

ETF Options Watch

Plumbing the depths of HYG liquidity

Asset Allocation

Is the glass half empty or half full?

Following the staggering growth in ETF assets in the past 10 years, investors and regulators alike have raised concerns around potential systemic risks posed by some ETFs. In particular, some market participants argue that ETFs tracking less liquid assets (e.g., US corporate bonds) may create a “liquidity illusion” that could easily disappear in the context of a crisis. But can ETF liquidity really vanish in times of market stress? iShares iBoxx High Yield Corporate Bond ETF (HYG) constituents’ intraday prices and primary/secondary volume data allows us to analyze the risk of a liquidity vacuum in the context of the 4Q18 sell-off episode.

An HYG liquidity black hole was largely avoided in 4Q18...

We find that, despite the heightened market stress, HYG’s liquidity transformation process and arbitrage mechanism appear to not have been impaired, as: (i) primary activity was only a fraction of total trading volume in HYG and not appreciably higher than the current 1yr average, and (ii) the size and standard deviation of cash redemptions vs. creations was not abnormal, indicating a limited change in the composition of the underlying portfolio. In addition, we note that, on average, episodes in which HYG traded at the deepest discount to NAV during this period were likely a function of light activity in the cash bond market (due to holidays). As such, discounts to NAV were likely due mostly to HYG contributing to price discovery.

...but the arbitrage mechanism likely came under stress

While a worst-case scenario for HYG was avoided in Q4-18, our analysis also shows that price discovery was likely not the sole explanation for the deep discounts to NAV that arose in this period. The tracking error between cash bonds and HYG was larger than that between cash bonds and HYG NAV across all liquidity buckets, suggesting limits to the ETF creation-redemption liquidity transformation may have partly driven deep discounts to NAV. Lastly, it is worth mentioning that, unlikely in 4Q18, primary activity in HYG was relatively subdued during the 2H15 sell-off. In short, while the ETF market continues to evolve and the 4Q18 episode provides some encouraging signals, liquidity cannot always be taken for granted.

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Asset Allocation
Global

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Plumbing the depths of HYG liquidity

The staggering growth in ETFs has recently been associated with a number of potential risks and externalities including complexity, opacity and contagion risk, counterparty and collateral risk, issuer concentration and associated operational risk.

Regulators have also expressed concerns. For instance, the Depository Trust & Clearing Corporation, in a recent white paper assessing future threats to financial stability, called growth in the ETF market and its liquidity dynamics “two of the most significant post-crisis evolutions that could be potential sources of systemic market-related risks.”

One of the most frequently cited concerns in the ETF market is that it creates a “liquidity illusion” that could easily disappear in the context of a crisis – exposing investors to significant losses and an inability to sell their shares. This is particularly true for ETFs that track less liquid assets (e.g., US corporate bonds or emerging market bonds). The liquidity transformation these ETFs provide could, some argue, disappear abruptly in times of market stress.

With a specific focus on the iShares iBoxx High Yield Corporate Bond ETF (HYG) (the largest High Yield (HY) ETF), the aim of this report is to add to the ongoing debate around whether or not ETFs could pose systemic risk, specifically through the channel of the decoupling of ETF prices from those of constituent securities in times of stress.

Most of this report will focus on the Q4-18 sell-off episode as our benchmark scenario to inspect the risk a liquidity hole. Partly, this is because given its proximity in time, we have more data available, which allows for a more granular analysis. At the same time, as fixed income ETF markets mature, liquidity provision conditions evolve as well, potentially rendering more distant market stress episodes more obsolete and less relevant for the present market landscape. This being said, for the sake of comprehensiveness, in the last section of this report we touch on more distant episodes of market stress, including the 2015 sell-off (which saw the HY energy meltdown).

Finally, we want to stress that the aim of this report is not necessarily to draw comprehensive and definitive conclusions, but to highlight the complexity of real-world responses, and look for and identify measures that help in gauging and monitoring areas of potential concern and distress.



Spelling out the “liquidity illusion” risk & inspecting its footprints in real life

While most ETFs track liquid equity indices, one of their key features relates to their capacity to also replicate baskets of less liquid assets in the form of more liquid tradable securities. ETFs that track an index of relatively illiquid assets (e.g. corporate bonds in emerging markets) create a mismatch between the *expected* liquidity of ETF shares and the underlying assets. Indeed, the higher liquidity of ETF shares vis-à-vis the underlying assets can attract investors who would not otherwise be willing to be exposed to the more illiquid underlying assets, especially for short-term directional bets.

In this sense, ETFs provide a liquidity transformation with repercussions on investors' behaviour. Some argue this transformation mechanism is not robust enough and will vaporize in times of market stress (when liquidity is most needed).

What would such a liquidity hole actually look like? In times of financial stress, APs may be confronted with a large number of investors selling ETF shares, thus depressing their price. If APs react to the price drop by buying ETF shares, they can then redeem them according to the following mechanism: APs deliver ETF shares back to the ETF and receive either the constituent securities (in-kind redemptions) or the equivalent amount of cash (cash redemptions), or a combination of both (for a more in-depth description of the creation/redemption mechanism, please see our prior [ETF Option Watch report](#)).

In the first case, they will sell the securities to flatten their inventories; in the second, the ETF sponsor will sell a slice of the constituent portfolio to recover the cash paid to the AP. In both cases, the redemption results in the sale of the corresponding fraction of underlying securities, putting further pressure on the underlying bonds.

In theory, physical ETFs should be less likely to experience investor runs if they operate exclusively via in-kind redemptions. Indeed, the composition of the redemption basket does not change in response to redemption requirements, so there should be no first-mover advantage in the sense of entitling those who ask for redemption first to the most liquid assets.

In practice, the redemption basket for HYG is negotiated between APs and the fund, and as such, increased fund redemptions in the primary market could also detrimentally change the composition of the underlying portfolio basket, as APs become increasingly reluctant to accept the less liquid bonds. Ultimately this may generate system-fire sales and negative feedback loops, once healthy portions of the fund are liquidated leaving only distressed and illiquid notes.

The implicit assumption underpinning the above argument is that, if there were no ETFs, investors would not take short term positions so aggressively. In other words, the real issue is about a mismatch in liquidity expectations, and to the extent that investors may heavily rely on ETFs for liquidity needs, this may create a fire sale situation.

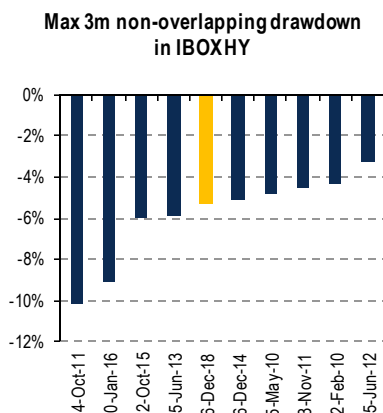
Having laid out the hypothetical arguments of an ETF-induced “liquidity black hole”, how does a real-world example of a stressed market stack up against it in terms of liquidity, pricing, and investor flow? In the following section, we look specifically at the recent episode of market distress in Q4-18.

Just because you can't see a black hole, doesn't mean you can't detect one:

liquidity lessons from the Q4-18 sell-off episode

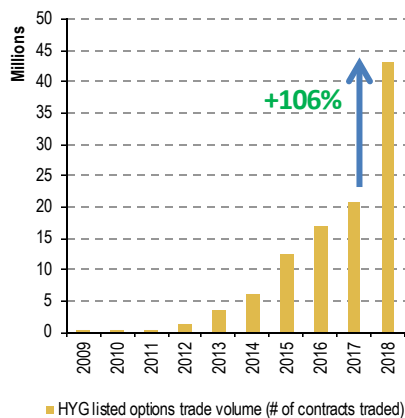
The IBOXHY Index (which underlies the HYG ETF) has recorded a negative calendar year return only four times over the past 20 years. 2018 was one of those four years. In particular, Q4-18 was the fifth largest drawdown occurring in any non-overlapping 3m rolling window in the past 10 years (see Chart 1). Listed options activity was also elevated (see Chart 2 and 3).

Chart 1: Q4-18 was the fifth largest drawdown in any non-overlapping 3m rolling window in the past 10 years for IBOXHY



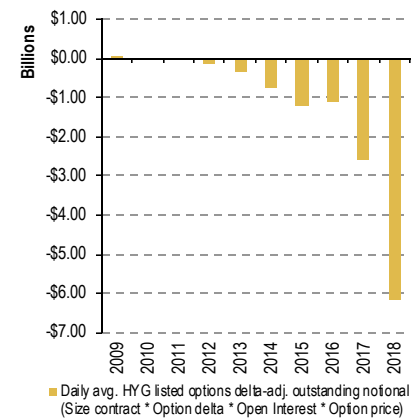
Source: BofA Global Research

Chart 2: 2018 saw an abnormal increase in HYG options activity, as HYG options volume more than doubled vs. 2017



Source: BofA Global Research

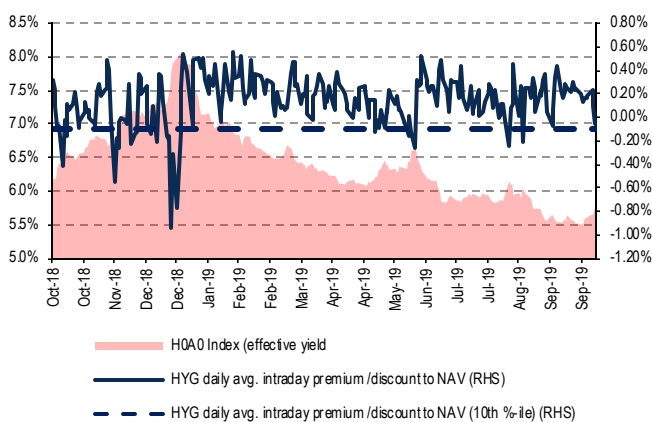
Chart 3: Assuming investors are naturally long options, put options were responsible for much of the increase in HYG options OI in 2018



Source: BofA Global Research

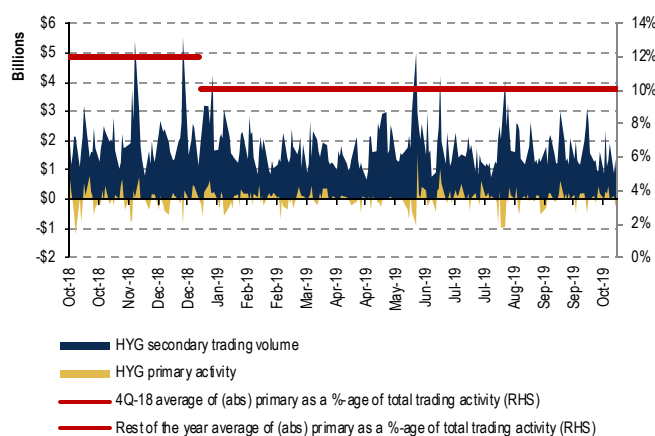
As the effective yield on the ICE BofA US High Yield Master II Index rose from 6.2% to a max of 8.1%, HYG often traded at a discount to NAV. Indeed, the 10th %-ile of the daily deviation from the NAV¹ from Oct-18 to Oct-19 was -9.3bps, which was exceeded more than once every four days in 4Q-18 (see Chart 4).

Chart 4: Q4-18 saw most of the instances over the past year where HYG traded at a large discount to NAV



Source: BofA Global Research

Chart 5: In Q4-18, HYG primary activity as a fraction of the total trading volume did not increase materially from the current 1yr average



Source: BofA Global Research

¹Given market makers look to profit from arbitrage opportunities in real time, we actually use the IIV taken at 5min intervals throughout the day, and calculate what we call for short "discount to NAV" as the average throughout the day of the difference between IIV and HYG's intraday price.

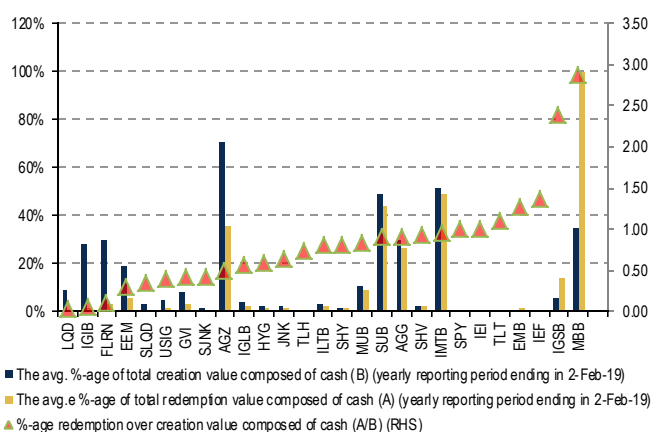


A number of measures suggest that Q4-18 was a period where in aggregate the liquidity transformation mechanism in the HYG market was not impaired, thus avoiding a scenario of fire sales and negative feedback loops. For instance, Chart 5 shows that in Q4-18, primary activity in HYG was only a small fraction of the total trading volume (primary + secondary) and was not materially higher than the current 1yr average.

