Coordinated rise in x-asset risk a warning sign, but still low vol leaves hedges cheap

Bank of America Merrill Lynch

Asset Allocation

06 September 2017

X-asset vols crept higher but remain historically low

Hedge costs in 27 out the 35 assets in our screen rose over the month led by Chinese equity volatility (HSI & HSCEI 3M vols rose by 4.4% and 4.8% respectively, Table 2). However, the uptick in volatility and credit spreads in most cases was modest in magnitude, leaving global cross asset risk metrics well within benign territory amid a backdrop of rising geopolitical tensions on the Korean peninsula (Table 1). This means that it is still historically cheap to purchase efficient hedges ahead of what is already proving to be a catalyst-rich fall.

Correlation across assets (and their vols) is on the rise

Short-dated cross asset correlation has been rising over the past few months and currently stands at 50%, its highest level in over a year. Meanwhile, the correlation of cross asset *vols* may have also reached a turning point: August has been the first month in over a year to witness a simultaneous rise in global equity, rates, commodity and FX volatility (Chart 15). This observation suggests that disparate pockets of the market are finally beginning to agree on the presence of risk, albeit to varying extents.

IG Credit payers & Gold calls are still efficient tail hedges

US & EU IG credit payers are the top ranking tail hedges in our screen closely followed by calls on gold (and gold ETF) despite neither of the two asset classes having been immune to the build-up geopolitical risk. In fact, gold has rallied approx. 5% since our last publication where we highlighted gold calls as an efficient "safe haven" option hedge. In credit, the European market posted its first month of losses (in excess return terms) since Feb-17 and the worst since Nov-16, while US IG spreads widened in August on the back of excess supply, geopolitics and domestic issues.

Nikkei puts screen as a good value global equity hedge

Proxy hedging global equities with US and EU IG & HY credit payers screen as best value across all assets in our universe. Within equities, Nikkei puts screen as the top MSCI World proxy hedge – unsurprisingly perhaps given that Nikkei volatility is near multi-year lows both outright and vs. other equity vols. Importantly, Nikkei puts would have experienced considerably less basis risk than most other proxies in our screen during the top 10 global equity drawdowns since 2006.

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Table 1: X-asset vols & credit spreads

	Cur. level	1M chg.	%-ile
Global Equity Vol	12.9%	1.8%	4%
Global FX Vol	8.3%	0.1%	22%
Commodity Vol	19.5%	0.8%	16%
Global Rates Vol (bp)	46.8	0.2	1%
US IG Credit (bp)	57.4	0.0	8%
US HY Credit (bp)	323.7	2.2	6%
iTraxx EU Main (bp)	53.7	1.1	6%
iTraxx EU Xover (bp)	234.3	-1.2	1%

Equity Vol: SPX, SX5E, UKX, NKY & HSI 3M ATM vol
FX Vol: USDJPY, EURUSD & GBPUSD 3M ATM vol
Commodity Vol: Crude Oil, Gold & Copper 3M ATM vol
Rates Vol: ML Swaption 3M Vol Index US & EUR
Source: BofA Merrill Lynch Global Research. Data as of 4-Sep-17. %-iles are based on data since May-07. *Change since 31-Jul-17.

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Timestamp: 06 September 2017 05:53PM EDT

Cross-asset tail hedging

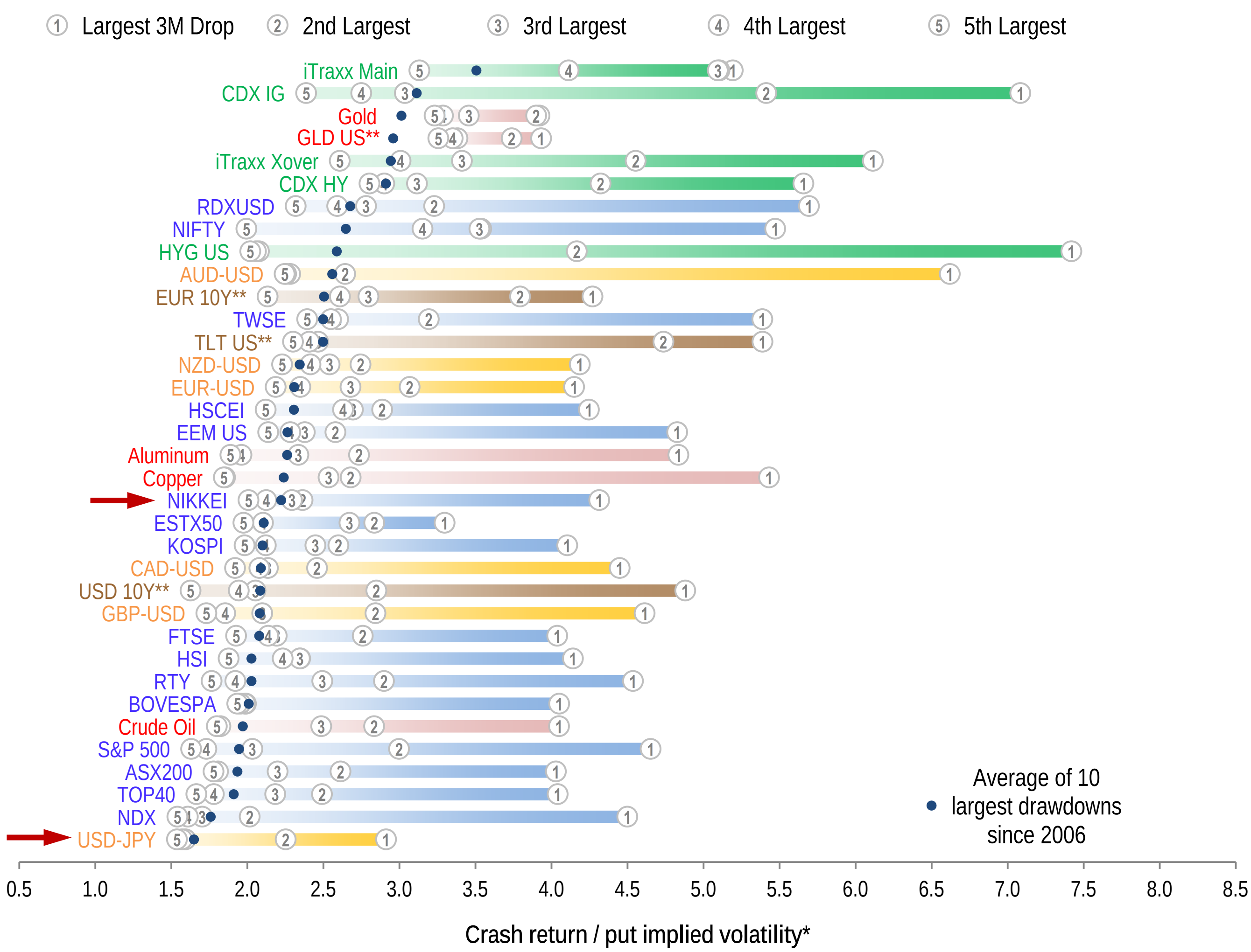
Identifying value in puts across asset classes

Chart 1 shows crash returns of different assets during historical tail events per unit of current OTM option implied volatility. We measure tail events by the 10 largest 3M drops since Jan-06 (see Finding cheap hedges: the framework for how we algorithmically identify these events). Ranked by the average, the screen shows that the hedges which are most underpricing historical drawdowns are: **US & EU IG credit payers, Gold calls** and **RDXUSD (Russian equity) puts**:

- **US & European IG credit payers** still rank as the best value hedges across all assets in our universe followed by **Gold (and Gold ETF) calls**.
- In equities, **RDXUSD (Russia), NIFTY (India)** and **TWSE (Taiwan)** puts screen as top hedges while **puts on NASDAQ (US Tech), Top40 (S. Africa)** and **ASX200 (Australia)** rank as the most expensive.
- **USDJPY puts** once more inhabit the far bottom of our screen (most expensive tail hedge) as the ongoing geopolitical risk flare on the Korean peninsula has likely increased demand for JPY as a risk-off asset. In contrast, **Nikkei puts**, while belonging to the same region, currently rank as the cheapest DM equity hedge.

Chart 1: Cross-asset tail hedging screen: EU & US IG Credit payers are currently most underpricing historical widening of spreads

For an explanation of how to interpret this chart see Finding cheap hedges: the framework.



Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *3M 25% delta put volatility for each asset, see Finding cheap hedges: the framework for more details on the methodology behind this diagram. **3M 25% delta call volatility (receiver premia) for TLT US (USD & EUR 10Y rates).

As a reference, Table 2 shows the largest drops (unless stated otherwise) within 3M in each asset class between ‘06 and ‘17, ranked in the same order as the assets in Chart 1.

