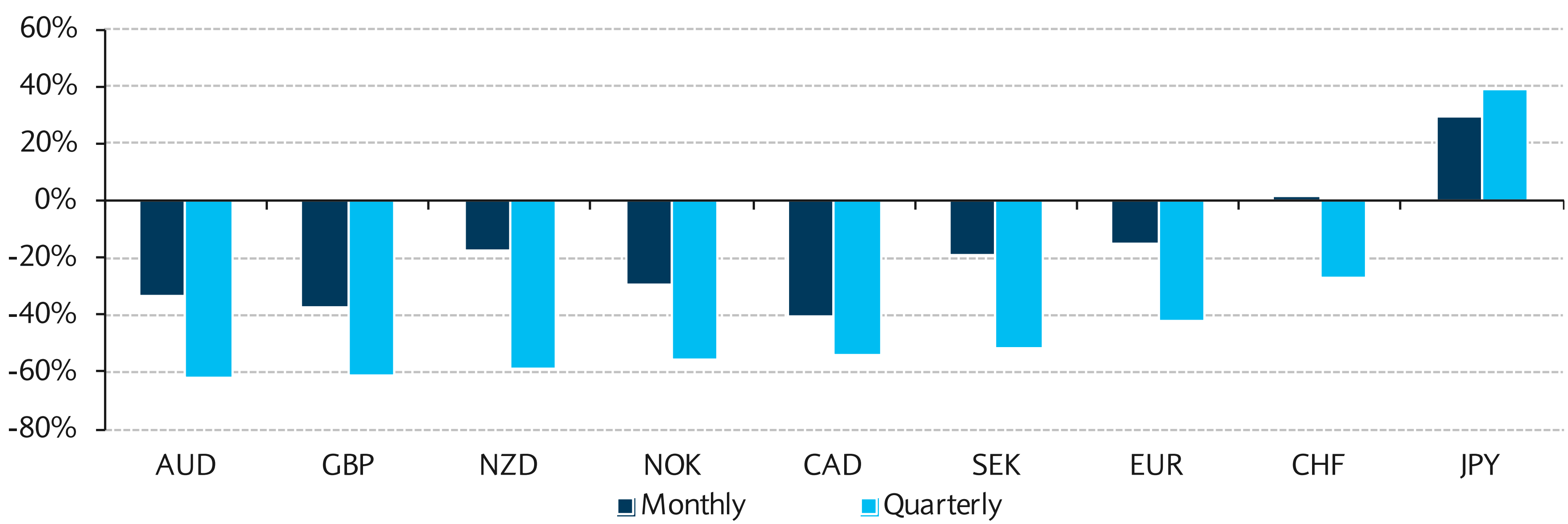


Source: Barclays Research

Correlations between FX and Liquidity Cost Scores (LCS)

- UTC induced by FX-hedging depend on the correlation between currency returns and changes in liquidity
  - Positive correlation between LCS and currency returns is going to increase induced UTC as currencies would appreciate vs. USD when LCS increases
- We report correlations between FX returns and changes in LCS on monthly and quarterly horizons
- Most currencies have negative correlations with LCS changes, leading to lower induced UTC
- The correlation between FX returns and changes in LCS is positive for JPY

Correlations between FX returns and changes in LCS of the US Corp IG Index
Feb 2007 – Dec 2015

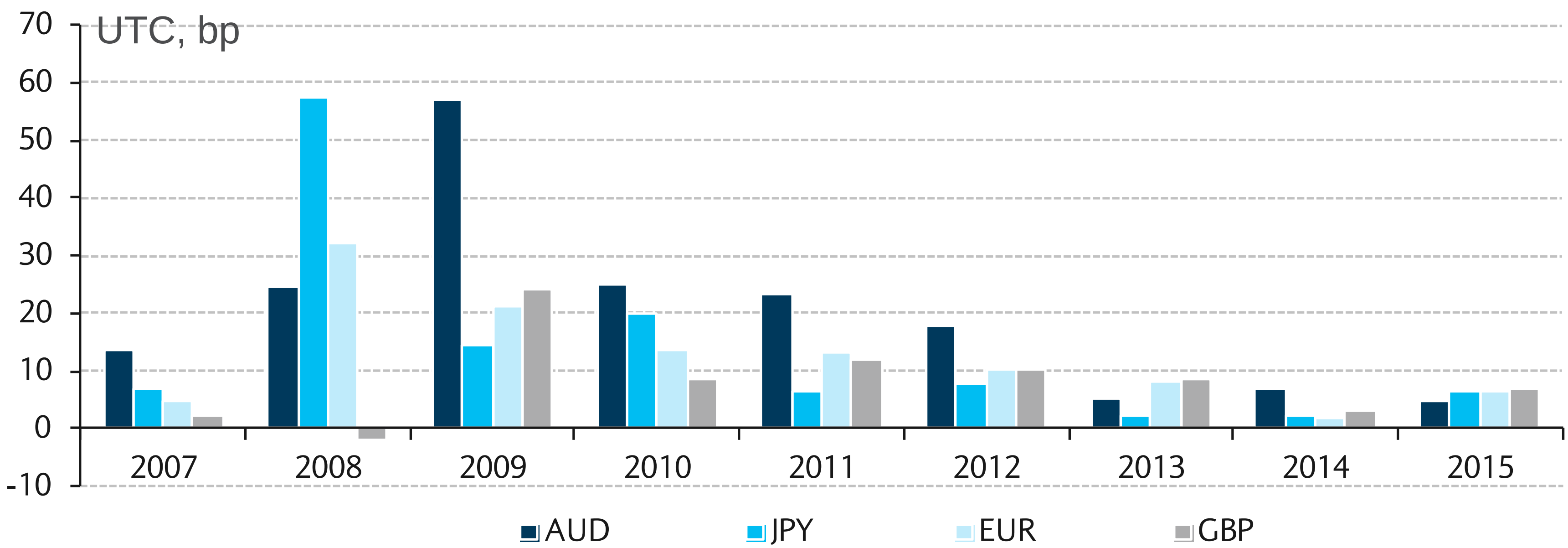


Source: Barclays Research

Yearly UTC induced by FX-hedging

- We report yearly UTC induced by hedging US Corp IG into AUD, JPY, EUR and GBP
- Significant incremental transaction costs were incurred by:
    - JPY-hedged index in 2008 as JPY significantly appreciated relative to USD
    - AUD-hedged index in 2009-2012 as AUD appreciated relative to USD
- UTC induced by FX-hedging have been relatively low in recent years