Also, a fire sale situation would likely be preceded by anomalous activity in cash redemptions, as APs become increasingly reluctant to exchange HYG shares for highly illiquid basket constituents and would likely ask for larger cash components in the redemption basket.

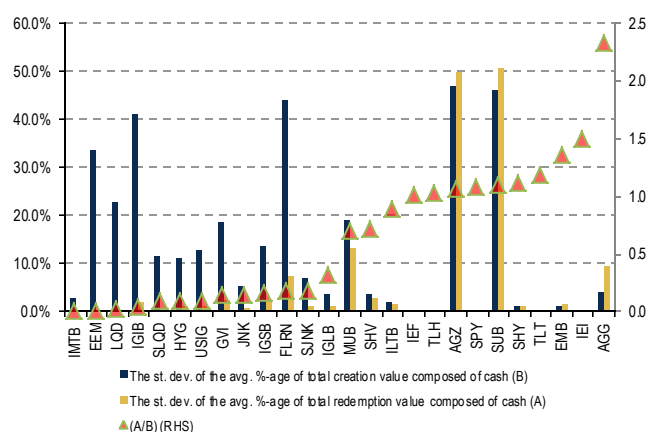
As such, one might expect to see: i) a higher %-age of total redemption value composed of cash vs. total creation value in stress periods, and/or ii) a higher st. dev. of the average %-age of total redemption value composed of cash vs. creation. However, based on SEC filings (Form N-CEN) for the year ending on 2-Feb-19, neither was true for HYG, nor for a large section of other FI ETFs, for instance (see Chart 6 and 7).

Chart 6: In 2018, cash redemptions represented a smaller fraction vs creations



Source: BofA Global Research, SEC filings (Form N-CEN)

Chart 7: In 2018, comparing standard deviation in cash redemptions vs. creations does not suggest anomalous cash redemption activity

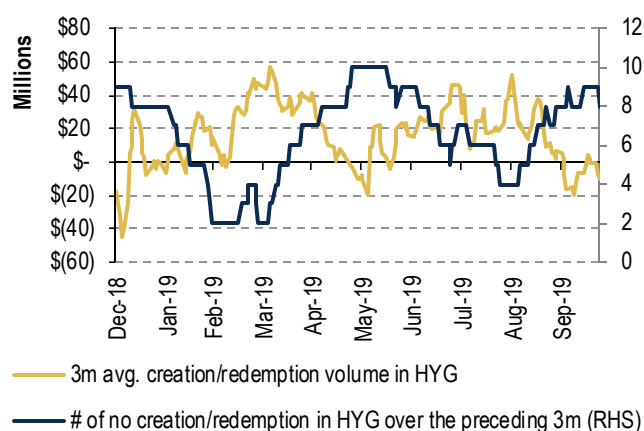


Source: BofA Global Research, SEC filings (Form N-CEN)

While relatively small primary activity and unexceptional cash redemption activity suggest a fire sale situation was largely avoided in Q4-18, there may still be signs of partial breakdowns in the liquidity transformation. After all, during this period HYG did experience numerous episodes of material discounts to NAV.

Furthermore, while primary activity in aggregate did not appear to be anomalously large, the number of days where there was no creation or redemption was in fact unusually high. Interestingly, this was also the case during other episodes of redemption pressure over the past year (May/Jun19, Sep/Oct19; see Chart 8). In particular, by looking at the interaction between HYG primary activity, HYG and underlying cash bond secondary activity, and discounts to NAV, we want to look for hints that limits to the arbitrage mechanism played a non-trivial part in the decoupling of HYG price from its constituent securities.

Chart 8: While primary activity remained a fraction of secondary activity, the number of days with no CRs was unusually high during episodes of redemption pressure over the past year

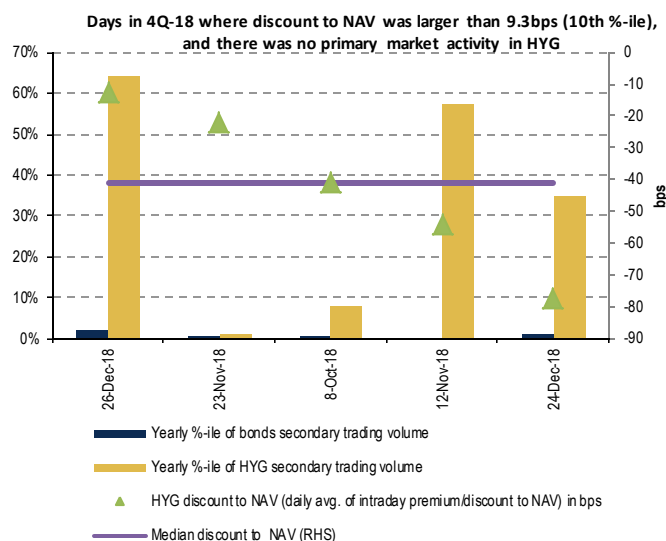


Source: BofA Global Research

Firstly, we isolate days in Q4-18 where the discount to NAV was abnormally large (1yr 10th %-ile of deviation to NAV = -9.3bps). This happened on seventeen days.

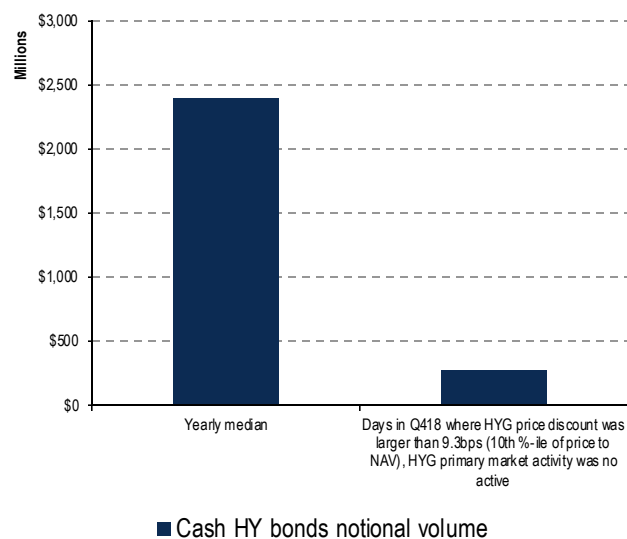
On five of these seventeen days, there was no primary activity. The very first thing to note is that the median discount to NAV across these five episodes was much larger than when there was primary activity (i.e., during the other twelve episodes). Indeed, the median discount to NAV was -41.6 bps (see Chart 9) vs. -17.2bps (see Chart 15).

Chart 9: The median discount to NAV across days in Q4-18 when there was no primary activity was much larger than when there was primary activity



Source: BofA Global Research

Chart 10: Days in Q4-18 with large discounts to NAV and no primary activity were also characterized by extremely low cash bond trading volume in the secondary market



Source: BofA Global Research

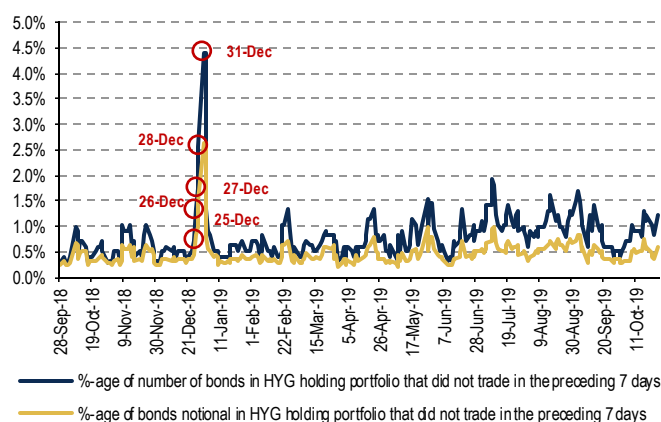
Importantly, during these five episodes, secondary volume in the underlying cash bonds was extremely low by historical standards. For instance, looking at the volume for the 200 most liquid cash bonds in HYG as of Q4-18 quarter-end, the median daily volume was ~one-tenth of the typical daily volume seen from Oct18 to Oct19 (\$2.4bn vs. \$271mn (Chart 10).

For two of these five episodes (24-Dec and 26-Dec), the number and notional of bonds that had not traded in the previous week skyrocketed (see Chart 11). Three of those five days (8-Oct, 12-Nov, and 23-Nov) saw the highest %-age of stale bond prices on



average (see Chart 12). In short, days in Q4-18 when there was no HYG primary activity and the discount to NAV was deep were days where activity in the HY cash bond market was very light.

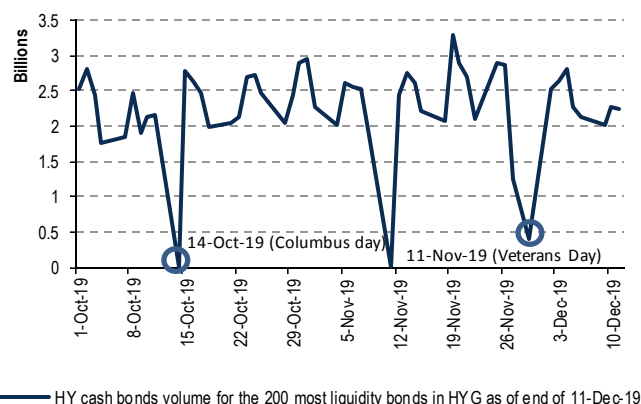
Chart 11: The number and notional of HY cash bonds that had not traded in the previous week skyrocketed during the last week of Dec-18



Source: BofA Global Research

Extremely low liquidity in the cash bond market associated with an inactive HYG primary activity may suggest that indeed the liquidity transformation mechanism was seriously impaired. However, we believe this is the wrong conclusion here. A much more sensible conclusion is that poor liquidity was caused by the fact that these episodes fell on days that were either holidays (Columbus Day and Veterans Day on 8-Oct and 12-Nov)², or around holidays (Christmas Day and Thanksgiving). For reference, HY cash bond volumes similarly collapsed on Columbus Day and Veterans Day in Q4-19, a period broadly marked by favorable liquidity conditions for risky assets (see Chart 13).

Chart 13: Similar to Q4-18, HY cash bond volumes collapsed on Columbus Day and Veterans Day in Q4-19, a period broadly marked by favorable liquidity conditions for risky assets

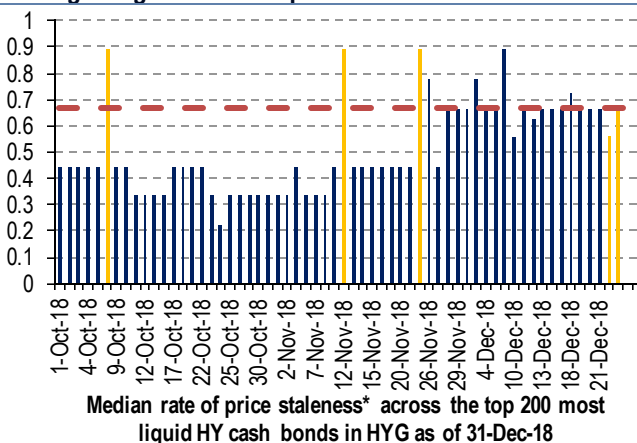


Source: BofA Global Research

During these five episodes, the notion that in such poor liquidity conditions for HY cash bonds, much of the discount to NAV was due to HYG contributing to price discovery seems highly equitable. As a measure of “price discovery”, we use the ratio of HYG to cash bond secondary market volumes. A higher ratio means higher “price discovery”

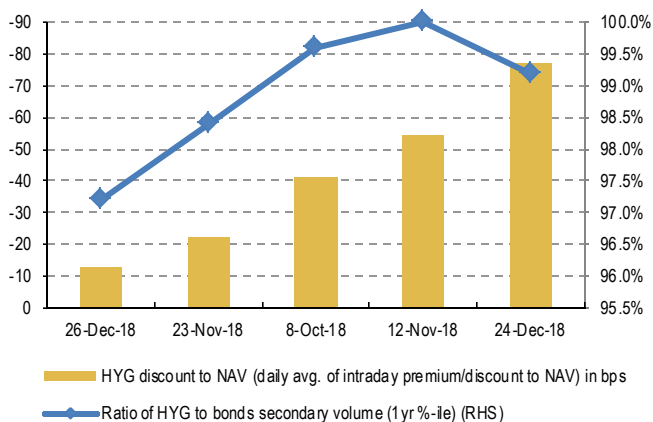
²HYG APs are open for business both on Columbus Day and Veterans Day, given that equity markets are open, and while Treasury markets are closed, HY cash bonds can still trade, as they trade OTC.

