UBS's Yield Enhancement Strategy ("YES") Returns - and then the Losses – Were Caused by Equity Market Exposure

By Craig McCann, Regina Meng, Edward O'Neal[1]

Introduction

The most recent inductee into the Hall of Fame for portfolio managers who claim to have found the secret sauce to a market-neutral strategy which could generate steady returns but was felled by modest market movements is UBS's Yield Enhancement Strategy ("YES") Team.[2]

The YES Team moved from Credit Suisse to UBS in early 2016. The UBS marketing materials in 2016 and 2017 claim YES was market-neutral and had generated monthly returns for 12 years that had been uncorrelated with the stock and bond markets. As you will see below, either the prior returns reported by UBS were false or the strategy implemented at UBS in 2016, 2017 and 2018 differed markedly from what had been implemented previously at Credit Suisse.

UBS claimed that the YES strategy involved selling out of the money put and call options and buying the same number of further out of the money put and call options on the same S&P Index with the same expiration. The combination of four options is sometimes referred to as an "Iron Condor".

UBS claimed YES's returns were generated by "time decay" in option values and from the difference between implied volatility and realized volatility independent of the direction of the market. Sounds sophisticated but UBS was effectively claiming to arbitrage systematic mispricing in the market for short term S&P500 Index options – a fool's errand if there ever was one. In fact, YES was an old-fashioned actively-managed stock portfolio constructed through actively trading equity index options.

UBS accounts subjected to YES treatment suffered losses of 12% to 14% in December 2018 when the S&P 500 dropped 9.2% because the overlay was more than 100% invested in the stock market rather than market neutral as marketed by UBS.

As of October 2, 2019, there were 48 FINRA arbitration claims filed against UBS reflected on 50 UBS brokers' BrokerCheck reports.

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[2] A virtually identical strategy was sold by Merrill Lynch under the brand name Collateral Yield Enhancement Strategy or CYES.

In the next Section we explain the option basics necessary to understand the YES strategy. In Section 3, we illustrate how UBS actually implemented the strategy with predictably disastrous results. In Section 4, we present how UBS described the strategy in its marketing materials.

Option Basics

Call Options

A call option is a contract which gives the owner the right to buy an asset at the end of the contract's term for a specified value referred to as the strike price.

If the underlying asset can be bought and sold in the market for less than the strike price at expiration, the call option contract expires worthless since the contract holder will not choose to exercise her contractual right to buy the asset for more than she could buy it for in the market.

If the underlying asset can be bought and sold in the market for more than the strike price at expiration, the call option contract will be worth the difference in the strike price and the market value of the asset. The contract holder can realize this difference by exercising the call option, purchasing the asset at the option's strike price and selling it in the market at the higher prevailing market price.

Put Options

A put option is a contract which gives the holder the right to sell an asset at the end of the contract's term for a specified value referred to as the strike price.

If the underlying asset can be bought and sold in the market for more than the strike price at expiration, the put option contract expires worthless since the contract holder will not choose to exercise her contractual right to sell the asset for less than she could sell it for in the market.

If the underlying asset can be bought and sold for less than the strike price at expiration in the market, the put option contract will be worth the difference in the strike price and the market value of the asset. The contract holder can realize this difference by purchasing the asset in the market at the higher prevailing market price exercising the put option, at the option's strike price and selling it in the market at the higher prevailing market price.

Buying versus Selling Short Put and Call Options

Standardized options can be bought or sold through a brokerage firm. For each outstanding option there is both an investor with rights under the contract and an investor with equal but opposite obligations.

An investor who sells ("sells short" or "writes") a call option is required to sell the underlying asset on the call option's expiration date at the call option's exercise price. If the underlying asset is trading in the market at a price that is higher than the call option's strike price, the seller of the call option must sell the underlying asset for less than it then costs to replace and so loses the difference between the underlying asset's then current market value and the call option's strike price.

An investor who sells ("sells short" or "writes") a put option is required to buy the underlying asset on the put option's expiration date at the put option's exercise price. If the underlying asset is trading in the market at a price that is below the put option's strike price at expiration, the seller of the put option must buy the underlying asset for more than it then can be sold for and so loses the difference between the underlying asset's then current value and the put option's strike price.

In-the-Money, Out-of-the-Money, At-the-Money

If a call option's underlying asset's price is greater than the strike price, the call option is in-the-money because exercising the option and selling the acquired asset would generate a positive net cashflow ignoring the payment paid, referred to as the option premium, when the call option was bought.

Analogously, if a put option's underlying asset's price is less than the strike price, the put option is in-the-money because buying the underlying asset at the market price and exercising the put option to sell the acquired asset at the strike price would generate a positive net cashflow ignoring the payment paid, referred to as the option premium, when the put option was bought.

If the call option or put option cannot be exercised and a positive net cashflow received the option is said to be out-of-the-money. This occurs when the underlying asset price is below the strike price of a call option or above the strike price of a put option.

If a put or call option's underlying asset's price is equal to the option's strike price, the option is said to be at-the-money.

Physical versus Cash Settlement

The discussion so far has implied that the underlying asset was bought and sold when a put or call option was exercised. This actual exchange of the underlying asset is called "physical settlement". Some option contracts are settled at expiration this way but many options are settled by an exchange of cash equal to the difference between the underlying asset's market value and the option's strike price if it is positive to the option holder. This is referred to as "cash settlement".

Contract Multipliers

Option prices or "premiums" are quoted per unit of the underlying asset but each contract traded is for multiple units – typically 10, 100 or 1,000 units – of the underlying asset. So, for example, a sale of one call option contract at $30 would generate sale proceeds of $3,000 if the contract multiplier is 100 (1 × 100 × $30 = $3,000).

Realized gains or losses on options are the difference between the price paid to purchase the option and the price received when selling or selling short the option or the option's in-the-money-amount when the option is exercised. For example, if an account buys a call option contract for $11.75 and later sells it for $0.35 it will have lost $1,140 per contract if the contract multiplier is 100 (100 × ($0.35 - $11.75) = - $1,140).[3]

Option payoffs at expiration per contract equal the difference between the option's strike price and the underlying asset's market value multiplied by the contract's multiplier. For example, if a put option contract with a strike price of 2500 expires when the underlying asset price or index level is 2300, investors who own the contract receive $20,000 per contract and investors who are sold short the contract pay $20,000 per contract if the contract multiplier is 100 (1 × 100 × ($2500-$2300) = $20,000). If the owner of the put option paid, and the seller of the put option received, $5,000 – quoted as a price of $50 – the net profit to the put option holder, and the net loss to the put option seller, is $15,000.

Index Options

The options traded in the YES strategy are cash-settled S&P Index options traded on the CBOE. These options have a $100 multiplier. Index option prices or "premiums" are quoted per unit of the underlying index level.

