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Equity Research
18 November 2019

DERIVATIVES

U.S. Equity Derivatives Strategy

Sentiment and Negative Convexity Metrics Weekly

In this weekly publication, we offer a brief overview of the current state of negative convexity factors. We discuss value-added market intelligence covering investor sentiment, futures liquidity, hedger/speculator positioning and other negative convexity factors.

FIGURE 1

Snapshot of negative convexity risks in the equity markets

Investor Sentiment and Positioning (Score)			
Retail Sentiment	**Positioning**	**Institutional Sentiment**	**Positioning**
AAII Retail Investor Bull-Bear Sentiment	High (66%)	SPX Futures positioning	Neutral (-27%)
Global Equity Fund Flows	Moderately Positive (76%)	Equity Short Interest	High (86%)
VIX ETP flows	High (51%)	Equity Option Skew	Neutral (48%)
Negative Convexity Risks (5Yr Percentile)			
Negative Convexity Sources	**Risk**	**Negative Convexity Sources**	**Risk**
Volatility Target Funds	Neutral (3%)	Short positioning of VIX futures Speculators	High (100%)
SPX Option Market maker gamma and Intraday Autocorrelation	Low (-93%)	Leveraged VIX ETP gamma flows	High (59%)
General Liquidity (5Yr Percentile)			
SPX Emini Intraday order book depth			Poor (-17%)

Source: Barclays Research, American Association of Individual Investors, Bloomberg, EPFR, OptionMetrics, CFTC, and Refinitiv. Note: In the brackets, we show the Score = 2*(5 Year Percentile of the last value for the metrics) -1.

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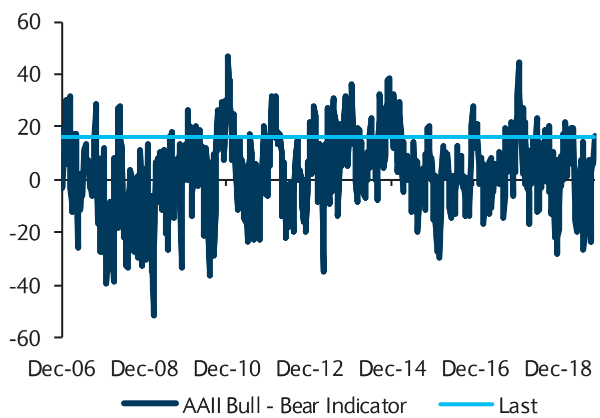
RETAIL INVESTOR SENTIMENT

FIGURE 2

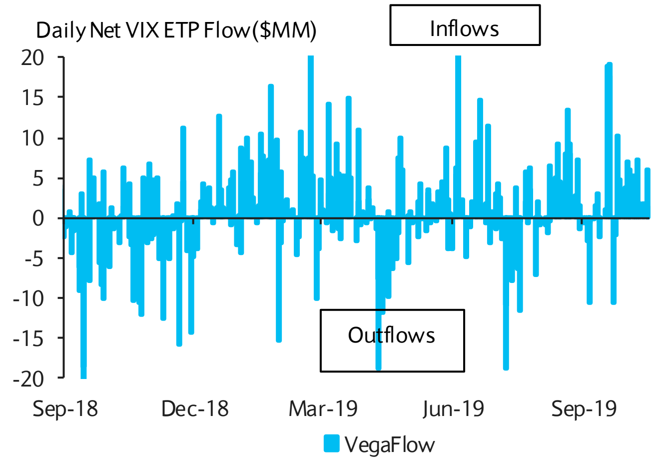
Retail Investor Sentiment(AAII Bull – Bear): High



Source: Barclays Research, Bloomberg

FIGURE 3

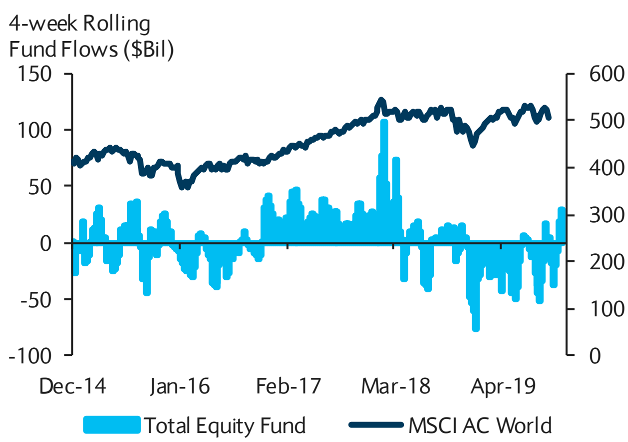
Daily VIX ETP Fund Flows: High



Source: Barclays Research, Bloomberg

FIGURE 4

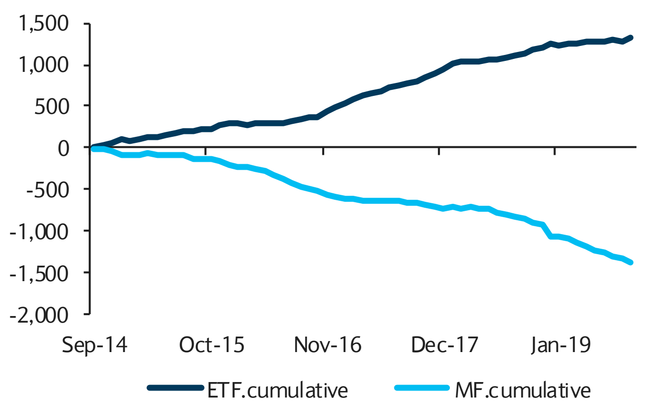
Global Equity Fund Flows: Moderately Positive