Table 2: 10 largest 3M drawdowns across asset classes since Jan-06

Asset Name	Asset Category	10 Largest 3M drawdowns					3Mth 25 Delta Vol*	Vol Change†
iTraxx Main	Credit	-4% (Sep-11) -2% (Mar-09)	-4% (Mar-08) -2% (Nov-11)	-4% (Dec-08) -2% (Feb-16)	-3% (May-12) -2% (Aug-07)	-2% (Jun-10) -1% (Jun-13)	52.2%	5.6%
CDX IG	Credit	-5% (Dec-08) -2% (Jun-10)	-4% (Mar-08) -2% (Aug-07)	-2% (Mar-09) -2% (Feb-16)	-2% (Jul-08) -2% (Jun-12)	-2% (Oct-11) -1% (Nov-07)	51.8%	4.1%
Gold	Commodity	25% (Feb-09) 20% (Nov-07)	25% (May-06) 18% (Mar-16)	22% (Sep-11) 14% (Jul-06)	21% (Mar-08) 14% (Oct-10)	21% (Nov-09) 13% (Aug-13)	12.8%	1.1%
GLD US**	Commodity	26% (May-06) 21% (Nov-09)	25% (Feb-09) 17% (Mar-16)	23% (Mar-08) 14% (Oct-10)	22% (Sep-11) 14% (Jul-06)	22% (Nov-07) 13% (Aug-13)	13.2%	1.2%
iTraxx Xover	Credit	-17% (Dec-08) -6% (Feb-16)	-12% (Sep-11) -6% (Nov-11)	-9% (Mar-08) -5% (May-12)	-8% (Aug-07) -4% (Mar-09)	-7% (Jun-10) -4% (Jun-13)	47.2%	4.9%
CDX HY	Credit	-18% (Dec-08) -8% (Jul-07)	-14% (Mar-09) -7% (May-10)	-10% (Oct-11) -7% (Nov-11)	-9% (Oct-09) -6% (Feb-10)	-9% (Mar-08) -5% (Jun-09)	43.4%	3.0%
RDXUSD	Russian Equity	-68% (Oct-08) -27% (Jan-16)	-39% (Nov-08) -26% (Jul-09)	-33% (Oct-11) -26% (May-12)	-31% (Dec-14) -22% (Aug-15)	-28% (Jun-06) -21% (May-10)	23.0%	-2.2%
NIFTY	Indian Equity	-38% (Nov-08) -13% (Jan-09)	-25% (Mar-08) -13% (Mar-07)	-24% (Jun-06) -12% (Feb-11)	-22% (Jul-08) -12% (Dec-11)	-14% (Aug-11) -12% (Jul-09)	13.6%	1.5%
HYG US	US Credit	-30% (Dec-08) -7% (Nov-11)	-17% (Mar-09) -7% (Jul-08)	-8% (Jan-16) -6% (Mar-08)	-8% (Oct-11) -6% (Jun-10)	-8% (Aug-07) -6% (Feb-10)	8.0%	0.3%
AUD-USD	Currency	-31% (Oct-08) -10% (Oct-08)	-12% (Jul-13) -9% (Aug-07)	-11% (May-10) -9% (Sep-15)	-11% (Feb-15) -8% (May-12)	-10% (Sep-11) -8% (Nov-11)	9.3%	0.0%
EUR 10Y**	Rates	9% (Dec-08) 4% (Aug-14)	8% (Sep-11) 4% (Jan-12)	6% (Jun-12) 4% (Jan-15)	5% (Aug-10) 4% (May-10)	4% (Feb-16) 4% (Mar-09)	0.3%	0.0%
TWSE	Taiwanese Equity	-38% (Nov-08) -14% (Aug-07)	-22% (Jul-08) -13% (Feb-10)	-18% (Oct-11) -13% (Jun-06)	-18% (Jan-08) -12% (Jun-12)	-17% (Aug-15) -11% (Nov-11)	13.7%	2.9%
TLT US**	T-Bills	29% (Dec-08) 9% (Jul-16)	26% (Sep-11) 9% (Feb-16)	13% (Jan-15) 8% (Aug-10)	13% (Jun-12) 8% (Aug-15)	12% (Jul-10) 8% (Nov-11)	10.8%	0.5%
NZD-USD	Currency	-22% (Nov-08) -11% (Oct-11)	-14% (Mar-09) -10% (Oct-14)	-13% (Jul-15) -10% (Aug-08)	-13% (Aug-07) -9% (May-12)	-12% (Apr-06) -9% (Jun-13)	10.5%	0.5%
EUR-USD	Currency	-17% (Oct-08) -8% (Jan-12)	-13% (Mar-15) -7% (Jul-12)	-11% (Jun-10) -7% (Oct-14)	-10% (Mar-09) -7% (Dec-16)	-9% (Feb-10) -7% (Nov-15)	8.2%	0.2%
HSCEI	Hong Kong Equity	-47% (Oct-08) -21% (Mar-08)	-32% (Sep-15) -21% (Jan-09)	-30% (Jan-08) -18% (Jun-13)	-29% (Oct-11) -17% (May-12)	-23% (Jan-16) -16% (Jun-06)	21.2%	4.8%
EEM US	Emerging Market Equity	-45% (Oct-08) -19% (Jan-16)	-24% (Sep-11) -15% (Jan-08)	-22% (Nov-08) -15% (May-12)	-21% (Jun-06) -15% (Mar-09)	-20% (Aug-15) -14% (May-10)	18.0%	1.5%
Aluminum	Commodity	-43% (Dec-08) -16% (Sep-08)	-24% (Jun-06) -16% (Oct-11)	-21% (Jun-10) -15% (Feb-06)	-17% (Aug-15) -15% (Sep-07)	-17% (Feb-09) -15% (Jun-12)	17.2%	2.8%
Copper	Commodity	-56% (Dec-08) -19% (Dec-07)	-28% (Jan-07) -17% (Jun-06)	-26% (Oct-11) -16% (Feb-15)	-19% (Jun-10) -16% (Jan-16)	-19% (Aug-15) -15% (Apr-13)	20.0%	3.3%
NIKKEI	Japanese Equity	-36% (Oct-08) -16% (Jun-13)	-20% (Feb-16) -16% (Jun-12)	-19% (Mar-08) -16% (Jul-10)	-18% (Mar-09) -15% (Jun-06)	-17% (Mar-11) -14% (Oct-11)	16.4%	2.0%
ESTX50	European Equity	-29% (Nov-08) -17% (Jun-12)	-25% (Sep-11) -15% (Jul-08)	-24% (Mar-09) -15% (Sep-15)	-19% (Mar-08) -14% (Jun-10)	-18% (Feb-16) -12% (Nov-11)	17.4%	1.8%
KOSPI	Korean Equity	-32% (Oct-08) -15% (Aug-07)	-20% (Aug-11) -14% (Mar-09)	-19% (Aug-08) -11% (Aug-15)	-17% (Feb-08) -11% (May-12)	-15% (Jun-06) -10% (Jun-13)	15.3%	2.7%
CAD-USD	Currency	-18% (Oct-08) -8% (Jul-15)	-10% (Feb-15) -6% (Mar-09)	-9% (Jan-16) -6% (Aug-08)	-8% (Oct-11) -6% (Jan-14)	-8% (Dec-07) -6% (May-10)	8.0%	-0.2%
USD 10Y**	Rates	17% (Dec-08) 5% (Jul-09)	10% (Sep-11) 5% (Jun-12)	7% (Jul-10) 5% (Jan-15)	7% (Jan-08) 5% (Sep-07)	6% (Feb-16) 5% (Mar-08)	0.5%	0.0%
GBP-USD	Currency	-19% (Nov-08) -7% (Jan-16)	-12% (Jul-16) -6% (May-10)	-9% (Jan-09) -6% (Oct-16)	-8% (Mar-10) -6% (Oct-14)	-7% (Mar-13) -6% (Jan-15)	8.2%	0.2%
FTSE	UK Equity	-27% (Oct-08) -13% (Mar-08)	-19% (Mar-09) -11% (Aug-15)	-15% (Jul-08) -10% (May-12)	-14% (Aug-11) -9% (Aug-07)	-13% (Jul-10) -9% (Jun-13)	13.3%	1.3%
HSI	Hong Kong Equity	-38% (Oct-08) -16% (Jan-16)	-22% (Sep-15) -16% (Jul-08)	-22% (Oct-11) -12% (Jun-13)	-21% (Mar-08) -12% (May-12)	-17% (Jan-09) -12% (May-10)	18.0%	4.4%
RTY	US Small Cap Equity	-40% (Nov-08) -15% (Jul-10)	-25% (Mar-09) -11% (Jun-06)	-22% (Sep-11) -11% (Aug-07)	-17% (Feb-16) -11% (Nov-11)	-15% (Jan-08) -10% (Aug-15)	17.0%	0.2%
BOVESPA	Brazilian Equity	-40% (Oct-08) -18% (Jun-06)	-19% (Jun-12) -17% (Aug-11)	-19% (Oct-08) -15% (May-10)	-19% (Jan-16) -15% (Aug-15)	-19% (Jul-13) -15% (Aug-07)	18.9%	-0.9%
Crude Oil	Commodity	-63% (Dec-08) -25% (Nov-06)	-44% (Jan-15) -22% (Jun-12)	-38% (Jan-16) -21% (Oct-14)	-28% (Aug-15) -19% (May-10)	-28% (Sep-08) -17% (Jan-07)	29.2%	-0.7%

Table 2: 10 largest 3M drawdowns across asset classes since Jan-06

Asset Name	Asset Category	10 Largest 3M drawdowns					3Mth 25 Delta Vol*	Vol Change†
S&P 500	US Equity	-33% (Nov-08) -11% (Jul-08)	-21% (Mar-09) -10% (Feb-16)	-15% (Aug-11) -9% (Aug-15)	-12% (Jul-10) -8% (Nov-11)	-12% (Mar-08) -8% (Jun-12)	14.1%	1.6%
ASX200	Australian Equity	-29% (Nov-08) -12% (Sep-11)	-19% (Mar-08) -11% (Sep-15)	-16% (Jul-08) -10% (Aug-07)	-13% (Mar-09) -9% (Jun-13)	-13% (May-10) -8% (Jan-16)	14.2%	0.5%
TOP40	South African Equity	-30% (Nov-08) -12% (Aug-07)	-19% (Aug-08) -11% (Jan-16)	-16% (Mar-09) -11% (Aug-11)	-13% (Jan-08) -9% (May-10)	-13% (Jun-06) -9% (Oct-14)	14.8%	1.4%
NDX	US Equity	-39% (Nov-08) -13% (Jul-06)	-18% (Mar-08) -12% (Jul-10)	-15% (Mar-09) -10% (Aug-15)	-14% (Aug-11) -10% (Nov-12)	-13% (Feb-16) -9% (May-12)	17.0%	-1.0%
USD-JPY	Currency	-15% (Dec-08) -8% (Jun-13)	-11% (Mar-08) -7% (May-06)	-8% (Apr-16) -7% (Sep-07)	-8% (Aug-16) -7% (Oct-09)	-8% (Sep-10) -6% (Aug-11)	10.1%	0.1%

Source: BofA Merrill Lynch Global Research Data: 4-Sep-17. *Note that these are the actual 3Mth 25 delta implied vols (3M 25d Receiver premiums for USD & EUR 10Y rates) and not the adjusted vols used in the analysis as described in Finding cheap hedges: the framework. **Largest 3M *gains* since Jan-06. † Percentage point change in 3Mth 25 delta vols (premia for USD and EUR rates) since 31-Jul-17.

Hedging benchmarks w/out liquid options

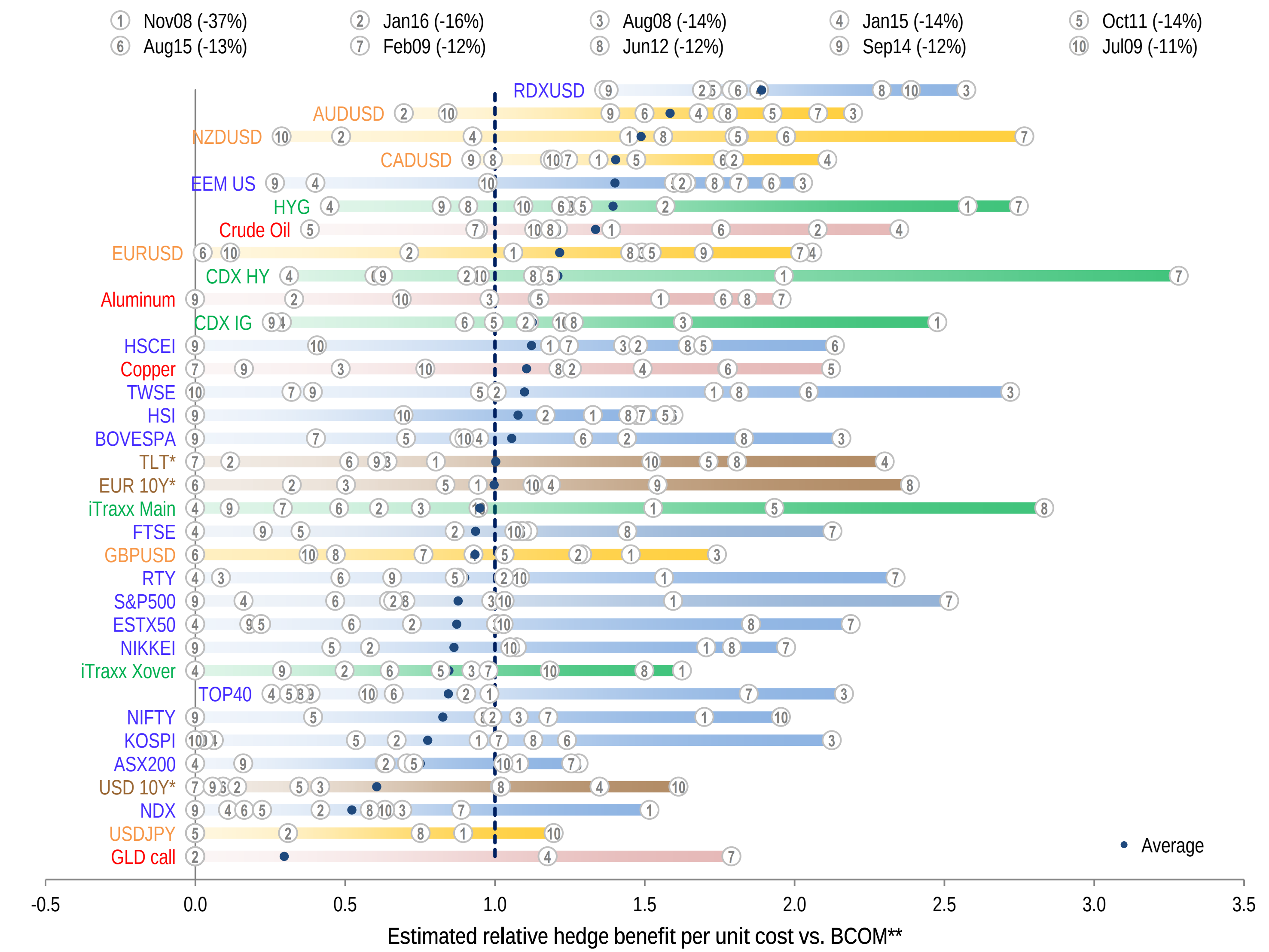
This section aims to identify the most efficient tail hedges for common constituents of broad cross asset portfolios. Importantly, the benchmarks we consider in Chart 2 to Chart 5 do not possess liquid option markets for comparison, meaning our standard proxy hedging screen is not applicable. Instead, we infer the relative efficacy of potential hedges by ranking their crash beta (as a proportion of their current implied volatility) during the 10 most severe declines of the benchmark. Whenever a proxy asset does not decline for a given sell-off in the benchmark, this hedge benefit is registered as 0, highlighting the basis risk of proxy hedging (see Method III in Finding cheap hedges: the framework for a detailed explanation).

Hedging commodity exposure (BCOM)

RDXUSD (Russian equity) puts continue to screen as the best value broad commodity hedge – more so even than last month – given their consistent returns during commodity sell-offs and their low basis risk compared to other proxy hedges.

Chart 2: Proxy hedge screen: Bloomberg Commodity Index

For an explanation of how to interpret this chart see Finding cheap hedges: the framework.



Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates). **Hedge benefit = Proxy return / [Benchmark return X Proxy 3M 25d vol] for each proxy and each of the 10 largest drawdowns of the benchmark. These are then normalized by the median level of the Average Hedge Benefit across all proxies.

