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Market Risk Call

November 2017

MRA

MACRO RISK ADVISORS

- The environment for global growth is nominally better and, through less economic divergence across geographies, safer. The inflation and deflation tails have moderated.
- Asset prices are full by common valuation measures, creating a less sanguine outlook for forward looking returns. Trades may be crowded. Focus on factor divergences in hunt for next risk off.
- The cost of carry has rarely been so punitive. Low VIX and cross-asset risk premia notwithstanding, the plunge in realized volatility has left even the cautious investor unable to finance hedges.
- Central Bank policy is in flux, but remains an anchor to asset price outcome suppression.

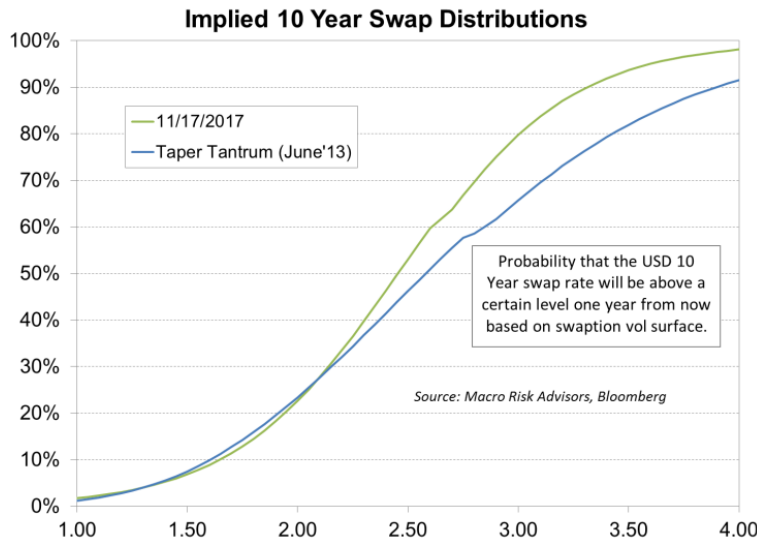
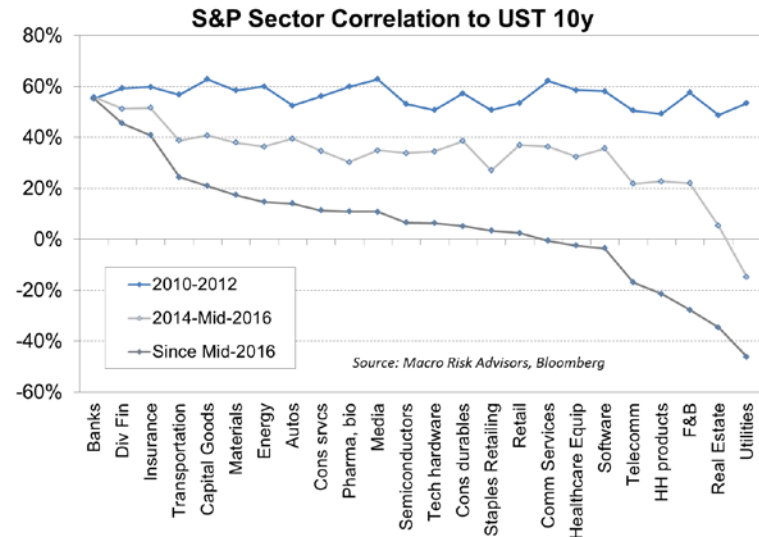
Comments on Equity Volatility and Carry

- Implied vol has caught a small bid relative to realized, largely on the back of some idiosyncratic moves in high yield credit.
- At one point last week, the VIX closed 9 points above the ten day realized vol! Not easy to hold options with this dynamic.
- Realized correlation continues to be very low. We link this back to the disparate relationship that sectors have with rates. Rate volatility levels continue to be near all time lows.
- GLD vol now trading below SPY vol, a rare occurrence.
- Funding hedges out to year end demands attention to seasonally impacted carry profile (December a good month for risk). Focus on put spreads and flies.