[3] For some option's the payoff at expiration is based on a settlement value which may be different than a closing asset price or spot index level

Example Index Option Payoffs at Expiration

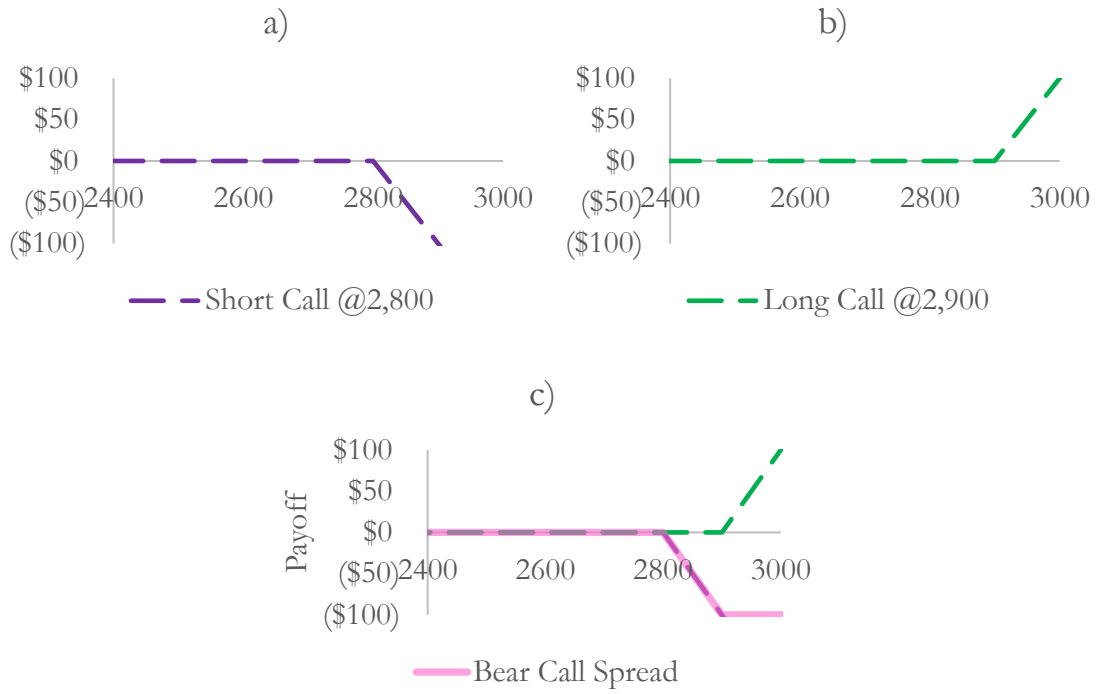
Call Options

Figure 1a plots the payoffs at expiration to selling short a call option with a strike price of 2800. At expiration, the seller of the call option pays (and the owner of the call option receives) $100 per contract for every unit the index level is greater than 2800.

Figure 1b plots the payoffs at expiration to owning a call option with a strike price of 2900. The owner of the call option receives (and the seller of the call option pays) $100 per contract for every unit the index level is greater than 2900.

Figure 1c) plots the payoffs at expiration to a combination position of one short call option with a strike price of 2800 and a long call option with a strike price of 2900.

Figure 1 Call Option Payoffs at Expiration



The combination of a short call option and a long call option on the same underlying asset with the same expiration date but a higher strike price is referred to as a "bear call spread". With this bear call spread combination, at expiration the investor pays $100 per unit the index level is above 2800 until the index level is 2900 as a result of the short call option component and then suffers no more losses as a result of index levels above 2900 as payoffs from the long call option thereafter offset losses on the short put

option. The maximum loss is $10,000 and is realized when the index settlement value is greater than 2900.

The net premium received from entering into the "bear call spread" illustrated in Figure 1c) is positive because call options are less valuable the higher their strike price, other things equal. That is, the premium received from selling the call option with a strike price of 2800 is greater than the premium paid to buy the call option with a strike price of 2900. The net premium is compensation the investor receives for bearing the risk of losing up to $10,000 per contract if the index is greater than 2800 at expiration. The bear call spread is so-named because the strategy will be profitable if the market remains stable or declines (as in a "bear" market).

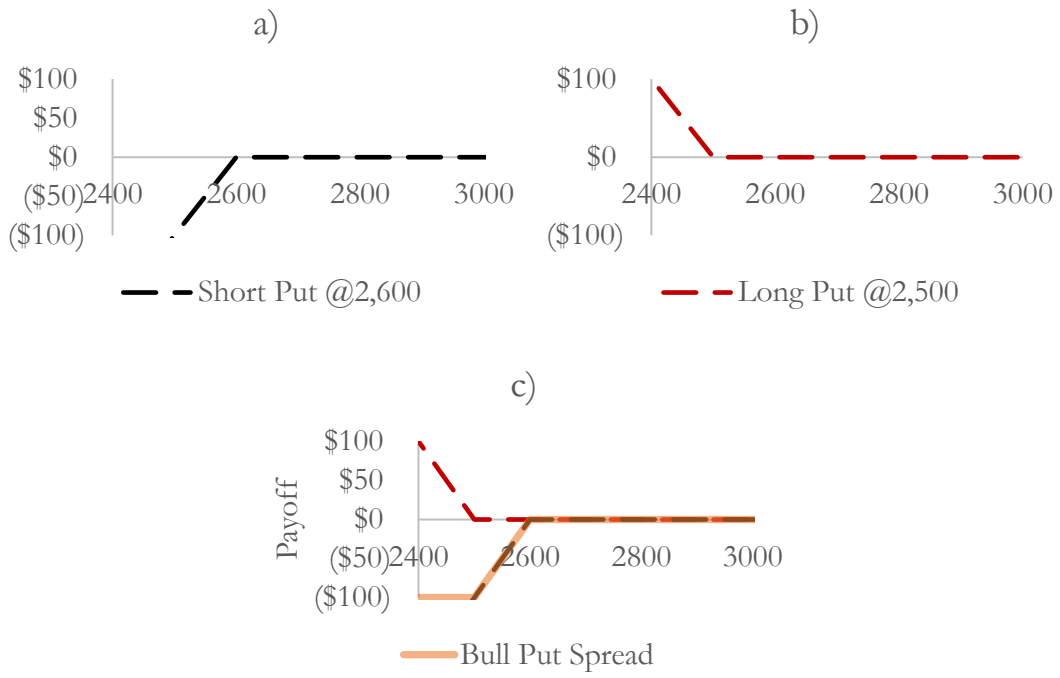
Put Options

Figure 2a plots the payoffs at expiration to selling short a put option with a strike price of 2600. The seller of the put option pays (and the owner of the put option receives) $100 per contract for every unit the index settlement level is less than 2600.

Figure 2b plots the payoffs at expiration to owning a put option with a strike price of 2500. The owner of the put option receives (and the seller of the put option pays) $100 per contract for every unit the index settlement level is less than 2500.

Figure 2c plots the payoffs at expiration to a combination position of one short put option with a strike price of 2600 and one long put option with a strike price of 2500.

Figure 2 Put Option Payoffs at Expiration



The combination of a short put option and a long put option on the same underlying asset with the same expiration date but a lower strike price is referred to as a "bull put spread". With this bull put spread combination, at expiration the investor pays $100 per unit the index level is below 2600 until the index level is 2500 as a result of the short put option component and then suffers no more losses as a result of index levels below 2500 as payoffs from the long put option thereafter offsets losses on the short put option. The maximum loss is $10,000 and is realized when the index settlement value is below 2500.

