

CAPITAL MARKETS

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Equity Derivatives Research

Hedging Strategies

Analysts:

Thierry Cantet,

Head of Equity Derivatives Research

33 1 41 89 44 38

Ghada Khraiche,

Head of Convertible Bonds Research

33 1 41 89 94 44

Raphael Hasson,

Equity Derivatives Analyst

33 1 41 89 66 79

EQD-Flow-Research-EMEA@calyon.com

Bloomberg: CADR

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Time to protect your portfolio

- The global indices are close to their highest levels since 6 or 7 years.
- Over the last 2 years, buying protection on European Equity markets has not been rewarded.
- We have lived in a goldilocks scenario, low equity valuation, strong growth, low bond yields, that is now coming to an end.
- We are not negative but believe that markets will be more hectic in the coming quarters. All investors should now consider hedging their portfolio to secure capital gains.
- **This document proposes and recommends several hedging strategies:**
 - **Vanilla options strategies**
 - **Exotic and structured products strategies**
 - **Volatility strategies**



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Summary of our recommendations

- A Vanilla strategy: **the Long 6M Put Ratio 95% - 100%**
This is a credit strategy (thanks to the high skew) which guarantees an outperformance over the underlying up to a 90% decrease. The hedging is effective at maturity.
- A Basket strategy: **the Long 3M ATM Put Best Of**
This is really cheaper than the Put but with an almost as efficient protection in the case of a market crash (benefits from the increase of both volatility and correlation). The retained maturity is only 3M because there is a time delay in its valuation (uncertainty on which index will be the best).
- A Barrier strategy: **the Long 3M ATM Put Down & Out**
This is perfect when the investor anticipates that the market will not fall below the barrier. This strategy costs half the price of a classical put and represents the same protection as long as we don't reach the barrier. We would recommend an ATM PDO with an American barrier at 85% on SX5E.
- A Volatility strategy: **the Long 6M Downside Conditional Variance Swap**
It has no cost at inception and benefits from a high realized volatility in the case of a market crash. Its only weakness is the case of an underlying which decreases slowly below its barrier. We would recommend a 90% Downside Conditional Variance Swap on SX5E.

For further explanations, refer to page 9-11.

Buying protection will now be rewarded

Over the last two years, buying protection on European Equity markets has not been rewarded. We have lived in a trend of bull market with low volatility.

Bears have had few moments to celebrate (May 06 and Feb 07) but markets corrections have been followed by impressive bull markets. The timing for buying protection was very difficult and lead in many case to underperformance.

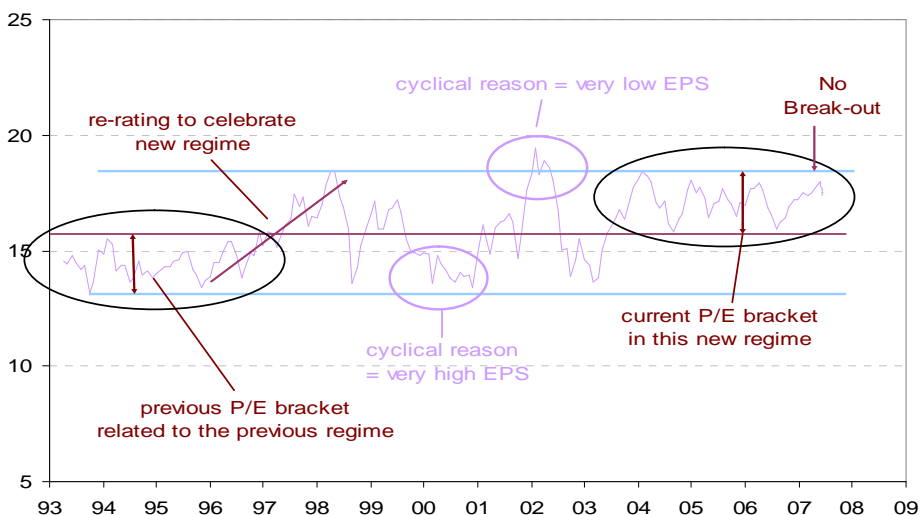
We think this will change from now, as shown early June.

We are still quite optimistic on European equities and still think it is one of the best asset class in the world, far away from a bubble situation. The European economy and European corporates should surprise on the upside in the coming quarters.

However, we have lived in a goldilocks scenario, this is now over.

- Bond yields are up and this will go on, as the bond market is taking into account global and European growth, that seems sustainable and probable monetary tightening. Equities are now vulnerable to an inflation scare.
- Emerging equities (especially the Shanghai market) are showing dangerous signs as witnessed early June. Any downturn in the BRIC equity markets, will increase volatility.
- Valuations are higher now and are not a help anymore for European equity
- The long period of cheap credit seems to be finally over.
- The M&A support should go on, however for the first time since 2003, 10 year interest rates in the euro zone are higher than the free cash flow yield of European companies (4.1% 2007 median FCF yield in Europe).
- Volatility that was at multi years low, should stabilize at higher levels (around 17% 3M IV for SX5E), which is the current level, that takes into account market consolidation threats. The 2 years median is around 14%, with minimums around 10%.

Median Forward PE – S&P Global 1500

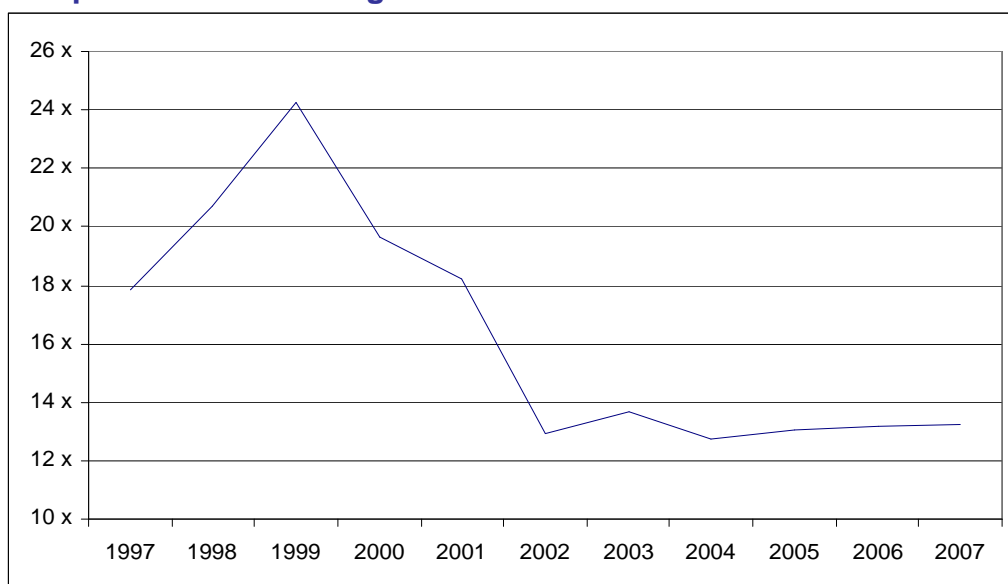


Source: CA Cheuvreux

As far as Europe is concerned, we have argued that, without the support from rising investor appetite for risk, there would be little further convergence of equity valuations between Europe and the US market this year. The transatlantic convergence of valuations has boosted annual returns from European equities by 3-4% on average through the 2003-2006 period. Consequently, equity returns in the region are now essentially a function of profit growth. Returns in Europe are moving back to a normal trend rate.

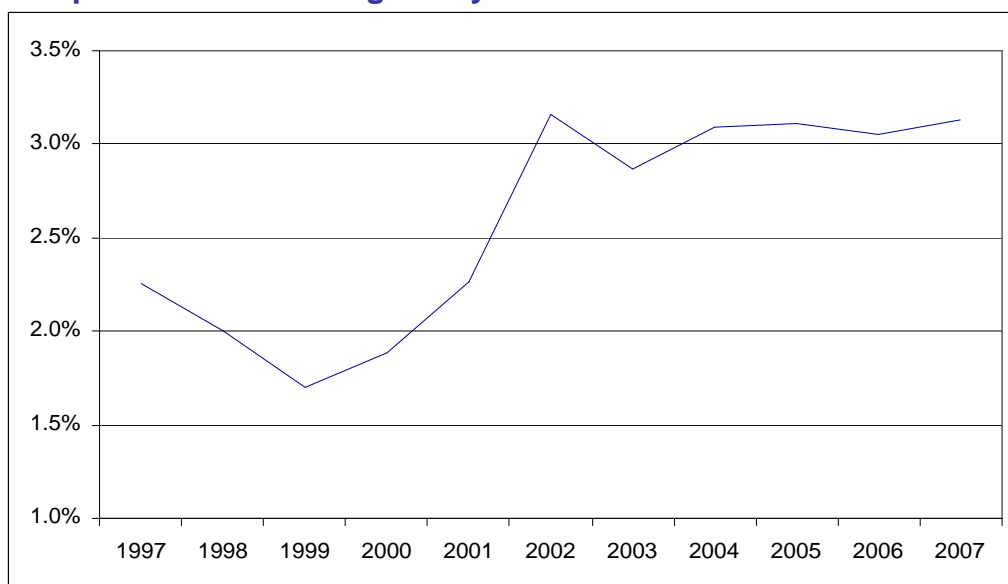
In Europe, over the last 5 years, PE has stabilized at around 13 and div yield at above 3%.