RISK MEASURES						2 Year Analysis	
(Source: Macro Risk Advisors, Bloomberg)						-Mean -Current -Median	
US Equities	Close	1m chg	Min	Max	Devs	%-tile	
SPX 3m IV	10.9	2.0	8.6	24.2	(0.7)	27%	
SPX 12m IV	14.1	1.2	12.3	22.3	(0.7)	32%	
SPX 3m skew (25d p-c)	5.5	1.5	3.8	9.4	(0.4)	42%	
VIX 3rd - 1st fut spread	2.1	0.1	(4.4)	5.4	0.1	49%	
SPX 3M I-Corr	27.2	6.1	20.2	71.0	(1.2)	14%	
SPX 3M R-Corr	6.1	(10.4)	6.1	57.0	(1.9)	0%	
CNH 3m IV	4.4	(1.1)	2.9	10.5	(0.8)	23%	
JPY 3m IV	8.3	(0.1)	7.4	14.1	(1.4)	8%	
EUR 3m IV	6.3	(0.4)	6.1	12.0	(1.9)	2%	
1Y / 5Y Swaption Vol	63	(1.9)	63	92	(1.8)	0%	
US 10y BE	1.88	0.04	1.2	2.1	0.8	75%	
EEM 3m IV (EM)	15.1	(1.6)	14.4	47.1	(1.3)	6%	
HYG 3m IV	6.3	1.9	3.8	17.5	(0.7)	28%	
IWM 3m IV (Russell)	15.7	2.6	13.0	28.6	(0.7)	23%	
CDX IG 5Y	55	1.2	52	125	(1.2)	5%	
CDX HY 5Y	327	11.9	306	589	(0.9)	20%	
GLD 3m IV	10.4	(0.4)	10.0	23.1	(1.6)	1%	
USO 3m IV (WTI Crude)	25.8	(1.3)	23.2	68.3	(1.2)	3%	

The Importance of Rates

- Equity investors are short the straddle on rates. If rates swiftly rise or fall, a negative outcome is likely for equity investors.
- In our most recent “Global Market Risk” piece, we review differences in two rate increasing episodes: the 2013 taper and the 2016 election aftermath.
- While both events saw a roughly 80bps increase in 10 year rates, swaption vols rose meaningfully more in the Taper event, leading to a wider distribution of expected future rate expectations (chart on below left).
- In addition, the correlation of the XLF to the 10 year was dramatically different in the post election period, where both rates and the XLF rose versus the taper.