Incremental yearly UTC induced by hedging US Corp IG into selected currencies

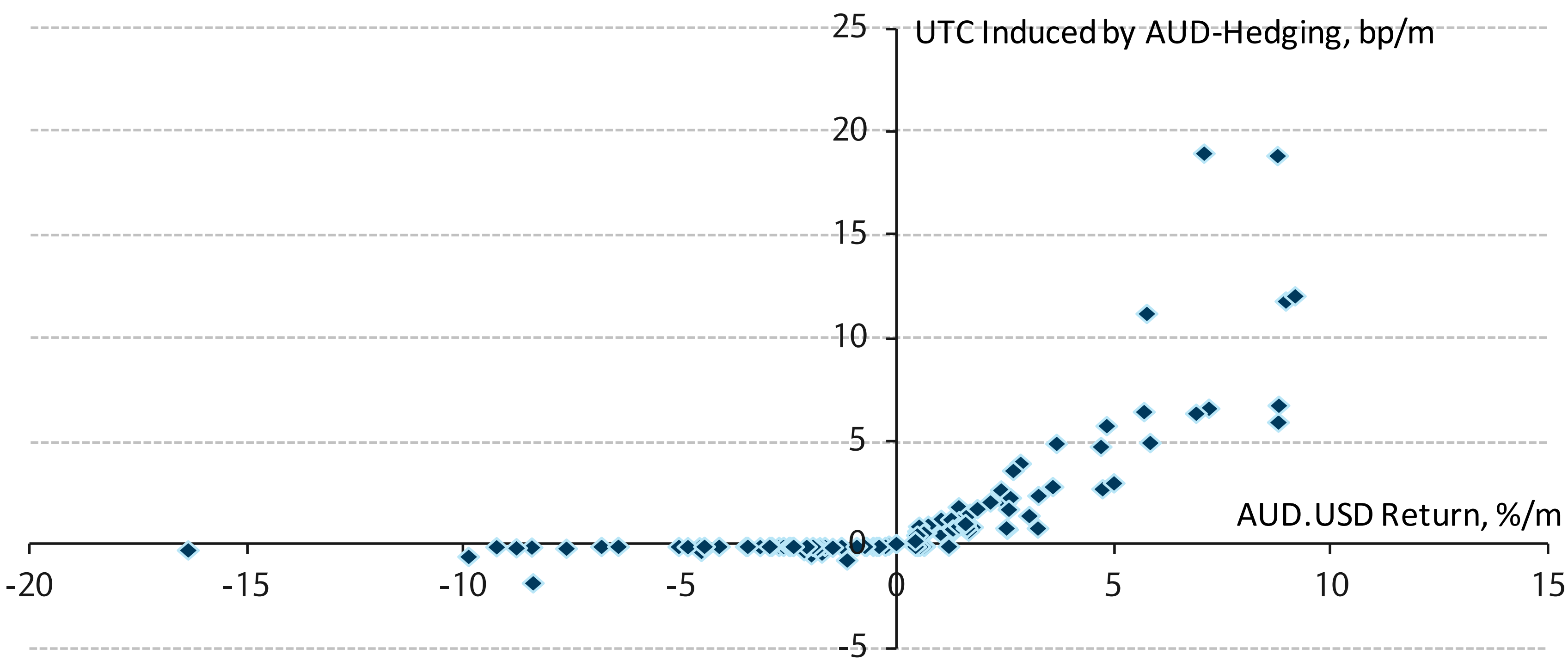


Source: Barclays Research

Induced UTC versus currency returns

- We plot UTC induced by hedging the US Corp IG index into AUD versus returns of AUD.USD
- Appreciation of AUD over USD is associated with incremental UTC since positive P&L of the currency-overlay has to be reinvested in the underlying index
- Negative P&L of the FX overlay does not significantly change TC since net cash balances of the US Corp IG index (ex .FX P&L) are typically negative => TC of selling bonds are reflected in index performance
- Similar pattern holds for other currencies as well

UTC induced by hedging the US Corp Index vs. FX returns, Feb 2007 – Dec 2015



Source: Barclays Research

Uncompensated rebalancing costs induced by currency-hedging of the US HY Index

Turnover and UTC of the US HY Index

- We calculate incremental turnover and UTC induced by hedging US HY into G10 currencies
- For the US HY index, turnover components contributing to UTC are:
  - Rebalancing buy of continuing bonds
  - Purchase of new bonds joining the index (for US HY newly issued bonds are priced at Bid)
- Incremental UTC induced by FX-hedging varies in the range 4-33bp/y
- UTC of the unhedged US HY index has been very significant: 76bp/y

Incremental turnover and UTC induced by FX-hedging of US HY, Feb 2007 – Dec 2015

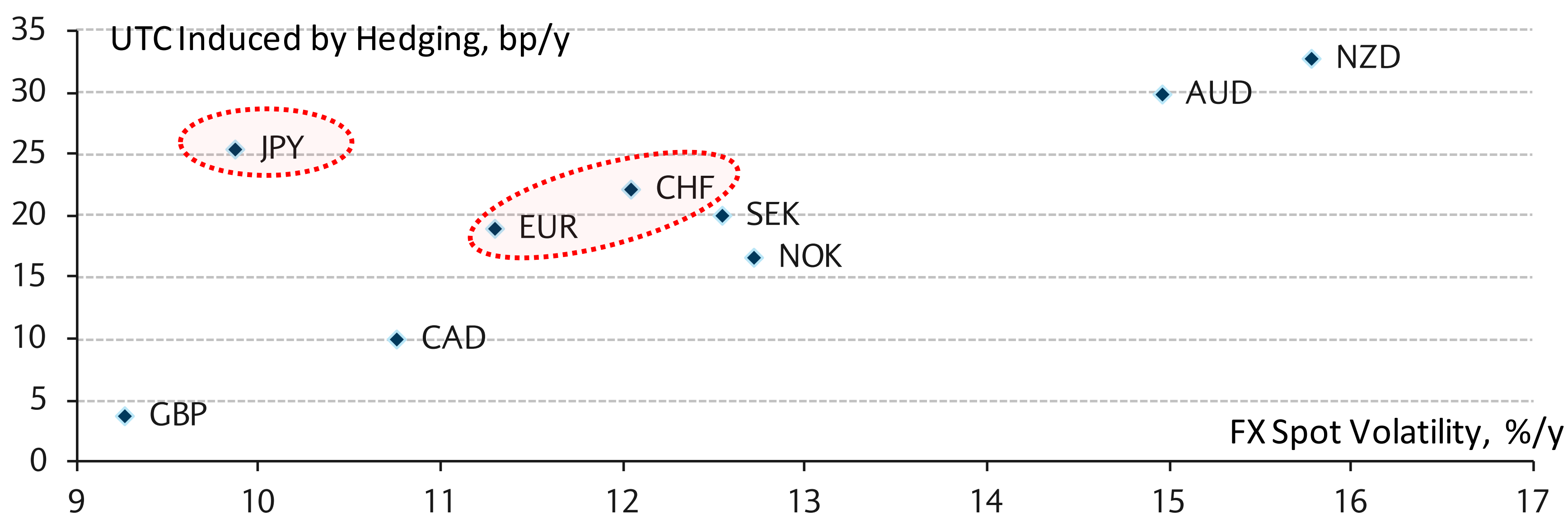
	Cash (% MV of UH /yr)	Leaving Bonds (% MV of UH /yr)	Rebalancing Sell (% MV of UH /yr)	New Issues (% MV of UH /yr)	Other Joining Index (% MV of UH /yr)	Rebalancing Buy (% MV of UH /yr)	Incremental Transaction Cost (bp/y)
Unhedged	**7.7**	**23.4**	**10.0**	**24.8**	**8.3**	**8.0**	**75.9**
In Excess of the UH Index							
Hedged NZD	3.4	0.0	11.4	0.2	0.0	14.5	32.9
Hedged AUD	2.5	0.0	10.6	0.2	0.0	12.9	30.0
Hedged CHF	1.8	0.0	7.7	0.1	0.0	9.5	22.2
Hedged SEK	-1.7	0.0	11.3	0.0	0.0	9.6	20.1
Hedged NOK	-2.6	0.0	11.6	0.0	0.0	9.0	16.7
Hedged JPY	-0.3	0.0	8.8	-0.1	0.0	8.7	25.5
Hedged EUR	-2.0	0.0	9.6	0.0	0.0	7.6	19.1
Hedged CAD	-1.6	0.0	7.5	0.1	0.0	5.8	10.1
Hedged GBP	-2.9	0.0	7.2	0.1	0.0	4.3	3.9

Source: Barclays Research

UTC Induced by FX-hedging versus FX volatility

- UTC induced by FX-hedging are positively related to FX volatility
- We plot incremental UTC induced by FX-hedging versus FX volatilities for G10 currencies
    - Lower UTC are associated with less volatile currencies
    - “Safe haven” currencies (JPY and CHF) have higher TC for their volatility levels because they tend to appreciate in periods of market turmoil, when corporate bond liquidity is poor