The net premium received from entering into the "bull put spread" illustrated in Figure 2c) is positive because put options are less valuable the lower their strike price, other things equal. That is, the premium received from selling the put option with a strike price of 2600 is greater than the premium paid to buy the put option with a strike price of 2500. The net premium is compensation the investor receives for bearing the risk of losing up to $10,000 per contract if the index is less than 2600 at expiration. The bull put spread is so-named because the strategy will be profitable if the market remains stable or increases (as in a "bull" market).

Example Iron Condor Payoffs at Expiration

An "iron condor" is created by combining the bear call spread in Figure 1c) with the bull put spread in Figure 2c). Figure 3 illustrates the iron condor's payoffs at expiration created by combining the options in call options in Figure 1c) with the put options in Figure 2c). At expiration this combination of 4 options on the same underlying asset and the same expiration date pays nothing (and so the investor keeps the net premium as profit) if the index level is between the strike prices of the put and call options which were sold short. If the index level at option expiration is below the short put option's strike price the investor pays out up to the difference between the put options' strike prices. Likewise, if the index level at option expiration is above the short call option's strike price the investor pays out up to the difference between the call options' strike prices.

Figure 3 Iron Condor Payoffs at Expiration

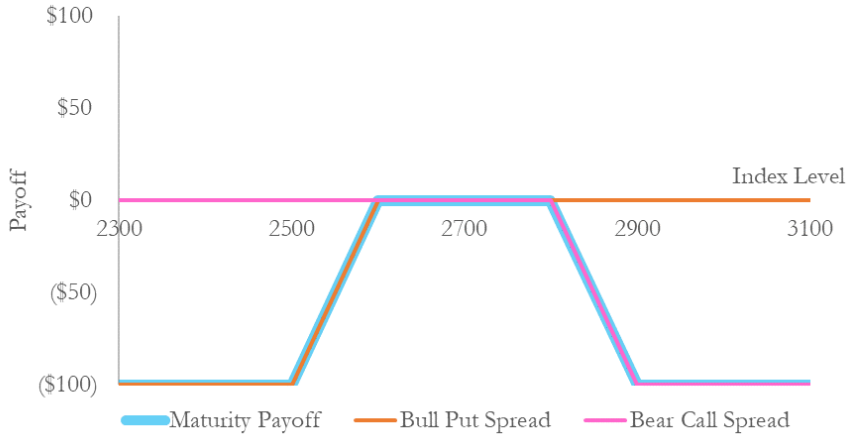
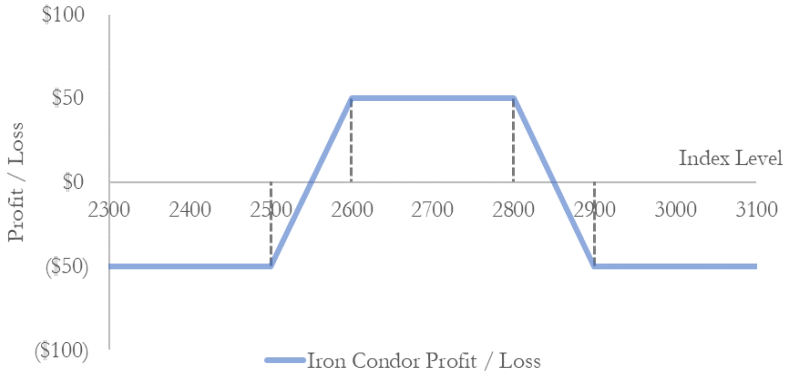


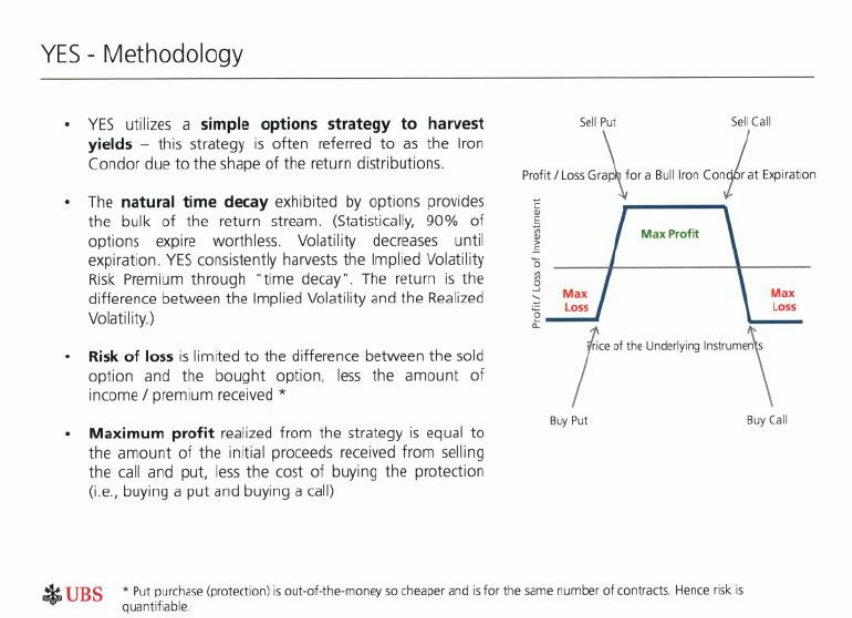
Figure 4 adds the net premium from trading the four options illustrated in Figure 3. Consistent with UBS's marketing materials we assume this net premium to be $50 or half the maximum negative cash flow at expiration for the iron condor. As we show below, UBS incorrectly illustrated the YES strategy with a payoff diagram identical to the one in Figure 4. The payoffs in Figure 4 are symmetrical, i.e. the maximum loss is the same whether the market goes up or goes down and the maximum net loss equals the net option premium received.

Figure 4 Iron Condor Profit of Loss Including Net Premium



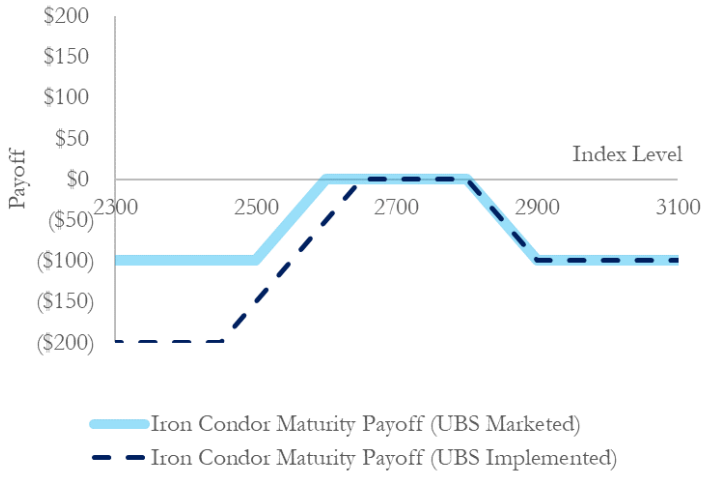
UBS's marketing materials repeatedly included a maturity payoff diagram for a symmetric iron condor virtually identical to the one illustrated in Figure 3 and Figure 4. See Figure 5.