Chart 12: Days in Q4-18 where there was no HYG primary activity also saw a high %-age of stale bond prices



Source: BofA Global Research. *For the top 200 most liquid HY cash bonds in HYG, we observe the intraday price 9 times a day and calculate how frequently within that day the prices changes (as a %-age of the total # of observations); we then take the median across all 200 bonds for that given day.

Chart 14: Higher HYG vs cash bond trading volume was generally associated with deeper discounts to NAV

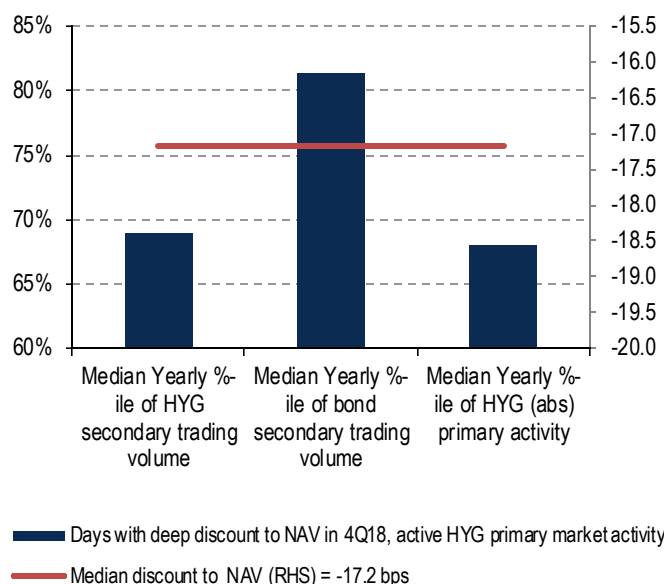


Source: BofA Global Research

power”, and as such, a deeper discount. Firstly, this ratio was historically elevated during those five days (see Chart 14). Generally, it also seems the case that the higher the trading volume ratio, the deeper the discount to NAV (admittedly, there is little variation in the trading volume ratio for these points, making the relationship relatively less significant).

How about days in Q4-18 when the discount to NAV was deep and the primary market was active? On such days, not only did primary active take place, but it was also quite robust (on average the \$ value of primary activity across these twelve episodes was in the yearly 68th %-ile). In addition, during these instances, the secondary market (either in the underlying bonds or in HYG, or in both) was relatively healthy (on avg. trading volume was in the ~70th %-ile over the past year for both HYG and cash bonds; see Chart 15).

Chart 15: Days in Q4-18 where there was robust primary activity in HYG were accompanied also by days of robust liquidity in the secondary market for HYG and its underlying bonds



Source: BofA Global Research

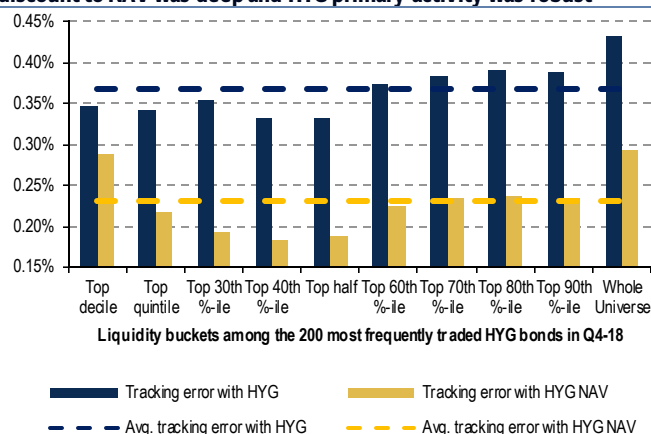
All of this points to generally relatively healthy trading conditions *in aggregate*, and a functional interaction between the primary and secondary market through the arbitrage mechanism. However, looking at the aggregate level may conceal stress conditions at a more granular level. To drill further into this issue, we try to establish whether the discount to NAV was a function of HYG contributing to price discovery or the arbitrage mechanism showing signs of stress. To this end, we compare the price dynamics of HY cash bonds with different degrees of liquidity to HYG and HYG NAV. The intuition is the following: if HYG contributed to price discovery, we would expect the most liquid bonds and HYG to track each other more closely than w.r.t. HYG NAV.

Specifically, we look at the top 200 most frequently traded bonds in HYG between 1-Oct-18 and 31-Dec-18. We then slice this universe in buckets with different degrees of liquidity (based on the bid-ask price), and finally compute the tracking error (TE) of returns for these buckets vs. HYG and HYG NAV during those twelve days with deep discounts to NAV and an active primary market.

Chart 17 shows that while indeed the TE between cash bonds and HYG tends to increase as the liquidity of the buckets degrades (i.e., HYG trades more in-line with the more liquid cash bonds), it is larger than between cash bonds and HYG NAV across all liquidity buckets. This confutes the notion that the discrepancy between HYG and HYG NAV is due to HYG being more closely aligned to the behavior of the most liquid cash bonds.



Chart 16: Tracking error between the 200 most frequently traded HY cash bonds in HYG during Q4-18, HYG, and HYG NAV on days where the discount to NAV was deep and HYG primary activity was robust



Source: BofA Global Research

Extending this analysis further, we look at the TE during the entire Q4-18 period. For instance, Chart 18 compares HY cash bonds in the top 30th %-ile liquidity bucket with HYG and HYG NAV. Again the TE w.r.t. HYG is larger than w.r.t. HYG NAV. Some episodes where HYG decoupled are optically quite self-evident too (between the 6th to the 10th and the 20th to the 24th of December; see circles in Chart 18).

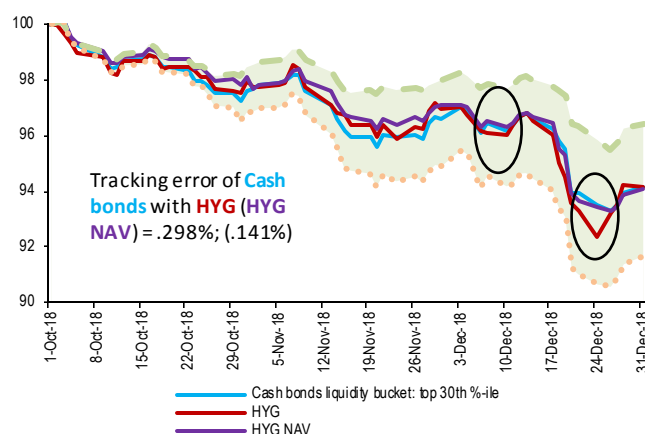
In addition, more generally there is no evidence that HYG tends to more closely track the most liquid cash bond buckets. All of this, in our view, suggests that the deep discounts to NAV generally witnessed in Q4-18 cannot only be a function of HYG contributing to price discovery, but are also a sign of the liquidity transformation process coming under stress.

In conclusion, in spite of Q4-18 being a period of heightened market stress, the relative size of primary activity vs. total trading in HYG, as well as the size and standard deviation of cash redemptions vs. creations suggests that *in aggregate* the liquidity transformation process and arbitrage mechanism in HYG were not impaired, largely avoiding a scenario of fire sales and a negative feedback loop.

In addition, we find evidence that on average the episodes with the deepest discounts to NAV were likely a function of light activity in the cash bond market (due to holidays), and as such, discounts to NAV in these particular episodes were likely due mostly to HYG contributing to price discovery.

At the same time, our analysis also suggests that overall during Q4-18 price discovery cannot be the only explanatory variable behind deep discounts to NAV, with limits to the liquidity transformation likely being the other important driver.

Chart 17: Tracking error between the 200 most frequently traded HY cash bonds in HYG during Q4-18, HYG, and HYG NAV during the entire last quarter of 2018



Source: BofA Global Research

What about other sell-off episodes?

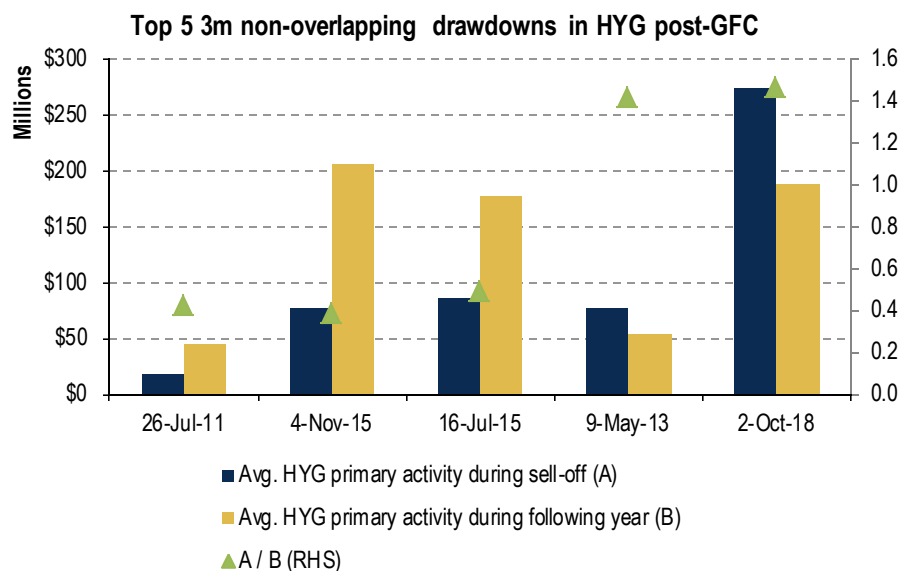
In the Dec-19 ETF Options Watch, we [showed](#) that HYG primary activity during Q4-18 was actually higher than on average from Oct-18 to Oct-19. This is good news, as it suggests the liquidity transformation mechanism played an important role in price formation at a time when arbitrage opportunities were more abundant. Is this always the case for other episodes of market stress?

Chart 19 shows the average primary activity during the top five 3m non-overlapping drawdowns in HYG post-GFC (from peak to trough) and during the following year. Particularly important is the sell-off that took place in H2-15, amidst the HY energy meltdown, which many see as a truly credit-specific stress episode.

The chart shows that during the last quarter of 2015 (second set of bars), primary activity during the sell-off was markedly lower compared to the following year (less than half). However, primary activity was equally subdued in the first large sell-off of 2015 (Jul-15 to Oct-15), when the HY energy meltdown was still relatively contained. In other words, it seems arbitrary to us to assume that H2-15 qualifies as a better template than Q4-18 for what is to be expected going forward in a scenario where credit is at the epicenter of market stress.

At the same time, Chart 19 also shows that Q4-18 cannot be taken as a one-size-fits-all template for how the HYG arbitrage mechanism is expected to work in times of stress.

