

- Implied Assets: how to generate uncorrelated returns? -

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LYXOR

Fabrice Tenga
Head of Quantitative Management

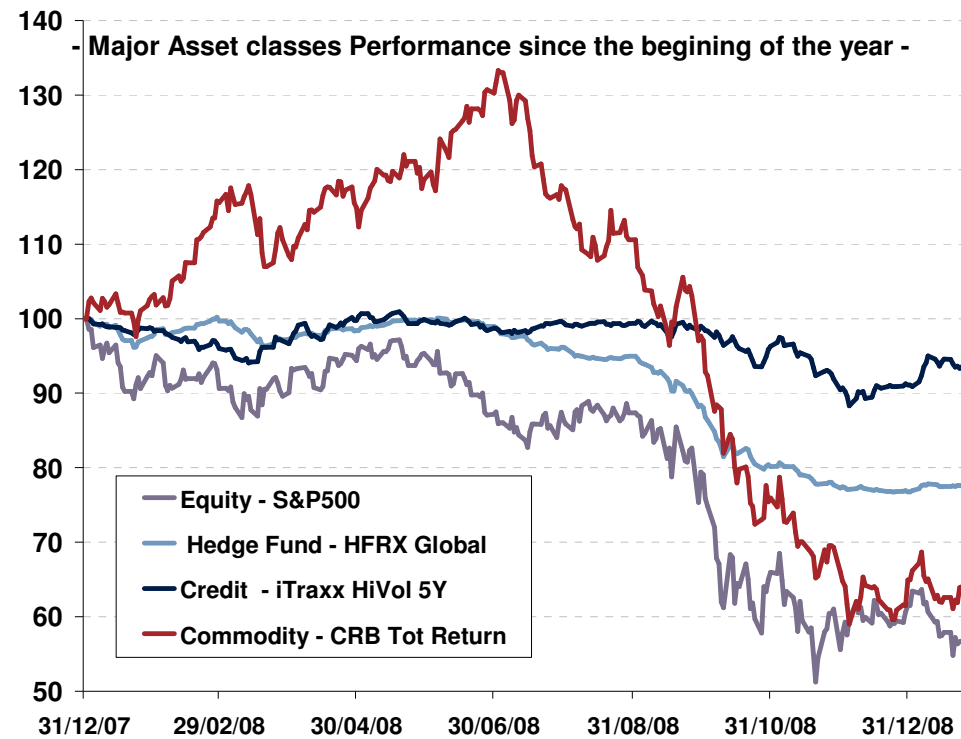
- Contents
- **Implied Volatility as an example of implied Assets**
- **Implied Assets: how to turn market opportunities into investment strategies ?**
- **Implied Assets: investment strategies that generate uncorrelated returns**



- Implied Volatility as an example of implied Assets -

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- IMPLIED ASSETS: LOOKING FOR UNCORRELATED ASSET CLASSES 1/2 -
- We observe in the recent crisis a strong correlation among various asset classes

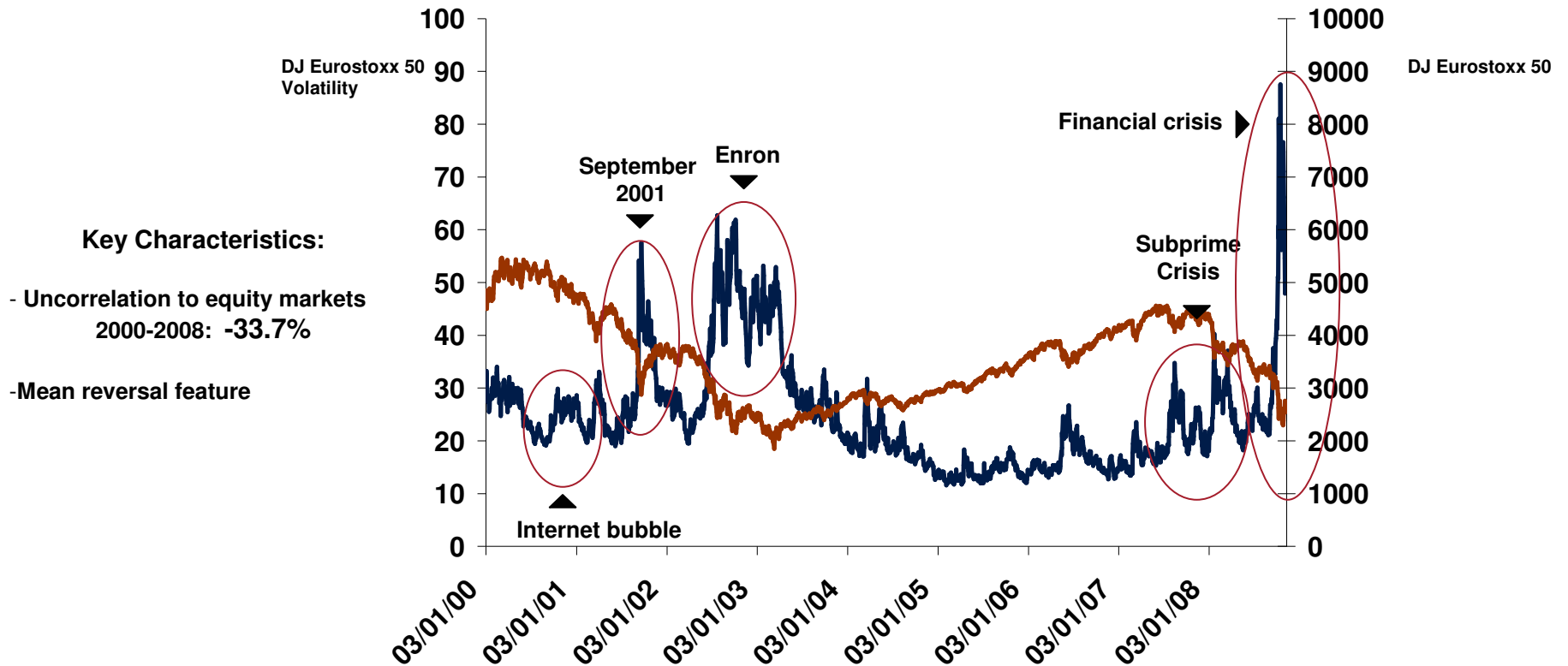


- Institutional investors are looking for non correlated asset classes or systematic hedge against equity market decrease: implied asset and especially volatility turn out to be an attractive opportunity

Source: Lyxor, Bloomberg

- IMPLIED ASSETS: LOOKING FOR UNCORRELATED ASSET CLASS 2/2 -
- Volatility offers specific characteristics: uncorrelation and mean reversal feature -

- DJ Eurostoxx 50 and underlying volatility index (V2X) since early 2000 -



Key Characteristics:

- Uncorrelation to equity markets
2000-2008: -33.7%
- Mean reversal feature

Source: Lyxor, Bloomberg

- VOLATILITY AS A SOURCE OF ARBITRAGE STRATEGIES

- Volatility: from hedging strategies to arbitrage strategies

- Volatility surface

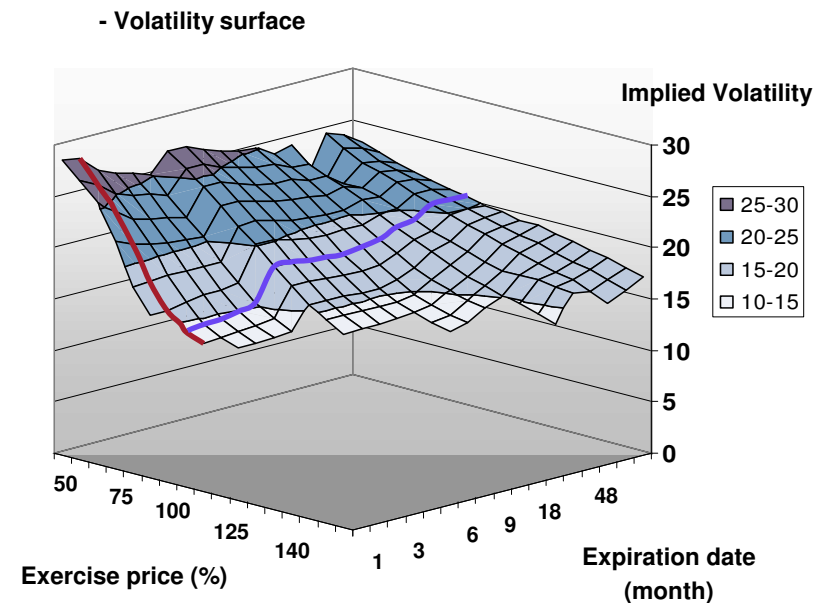
All the implied volatilities inside option prices are represented as a function of two parameters: exercise price and expiration date

The volatility surface presents an irregular structure that can change over time. Its shape and deformations offer multiple opportunities of arbitrage:

« Smile » or « Skew »



Term structure of volatility



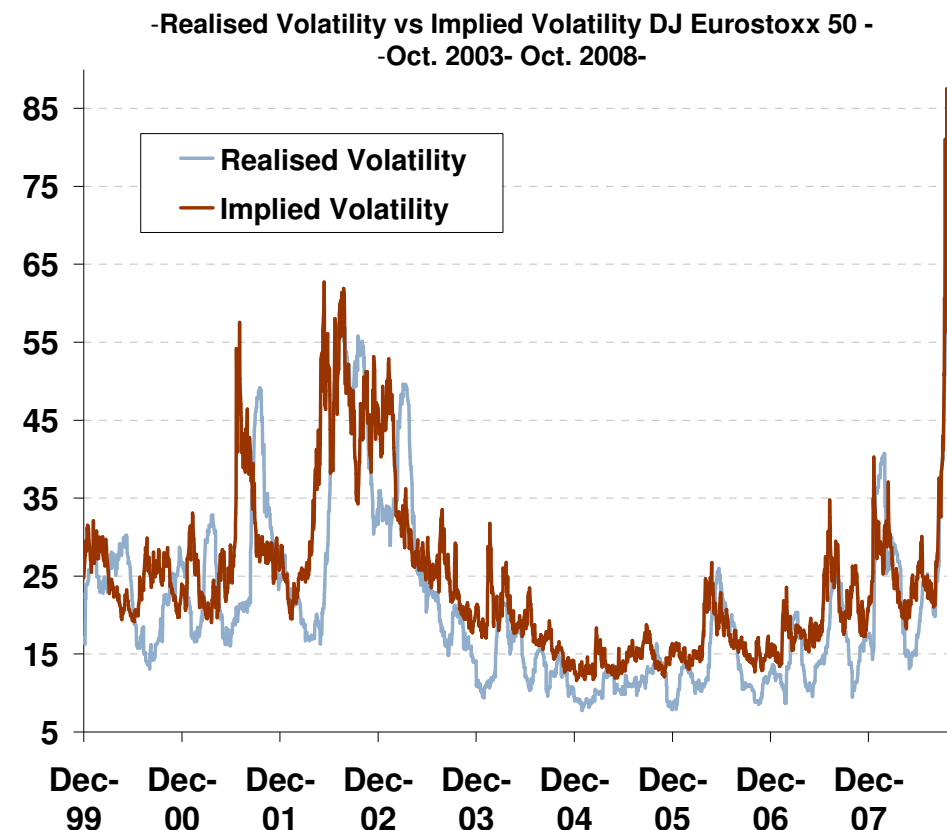
► Various investment strategy opportunities

Source: Lyxor, December 2007

- TRADING VOLATILITY 1/3 -
- Realised Volatility vs Implied Volatility -

Realised or Historical Volatility is an backward looking measure over a given time period. Realised Volatility is calculated by determining the standard deviation form the average price in the given time period.

Implied Volatility is a forward looking measure derived from the market price of option. Implied volatility is an ex ante measure that reflects the forecast of market (investors) on the future realised volatilities on different maturities.

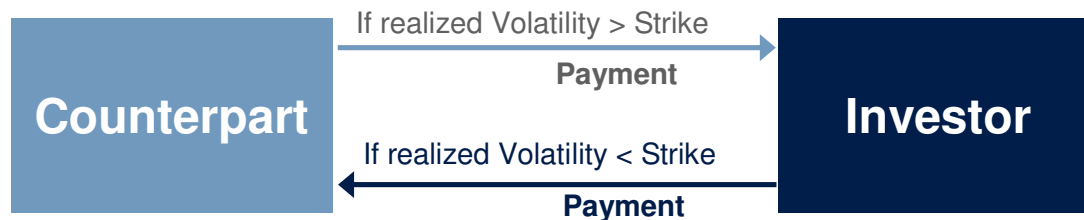


Realised Volatilitéé 1M vs Implied Volatility V2X. Source: Lyxor, Bloomberg

- **TRADING VOLATILITY THROUGH VARIANCE SWAP -**

- **Variance Swap definition -**

- A Variance Swap is a forward contract on annualized realized variance, the square of volatility
- The buyer of a Variance Swap is swapping a pre-determined fixed level (the strike) against an unknown realized Variance (floating) over a given period of time (typically between the trade date and the maturity)
- The payout of a long investor Variance Swap position vs a counterpart is:



- A Variance Swap can be viewed as a portfolio of Call and Put options but this instrument is much more simple to trade than options which require daily hedge with futures

Variance Swap can be a very simple and an efficient instrument to get a pure exposure to volatility