Source: EPFR, Barclays Research, Bloomberg

FIGURE 5

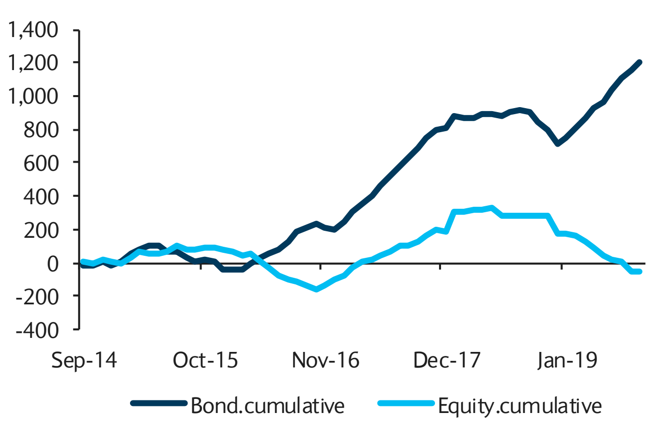
Global Equity Fund Flows by Fund Type



Source: EPFR, Barclays Research, Bloomberg

FIGURE 6

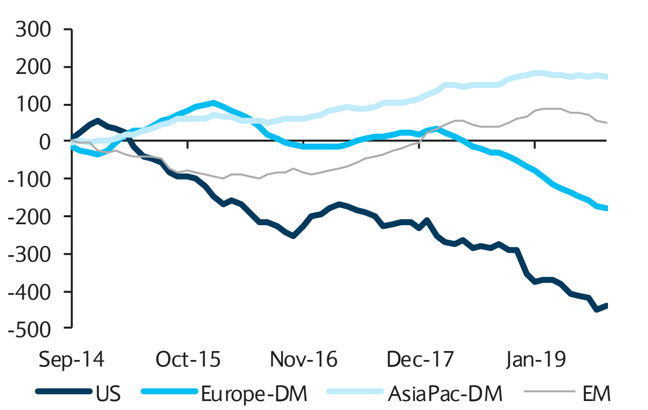
Global Fund Flows by Asset Type



Source: EPFR, Barclays Research, Bloomberg

FIGURE 7

Global Equity Fund Flows by Region

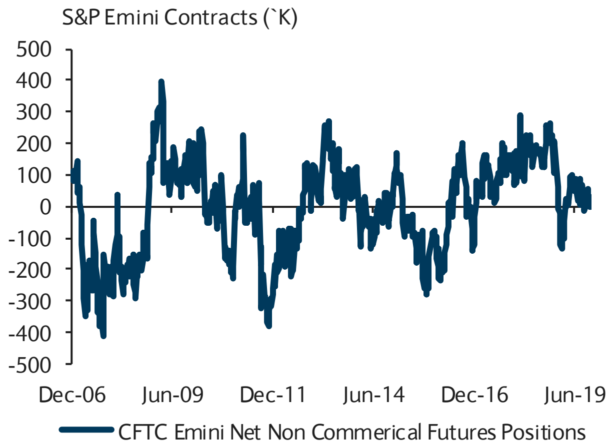


Source: EPFR, Barclays Research, Bloomberg

INSTITUTIONAL INVESTOR SENTIMENT

FIGURE 8

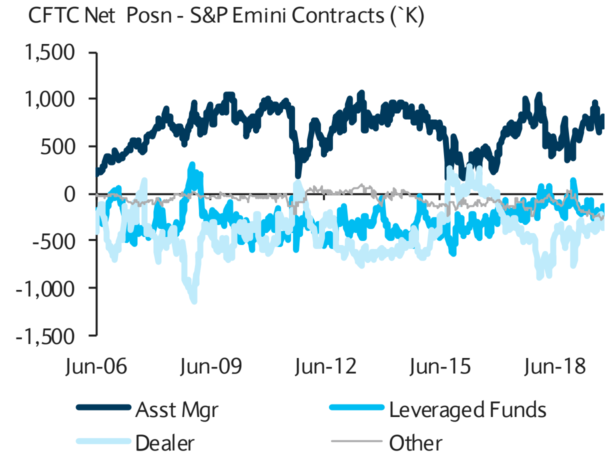
SPX E-mini Net Speculator positioning: Neutral