Chart 18: Comparison of average primary activity during the top five 3m non-overlapping drawdowns in HYG post-GFC (from peak to trough) and during the following year



Source: BofA Global Research



APPENDIX

Listed options expiration schedules and liquidity monitor for 53 ETFs

Table 1: Table is ordered by asset class first, and within asset class by average daily notional option volume over the past 3m

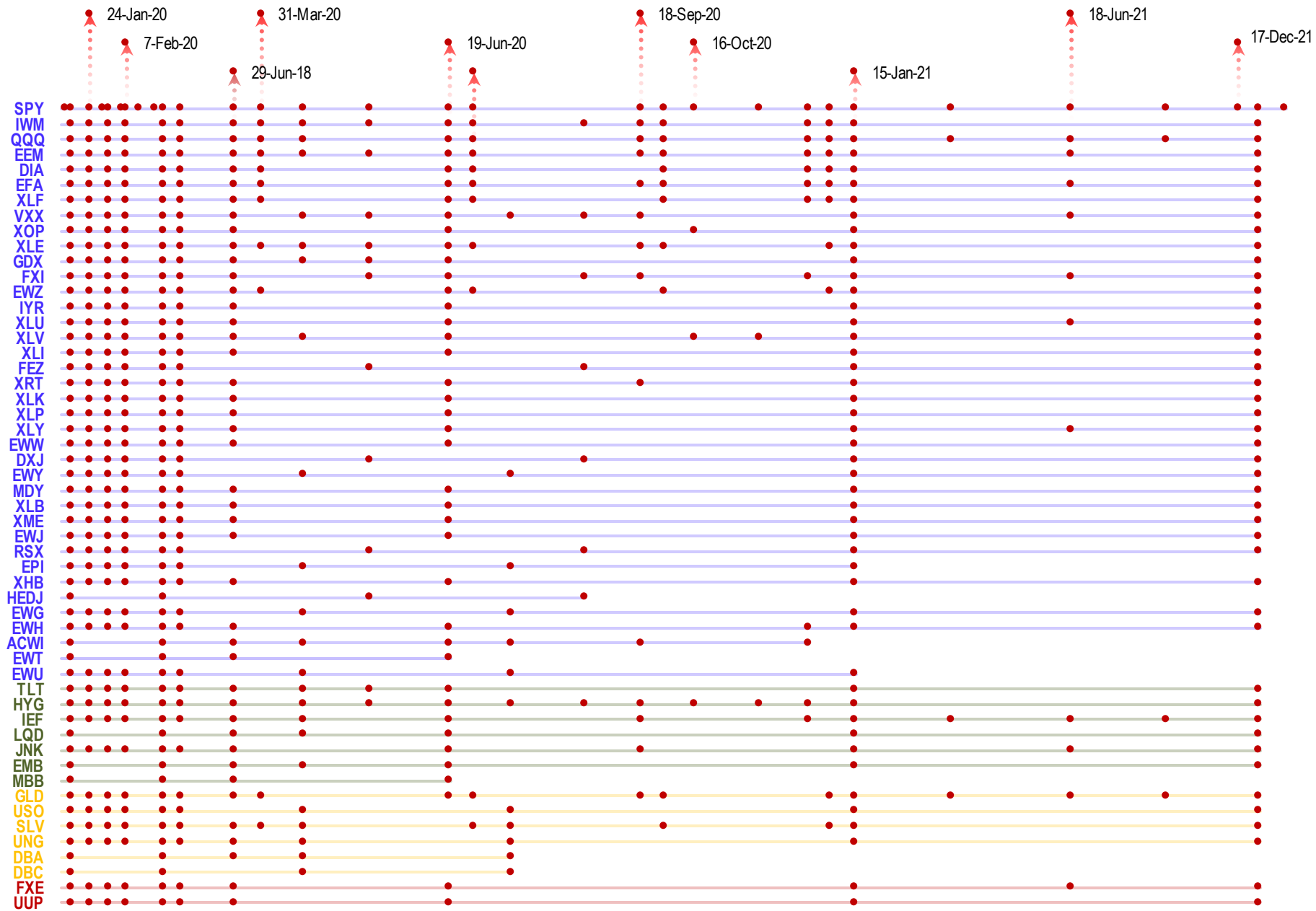
Description			Expiration schedule		Liquidity				
Security Name	a.mjd	Asset Class	Cycle	Listings outside regular schedule*	Total Call OI	Total Put OI	Total OI	Avg. daily option volume notional over past 3m	Option avg. bid/ask spread (vol pts)**
SPDR S&P 500 ETF Trust	SPY	Equity	Mar	2-7w, 3F x-1, L x 8, Q x 4	218B	425B	643B	80B	0.04
Invesco QQQ Trust Series 1	QQQ	Equity	Mar	2-7w, 3F x-1, L x 6, Q x 4	41B	99B	140B	11B	0.09
iShares Russell 2000 ETF	MM	Equity	Feb	2-7w, 3F x 4, L x 3, Q x 4	23B	46B	69B	5B	0.09
iShares MSCI Emerging Markets	EEM	Equity	Mar	2-7w, 3F x-1, L x 4, Q x 4	16B	25B	41B	2B	0.32
SPDR Dow Jones Industrial Aver	DIA	Equity	Mar	2-7w, 3F x-1, L x 3, Q x 4	7B	8B	15B	1B	0.29
iShares MSCI EAFE ETF	EFA	Equity	Mar	2-7w, 3F x-1, L x 4, Q x 4	7B	19B	26B	979M	0.41
iShares China Large-Cap ETF	FXI	Equity	Feb	2-7w, 3F x 3, L x 4	7B	12B	19B	756M	0.31
iShares MSCI Brazil ETF	EWZ	Equity	Mar	2-7w, 3F x-1, L x 2, Q x 4	7B	7B	14B	749M	0.25
iPath Series B S&P 500 VIX Sho	VXX	Equity	Mar	2-7w, 3F x-1, L x 3	1B	1B	3B	437M	0.87
Financial Select Sector SPDR F	XL	Equity	Mar	2-7w, 3F x-1, L x 3, Q x 4	3B	7B	10B	408M	0.29
Energy Select Sector SPDR Fund	XLE	Equity	Mar	2-7w, 3F x-1, L x 2, Q x 4	4B	5B	9B	368M	0.22
SPDR S&P Oil & Gas Exploration	XOP	Equity	Mar	2-7w, 3F x-1, L x 3	3B	4B	8B	319M	0.25
VanEck Vectors Gold Miners ETF	GD	Equity	Mar	2-7w, 3F x-1, L x 2	4B	3B	7B	313M	0.19
Health Care Select Sector SPDR	XLV	Equity	Mar	2-7w, 3F x-1, L x 4	1B	3B	4B	267M	0.20
Utilities Select Sector SPDR F	XL	Equity	Mar	2-7w, 3F x-1, L x 3	1B	3B	4B	265M	0.19
iShares U.S. Real Estate ETF	IYR	Equity	Mar	2-7w, 3F x-1, L x 2	1B	3B	4B	209M	0.21
Consumer Discretionary Select	XL	Equity	Mar	2-7w, 3F x-1, L x 3	2B	2B	5B	196M	0.29
Technology Select Sector SPDR	XLK	Equity	Mar	2-7w, 3F x-1, L x 2	1B	4B	5B	166M	0.19
Industrial Select Sector SPDR	XLI	Equity	Mar	2-7w, 3F x-1, L x 2	916M	2B	3B	160M	0.25
Consumer Staples Select Sector	XLP	Equity	Mar	2-7w, 3F x-1, L x 2	1B	2B	3B	156M	0.21
SPDR S&P Retail ETF	XRT	Equity	Mar	2-7w, 3F x-1, L x 2	367M	654M	1B	66M	0.40
Materials Select Sector SPDR F	XL	Equity	Mar	2-7w, 3F x-1, L x 2	627M	749M	1B	58M	0.33
iShares MSCI Mexico ETF	EW	Equity	Mar	2-7w, 3F x-1, L x 2	425M	774M	1B	43M	0.44
iShares MSCI Japan ETF	EW	Equity	Mar	2-7w, 3F x-1, L x 2	408M	599M	1B	30M	0.34
SPDR S&P MidCap 400 ETF Trust	MD	Equity	Mar	2-7w, 3F x-1, L x 2	381M	583M	964M	29M	0.64
VanEck Vectors Russia ETF	RS	Equity	Feb	2-7w, L x 2	188M	445M	633M	29M	1.74
SPDR S&P Metals & Mining ETF	XME	Equity	Mar	2-7w, 3F x-1, L x 2	658M	387M	1B	27M	0.26
iShares MSCI South Korea ETF	EW	Equity	Jan	2-7w, L x 2	458M	437M	895M	27M	0.27
SPDR EURO STOXX 50 ETF	FE	Equity	Feb	2-7w, L x 2	224M	367M	591M	21M	0.85
SPDR S&P Homebuilders ETF	XHB	Equity	Mar	2-7w, 3F x-1, L x 2	289M	300M	589M	16M	0.70
iShares MSCI United Kingdom ET	EW	Equity	Jan	2-7w, L x 1	148M	138M	286M	14M	2.95
WisdomTree Japan Hedged Equity	DX	Equity	Feb	2-7w, L x 2	56M	102M	158M	13M	1.01
iShares MSCI Hong Kong ETF	EW	Equity	Mar	2-7w, 3F x-1, L x 3	44M	109M	153M	7M	2.95
iShares MSCI ACWI ETF	AC	Equity	Jan	3F x 3, L x 1	60M	161M	220M	6M	1.02
iShares MSCI Taiwan ETF	EW	Equity	Mar	3F x-1	48M	73M	121M	5M	0.87
iShares MSCI Germany ETF	EW	Equity	Jan	2-7w, L x 2	70M	84M	155M	2M	2.53
WisdomTree India Earnings Fund	EPI	Equity	Jan	2-7w, L x 1	134M	248M	382M	2M	4.72
WisdomTree Europe Hedged Equit	HED	Equity	Feb		3M	22M	24M	387k	0.78
iShares iBoxx High Yield Corpo	HY	Fixed Income	Mar	2-7w, 3F x-1, L x 5	6B	30B	36B	1B	0.68
iShares 20+ Year Treasury Bond	TL	Fixed Income	Mar	2-7w, 3F x-1, L x 2	6B	9B	15B	1B	0.21
iShares iBoxx \$ Investment Gra	LQ	Fixed Income	Mar	3F x-1, L x 2	2B	3B	5B	98M	1.05
iShares 7-10 Year Treasury Bon	IE	Fixed Income	Mar	2-7w, 3F x-1, L x 6	1B	5B	6B	95M	1.20
iShares JP Morgan USD Emerging	EMB	Fixed Income	Mar	3F x-1, L x 2	689M	530M	1B	43M	1.10
SPDR Bloomberg Barclays High Y	JNK	Fixed Income	Mar	2-7w, 3F x-1, L x 3	673M	1B	2B	16M	1.12
iShares MBS ETF	MB	Fixed Income	Mar	3F x-1	726k	4M	5M	1M	1.09
SPDR Gold Shares	GL	Commodity	Mar	2-7w, 3F x-1, L x 5, Q x 4	33B	18B	51B	2B	0.09
iShares Silver Trust	SL	Commodity	Jan	2-7w, 3F x 1, L x 2, Q x 4	5B	2B	7B	204M	0.39
United States Oil Fund LP	US	Commodity	Jan	2-7w, L x 2	933M	893M	2B	68M	2.00
United States Natural Gas Fund	UN	Commodity	Jan	2-7w, 3F x 1, L x 2	675M	385M	1B	64M	0.69
Invesco DB Commodity Index Tra	DB	Commodity	Jan		9M	2M	11M	566k	5.10
Invesco DB Agriculture Fund	DB	Commodity	Jan	3F x 1	38M	7M	45M	472k	4.09
Invesco CurrencyShares Euro Cu	FXE	FX	Mar	2-7w, 3F x-1, L x 3	365M	549M	914M	28M	0.45
Invesco DB US Dollar Index Bul	UUP	FX	Mar	2-7w, 3F x-1, L x 2	109M	84M	194M	6M	0.93

Source: BofA Global Research. Data as of 13-Jan-20. *At any given time, there are at least four different expiration months trading on a particular ETF. All ETFs will have options expiring on the 3rd Friday for at least the two near-term expiration months along with two months from their expiration quarterly cycle. For instance, as of 1-Jan an ETF with a Mar cycle will have options expiring in Jan, Feb, Mar, Jun. Recent exchange rules now allow for the listing of additional months beyond just four available expirations, so there are deviations from standard listing procedures. In this table we list additional 3rd Fri available expirations, as well as weeklies (=w), LEAPS (=L, i.e., options expiring >9m out), and quarterlies (=Q, i.e., options expiring the last trading day of Mar/Jun/Sep/Dec). **Avg. bid ask spread of the ATM straddle expiring on the third available expiry.



Listed options expiry schedules for 53 US domiciled ETFs

Chart 19: Charts shows all available listed expiries for 53 US domiciled ETFs



Source: BofA Global Research, Bloomberg. Data as of 12-Jan-20.