- TRADING VOLATILITY 2/3 -
- Volatility Smile of S&P 500 -

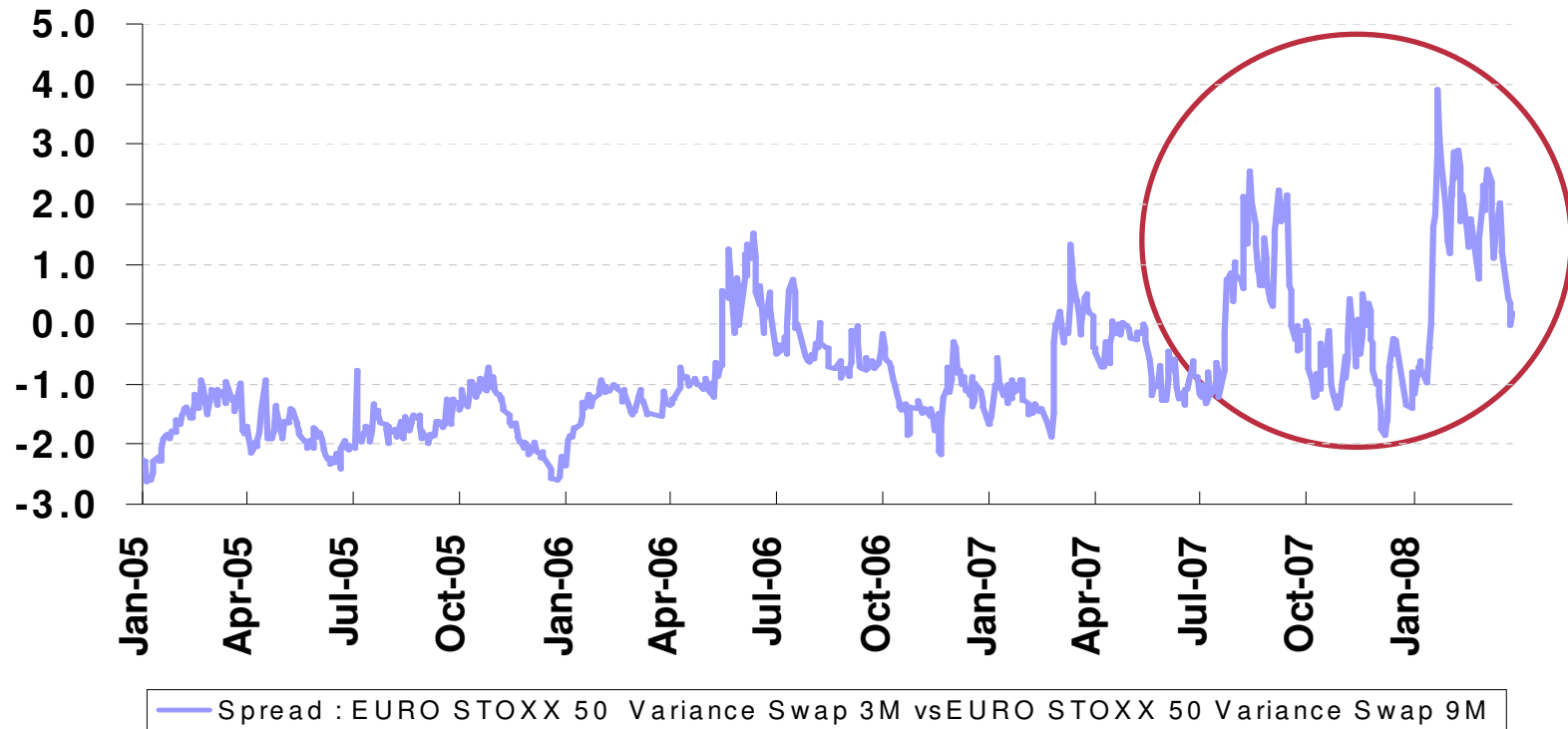
- Smile S&P 500 (Jan. 2005 - Mar. 2008)



Source: Lyxor , Société Générale, March 2008

- TRADING VOLATILITY 3/3 -
- Term Structure of Volatility of Eurostoxx 50 -

- Term Structure of Volatility Eurostoxx 50 (Jan. 2005 - Mar.2008)



Source: Lyxor, Société Générale, mars 2008



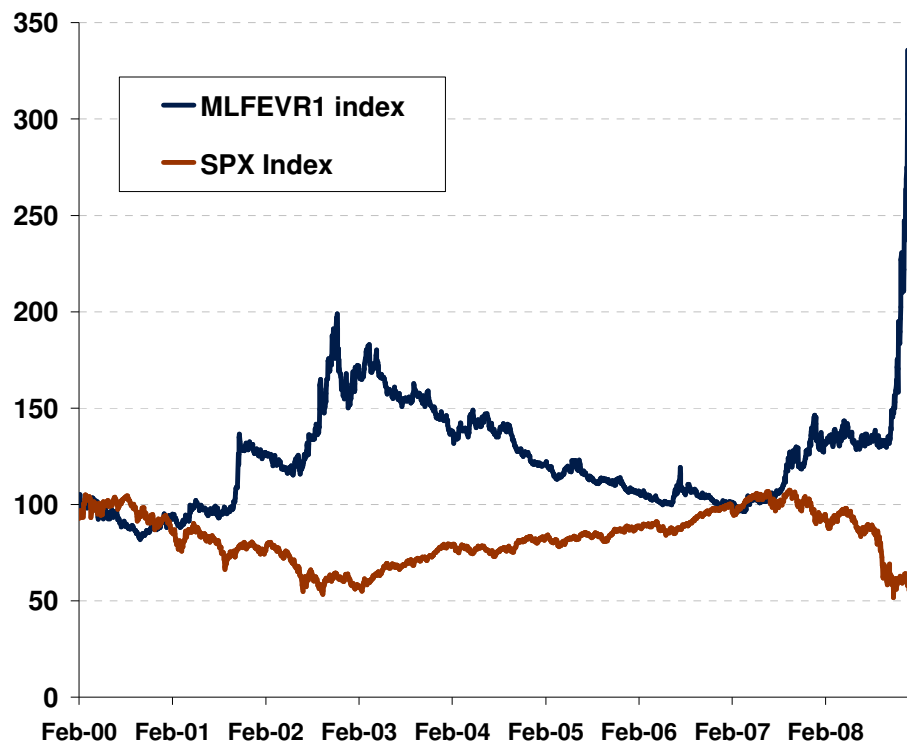
- Implied Assets: how to turn market opportunities into investment strategies ?-

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-VOLATILITY AS A HEDGING TOOL: SIMPLE STRATEGY -

- Long exposure volatility strategy offers a good hedge in crisis periods... but suffers heavy negative costs of carry during other periods

- S&P 500 and MLFEVR Index since early 2000 -



Since January 3rd 2000	Long Volatility Strategy (MLFEVR1 index)	Equity Index (S&P500 Index)
2008	68,76%	-38,49%
2007	30,20%	3,53%
2006	-5,50%	13,62%
2005	-11,57%	3,00%
2004	-12,08%	8,99%
2003	-19,99%	26,38%
2002	35,41%	-23,37%
2001	36,24%	-13,04%
2000	-6,78%	-9,27%

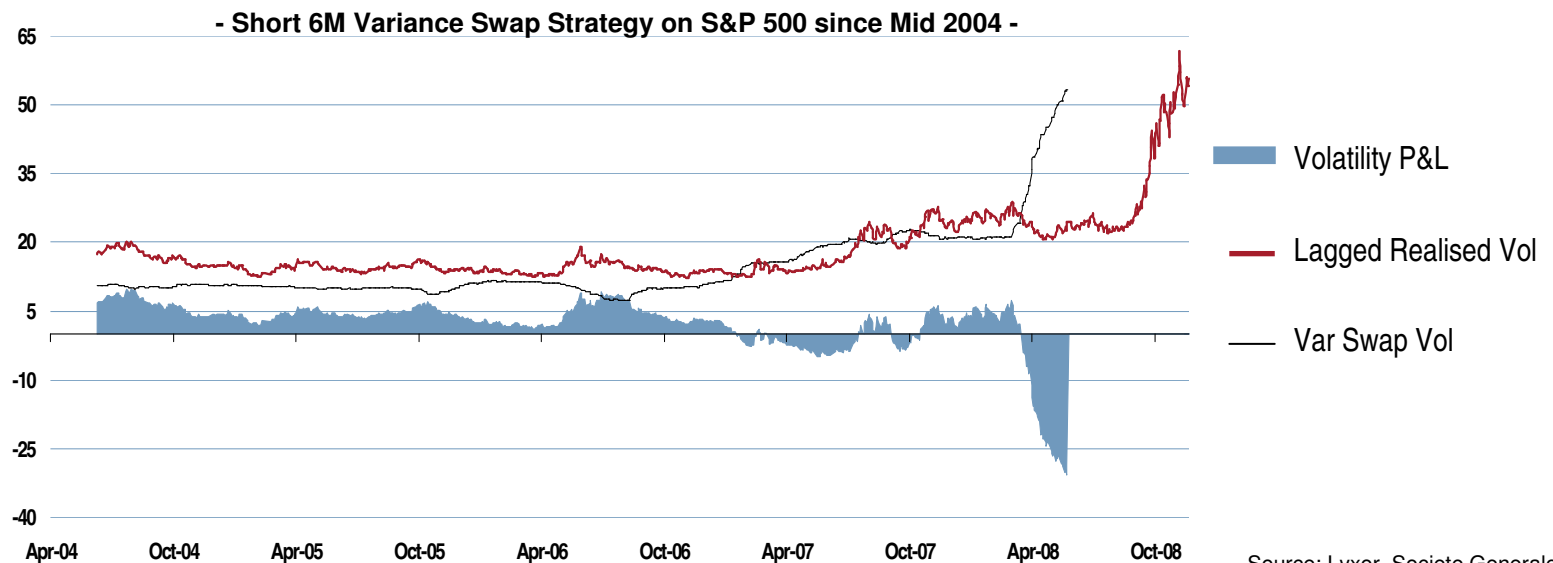
-MLFEVR Index consists of a systematically rolled long positions on forward starting variance swaps on S&P 500
 -Forward starting variance swaps (eg 3M in 3M forward volatility swaps) gives you a pure exposure to implied volatilities, usually at an extra cost due to the upward sloping curve of the term structure

How to compensate this negative carry?