Tightest in more than 50 years

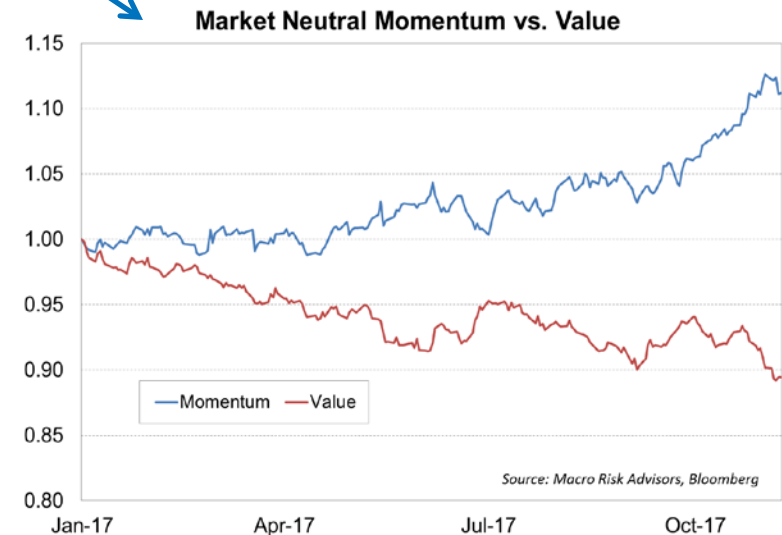
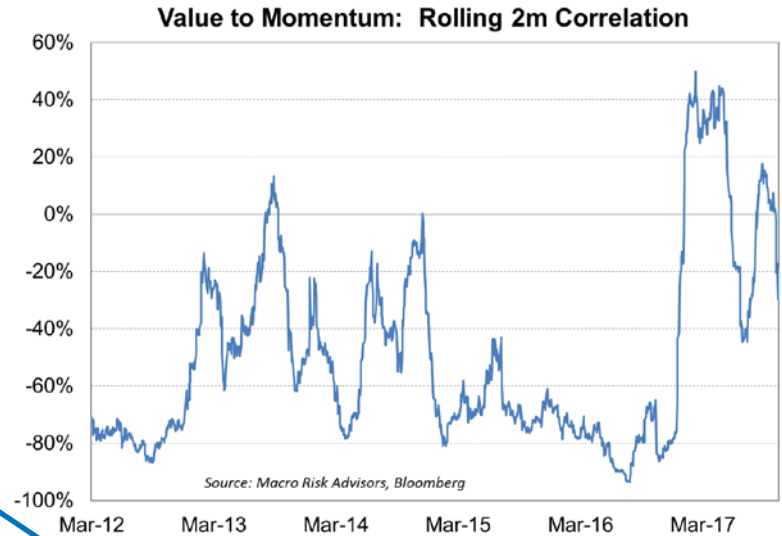
Year	Average MOVE	Low UST 10Y Yield	High UST 10Y Yield	10Y Yield Range
2009	131.9	2.20	3.95	1.75
2010	92.3	2.38	3.99	1.60
2011	94.1	1.72	3.74	2.02
2012	69.9	1.39	2.38	0.99
2013	71.4	1.63	3.03	1.40
2014	62.0	2.06	3.03	0.97
2015	81.0	1.64	2.48	0.84
2016	71.8	1.36	2.60	1.24
2017	58.2	2.04	2.63	0.59

Source: MRA, Bloomberg Data

Factor Correlations and Observations

- An unwind of the outperformance of momentum versus value could be a feature of the next risk off.
- This outperformance, on the order of 20% in 2017 has been incredibly substantial, especially when weighed against the low level of market volatility this year.

Asset Class	Asset	Sharpe Ratio				
		2013	2014	2015	2016	2017
Equity	SPX	2.56	1.28	-0.03	1.07	2.30
	IWM	2.31	0.34	-0.38	1.36	0.68
	QQQ	2.63	1.42	0.40	0.61	2.75
	Momentum	1.28	0.01	1.64	-1.14	1.58
	Value	2.56	0.25	-0.77	1.52	-1.48
	SX5E	1.07	0.37	0.17	0.38	1.13
	NKY	1.90	0.55	0.36	0.28	1.55
	EEM	-0.50	-0.10	-0.83	0.67	2.58
	KOSPI	-0.17	-0.09	0.08	0.57	2.82
	HSCEI	-0.30	1.00	-0.80	0.23	2.00
AS51	1.67	0.64	0.17	1.01	1.03	
Rates	TLT	-0.92	2.64	-0.16	0.02	0.69
Credit	HYG	0.78	0.30	-0.86	1.70	0.95
	LQD	-0.36	1.94	-0.32	1.14	1.16
FX	EUR	0.58	-1.96	-0.88	-0.56	1.35
	JPY	-1.47	-1.57	-0.13	0.14	0.30
	GBP	0.31	-0.99	-0.61	-1.24	0.69
	AUD	-1.23	-0.65	-0.76	0.00	0.96
	CAD	-0.96	-1.21	-1.76	0.35	0.81
	BRL	-0.55	-0.11	-1.15	2.00	0.59
	INR	-0.29	1.17	0.62	0.71	2.53
	MXN	0.19	-1.29	-1.16	-0.83	1.15
Commodities	USO	0.06	-1.89	-1.07	0.08	-0.01
	GLD	-1.29	-0.23	-0.71	0.42	0.96



Trade Construction

- Buy a 6 month 95% down and out put on FANGA (FB, AMZN, NFLX, GOOG, AAPL).
- Trade expires worthless if basket value closes down 20% or more on any day from trade date.
- Indicative premium is 110bps (35% cheaper than vanilla put spread).



