Europe warms to weekly options

After their introduction in the US more than a decade ago, weekly options have now become part of the investment toolkit of many financial professionals worldwide.

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According to our calculations, weekly options traded on European derivative markets now account for 6-8% of total options volume. This is in sharp contrast to the US where we observed that weekly options volume as percentage of the total options volume on the SPX is now about 30% on an annual basis and on some days as high as 47%. The difference between the proportions of volume in weekly options traded in the US and Europe indicates

TABLE 1. LSEDM – FTSE 100 INDEX WEEKLY OPTIONS CONTRACT SPECIFICATION

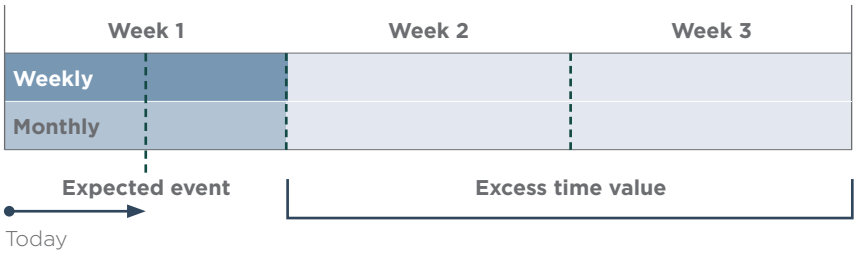
Contract Underlying	The FTSE 100 Index. The benchmark Index for the United Kingdom.
Type of Contract	European Style, Cash settled Call and Put Option Contracts.
Central Counterparty	LCH.Clearnet.
Trading Hours	08:00 – 17:00 London time for Order book trading and Block Trading. 07:30 – 17:30 London time for manual Trade Reporting. On Expiration Day, trading finishes as soon as reasonably practicable after 12:02 once the mid-day intraday auction ends and the Expiry Settlement Price of the Index has been determined.
Exercise Window	18:10 – 18:40 London time on Expiration Day.
Multiplier	GBP 10 per Index point.
Currency	GBP, British Pound, £.
Quotation display	Option Premium in Index points.
Tick Size and Tick Value	Tick Size 0.5 — Tick Value GBP 5
Listing Day	Each Monday of the month, except the first Monday. Where this is not a normal Trading Day, the preceding Trading Day shall be used.
Expiration Day and Week	Each Friday of the month, except the third Friday. Where this is not a normal Trading Day, the preceding Trading Day shall be used.
Contract lifetimes	Out to 1 month
End of Day Price	Price used to calculate theoretical value of Option Contract positions in order to facilitate the margining process at the clearing level. This price is calculated in accordance with standard Black Scholes options pricing model.
Exercise Settlement Price	The value of the FTSE 100 Expiry Index as calculated by FTSE at 12:02 on the Expiration Day or as soon as reasonably practicable, following the mid-day intraday auction on the London Stock Exchange http://www.lseg.com/sets/intra-day-auctions (plus up to 30 seconds random interval and any price monitoring extensions or Market Order extensions in any of the constituent Stocks). The London Stock Exchange Derivatives Market shall take this value and round to the nearest 0.5 Index points to establish the Exercise Settlement Price.
Exercise Settlement	One Bank Day after Expiration Day for payment of Exercise Settlement Amount.
Premium Settlement	One Bank Day after the Trade Day.

TABLE 2

	FRONT MONTH					BACK MONTH			
	WHICH LISTED WEEKLY CONTRACT AVAILABLE								
Week of Month*	W1	W2	Monthly	W4 (if listed)	W5	W1	W2	Monthly	W4
First	Y	Y	Y	Y	Y	N	N	Y	N
Second	expired	Y	Y	Y	Y	Y	N	Y	N
Third	expired	expired	Y	Y	Y	Y	Y	Y	N
Fourth	expired	expired	expired	Y	Y	Y	Y	Y	N
Fifth	expired	expired	expired	expired	Y	Y	Y	Y	Y

* with a Friday in it

FIGURE 1



Short dated options are now seen as a natural complement of any derivatives exchange product palette

that there is scope for substantial growth for this product across European equity derivatives markets.