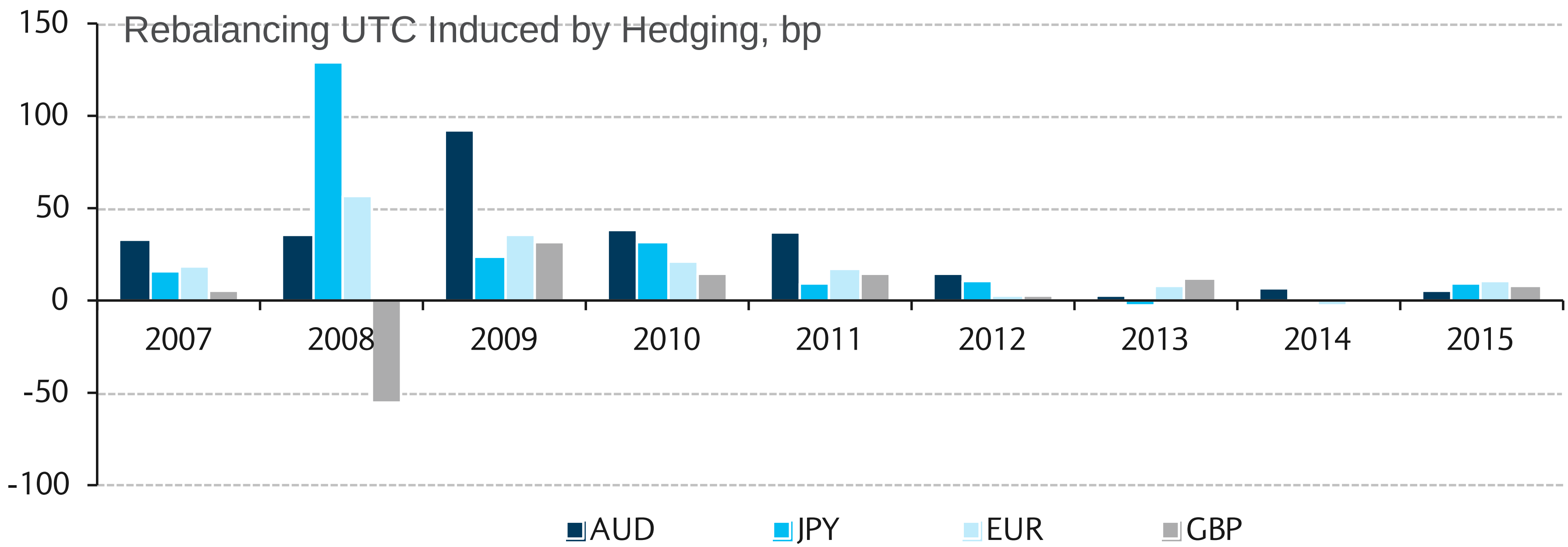
UTC induced by FX-hedging vs. FX volatility, Feb 2007 – Dec 2015



Induced UTC for selected currencies

- We report yearly UTC induced by hedging the US HY index into AUD, JPY, EUR, and GBP
- Significant incremental UTC are incurred by
  - JPY-hedged index in 2008 as JPY significantly appreciated relative to USD
  - AUD-hedged index in 2009
- In contrast, the GBP-hedged index experienced a reduction in UTC in 2008 as GBP depreciated relative to USD, resulting in lower cash balances to be reinvested into the underlying index
- Incremental UTC induced by FX-hedging have recently been relatively low

Yearly UTC induced by FX-hedging of US HY into selected currencies

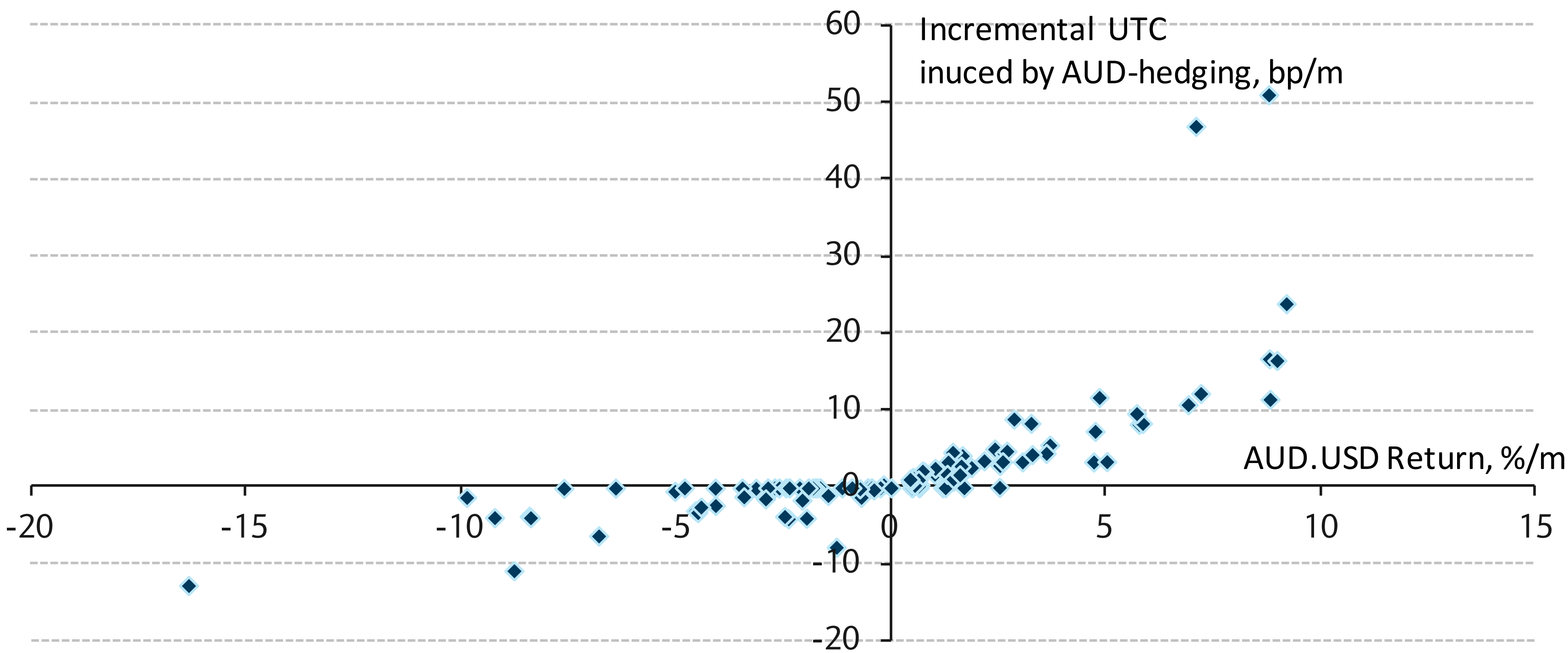


Source: Barclays Research

Induced UTC versus currency returns

- We plot UTC induced by hedging US HY into AUD versus returns of AUD.USD
- Appreciation of AUD is associated with incremental UTC as positive P&L of the FX-overlay has to be reinvested
- When AUD declines, portfolio UTC can be reduced as well because a negative P&L of the FX-overlay reduces the balance (sold bonds + coupons – new bonds) that has to be reinvested