Source: Barclays Research, Bloomberg

FIGURE 9

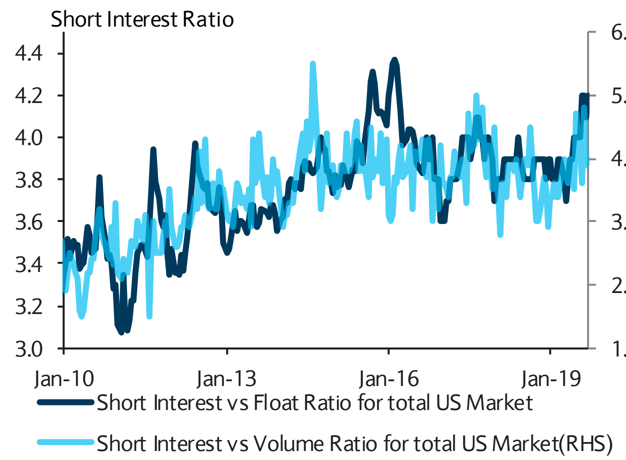
SPX E-mini Net positioning by Asst Mgr/Lev Funds/Dealers



Source: Barclays Research, Bloomberg

FIGURE 10

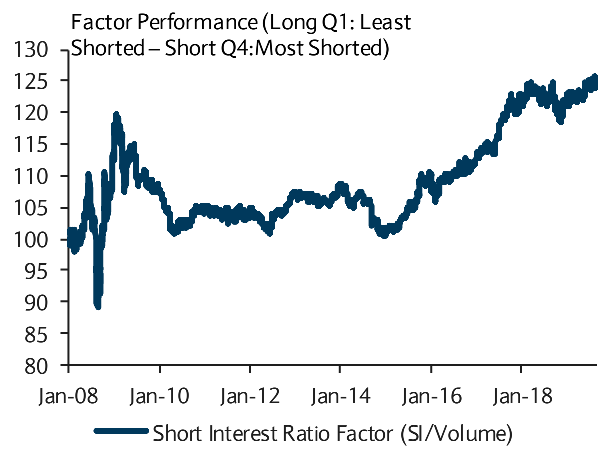
US Equities Short Interest Ratio: High



Source: Barclays Research, Bloomberg

FIGURE 11

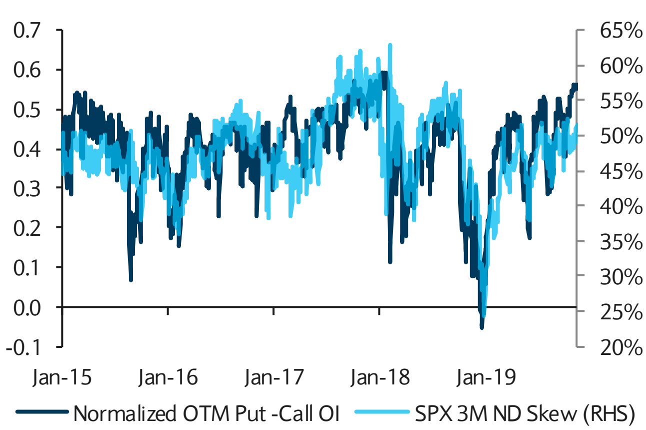
Short Interest Ratio Factor Performance (Long Q1- Short Q4)



Source: Barclays Research, Bloomberg. Note Q1=Low SI Ratio Q4= High SI Ratio.

FIGURE 12

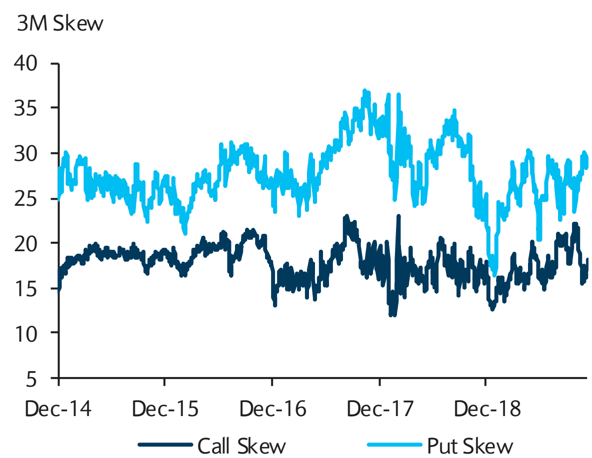
SPX Normalized 3M skew and Normalized OTM Puts-Call OI Ratio: Neutral



Source: Barclays Research, Bloomberg OptionMetrics.