THE ROLE OF EXCHANGES

Short dated options are now seen as a natural complement of any derivatives exchange product palette. For instance, weekly options on the FTSE 100 Index listed on London Stock Exchange Derivatives Market (LSEDM) were the first short-dated options on a UK based underlying, listed on a UK exchange. They expanded the LSEDM product range on UK underlyings that already included standard options on the FTSE 100 Index with monthly maturities and FTSE 100 Index futures contracts with quarterly expiration. As with all other derivatives products offered by LSEDM, weekly options are cleared by LCH and benefit from margin offsets against corresponding futures positions.

Liquidity in weekly options is developed in cooperation with market makers and based on agreements between the exchange and market making firms. Market makers enter an arrangement to meet the obligations of maximum spreads and minimum size across maturities and strike prices thereby providing substantial benefits to all the users.

The success of weekly options on equity indices has incentivised derivatives exchanges to make them available on a variety of additional asset classes from interest rates to FX, and a selection of commodities including Oil, Natural Gas, Corn, Wheat and Soybeans.

EXPIRY CYCLE

Weekly options are short-dated options usually with eight calendar-day maturity. Exchanges can make available multiple weekly maturities, usually up to four weeks, starting and expiring on different days of the week. For instance, on LSEDM weekly options begin trading on Monday and expire on Friday and four maturities are made available at any given time offering investors the opportunity to trade up to 32 days in the future in convenient weekly maturities.

Although weekly options can be considered just as options with very short-term maturities, the fact that they are made available on a weekly basis allow investors to take advantage of some specific events occurring in the short term. Dealing in short-dated options require users to pay specific attention to parameters that might not usually apply to longer dated maturity options that are sold long before maturity or allow more time for desired outcomes to materialize.

In this paper, we review the main differences in behaviour between short dated options and longer dated ones and how rapid time decay impacts the price and exposure of these options. We will also discuss some of the most popular trading

TABLE 3

		Weekly option							Monthly option						
At-the-money	Spot	Weekly option premium	Premium change	Days to maturity	Gamma	Gamma change	Theta	Theta change	Monthly option premium	Premium change	Days to maturity	Gamma	Gamma change	Theta	Theta change
T = 0	100	1.06		7 day	0.144		-0.080		2.11		30 day	0.069		-0.039	
T = 1 (3% underlying change)	103	3.10	185%	4 day	0.079	-45%	-0.048	-40%	3.84	82%	26 day	0.061	-12%	-0.037	-6%
5% Out-of-the money	Spot	Weekly option premium	Premium change	Days to maturity	Gamma	Gamma change	Theta	Theta change	Monthly option premium	Premium change	Days to maturity	Gamma	Gamma change	Theta	Theta change
T = 0	100	0.04		7 day	0.030		-0.016		0.58		30 day	0.047		-0.026	
T = 1 (3% underlying change)	103	0.33	3.90	4 day	0.113	280%	-0.066	304%	1.34	122%	26 day	0.064	36%	-0.038	45%

strategies using weekly options and how investors can benefit from them.

THE SAME, YET DIFFERENT

Weekly options are introduced on a rolling basis with the current week being the shortest maturity, therefore the time value component of their price is relatively small. This makes them an useful tool to implement short-term hedging strategies or take advantage of specific macro events with a comparably low outlay of premium. Compared to longer-dated maturity, directional trades can be implemented in an efficient way as users don't need to pay for additional time value that they might not need as the event is likely to take place long before the maturity of a long dated option as illustrated in Figure 1.

The advantages of short-dated options are not limited to their efficiency when timing the market by being comparatively cheaper than longer-dated ones. Because of their short maturity these options tend to be extremely reactive to sudden market changes and present a better return profile than longer dated ones.

In the example above (table 3) we compare the return of a weekly option and a monthly option under the assumption of a 3% market move taking place in the next three days.

We can observe how the premium of the short-dated maturity both at and out-of-the-money options is more reactive to a 3% move over a period of three days than a longer dated maturity option, in this case with 30 days of residual life, with the same strike prices. We also notice how the behaviour of the premium level changes in occasion of important price variations. The premium of the weekly options increases by nearly 185% whereas the corresponding monthly with three weeks to maturity only increases by 82%. The comparison is even more compelling when using 5% out-of-the-money strikes. The weekly premium increases by 390% and the monthly only by 122%.