UTC induced by FX-hedging vs. FX volatility, Feb 2007 – Dec 2015

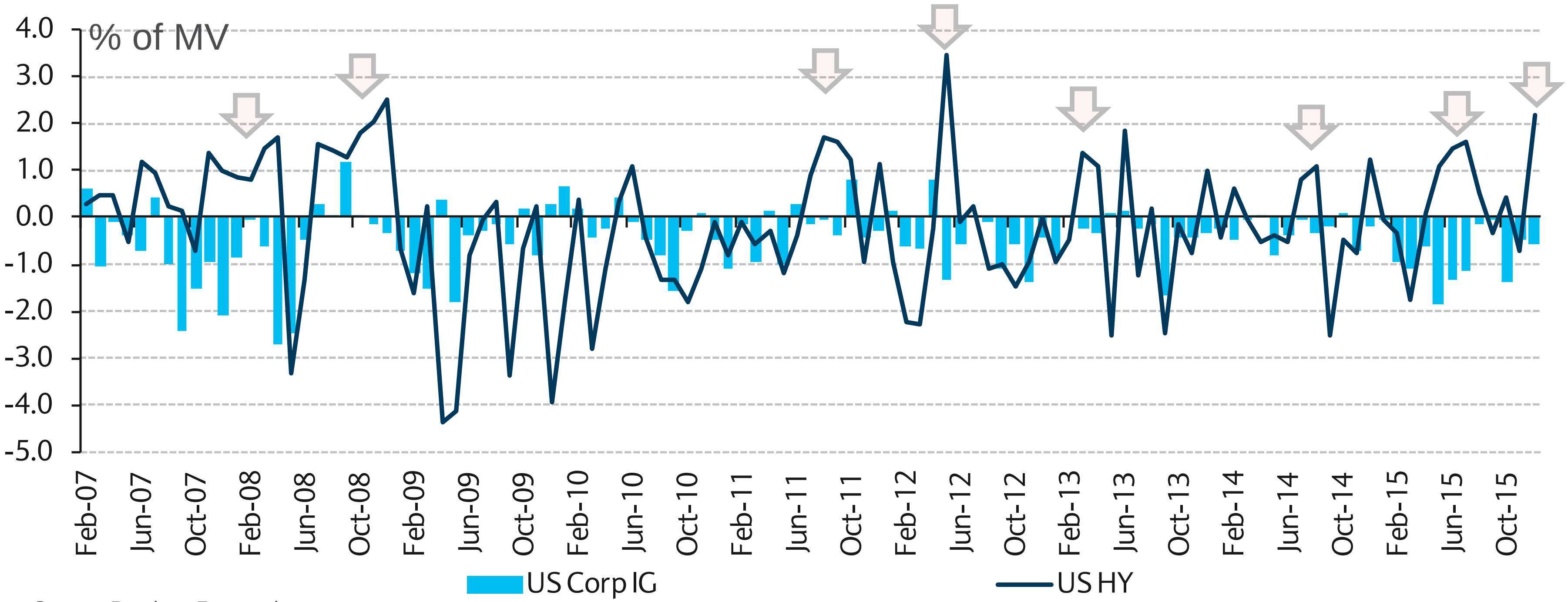


Source: Barclays Research

Induced UTC and cash balances: IG versus HY

- Slides 8 and 14 show that induced UTC of GBP-hedged US HY index is lower than that of US Corp IG
  - However, LCS of the HY index is higher than that of IG
  - This result is attributed to different cash balances of the two indices
- We report monthly net balances of unhedged US Corp IG and HY indices
  - Balances of US Corp IG are typically *negative* => a negative FX P&L does NOT change UTC
  - Balances of US HY are often *positive* => a negative FX P&L can reduce UTC

Net cash balances of US Corp IG and HY Indices, Feb 2007 – Dec 2015

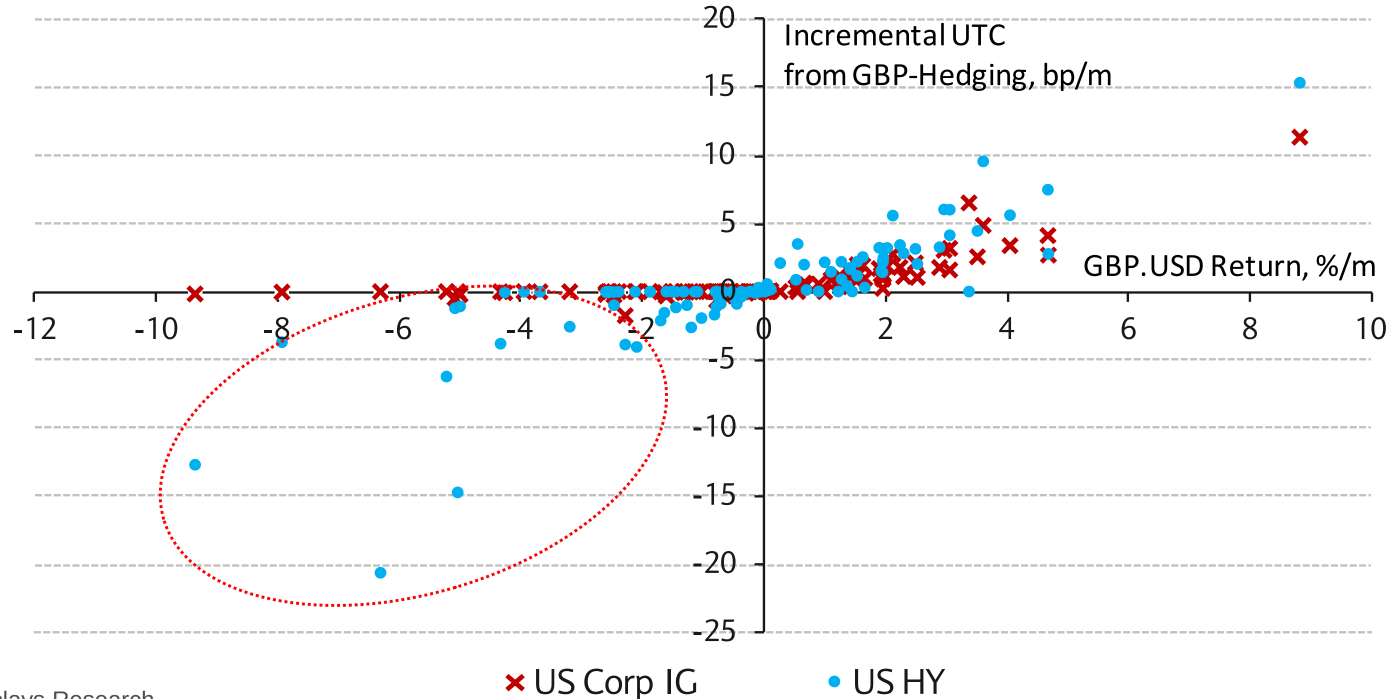


Source: Barclays Research

Induced UTC and cash balances (cont.)

- Unhedged US HY index frequently has positive monthly net cash balances
  - Negative P&L of GBP.USD can reduce positive balance and lead to lower UTC
  - This is NOT the case for US Corp IG whose balances are typically negative – reducing them further would not change index UTC => TC from selling bonds are reflected in the index performance
  - Note, however that this a reflection of index pricing conventions => actual turnover and costs for investors is likely to increase

UTC induced by FX-hedging vs. FX returns, Feb 2007 – Dec 2015



Source: Barclays Research

Summary of induced UTC across US Fixed Income

- We use historical liquidity cost scores (LCS) to calculate induced UTC across US credit and corporate indices hedged into G10 currencies
- We cover the period 2007-2015
    - Typically, induced UTC are higher for currency-hedged US HY index than for US Corp or Credit Indices
    - US Corp, US Credit and US HY hedged into CAD experience very similar induced UTC
    - US HY index hedged into GBP has a lower induced UTC than US Corp and US Credit indices

UTC Induced by FX-hedging for US Bond Indices, Feb 2007– Dec 2015

	US Corp IG	US Credit	US HY
Unhedged (UH)	**3.7**	**4.2**	**75.9**
	In Excess of UH Indices		
Hedged NZD	21.8	20.7	32.9
Hedged AUD	20.1	18.9	30.0
Hedged CHF	15.7	14.8	22.2
Hedged SEK	15.0	14.4	20.1
Hedged NOK	13.5	12.6	16.7
Hedged JPY	14.0	13.2	25.5
Hedged EUR	12.6	12.1	19.1
Hedged CAD	10.7	10.1	10.1
Hedged GBP	8.4	7.7	3.9

Source: Barclays Research

Summary of induced UTC across US Fixed Income (cont.)