Table 3: Top 5 ranking MSCI World proxy hedges

Asset	10 largest BCOM 3M drawdowns										Average crash beta*	R2	Avg crash beta / 3M 25d Vol	Normalised by median
	Nov-08	Jan-16	Aug-08	Jan-15	Oct-11	Aug-15	Feb-09	Jun-12	Sep-14	Jul-09				
BCOM	-37.2%	-15.6%	-14.5%	-13.6%	-13.5%	-13.5%	-12.2%	-11.8%	-11.5%	-10.9%	1.0	-	-	-
RDXUSD	-61.3%	-24.3%	-34.3%	-23.6%	-21.5%	-22.5%	-15.4%	-24.9%	-14.6%	-23.9%	1.7	87%	7.2	1.9
AUDUSD	-23.5%	-3.9%	-11.4%	-8.2%	-9.4%	-7.3%	-9.1%	-7.5%	-5.7%	-3.3%	0.6	82%	6.0	1.6
NZDUSD	-21.9%	-3.1%	-10.7%	-5.1%	-10.0%	-10.8%	-13.7%	-7.5%	-8.4%	-1.3%	0.6	56%	5.6	1.5
CADUSD	-15.5%	-8.7%	-5.3%	-8.9%	-6.2%	-7.4%	-4.7%	-3.6%	-3.3%	-4.0%	0.4	82%	5.3	1.4
EEM US	-43.4%	-18.1%	-20.9%	-3.9%	-15.4%	-18.5%	-15.8%	-14.6%	-2.2%	-7.6%	1.0	77%	5.3	1.4

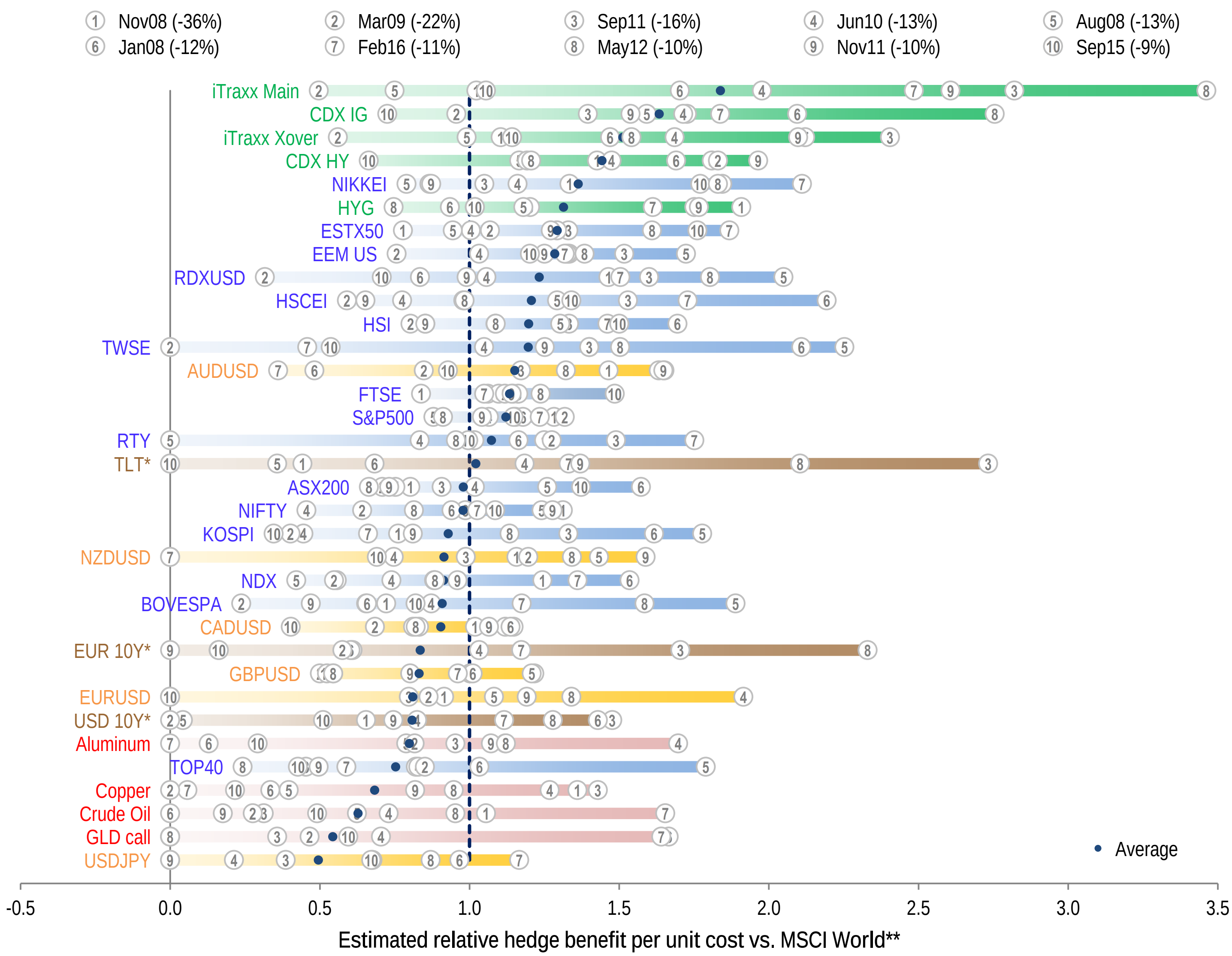
Source: BofA Merrill Lynch Global Research Data: 4-Sep-17. *Crash beta = max[0, Proxy return / Benchmark return].

Hedging global equities (MSCI World)

Credit hedges still rank as top value hedges for global equities, but Nikkei (Japanese equity) puts currently screen as best value within equities with lesser basis risk.

Chart 3: Proxy hedge screen: MSCI World Benchmark

For an explanation of how to interpret this chart see Finding cheap hedges: the framework.



Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates). **Hedge benefit = Proxy return / [Benchmark return X Proxy 3M 25d vol] for each proxy and each of the 10 largest drawdowns of the benchmark. These are then normalized by the median level of the Average Hedge Benefit across all proxies.

Table 4: Top 5 ranking MSCI World proxy hedges

Asset	10 largest MSCI World 3M drawdowns										Average crash beta*	R2	Avg crash beta / 3M 25d Vol	Normalised by median
	Nov-08	Mar-09	Sep-11	Jun-10	Aug-08	Jan-08	Feb-16	May-12	Nov-11	Sep-15				
MSCI World	-35.6%	-22.2%	-16.5%	-13.0%	-12.6%	-12.0%	-10.7%	-10.4%	-10.1%	-9.4%	1.0	-	-	-
iTraxx Main	-3.3%	-0.9%	-3.8%	-2.2%	-0.8%	-1.6%	-2.0%	-3.0%	-2.1%	-0.7%	0.1	12%	9.7	1.9
CDX IG	-4.8%	-1.7%	-1.8%	-1.7%	-1.6%	-2.0%	-1.5%	-2.2%	-1.2%	-0.5%	0.1	74%	8.2	1.6
iTraxx Xover	-12.7%	-3.8%	-11.7%	-6.8%	-3.7%	-4.9%	-6.1%	-4.8%	-6.2%	-2.9%	0.4	42%	8.0	1.6
CDX HY	-16.9%	-13.5%	-9.9%	-6.4%	-4.9%	-6.8%	-4.3%	-4.2%	-6.6%	-2.1%	0.5	88%	7.3	1.4
NIKKEI	-35.8%	-17.8%	-14.4%	-12.8%	-9.0%	-18.0%	-18.2%	-15.6%	-7.7%	-13.8%	1.1	72%	6.6	1.3

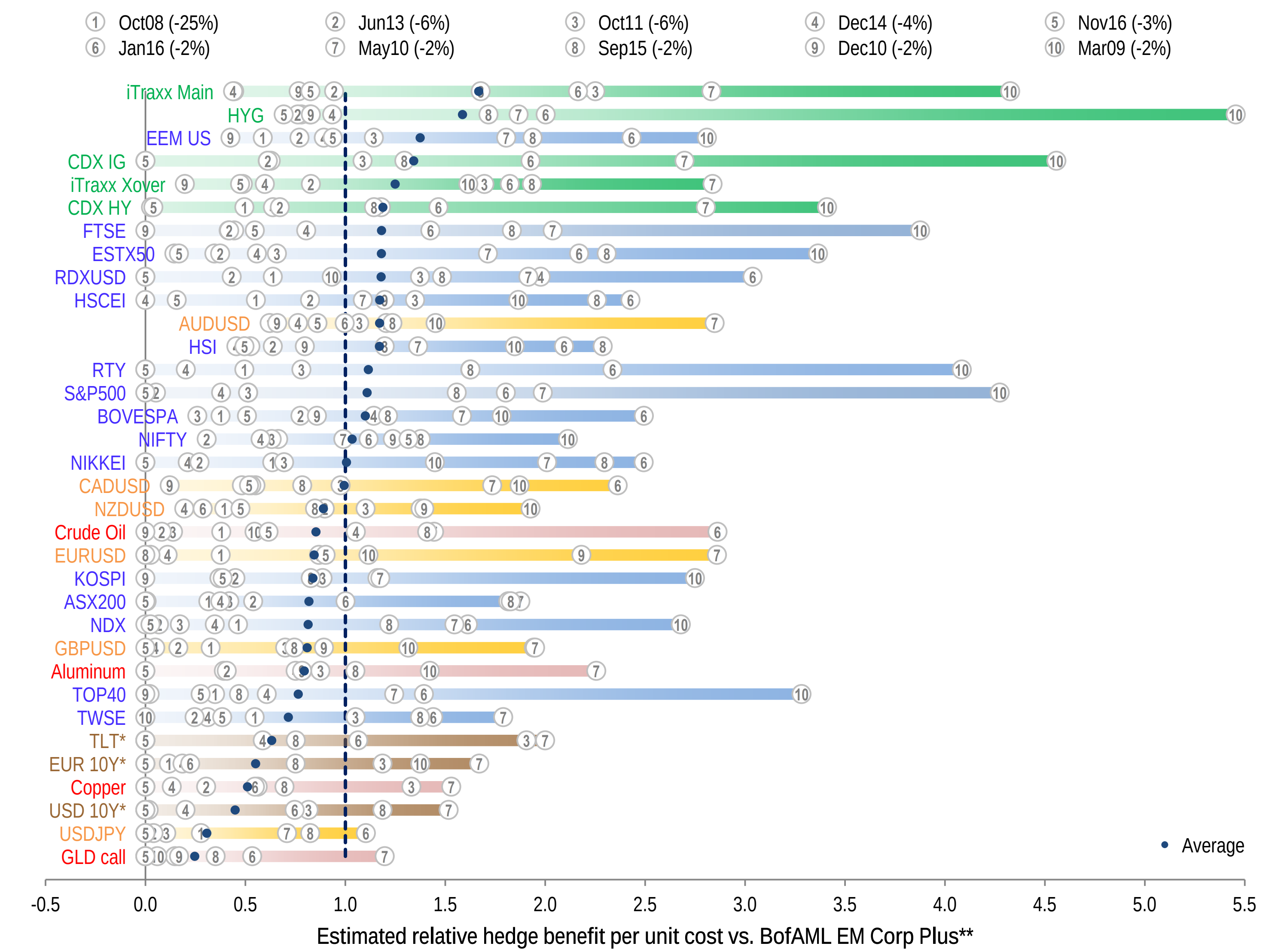
Source: BofA Merrill Lynch Global Research Data: 4-Sep-17. *Crash beta = max[0, Proxy return / Benchmark return].

Hedging EM Credit (BofAML EM Corporate Plus)

European IG credit payers rank as the top value hedge for EM credit exposure with HYG (US HY Credit ETF) puts a close second and affording the least amount of historical basis risk.

Chart 4: Proxy hedge screen: BofAML EM Corporate Plus Benchmark

For an explanation of how to interpret this chart see Finding cheap hedges: the framework.



Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates). **Hedge benefit = Proxy return / [Benchmark return X Proxy 3M 25d vol] for each proxy and each of the 10 largest drawdowns of the benchmark. These are then normalized by the median level of the Average Hedge Benefit across all proxies.