Risks Hedged

- Facebook, Apple, Netflix, Google, Amazon will likely underperform in a market decline.
- Narrative shifts away from technology companies driving broader market declines.
- Correlated unwind of Momentum factor.

Trade Thesis

- Equity market leadership and earnings growth has largely been attributed to large cap technology names over the past several years.
- Recent earnings announcements have exceeded expectations in the FANGA basket but continue to reset further upward increasing risk of disappointment at elevated multiples.
- Any risk shock to the global equity market or alteration in the low vol narrative is likely to include significant underperformance of this market leadership growth basket.
- The ability to buy a very low premium 6 month structure by betting on a highly correlated down move is an attractive way to hedge states of the world where these equities underperform.
- We show back-tests on the following page.

Pricing Dynamics

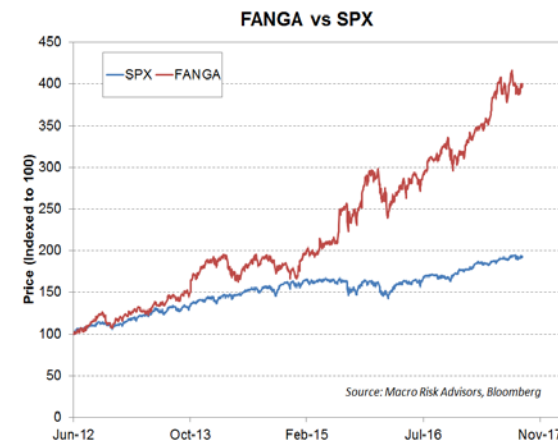
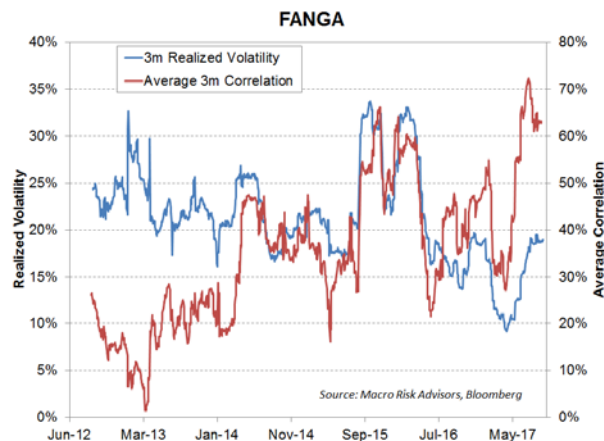
- While historical ITM rates are low, the small bps cost to this trade allows protection to be held for much longer without the MTM volatility/ theta drag associated with most hedging strategies.
- Higher correlation helps cheapen this structure. Correlation matrix shown right and rolling realized correl shown in graph below.

	FB	AMZN	NFLX	GOOGL	AAPL
FB		71.9%	58.4%	73.8%	56.6%
AMZN	75.3%		54.5%	67.2%	60.1%
NFLX	60.8%	59.8%		57.7%	45.0%
GOOGL	77.2%	73.6%	64.9%		55.3%
AAPL	53.4%	58.5%	44.2%	62.9%	

Realized Correlation: Top right of matrix is last 6 months, bottom left is last 3 months.

