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Delta hedging en option

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OPTION ?

PRICING

HEDGING

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BASIC NOTIONS

OPTION	CALL	PUT
BUY	= Right to buy	= Right to sell
SELL	= Commitment to sell	= Commitment to buy

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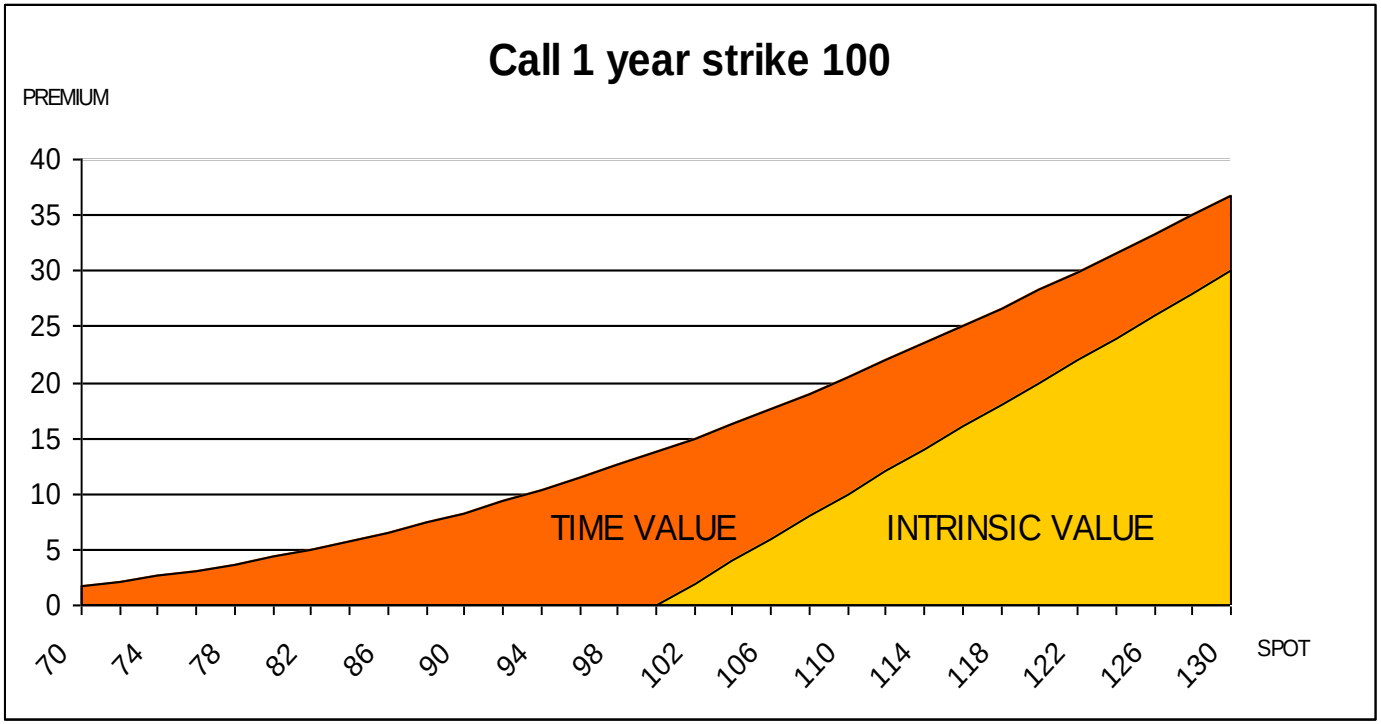
DELTA HEDGE : How to manage a book in options ?