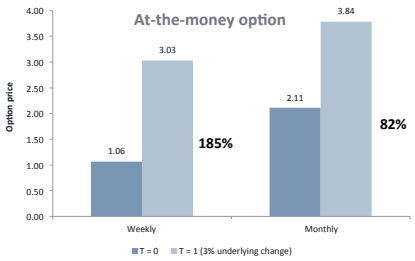
The example above emphasizes the changes in theta and gamma when comparing options with different strikes. As strikes move in-the-money, gamma decreases as it delivers delta to the option while for the out-of-the-money option it increases as it approaches the at-the-money level. Time-decay slows as the at-the-money strike moves in-the-money while theta "bleeds" the premium of the out-of-the-money option.

With little time value in the option premium, the sellers of options might not be fairly compensated for the risk of exercise if the option ends in the money. As such, weeklies may be less suitable for systematic income strategies or credit spreads.

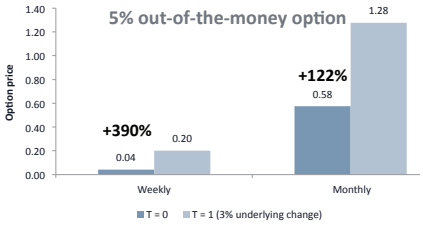
When trading short-dated options, it is worth noting that time decay is strongly related to the degree of moneyness of the option. All things being equal theta will decay faster and more linearly for in-the-money and out-of-the-money strikes. At-the-money options will preserve their time value longer but time decay only accelerates in the last two days before maturity as shown in the graph below.