- We use historical liquidity cost scores (LCS) to calculate induced UTC across different US bond indices hedged into G10 currencies
- We cover a shorter period: 2012-2015 (LCS for EM indices are available only from Feb 2012)
  - Induced UTC are very small for US Treasury index due to low LCS
  - Induced UTC are comparable across US credit and EM USD indices
  - Induced UTC of US HY index seems relatively low in the considered period

Incremental UTC induced by FX-hedging for US bond indices, Feb 2012– Dec 2015

	US Treasury bp/yr	US Corp IG bp/yr	US Credit bp/yr	EM USD Sovereign bp/yr	EM USD Agg bp/yr	US HY yp/yr
Unhedged (UH)	**0.18**	**2.7**	**3.1**	**8.9**	**17.8**	**45.2**
			In Excess of UH Indices			
Hedged NZD	0.35	12.7	12.0	13.4	13.2	13.9
Hedged AUD	0.21	7.6	6.9	6.8	7.5	6.4
Hedged CHF	0.20	7.3	6.6	7.1	7.7	5.7
Hedged SEK	0.21	8.6	8.1	8.3	8.1	7.5
Hedged NOK	0.24	8.6	7.7	8.7	8.7	5.5
Hedged JPY	0.10	4.6	4.3	4.0	4.4	4.5
Hedged EUR	0.18	6.6	6.2	6.8	5.2	4.9
Hedged CAD	0.15	5.5	4.8	4.2	4.4	1.6
Hedged GBP	0.21	6.9	6.3	7.0	6.3	5.9

Source: Barclays Research

Reducing rebalancing UTC induced by hedging

Possible remedies to reduce UTC

UTCs induced by currency-hedging in benchmarked portfolios can be reduced in several ways:

- Asset managers can typically offer several share classes hedged into different currencies in order to diversify P&L from the aggregate FX overlay => rebalancing UTC should decline due to reduced volatility of the FX overlay
  - Managers, however, have limited control over the distribution of AUM across share classes

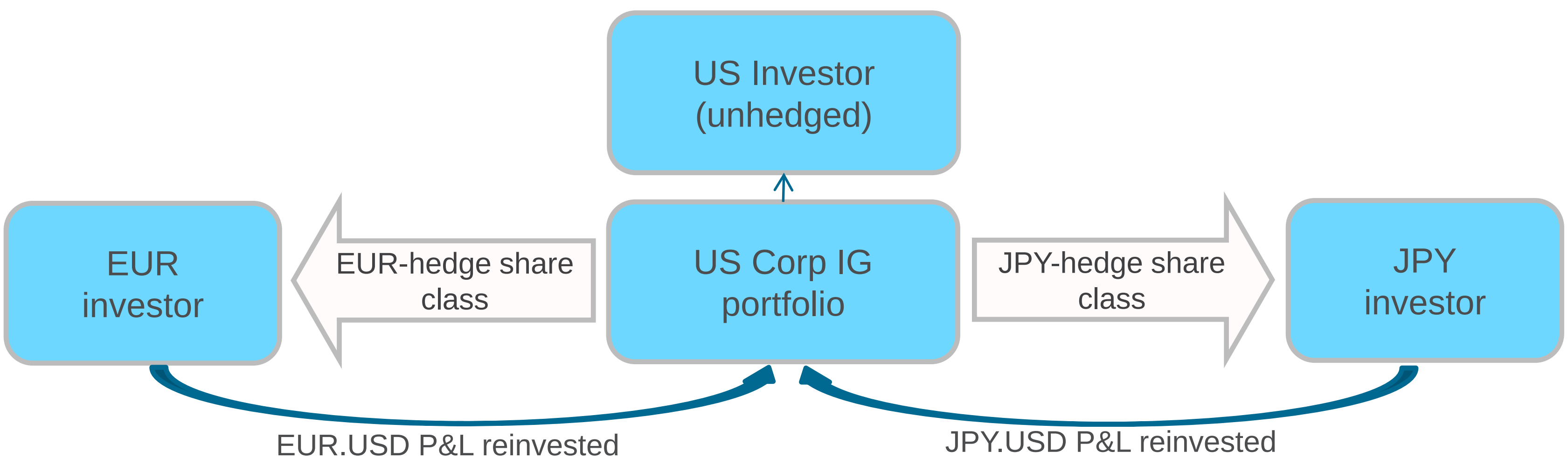
- In an aggregate mandate asset managers can choose to rebalance FX P&L into more liquid assets (eg, Treasuries) => rebalancing UTC should decline due to lower LCS

- Asset managers can strategically decide to reinvest FX P&L into the underlying portfolio less frequently => while induced UTC are likely to decline, the entire portfolio will experience tracking errors relative to the standard currency-hedged index as a result
  - Alternatively, portfolio managers can adopt currency-hedged benchmarks that do not require frequent rebalancing of the FX P&L (this would reference the portfolio to a customised index)

Fund with multiple share classes

- Asset managers typically offer several currency-hedge share classes for a fixed income portfolio
- As currencies are imperfectly correlated , this allows to reduce induced UTCs
- Consider, for example, a US Corp IG manager who offers EUR and JPY – hedge share classes
    - EUR.USD and JPY.USD are imperfectly correlated
    - P&Ls of EUR and JPY overlays can sometimes offset each other, which would reduce reinvested amounts and associated induced UTC
- An asset manager, however, has limited control over AUM distribution across currency-hedge share classes – which percentage of the portfolio is hedged into EUR and which into JPY?