Source: Lyxor, Bloomberg, Merrill Lynch

-VOLATILITY AS A HEDGING TOOL: LOOKING FOR POSITIVE CARRY

- Combining long volatility exposure with other positions generating positive carry on the long term.
- Using volatility to generate a positive carry
- Implied volatility is usually higher than realized volatility as market takes into account extreme risk realization (Volatility Risk Premium)
- A short exposure to spot index volatility through Spot Start Variance Swaps generates a positive carry under normal market environment but will suffer from short term realised volatility spike.



- VOLATILITY AS A HEDGING TOOL: SOPHISTICATED SOLUTION COMBINING LONG VOLATILITY EXPOSURE AND POSITIVE CARRY

- Philosophy

- **Index implied/realized volatility arbitrage strategy** offering long volatility exposure and positive carry

- Market inefficiencies

- Volatility term structure might be temporary flat or inverted
- Implied volatility is usually higher than realized volatility as market takes into account extreme risk realization

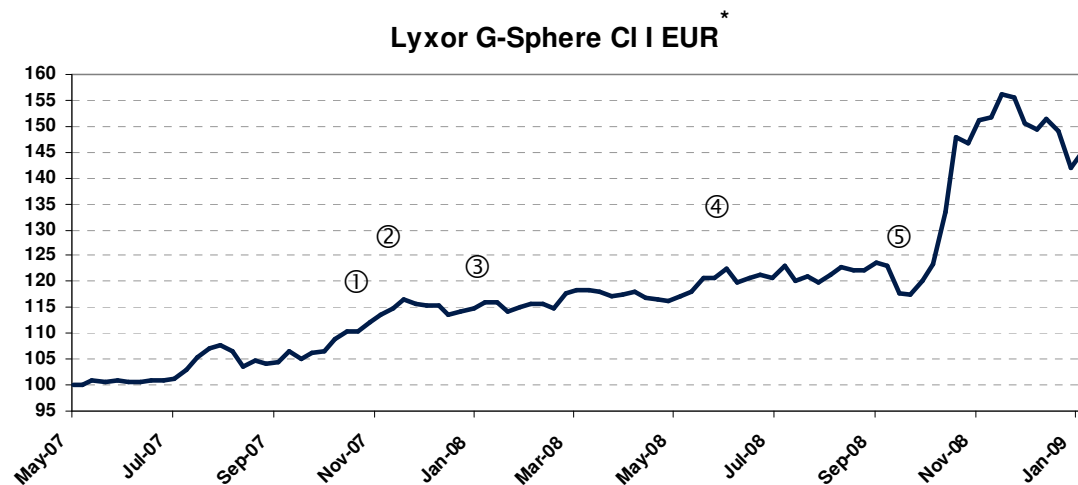
- Strategy implementation

- Index implied/realized volatility arbitrage are implemented through two legs:
 - Long exposure to implied volatility of indices through Forward Start Variance Swaps (generating positive vega exposure)
 - Short exposure to spot index volatility through Spot Start Variance Swaps (generating positive carry)
- Active management of the net Vega exposure (key to lock profits)

- Sensitivities

- Vega: positive
- Correlation: neutral

- INDEX IMPLIED/REALIZED VOLATILITY ARBITRAGE STRATEGY PERFORMANCE



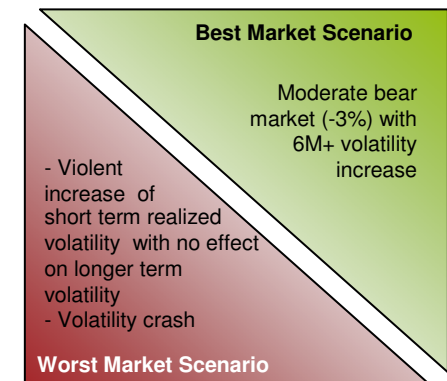
-KEY FIGURES-

- Performance since inception	50,88%
- Annualized rate of return	27,30%
- Annualized volatility	14,33%
- Sharpe ratio (r= 3M Euribor)*	1,57
*risk free rate	

- ❶ In October the fund benefited from the short volatility positions thanks to the moderate movements on the market.
- ❷ The majority of the profit generated in October and November by long exposure to stock volatility has been protected in December through lowering of the leverage on these positions.
- ❸ The fund suffered from the high realized volatility on the second half of January. The losses have been offset by the gains on the long fwd vol positions and the fund is flat over January.
- ❹ The Fund benefited from the volatility spike during the beginning of the month. Gain was then locked and the Fund did not suffer from the subsequent decrease in volatility during the second half of the month. In addition, the fund benefited from the reversion to a more normal slope in the term structure of volatility
- ❺ The Fund suffered from the important increase of realized Volatility in the market rebound of Sept. 19th (unusual adverse scenario)

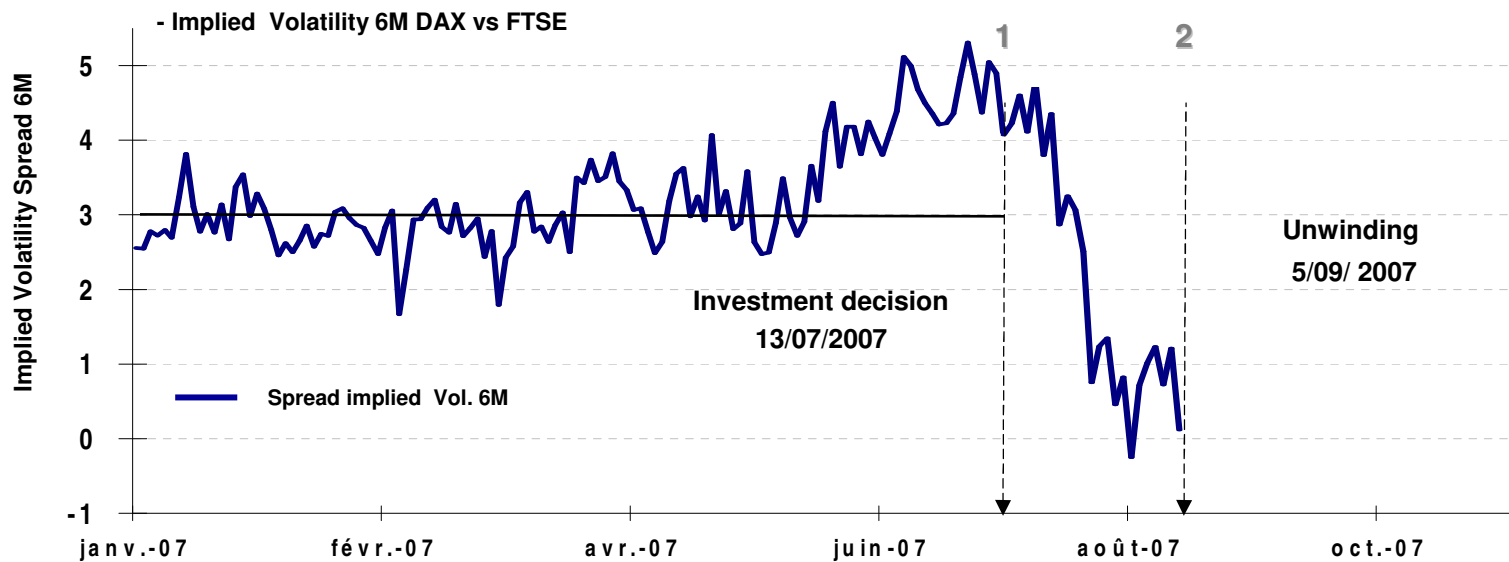
Figures since inception in May 2007, as of Jan. 20th 2009