Table 5: Top 5 ranking BofAML EM Corporate Plus proxy hedges

Asset	Oct-08	Jun-13	Oct-11	Dec-14	Nov-16	Jan-16	May-10	Sep-15	Dec-10	Mar-09	Average crash beta*	R2	Avg crash beta / 3M 25d Vol	Normalised by median
	10 largest BofAML EM Corp Plus 3M drawdowns													
BofAML EM Corp Plus	-24.8%	-6.2%	-5.7%	-3.8%	-2.8%	-2.5%	-2.5%	-2.4%	-2.1%	-1.9%	1.0	-	-	-
iTraxx Main	-2.7%	-1.3%	-3.0%	-0.4%	-0.5%	-1.2%	-1.7%	-0.9%	-0.4%	-1.8%	0.4	33%	24.7	1.7
HYG	-23.8%	-5.5%	-5.2%	-4.1%	-2.2%	-5.8%	-5.3%	-4.9%	-2.0%	-11.9%	1.8	77%	22.7	1.6
EEM US	-39.3%	-12.8%	-17.6%	-9.1%	-7.0%	-16.2%	-12.0%	-12.7%	-2.4%	-14.2%	3.7	82%	19.7	1.4
CDX IG	-3.5%	-0.8%	-1.4%	-0.5%	0.0%	-1.1%	-1.5%	-0.7%	0.1%	-1.9%	0.3	62%	19.2	1.3
iTraxx Xover	-10.8%	-4.1%	-8.2%	-1.8%	-1.1%	-3.5%	-6.1%	-3.7%	-0.3%	-2.5%	1.0	59%	18.5	1.3

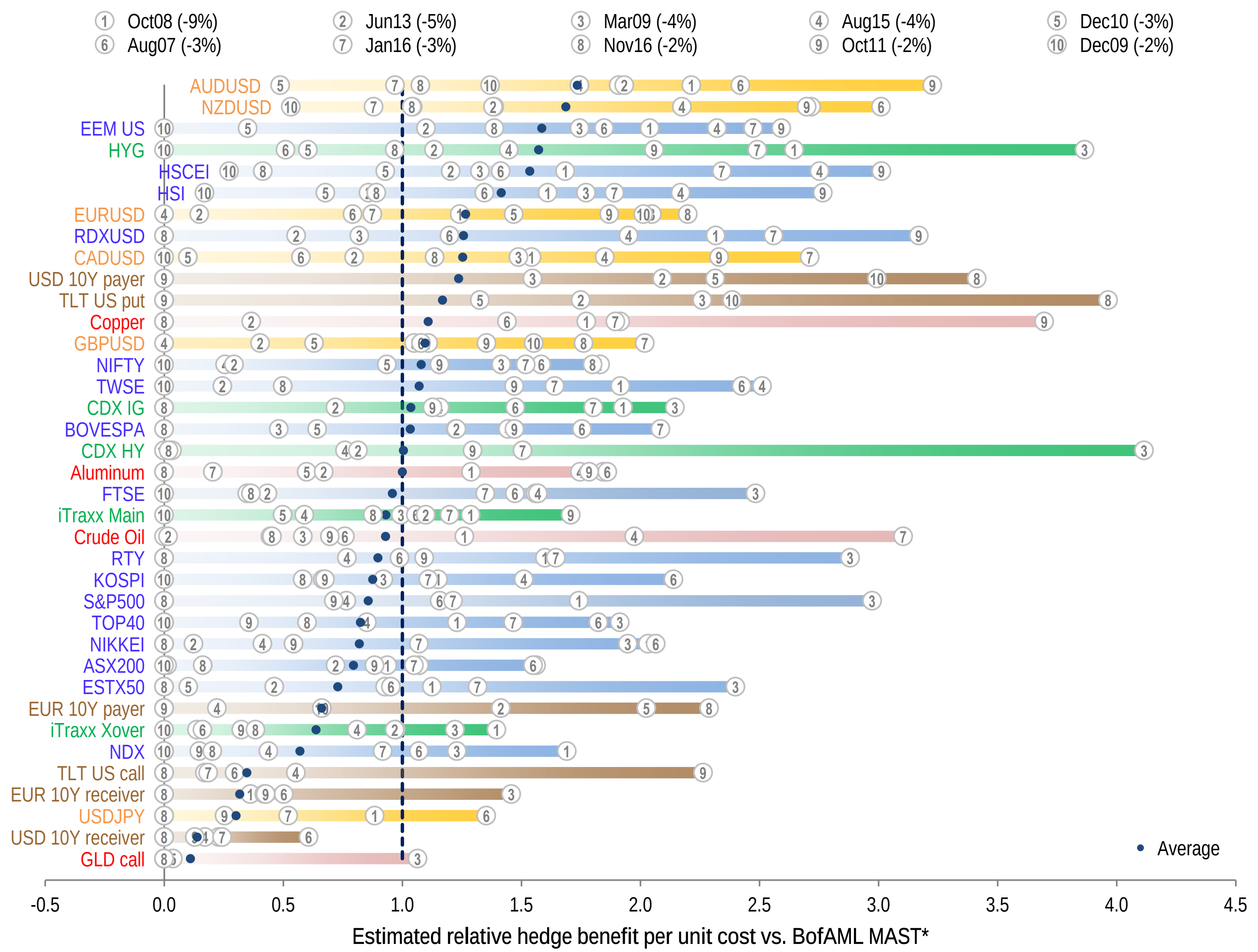
Source: BofA Merrill Lynch Global Research Data: 4-Sep-17. *Crash beta = max[0, Proxy return / Benchmark return].

Hedging a diversified multi-asset portfolio

AUDUSD and NZDUSD puts screen as top value hedges for popular diversified multi-asset portfolios (as represented by our BofAML MAST index).

Chart 5: Proxy hedge screen: BofAML MAST

For an explanation of how to interpret this chart see Finding cheap hedges: the framework.



Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Hedge benefit = Proxy return / [Benchmark return X Proxy 3M 25d vol] for each proxy and each of the 10 largest drawdowns of the benchmark. These are then normalized by the median level of the Average Hedge Benefit across all proxies.

Table 6: Top 5 ranking BofAML MAST proxy hedges

Asset	10 largest BofAML MAST 3M drawdowns										Average crash beta*	R2	Avg crash beta / 3M 25d Vol	Normalised by median
	Oct-08	Jun-13	Mar-09	Aug-15	Dec-10	Aug-07	Jan-16	Nov-16	Oct-11	Dec-09				
BofAML MAST	-9.1%	-4.8%	-4.0%	-3.6%	-3.5%	-3.2%	-3.1%	-2.3%	-2.2%	-2.1%	1.0	-	-	-
AUDUSD	-23.6%	-10.8%	-8.9%	-7.4%	-2.0%	-8.9%	-3.6%	-2.9%	-8.3%	-3.3%	2.0	82%	21.5	1.7
NZDUSD	-16.7%	-8.7%	-14.3%	-10.4%	-4.8%	-12.6%	-3.6%	-3.1%	-7.9%	-1.5%	2.2	50%	20.9	1.7
EEM US	-43.0%	-12.2%	-16.1%	-19.5%	-2.8%	-13.5%	-18.0%	-7.4%	-13.3%	0.7%	3.7	74%	19.6	1.6
HYG	-24.1%	-5.4%	-15.4%	-5.2%	-2.1%	-1.6%	-7.8%	-2.2%	-4.5%	3.2%	1.6	73%	19.5	1.6
HSCEI	-41.9%	-15.9%	-14.6%	-27.4%	-9.0%	-12.3%	-20.3%	-2.6%	-18.3%	-1.6%	4.2	65%	19.0	1.5

Source: BofA Merrill Lynch Global Research Data: 4-Sep-17. *Crash beta = max[0, Proxy return / Benchmark return].

Best cross-asset proxy hedges

Chart 6 through Chart 12 show ratios of historical crash betas (versus a benchmark) to relative hedge costs (see Benchmark proxy hedging in Finding cheap hedges: the framework for a detailed explanation of the methodology). Whenever a proxy asset does not decline for a given sell-off in the benchmark, this hedge benefit is registered as 0, highlighting the basis risk of proxy hedging.

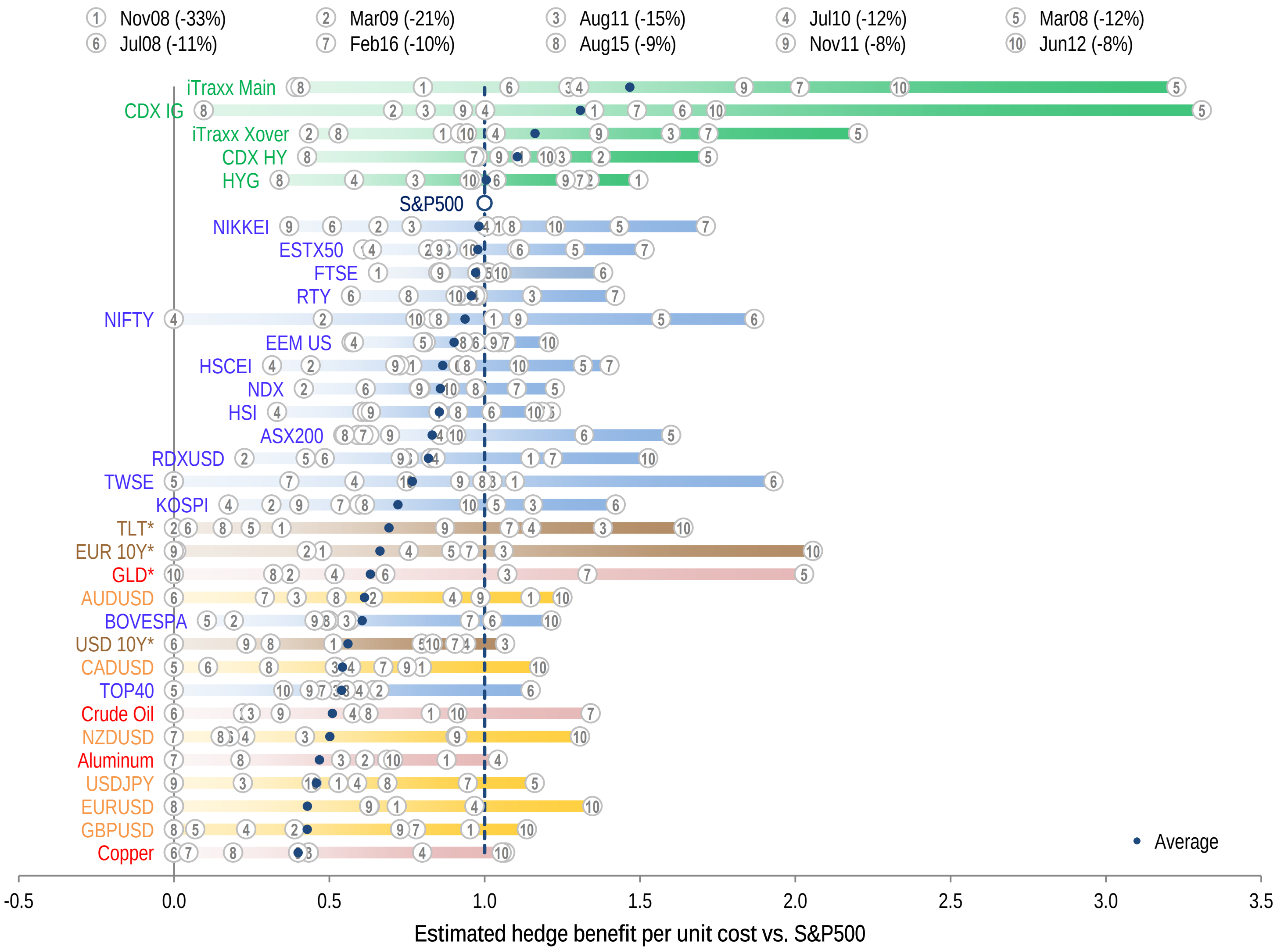
For appropriate proxy hedges, we look for:

1. **Average hedge benefit per unit cost > 1** (better value than the benchmark hedge)
2. **Closely distributed hedge benefits in past sell-offs** (consistency of proxy hedge)
3. **Min hedge benefit > 0** (low basis risk to benchmark)

Hedging US equities (S&P500)

Credit is the only asset class which possesses higher ranking US equity proxy hedges than S&P puts. In fact, all 5 credit hedges in our universe would have generated between 1% (HYG puts) and 47% (EU IG credit payers) more value than S&P puts during the 10 largest US equity sell-offs, at current pricing.