US Corp IG Portfolio with EUR and JPY -Hedge Share Classes

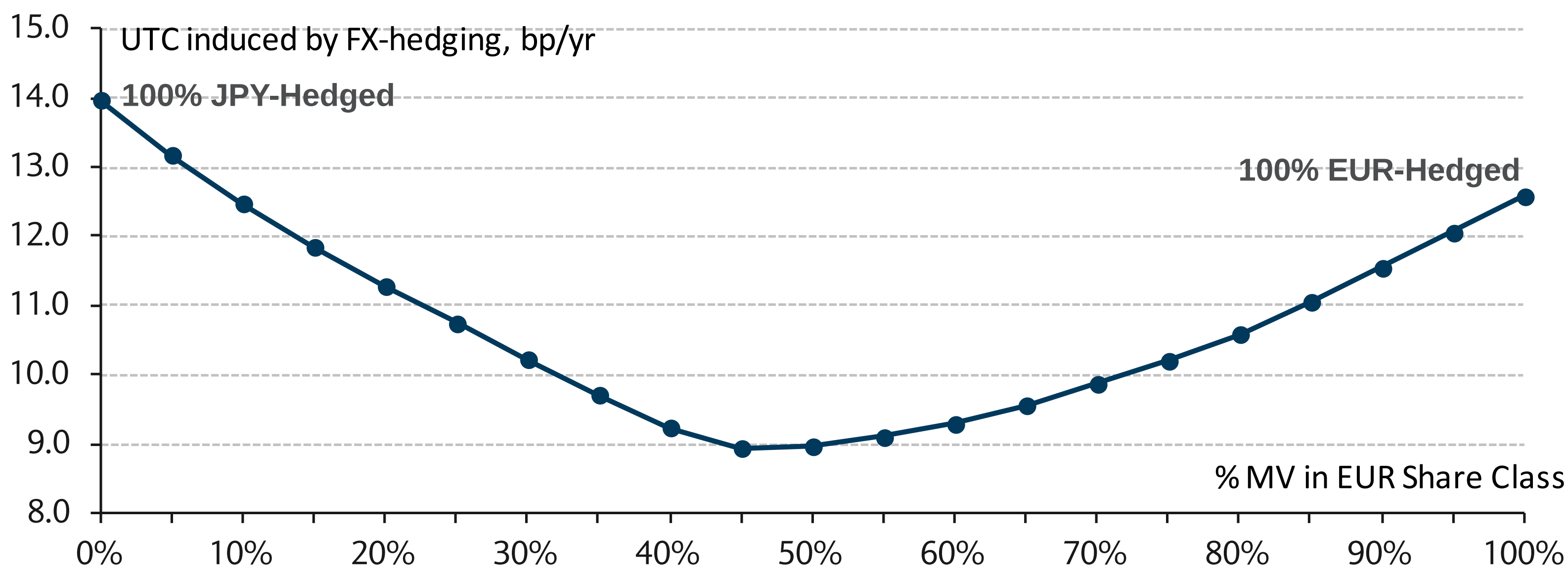


Source: Barclays Research

Induced UTC with multiple share classes

- Do induced UTC get reduced when a fund has multiple share classes?
- Consider an example of the US Corp IG portfolio with EUR and JPY- hedge share classes
- How UTC induced by currency-hedging depends on the portfolio %MV distribution between EUR and JPY?
  - Cash flows from EUR and JPY hedging overlays should sometime offset each other
  - Induced UTCs for JPY and EUR–only hedged portfolios are is 14bp/yr and 12.6bp/yr respectively
  - When the portfolio combines EUR and JPY share classes, induced UTCs are reduced

US Corp IG mandate with EUR and JPY – hedged share classes:
Induced UTC vs. portfolio share in EUR-hedged class, Feb 2012– Dec 2015

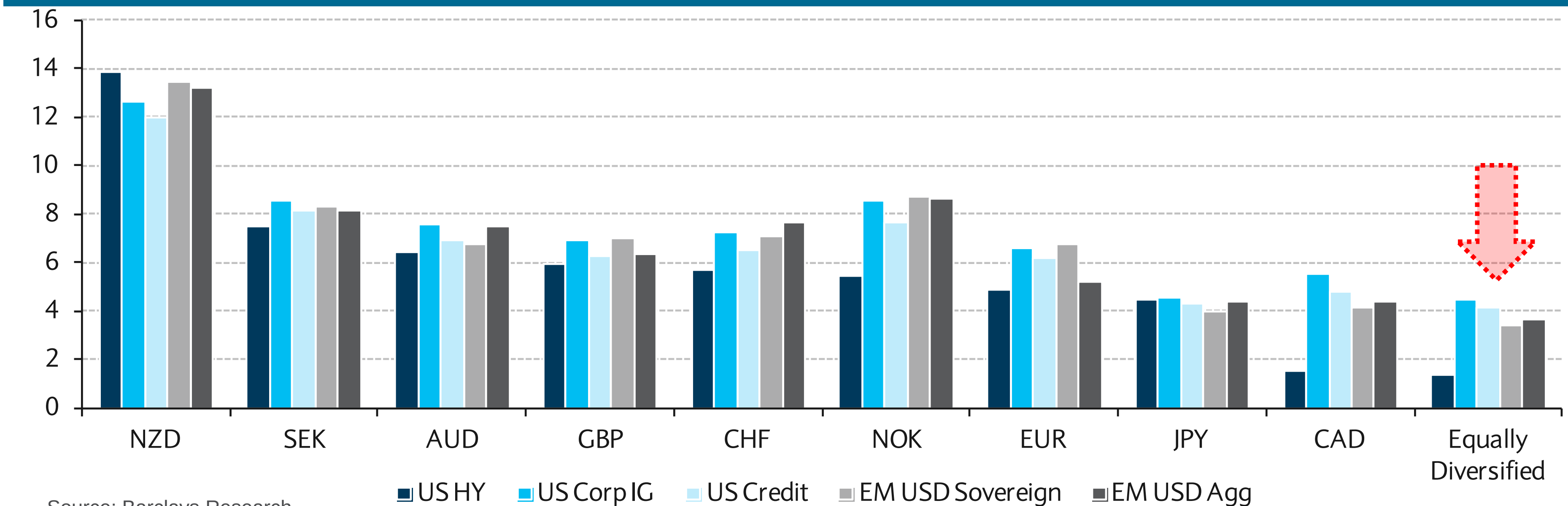


Source: Barclays Research

Induced UTC with multiple share classes (cont.)

- Reduction of induced UTC in a multi currency-hedge share class portfolio depends on
  - portfolio distribution across share classes
  - currency volatilities
  - currency correlations
- We measure induced UTC, assuming equal distribution across G10 currencies (ex. USD)
- While UTC of a portfolio diversified across currency-hedge share classes are lower, they are still significant

UTC induced by FX-hedging for US bond indices, Feb 2012– Dec 2015

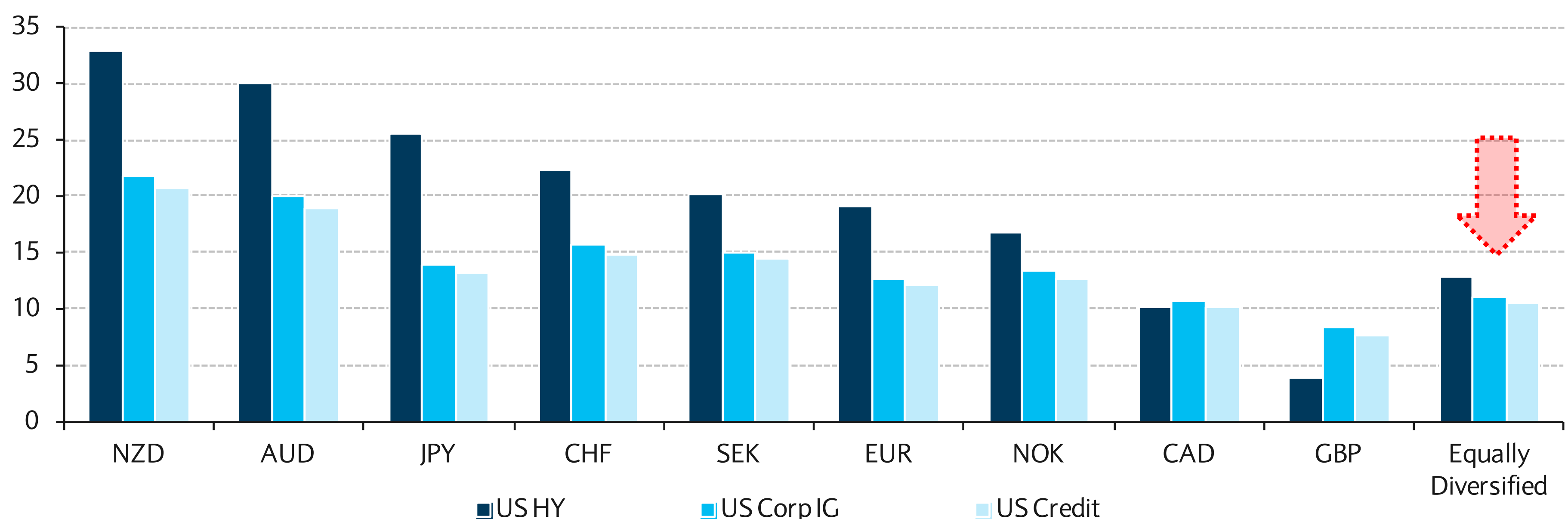


Source: Barclays Research

Induced UTC with multiple share classes (cont.)