Past performance does not guarantee future results



– EXAMPLE OF INDEX VOLATILITY ARBITRAGE STRATEGY 1/3 –

– Implied Volatility arbitrage DAX vs FTSE –



-Strategy long IV FTSE Short IV DAX
-Rationale: spread on the historical highest
Anticipated volatility on Financial sector



Source: Lyxor, February 2008

- EXAMPLE OF INDEX VOLATILITY ARBITRAGE STRATEGY 2/3 -

- Philosophy

- Advanced **index volatility arbitrage strategy** taking advantage of the mean reversion feature of index volatility

- Market inefficiency

- Both intra-zone and inter-zone Index volatilities are correlated on mid-term basis however market might temporary price a non-convergence

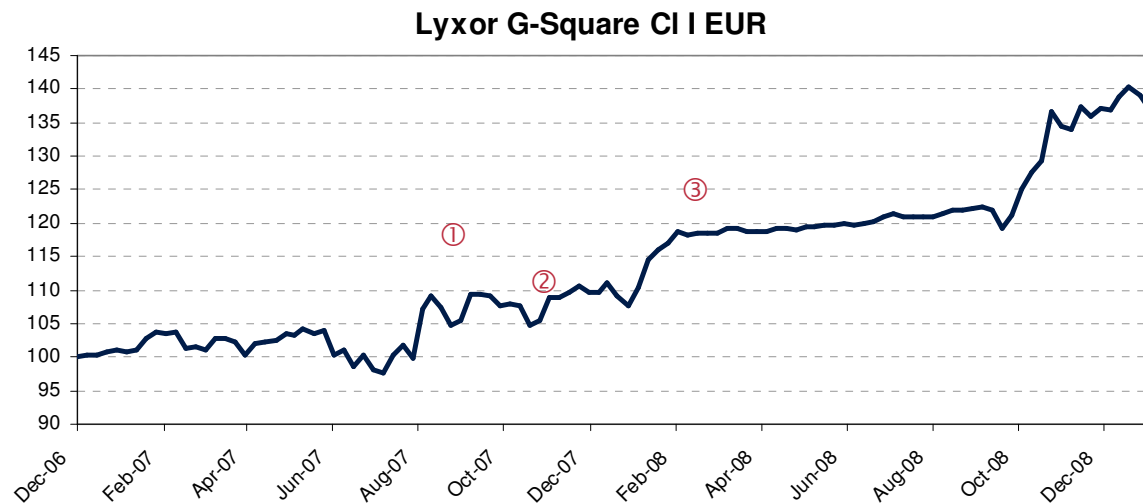
- Strategy implementation

- Index volatility arbitrage are implemented through two different approaches:
 - Arbitrage on implied volatility term structure of indices through Forward Start Variance Swaps
 - Arbitrage on implied vs realized volatility of different indices through Spot Start Variance Swaps

- Sensitivities

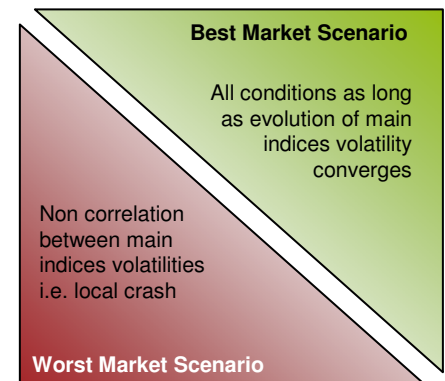
- Vega: neutral
- Correlation: neutral

-EXAMPLE OF INDEX VOLATILITY ARBITRAGE STRATEGY 3/3 -



- ❶ Rise in Asian index volatilities during July and August
- ❷ In October the fund suffered from a decrease in correlation between European and US markets
- ❸ The fund benefited in January from volatility spreads between American and European/Asian indices.

-KEY FIGURES-	
- Performance since inception	38,01%
- Annualized rate of return	16,50%
- Annualized volatility	11,02%
-Sharpe ratio (r= 3M Euribor)*	1,08
*risk free rate	



*Figures since Inception in December 06, as of January 20,2009 - Class EUR

Past performance does not guarantee future results

Implied Assets: how to generate uncorrelated returns?

December 2008

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- EXAMPLE OF DISPERSION ARBITRAGE STRATEGY 1/2 -


- Philosophy

- Optimized dispersion strategy based on **arbitrage between specific stocks and indices volatilities**

- Market inefficiency

- The spread of realized vs implied volatility of certain stocks is undervalued with respect to their market

- Strategy implementation

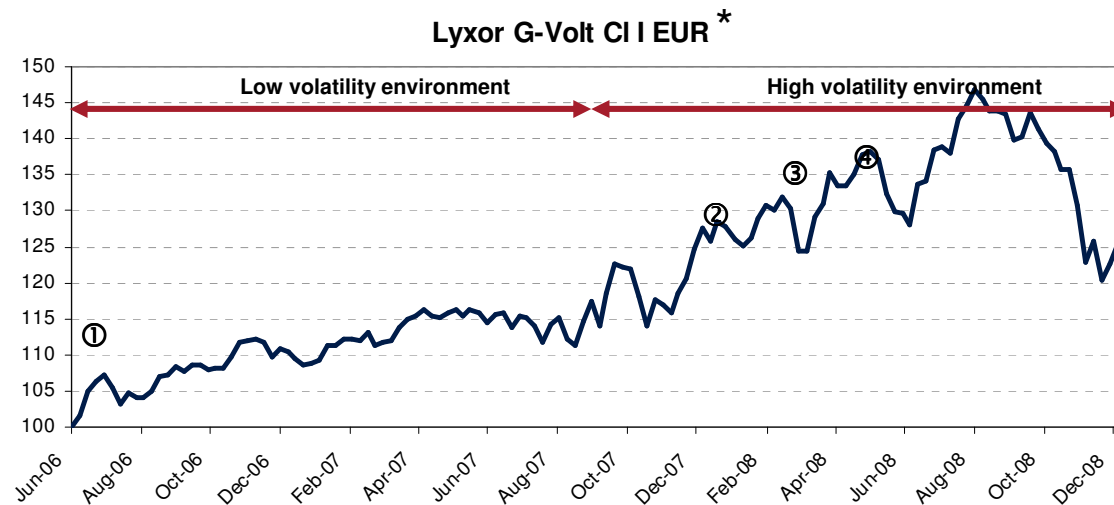
- Arbitrage between stocks and indices volatilities through:
 - Long position on 2-Year realized volatility of selected stocks
 - Short position on 2-Year realized volatility of underlying indices
-  Long dispersion position