Europe PE: DJ Stoxx large PE



Source : Calyon, Datastream

Europe PE: DJ Stoxx large Div yield



Source : Calyon, Datastream

Let us quote the conclusion of a historical examination of the rise and fall of equity bull markets, published in the Review of the Reserve Bank of St. Louis recently:

Stock Market Booms and Monetary Policy in the 20th Century.

*"The authors find - - - that stock market booms typically arose during periods of above-trend growth of real output and below-average inflation, suggesting that booms reflected both real macroeconomic phenomena and monetary policy. They find little evidence that booms were fuelled by excessive liquidity. **Booms often ended within a few months of an increase in inflation and consequent monetary policy tightening.** They find few differences across the different monetary policy regimes of the century."*

Michael Bordo & David Wheelock

Federal Reserve Bank of St. Louis, Review, March/April 2007

Our interpretation is that it is not just the speed of adjustment of bond markets that is causing turbulence. Bond markets are sending a warning. The message is that world growth must moderate because the threat to price stability is rising. Investor appetite for risk should adjust accordingly. This has not yet happened. Credit spreads have hardly moved. It is the US\$ that has strengthened, not the Yen. Risky assets therefore remain vulnerable.

The maximum downside that we have experienced on SX5E over the last 2 years is -11% over 3 months.

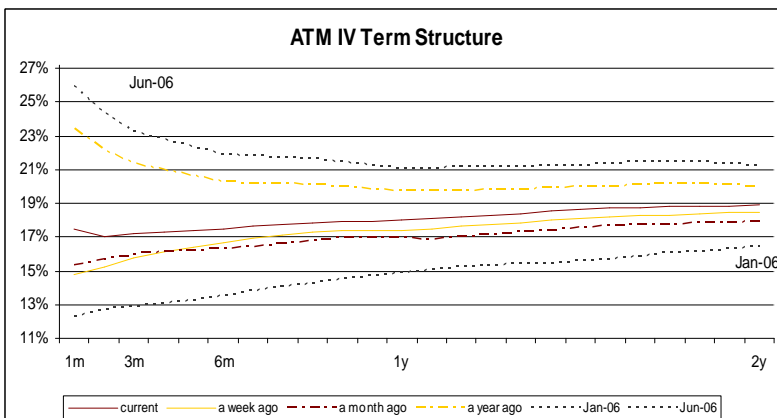
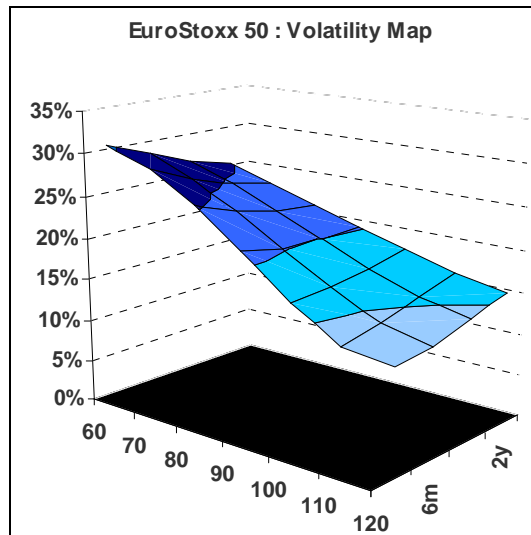
WORST	perf 3M			perf 6M			perf 1Y		
	SX5E	SPX	NKY	SX5E	SPX	NKY	SX5E	SPX	NKY
last 1Y	-11.24%	-6.25%	-14.70%	-7.60%	-4.62%	-11.02%	1.67%	-0.06%	-1.76%
last 2Y	-11.24%	-6.25%	-14.70%	-7.60%	-4.62%	-11.02%	1.67%	-0.06%	-4.13%
last 5Y	-31.78%	-25.13%	-19.88%	-38.94%	-28.86%	-28.80%	-50.90%	-33.02%	-34.69%
last 10Y	-33.05%	-25.13%	-26.32%	-38.94%	-28.86%	-33.75%	-50.90%	-33.33%	-40.82%

European index valuation in case of a market correction

Index move	DIV Yield2007	PE 2007
Current : stable	3.13%	13.8
Scenario 1: -10%	3.48%	12.4
Scenario 2 : 15%	3.69%	11.8

These calculations are made with stable Dividend and EPS as we think that any market correction would not come from downward revisions in Europe, as earnings and economy are pretty strong.

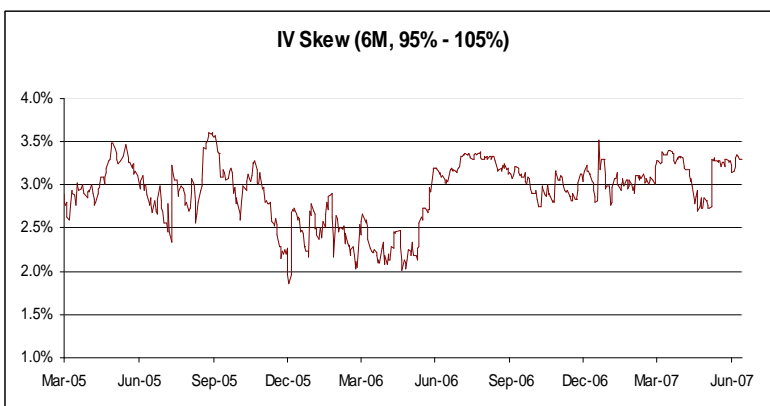
Volatility Analysis



The term structure is flat, slightly inverted for very short term.

This is not surprising as the market fears a correction.

The term structure level is far from its highest level, but quite high compared to recent levels.



As for the term structure, the skew is far from its maximum but is quite high compared to recent levels.

The skew level (95 - 105) is back at 3.5%, close to the maximum of its trading range (2.5% - 3.5%).

Source: Calyon

	Percentile on 2Y Matrix			SX5E INDEX	
	70%	80%	90%	100%	110%
3m	68%	82%	87%	86%	83%
6m	85%	89%	89%	88%	88%
1y	89%	91%	91%	91%	93%
2y	89%	91%	92%	92%	93%

0% means lowest level since 2 years, 100% means highest level

Today volatilities are expensive on almost all strikes and maturities.

Put options are then quite expensive; this advantages long – short options protection strategies (in order to benefit from the high skew) in order to minimize the impact of volatility in the price of the hedging.

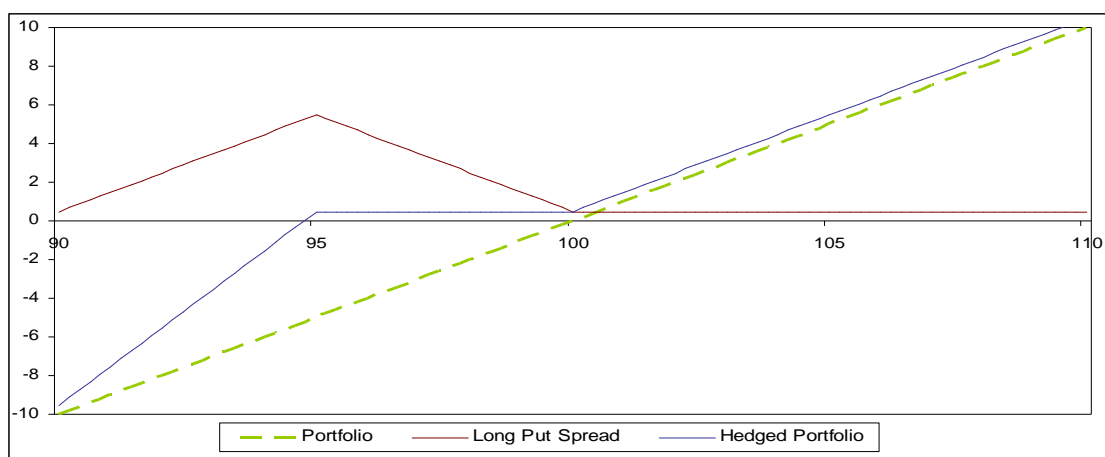
Our hedging recommendations

We recommend four strategies:

I. A Vanilla strategy: The Long 6M Put Ratio 95% - 100%

In order to benefit from the high skew, we recommend investors to buy put ratios. For 6M, this is a credit strategy, thanks to the high level of the OTM volatility. The theta is not too penalizing and investors could roll the position regularly. In case of market increase, the investor is outperforming (credit strategy). And the investor is outperforming up to a 90% decrease, which we think is quite safe.