At-the-money options will experience a larger loss in premium value because they

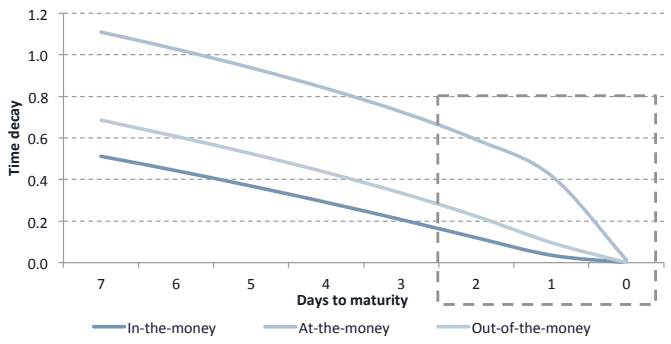
GRAPH 1



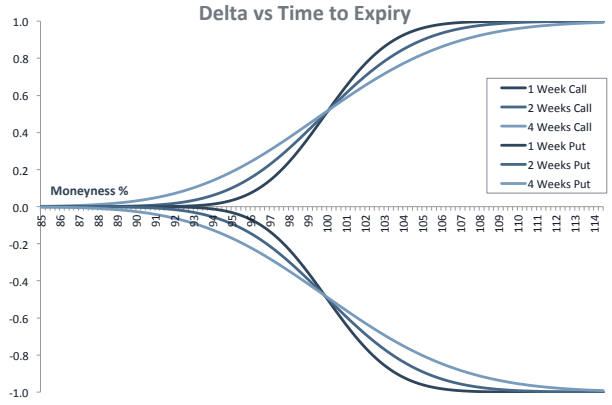
GRAPH 2



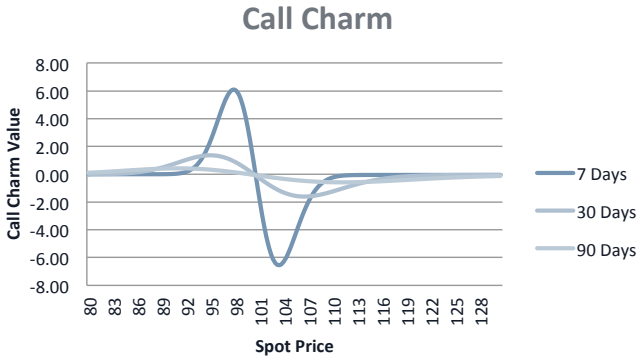
GRAPH 3



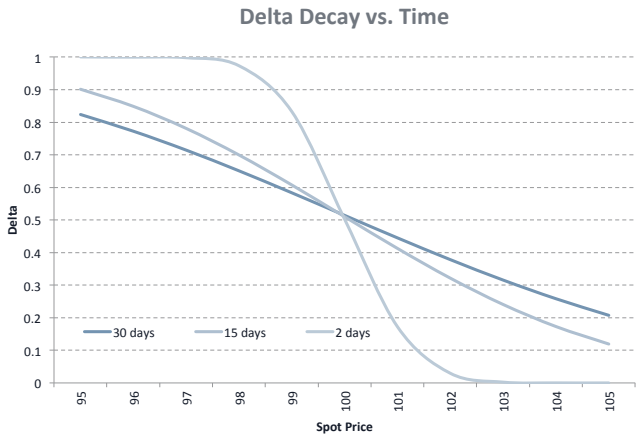
GRAPH 4



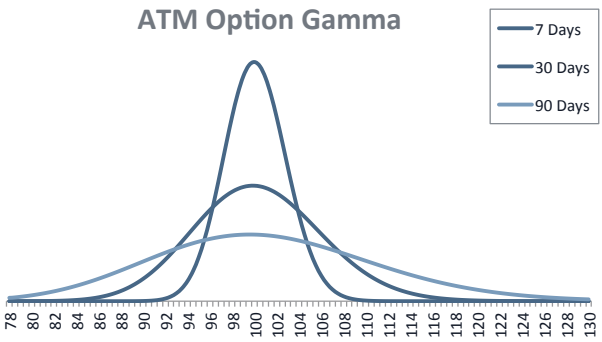
GRAPH 5



GRAPH 6



GRAPH 7



have a higher time value. However time decay for at-the-money will accelerate towards maturity more than for corresponding in and out-of the-money strikes. Far out-of-the-money options have a lower time value than at-the-money options reflecting the small probability to be in-the-money at expiration and their decay is more linear than for at-the-money options.

THE GREEKS

In the example above we have described how changes in the Greeks are accentuated in short-dated options. However understanding how these factors relate to each other will help fully realizing the potential and flexibility of these instruments. In order to analyse these relationships we need to consider higher order derivatives such as charm, color and speed in addition to the traditional first-order Greeks, delta, gamma, theta and vega.

DELTA

When considering short-dated options delta tend to behave in slightly different way than for a longer-dated maturity. The delta of out-of-the-money options will tend to be lower for short-dated options than for long-dated options. However the opposite is true when options are in-the-money; delta of a short-dated option will be higher at a specific strike than the delta of the corresponding longer-dated option (Graph 4).

Since short-dated options are very reactive to changes in underlying conditions, the rate at which these parameters change will help planning trading and understanding the behaviour with only few days to reach the intended outcome. Charm, the measure of how delta decays with the passage of time, is therefore even more useful than delta in determining how big the changes in underlying will have to be in time in order for delta to move in the desired direction. If we know how much delta decays over time then we know how much the underlying needs to "push" in our favour in order for a long option position to move in-the-money. Conversely the same measure will tell the holder of a short option position how fast he is rewarded by the market moving contrary the strike. Charm is also helpful when dynamically hedging position as it predicts how many units of delta must be bought and sold in order to reach delta neutrality if the underlying does not move.

GAMMA

Traders can take advantage of the rapid change in a shorter-term option's gamma. Options gamma – the rate of change of delta and in itself a second-order Greek– is at its highest for at-the-money short-term options. This makes the price of options very reactive to changes in the price of the underlying. Weekly options make high gamma available to investors immediately. This is due to the lower uncertainty in selecting a strike price that might end up out-of-the-money or incurring the drawback of paying for additional time value while waiting for high gamma to come into effect.

The price of a short-dated option will respond more than the one of a long-dated one to a change of the value of the underlying. The responsiveness of the option will increase as it approaches its expiry. This relationship is captured by a third order derivative called color. Color measures how the impact of high gamma near expiry will cause sharp changes in delta thus creating a benefit for holders of long positions that see an increased probability of their options expiring in-the-money.