Trade Risk Factors	Min / Median / Max (last 2 Years)				
<small>(Source: Macro Risk Advisors, Bloomberg)</small>					
			<small>- 1m ago</small>	<small>- current level</small>	<small>- Median</small>

Risk Factor	Close	1m chg	Min	Max	%-tile
FB 6m 95% IV	27.8	+2.0	22.7	42.7	47%
AMZN 6m 95% IV	25.6	-0.1	22.6	41.4	23%
NFLX 6m 95% IV	36.5	+0.1	30.2	61.6	25%
GOOGL 6m 95% IV	21.4	+0.4	18.2	33.4	23%
AAPL 6m 95% IV	25.1	+1.6	19.8	37.8	61%



Trade Construction

- HY25 5 year CDX Dec17 Payer Swaption struck at 106 offered at 29 bps
- Spot reference 109; credit option delta ~ 12



Risks Hedged & Pricing Dynamics

- US Growth fades leading to re-primed expectations of future credit default cycle
- Fed tightening timeline accelerated
- Liquidity issues create market air pocket and increases the price of jump risk

Trade Thesis

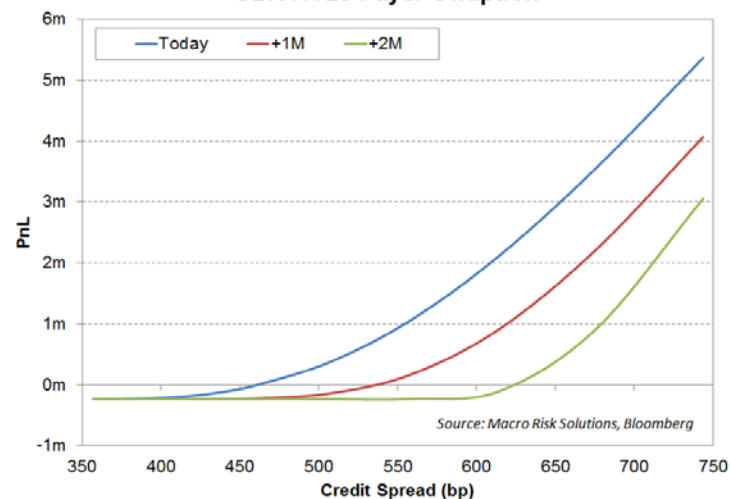
- Market consensus supports continued low volatility 'grinding' performance of HY bond market as credit cycle low default regime.
- Market dominated by flows, much of which is passive. However, price reaction has become more sensitive to a reversal of inflows.
- Well discussed crowdedness of credit market exposes it to "key hole" effect of a coordinated unwind. Liquidity mismatch is a risk. Open ended mutual funds now hold ~30% of high yield (Europe 22%).
- Low rates have pushed the duration of fixed income portfolios to highest on record. A sudden increase in UST yields could produce tantrum.
- Percentage of HY bond universe in daily liquidity retail products now at ~25%.
- Exceptionally low level of implied credit vol allows credit payer swaption to provide a more attractive, leveraged payoff profile versus flat price.
- In addition to duration sensitivity, reliance on low interest rates to propagate re-financing opportunities for challenged credits may evolve as Fed behavior changes, USD strengthening continues, and profit cycle turns.

Pricing Dynamics

- Swaption pricing shows a 5:1 payoff into a 5% SPX sell-off.
- Investor reach for yield has taken implied volatility prices on HY bond index options to historically low levels.
- Skew between ATM and OTM quite flat allowing for cheaper convexity structuring and > delta pick in price jump.

Trade Risk Factors		Min / Median / Max (last 2 Years)			
<small>(Source: Macro Risk Advisors, Bloomberg)</small>					
			<small>- 1m ago</small>	<small>- current level</small>	<small>- Median</small>
Risk Factor	Close	1m chg	Min	Max	%-tile
CDX HY 5y	330.6	+8.1	305.9	589.9	25%
CDX HY 5Y 1M Volatility	16.6	-1.0	13.3	59.4	10%
CDX HY 5Y 1M ATM IV	30.8	+5.8	22.4	58.3	33%
CDX HY 5Y 1M 105% Skew	5.5	+0.2	0.2	6.1	99%
SPX 1M Volatility	3.8	-0.8	3.2	24.6	1%
SPX 1M ATM IV	8.1	+1.3	6.3	25.4	21%
SPX 1M 95% Skew	6.4	-0.3	3.5	7.0	90%

CDX HY25 Payer Swaption



Long Credit Payer Swaption vs. SPY Put

SPY puts vs. Credit Payer Swaption

- In the grid, we show projected performance of a SPY Dec 253 put versus a Dec credit payer swaption struck at 106 on the HY CDX.
- We shock SPY down in 1% increments and make corresponding shocks to credit spreads, equity vol and credit vol.
- We make assumptions around the beta of credit spreads to SPX. At current spreads, a 5% decline in the SPX would constitute 65bps of spread widening.
- Projecting forward over the next 4 weeks, we analyze the MTM valuation of each instrument.