Chart 6: Proxy hedge screen: S&P500 Benchmark

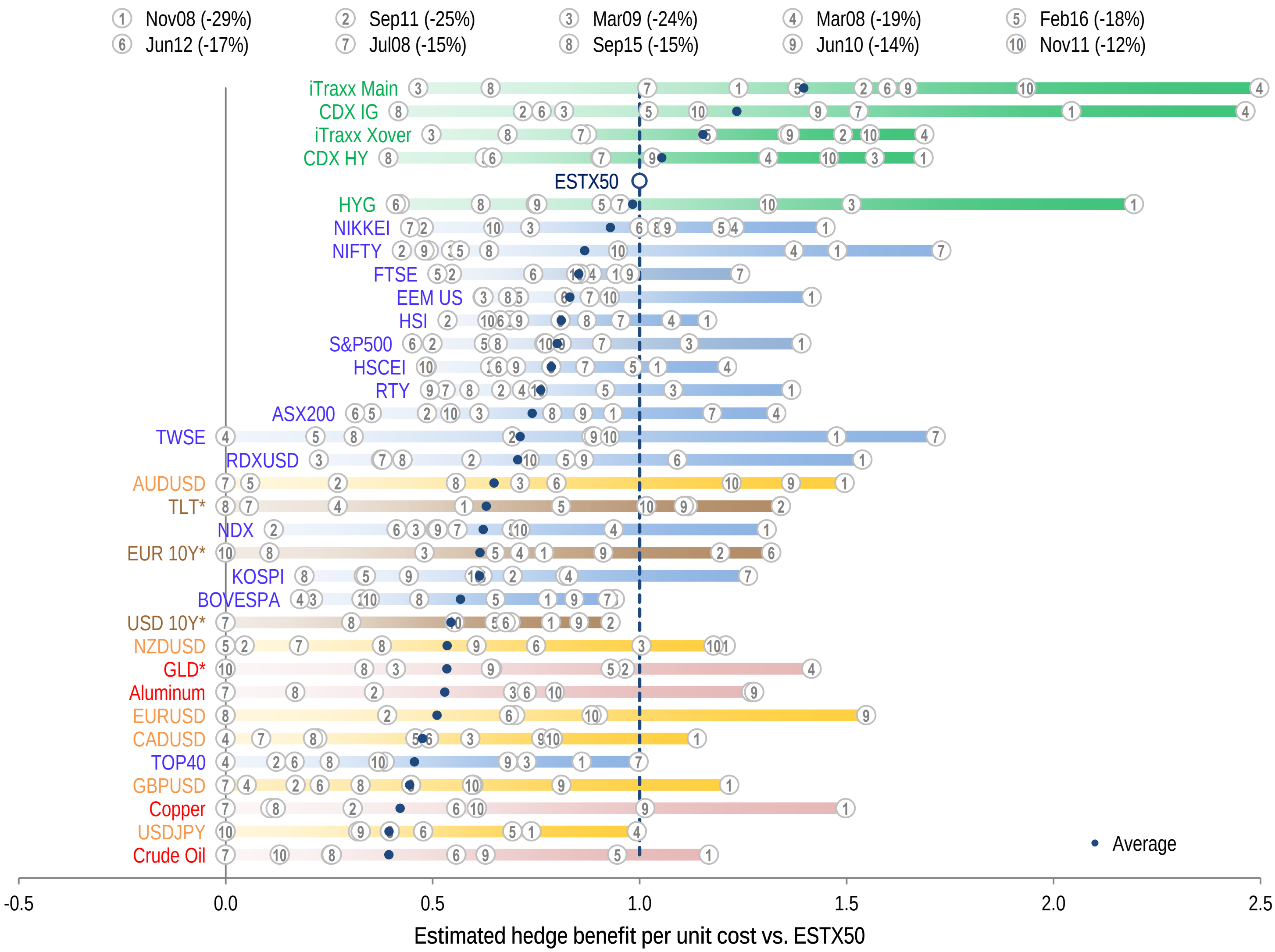


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Hedging European equities (Euro STOXX 50)

Similar to the case of the S&P, credit hedges (ex-HYG puts) currently screen as better value than ESTX50 puts for hedging European equity exposure.

Chart 7: Proxy hedge screen: ESTX50 Benchmark

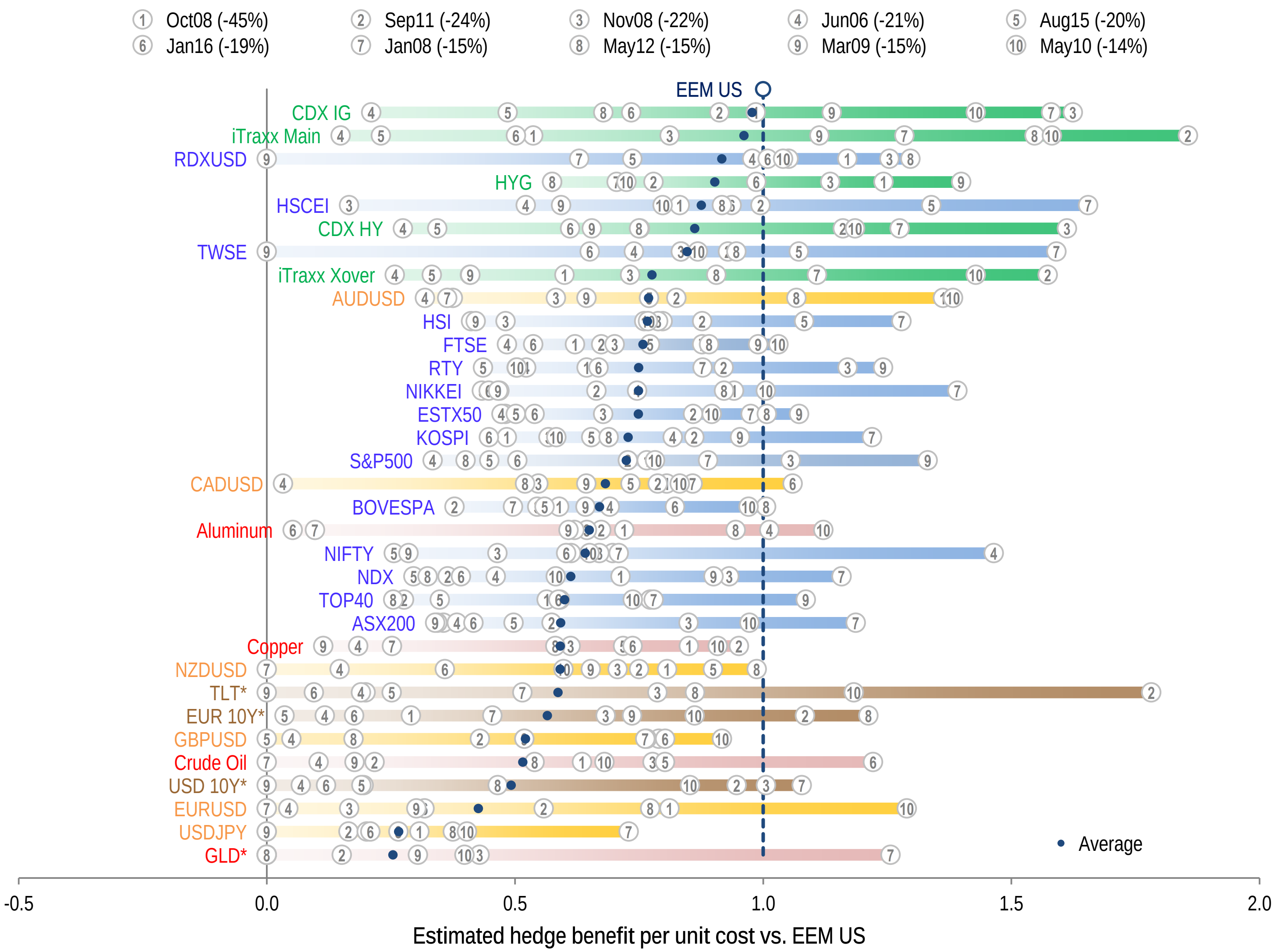


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Hedging Emerging market equity exposure (EEM)

Proxy hedging EEM at current levels does not screen efficent.

Chart 8: Proxy hedge screen: EEM US Benchmark

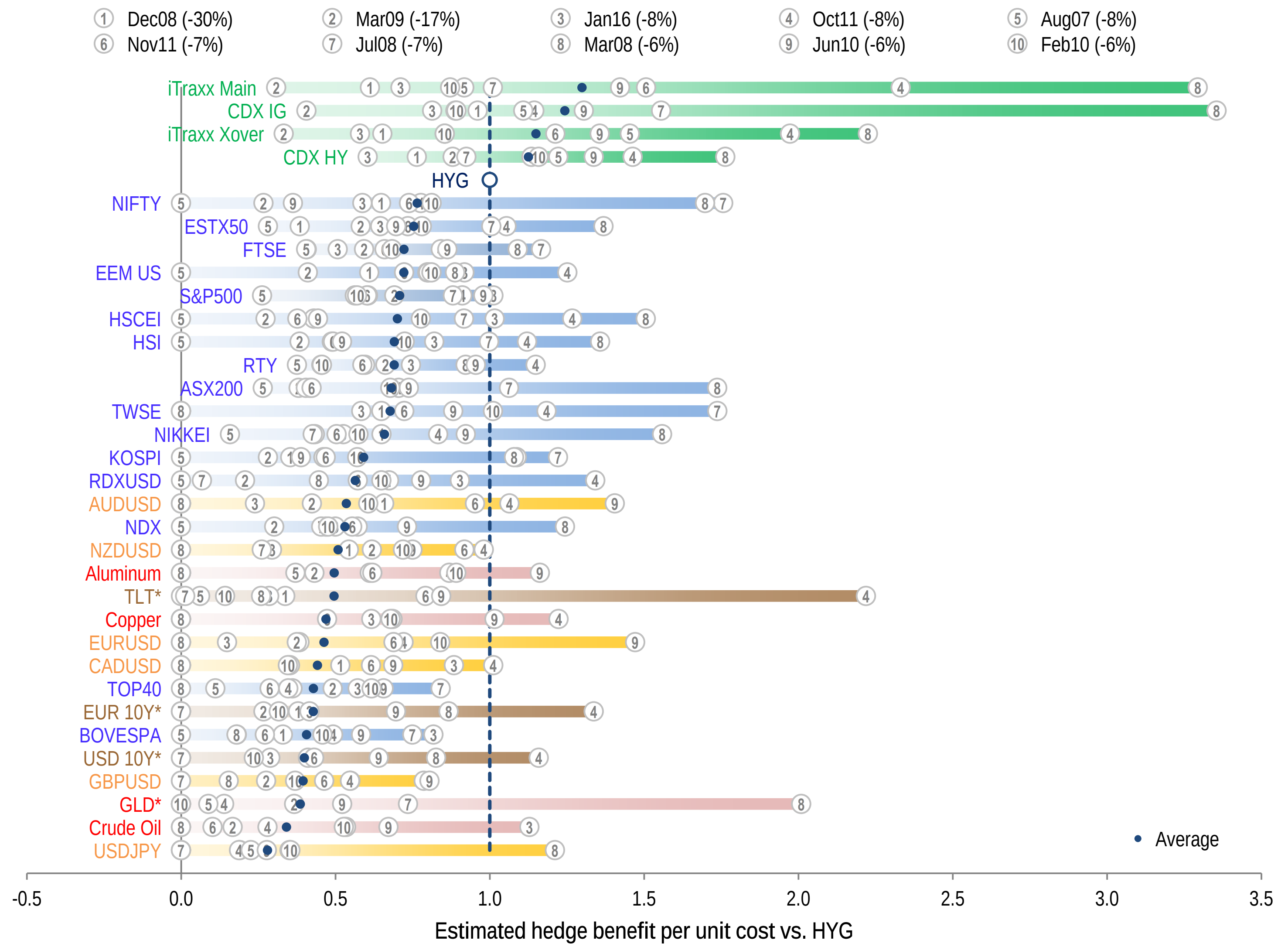


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Hedging HY Credit

US & EU credit payers continue to screen as better value hedges than HYG puts on average, at current pricing.

Chart 9: Proxy hedge screen: HY Credit Benchmark

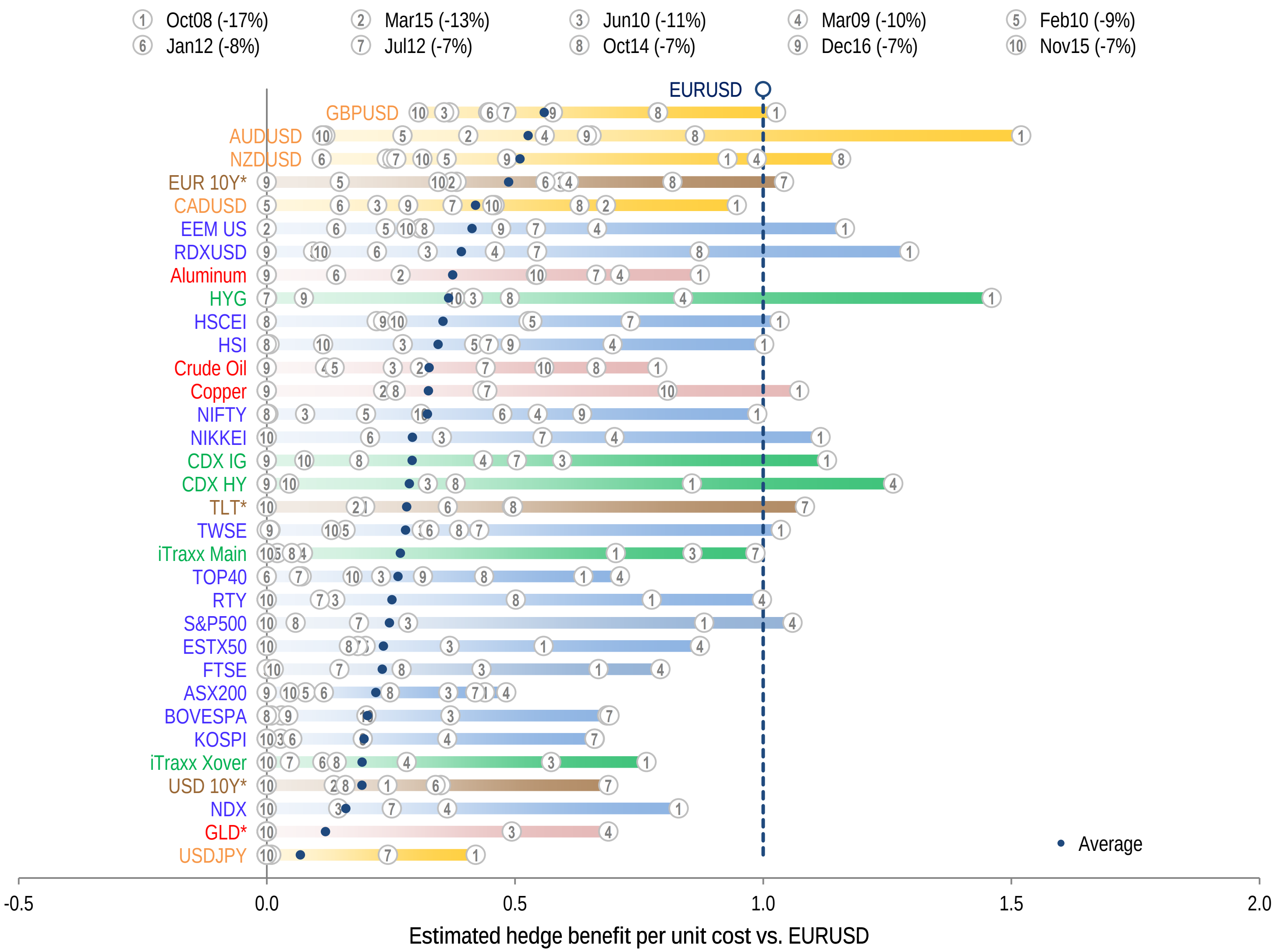


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Hedging the EURO (EURUSD)

Proxy hedging EURUSD weakness is not efficient at present.