FIGURE 13

SPX 3M Skew Upside(Call) and Downside(Put) 3M Skew

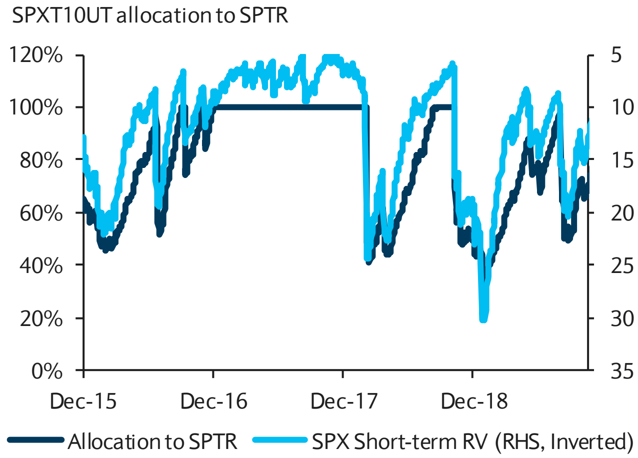


Source: Barclays Research, Bloomberg, OptionMetrics

NEGATIVE CONVEXITY SOURCES

FIGURE 14

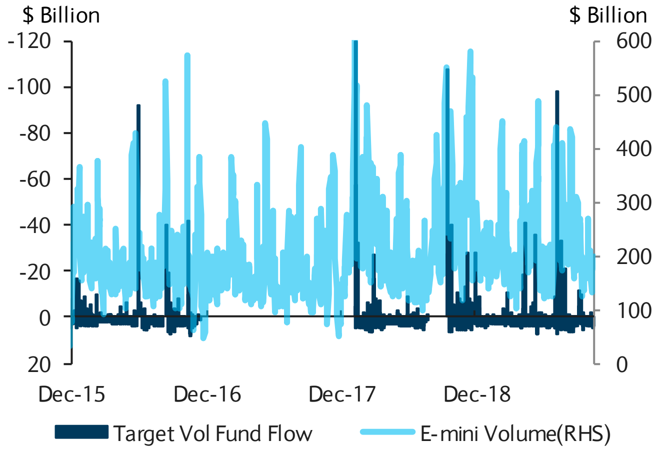
Volatility Target Fund Allocation and SPX Short Term RV: Neutral



Source: Barclays Research, Bloomberg

FIGURE 15

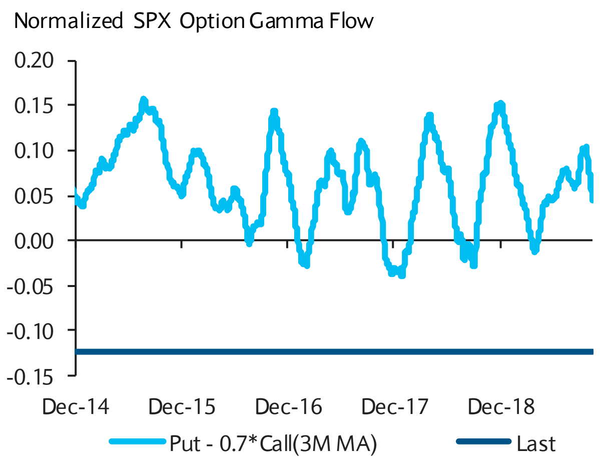
Target Volatility Fund Flow and SPX E-mini Volume



Source: Barclays Research, Bloomberg

FIGURE 16

SPX Option Market Maker Short Gamma Inventory: Low

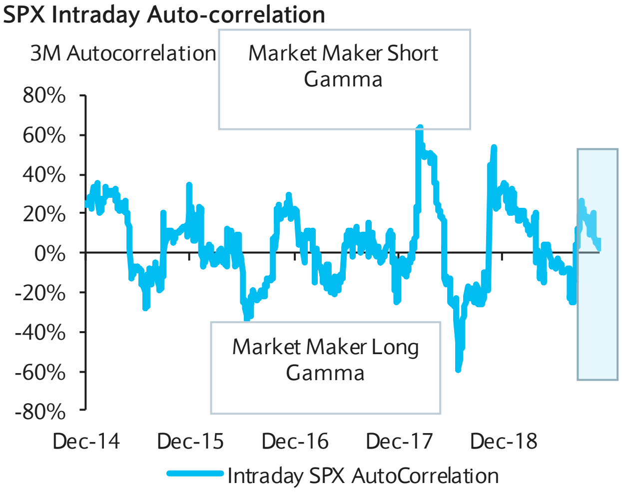


Source: Barclays Research, Bloomberg, OptionMetrics.

Note: We estimate Normalized Market Maker Gamma = (Put Gamma – 0.7 *Call Gamma)/Future Dollar Volume. We include SPX and SPY gamma and future dollar volume. Last: Last raw value of Normalized Gamma. Last : last value of Raw Normalized Gamma

FIGURE 17

SPX Intraday Auto-correlation

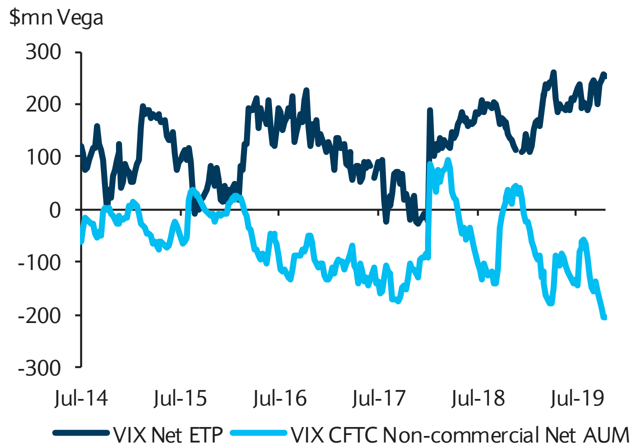


Source: Barclays Research, Bloomberg, Refinitiv.