SPY	SPY Dec17 253 Put
CDX HY	CDX HY 5Y Dec17 106 Payer Credit Swaption

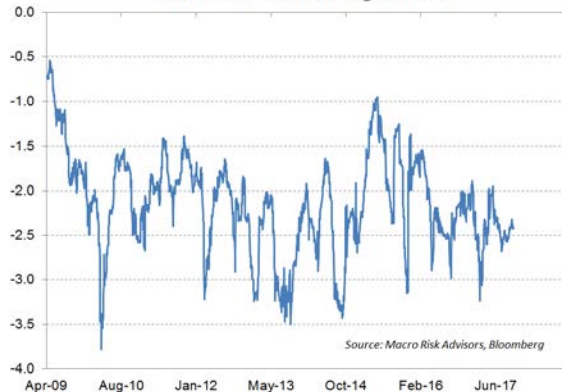
	Beta
SPY Vol-SPY Price	-9.4
CDX Spread-SPY Price	Custom
CDX Vol-CDX Spread Beta	0.275

	% Change	-5%	-4%	-3%	-2%	-1%	0%	+1%	+2%	+3%	+4%	+5%
SPY	Vol	17.7	16.0	14.5	13.2	11.9	10.8	9.8	8.9	8.0	7.3	6.6
CDX HY	Spread	396	383	361	351	339	331	329	327	325	323	321
	Vol	56.9	53.4	47.3	44.6	41.3	39.1	38.5	38.0	37.4	36.9	36.3

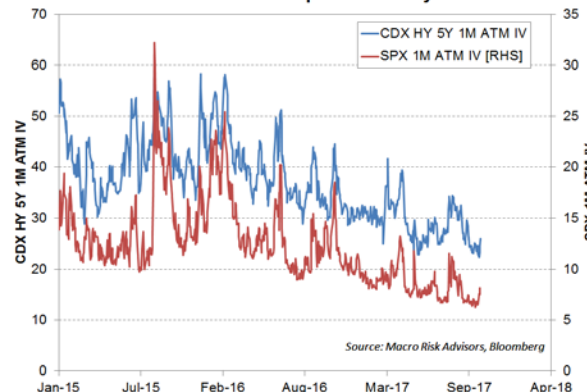
	SPY	+4.6x	+3.5x	+2.4x	+1.5x	+0.7x	0x	-0.5x	-0.8x	-0.9x	-1.0x	-1.0x
Today	CDX HY	+5.3x	+4.1x	+2.2x	+1.4x	+0.6x	+0.1x	+0.0x	-0.1x	-0.2x	-0.2x	-0.3x
+1W	SPY	+4.3x	+3.2x	+2.1x	+1.2x	+0.4x	-0.2x	-0.6x	-0.9x	-1.0x	-1.0x	-1.0x
	CDX HY	+4.8x	+3.7x	+1.8x	+1.1x	+0.3x	-0.1x	-0.2x	-0.3x	-0.3x	-0.4x	-0.5x
+2W	SPY	+3.9x	+2.8x	+1.8x	+0.9x	+0.1x	-0.4x	-0.8x	-0.9x	-1.0x	-1.0x	-1.0x
	CDX HY	+4.4x	+3.2x	+1.4x	+0.7x	+0.1x	-0.3x	-0.4x	-0.5x	-0.5x	-0.6x	-0.6x
Expiry	SPY	+3.2x	+1.9x	+0.7x	-0.5x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x
	CDX HY	+2.2x	+0.9x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x	-1.0x

- Based on the various assumptions, the relative performance of each instrument is scenario dependent. To the down 4-5% scenario in the SPY, the credit option does a little bit better on an MTM basis, but less so at maturity. In small moves down, the SPY option does slightly better. In moves higher in the SPY, we assume a much lower beta of credit spreads to market direction, enabling the credit option to remain more live for longer.