As the delta is slightly positive at the beginning, we like a 6M length, as we will gradually benefit from the positive theta (no gamma hedging). The worst scenario for this position would be a rapid consolidation of the market of more than 10%.



II. A Basket strategy: The Long 3M ATM Put Best Of (SX5E, SPX & NKY)

The rationale is that any market consolidation should come from outside Europe as we have explained before, either a US tightening or an Asian crisis. In case of an Asian crisis, the NKY is likely to be the worst performer. The SPX is usually defensive (it is usually the best), however, thanks to the European economic story that is very strong, the SX5E is likely to resist quite well. This is why we choose the following basket: SX5E, SPX & NKY.

The spread between a SX5E 3M ATM Put and a Put Best Of is 2.25% (3.5% vs 1.25%).

This means that as long as the best performer outperforms the SX5E by less than this spread, the Put Best Of is better.

The Put Best Of benefits from the increase of both volatility and correlation generally witnessed during market corrections.

The high level of the correlation between these indices in the case of a fall of the markets explains the limited underperformance of the best index versus the basket of the 3 indices. Despite this fact, the Put Best of costs about half the price of a put on the basket and about a third of the price of a put on the SX5E (at given maturity and strike).

The retained maturity is 3 months because there is a time delay in the valuation of the Put Best Of. This delay is due to the uncertainty on which index will be the best. The delta at

inception is low (-0.1), and becomes more sensitive to index moves at time goes by. Therefore a short maturity for put best off is recommended.

Example:

Index	NKY	S&P	SX5E
Perf	-15%	-10%	-12%

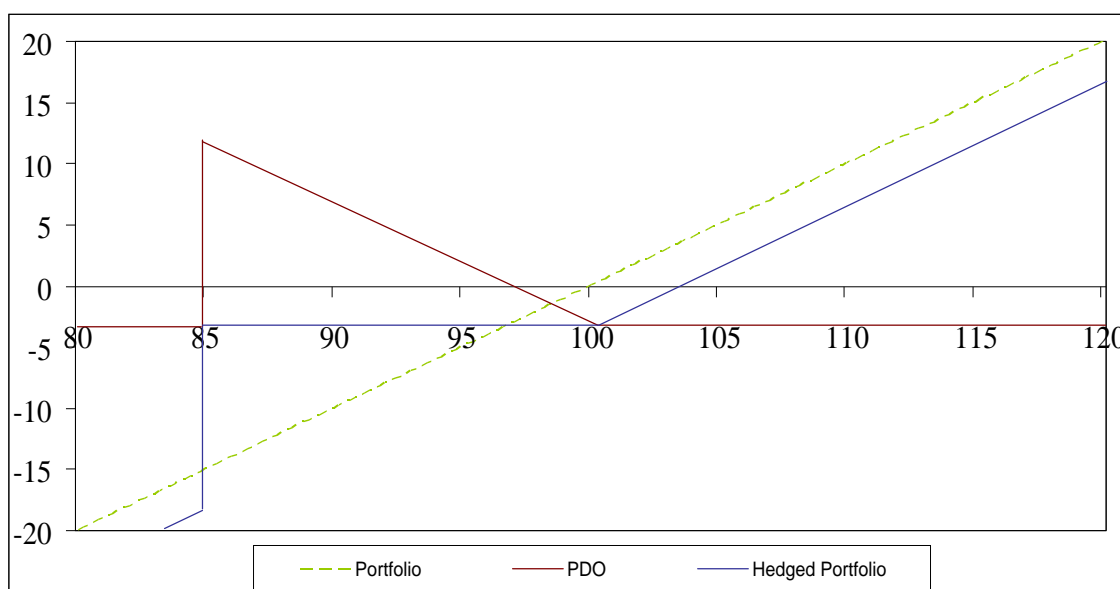
The retained performance would be the one of the SPX.
 The payoff at maturity would be: $100\% - 100\% * (1 - 10\%) = 10\%$

III. A Barrier strategy: The Long 3M ATM Put Down & Out

We think that it is unlikely to have a European market correction of more than 15% over 3 months. Over the last three years, the maximum 3 months drop was 11.3% for SX5E and 15% would lead to low valuation ratios (3.7% div yield and 11.8 PE).

For barrier options, we would recommend to fix out american barriers at 85% (european barriers at 90%).

This strategy costs half the price of a classical put and represents the same protection as long as we don't reach the barrier. **We would recommend an ATM PDO with an american barrier at 85% on SX5E for 3 months.**

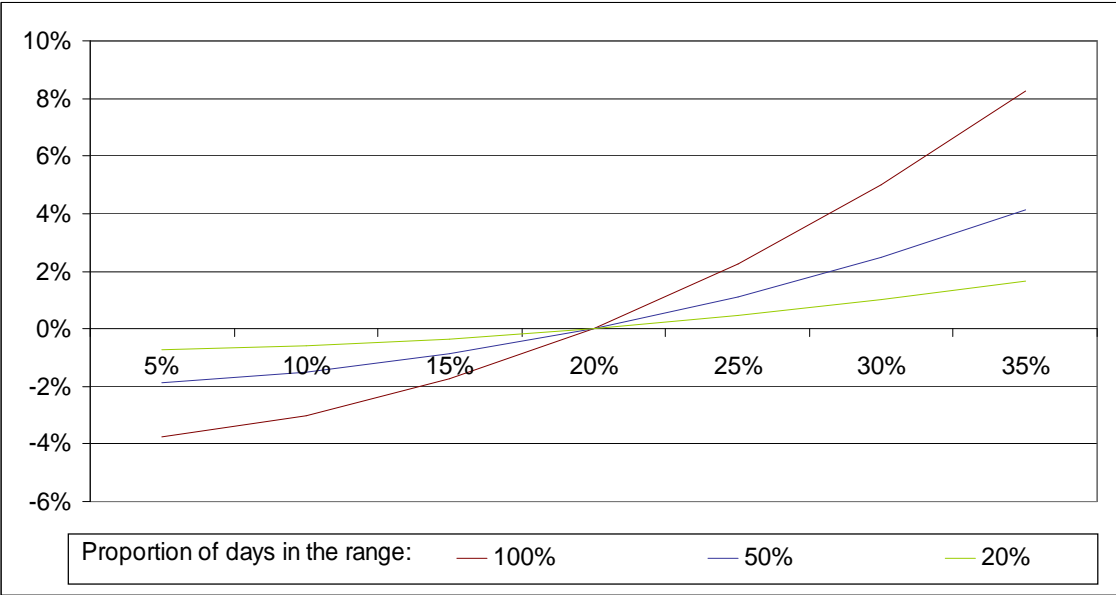


IV. A Volatility strategy: The Long 6M 90% Downside Conditional Variance Swap

This strategy has no cost at inception and benefits from a high realized volatility in the case of a market crash. Its only weakness is the case of an underlying which decreases slowly below its barrier.

We would be long volatility only in case of a market crash (-10%). Volatility is likely to stay high following the market crash (further consolidation, sharp rebound...).

In case of no market crash, volatility will not be measured during the period and the payoff will be zero. 6Months is quite flexible as the event could occur after 3 months, there is no theta. Post events, we could benefit from several observations.