- Tactical adjustment of net Vega exposure

- Sensitivities

- Vega: neutral
- Correlation: negative

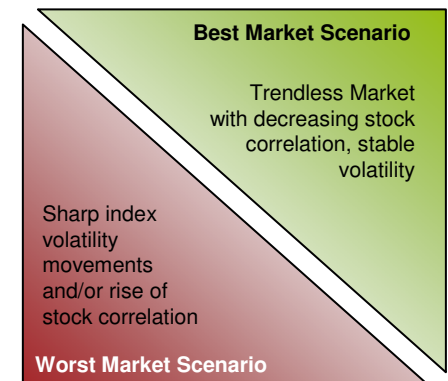
-EXAMPLE OF DISPERSION ARBITRAGE STRATEGY 2/2 -



-KEY FIGURES-

- Performance since inception	21,04%
- Annualized rate of return	7,54%
- Annualized volatility	14,97%
-Sharpe ratio (r= 3M Euribor)*	0,21
*risk free rate	

- ❶ The fund benefited from a good entry point as the level of volatility indices was high.
- ❷ Significant positive performance thanks to its negative sensitivity to implied correlation which has dropped in financial markets.
- ❸ The fund resisted to the sharp decrease of equity markets as consequence of implied correlation decrease and stocks basket diversification.
- ❹ Real capacity to quickly recover whether the market fall continues or the markets rebound.



*Figures since Inception in June 06, as of January 20,2009- Class EUR

Past performance does not guarantee future results

Implied Assets: how to generate uncorrelated returns?

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- EXAMPLE OF SOPHISTICATED EXOTIC OPTION STRATEGY: SKEW /SMILE VOLATILITY ARBITRAGE STRATEGY 1/3-

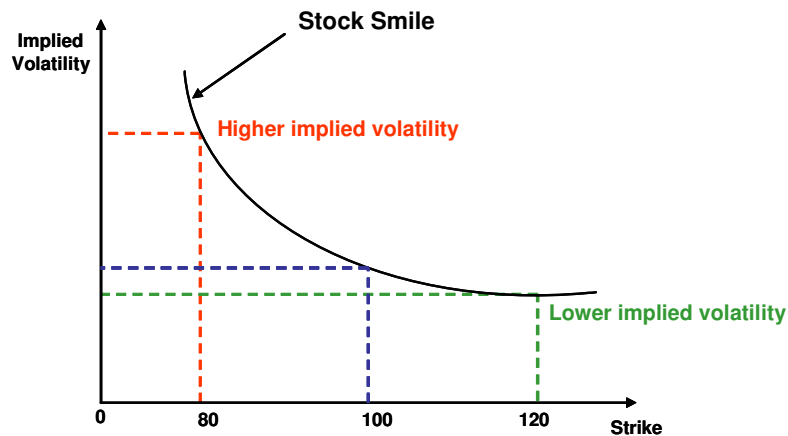
- Philosophy

- **Skew /Smile volatility arbitrage strategy** offering long volatility exposure

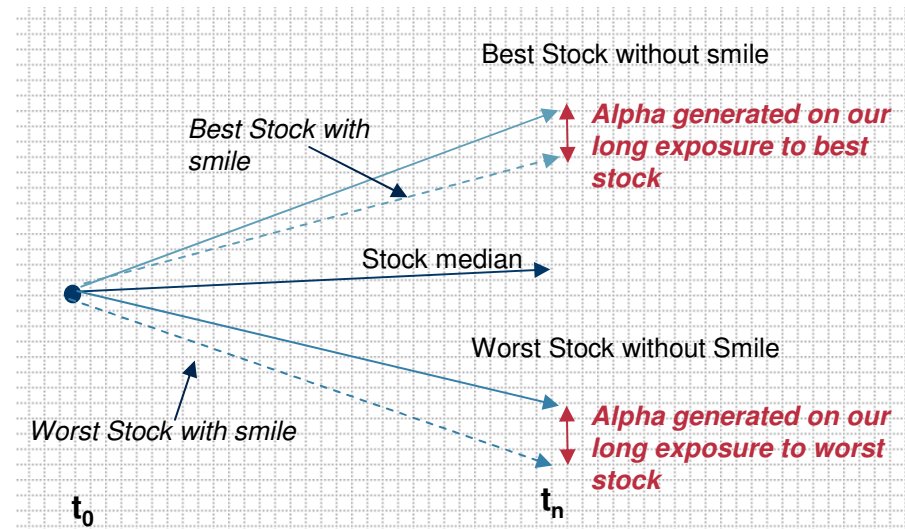
- Market inefficiencies

- On a short term basis, the non-realization of the smile of volatility generates investment opportunities

Volatility Smile



Stock performance



- EXAMPLE OF SOPHISTICATED EXOTIC OPTION STRATEGY: SKEW /SMILE VOLATILITY ARBITRAGE STRATEGY 2/3 -

- Philosophy

- **Skew /Smile volatility arbitrage strategy** offering long volatility exposure

- Market inefficiencies

- On a short term basis, the non-realization of the smile of volatility generates investment opportunities

- Strategy implementation

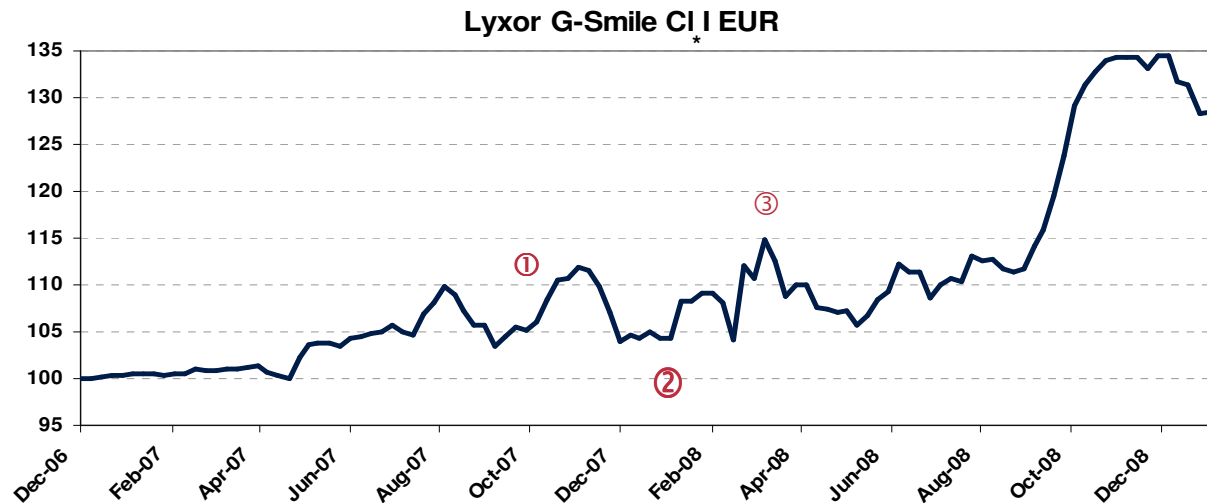
- Compute a basket of stocks with low implied volatility and high smile
- Exploit the undervaluation of the best performing stocks of this basket and the undervaluation of the worst performing stocks of this same basket

$$\text{Basic Pattern Lyxor G-Smile} = \sum_{i=1}^{10} \text{Max}(\text{Floor}; (\text{PerfUpBasket}_i + \text{PerfDownBasket}_i) / 2 - \text{PerfMedianBasket}_i - \text{strike})$$