Since large changes in gamma lead to dramatic changes in the delta of an option, it is useful to monitor the rate of change of gamma in relation to movements in the underlying. The interaction of changes in gamma and the underlying price is exemplified by another third order derivative called Speed. This risk parameter is particularly important when dynamically hedging positions with strikes close to the at-the-money level approaching maturity because the delta of the position will tend to "explode" on sudden underlying moves.

Color and speed are very important in order to maximise strike price selection and optimise the implicit leverage offered by short term options.

TIME AND VOLATILITY

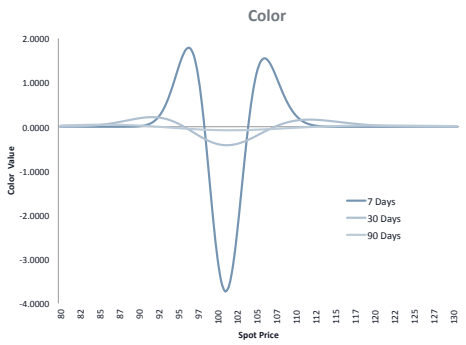
Short-dated options are becoming more important for short term volatility traders because they offer the possibility to implement trades that take advantage of the relationship between time decay and volatility on a weekly basis.

When an option has short residual time before maturity the impact of a change in volatility will be less than for a corresponding option with a longer residual life.

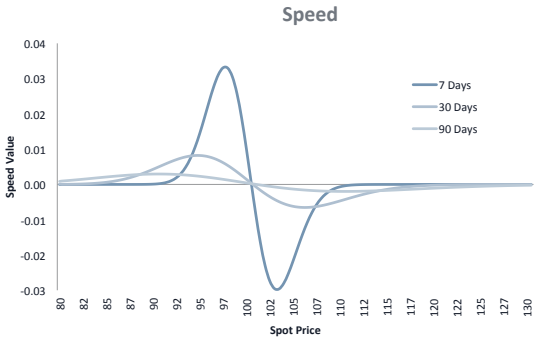
However, the impact time decay has on the volatility skew becomes more relevant because the volatility skew increases as

The price of a short dated option will respond more than the one of a long dated one to a change of the value of the underlying

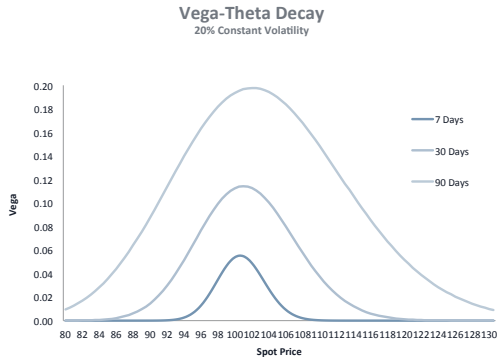
GRAPH 8



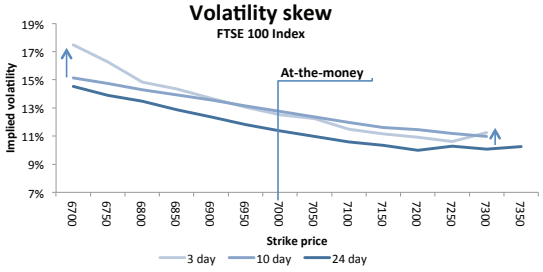
GRAPH 9



GRAPH 10



GRAPH 11



The small time value of weekly options benefits buyer of calls and puts whereas the fast time decay works against them but benefits the sellers of options

the option maturity decreases; this change in skew will increase the value of the long skew position and decrease the value of the short skew positions. While the effect is negligible for long-dated options it has a substantial impact on short-dated options.

When looking at the volatility skew of weeklies it is worth noting that options that are priced at a very high implied volatility level might present good opportunities to buy relatively cheap gamma. Looking at the theta/vega ratio of a contract is one way to understand how risky it is to be short volatility compared to time decay.