Figure 5 UBS Illustrated a Symmetric Iron Condor



The option combinations UBS implemented were not symmetrical like the combination of options UBS illustrated. UBS systematically sold put options which were less out of the money than the call options it simultaneously sold. It also systematically, bought put options which were much further out of the money than the call options it was buying. Rather than look like Figure 3, the option combinations entered into by UBS looked like the asymmetric combination illustrated in Figure 6.

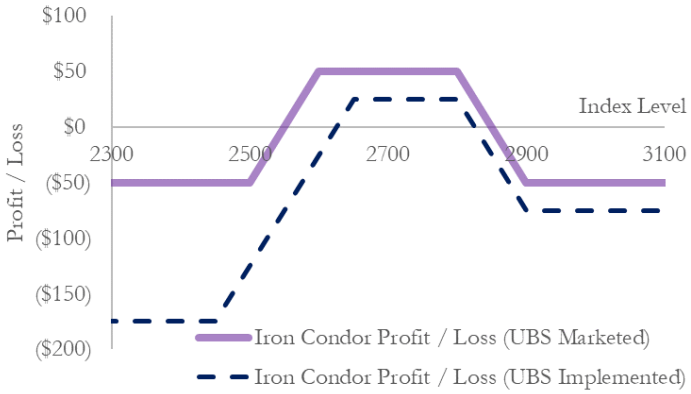
Figure 6 UBS's YES Entered into Option Combinations with Positive Stock Market Risk



The Iron Condors UBS implemented were not market neutral. The stylized combination of options in Figure 6 illustrating UBS's actual implementation lose more when the stock index drops than it loses when the stock index goes up. As we explain further below the Iron Condors UBS implemented were sometimes short the market although most of the time they were long the market and so would lose money when the stock index declined.

In addition to misrepresenting the equity exposure of the YES option strategy, UBS misrepresented its likely profits. UBS illustrated the net option premiums to be equal to the half the maximum payout at expiration under the option contracts in the presentation materials we excerpt in Figure 5. In fact, the net premiums received when an account entered into an option combination were small relative to the maximum payout at expiration under the option contracts and so the maximum net losses were many times the maximum net gain to the strategy. See Figure 7.

Figure 7 YES Option Combinations Were Much Less Profitable Than UBS Illustrated



Option Deltas

The value of an option varies with the price of the underlying asset. The value of options that are far out-of-the-money are not much affected by changes in the value of the underlying asset while the value of options that are deep in-the-money change nearly dollar-for-dollar with changes in the value of the underlying asset.

Call option values increase (and put option values decrease) with increases in the value of the underlying asset. The change in an option's value divided by the change in the value of the underlying asset is referred to as the option's **delta**. For example, if a call option's value increased from $30 to $35 when the underlying asset value increased 10 units from 2700 to 2710, the delta is 0.5 [(35-30) ÷ (2710-2700) = 0.5].

Figure 8 plots the value of a put option and the amount the put option is in-the-money. The slope of the line plotting the put option's value for various underlying asset values is the put option's delta. The slope tells us how much the put option's value changes for small changes in the underlying asset. Put options payoff less at expiration the higher the value of the underlying asset so, not surprisingly, prior to expiration increases in the value of the underlying index *decreases* the value of the put option. That is, a put option's delta is negative.

At-the-money put options have a delta of approximately -0.5. Put options that are deep in-the-money have deltas that are close to -1.0 and put options that are deep out-of-the-money have deltas that are close to 0.

Figure 8 Put Options Are Worth Less, The Higher the Index; Their Deltas are Negative

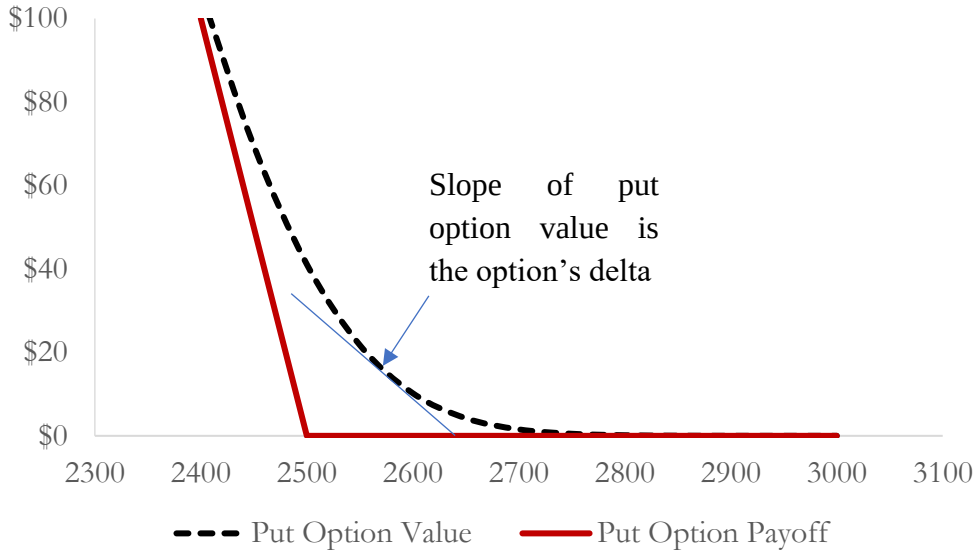


Figure 9 plots the value of a call option and the amount the call option is in-the-money. The slope of the line representing option values for various underlying asset values is the call option's delta. The slope tells us how much the call option's value changes for small changes in the underlying asset. Call options payoff more at expiration the higher the value of the underlying asset so prior to expiration increases in the value of the underlying *increases* the value of the call option. That is, the slope of the call option value line - a call option's delta is positive.

At-the-money call options have a delta of approximately 0.5. Call options that are deep in-the-money have deltas that are close to 1.0, and call options that are deep out-of-the-money have deltas that are close to 0.