Fund specifications and liquidity monitor for 53 US domiciled ETFs

Table 2: Table is ordered by asset class first, and within asset class by Net Assets

Description					Liquidity			
Security Name	Symbol	Asset Class	Geographical Focus	Net Assets (\$ mn)	Market share of US domiciled ETF market	Expense Ratio	1m avg. notional volume	Bid/Ask spread (bps)
SPDR S&P 500 ETF Trust	SPY	Equity	U.S.	315,249	7.0%	0.09%	19B	0.33
Invesco QQQ Trust Series 1	QQQ	Equity	U.S.	90,641	2.0%	0.20%	5B	0.49
iShares MSCI EAFE ETF	EFA	Equity	Global	64,660	1.4%	0.31%	2B	1.44
iShares Russell 2000 ETF	IWM	Equity	U.S.	47,348	1.1%	0.19%	3B	0.65
iShares MSCI Emerging Markets	EEM	Equity	Global	31,461	0.7%	0.67%	3B	2.22
Technology Select Sector SPDR	XLK	Equity	U.S.	27,233	0.6%	0.13%	809M	1.07
Financial Select Sector SPDR F	XLFX	Equity	U.S.	26,089	0.6%	0.13%	1B	3.25
SPDR Dow Jones Industrial Average	DIA	Equity	U.S.	23,040	0.5%	0.17%	633M	0.73
Health Care Select Sector SPDR	XLV	Equity	U.S.	20,608	0.5%	0.13%	626M	0.98
SPDR S&P MidCap 400 ETF Trust	MDY	Equity	U.S.	18,881	0.4%	0.24%	330M	1.56
Consumer Discretionary Select	XLY	Equity	U.S.	15,392	0.3%	0.13%	455M	0.80
iShares MSCI Japan ETF	EWJ	Equity	Japan	14,154	0.3%	0.47%	407M	1.68
Consumer Staples Select Sector	XLP	Equity	U.S.	13,019	0.3%	0.13%	674M	1.61
VanEck Vectors Gold Miners ETF	GDXX	Equity	Global	12,875	0.3%	0.53%	1B	3.48
Industrial Select Sector SPDR	XLI	Equity	U.S.	12,477	0.3%	0.13%	867M	1.21
iShares MSCI ACWI ETF	ACWI	Equity	Global	11,360	0.3%	0.31%	176M	1.28
Energy Select Sector SPDR Fund	XLE	Equity	U.S.	11,285	0.3%	0.13%	839M	1.67
iShares MSCI Brazil ETF	EWZ	Equity	Brazil	10,886	0.2%	0.59%	1B	2.13
Utilities Select Sector SPDR F	XLU	Equity	U.S.	10,785	0.2%	0.13%	901M	1.56
iShares China Large-Cap ETF	FXI	Equity	China	4,737	0.1%	0.74%	973M	2.27
iShares MSCI South Korea ETF	EWY	Equity	South Korea	4,711	0.1%	0.59%	201M	1.63
iShares U.S. Real Estate ETF	IYR	Equity	U.S.	4,381	0.1%	0.42%	695M	1.09
Materials Select Sector SPDR F	XLB	Equity	U.S.	4,063	0.1%	0.13%	366M	1.68
iShares MSCI Taiwan ETF	EWT	Equity	Taiwan	3,717	0.1%	0.59%	148M	2.46
WisdomTree Europe Hedged Equity	HEDJ	Equity	Europe	3,489	0.1%	0.58%	21M	1.55
iShares MSCI United Kingdom ETF	EWU	Equity	U.K.	2,623	0.1%	0.47%	79M	2.97
WisdomTree Japan Hedged Equity	DXJ	Equity	Japan	2,609	0.1%	0.48%	48M	1.92
SPDR S&P Oil & Gas Exploration	XOP	Equity	U.S.	2,500	0.1%	0.35%	659M	4.23
SPDR EURO STOXX 50 ETF	FEZ	Equity	Eurozone	2,278	0.1%	0.29%	59M	2.46
iShares MSCI Germany ETF	EWG	Equity	Germany	2,118	0.0%	0.48%	95M	3.40
iShares MSCI Hong Kong ETF	EWH	Equity	Hong Kong	1,868	0.0%	0.48%	138M	4.08
VanEck Vectors Russia ETF	RSX	Equity	Russia	1,361	0.0%	0.64%	142M	3.90
iShares MSCI Mexico ETF	EWX	Equity	Mexico	1,046	0.0%	0.47%	121M	2.24
WisdomTree India Earnings Fund	EPI	Equity	India	1,012	0.0%	0.85%	28M	4.13
iPath Series B S&P 500 VIX Short	VXX	Equity	U.S.	0,811	0.0%	0.89%	500M	6.81
SPDR S&P Homebuilders ETF	XHB	Equity	U.S.	0,766	0.0%	0.35%	77M	2.26
SPDR S&P Metals & Mining ETF	XME	Equity	U.S.	0,589	0.0%	0.35%	67M	3.58
SPDR S&P Retail ETF	XRT	Equity	U.S.	0,176	0.0%	0.35%	142M	2.25
iShares iBoxx \$ Investment Grade	LQD	Fixed Income	U.S.	35,303	0.8%	0.15%	1B	0.79
iShares MBS ETF	MBB	Fixed Income	U.S.	21,853	0.5%	0.06%	164M	0.95
iShares iBoxx High Yield Corporate	HYG	Fixed Income	U.S.	19,352	0.4%	0.49%	1B	1.13
iShares 7-10 Year Treasury Bond	IEF	Fixed Income	U.S.	17,590	0.4%	0.15%	343M	0.91
iShares 20+ Year Treasury Bond	TLT	Fixed Income	U.S.	16,852	0.4%	0.15%	1B	0.77
iShares JP Morgan USD Emerging	EMB	Fixed Income	Global	15,841	0.4%	0.39%	300M	0.90
SPDR Bloomberg Barclays High Yield	JNK	Fixed Income	U.S.	11,352	0.3%	0.40%	506M	0.91
SPDR Gold Shares	GLD	Commodity	Global	43,677	1.0%	0.40%	1B	0.69
iShares Silver Trust	SLV	Commodity	Global	6,394	0.1%	0.50%	207M	5.91
United States Oil Fund LP	USO	Commodity	U.S.	1,419	0.0%	0.72%	208M	7.84
Invesco DB Commodity Index Tracking	DBC	Commodity	Global	1,408	0.0%	0.89%	21M	6.29
United States Natural Gas Fund	UNG	Commodity	U.S.	0,493	0.0%	0.70%	82M	6.02
Invesco DB Agriculture Fund	DBA	Commodity	Global	0,356	0.0%	0.89%	4M	6.56
Invesco CurrencyShares Euro Currency	FXE	FX	Eurozone	0,284	0.0%	0.40%	11M	1.07
Invesco DB US Dollar Index Bull	UUP	FX	U.S.	0,247	0.0%	0.79%	13M	3.82

Source: BofA Global Research. Data as of 12-Jan-20.

Tradability monitor for 53 US domiciled ETFs

Table 3: Table is ordered by asset class first, and within asset class by Net Assets

Description			Tradability in Secondary Market					Tradability during Creation / Redemption				
			Price to NAV**									
Security Name	Symbol	Asset Class	Daily 1m avg. Bid Ask		Current	5th %-ile	Median	95th %-ile	Daily 1m avg. Creation Implied			
			notional volume	spread (bps)*					Creation Unit Size†	notional volume / Creation Unit‡	Unit Cost (bps)⁴	Implied Liquidity *
SPDR S&P 500 ETF Trust	SPY	Equity	19B	0.33	1.0	-4.9	0.1	4.9	50K	1185	1.8	40M
Invesco QQQ Trust Series 1	QQQ	Equity	5B	0.49	-0.3	-6.5	0.3	6.6	50K	422	0.9	29M
iShares MSCI EAFE ETF	EFA	Equity	2B	1.44	-30.1	-77.5	2.8	59.7	600K	39	3.6	33M
iShares Russell 2000 ETF	IWM	Equity	3B	0.65	5.5	-7.5	0.7	8.8	50K	304	3.6	2M
iShares MSCI Emerging Markets	EEM	Equity	3B	2.22	8.8	-113.6	6.5	101.4	450K	133	3.7	22M
Technology Select Sector SPDR	XLK	Equity	809M	1.07	-2.8	-4.8	0.3	5.6	50K	170	1.1	47M
Financial Select Sector SPDR F	XLF	Equity	1B	3.25	-4.0	-8.1	0.1	8.0	50K	751	3.3	54M
SPDR Dow Jones Industrial Aver	DIA	Equity	633M	0.73	1.2	-4.0	0.5	5.4	50K	44	0.7	5M
Health Care Select Sector SPDR	XLV	Equity	626M	0.98	-0.1	-5.4	0.3	6.7	50K	122	1.0	22M
SPDR S&P MidCap 400 ETF Trust	MDY	Equity	330M	1.56	3.4	-4.5	0.5	5.0	25K	35	3.2	3M
Consumer Discretionary Select	XLY	Equity	455M	0.80	-2.4	-4.6	0.2	4.6	50K	72	0.8	19M
iShares MSCI Japan ETF	EWJ	Equity	407M	1.68	-53.5	-125.6	1.7	109.5	150K	45	5.6	22M
Consumer Staples Select Sector	XLP	Equity	674M	1.61	2.2	-6.0	0.7	6.7	50K	214	1.6	20M
VanEck Vectors Gold Miners ETF	GDX	Equity	1B	3.48	14.5	-39.6	3.6	43.9	50K	1004	3.6	4M
Industrial Select Sector SPDR	XLI	Equity	867M	1.21	-0.2	-5.6	0.1	5.8	50K	208	1.2	24M
iShares MSCI ACWI ETF	ACWI	Equity	176M	1.28	-11.2	-33.3	2.6	28.6	200K	11	4.9	550K
Energy Select Sector SPDR Fund	XLE	Equity	839M	1.67	5.3	-9.1	0.0	8.5	50K	280	1.7	15M
iShares MSCI Brazil ETF	EWZ	Equity	1B	2.13	-98.4	-105.8	0.0	99.4	50K	434	10.3	8M
Utilities Select Sector SPDR F	XLU	Equity	901M	1.56	2.9	-6.9	0.3	7.1	50K	278	1.5	13M
iShares China Large-Cap ETF	FXI	Equity	973M	2.27	38.3	-147.1	-4.5	130.9	150K	144	1.9	5M
iShares MSCI South Korea ETF	EWY	Equity	201M	1.63	33.6	-155.0	0.0	126.5	50K	63	12.6	2M
iShares U.S. Real Estate ETF	IYR	Equity	695M	1.09	0.0	-10.4	0.0	9.7	50K	148	0.5	11M
Materials Select Sector SPDR F	XLB	Equity	366M	1.68	4.9	-6.6	0.0	5.8	50K	122	1.7	8M
iShares MSCI Taiwan ETF	EWT	Equity	148M	2.46	7.3	-158.9	-2.6	131.2	100K	35	10.8	3M
WisdomTree Europe Hedged Equit	HEDJ	Equity	21M	1.55	-29.4	-61.9	-2.5	45.6	50K	6	2.8	2M
iShares MSCI United Kingdom ET	EWU	Equity	79M	2.97	-23.7	-63.0	2.8	57.9	100K	24	10.4	28M
WisdomTree Japan Hedged Equity	DXJ	Equity	48M	1.92	-52.2	-158.7	-2.3	115.7	50K	18	7.7	4M
SPDR S&P Oil & Gas Exploration	XOP	Equity	659M	4.23	12.2	-19.4	1.4	18.3	50K	572	2.2	15M
SPDR EURO STOXX 50 ETF	FEZ	Equity	59M	2.46	-19.2	-61.6	3.2	56.2	50K	29	7.3	47M
iShares MSCI Germany ETF	EWG	Equity	95M	3.40	-10.1	-66.7	3.2	55.7	300K	11	1.7	22M
iShares MSCI Hong Kong ETF	EWH	Equity	138M	4.08	8.0	-119.9	-7.7	82.5	75K	73	10.5	4M
VanEck Vectors Russia ETF	RSX	Equity	142M	3.90	12.5	-85.9	1.3	90.7	50K	108	3.8	2K
iShares MSCI Mexico ETF	EWX	Equity	121M	2.24	-21.5	-66.6	-2.3	71.3	100K	26	3.0	229K
WisdomTree India Earnings Fund	EPI	Equity	28M	4.13	-20.2	-104.0	1.3	90.5	200K	6	9.8	2M
iPath Series B S&P 500 VIX Sho	VXX	Equity	500M	6.81	19.2	--	--	--	25K	1431	0.0	--
SPDR S&P Homebuilders ETF	XHB	Equity	77M	2.26	-1.9	-6.9	-0.6	6.7	50K	33	1.1	7M
SPDR S&P Metals & Mining ETF	XME	Equity	67M	3.58	5.0	-11.4	0.6	11.7	50K	48	1.8	3M
SPDR S&P Retail ETF	XRT	Equity	142M	2.25	5.2	-10.1	-0.9	9.0	50K	63	1.1	5M
iShares iBoxx \$ Investment Gra	LQD	Fixed Income	1B	0.79	14.8	-14.2	11.3	32.7	100K	88	0.4	64K
iShares MBS ETF	MBB	Fixed Income	164M	0.95	-0.9	-7.4	1.0	8.6	100K	15	0.3	--
iShares iBoxx High Yield Corpo	HYG	Fixed Income	1B	1.13	30.6	-16.6	20.7	44.5	100K	168	0.6	13K
iShares 7-10 Year Treasury Bon	IEF	Fixed Income	343M	0.91	5.4	-7.1	2.9	11.8	100K	31	0.0	5M
iShares 20+ Year Treasury Bond	TLT	Fixed Income	1B	0.77	14.5	-22.6	4.1	26.4	100K	84	0.0	135K
iShares JP Morgan USD Emerging	EMB	Fixed Income	300M	0.90	27.1	-10.4	21.9	56.3	100K	26	0.6	551K
SPDR Bloomberg Barclays High Y	JNK	Fixed Income	506M	0.91	19.1	-21.9	12.1	32.9	200K	23	0.2	--
SPDR Gold Shares	GLD	Commodity	1B	0.69	43.6	-64.8	1.0	68.6	100K	71	1.4	--
iShares Silver Trust	SLV	Commodity	207M	5.91	95.9	-126.6	3.2	147.9	50K	246	5.9	--
United States Oil Fund LP	USO	Commodity	208M	7.84	25.0	-58.4	-0.4	53.7	100K	170	8.2	--
Invesco DB Commodity Index Tra	DBC	Commodity	21M	6.29	10.8	-32.7	-3.4	26.3	200K	7	1.6	--
United States Natural Gas Fund	UNG	Commodity	82M	6.02	13.0	-71.7	5.4	73.2	100K	49	5.9	--
Invesco DB Agriculture Fund	DBA	Commodity	4M	6.56	12.4	-21.7	-2.5	15.6	200K	1	1.5	--
Invesco CurrencyShares Euro Cu	FXE	FX	11M	1.07	5.2	-29.0	-0.3	30.3	50K	2	0.9	--
Invesco DB US Dollar Index Bul	UUP	FX	13M	3.82	-3.9	-10.4	-0.7	10.0	200K	2	1.0	--