Variance Swap Strike at 20% as an example

Summary of the strategies:

Qualitative comparison table

Strategy	Price	Protection	Potential loss if scenario wrong	timing	Complexity
Long Put	--	++	++	-	Vanilla
Long Put Spread	+	+	++	+	Vanilla
Long Put Ratio (N=2)	++	-	++	--	Vanilla
Long Put Ratio Back Spread	+	+	+	-	Vanilla
Long Put Ladder	++	+	++	-	Vanilla
PDI	-	+	+/-		Vanilla
PDO	+	+	+/-		Vanilla
PUI	+	+	+/-		Vanilla
Put Best of	+	+	++		Exotic
Put Cliquet	--	++	++		Exotic
Put Lookback	--	++	++		Exotic
Variance Swap	+	-	+	=	Volatility
Downside Conditional Variance Swap	+	=	++	=	Volatility

Price legend

++	Credit Strategy
+	Cheap
-	Intermediate
--	Expensive

Protection legend

++	Perfect hedge
+	Good hedge
-	Limited hedge
--	Very limited hedge

Potential loss legend

++	Small
+	Intermediate
-	Big
--	Unlimited

Timing legend

++	Very positive time effect
+	Positive time effect
-	Exposed to time decay
--	Very exposed to time decay

Quantitative comparison table

Maturity: 6 months

Underlying: SX5E (except for Put Best Of)

Pricing date: 06/14/07

Strategy	Composition	Price	Greeks at Issue			
			Delta	Gamma	Vega	Theta
Long Put	L Put 100	4.14%	-43.0%	0.1%	12.3	-0.41
Long Put Spread	L Put 100, S Put 95	1.54%	-14.3%	0.0%	1.5	0.03
Long Put Ratio	L Put 100, 2 * S Put 95	-1.06%	14.4%	0.0%	-9.2	0.47
Long Put Ratio Back Spread	2 * L Put 100, S Put 105	1.79%	-25.2%	0.1%	12.6	-0.54
Long Put Ladder	L Put 100, L Put 105, S Put 110	0.86%	-25.9%	0.1%	15.0	-0.62
PDI	L Put 100 down & in, barrier @ 90	3.63%	-44.3%	0.1%	15.2	
PDO	L Put 100 down & out, barrier (amer) @ 85	1.73%	-7.2%	0.0%	-5.0	
PUI	L Put 105 up & in, barrier @ 105	2.22%	28.3%	0.1%	10.7	
Put Lookback	L Put 100, Underlying : SX5E	5.67%	-88.3%	0.2%	15.5	
Put Best Of (3 months)	Underlying : basket on SX5E, S&P & NKY	1.25%				

“Delta = -1” strategies versus option strategies

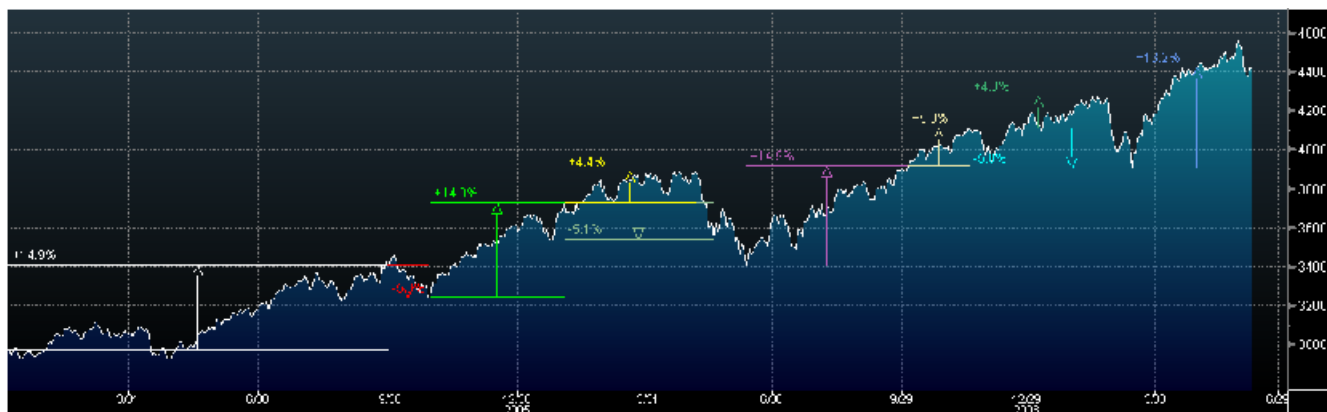
Short Future Contract

Reverse certificate

EuroStoxx short ($\beta=-1$)

We have backtested a dynamic hedging strategy:

- If the underlying increases by more than 15%* → hedge
- If the underlying decreases by more than 5%** → exit protection



Source: Bloomberg

* Our next hedge will begin after the underlying experiences an increase of 15% during any period beginning after the day we exit the last hedging.

** We exit the protection when the underlying experiences a decrease of 5% during any period beginning exactly the day we bought the last hedging.

If the portfolio still increases by more than 5% after the day we buy the hedge, we re-strike the protection at this last level.

The two tested strategies are:

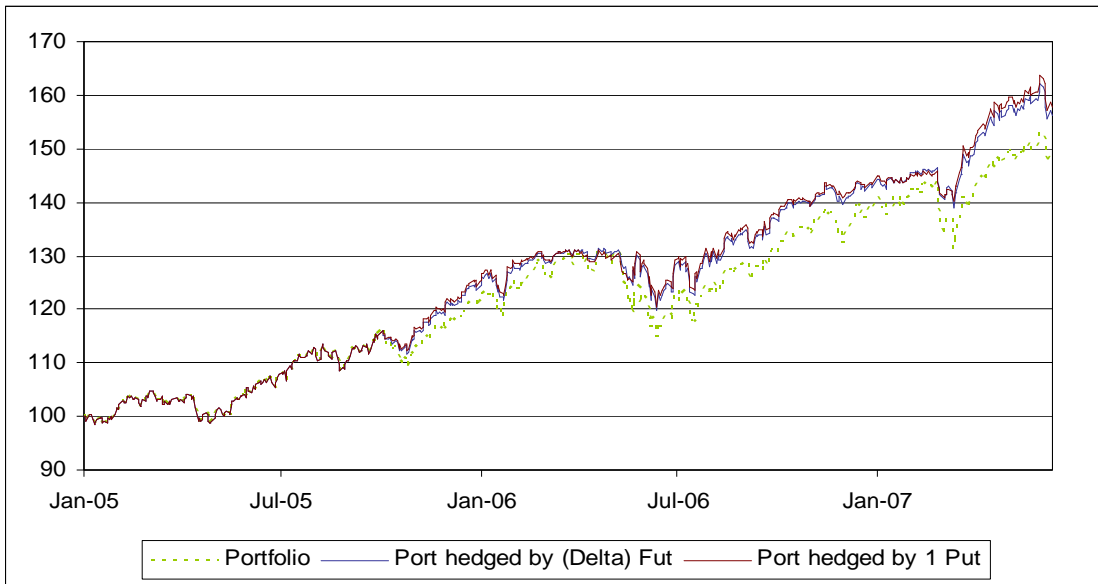
- The purchase of a put maturity 6M, strike 100%
- The sell of an equivalent quantity of future with the delta of the put (in order to compare two strategies with the same proportion of hedging)

Here is the recapitulative table for each period: we start at the beginning of 2005, on SX5E.

	Date	Perf since last step		
		Portfolio	Delta Hedge Future	Delta Hedge Put
Start	1/3/2005	0.0%	0.0%	0.0%
1st hedging begins	9/28/2005	15.5%	15.5%	15.5%
stop 1st hedging	10/27/2005	-5.5%	-3.2%	-2.6%
2nd hedging begins	2/1/2006	15.0%	15.0%	15.0%
stop 2nd hedging	5/22/2006	-5.1%	-3.2%	-3.2%
3rd hedging begins	10/5/2006	11.3%	11.3%	11.3%
re-striking	11/15/2006	5.0%	3.3%	3.0%
stop re-striking hedging	3/14/2007	-5.0%	-2.8%	-2.3%
Now	6/13/2007	12.2%	12.2%	12.2%
Total		47.6%	55.9%	57.4%

Source: Calyon

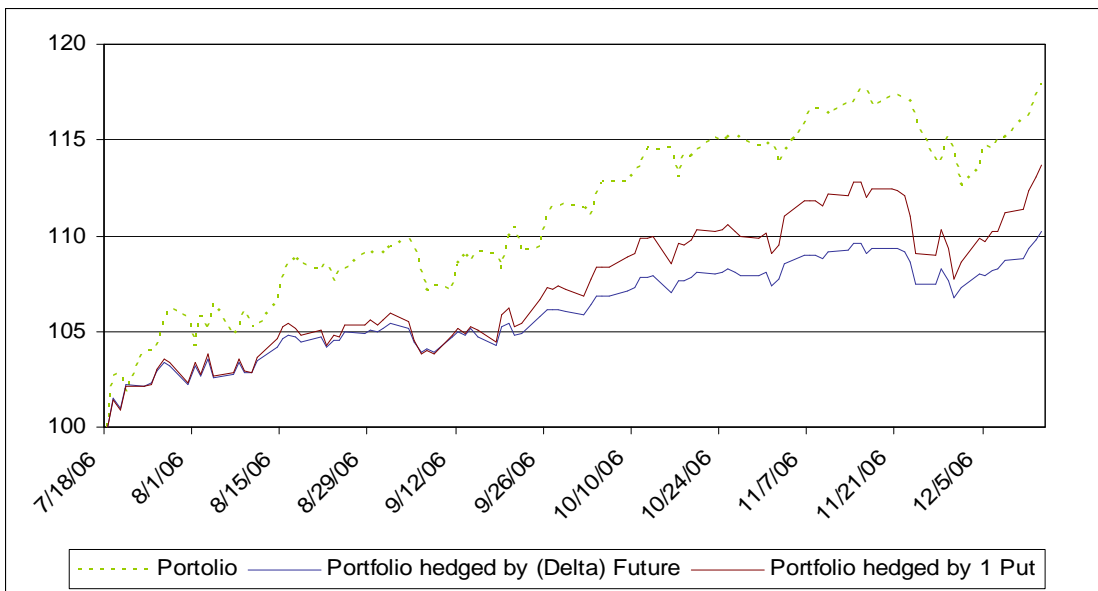
This is the mark-to-market evolution of the different strategies



Both hedging strategies outperform the reference portfolio.