Chart 10: Proxy hedge screen: EURUSD Benchmark

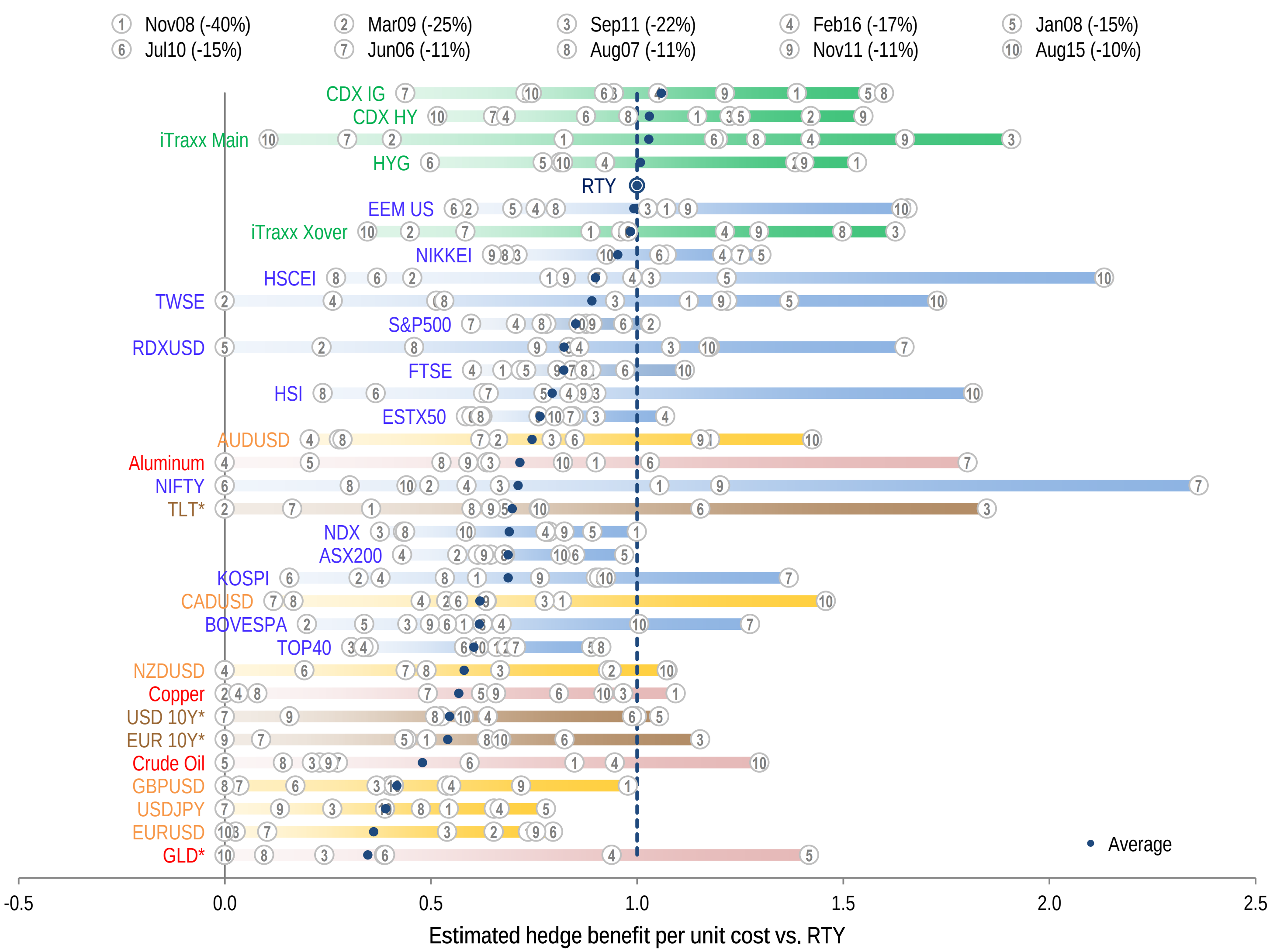


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Hedging US small/mid-cap equities (RTY)

Last month we noted that multiple (mainly EM) equity puts screened as better value US small/mid-cap proxy hedges than RTY puts. However, with EM equity volatility having risen more than RTY vol, this is no longer the case. Credit payers on the other hand, still rank higher than RTY puts on average, but come with material basis risk.

Chart 11: Proxy hedge screen: RTY Benchmark

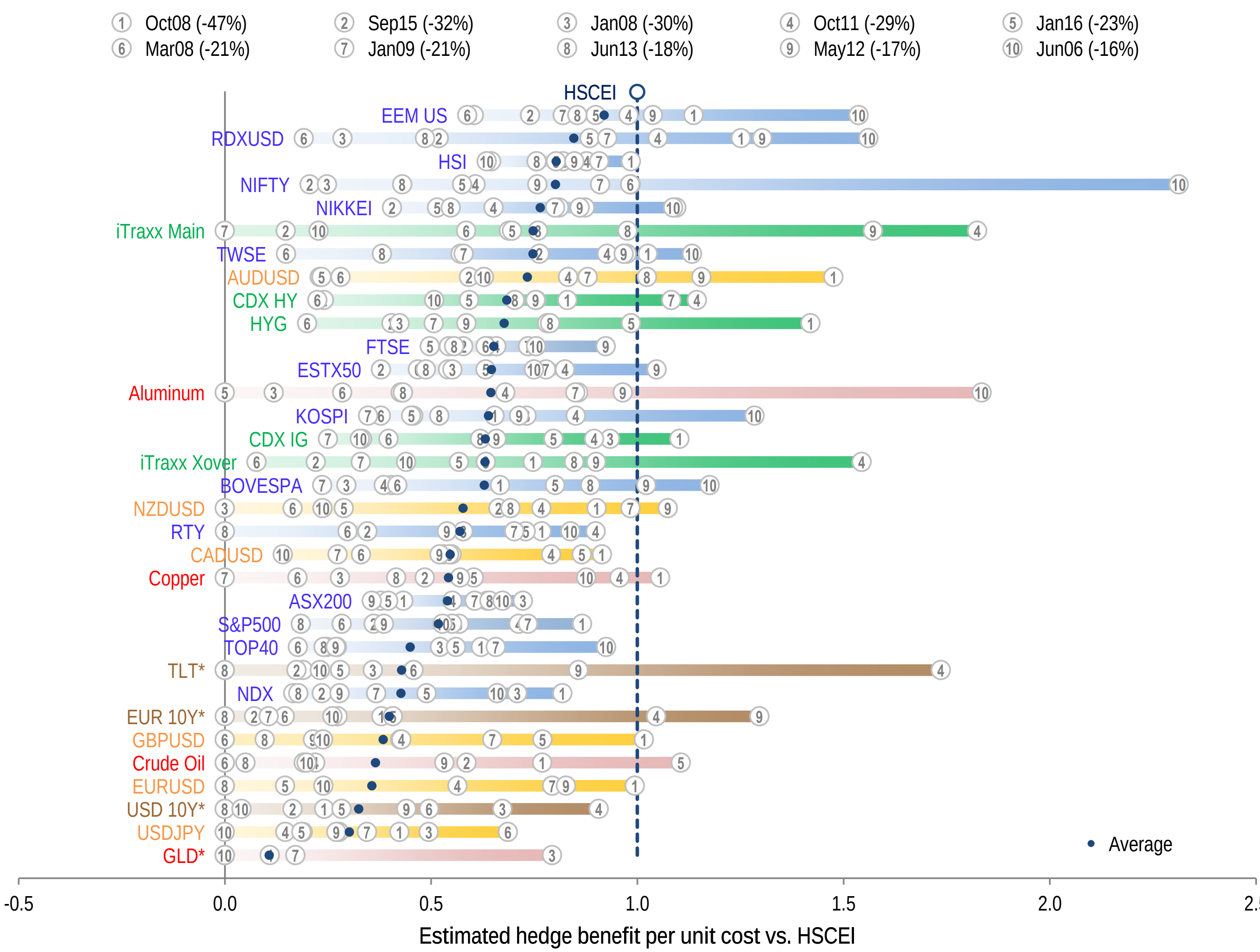


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Hedging Chinese equities (HSCEI)

Despite the rise in Chinese equity volatility, our screen does not yield efficient HSCEI proxy hedges.

Chart 12: Proxy hedge screen: HSCEI Benchmark

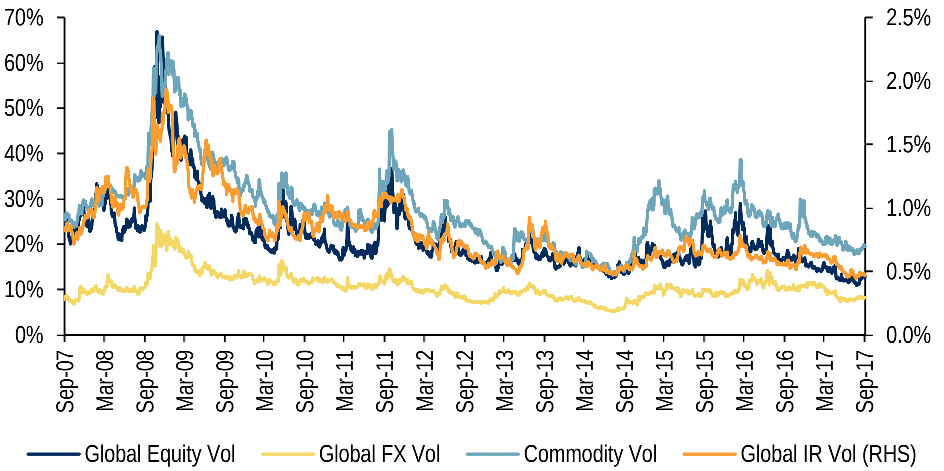


Source: BofA Merrill Lynch Global Research. Data: 4-Sep-17. *Call volatility (Receiver premia) used for TLT US (EUR & USD 10Y rates).

Global cross-asset volatility trends

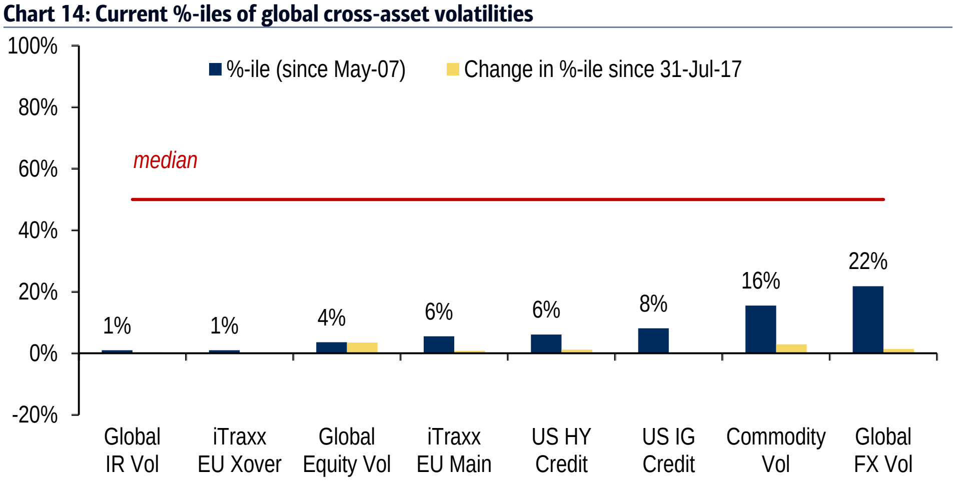
• All cross asset risk measures apart from EU IG credit spreads rose modestly over the month, yet remain in significantly benign territory
• Aug-17 marked the first time since Jan-16 when global equity, rates, commodity and FX vols all moved in the same direction (Chart 15)

Chart 13: History of global cross-asset implied volatilities



Source: BofA Merrill Lynch Global Research (data from 1-Sep-07 to 4-Sep-17). 3M ATM implied vols on Equities (S&P500, ESTX50, FTSE 100, Nikkei 225, HSI), Interest Rates (Europe and US), FX (EUR/USD, USD/JPY, GBP/USD) and Commodities (Crude Oil, Gold and Copper).