Source: BoFA Global Research. Data as of 12-Jan-20. *Bid-Ask spread taken as of EOD and sourced from BBG. **Price to NAV = (Price - NAV)/NAV; a +ive (-ive) number indicates that the ETF is trading at a premium (discount) to NAV; values calculated at the end of trading day. †The smallest block of creation/redemption units that an Authorized Participant (AP) can either create or redeem at NAV with the issuer in exchange for the underlying shares of the fund. ‡The higher the number, the more likely that liquidity providers will trade the fund in size. §The standard fee to create or redeem 1 creation unit of an ETF as a %-age of the dollar value of 1 creation unit. * Max number of creation/redemption units that an AP can either create or redeem without having to trade more than 25% of the 1m avg. volume of any security in the basket, assuming that AP could trade 25% of any stock's individual ADV without adversely affecting the price. Calculation is based on the Implied Daily Tradable Shares calculation created by David J. Abner and delineated in "The ETF Handbook" (Wiley 2010).



Current volatility metrics relative to the past year for 53 US domiciled ETFs

Table 4: Table is ordered by asset class first, and within asset class by average daily notional option volume over the past 3m

Security Name	Symbol	Asset Class	3m 50Δ implied vol (A)	(A) 1-yr %ile	1m realized vol (B)	Ratio (A/B = C)	(C) 1-yr %ile	3m 25Δ skew* (D)	(D) 1-yr %ile	1yr 50Δ implied vol	1yr-3m term structure** (E)	(E) 1yr %ile
SPDR S&P 500 ETF Trust	SPY	Equity	12.0%	11%	8.0%	1.5	78%	6.1%	59%	14.4%	2.4%	87%
Invesco QQQ Trust Series 1	QQQ	Equity	15.5%	17%	10.3%	1.5	80%	6.4%	49%	17.0%	1.6%	71%
iShares Russell 2000 ETF	IWM	Equity	14.1%	0%	7.3%	1.9	98%	5.3%	26%	16.6%	2.4%	100%
iShares MSCI Emerging Markets	EEM	Equity	15.0%	0%	13.9%	1.1	32%	1.1%	6%	17.2%	2.2%	85%
SPDR Dow Jones Industrial Aver	DIA	Equity	12.7%	23%	9.1%	1.4	68%	4.9%	42%	14.7%	2.1%	79%
iShares MSCI EAFE ETF	EFA	Equity	10.8%	19%	8.9%	1.2	65%	3.4%	13%	13.1%	2.3%	86%
iShares China Large-Cap ETF	FXI	Equity	17.6%	21%	17.5%	1.0	36%	2.0%	2%	19.4%	1.8%	74%
iShares MSCI Brazil ETF	EWZ	Equity	25.1%	7%	16.2%	1.6	98%	6.4%	75%	25.8%	0.6%	74%
iPath Series B S&P 500 VIX Sho	VXX	Equity	76.3%	79%	52.2%	1.5	74%	-20.5%	23%	82.9%	6.6%	55%
Financial Select Sector SPDR F	XLF	Equity	15.9%	33%	11.5%	1.4	82%	4.7%	49%	17.4%	1.6%	57%
Energy Select Sector SPDR Fund	XLE	Equity	19.1%	41%	17.4%	1.1	75%	3.1%	3%	19.8%	0.7%	46%
SPDR S&P Oil & Gas Exploration	XOP	Equity	30.2%	22%	29.4%	1.0	81%	3.3%	1%	31.2%	1.0%	95%
VanEck Vectors Gold Miners ETF	GDX	Equity	26.9%	54%	24.9%	1.1	80%	-1.7%	46%	28.9%	2.0%	70%
Health Care Select Sector SPDR	XLV	Equity	13.6%	18%	8.5%	1.6	94%	4.8%	68%	16.0%	2.5%	84%
Utilities Select Sector SPDR F	XLU	Equity	12.9%	51%	8.1%	1.6	93%	2.9%	75%	11.5%	-1.4%	6%
iShares U.S. Real Estate ETF	IYR	Equity	12.0%	10%	11.5%	1.0	39%	3.5%	10%	13.4%	1.4%	81%
Consumer Discretionary Select	XLY	Equity	13.9%	13%	9.2%	1.5	77%	5.0%	76%	15.3%	1.4%	48%
Technology Select Sector SPDR	XLK	Equity	16.2%	16%	11.8%	1.4	79%	5.5%	11%	15.0%	-1.1%	8%
Industrial Select Sector SPDR	XLI	Equity	14.7%	8%	11.0%	1.3	79%	5.9%	85%	16.6%	2.0%	75%
Consumer Staples Select Sector	XLP	Equity	14.6%	84%	6.1%	2.4	96%	6.0%	100%	13.3%	-1.3%	14%
SPDR S&P Retail ETF	XRT	Equity	18.9%	24%	14.8%	1.3	79%	-8.8%	0%	21.4%	2.5%	91%
Materials Select Sector SPDR F	XLB	Equity	15.2%	20%	10.7%	1.4	82%	4.7%	32%	17.8%	2.6%	86%
iShares MSCI Mexico ETF	EWX	Equity	16.4%	1%	15.9%	1.0	38%	3.7%	19%	19.9%	3.5%	97%
iShares MSCI Japan ETF	EWJ	Equity	11.7%	18%	9.5%	1.2	68%	2.3%	7%	13.5%	1.8%	68%
SPDR S&P MidCap 400 ETF Trust	MDY	Equity	13.1%	22%	7.8%	1.7	95%	4.9%	27%	15.3%	2.1%	93%
VanEck Vectors Russia ETF	RSX	Equity	17.9%	7%	22.4%	0.8	0%	3.8%	1%	20.3%	2.4%	86%
SPDR S&P Metals & Mining ETF	XME	Equity	23.9%	34%	14.9%	1.6	90%	1.6%	3%	28.5%	4.6%	97%
iShares MSCI South Korea ETF	EWY	Equity	18.1%	34%	19.5%	0.9	27%	3.2%	14%	19.7%	1.6%	67%
SPDR EURO STOXX 50 ETF	FEZ	Equity	12.5%	4%	10.5%	1.2	65%	4.4%	42%	14.2%	1.7%	72%
SPDR S&P Homebuilders ETF	XHB	Equity	16.2%	7%	9.9%	1.6	83%	3.6%	18%	20.3%	4.1%	90%
iShares MSCI United Kingdom ET	EWU	Equity	12.1%	13%	13.5%	0.9	18%	3.7%	26%	13.9%	1.8%	84%
WisdomTree Japan Hedged Equity	DXJ	Equity	15.6%	38%	13.3%	1.2	73%	3.3%	27%	17.2%	1.6%	52%
iShares MSCI Hong Kong ETF	EWH	Equity	15.5%	33%	14.7%	1.1	57%	3.9%	39%	17.8%	2.3%	90%
iShares MSCI ACWI ETF	ACWI	Equity	11.5%	27%	7.9%	1.4	82%	5.1%	84%	13.3%	1.9%	74%
iShares MSCI Taiwan ETF	EWT	Equity	14.9%	27%	14.6%	1.0	33%	3.0%	11%	15.8%	0.9%	57%
iShares MSCI Germany ETF	EWG	Equity	13.0%	1%	12.3%	1.1	63%	4.4%	26%	15.1%	2.0%	98%
WisdomTree India Earnings Fund	EPI	Equity	16.3%	1%	12.8%	1.3	54%	2.9%	6%	17.5%	1.2%	88%
WisdomTree Europe Hedged Equit	HEDJ	Equity	12.1%	6%	12.3%	1.0	46%	4.6%	56%	13.4%	1.2%	82%
iShares iBoxx High Yield Corpo	HYG	Fixed Income	4.9%	6%	3.3%	1.5	53%	2.7%	30%	7.9%	2.9%	90%
iShares 20+ Year Treasury Bond	TLT	Fixed Income	10.8%	55%	14.0%	0.8	11%	-0.3%	57%	11.5%	0.7%	44%
iShares iBoxx \$ Investment Gra	LQD	Fixed Income	4.7%	38%	5.2%	0.9	22%	1.0%	61%	5.9%	1.2%	94%
iShares 7-10 Year Treasury Bon	IEF	Fixed Income	5.1%	40%	6.0%	0.9	10%	-1.0%	11%	5.5%	0.3%	55%
iShares JP Morgan USD Emerging	EMB	Fixed Income	5.9%	24%	4.9%	1.2	72%	1.5%	30%	6.7%	0.8%	22%
SPDR Bloomberg Barclays High Y	JNK	Fixed Income	5.5%	11%	3.6%	1.5	52%	2.9%	47%	7.1%	1.6%	6%
iShares MBS ETF	MBB	Fixed Income	2.0%	4%	2.2%	0.9	5%	0.3%	16%	2.3%	0.3%	68%
SPDR Gold Shares	GLD	Commodity	11.3%	56%	8.6%	1.3	93%	-3.6%	34%	12.9%	1.7%	62%
iShares Silver Trust	SLV	Commodity	19.4%	67%	16.5%	1.2	67%	-4.8%	26%	23.0%	3.6%	76%
United States Oil Fund LP	USO	Commodity	28.1%	23%	24.5%	1.1	61%	3.5%	9%	28.6%	0.5%	75%
United States Natural Gas Fund	UNG	Commodity	36.1%	45%	38.8%	0.9	19%	-5.9%	28%	34.6%	-1.6%	49%
Invesco DB Commodity Index Tra	DBC	Commodity	14.4%	20%	12.5%	1.2	56%	0.0%	0%	15.2%	0.8%	92%
Invesco DB Agriculture Fund	DBA	Commodity	12.9%	26%	12.1%	1.1	20%	-0.2%	86%	13.4%	0.5%	47%
Invesco CurrencyShares Euro Cu	FXE	FX	4.5%	1%	4.5%	1.0	26%	-0.2%	10%	5.4%	0.9%	92%
Invesco DB US Dollar Index Bul	UUP	FX	5.7%	24%	7.1%	0.8	5%	1.6%	73%	5.2%	-0.5%	39%