Note: SPX Autocorrelation = Rolling 3M SPX intraday Autocorrelation between returns from previous close to 3:30 PM and 3:30 PM to close

FIGURE 18

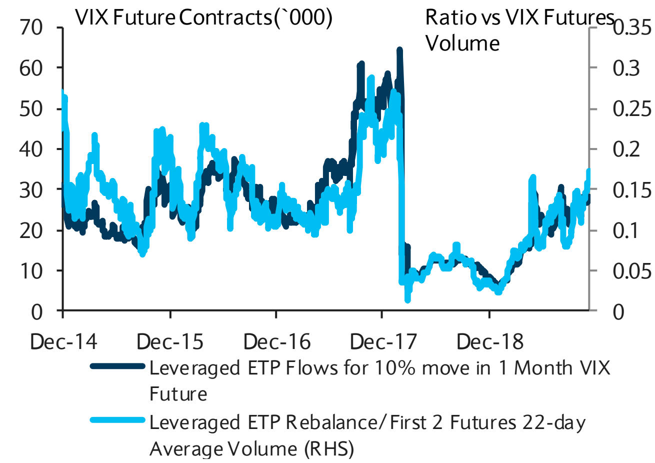
Non-Commercial Net VIX Futures Vega and Net ETP VIX Futures Vega: High



Source: Barclays Research, Bloomberg, CFTC

FIGURE 19

Theoretical Flow from Leveraged VIX ETP rebalancing: High

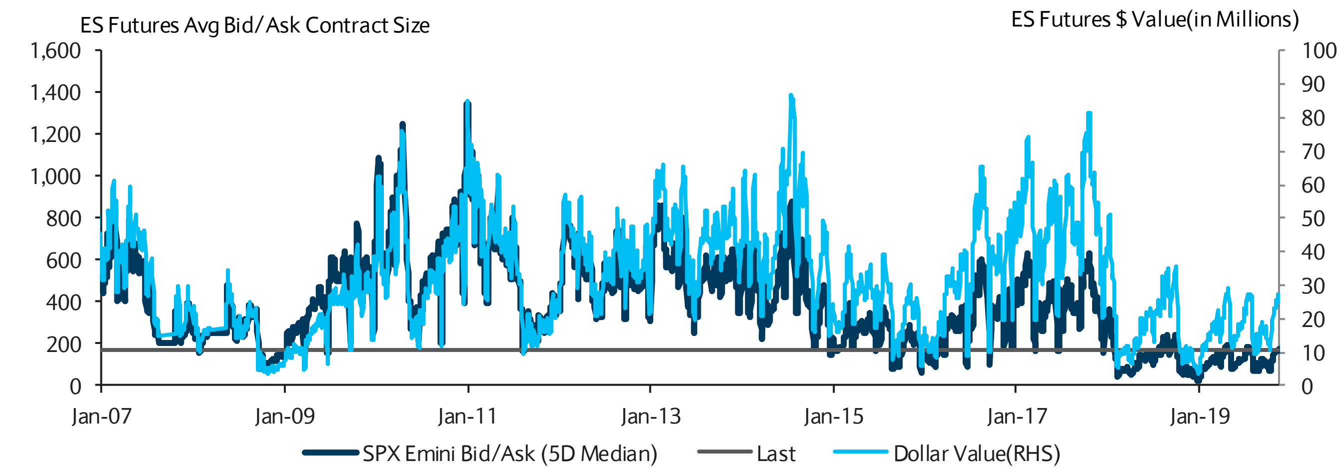


Source: Barclays Research, Bloomberg

Details of the theoretical flow calculation for leveraged ETPs in the Appendix

FIGURE 20

SPX E-mini futures depth (proxy for liquidity): Poor



Source: Barclays Research, Refinitiv

APPENDIX

Retail and Institutional Investor Sentiment

While sentiment is not a source of risk itself, extreme sentiment coupled with stretched market positioning increases the risk of positioning unwind and elevated volatility. We also look at positioning from both a Retail and Institutional investor base to provide a balanced picture of positioning-related risks.

Figure 2: Investor Sentiment (AAII Bull – Bear)

- **An overly bullish/bearish AAII sentiment reading coupled with extended positioning poses a risk to the market if there is a reversal in sentiment.**

We use the AAII Bull – Bear Index as a proxy for Retail investor sentiment. The sentiment index is based on the individual investor sentiment survey conducted by American Association of Individual Investors (AAII), which asks '**the direction members feel the stock market will be in next 6 months,**' on a weekly basis. The difference between the AAIIBULL Index and AAIIBEAR Index provides a measure of investor optimism/pessimism over the near term.

Figure 3 : VIX ETP flows

- **VIX ETPs is primarily used as a hedging tool by retail investors/ retail investment advisors who have limited access to other hedging alternatives. We view inflows into VIX ETPs as a sign of bullish retail sentiment as it indicates the investors are not in cash and have active risk exposure.**

Retail investor trading behaviour in VIX ETPs has been consistent over the past couple of years. The typical playbook has been to buy VIX ETPs in periods of declining volatility leading to inflows and unwind these ETPs during a spike in volatility to monetize the gains slowly over a period of a week.