Figure 9 Call Options Are Worth More, The Higher the Index; Their Deltas are Positive

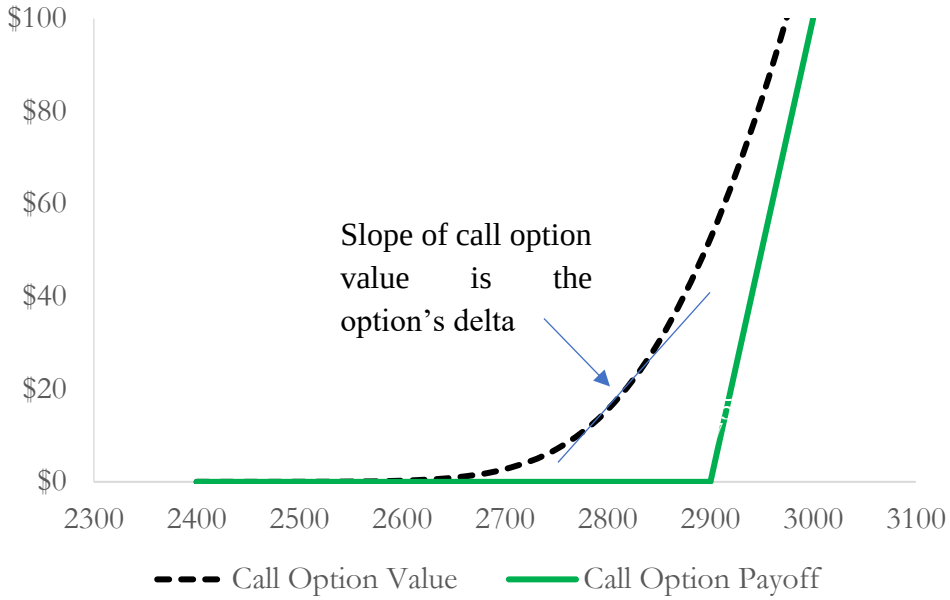


Figure 8 and Figure 9 illustrate the values, maturity payoffs and deltas for long put and long call positions. Short put and call positions have deltas equal to, but opposite in sign from, long put and call options because the payoffs at expiration to a short option position is equal to the negative of the payoff to a long position in the same option. A short put option position has a positive delta and a short call option position has a negative delta.

Delta-adjusted Notional Values

An option's **notional value** is equal to the current level of the underlying asset multiplied by the contract multiplier. For example, if the underlying asset level is 2700 and the contract multiplier is 100, the notional value of each contract is $270,000. The notional value is not a risk measure - it is not a meaningful measure of an option's exposure to the underlying asset value. A 1-unit change in the underlying index level will not cause the value of the option to change by 1-unit. Also, a 1% change in the index level in our example from 2700 up to 2727 or down to 2673 will not cause the option with a $270,000 notional value to gain or lose $2,700.

An option's risk related to changes in the underlying asset's value is its *delta* and the dollar value of an option's exposure to the underlying asset is its *delta-adjusted* notional value. The delta-adjusted notional value of an option is the option's delta multiplied by its notional value. For example, a call option on the S&P 500 with a delta

of 0.6 will have a delta-adjusted notional value of $162,000 if the index level is currently 2700 [100 × 0.6 × 2700 = $162,000]

The delta-adjusted notional value of a combination of options or of a portfolio of options on the same underlying asset is easy to calculate since it is simply the sum of the delta-adjusted notional values of each option position.

Consider the notional and delta-adjusted notional value of the iron condor combination illustrated in Figure 3. The four options include a short and a long put option and a short and a long call option on the same underlying asset. In our example, the long put and the long call are both approximately 200 units out of the money when, as on February 21, 2018, the current level of the index was 2701.39. Also, the short put and the short call were both approximately 100 units out-of-the-money. The option deltas for each option on February 21, 2018 are listed in Table 1 The delta-adjusted notional value of the example iron condor is 0.

In the illustration in Table 1, if the underlying index changed slightly from 2701.39 the aggregate market value of the 4 options would not change. The long put option's value would drop slightly but the decline would be offset by the equal increase in the value of the long call option. And, the short put option's value would drop slightly but the decline in the value of that liability would be offset by the equal increase in the value of the liability associated with the short call option. The mark-to-market value of the symmetrical iron condor would be unchanged.

Table 1 Delta-adjusted Notional Value, UBS Illustrated Iron Condor, February 21, 2018

	Delta	Quantity	Notional Value	Delta Adjusted Notional Value
Long Put, Strike @ 2500	-0.108	1	270,139	-29,202
Short Put, Strike @ 2600	-0.224	-1	270,139	60,403
Short Call Strike @ 2800	0.134	-1	270,139	-36,199
Long Call Strike @ 2900	0.019	1	270,139	4,998
Iron Condor	0.0			0

The delta of the put option with a strike price equal to 2450 in Figure 6 is smaller than the delta of the put option with a strike price equal to 2500 in Figure 3. Also, the delta of the put option with a strike price equal to 2650 in Figure 6 is larger than the delta of the put option with a strike price equal to 2600 in Figure 3. UBS marketed the symmetric option combination in Figure 3 but systematically implemented the asymmetric option combination in Figure 6 and so Table 1's delta = 0 does not capture

the equity exposure of the strategy UBS actually implemented. The delta-adjusted notional value of iron condors like what UBS actually implemented is $36,442 – not $0 – per contract as UBS repeatedly implied in its marketing materials. The value of this combination of options will rise and fall with the S&P 500. That is, the option combination UBS implemented has stock-market risk and the returns to the combination will therefore be positively correlated with stock market returns.

Table 2 Delta-adjusted Notional Value, UBS Implemented Iron Condor February 21, 2018

	Delta	Quantity	Notional Value	Delta Adjusted Notional Value
Long Put, Strike @ 2450	-0.078	1	270,139	-20,936
Short Put, Strike @ 2650	-0.328	-1	270,139	88,579
Short Call Strike @ 2800	0.134	-1	270,139	-36,199
Long Call Strike @ 2900	0.019	1	270,139	4,998
Iron Condor	0.135			36,442

Counting Contracts Is Not Measuring Risk

The option combinations illustrated above have the same number of long and short call option and long and short put option contracts but have very different economic risk exposures. Clearly, despite UBS's marketing materials, having an equal number of long and short put contracts and an equal number of long and short call contracts does not make the YES strategy market neutral.

In the symmetric iron condor illustrated in Figure 3, the amount the investor would gain or lose is the same whether the index level increased or decreased 10, 25, 50 or even 100 from the 2700 current level. The investor pays out nothing if the index level is between 2600 and 2800 at expiration. It is also true in the symmetrical iron condor that the amount the investor would have to pay out for each additional unit the index is below 2600 is the same as she would pay out for each additional unit the index is above 2800. Prior to expiration and for small changes around 2700, the value of the option combination in Figure 3 is independent of the level of the index.