Source: BofA Global Research, Bloomberg. Data as of 12-Jan-20. *3m 25Δ skew = 5-day MA of (25Δ put - 25Δ call). **1yr-3m term structure = 12m 50Δ - 3m 50Δ implied vol spread



Options' based sentiment indicator for 53 US domiciled ETFs

Table 5: The 10 most bearish: table ordered by highest average score across i) options put-call ratio (1yr %-ile), ii) 3m 50Δ implied / 1m realized vol (1yr %-ile), iii) skew (1yr %-ile), and iv) short interest (1yr %-ile)

Name	Ticker	Options put-call ratio (1yr %-ile)*	3m 50Δ implied / 1m realized vol (1-1yr %-ile)	Skew (1yr %-ile)**	Short Interest (1yr %-ile)†
PowerShares DB Agriculture Fun	DBA	54%	84%	97%	88%
PowerShares DB US Dollar Index	UUP	68%	95%	72%	85%
iShares iBoxx \$ Investment Gra	LQD	62%	77%	58%	92%
iShares MBS ETF	MBB	80%	95%	13%	93%
iShares MSCI ACWIETF	ACWI	83%	17%	85%	71%
iShares MSCI United Kingdom ET	EWU	61%	78%	23%	78%
Consumer Discretionary Select	XLV	52%	19%	66%	97%
WisdomTree Europe Hedged Equit	HEDJ	72%	51%	46%	64%
WisdomTree India Earnings Fund	EPI	94%	50%	3%	82%
iShares 7-10 Year Treasury Bon	IEF	91%	90%	11%	37%

Source: BofA Global Research. *1-yr %-ile is calculated off the latest 1m MA of the put-call ratio. **3m 25Δ skew = 5-day MA of (25Δ put – 25Δ call). † Short Interest = ratio of short Interest over shares outstanding

Table 6: The 10 most bullish: table ordered by highest average score across i) options put-call ratio (1yr %-ile), ii) 3m 50Δ implied / 1m realized vol (1yr %-ile), iii) skew (1yr %-ile), and iv) short interest (1yr %-ile)

Name	Ticker	Options put-call ratio (1yr %-ile)*	3m 50Δ implied / 1m realized vol (1-1yr %-ile)	Skew (1yr %-ile)**	Short Interest (1yr %-ile)†
Energy Select Sector SPDR Fund	XLE	44%	20%	2%	7%
iShares Russell 2000 ETF	IWM	29%	1%	13%	35%
SPDR S&P Oil & Gas Exploration	XOP	59%	15%	3%	2%
iShares MSCI Japan ETF	EWJ	43%	29%	8%	0%
United States Oil Fund LP	USO	45%	8%	14%	26%
SPDR S&P500 ETF Trust	SPY	22%	22%	55%	2%
Technology Select Sector SPDR	XLK	57%	22%	15%	10%
Materials Select Sector SPDR F	XLB	56%	21%	28%	4%
SPDR EURO STOXX 50 ETF	FEZ	40%	35%	35%	5%
iShares MSCI Germany ETF	EWG	49%	36%	16%	16%

Source: BofA Global Research. *1-yr %-ile is calculated off the latest 1m MA of the put-call ratio. **3m 25Δ skew = 5-day MA of (25Δ put – 25Δ call). † Short Interest = ratio of short Interest over shares outstanding

For ETF recommendations to implement BofA Global Research US equity core view, please see our ETFs 2020 [year ahead](#).



Summary of Open Trades (12-Jan-20)

Price data for open level reflects the price on open date and does not necessarily reflect the price at which the trade could be executed at the date of this report. Our trades are structured to be executed on the open date and are not necessarily appropriate to execute as formulated beyond that date.

Table 7: Summary of open trades as of 12-Jan-20

Trade Description	Open Date	Open Level	Expected Trade Term	Rationale
Buy XLV Jan20 92 bullish risk reversal @ 2.9% (ref. 92.41)	6-Sep-18	2.9%	Jan20	As per BofA asset allocation. Risk to the trade: US equities continue to sell off
Buy XLI Jan20 78 bullish risk reversal @ 2.0% (ref. 77.83)	6-Sep-18	2.0%	Jan20	As per BofA asset allocation. Risk to the trade: US equities continue to sell off

Source: BofA Global Research.

Summary of Closed Trades (12-Jan-20)

Table 8: Summary of closed trades as of 12-Jan-20

Trade Description	Open Date	Open Level	Close Level	Close Date	Rationale
Buy XLY Jan18 87 bullish risk reversal	10-Mar-17	-0.1%	0.7%	20-Mar-17	Risk-reward profile is less favourable today than at the start of the year; sector remains one of the most crowded sectors by fund managers, is most negatively impacted by rising wages given the labour intensity of its companies
Buy UUP Jun19 25 put and sell Jun19 27 call	20-Dec-18	0.7%	0.0%	Jun19	How to trade a weaker dollar through ETFs
Buy SMH Jul19 107/113 (34d/14d, ref.102.14) call spreads	4-Jun-19	1.5%	6%	Jul19	How to trade positive surprises from a last min trade deal
Buy FXE Apr 103-100 put spreads	10-Mar-17	\$0.57	\$0	21-Apr-17	The FXE put spreads expired OTM as stalling progress on the tax reform failed to propel USD higher and investors discounted <u>little risk</u> ahead of the French election.
Buy RSX Jan18 20 bullish risk reversal	10-Mar-17	-2.6%	-4.4%	9-Jun-17	Our investment strategists are no longer OW Russia
Buy USO May 11-12 call spreads	10-Mar-17	\$0.19	\$0.0	19-May-17	Trade expired
Buy GDX May 22-24 call spreads	10-Mar-17	\$0.66	\$0.86	19-May-17	Trade expired
Buy IWM May136-140 call spreads	10-Mar-17	\$1.81	\$0.03	19-May-17	Trade expired
Buy DXJ May 50-52 call spreads	7-Apr-17	\$0.89	\$1.35	19-May-17	Trade expired
Buy XOP Jun 37-39 call spreads	7-Apr-17	\$0.91	\$0.0	16-Jun-17	Trade expired
Buy TLT Jun 120-115 put spreads	7-Apr-17	\$1.68	\$0.0	16-Jun-17	Trade expired
Buy GLD Jun120-125 call spreads	7-Apr-17	\$1.62	\$0.0	16-Jun-17	Trade expired
Buy XOP Jul 37-40 call spreads	15-May-17	\$0.73	\$0.0	21-Jul-17	Trade expired
Buy IWM Jan18 136 bullish	10-Mar-17	-0.7%	-0.1%	10-Aug-17	Small caps usually lag during Fed tightening cycles. Have become more reasonably valued vs. large caps but our strategists now prefer large.
Buy SLV Aug 14-16-17.5 call spread collars	15-May-17	\$0.25	\$0.1	18-Aug-17	Trade expired
Buy XLE Jan18 70 bullish risk reversal	10-Mar-17	-0.4%	-7.9%	13-Sep-17	Our investment strategists are no longer OW Energy
Buy XLP Jan18 55 bearish risk reversal	10-Mar-17	2.0%	0.7%	13-Sep-17	Our investment strategists are no longer UW Staples
Buy IWM Jan18 136 bullish risk reversal	10-Mar-17	-0.7%	3.6%	14-Sep-17	Small caps usually lag during Fed tightening cycles. Have become more reasonably valued vs. large caps but we still prefer large.
Buy EEM Sep 37-40-43 put spread collars	15-May-17	\$0.00	-\$2.59	15-Sep-17	Trade expired
Buy 1x QQQ Sep 141 call and sell 2x Sep 146 calls	9-Jun-17	\$0.96	\$4.7406	15-Sep-17	Trade expired
Buy XLF Sep 25 calls	9-Jun-17	\$0.45	-\$0.23	15-Sep-17	Trade expired
Buy EFA Sep 67-70 call spreads	9-Jun-17	\$0.73	\$1.06	15-Sep-17	Trade expired
Buy XME Sep 32-36 call spreads	9-Jun-17	\$0.72	-\$0.1	15-Sep-17	Trade expired
Buy EWZ Sep17 37.5 call and sell Jan18 45 call	14-Jul-17	\$0.89	\$5.85	15-Sep-17	Trade expired
Buy GLD Sep17 130 calls	11-Aug-17	35c	\$0	15-Sep-17	Trade expired
Buy 1x GDX Sep17 24.5 calls & sell 0.5x Jun18 34.0 calls	11-Aug-17	14.5c	\$0	15-Sep-17	Trade expired
Buy GLD Sep17 130 calls & sell IYR Sep17 83 calls	11-Aug-17	26c	\$0	15-Sep-17	Trade expired
Buy SPY Jan18 238 bearish risk reversal	10-Mar-17	1.0%	-5%	28-Sep-17	Trade expired
Buy EEM Jan18 38 bearish risk reversal	10-Mar-17	1.2	-14.5%	28-Sep-17	Trade expired
Buy FXI Jan18 38 bullish risk reversal	10-Mar-17	-2.1%	11.7%	28-Sep-17	Trade expired
Buy EWY Jan18 58 bullish risk reversal	10-Mar-17	0.7%	13.3%	28-Sep-17	Trade expired
Buy EWT Jan18 32 bullish risk reversal	10-Mar-17	0.3%	9.6%	28-Sep-17	Trade expired
Buy EEM Oct 44 calls	14-Jul-17	\$1.13	\$2.26	20-Oct-17	Trade expired
Buy EWW Sep 58-63 call spreads	14-Jul-17	\$1.18	\$0.0	20-Oct-17	Trade expired
Buy UUP Oct17 24 calls	14-Sep-17	\$21c	\$0.35	20-Oct-17	Trade expired
Buy XLB Jan18 52 bearish risk reversal	10-Mar-17	1.1%	-12.9%	13-Dec-17	Change in rating from bearish to bullish
Buy XLV Jan18 76 bullish risk reversal	10-Mar-17	-0.1%	9.1%	13-Dec-17	Change in rating from bullish to neutral
Buy HYG Dec17 88 puts	29-Sep-17	1.3%	1.8%	Dec17	Trade expired
Buy HYG Dec17 88/84 put spreads	29-Sep-17	0.9%	1.8%	Dec17	Trade expired
Buy 0.4x IWM Dec17 139 put and sell 1x HYG 85 put	29-Sep-17	0%	0%	Dec17	Trade expired
Buy HYG Dec17 89 calls	29-Sep-17	0.3%	0%	Dec17	Trade expired
Buy SPY Dec17 256 calls & sell notional-equivalent EEM Dec17 48.0 calls	14-Sep-17	\$0	3.9%	Dec-17	Trade expired
Buy SPY Dec17 256 calls & sell notional-equivalent QQQ Dec17 152.0 calls	14-Sep-17	\$0	0.6%	Dec-17	Trade expired
Buy XLE Dec17 68-71 call spreads	14-Sep-17	74c	1.0%	Dec-17	Trade expired
Buy ACWI Oct17 63 bullish risk reversal	10-Mar-17	-0.20%	10%	20-Oct-17	Trade Expired
Buy SPY Mar18 250 bullish risk reversal	28-Sep-17	0.10%	9%	16-Mar-18	Trade Expired