We observe a little outperformance of the strategy with the put. This outperformance is limited (+1.5pts on 2 years) because the backtested strategy offers a particularly good timing for the future.

Let's analyze another example: a bad timing after the May 06 market correction.



After the market correction of May 06, the SX5E decreased by almost 5% between the 10th and the 17th of July. An investor could have decided to hedge his portfolio against any decrease beyond this point.

Unfortunately, this is a bad timing because after this day, the index almost increased everyday.

Let's analyze the behavior of the two hedging strategies in these conditions:

- The put strategy constantly outperforms the future strategy.
- The underperformance of the put strategy is limited to the premium of the put. This is not the case for the future.

The convexity of the option strategies is revealed in the case of an increase of the portfolio (wrong anticipation): the underperformance is limited to the premium of the optional strategy.

The future inflicts an unlimited underperformance in the case of an increase, particularly in the case of opening gaps.

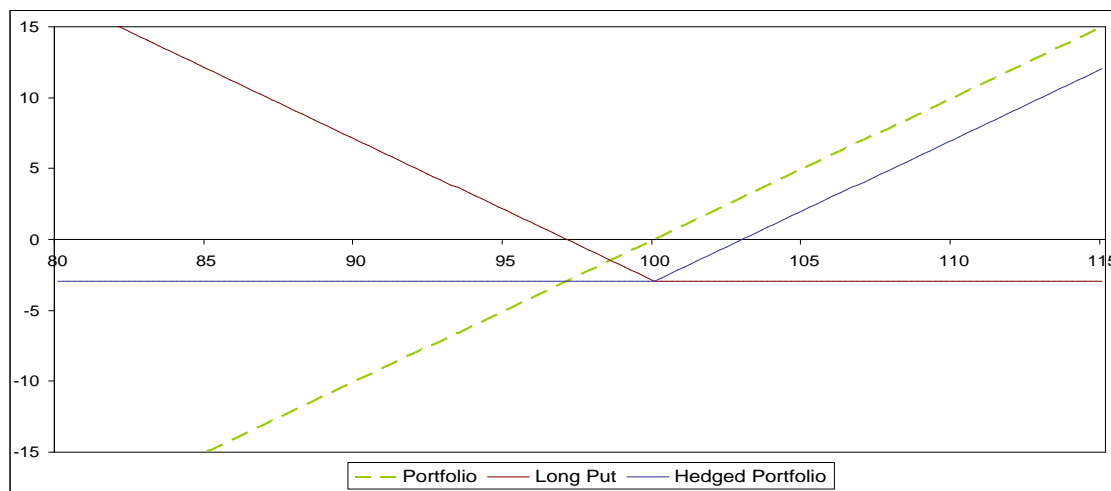
Conclusion:

The put protection is better than the future protection in most cases. However, the simple put protection is not the best (expensive) option strategy.

Combined options payoff and exotic strategies will be even more efficient than a put and than a future.

II Vanilla option strategies

Long Put



Market expectation: market bearish / volatility bullish

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited to the premium paid
- Break-even: Put Strike – Put Premium

Market sensitivities at 30 days to expiry:

Underlying	down	ATM	up
Delta	---	--	-
Gamma	++	+++	++
Vega	+	++	+
Theta	-	--	-

Strengths:

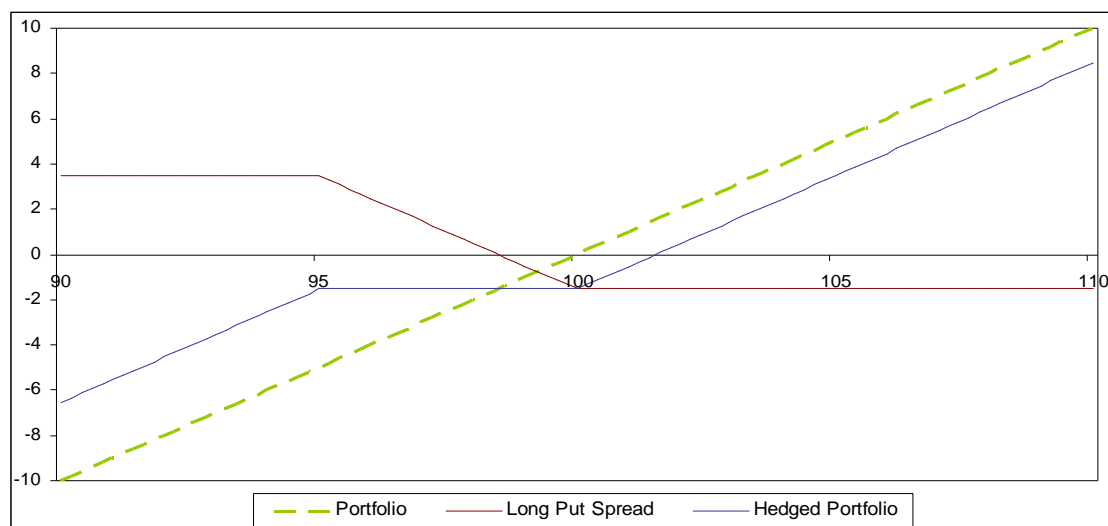
- Total hedging in the case of a fall of the underlying
- Limited underperformance in the case of a rise of the underlying
- Double effect in the case of a market crash (volatility goes up): the put protection and the positive volatility exposure

Weaknesses:

- The high price of the Put

Price: Maturity: 6M Underlying: SX5E Strike: 100% **Price: 4.1%**

Long Put Spread



Long ATM Put and Short OTM Put

Market expectation: market bearish / volatility neutral

Hedge and loss characteristics at expiry:

- Hedge: limited
- Loss: limited to strategy premium
- Break-even: ATM Put Strike – Strategy Premium

Market sensitivities at 30 days to expiry:

Underlying	down	ATM	up
Delta	-	--	-
Gamma	-	0	+
Vega	-	0	+
Theta	+	0	-

Strengths:

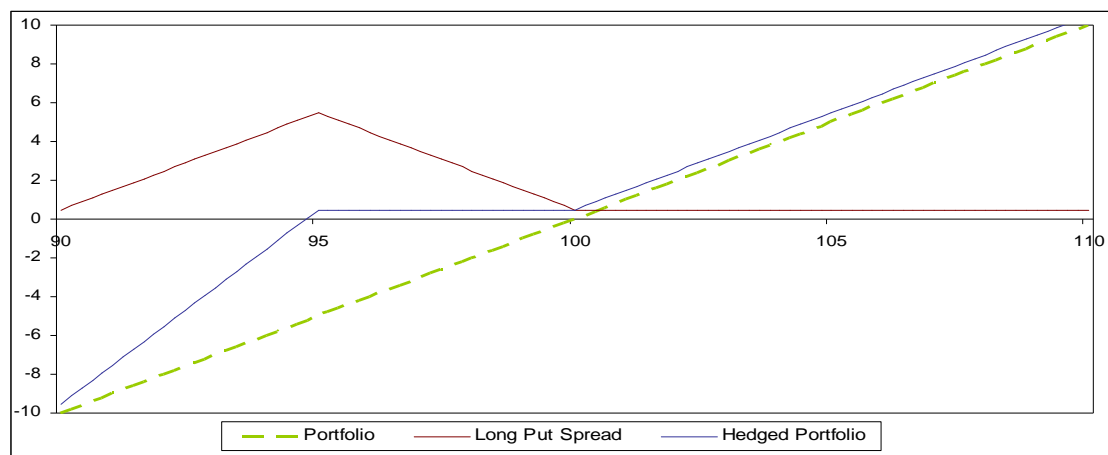
- Cheaper than the Long Put
- Flexibility of the hedging according to the anticipations
- Limited loss exposure if the underlying rises
- Low exposure to time and volatility

Weaknesses:

- Weaker Delta than the Long Put
- Limited hedge if the underlying falls

Price: Maturity: 6M Underlying: SX5E Strike: 95%/100% **Price: 1.5%**

Long Put Ratio



Long ATM Put and N Short OTM Puts (95%)

Market expectation: market bearish / volatility bearish

Hedge and loss characteristics at expiry:

- Hedge: limited (greatest at the OTM Puts' strike)
- Loss: unlimited in a falling market
- Break-even: **higher:** ATM Put Strike – Strategy Premium; **lower:** OTM Puts' Strike

Market sensitivities at 30 days to expiry:

- **Delta:** Increases towards +1 as market falls. If approaching expiry, the underlying is around the ATM Put's strike, the delta may become negative.
- **Gamma:** Highest at the ATM Put's strike and declines as underlying falls below. If approaching expiry, the underlying is at the OTM Put's strike, the gamma can be positive.
- **Theta:** it is negative as short options are effected by time decay. If however, the underlying remains above, or around the OTM strike, the theta may become negative.
- **Vega:** is negative. If the underlying is at the OTM strike near maturity, it may be positive.