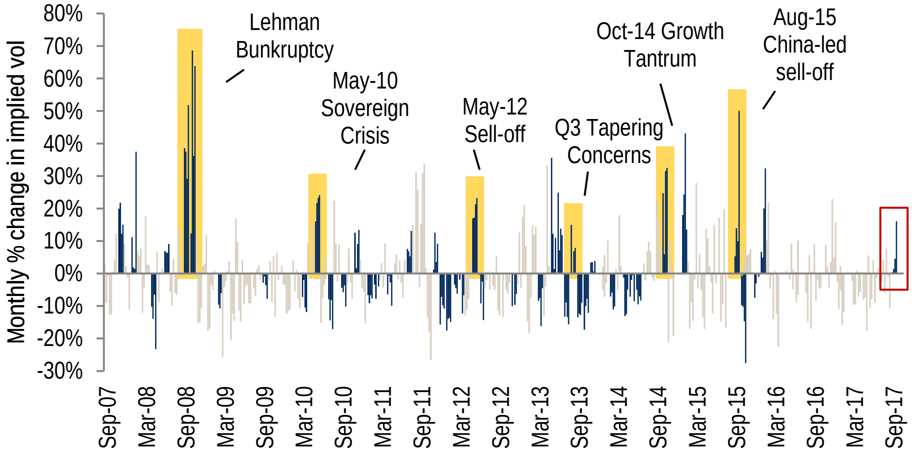
Chart 14: Current %-iles of global cross-asset volatilities



Source: BofA Merrill Lynch Global Research (data as of 4-Sep-17). 3M ATM implied vols on Equities (S&P500, ESTX50, FTSE 100, Nikkei 225, HSI), Interest Rates (Europe and US), FX (EUR/USD, USD/JPY, GBP/USD) and Commodities (Crude Oil, Gold and Copper).

Chart 15: Month-on-month changes in cross-asset volatility, blue bars show when there is high correlation in asset volatility (i.e. all move in the same direction)

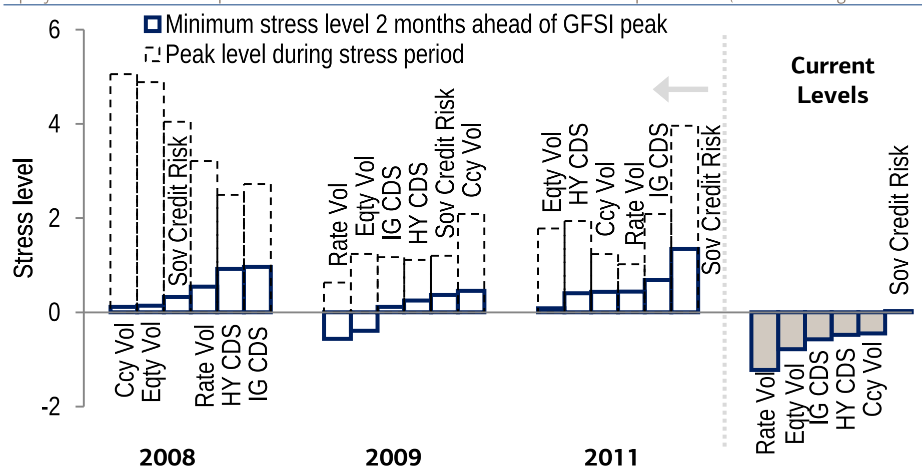
Equity, rates, FX & commodity volatilities until this month hadn't experienced a coordinated move up or down for the longest period in at least 10 years



Source: BofA Merrill Lynch Global Research. Monthly data from 1-Sep-07 to 4-Sep-17.
Monthly % Change in 3M ATM implied volatilities on: Interest Rates (Europe and US), FX (EUR/USD, USD/JPY, GBP/USD), Commodities (Crude Oil, Gold and Copper) and Equities (S&P500, ESTX50, FTSE 100, Nikkei 225, HSI).

Chart 16: Min 2 months ahead of historical stress peaks, including current levels

The chart illustrates why it is useful to consider the relative pricing of options across asset classes to hedge against tail events: option markets often underestimate the severity of market shocks, and to different degrees. In 2008, currency and equity vols were the most optimistic ahead of the Lehman crisis and the most surprised after (rose to the highest levels).



Source: BofA Merrill Lynch Global Research (data as of 4-Sep-17). Z-scores calculated using data since 2001 (where available) as per the GFSI methodology.

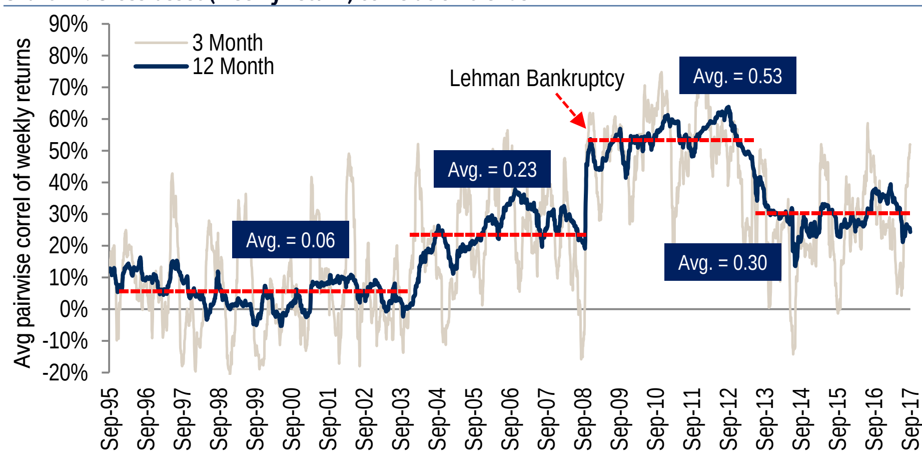
Global cross-asset correlation trends

Short-dated (3M) cross asset correlation continued to rise reaching a level of 50%, its highest level in over 1y.

Historically there have been 3 distinct cross asset correlation regimes since 1995. Interestingly, we see a broadly upward trend since Oct-03, well before the Lehman bankruptcy in Sep-08. This is related to the liquidity driven crush in asset risk-premia that helped drive investment leverage higher.

Long-term correlation established a new regime since 3Q13, similar to the '03 to '08 correlation environment.

Chart 17: Cross-asset (weekly return) correlation trends



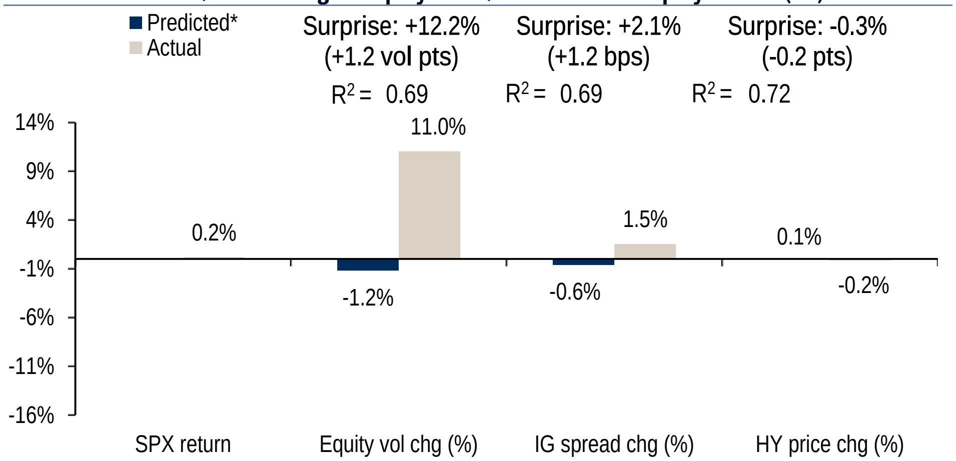
Source: BofA Merrill Lynch Global Research. Daily data from 1-Sep-95 to 4-Sep-17.
3M/1Y average pairwise correlation between the weekly returns of the Dollar Index (DXY, inverted), S&P Goldman Sachs Commodity Index (SPGSCITR), MSCI All Country World Index (MXWD) and the BofA Merrill Lynch US High Yield Master II Index (H0A0 Index).

Macro trends in equity vs credit markets

• US equity volatility rose significantly more than expected given the S&P ended the month roughly flat, while credit spreads behaved as expected
• A similar pattern was observed in Europe where equity vol rose more than anticipated by our historical regression model

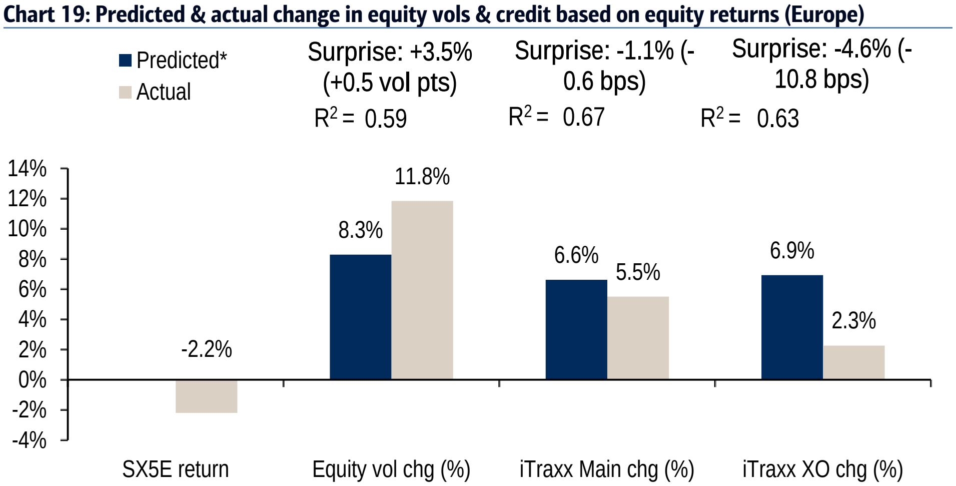
If equities decline, we expect the cost of hedging in the equity derivative and credit derivative markets to rise (and vice-versa for a rise in equities). Based on this relation, we regress historical changes in equity vol and CDS spreads against equity returns. The **bar charts below illustrate how the derivatives markets behaved in the past month relative to expectations** based on this regression.

Chart 18: Predicted & actual change in equity vols & credit based on equity returns (US)



Source: BofA Merrill Lynch Global Research. * Predicted 1-month change based on orthogonal regressions of i) changes in 3M ATM S&P500 vol, (bottom chart: ESTX50 vol), ii) Markit CDX North America Investment Grade CDS spread (bottom chart: iTraxx Crossover) and iii) Markit CDX North America High Yield CDS price index (bottom chart: iTraxx Main CDS) against S&P500 changes (bottom chart: ESTX50 changes), using 3 years of monthly data. Regression data is from 10-Sep-14 to 3-Aug-17. Actual 1-month data from 3-Aug-17 to 1-Sep-17.

Chart 19: Predicted & actual change in equity vols & credit based on equity returns (Europe)



Source: BofA Merrill Lynch Global Research. * Predicted 1-month change based on orthogonal regressions of i) changes in 3M ATM S&P500 vol, (bottom chart: ESTX50 vol), ii) Markit CDX North America Investment Grade CDS spread (bottom chart: iTraxx Crossover) and iii) Markit CDX North America High Yield CDS price index (bottom chart: iTraxx Main CDS) against S&P500 changes (bottom chart: ESTX50 changes), using 3 years of monthly data. Regression data is from 11-Sep-14 to 4-Aug-17. Actual 1-month data from 4-Aug-17 to 4-Sep-17.