Table 8: Summary of closed trades as of 12-Jan-20

Trade Description	Open Date	Open Level	Close Level	Close Date	Rationale
Buy HEDJ Jan18 61.20 bullish risk reversal	10-Mar-17	0.20%	8%	19-Jan-18	Trade Expired
Buy EWU Jan18 32 bullish risk reversal	10-Mar-17	-2.10%	14%	19-Jan-18	Trade Expired
Buy DXJ Jan18 51.78 bullish risk reversal	10-Mar-17	1.10%	17%	19-Jan-18	Trade Expired
Buy FXI Jan18 38 bullish risk reversal	10-Mar-17	-2.1	27%	19-Jan-18	Trade Expired
Buy EEM Mar18 44 bullish risk reversal	28-Sep-17	0.30%	11%	16-Mar-18	Trade Expired
Buy TLT Jan18 117-110 put spread	10-Mar-17	2.90%	0%	19-Jan-18	Trade Expired
Buy LQD Jan18 116 bearish risk reversal	10-Mar-17	1.90%	-3%	19-Jan-18	Trade Expired
Buy HYG Jan18 86 bearish risk reversal	10-Mar-17	4.00%	-1%	19-Jan-18	Trade Expired
Buy EMB Jan18 112 bearish risk reversal	10-Mar-17	3.80%	-3%	19-Jan-18	Trade Expired
Buy MBB Sep17 105 bearish risk reversal	10-Mar-17	1.50%	-1%	15-Sep-17	Trade Expired
Buy USO Jan18 10 bullish risk reversal	10-Mar-17	4.20%	21%	19-Jan-18	Trade Expired
Buy XME Jan18 30 bullish risk reversal	10-Mar-17	0.30%	22%	19-Jan-18	Trade Expired
Buy GLD Jan18 115 bullish risk reversal	10-Mar-17	1.00%	9%	19-Jan-18	Trade Expired
Buy small caps (IWM) Jan18 151/156 call spreads	10-Nov-17	0.9%	3.2%	19-Jan-18	Trade Expired
Buy IWM Jan18 151 call and sell IWM Dec17 153 call	10-Nov-17	0.9%	4.4%	19-Jan-18	Trade Expired
Buy XHB Jan18 39 puts	10-Nov-17	1.4%	0%	19-Jan-18	Trade Expired
Buy Regional banking (KRE) Jan18 57-60 call spreads	10-Nov-17	1.2%	4.8%	19-Jan-18	Trade Expired
Buy Chinese large caps (FXI) Feb18 44/38 put spreads	13-Dec-17	1.6%	0%	16-Feb-18	Trade Expired
Buy XLB Mar18 58/52 put spreads	13-Dec-17	1.5%	0%	16-Mar-18	Trade Expired
Buy USO Feb18 11/9.5 put spreads	13-Dec-17	2.1%	0%	16-Feb-18	Trade Expired
Buy XME Mar18 32/29 put spreads	13-Dec-17	2.0%	0%	16-Mar-18	Trade Expired
Buy DXJ May18 55 put and sell DXJ May18 51 put	16-Mar-18	1.56%	0%	May18	Trade Expired
Buy DBC Apr18 17 call for indic	8-Feb-18	1.6%	2.8%	Apr18 expiry	Trade Expired
Buy USO Apr18 12.5 call and sell USO Apr18 11 put	8-Feb-18	1.2%	10.5%	Apr18 expiry	Trade Expired
Buy 1x XOP May18 35 call and sell 2x XOP May18 40 calls	8-Feb-18	2.2%	5.7%	May18 expiry	Trade Expired
Buy 1x RSX May18 23 call and sell 2x RSX May18 25 calls	8-Feb-18	1.9%	0%	May18 expiry	Trade Expired
Buy UK equities (EWU) Apr18 34 30 put spreads	13-Dec-17	1.3%	0%	Apr18 expiry	Trade Expired
Buy SMH May18 112 puts and sell SMH May18 100 puts and 115 calls	16-Mar-18	0.4%	6.7%	May18	Trade Expired
Buy HEDJ Jan19 65 bullish risk reversal	18-Mar-18	-2.0%	-2.3%	25-Jun-18	Change of investment thesis
Buy 1x XME Jun18 37 call and sell 2x XME Jun18 41 calls	8-Feb-18	1.9%	0%	Jun-18	Trade Expired
Buy FXI Jun18 47 put and sell FXI Jun18 41 put and FXI Jun18 53 call	16-Mar-18	0.6%	0.48%	Jun-18	Trade Expired
Buy GLD Jun18 130/140 call spread	16-Apr-18	1.2%	0%	Jun-18	Trade Expired
Buy GLD Jun18 128/140 call spreads vs. selling GLD Jun18 124 puts	16-Apr-18	1.0%	0%	Jun-18	Trade Expired
Buy 4.5x GDX Jun18 26 call and sell GLD Jun18 136 call	16-Apr-18	0.0%	0%	Jun-18	Trade Expired
Buy EMB Sep18 110 calls and sell 106/100 put spreads	29-May-18	0.7%	0%	Sep-18	Trade Expired
Buy EMB Dec18 110 calls and sell Sep18 112 calls	29-May-18	1.1%	0.3%	Sep-18	Trade Expired
Buy EWW Sep18 48 calls and sell 52 calls	25-Jun-18	2.2%	6.5%	Sep-18	Trade Expired
Buy EWW Sep18 48 calls, sell EWW Sep18 43 puts	25-Jun-18	2.0%	6.5%	Sep-18	Trade Expired
Buy EPI Sep18 28 calls	31-Jul-18	0.7%	0%	Sep-18	Trade Expired
Buy RSX Sep18 23 calls	31-Jul-18	1.1%	0%	Sep-18	Trade Expired
Sell 1x FXI Oct18 43 call, buy 2x FXI Oct18 45 calls (ref. 43.28)	31-Jul-18	0.0%	0.0%	Oct-18	Trade Expired
Buy HEDJ Jan19 65 bullish risk reversal	16-Mar-18	-2.0%	-6.4%	6-Nov-18	Trade Expired
Buy MBB Sep18 104.00 bearish risk reversal @ 0.4% (ref. 104.21)	16-Mar-18	2.7%	1.3%	Sep18	Trade Expired
Buy XLY Jan19 98 bearish risk reversal @ 0.3% (ref. 97.88)	5-Nov-18	0.3%	3.3%	Jan-19	Trade Expired
Buy XLF Jan19 28 bullish risk reversal @ -0.8% (ref. 27.67)	5-Nov-18	-0.8%	-20.7%	Jan-19	Trade Expired
Buy XLU Jan19 55 bearish risk reversal @ 0.9% (ref. 55.32)	5-Nov-18	0.9%	0.7%	Jan-19	Trade Expired
Buy XLK Jan19 64 bullish risk reversal @ 0.7% (ref. 64.12)	5-Nov-18	0.7%	-6.1%	Jan-19	Trade Expired
Buy XLB Jan19 59 bullish risk reversal @ 0.0% (ref. 59.00)	5-Nov-18	0.0%	-20.0%	Jan-19	Trade Expired
Buy IYR Jan19 82 bearish risk reversal @ 2.9% (ref. 82.12)	5-Nov-18	2.9%	8.5%	Jan-19	Trade Expired
Buy XLI Jan19 71 bullish risk reversal @ 0.8% (ref. 71.36)	5-Nov-18	0.8%	-12.6%	Jan-19	Trade Expired
Buy XLV Jan19 90 bullish risk reversal @ 0.5% (ref. 90.05)	5-Nov-18	0.5%	-7.7%	Jan-19	Trade Expired
Buy EWT Jan19 32 puts and sell FXI Jun18 53 calls	16-Mar-18	1.4%	0%	Jan19	Trade Expired
Buy HEDJ Jan19 65 bearish risk reversal @ 3.2%	25-Jun-18	3.2%	-8.7%	Jan19	Trade Expired
Buy USO Jan19 14.5 bullish risk reversal @ -1.5%	25-Jun-18	-1.5%	-20%	Jan19	Trade Expired
Buy GLD Jan19 119 bullish risk reversal @ 1.7%	25-Jun-18	1.7%	1.7%	Jan19	Trade Expired
Buy XLI Dec18 81/86 call spreads	8-Oct-18	1.6%	0%	Dec18	Trade Expired
Buy TLT Dec18 115/120 call spreads	8-Oct-18	1.0%	4.4%	Dec18	Trade Expired
Buy IWM Dec18 160/150 put spreads	8-Oct-18	1.4%	6%	Dec18	Trade Expired
Buy TLT Dec18 112/106 put spreads (ref. 112.52)	5-Nov-18	1.2%	0%	Dec18	Trade Expired
Buy FXE Dec18 109/105 put spreads (ref. 109.18)	5-Nov-18	0.8%	0.4%	Dec18	Trade Expired
Overlay long SPX with SPY 1x2 Dec18 275/290 call ratios	5-Nov-18	1.6%	0%	Dec18	Trade Expired
Buy GLD Mar19 123 calls for 1.3%	20-Dec-18	1.3%	0%	Mar19	Trade Expired
Buy FXY Mar19 88 calls for 1.0%	20-Dec-18	1.0%	0%	Mar19	Trade Expired
Buy NVDA Apr19 150 calls and sell SMH Apr19 98 calls	31-Jan-19	2.3%	4.8%	Apr19	Trade Expired
Buy SMH Apr19 85/98/105 call spread collars:	31-Jan-19	1.6%	7.2%	Apr19	Trade Expired
Buy EWU Apr19 33 puts and sell UKX Apr19 7250 puts	21-Mar-19	0.5%	0%	Apr19	Trade Expired
Buy TLT Jul19 126 puts and sell TLT Jul19 139 calls	20-Jun-19	0.0%	0.0%	Jul19	Trade Expired
Sell TLT Jul19 132 straddle to fully finance 5x TLT Jul19 129 puts and 2.5x 136 calls	20-Jun-19	0.1%	-0.2%	Jul19	Trade Expired



Table 8: Summary of closed trades as of 12-Jan-20

Trade Description	Open Date	Open Level	Close Level	Close Date	Rationale
Buy DXJ Aug19 49/53 (37d/5d, ref. 47.87) call spreads	4-Jun-19	1.7%	0%	Aug19	Trade Expired
Buy EWZ Sep19 36 puts & sell EWZ Sep19 30 puts	23-Apr-19	3.2%	0%	Sep19	Trade Expired
Buy EWT Sep19 35/38 (36d/7d, ref. 33.37) call spreads	4-Jun-19	2.0%	4.1%	Sep19	Trade Expired
Buy FXA Sep19 67 puts (35d, ref. 67.83)	11-Aug-19	0.81%	0%	Sep-19	Trade Expired
Buy EWT Sep19 31 puts (14d, ref. 34.1)	11-Aug-19	0.70%	0%	Sep-19	Trade Expired
Buy USO Oct19 9 puts (ref. 10.61)	11-Aug-19	0.80%	0%	Sep-19	Trade Expired

Source: BofA 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

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

Specific risks to covered call strategies: If the stock finishes below the noted "breakeven point" at expiry, the investor's position will be valued lower; however, any discount in value will be partially offset by option premium received. If the stock finishes above the noted strike on expiry, the investor may have their underlying shares called-away (sold); however, realizing a profitable capped return equaling the noted call-away return.

- When the underlying stock price meaningfully lies above the short call strike price, the investor is at risk of having their underlying shares called-away (sold). Holders can employ the following tactics to avoid call-away:

Roll-out (Roll Forward): Buy back the calls that were originally sold and sell same strike calls at a later expiry. Because of the time value, this transaction usually results in an initial net credit.

Roll-up: Buy back the calls that were originally sold and sell higher strike calls at the same expiry. Because of intrinsic value, this transaction usually results in a net debit.

Roll-up & out: Buy back the calls that were originally sold and sell higher strike calls at a later expiry. The transaction can result in either a net debit or credit.

- When the underlying stock price meaningfully underperforms, the investor will have an opportunity to shift strikes and/or expiries to generate further income.



Roll-out (Roll Forward): Buy back the calls that were originally sold and sell same strike calls at a later expiry. Because of the time value, this transaction usually results in an initial net credit.

Roll-down: Buy back the calls that were originally sold and sell lower strike calls at the same expiry. Because of intrinsic value, this transaction usually results in an initial net credit.

Roll-down & out: Buy back the calls that were originally sold and sell lower strike calls at a later expiry. Because of time value and intrinsic value, this transaction will result in an initial net credit.

General return risks associated with covered call strategies

While covered call strategies will underperform stocks in fast bull markets, they will still realize significant profits. Covered call strategies tend to outperform outright stock ownership in flat, down and slightly up markets.

Covered call strategies allow clients to increase their yield on equity positions in exchange for giving up some of the potential upside in the underlying securities. While covered call strategies will underperform stocks in fast bull markets, they will still realize significant profits. Covered call strategies tend to outperform outright stock ownership in flat, down and slightly up markets. Covered call strategies tend to dampen the effects of general market volatility by offsetting outlier returns. The payoff properties of the covered call, capped upside returns and reduced downside returns (offset by option premiums received), work to truncate holding period returns towards the mean and reduce the overall standard deviation of a sample portfolio. These properties are reflected by a portfolio net delta that is less than 100% (typically between 65-90%). By definition, a long stock-only position exhibits a constant 100% delta.

Option Liquidity Risk

While we believe the recommended options are liquid and appropriate for covered call writing, the premiums noted can change rapidly and adversely. Investors should consider these factors before executing a transaction.

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I, Francisco Blanch, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also



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