For each type of VIX ETP, we calculated the daily Vega flow into the ETP and based on the sign of the underlying VIX futures held in the ETP, we net the flow across ETPs. The flow differs from Vega AUM due to the significant decline in the value of most ETPs over time. We define the daily "flow" as follows: we first calculate the daily dollar flow for each product as the change in number of shares times the current price of the product and then convert this dollar flow into the equivalent number of VIX futures. We then calculate the cumulative flows based on the daily flow series.

Figure 4-Figure 7: Global Equity Fund Flow

- **Weaker equity fund flows despite strong equity returns highlights individual investors are being risk averse/cautious by not chasing the equity rally. On the flip side, a stronger equity fund flow points to investors signalling bullish sentiment.**

We track the rolling 4-week fund flow in Global Equity funds. The equities funds universe contains both Mutual Funds and Exchange Traded Funds. We view the flows to be driven primarily by individual investors or retail investment advisors. We also track the cumulative fund flows by slicing the funds into various categories:

- Fund Type: The global equity flows are bucketed into two fund categories Mutual Funds (MF) and Exchange Traded Funds (ETF). The flows highlight the AUM switch from active to passive funds.
- Asset Type: The global fund flows are bucketed into Equity and Fixed income buckets.

- Regions: The global equity flows are bucketed into the various regions namely – US, EU (Developed Markets), Asia-Pacific (DM) and Emerging markets.

To provide some context to the size of the flows, we show the distribution on AUM ($Trillion) across Fund Types, Asset Types and Regions in Figure 21.

FIGURE 21

Global Fund AUM Distribution by Asset Class, Fund Type and Geography

Category ($Trn)		All	US	Europe-DM	AsiaPac-DM	Global-DM	EM
Mkt-Cap($Trn)**		47.9	25.7	8.6	5.1	-	7.0
Equity	All	18.9	10.7	1.4	0.7	4.3	1.6
	MF	14.5	8.1	1.1	0.3	3.7	1.1
	ETF	4.4	2.6	0.2	0.4	0.6	0.4
Bond	All	8.6	5.2	1.0	0.1	1.5	0.7
	Govt	1.8	1.4	0.2	0.0	0.2	-
	Corp	1.7	0.9	0.4	0.0	0.4	-
	Mixed*	5.1	2.9	0.4	0.0	0.9	-
Money	All	5.2	4.1	0.8	0.0	0.2	-

Source: EPFR, Bloomberg, Barclays Research. Note: AUM in $Trillion. *All bond funds which are not classified in Government or Corporate are classified as Mixed. ** Market Cap is derived from MSCI indices: All (MSCI World Index); US: MSCI US index; Europe-DM: MSCI EU Index; AsiaPac-DM: MSCI Pacific Index; and EM:MSCI Emerging Markets Index.

Figure 8-Figure 9: SPX E-mini futures positioning

- **Stretched SPX E-mini futures net positioning by non-commercial traders is a source of risk.**

We use S&P E-mini futures non-commercial net outstanding positions as a metric to measure equity positioning of institutional investors. Positive positioning is linked to a bullish outlook but if the position becomes too stretched, it is susceptible to rapid unwinding by speculators. Similarly, we view negative net non-commercial S&P 500 futures positioning as bearish with extreme bearish positioning also as source of risk. The S&P E-mini 500 futures positioning is published in the Commitments of Traders (COT) report, which provides a breakdown of each Tuesday's open interest for markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC.

The *Traders in Financial Futures* (TFF) report separates large traders in the financial markets into the following four categories: Dealer/Intermediary; Asset Manager/Institutional; Leveraged Funds; and Other Reportables. The TFF report, like the COT reports, provides a breakdown of each Tuesday's open interest for markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. We show the position based on an alternate bucketing methodology for four trader types:

- Dealer/Intermediary: These participants are what are typically described as the “sell side” of the market. Though they may not predominately sell futures, they do design and sell various financial assets to clients. They tend to have matched books or offset their risk across markets and clients. Futures contracts are part of the pricing and balancing of risk associated with the products they sell and their activities. These include large banks (U.S. and non-U.S.) and dealers in securities, swaps and other derivatives.

- Asset Manager/Institutional. These are institutional investors, including pension funds, endowments, insurance companies, mutual funds and those portfolio/investment managers whose clients are predominantly institutional.
- Leveraged Funds. These are typically hedge funds and various types of money managers, including registered commodity trading advisors (CTAs); registered commodity pool operators (CPOs) or unregistered funds identified by CFTC. The strategies may involve taking outright positions or arbitrage within and across markets. The traders may be engaged in managing and conducting proprietary futures trading and trading on behalf of speculative clients.
- Other Reportables: Reportable traders that are not placed into one of the first three categories are placed into the "other reportables" category. The traders in this category mostly are using markets to hedge business risk, whether that risk is related to foreign exchange, equities or interest rates. This category includes corporate treasuries, central banks, smaller banks, mortgage originators, credit unions and any other reportable traders not assigned to the other three categories.