- Sensitivities

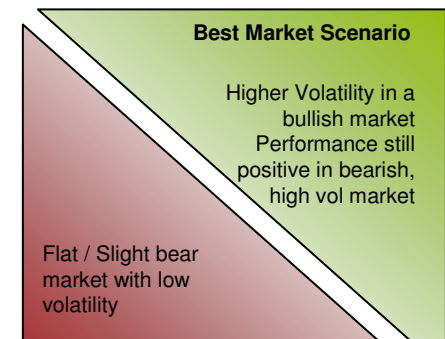
- Vega: positive
- Correlation: negative

-EXAMPLE OF SOPHISTICATED EXOTIC OPTION STRATEGY: SKEW /SMILE
VOLATILITY ARBITRAGE STRATEGY 3/3 -



-KEY FIGURES-	
- Performance since inception	28,82%
- Annualized rate of return	12,75%
- Annualized volatility	11,35%
-Sharpe ratio (r= 3M Euribor)*	0,72
*risk free rate	

- ① Strong performance thanks to the increase of stock markets and the decrease of the correlation between shares.
- ② The fund exhibited in January a long vol behavior and benefited from the spike of volatility.
- ③ Strong performance in March due to a spike in volatility and sharp increase of certain stocks with high volatility



*Figures since Inception in December 06, as of January 20,2009 - Class EUR

Past performance does not guarantee future results

Implied Assets: how to generate uncorrelated returns?

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- **Implied Assets: investment strategies that generate uncorrelated returns** -

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- LYXOR G-MULTI -

- Overview -

Investment philosophy

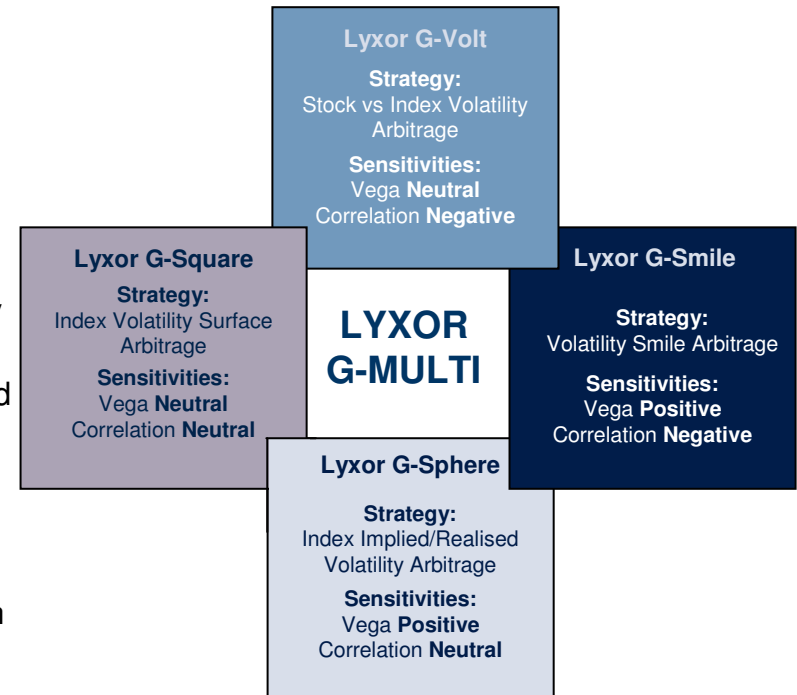
- Combining historically uncorrelated single strategies focusing on “implied assets” (volatility and correlation) linked to the equity markets
- Adding value through active allocation decisions between the strategies
- Benefiting both from diversification and Lyxor strategy allocation expertise

Investment process

- Pure single-strategy trading on implied assets managed by Lyxor experts*
- Individual strategies are model based but actively managed to provide consistent exposure to volatility and correlation
- Assets are shifted between strategies based on the judgment of the management team

Lyxor G-Multi investment objective

- The fund’s objective is to create a higher performance than any individual underlying strategy with a lower aggregate volatility



* There are currently 4 strategies. New strategies might be incorporated in the future.

- COMBINING UNCORRELATED STRATEGIES TO BENEFIT FROM DIVERSIFICATION -

- Lyxor has developed uncorrelated implied assets strategies -

- Generis strategy correlations (in EUR) since May, 9 2007 as of December 29, 2008 -

	Lyxor G-Volt	Lyxor G-Square	Lyxor G-Sphere	Lyxor G-Smile
Lyxor G-Volt	100%	-	-	-
Lyxor G-Square	-11%	100%	-	-
Lyxor G-Sphere	-46%	8%	100%	-
Lyxor G-Smile	-23%	5%	14%	100%

- Those Strategies are uncorrelated or non correlated to equity markets -

-Weekly correlation 2008 -

	S&P 500	DJ Eurostox
Lyxor G-Volt	9,0%	4,0%
Lyxor G-Square	10,8%	8,5%
Lyxor G-Sphere	15,7%	5,2%
Lyxor G-Smile	-16,2%	-19,8%

Weekly correlation - Source: Lyxor, Bloomberg

- LYXOR IMPLIED ASSET STRATEGIES -

-Investment strategies:

ISIN CODE	STRATEGY	INVESTMENT APPROACH	SENSITIVITY		Inception Date
			VEGA	CORRELATION	
JE00B2R5SW95	LYXOR G-MULTI	Multi-Strategy (Active allocation on Generis Strategies)	Active	Active	29-Apr-08
GB00B169J553	LYXOR G-VOLT	Stock vs Index Volatility Arbitrage	Neutral	Negative	06-Jun-06
JE00B1GCTP45	LYXOR G-SMILE	Volatility Smile Arbitrage	Positive	Negative	12-Dec-06
JE00B1GCTR68	LYXOR G-SQUARE	Index Volatility Surface Arbitrage	Neutral	Neutral	12-Dec-06
JE00B1WC087	LYXOR G-SPHERE	Index Implied/Realised Volatility Arbitrage	Positive	Neutral	09-May-07

-Performances (EUR) (as of Dec. 29th 2008):

STRATEGY	1 Year Performance	1 Year Annualized Volatility	1 Year Sharpe (over 3M Euribor)	Annualized Performance (since inception*)	Annualized Volatility (since inception*)	Sharpe since inception* (over 3M Euribor)
Lyxor G-Volt	9,74%	17,51%	0,27	13,52%	13,90%	0,66
Lyxor G-Square	22,48%	9,23%	1,89	17,93%	11,07%	1,20
Lyxor G-Sphere	28,34%	16,40%	1,42	27,47%	13,65%	1,66
Lyxor G-Smile	21,34%	14,28%	1,14	14,21%	11,36%	0,84

-Your Contact:

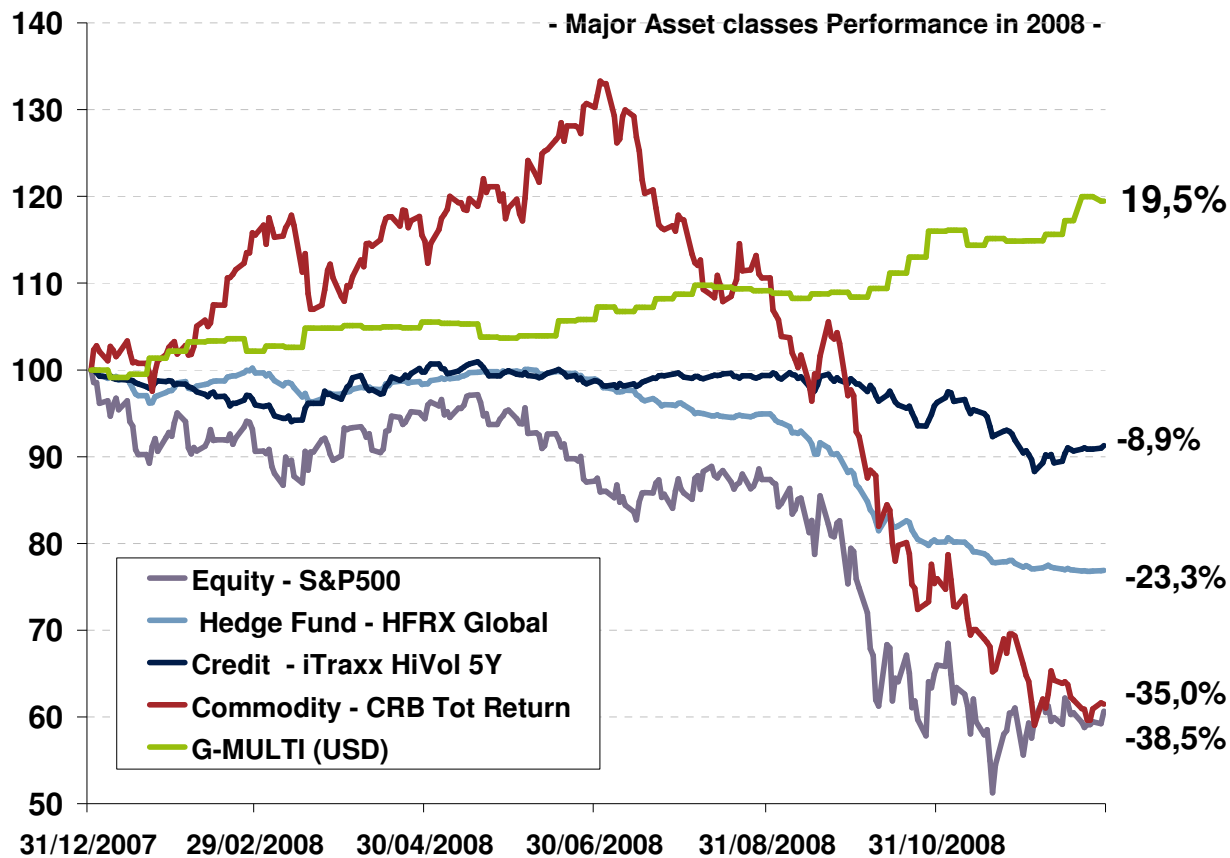
Jean-Paul Hobeika
Tel: +971 4 425 7585

jean-paul.hobeika@sgcib.com

Lyxor G-Multi (EUR) : +17.06% (from April 2008 to Dec 2008)
Proforma 2008 : perf +20.8% Vol: 6.82%

Source: Lyxor December 2008. Past performances of fund do not guarantee future results.

- IMPLIED ASSETS: EFFECTIVE UNCORRELATION TO TRADITIONNAL ASSET CLASSES -
- Active multi-strategy volatility approach generate effective uncorrelated returns



G-Multi (USD)

The performances and statistics (from Dec. 2007 to April 2008) correspond to a pro-forma based on the performance of the underlying single hedge funds as follows: Lyxor G-Volt ; Lyxor G-Square ; Lyxor G-Smile; Lyxor G-Sphere and from May 2008 to today to the performance of Lyxor G-Multi. The allocation is a combination of single hedge funds. The standard allocation corresponds to the median allocation previously defined. The active Pro-format allocation prior to May 2008 corresponds to an active allocation between the 3 defined indicative allocations. Indicative allocations were systematically implemented, on a weekly basis, according to the quantitative signals given by our model. In practice the portfolio allocation will be discretionary adjusted by the investment team.

Source: Lyxor, Bloomberg

-IMPLIET ASSET AS AN UNCORRELATED ASSET CLASS PERSPECTIVE 2009 AND CONCLUSION -

-Volatility can be used both as an efficient hedging tool and a source of uncorrelated return through arbitrage strategies

-Liquidity will be key:

- More and more actors are looking for hedge and protection which will provide more liquidity to this market
- Traded volumes on Vanilla options are huge (USD 1 trillion per day)
- So far there is a limited number of Hedge funds players on volatility arbitrage
- Lots of HF strategies are saturated. Higher appetite from FoF and FoHF will come to these strategies when comes the time to rebuild their portfolios
- Early stage of hedge fund cycle on volatility

-LYXOR has developped a large range of Hedge Fund taking advantage of volatility specific characteristics.

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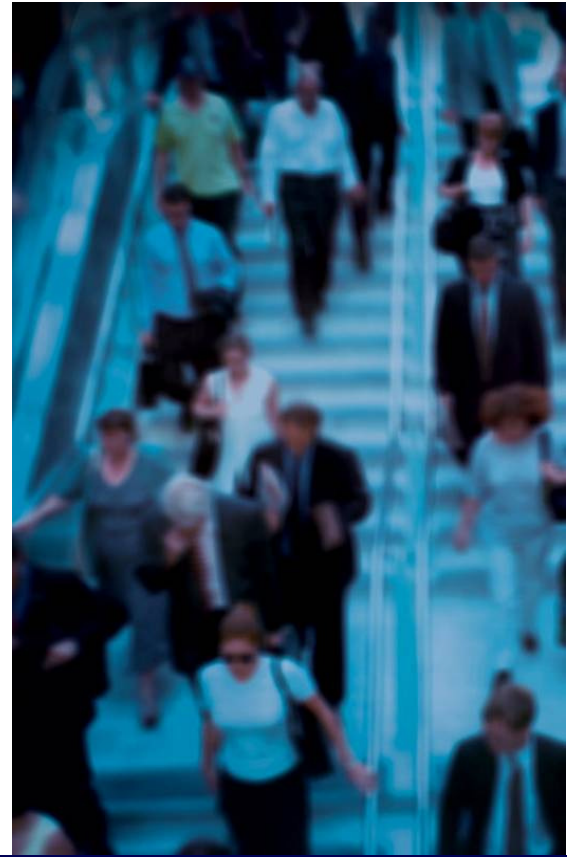
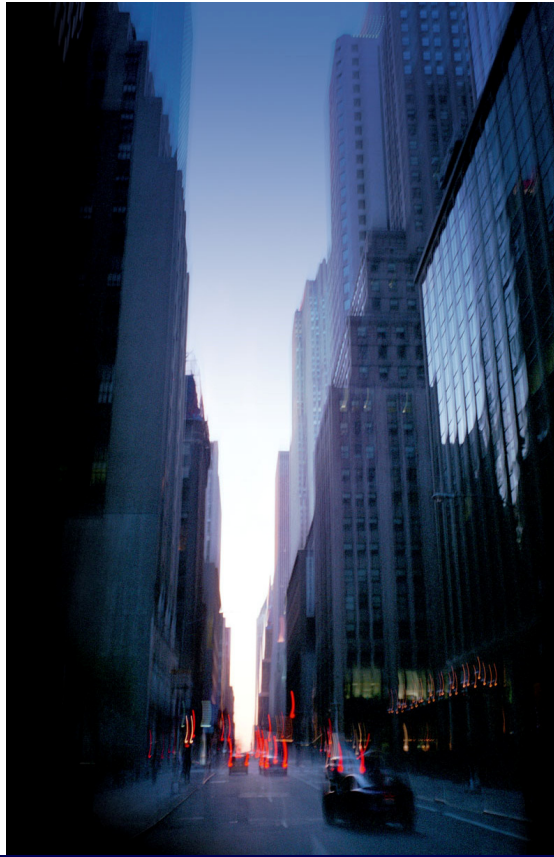
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