- We measure induced UTC in US *credit* portfolios equally split across G10 currencies (ex USD) in the period between 2007 and 2015
- UTC of portfolios equally diversified across share classes are still significant : ~10bp/yr
  - Large portion of systematic FX risk is attributed to USD re-valuation
- It is possible to optimise weights of different share classes based on currency volatilities and correlations to achieve lower UTC, but asset managers cannot fully control the AUM distribution across share classes

Incremental UTC induced by FX-hedging for US bond indices, Feb 2007– Dec 2015

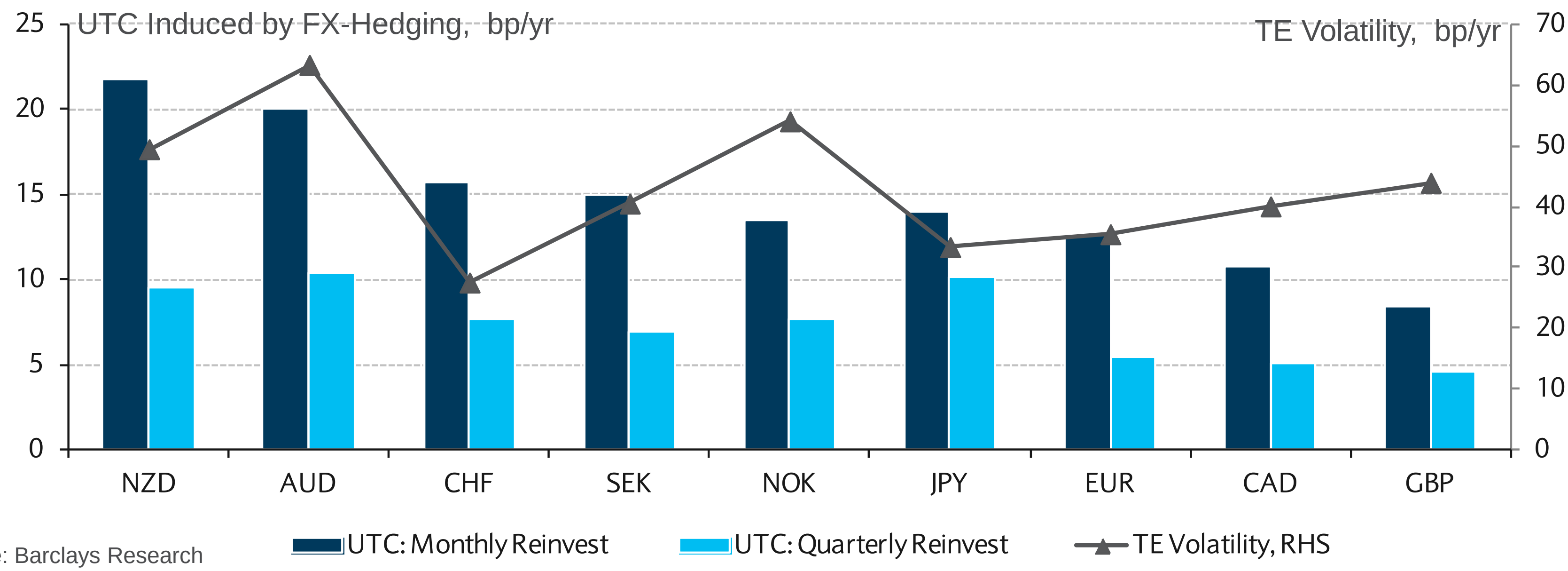


Source: Barclays Research

Quarterly reinvestment of FX P&L – US Corporate IG

- Another way to reduce induced UTC is to reinvest FX P&L quarterly as opposed to monthly
    - Non-invested P&L balance will accrue or pay (if negative) short-term rate in investor's base currency
    - The underlying portfolio will be under or over-invested relative to the standard currency-hedged index
    - => The portfolio will experience tracking errors
- We measure UTCs induced by hedging US Corp IG into G10 currencies on monthly and quarterly frequencies
- UTC induced by quarterly reinvesting FXP&L is significantly lower than that induced by monthly reinvesting
- The resulting portfolio has a significant tracking error volatility (TEV) relative to the hedged index

Hedged US Corp IG: reducing reinvestment frequency of FX P&L lowers UTC but introduces TE volatility wrt. the standard index, Feb 2007– Dec 2015

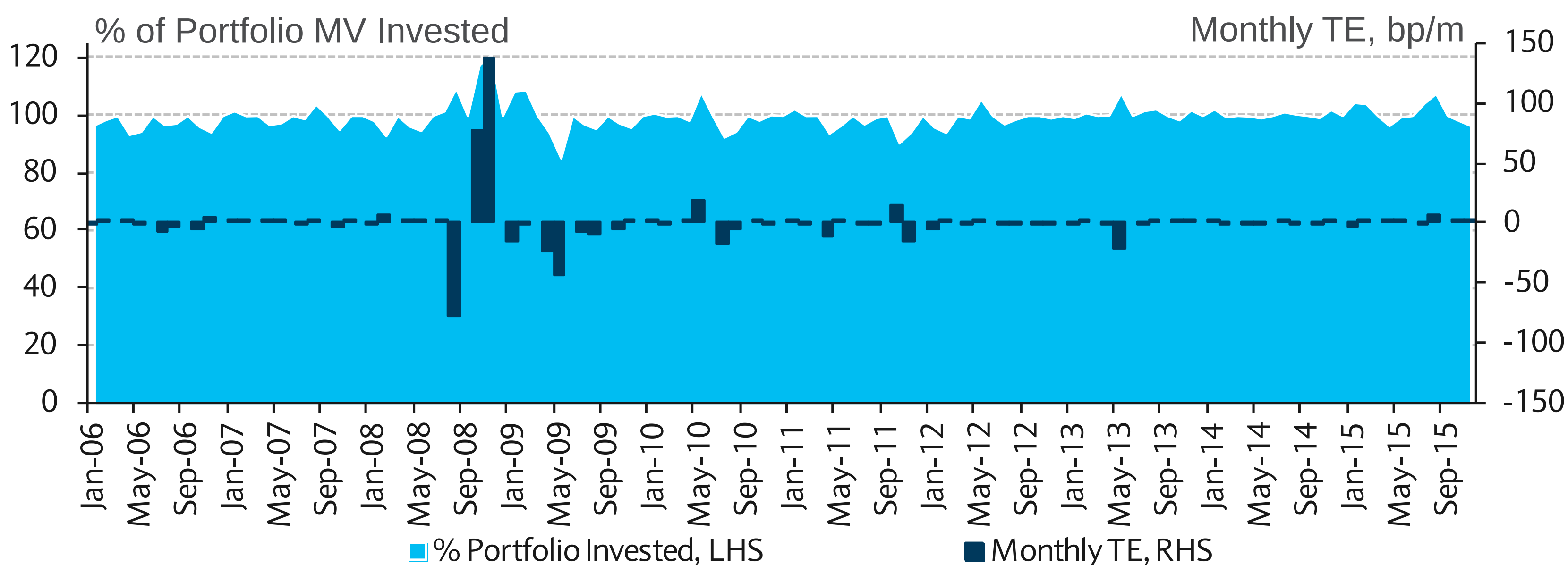


Source: Barclays Research

Quarterly reinvestment of FX P&L – US Corporate IG (cont.)

- Significant TEs of the currency-hedged portfolio with quarterly FX P&L rebalancing are due to the fact that the underling portfolio can be over (or under) -invested relative to the benchmark index
  - TE are especially large when un-invested FX balances are substantial and the portfolio experiences large returns (eg, 2008 – 2009 period)
  - Recent TEs of the portfolio with quarterly FX P&L rebalancing are relatively small