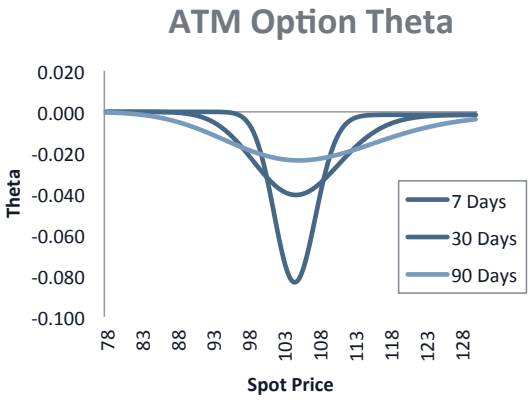
The small time value of weekly options benefits buyer of calls and puts whereas the fast time decay works against them. In the other hand the fast time decay might not be to the advantage of sellers of options. Time decay is not linear and tends to accelerate near expiration and the time value collected might not compensate adequately the seller of the short options for the risk of sudden increases in implied volatility.

This property is particularly important when considering buying out-of-the-money short dated options. Time-value of premium is already low. The small time component left in the option premium might represent good value opportunity to buy cheap downside protection or take advantage of sudden positive swings in the market with minimum premium cost.

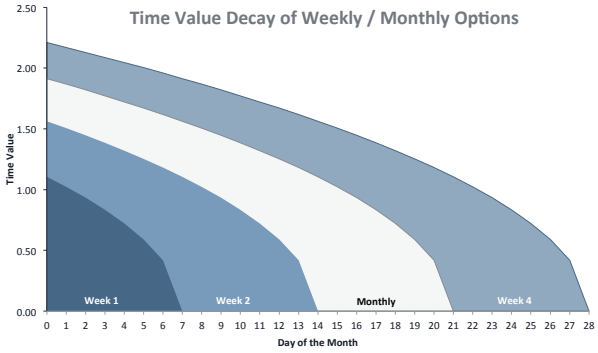
HOW TO USE WEEKLY OPTIONS

Except for their short maturity, weekly options are just standard options and therefore in theory can be used to implement the whole range of trading strategies, from hedging to spread and volatility positioning. However the small differences outlined in the previous section of this paper make them clearly less efficient than long dated options in achieving some specific objectives. Below we summarize what we believe are the most interesting and beneficial areas where the benefits offered by weekly options can be maximised.

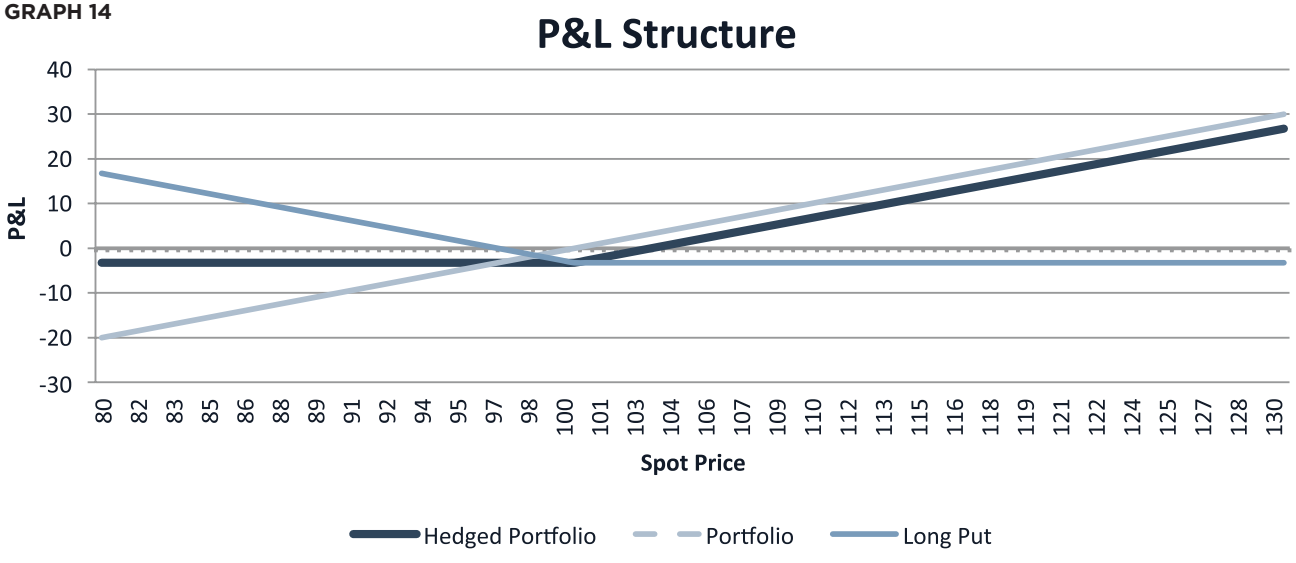
GRAPH 12



GRAPH 13



GRAPH 14



PORTFOLIO PROTECTION

Perhaps the most interesting use of weekly options is in the implementation of portfolio protection against the adverse effect of macro events.