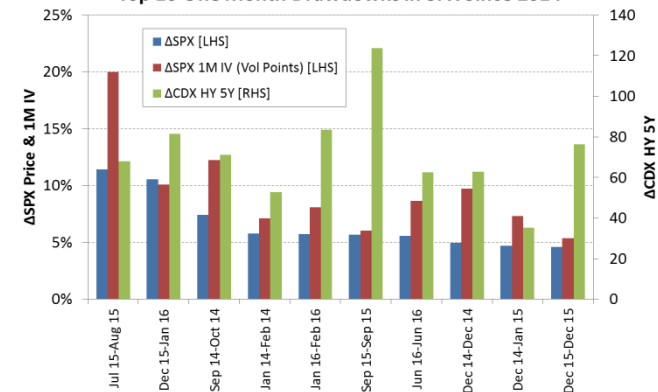
CDX HY 5Y-SPX Rolling 2m Beta



CDX HY 5Y Implied Volatility



Top 10 One Month Drawdowns in SPX Since 2014



Cross-Asset Long Vol Portfolio

- Our cross asset portfolio is paying some theta, but geared to do well in a 5% sell-off.
- Portfolio has a +32% correlation to the VIX and -19% correlation to the SPX.
- Key themes: 1) rate volatility 2) VIX unwind 3) credit risk off 4) factor unwind

Section	Trade	Premium At Risk/Max Loss		Position	Scenario Shocks (w/Historical ΔPnL (USD)		1M Decay
		%	\$		-5%	+5%	
Equity	SPY Nov29th 254/253 Put Spread	7.36%	94,120	1,176,500	865,297	-94,127	-94,120
	SPX Dec17 2526 Strike 2371 Barrier RKO Put	12.64%	161,569	38,550	944,106	-156,066	-161,569
	SPY Dec29th 264/266 Call Spread	7.82%	99,940	135,634,360	-95,199	857,311	-94,455
	EEM Dec17 45/43.5 Put Spread	3.91%	49,950	333,000	170,583	-47,380	-49,950
	Long XLF+IWM/Short SPY	10.22%	130,635	10,014,278	-122,762	122,762	0
Total		41.94%	536,214		1,762,025	682,500	-400,094
VIX	VIX Dec17 19/20 Call Spread	15.64%	199,988	2,666,500	471,242	-61,732	-125,913
	VIX Dec17 12.5/11.5 1x2 Put Spread	2.74%	35,000	1,262,500	15,530	-17,434	35,091
	Short VXX Shares	10.10%	129,188	-2,583,750	-586,664	116,269	245,456
	Total	28.48%	364,175		-99,891	37,102	154,635
FX	USDJPY Jan18 115 Strike 120 Barrier RKO Call	11.06%	141,418	7,542,648,500	-10,867	29,933	-43,270
	Total	11.06%	141,418		-10,867	29,933	-43,270
Credit	CDX HY Dec17 106 Payer	3.86%	49,374	18,500,000	368,124	-25,746	-49,374
	Total	3.86%	49,374		368,124	-25,746	-49,374
Rates	M9/M8 Eurodollar Spread (Jun19/Jun18)	7.04%	90,000	400	-57,824	57,824	34,407
	Total	7.04%	90,000		-57,824	57,824	34,407
Hybrid	SPX Mar18 2370 Contingent Put [USSW10 > 2	3.65%	46,615	24,241,190	139,450	-40,794	-12,143
	FANGA Mar18 95%/80% RKO Put	3.97%	50,742	9,300,000	50,662	-29,757	-13,218
	Total	7.61%	97,357		190,112	-70,551	-25,362
Total		100.0%	1,278,539		2,151,680	711,062	-329,059
					168.3%	55.6%	