Strengths:

- This strategy
- Limited loss exposure if the underlying rises

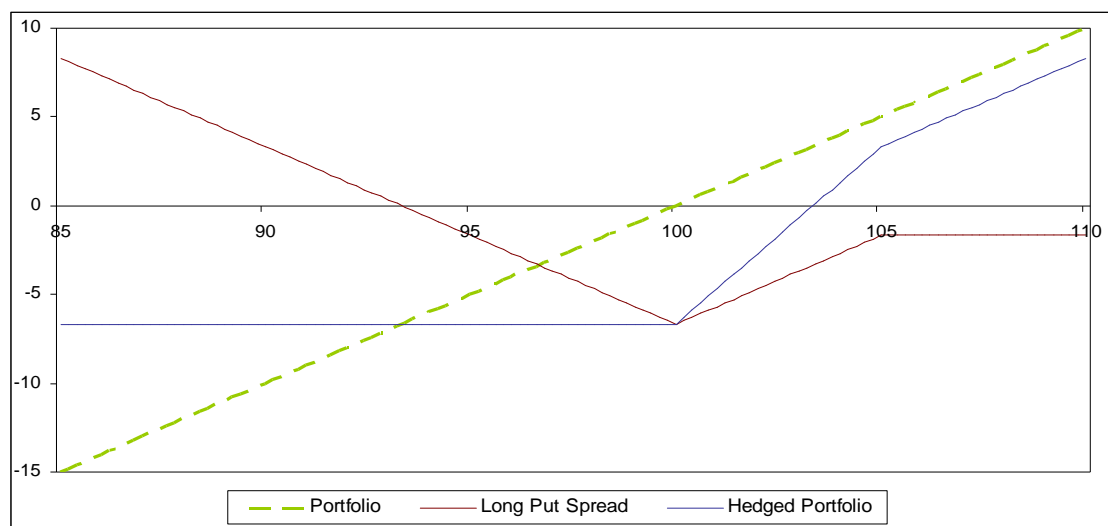
Weaknesses:

- In the case of a market crash (-10%), the protection does not work.
- Delta is positive at inception
- This strategy represents a hedging **at maturity.**

N is traditionally equal to 2 but can theoretically have any value (N can neutralize the Delta, Gamma or Vega exposure at inception; it can offset the value of the long put...)

Price: Maturity: 6M Underlying: SX5E Strike: 95%/100% **Price: -1.1%**

Long Put Ratio Back Spread



2 Long ATM Puts and Short ITM Put

Market expectation: market bearish / volatility bullish

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited
- Break-even: higher break-even point: ITM Put Strike
lower break-even point: ATM Puts' Strike – Strategy Premium

Market sensitivities at 30 days to expiry:

- **Delta:** Approaches -1 as underlying falls. If approaching expiry, the underlying is around the ATM strike, the delta may become positive.
- **Gamma:** Highest at the ATM strike and declines as the underlying falls below this point. If approaching expiry, the underlying is at the ITM strike, the gamma may become negative.
- **Theta:** Value of position will decrease as the long options are effected by time decay. If the underlying remains above, or around the ITM strike, the theta may become positive.
- **Vega:** Value of position will increase as implied volatility increases. If, approaching expiry, the underlying is around the ATM strike, the vega may become negative.

Strengths:

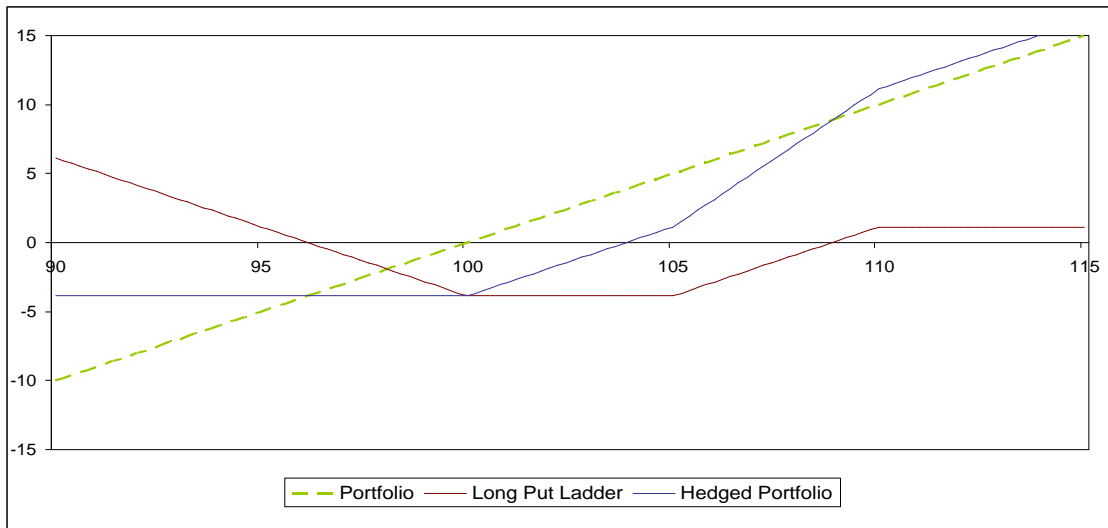
- The low price
- Limited loss exposure if the underlying rises

Weaknesses:

- Volatility has to be at a high level in order to reach 95 or 105, if not the strategy loses money

Price: Maturity: 6M Underlying: SX5E Strike: 100%/105% **Price: 1.8%**

Long Put Ladder



Long ATM Put, Long Put 105 and Short Put 110

Market expectation: market bearish / volatility bullish

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited
- Break-even: higher break-even point: ITM Put Strike
lower break-even point: ATM Puts' Strike – Strategy Premium

Market sensitivities at 30 days to expiry:

- **Delta:** Approaches -1 as underlying falls. If approaching expiry, the underlying is around the 105 or 110, the delta may become positive.
- **Gamma:** Highest between 100 and 105. If approaching expiry, the underlying is at 110, the gamma may become negative.
- **Theta:** Value of position will decrease as long options are effected by time decay. If the underlying remains above, or around 110, the theta may become positive.
- **Vega:** Value of position will increase as implied volatility increases. If, approaching expiry, the underlying is around 110, the vega may become negative.

Strengths:

- This is a credit strategy
- Limited loss exposure if the underlying rises and even potential upside

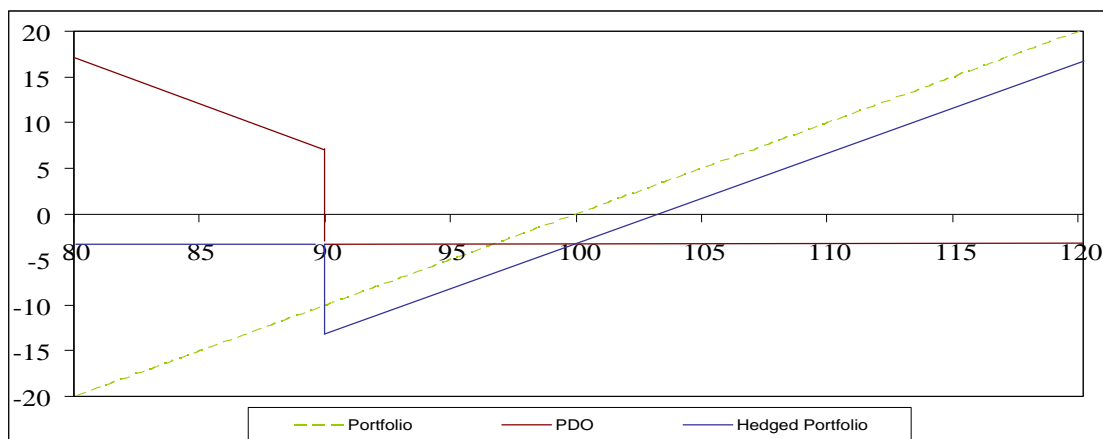
Weaknesses:

- Volatility has to be at a high level in order to reach the break-even points, if not the strategy loses money

Price: Maturity: 6M Underlying: SX5E Strike: 100%/105%/110% **Price: 0.9%**

III. Exotic and structured products

Long Barrier Put Down & In



Long ATM PDI, barrier 90%

Market expectation: market bearish / volatility bullish

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited
- Break-even: PDI barrier

Market sensitivities at 30 days to expiry:

Underlying	down	ATM	up
Delta	---	--	-
Gamma	++	+++	++
Vega	+	++	+
Theta	-	--	-

This strategy will be preferred in the anticipation of a bear market which will fall below the barrier.