Figure 10: Short Interest Ratio

- **Short interest ratio is a proxy for sentiment and source of risk (risk of short squeeze). Rising short interest ratio signals rising institutional investor pessimism. Large short interest relative to the float/volume leads to a higher risk of crowded exits during a short squeeze scenario.**

We track two popular metrics of short interest as a proxy for institutional investor sentiment/positioning:

- The Short Interest vs. Float index measures aggregated short interests vs. float ratio (%) from companies listed on NYSE, NASDAQ and AMEX as a total, updated twice a month. This only includes common stocks, REITs, Master Limited Partnerships, not including ETFs.
- The Short Interest vs. Volume index measures aggregated short interests vs. average daily traded volume(ADTV) ratio (%) from companies listed on NYSE, NASDAQ, and AMEX as a total, updated twice a month. This only includes common stocks, REITs, Master Limited Partnerships, not including ETFs.

Figure 11: Short Interest Ratio Factor Performance

We show the performance of a Short Interest Ratio (SI/Volume) Factor based long/short basket. The steps to construct the Short Interest Factor Strategy as follows:

- We bucket the S&P 500 stocks in a cross-sectional manner into four quartiles (Q1 to Q4) based on their short interest/daily trading volume ratio. Q1 – Least Shorted and Q4 – Most heavily Shorted stocks.
- Construct a dollar-neutral basket which is Short the Q4 of most shorted basket in SPX and Long the Q1, the least shorted basket.
- The basket is equal weighted and rebalanced on biweekly basis as the short interest data becomes available every two weeks.
- As the short interest information is released with a lag, we set 10-day lag to rebalance the new constituents to make it tradable.

Note: Past performance is not necessarily indicative of future results.

Figure 12 and Figure 13: SPX 3M skew and OTM Puts/Call OI Ratio

- **Steepening SPX skew and rising OTM SPX Put/Call ratio indicates professional investor sentiment turning more risk averse in the near term. While a flattening SPX skew and low SPX OTM Put/Call ratio indicate lacklustre hedging demand.**

Professional investors trade SPX options as a portfolio management tool to hedge/increase risk exposure. The investor view is expressed via trading put/call options and demand for puts indicates a cautious stance while demand for calls indicates a bullish stance. The skew measures the relative demand for put options relative to call options.

SPX OTM Put-Call Open Interest ratio

The OTM SPX Put-Call ratio is the difference of OTM Puts- Calls option open Interest and the metric isolated the SPX options by moneyness. We introduced the new metric OTM SPX Put-Call OI Ratio in the report *U.S. Equity Derivatives Strategy: Explaining divergence between the extreme SPX Put/Call Open Interest Ratio and SPX Skew*. In the report, we highlighted that calculating Put-Call ratio using (Out of the Money) OTM options as a cleaner way to extract investor sentiment and find that this new metric is also a more consistent with positioning information gleaned from the SPX skew. We calculate the daily SPX OTM Put – OTM Call OI normalized by the total option OI.

Normalized Skew and Upside/Downside Skew

We define the normalized delta skew as the difference of downside skew and upside skew. Downside skew is calculated by normalizing the difference between the implied volatility of 25 delta put and 50 delta put by 50 delta put implied volatility. Similarly, upside skew is calculated by normalizing the difference between the implied volatility of 25 delta call and 50 delta call by 50 delta call implied volatility.

Negative Convexity Sources

Figure 14-Figure 15: Volatility Target Fund Allocation, SPX Short-term RV, Target Volatility Fund Flow and SPX E-mini Volume

- **The growth in Target Volatility Funds has been a significant source of negative convexity, which has likely exacerbated the equity selloffs over the past few years.**

Target Volatility Funds target fixed portfolio volatility and decrease their overall leverage to maintain a fixed portfolio volatility. When the forecast volatility increases during market declines, these funds de-lever by selling equities, which further exacerbate the selloff. When the volatility normalizes, these funds re-lever the equities allocation back up. The precise details of how portfolio volatility is forecast are likely to vary across funds, but we use the S&P Daily Risk Control 10% index (ticker: SPXT10UT) as a benchmark strategy. This index rebalances between S&P exposure and cash to maintain a 10% volatility target.

We have discussed Volatility Target Funds in more detail in our past publications - *Global Volatility Outlook 2019: Sunny with a chance of thunderstorms*, December 14, 2018, *Global Volatility Outlook 2017: Navigating policy cross currents*, December 16, 2016 and *Global Volatility Outlook 2015: The QE Handoff: A Tricky Maneuver*, December 12, 2014.

Higher allocation to equities indicates higher negative convexity risk from Target Volatility funds during a risk-off scenario.

Figure 16: SPX Option Market Maker Short Gamma Inventory

- **Elevated Short Gamma exposure in the option market maker community could lead to elevated realized volatility due to end of day delta hedging flows.**

A long gamma exposure leads the market makers to delta-hedge in the reverse direction of the market move that day, thus dampening the realized volatility and a short gamma exposure leads the dealers to delta-hedge in the same direction of the market move that day, thus exacerbating the realized volatility.