In the asymmetric iron condor illustrated in Figure 6 the losses the investor suffers for declines in the index are greater than the losses she suffers for equal sized increases in the index. If the index is between 50 and 100 units below 2700 at expiration, the investor loses between $0 and $5,000 per contract but loses nothing if the index is between 50 and 100 units above 2700 at expiration. Moreover, the investor can lose up to

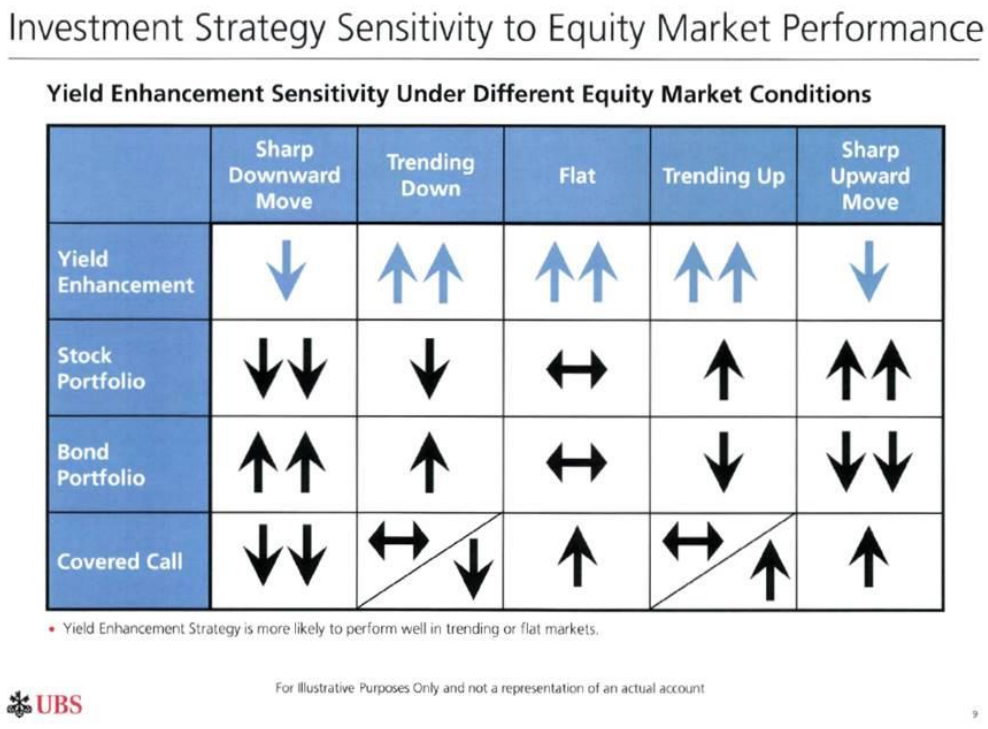
$20,000 per contract if the index is between 2450 and 2650 at expiration but similar increase in the index cause at most $10,000 in losses per contract. The investor is better off if the market goes up than if the market goes down and so has taken stock market risk through entering into the option combination in Figure 3.

It is not difficult to vary the strike prices to create a pattern of long and short call option and long and short put option contracts which together create the same payoffs as a short put option which has obvious positive stock market exposure or to create same payoffs as a short call option which has obvious negative stock market exposure.

UBS Misrepresented the YES strategy's source of returns and its risk

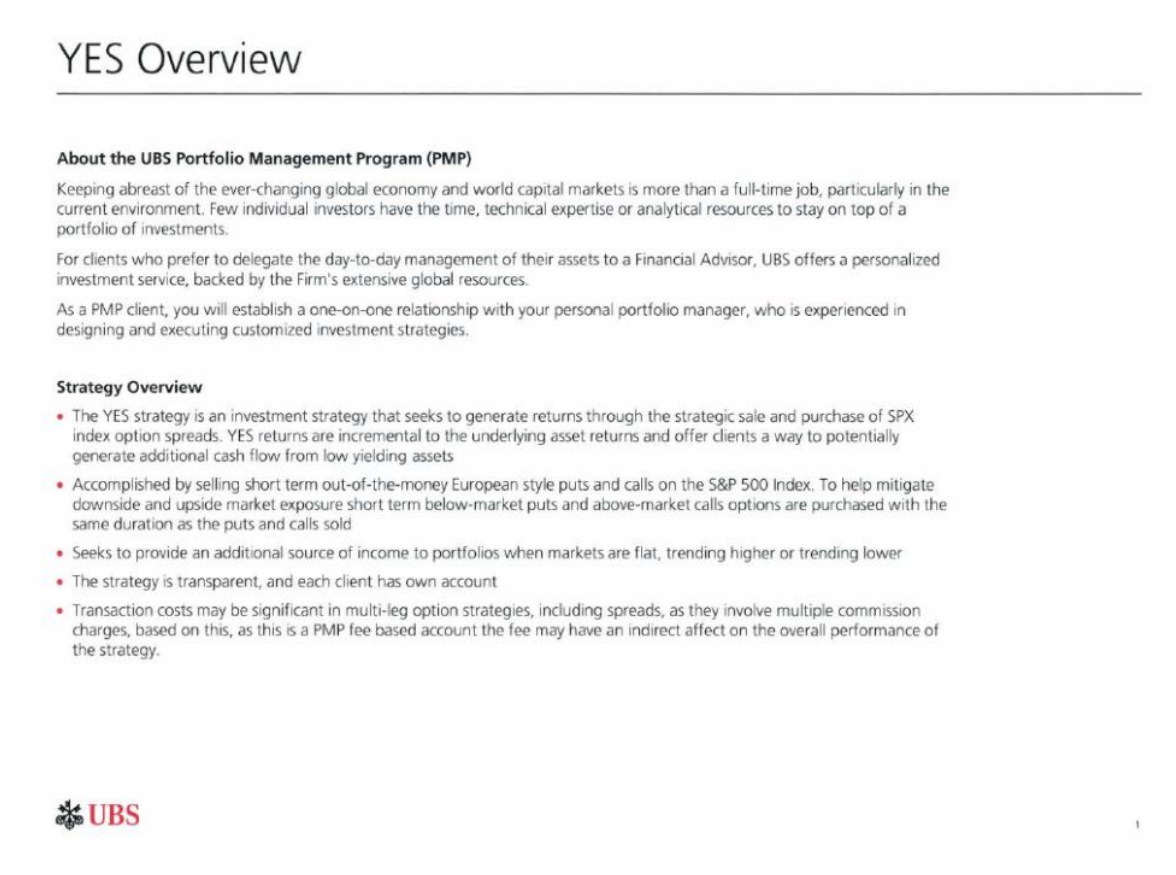
Consistent with the iron condor payoff graph in Figure 5, UBS's other marketing materials claimed the YES strategy did not take bets on the direction of the market. For example, UBS's marketing materials contained the slide excerpted in Figure 10. It shows the strategy making the same returns if the market goes down slightly, stays flat or goes up slightly. UBS also claimed the strategy lost similar amounts whether the market increased or decreased substantially.