Strengths:

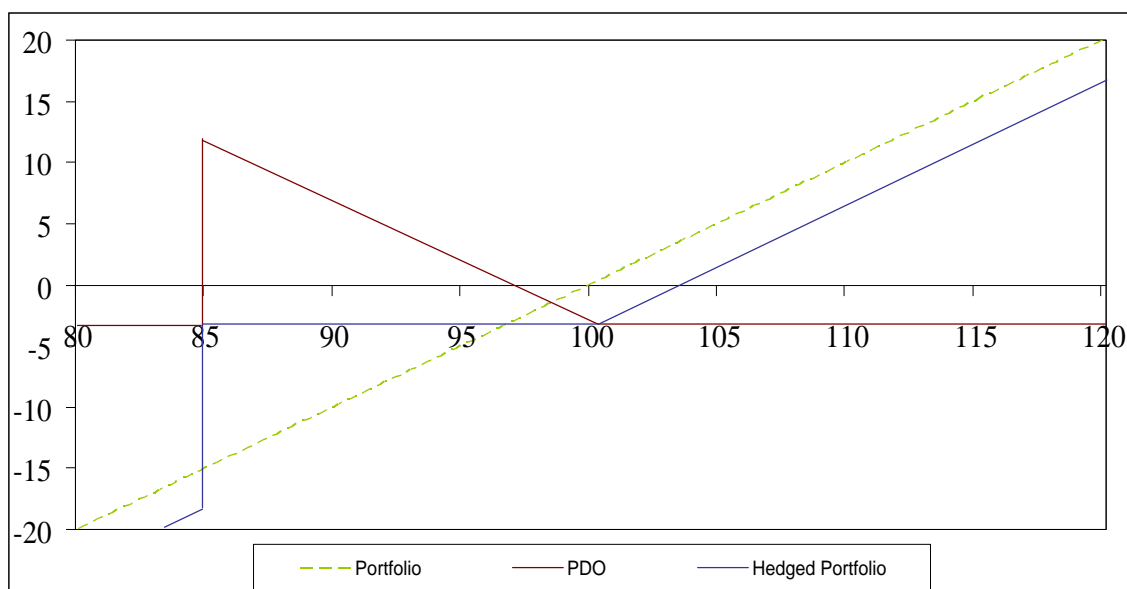
- Cheaper than the Put
- This strategy is cheaper when the volatility is low.

Weaknesses:

- No hedging at all if the underlying does not fall below the barrier.

Price: Maturity: 6M Underlying: SX5E Strike: 100% Barrier (US): 90% **Price: 3.6%**

Long Barrier Put Down & Out



Long ATM PDO, barrier 85%

Market expectation: market bearish / volatility bearish

Hedge and loss characteristics at expiry:

- Hedge: limited
- Loss: limited
- Break-even: higher break-even point: PDI Strike – PDI Premium
lower break-even point: PDI Barrier

Strengths:

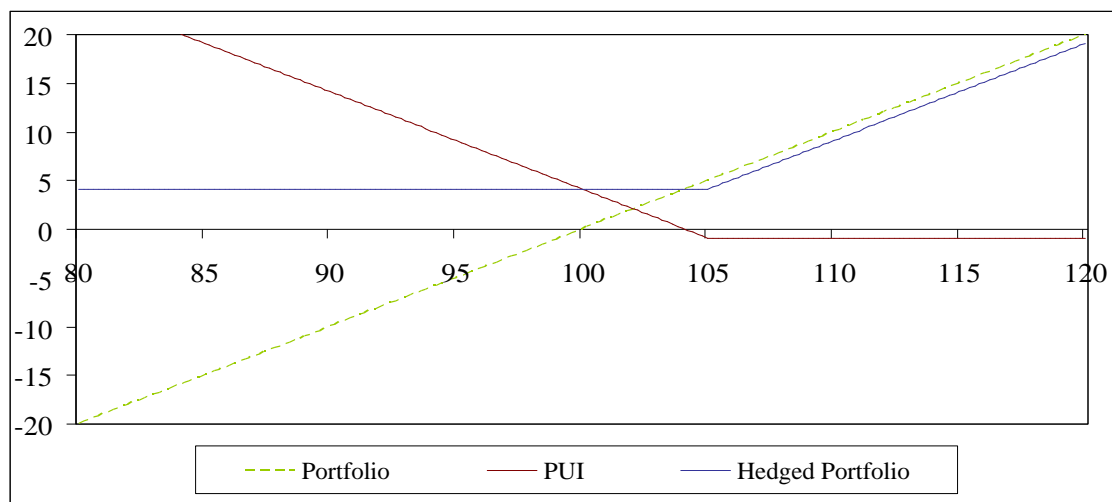
- The really low price
- This strategy is cheaper if the volatility is high.

Weaknesses:

- Limited profit if the underlying falls.
- No hedging at all if the underlying falls below the barrier.

Price: Maturity: 6M Underlying: SX5E Strike: 100% Barrier (US): 85% **Price: 1.7%**

Long Barrier Put Up & In



105% Put Up & In, barrier 105%

This payoff is activated only if the portfolio reaches 105 before declining. If not, the payoff is null.

Market expectation: Still 5% growth at least, before a bear market.

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited
- Break-even: PUI barrier

Strengths:

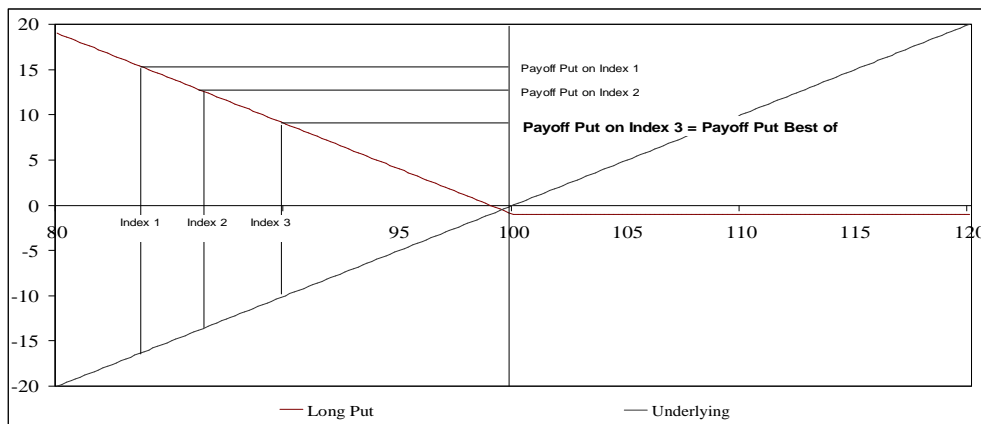
- The price is low
- This protection takes advantage of a market which still has upside potential, before an anticipated fall.

Weaknesses:

- No hedging at all if the underlying does not reach the barrier before it falls.

Price: Maturity: 6M Underlying: SX5E Strike: 105% Barrier (US): 105% **Price: 2.2%**

Long Put Best of



Market expectation: market bearish / volatility bullish

This option hedges against a general decrease of the markets. It is generally indexed on three indices; for example the main global indices: Eurostoxx50, S&P500 or Nikkei225.

The payoff at maturity: $100\% - (\text{last level} / \text{initial level})$ of the best of the 3 indices, if this is positive.

The high level of the correlation between these indices in the case of a fall of the markets explains the limited underperformance of the best index versus the basket of the 3 indices. Despite this fact, the Put Best of costs about half the price of a put on the basket and about a quarter of the price of a put on the SX5E (at given maturity and strike).

Example:

Index	NKY	S&P	SX5E
Perf	-10%	-13%	-15%

The retained performance would be the one of the NKY.

The payoff at maturity would be: $100\% - 100\% * (1 - 10\%) = 10\%$

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited to the premium paid
- Break-even: Put Best Of Strike – Put Best Of Premium

Strengths:

- Cheaper than the Put on the basket
- Benefits from market crash (volatility up and correlation up)

Weaknesses:

- There must be a maximum correlation between the best index on the period and the portfolio which has to be hedged in order to prevent a dramatic underperformance of the portfolio compared to the Put Best of.