The small premium exposure makes weekly options a useful tool to truncate downside exposure and deploy short term tactical hedge.

The addition of a put to a long stock portfolio has the benefit of creating a synthetic call portfolio with a long gamma and volatility exposure.

CALENDAR SPREADS

We have emphasized that when operating with a short time horizon the timing of the expected events play a very large role in selecting the correct maturity and strike price of an option. For this reason users of options rarely buy outright positions but prefer to enter spread combinations where they can reduce their risk and premium exposure by selling upside or time value. In other words weekly options allow investors to buy "event" insurance for a short period of time.

The interplay between short-dated options of different maturities is clearly of interest to all the users of calendar spreads. The fast time decay of weekly options can be used to take short positions and the premium received used to offset the cost of taking long positions in longer maturities or to adjust outright positions that are not performing according to expectations. Another application of short dated calendar spreads is their suitability to implement strategies based on the volatility term structure.

In a calendar spread the main risk is represented by the price of the underlying moving above the strike price of the short-dated option. Sudden jumps in market levels happen faster than any jump in implied volatility and if not actively managed can cause loss of profitability.

LONG VOLATILITY COMBINATIONS

In certain market situation where the outcome of an event is unknown and the direction of the market uncertain, weekly options can be used to take advantage of potential moves in either direction or from a unexpected surge in volatility. Long straddles and strangles can be used to buy event insurance when the magnitude and directional move of the market cannot be predicted with precision.

The cost of a long straddles and strangles can be further reduced by selling upside and downside protection if investors think that the market dislocation will be limited whatever the direction. By selling deep out of the money puts and calls one can obtain a reverse Iron Butterfly that will take advantage of an increase in volatility or a substantial price move but at a lower cost than a using a straddle albeit giving up some potential profit.

MARKET DYNAMICS

The interest surrounding short-term options has caused market practitioners and academics to start exploring further the pricing behaviour of these instruments. In particular the potential to capture "jump" or "gap" risk with more precision is part

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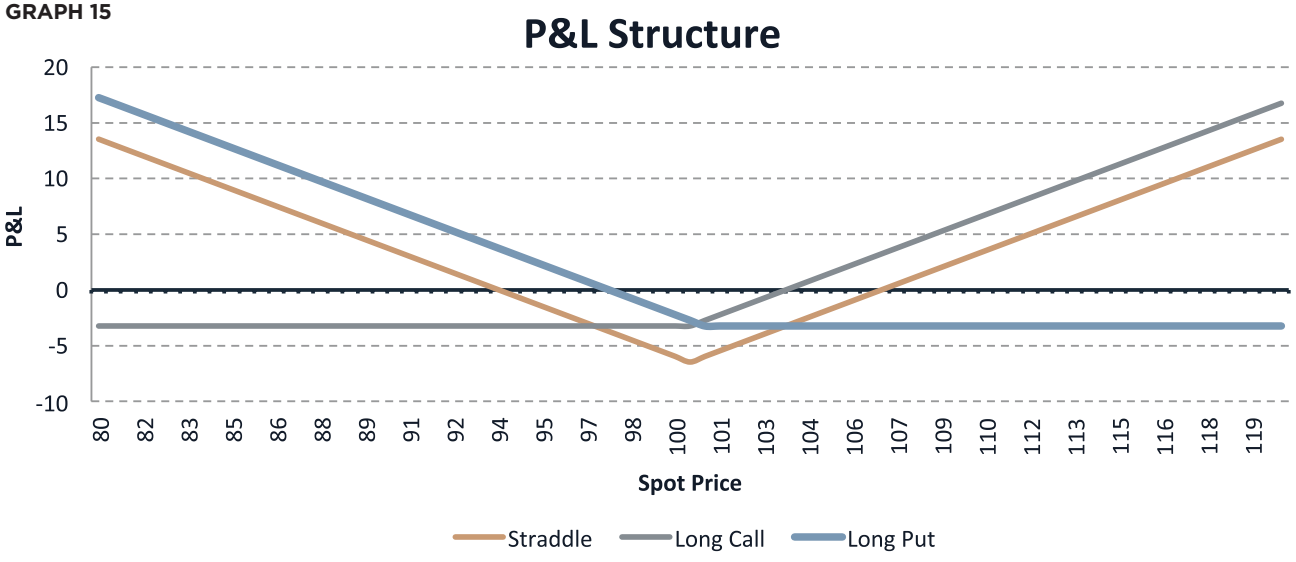
GRAPH 15