Figure 10 UBS's Infographic Showing no Directional Market Exposure



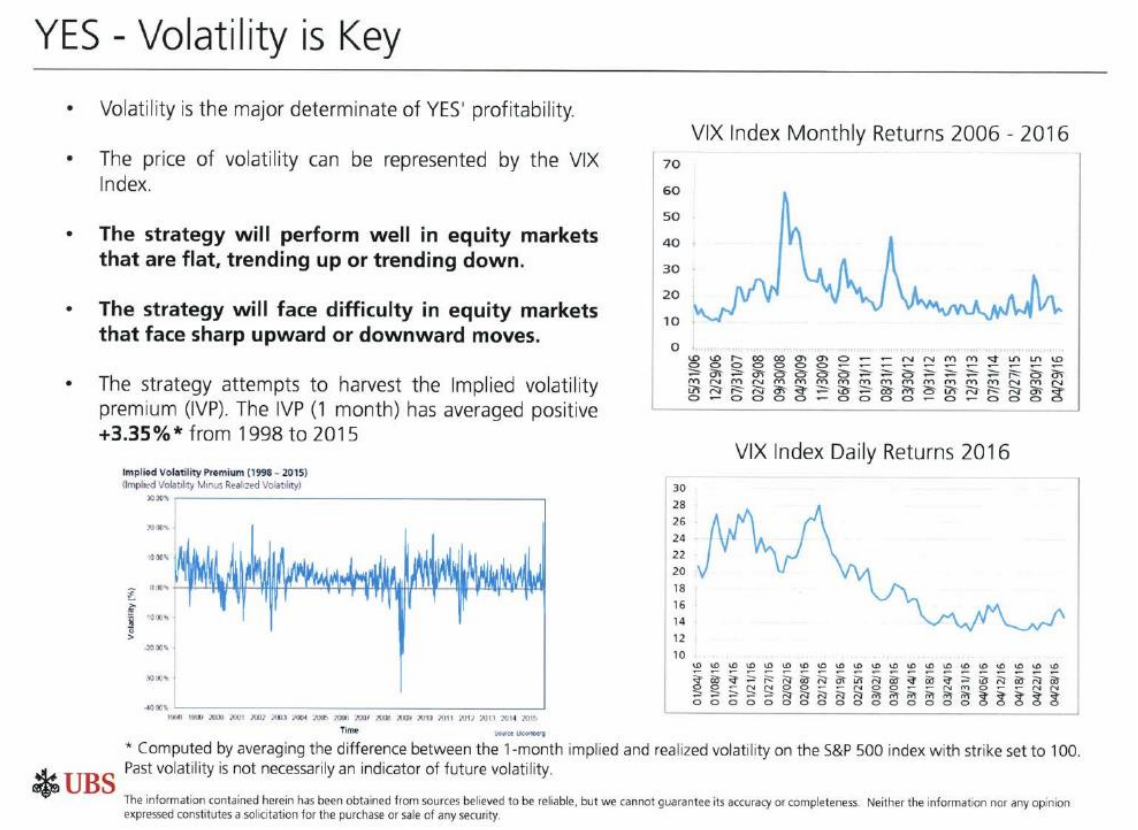
UBS's marketing materials also included the slide excerpted in Figure 11 which reads: "Seeks to provide an additional source of income to portfolios when the markets are flat, trending higher or trending lower." These statements were false but consistent with UBS's iron condor graph in Figure 9 and its up and down arrow graphic in Figure 10. The strategy does not generate positive returns so long as the S&P 500 remains within a range around the index level when the option combinations are entered into. This might be true if the option combinations were as illustrated in UBS's marketing materials and the options were held until expiration but the combinations used are not as UBS illustrated and the positions were turned over every few days even though they typically had five or six weeks remaining to expiration. Because the option combinations include directional bets on the market and are closed out at least weekly, the strategy makes or loses money when the market is "trending" up or down.

Figure 11 UBS's Infographic Showing no Directional Market Exposure



Similarly, UBS's marketing materials excerpted in Figure 12 falsely claimed "The strategy will perform well in equity markets that are flat, trending up or trending down."

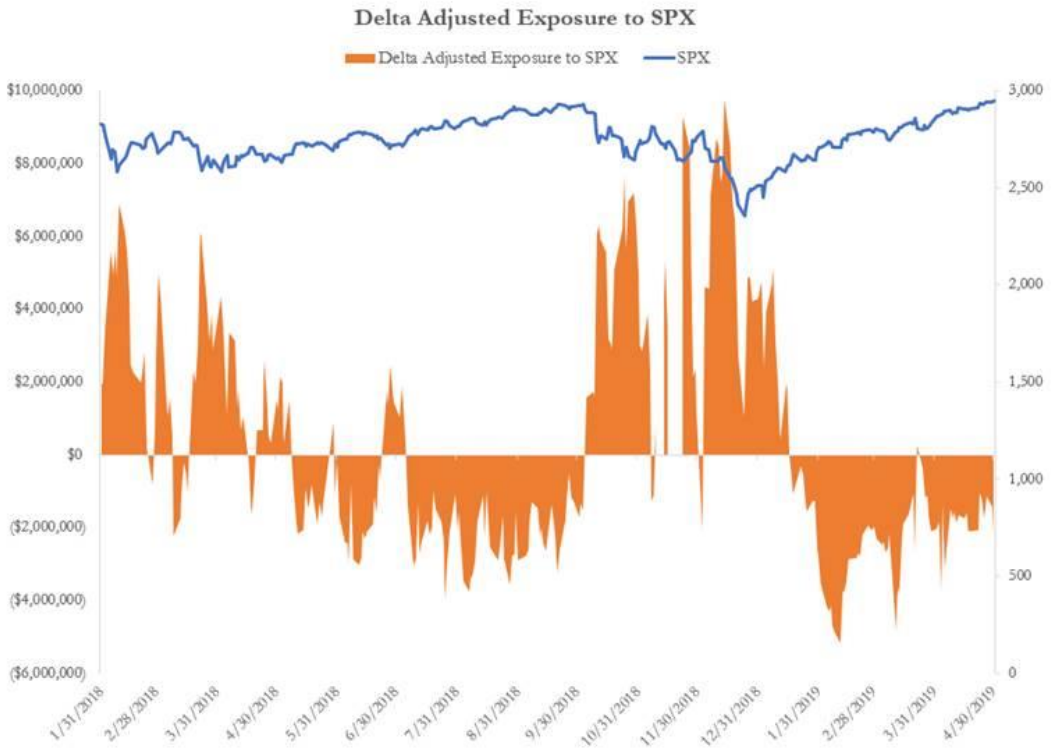
Figure 12 UBS Claims no Directional Market Exposure



Contrary to UBS's claims of no directional bias in the YES strategy as reflected in UBS's marketing materials excerpted in Figures 9-12, the YES strategy was taking large actively managed directional bets on the market. Figure 13 plots the daily delta-adjusted exposure of one of the YES strategy accounts. The orange-shaded areas reflect long market exposure when above $0 and short market exposure when below $0. The delta adjusted notional value of a market neutral strategy would be approximately $0.

During some periods in 2018 the account was long the market. This is especially true in December 2018; the account was long over $6 million, the SPX dropped 10% and the account lost $600,000. In other periods - like the summer of 2018 - the account was short smaller amounts and lost money as SPX increased slightly.