Price: Maturity: 6M Underlying: SX5E, S&P, and NKY Strike: 100% **Price: 1.25%**

Long Put Look Back

Like the Put Best of, this strategy adapts to market trend.

It can be indexed on a basket of the three main global indices: SX5E, S&P and NKY.

The payoff at maturity: $\text{Strike} - \text{Minimum value of the basket during the option's life}$.

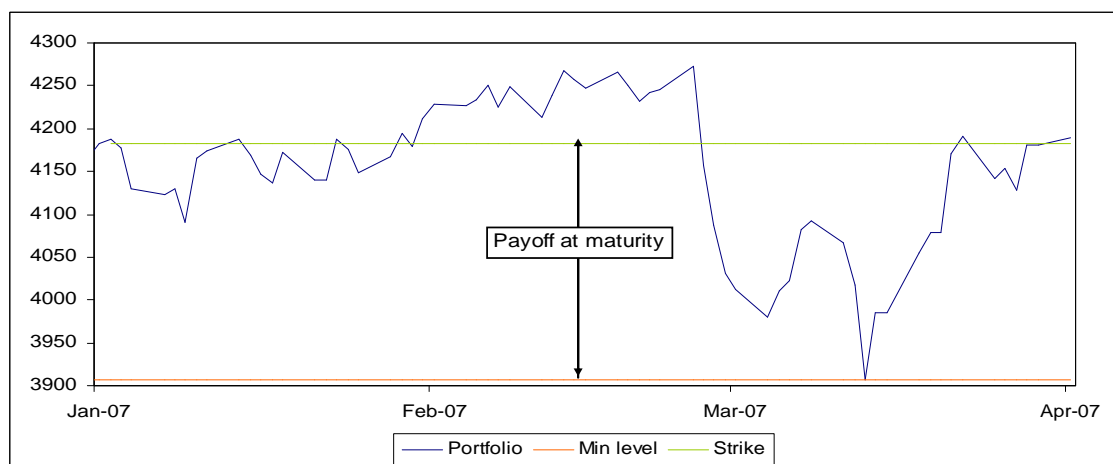
Example:

Maturity: 4 months

Start date: 1st of January 07

Strike: 100%

Price: 4%



The min level guarantees a payoff at maturity of 6.6%.

Even though the portfolio has recovered its initial value, this strategy has a positive impact (2.6% outperformance).

As soon as the portfolio's negative performance offsets the price of the put look back, this hedging strategy wins in all cases.

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: limited to the premium paid (this happens only when the underlying never goes below its initial value)
- Break-even: $\text{Put look back Strike} - \text{Premium}$

Strengths:

- This strategy adapts to market trend: it benefits from the worst observation.

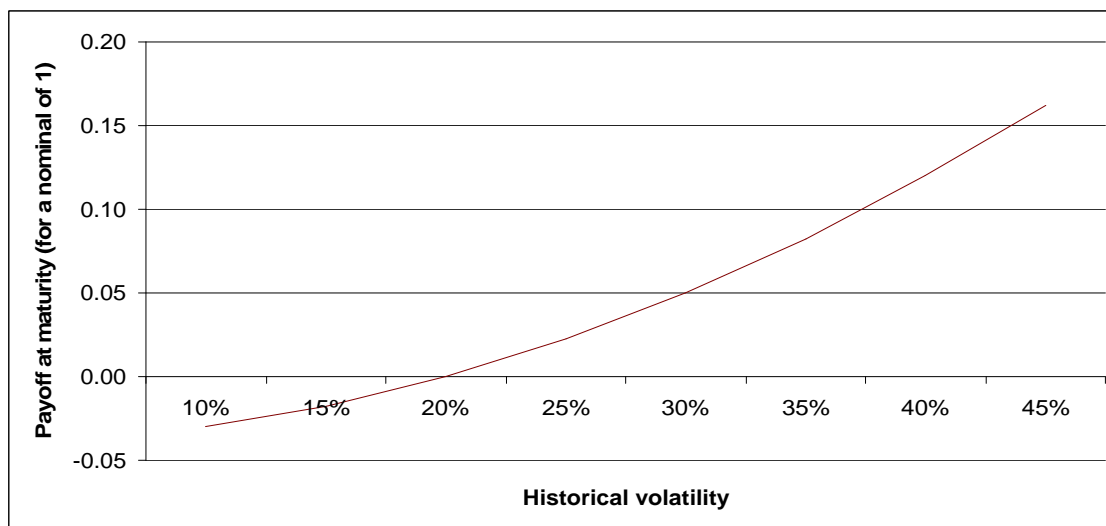
Weaknesses:

- The price: the Put Look Back is very sensitive to volatility (high vega: low vol \rightarrow low price)

Price: Maturity: 6M Underlying: basket (SX5E, S&P, NKY) Strike: 100% **Price: 5.7%**

IV. Indirect strategies

Long Variance Swaps



Strike 20%. (Variance swap level at inception)

Payoff: Nominal * (Historical Volatility² – Strike²)

Market expectation: market neutral / volatility bullish

Volatility generally increases in the case of a bear market, which should guarantee a positive payoff at maturity.

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: unlimited
- Break-even: HV = Variance Swap Strike

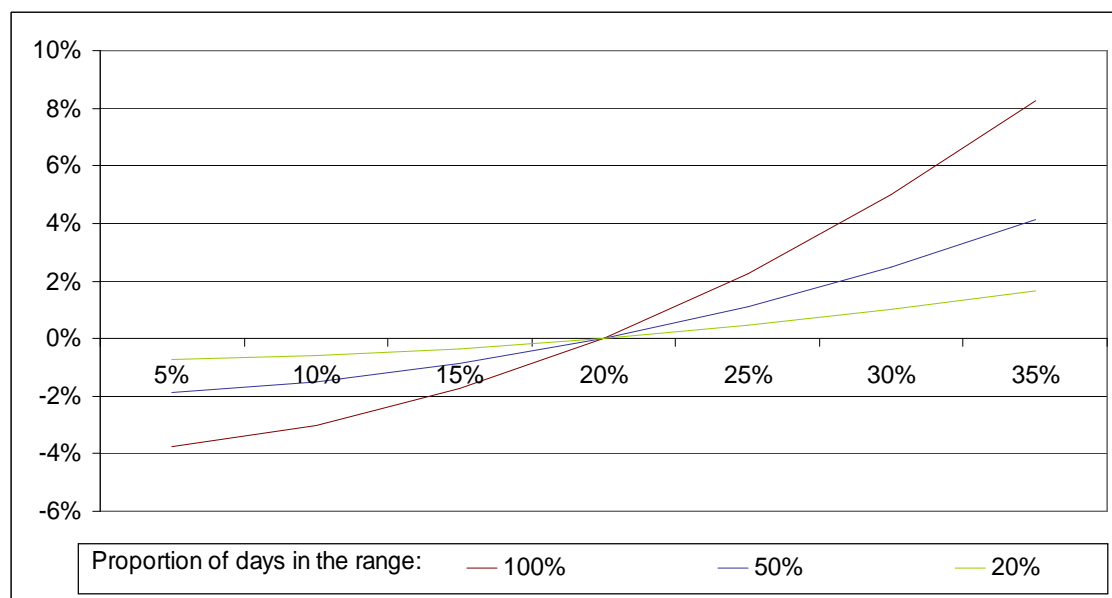
Strengths:

- Absolutely free at inception
- Can eventually benefit from an increase as from a decrease of the underlying
- The asymmetric profile of the payoff

Weaknesses:

- The underlying can decrease with a low volatility, resulting in a negative payoff if HV ends at a level under the strike.

Long Downside Conditional Variance Swaps



Strike 20%

Payoff: (% of days in range) * (Historical Volatility² – Strike²) * Nominal

Market expectation: market bearish / volatility bullish

Conditional variance swaps provide exposure to an asset's realized volatility, but only when the underlying trades within a pre-specified range.

In the case of a downside conditional variance swap, we only take into account the volatility exposure when the asset trades below the previous fixed barrier.

With a barrier at 90%, any small decrease of the underlying (resulting in small HV level) is not taken into account.

Hedge and loss characteristics at expiry:

- Hedge: unlimited
- Loss: unlimited
- Break-even: HV = Variance Swap Strike

Strengths:

- Absolutely free at inception
- The conditional aspect avoids the potential loss of the strategy in the case of a small decrease.
- The asymmetric profile of the payoff

Weaknesses:

- The underlying can decrease below the barrier with a low volatility, resulting in a negative payoff if HV ends at a level under the strike.

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