GRAPH 16

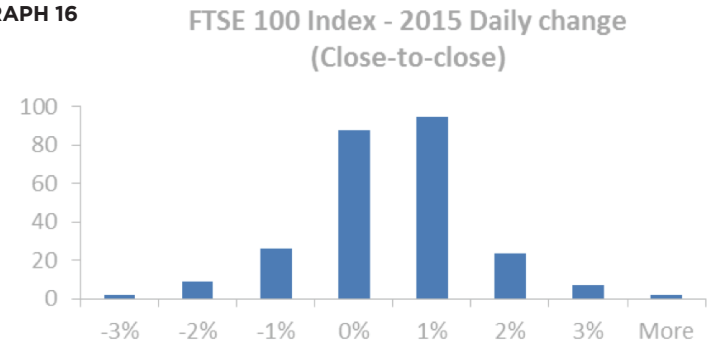


TABLE 4

Market daily change	Frequency	As % of trading days
-3%	2	0.79%
-2%	9	3.56%
-1%	26	10.28%
0%	88	34.78%
1%	95	37.55%
2%	24	9.49%
3%	7	2.77%
More	2	0.79%
Total trading days	253	100%

Implied volatility changes impact more at-the-money options and less far-out-of-the-money options, while market jumps govern changes in option prices for out-of-the-money strikes

of the trend towards taking advantage of short dated opportunities. For instance a 1% jump in market levels in the FTSE 100 Index can cause the underlying to go through two strike prices. While these wide gaps are not very common they can have a bigger impact on the price of an option than an equivalent move in volatility.

In a working paper published in 2015 for the National Bureau of Economic Research in Cambridge, Massachusetts, Andersen, Fusari and Todorov study the behaviour of weekly options on the S&P 500 Index. Using a non parametric model they confirm that the price of far out-of-the-money weekly options is more succeptible to the probability of jump risk than changes in implied volatility. However they also find that that the impact of changes in volatility is greater for at-the-money strikes. This leads to the conclusion that parametric models might not price the probability of negative tail events and that the probability of these events cannot be reliably deduced by the level of volatility implied by the market.

This is particularly interesting when observing how the market behaves. Even large mature markets tend to move on a daily basis more than one might expect. In 2015 for instance, the FTSE 100 close-on-close moved more than 2% in 33 occasion or 13% of the total trading days. This realization might indeed create in the mind of investors a new set of opportunities that can be seized using short dated options. However, it might also serve as a reminder that short-term risk cannot be discounted and that it needs to be priced using the appropriate model.

CONCLUSION

Weekly options are short-tem options that allow users to hedge their risk and take advantage of market opportunities with precision. In particular they provide powerful tool to capture sudden market moves caused by specific events. Users are not forced to pay additional premium to buy longer-dated options when the expected events are known to take place within the space of a few days.

They can also be used also to change the risk profile of a portfolio for short periods. Entire risk management strategies can be deployed quickly and unwound quickly or taken to expiration without the need to manage residual positions for a longer period of time.

In addition to the traditional benefits and behaviour of longer-dated options they also present some additional characteristics. As mentioned above, implied volatility changes impact more at-the-money options and less far-out-of-the-money options, while market jumps govern changes in option prices for out-of-the-money strikes.

For this reason, weekly options that were thought to be the product of choice of directional traders and retail investors, have now developed into a valuable mean to carry out sophisticated investment strategies.

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