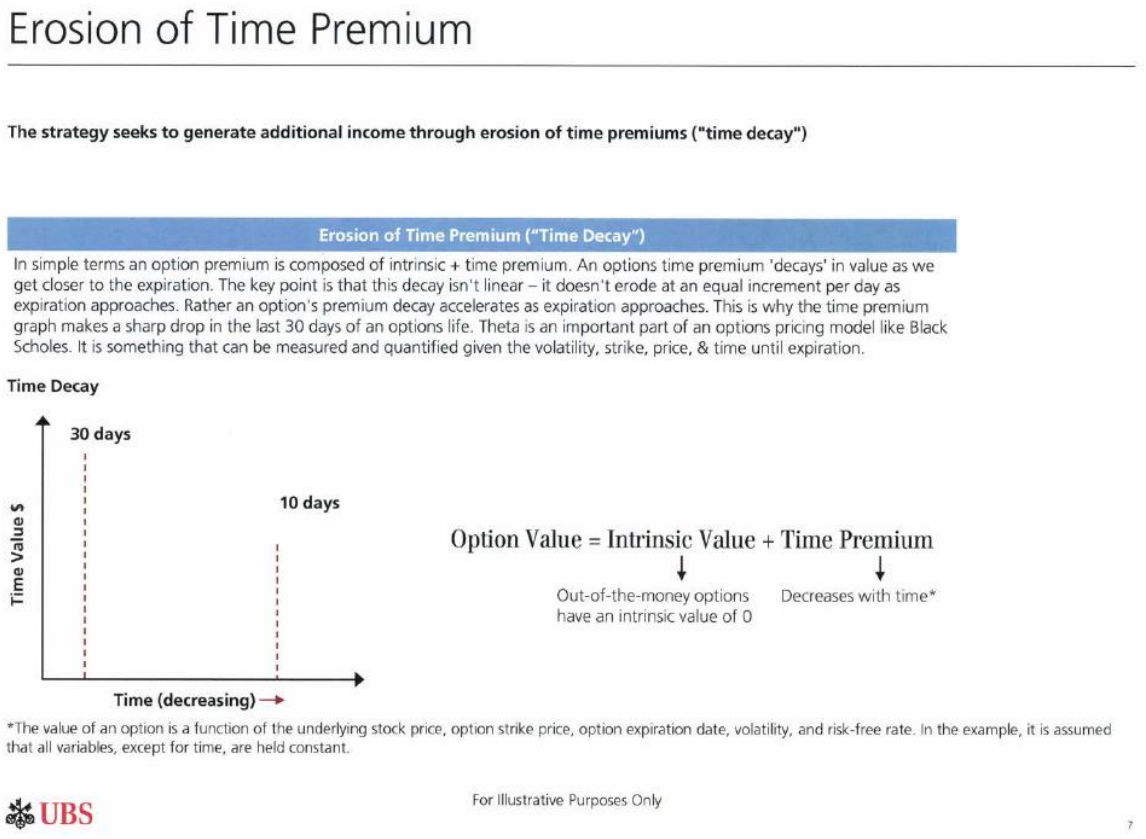
Figure 13 Example UBS's YES Account Contains Large Directional Market Exposure



The YES strategy is sometimes long the stock market, sometimes short the stock market. Each month the Strategy's returns depended nearly 100% on the direction of the market. When you look at 15 years of monthly returns during the time the manager is swinging wildly from long the market to short the market it looks like the Strategy is uncorrelated with the market but it is not. Depending on whether the manager was long or short the market at any given time the correlation was either +1.0 or -1.0.

UBS misrepresented that the source of returns to the YES strategy was the time-decay in option values. For example, UBS claimed in the marketing material excerpted in Figure 14 that "The Strategy seeks to generate income through erosion of time premiums ("time decay"). Although it seems complicated, the claim is that the manager is selling options short and buying later at lower prices keeping the difference between the net premium received when entering into the combination and the net cost to close out the position when the time premium has "decayed". This only makes positive risk adjusted returns if there are systematic inefficiencies in the market for short term S&P 500 Index options – inefficiencies which the YES team is uniquely able to arbitrage.

Figure 14 UBS Attributes YES Returns to Option Value Time Decay.



Returning to the excerpted marketing in Figure 9, UBS falsely claimed "The natural time decay exhibited by options provides the bulk of the return stream … The return is the difference between the Implied Volatility and the Realized Volatility." In fact, the bulk of the Strategy's returns were unrelated to time decay or the difference between the Implied Volatility and the Realized Volatility.

YES Was Simply an Actively Managed Stock Market Overlay

YES's returns are simply the returns to the market applied to the directional bets this active market timing portfolio manager placed. We estimated each day's expected daily P&L due to the account's delta, gamma, vega and theta exposure, added up by month and compared the resulting monthly P&L to the account statement P&L for the account reflected in Figure 13. Table 3 reports a YES account's monthly mark-to-market profit and loss and the profit and loss that would result for the account's daily exposures.

Table 3 The YES Strategy Returns Closely Track Equity Market Returns.

	Claimed Sources of Returns			Disavowed Equity Market			Monthly P&L	
Month	Time Decay	Volatility Changes	Total	Delta	Gamma	Total	Explained	Observed
	(1)	(2)	(3)=(1)+(2)	(4)	(5)	(6)=(4)+(5)	(7)	(8)
1/31/2018	0	0	0	0	0		0	0
2/28/2018	21,477	(1,479)	19,998	16,267	(186,100)	(169,833)	(149,834)	(149,366)
3/31/2018	69,467	(11,351)	58,117	24,067	(211,135)	(187,068)	(128,951)	(86,309)
4/30/2018	89,358	384	89,743	118,774	(116,193)	2,582	92,324	77,163
5/31/2018	62,664	1,042	63,706	44,986	(56,229)	(11,243)	52,463	67,807
6/30/2018	55,277	609	55,886	5,413	(42,939)	(37,526)	18,360	2,746
7/31/2018	61,858	7,018	68,877	7,025	(49,036)	(42,010)	26,866	12,198
8/31/2018	51,968	2	51,970	(55,630)	(29,072)	(84,701)	(32,731)	(64,329)
9/30/2018	52,361	1,916	54,278	9,173	(16,417)	(7,244)	47,034	66,692
10/31/2018	25,161	4,803	29,964	(111,424)	(363,578)	(475,002)	(445,038)	(356,441)
11/30/2018	134,705	(23,836)	110,869	266,170	(260,916)	5,254	116,123	159,117
12/31/2018	(21,414)	(656)	(22,069)	(597,199)	(74,218)	(671,418)	(693,487)	(668,770)
1/31/2019	8,084	(92,505)	(84,422)	64,726	32,724	97,449	13,028	52,891
2/28/2019	19,790	(13,086)	6,704	(121,623)	8,399	(113,224)	(106,520)	(103,378)
3/31/2019	40,413	(24,435)	15,978	(17,704)	4,991	(12,714)	3,264	(57,667)
4/30/2019	6,737	1,951	8,688	(83,119)	10,105	(73,014)	(64,326)	(100,630)
Total	677,908	(149,620)	528,287	(430,099)	(1,349,614)	(1,779,713)	(1,251,426)	(1,148,276)
Correlation			40.8%			95.8%	98.5%	100.0%

The exposures UBS claimed drove the profitability – time decay and volatility changes – together had only slight correlation (0.408) with the observed monthly returns. On the other hand, the exposures UBS disavowed – delta and gamma – together had a high correlation (0.958) with the observed monthly returns.

Thus, the YES returns were not the result of time decay in option prices or the difference between realized volatility and implied volatility as UBS claimed. UBS's YES Team was actively betting on the short-term direction of the S&P 500 and it was the wagered market exposure that explained the bulk of the returns investors in YES experienced.