SPX net market maker gamma exposure is calculated using the entire listed open interest and implicitly assumes that while short-put and long-call holders' delta hedge, the long-put and short-call holders do not. Since this is unlikely to be the case, the actual level of the gamma is likely to be grossly overstated and what matters is its trend.

$$\text{Normalized Net Gamma} = \frac{\text{Put} - 0.7 * \text{Call}}{\text{Future Dollar Volume}},$$

where Dollar Volume is a two-week moving average of $\text{Future Aggregate Volume} * \text{Price}$. Absolute level of Gamma has increased together with futures liquidity, resulting in range bound normalized value. In this report we use the raw and 3 month moving average of Normalized Gamma. For more discussion, see *Special Report: The Option Expiration Anomaly*, October 14, 2014,

Figure 17: SPX Intraday Auto-Correlation

- **When SPX option dealers/market makers are short gamma, the delta hedging flows drives the last hour intraday autocorrelation of SPX future returns to be positive, which can exacerbate volatility.**

Another point of reference to test whether market makers' short gamma positioning is exacerbating the realized volatility can be gleaned directly by quantifying the impact of their delta-hedging flow on underlying SPX futures price movements. Delta hedging is usually done near the close, probably within the last half of the day, and so measuring autocorrelation between SPX futures returns over the last half hour of the day and returns over the rest of day would quantify any impact that the market makers' delta-hedging flow has on the underlying SPX futures price movements near the close.

Thus, if dealers are long gamma, their delta hedging flow leads to negative autocorrelation and if they are short gamma, their delta-hedging flow would lead to positive autocorrelation. We track the SPX intraday autocorrelation over time in the Figure 17 using the 3-month SPX autocorrelation between returns from previous close to 3:30 PM and 3:30 PM to close.

We use the intraday autocorrelation metric in conjunction to the SPX Market Maker Gamma positioning to inform our view on the SPX Market Maker positioning and the associated negative convexity risk

Figure 18: Non-Commercial Net VIX Futures Vega and Net VIX Futures Vega

- **A significant net short positioning in VIX Futures by the non-commercial VIX futures traders can exacerbate volatility during a risk off scenario.**

All the VIX ETPs are portfolios of VIX futures; therefore, the exact hedge for ETP providers would be to buy or sell the equivalent number of VIX futures. It is thus interesting to compare the trends in VIX ETP AUM with the open interest in VIX futures. We have highlighted the strong dynamic of the VIX futures speculators supplying liquidity to the VIX ETP complex. Figure 12 highlights this relationship between the Net VIX futures positioning by Non-Commercial Traders as classified by CFTC along with Net VIX ETP AUM.

One source of risk is that non-commercial VIX futures traders who supply volatility to the long VIX ETP complex tend to unwind positions faster during a spike in volatility compared to the rate of the long VIX ETP holder, which can lead to outsized demand for volatility during a selloff.

Figure 19: Theoretical Flow from Leveraged VIX ETP rebalancing

- **High AUM in Leveraged VIX ETP means that the inherent negative gamma of the LETP managers induces higher end of day rebalancing. These elevated hedging flows exacerbated the VIX future moves and led to higher VIX volatility.**

The unwinding of AUM of leveraged VIX ETPs since 2018 has resulted in much lower end-of-day rebalancing compared to the past. For levered VIX ETPs like TVIX or inverse ETPs like XIV, daily rebalancing is required to keep the leverage ratio constant. We explore the impact of the rebalancing flows of the leveraged ETPs in the publications ***Index Volatility Weekly - Recent Increase in Vega of VIX ETPs***, February 21, 2012 and ***Update: Index Volatility Weekly - Implications of Recent Dynamics of TVIX***, February 29, 2012.

The number of shares that need to be traded to rebalance the hedge is given by:

$$m(m-1)\left(\frac{r}{r+1}\right)\frac{P_t^{ETF}}{P_t^{Index}}$$

Here “m” is the leverage ratio and “r” is the return of the underlying index. We show the number of VIX futures required to be traded for a +10% move in the one-month constant maturity VIX future due to Leveraged ETPs rebalancing.

Figure 20: SPX E-mini futures depth (proxy for liquidity)

- **During periods of risk aversion or elevated volatility, market depth in equity futures has declined markedly while there is significant trading volume. Poor market depth can lead to outsized market moves, exacerbating volatility, and is a sign of a fragile market.**

S&P500 E-mini futures is the most traded equity future and the SPX bid/offer size provides us the metric to track the liquidity in the equities market. In Figure 14, we track the typical bid-ask size for SPX E-mini futures for each day calculated as the median of the intraday mean of best bid and offer sizes based on tick data.

Right hand axis has S&P500 E-mini futures Dollar Value in millions calculated as Number of Contracts times Contract Size times ES1 Price.

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Overweight - The stock is expected to outperform the unweighted expected total return of the industry coverage universe over a 12-month

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