Finding cheap hedges: the framework

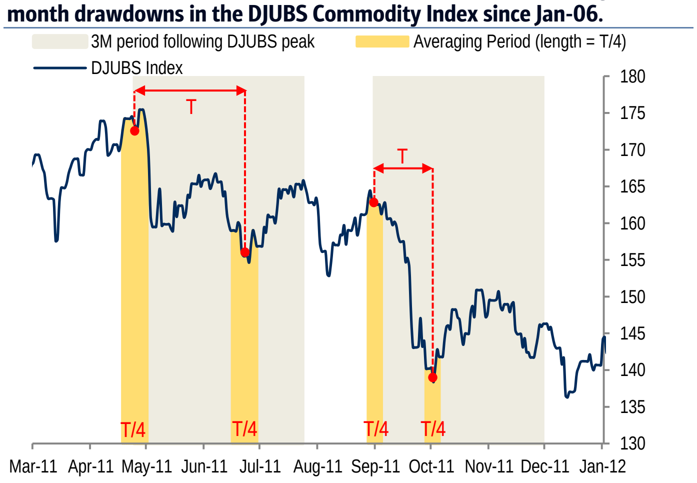
Method I: Cross asset tail hedging

Our cross asset tail hedging screen compares current put option costs to the magnitude of historical tail events in order to determine which options are most underpricing tail risk.

Interpreting the cross asset TH screen:

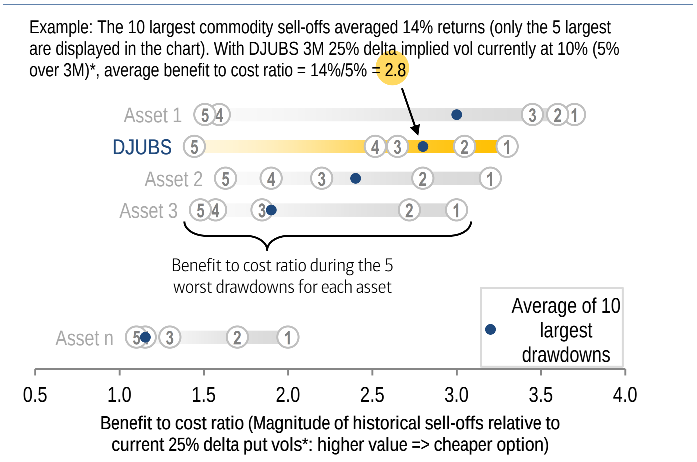
- Readings further to the right represent assets that are most underpricing historical tail events today
- An asset with a benefit-to-cost ratio of 2 indicates its options are half the price of an asset with a ratio of 1, assuming their historical tail returns were similar
- Looking across asset classes we perform a cost-benefit analysis comparing the cost of buying out-of-the-money put options to the magnitude of historical tail events, without consideration of hedging benchmarks. Assuming historical tail events represent the potential magnitude of future sell-offs, we look for options that are most underpricing downside risk.
- **Tail hedge benefit:** is measured by the magnitude of the 10 largest drawdowns occurring over non-overlapping 3-month periods since Jan-06 (Chart 20).
- **Hedging cost:** is measured by the current implied vol of 25 delta put options (*see footnote of Chart 21). We use out-of-the-money options as we are comparing their pricing of large downside risks. Equal delta options allow for easy comparison across assets.
- **High benefit / low cost:** The best value hedge is cheap to enter relative to its expected payoff in a tail event. The x-axis in the right-hand chart below maps out this ratio for past events and includes the average payout relative to today's put costs. Assets with points far to the right are most underpricing historical downside risks and hence represent best value.

Chart 20: This chart shows the 9th (Jul-11) and 3rd (Oct-11) largest 3-month drawdowns in the DJUBS Commodity Index since Jan-06.



Source: BofA Merrill Lynch Global Research. Put volatilities used here are for illustration and do not necessarily reflect current costs. Once a drawdown is identified to be within the top 10, the entire period shaded in grey is removed from the time series before identifying the next biggest drawdown.

Chart 21: This is a schematic illustrating how we calculate the benefit-to-cost ratio for each asset.



Source: BofA Merrill Lynch Global Research. *We make a slight adjustment to 25% delta vols in order to make the ratio of same delta vols equal to the ratio of option prices for two assets. This adjustment increases the volatility of high vol assets relative to lower vol assets (eg vol of credit spreads versus vol of currencies). Importantly, the adjustment is not dependent on the relative forward levels. Please ask us for more details.

Method II: Benchmark proxy hedging

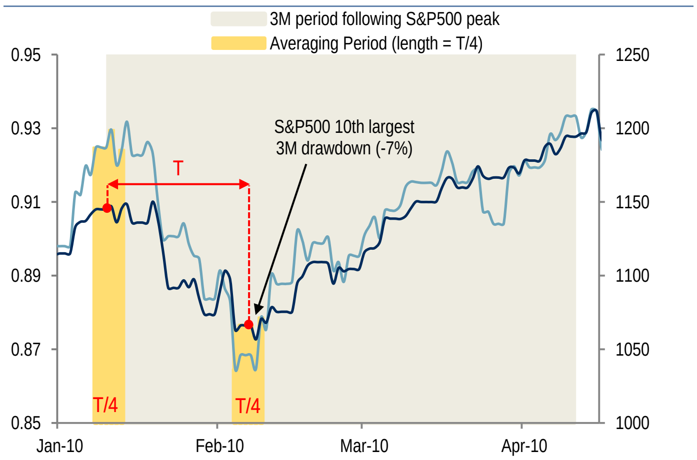
Interpreting the BPH screen:

- A reading > 1 indicates better value in the proxy put option vs. the benchmark
- Small variations along the x-axis mean the proxy has good tracking to the benchmark during large sell-offs
- All readings > 1 indicates the proxy has consistently been a better hedge at current pricing

For investors looking to hedge risk in a specific underlying benchmark, including equity, credit, commodity or currency, it is not only important to consider the cheapest options across asset classes, but also how the proxy asset correlates with the benchmark during times of stress. In severe risk-off events, asset correlations tend to 1 and proxy hedging can become attractive. Proxy hedging does not often work for small declines in benchmark assets due to the basis risk between asset classes.

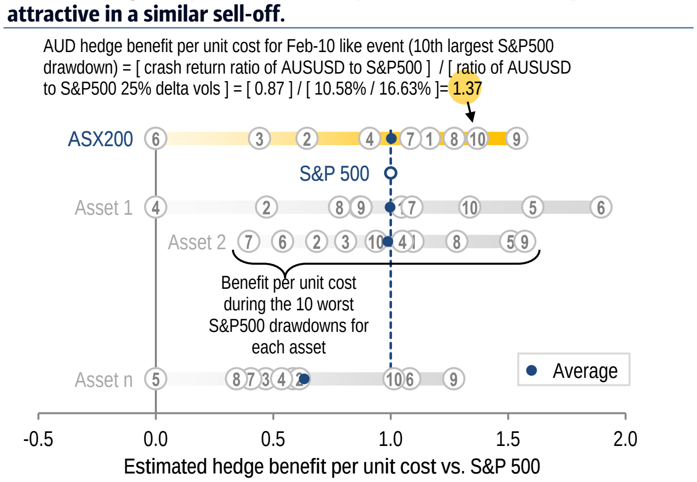
- Here, we identify options on proxy assets that our analysis shows can help hedge against declines in various benchmark assets, bearing in mind the trade-off between cost savings and tracking risk of the proxy asset.
- Proxy hedge benefit: We calculate how much proxy assets have fallen during the largest sell-offs in a benchmark asset (eg. S&P500, US HY Credit). "Crash betas" are computed based on the decline in the proxy and benchmark assets, respectively since Jan-05. For example, Chart 22 illustrates how the AUDUSD moved during the S&P500 sell-off in Feb-10.
- Relative hedge cost: The current ratio of 3M 25% delta put option implied volatility for the proxy vs. the benchmark.
- High benefit / low cost: Chart 23 summarizes how much the proxy asset declined during benchmark sell-offs relative to current option costs. A reading above 1 is desirable and means that proxy hedging would offer better value than put options on the benchmark, assuming relative asset performance is similar to the past during severe tail events.

Chart 22: S&P500 peak-to-trough return in the Feb-10 sell-off was -6.9%. AUDUSD fell by 6.0% over the same period.



Source: BofA Merrill Lynch Global Research. Average prices around the start and end points of the sell-off are used in order to allow for tracking and timing risk as well as removing noise.

Chart 23: Even though the S&P500 decline was larger, AUDUSD puts can be sufficiently cheaper than S&P500 puts to make AUDUSD puts more attractive in a similar sell-off.



Source: BofA Merrill Lynch Global Research. Put volatilities used here are for illustration and do not necessarily reflect current costs. *We make a slight adjustment to 25% delta vols in order to make the ratio of same delta vols equal to the ratio of option prices for two assets. This adjustment increases the volatility of high vol assets relative to lower vol assets (eg vol of credit spreads versus vol of currencies). Importantly, the adjustment is not dependent on the relative forward levels.

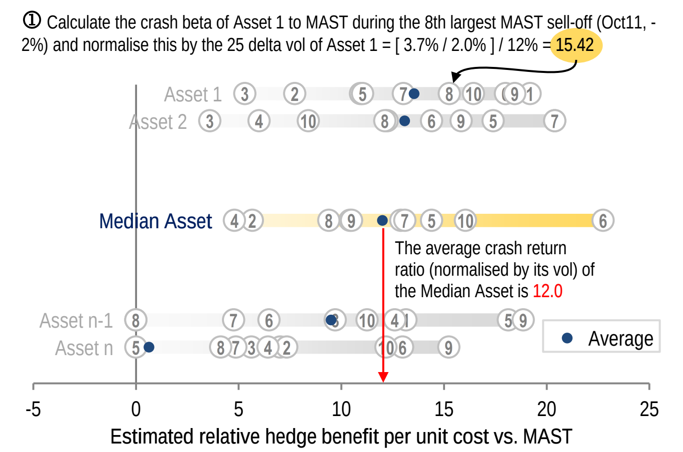
Method III: Hedging benchmarks w/out liquid options

If the benchmark does not have liquid options the best we can aim for is a relative ranking of potential proxy hedges, based on:

- The current cost of each proxy hedge (measured by their 3M 25 delta vols)
- The performance of each each proxy hedge during the 10 largest historical drawdowns of the benchmark (measured by their crash beta)

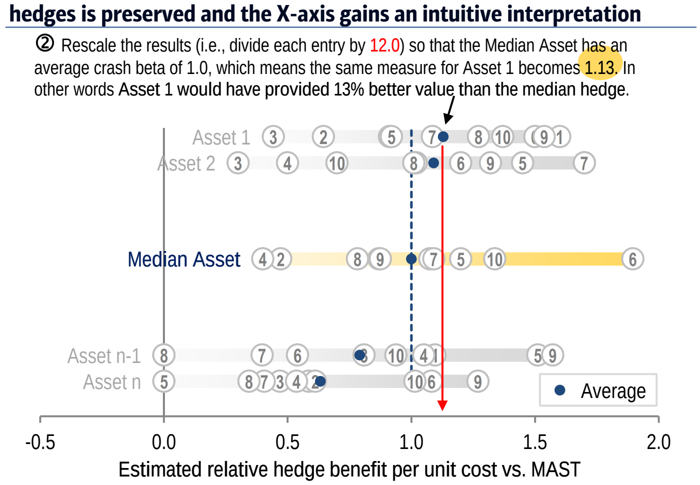
The interpretation is similar to the Benchmark Proxy Hedging case, with one important distinction: A reading of X>1 in Chart 25 means the proxy would have offered X times more hedge benefit per unit cost than the average benefit afforded by the median (i.e., middle ranking) asset in our screen.

Chart 24: The proxy hedges in our screen are ranked according to their average crash beta during the 10 largest BofAML MAST drawdowns since 2006 after being normalized by their respective 3M 25 delta vol



Source: BofA Merrill Lynch Global Research.

Chart 25: As a second step we rescale the results of Chart 24 by the average hedge benefit of the median asset. The ranking of the proxy hedges is preserved and the X-axis gains an intuitive interpretation



Source: BofA Merrill Lynch Global Research.

Options Risk Statement

Potential Risk at Expiry & Options Limited Duration Risk

Unlike owning or shorting a stock, employing any listed options strategy is by definition governed by a finite duration. The most severe risks associated with general options trading are total loss of capital invested and delivery/assignment risk... all of which can occur in a short period.

Investor suitability

The use of standardized options and other related derivatives instruments are considered unsuitable for many investors. Investors considering such strategies are encouraged to become familiar with the "Characteristics and Risks of Standardized Options" (an OCC authored white paper on options risks). U.S. investors should consult with a NASD Registered Options Principal.

For detailed information regarding the risks involved with investing in listed options: http://www.theocc.com/about/publications/character-risks.jsp

Bank of America Merrill Lynch

Disclosures

Important Disclosures

Equity Investment Rating Distribution: Financial Services Group (as of 30 Jun 2017)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	125	49.21%	Buy	98	78.40%
Hold	63	24.80%	Hold	43	68.25%
Sell	66	25.98%	Sell	34	51.52%

Equity Investment Rating Distribution: Global Group (as of 30 Jun 2017)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1550	51.41%	Buy	980	63.23%
Hold	674	22.35%	Hold	410	60.83%
Sell	791	26.24%	Sell	388	49.05%

* Issuers that were investment banking clients of BofA Merrill Lynch or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.

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