AUD-hedged US Corp IG with quarterly FX P&L rebalancing, Feb 2007– Dec 2015

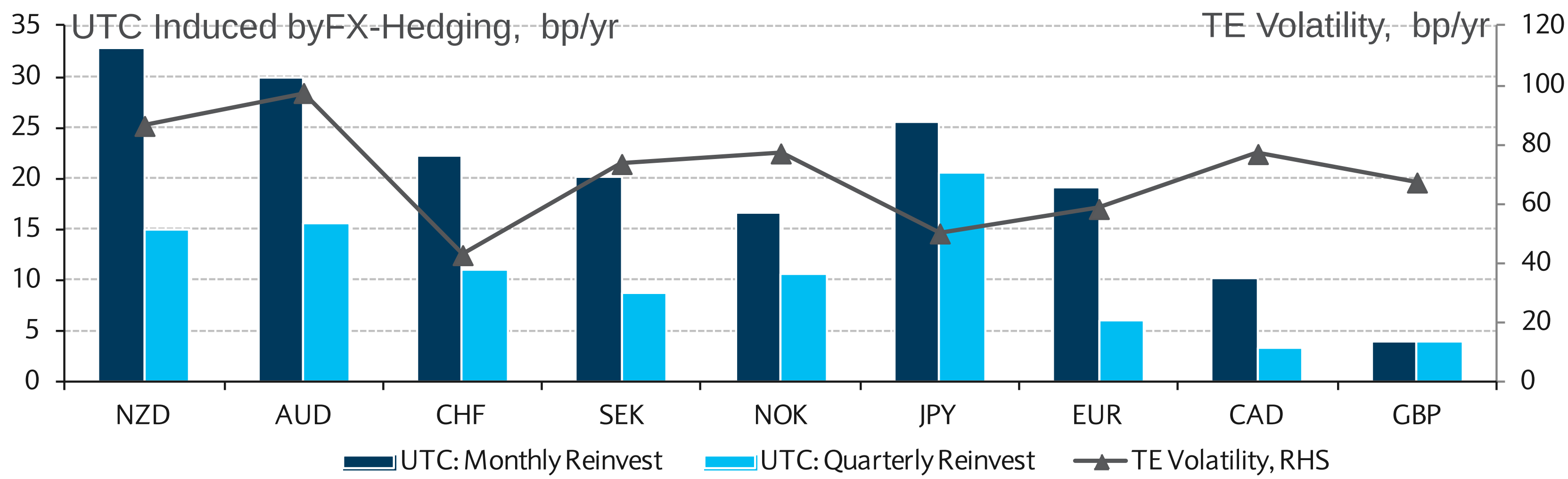


Source: Barclays Research

Quarterly reinvestment of FX P&L – US HY

- We quantify incremental UTC of US HY index induced by hedging into G10 currencies when FX P&L is reinvested monthly and quarterly
  - Non-invested FX balance is assumed to accrue or pay (if negative) short-term rate in investor's base currency
  - The underlying portfolio is under or over-invested relative to the hedged index and, therefore, experiences tracking errors
- UTC is reduced wrt. monthly rebalancing, but at the cost of a significant TEV relative to the index

Hedged US HY : reducing reinvestment frequency of FX P&L lowers UTC but introduces TE volatility wrt. the standard index, Feb 2007– Dec 2015



Source: Barclays Research

Quarterly reinvestment of FX P&L – Summary

- Changing rebalancing frequency of FX P&L from monthly to quarterly significantly reduces UTC induced by FX-hedging
- However, quarterly rebalancing introduces tracking errors relative to standard currency-hedged benchmarks
- We report average TEs and TE volatilities for several US fixed income indices in 2007-2015
  - Long-run TE can be negative or positive

Effect of switching reinvestment frequency of FX P&L from monthly to quarterly on induced UTC, Feb 2007– Dec 2015

	Barclays US Corp IG			Barclays US Credit			Barclays US HY		
	% Chg in UTC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in UTC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in UTC	Avg. TE [bp/yr]	TEV [bp/yr]
Hedged NZD	-56%	10.7	49.5	-55%	8.0	45.7	-54%	5.3	86.4
Hedged AUD	-48%	4.0	63.4	-46%	4.7	51.4	-48%	-20.6	97.5
Hedged CHF	-51%	-0.6	27.6	-50%	-0.9	28.5	-51%	-7.7	42.8
Hedged SEK	-54%	1.1	40.6	-53%	0.7	36.4	-57%	-10.7	73.6
Hedged NOK	-43%	15.0	54.1	-42%	12.5	39.4	-37%	-15.7	77.1
Hedged JPY	-28%	-22.4	33.4	-27%	-20.0	24.5	-19%	-16.6	50.1
Hedged EUR	-57%	3.5	35.5	-56%	0.6	30.3	-68%	-7.3	58.4
Hedged CAD	-52%	10.1	40.1	-52%	8.1	36.8	-66%	-9.0	76.9
Hedged GBP	-45%	1.4	44.0	-44%	6.8	38.0	2%	-5.3	67.3

Source: Barclays Research

Quarterly reinvestment of FX P&L – Summary (cont.)

- Changing rebalancing frequency of FX P&L from monthly to quarterly significantly reduces UTC induced by FX-hedging
- Quarterly rebalancing introduces TEs relative to standard currency-hedged benchmarks
- We report average TEs and TE volatilities for several US fixed income indices in 2012-2015
    - Long-run TE can be negative or positive

Effect of switching reinvestment frequency of FX P&L from monthly to quarterly on induced UTC, Feb 2012– Dec 2015

	Barclays US Treasury			Barclays US Corp IG			Barclays US Credit			Barclays EM USD Sov			Barclays EM USD Agg			Barclays US HY		
	% Chg in TC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in TC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in TC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in TC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in TC	Avg. TE [bp/yr]	TEV [bp/yr]	% Chg in TC	Avg. TE [bp/yr]	TEV [bp/yr]
NZD	-41%	-3.0	12.9	-43%	-4.2	14.3	-44%	-3.5	16.1	-44%	-4.2	23.1	-40%	-4.8	23.1	-34%	-0.1	19.9
AUD	-49%	-1.1	13.7	-55%	-2.5	12.4	-55%	-7.8	17.1	-62%	-9.7	25.0	-64%	-10.6	25.0	-51%	-14.6	19.1
CHF	-52%	0.2	10.2	-57%	-2.9	11.4	-56%	2.7	14.0	-63%	-3.1	17.3	-59%	-5.6	17.3	-74%	-8.7	16.4
SEK	-49%	-1.0	10.4	-55%	-2.9	13.6	-58%	-9.1	11.8	-64%	-7.1	18.8	-63%	-1.1	18.8	-61%	-13.7	21.4
NOK	-63%	5.1	10.0	-58%	-2.1	11.7	-59%	3.4	12.1	-68%	2.6	17.4	-71%	-11.0	17.4	-82%	-9.8	15.2
JPY	-46%	-13.5	10.5	-54%	-14.8	12.2	-56%	-22.3	17.8	-51%	-33.1	26.2	-67%	-27.3	26.2	-94%	-16.2	19.0
EUR	-51%	0.5	7.1	-54%	0.7	11.3	-53%	-3.2	13.0	-57%	7.4	14.6	-47%	-1.4	14.6	-71%	-2.1	14.1
CAD	-53%	-6.9	13.2	-61%	-2.4	12.4	-63%	-5.7	12.2	-65%	-3.8	19.7	-72%	-2.6	19.7	-171%	-2.3	17.5
GBP	-30%	-2.6	11.2	-34%	-3.1	11.8	-34%	0.0	9.5	-34%	-9.8	12.1	-29%	-5.1	12.1	-41%	-5.5	12.2

Source: Barclays Research

Conclusions

- Currency-hedged benchmarks assume FX P&L reinvested into the underlying index
- However, associated incremental rebalancing costs are not fully reflected in the index performance
  - These costs are different from those of running the FX hedging overlay
  - UTCs induced by FX-hedging are divided pro-rata among portfolio owners, including unhedged domestic investors – this unnecessarily penalises investors who do not require currency-hedging and creates a potential conflict of interests between domestic and foreign clients
- We calculate uncompensated transaction costs (UTC) induced by hedging US fixed income indices into G10 currencies
- Induced UTCs can be large and represent a significant performance drag, especially when market liquidity is poor and FX volatility is high
  - Positive correlation between currency returns and changes in liquidity costs also increases UTC

- Asset managers can reduce induced UTCs by funding FX gains and losses from a liquid asset class (eg, US Treasuries)
- Alternatively, asset managers can adopt an index with less frequent rebalancing of gains and losses resulting form currency hedging

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