Daily adjustment with the delta

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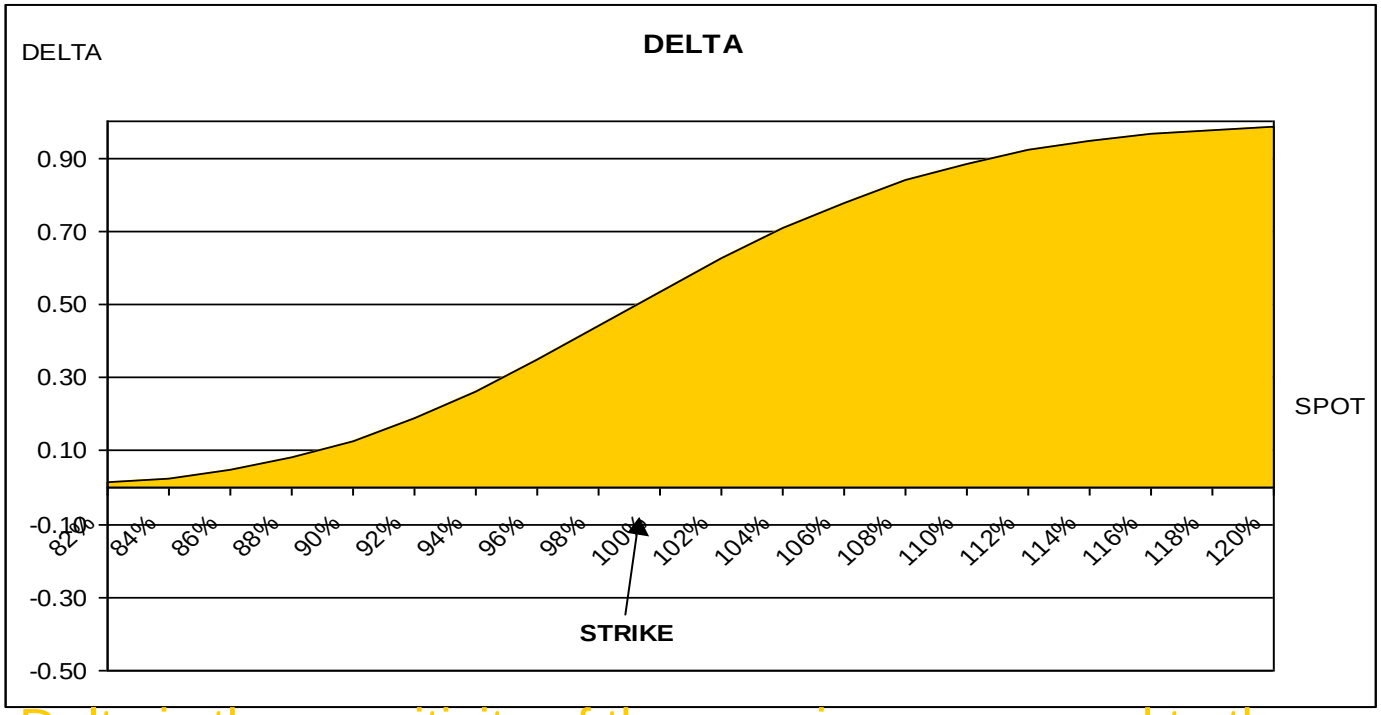
Delta

$$\frac{\Delta \text{ Premium}}{\Delta \text{ Spot}}$$

Option : Call
Strike : 100 %
Volatility : 30 %
Maturity : 1 Month

DELTA



Delta is the sensitivity of the premium compared to the spot

It can be very sensitive near the maturity of the option

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HEDGING

Option hedging for a Bank = use every day movement to earn money in exchange of a premium paid or to lose money in exchange of money recieved. The result depends mostly on daily volatility. There is no special difficulty if underlying is liquid.

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HEDGING CALL

How does the bank hedge if a **client Buys a Call**?

T0 :	price 100	Delta 50%	Buy 50		- 50
T1 :	price 110	Delta 60%	Buy 10		- 61
T2 :	price 100	Delta 50%	Sell 10	loss 1	-51
T3 :	price 90	Delta 40%	Sell 10	loss 1	-42
T4 :	price 100	Delta 50%	Buy 10		-52
T5 :	.....				

= Gamma -

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HEDGING

Buy call = buy delta stock + gamma –
Buy put = sell delta stock + gamma –
Sell call = sell delta stock + gamma +
Sell put = buy delta stock + gamma +

Gamma - : if stock rise The BANK buys, if stock fall The BANK sells
Gamma + : if stock rise The BANK sells, if stock fall The BANK buys

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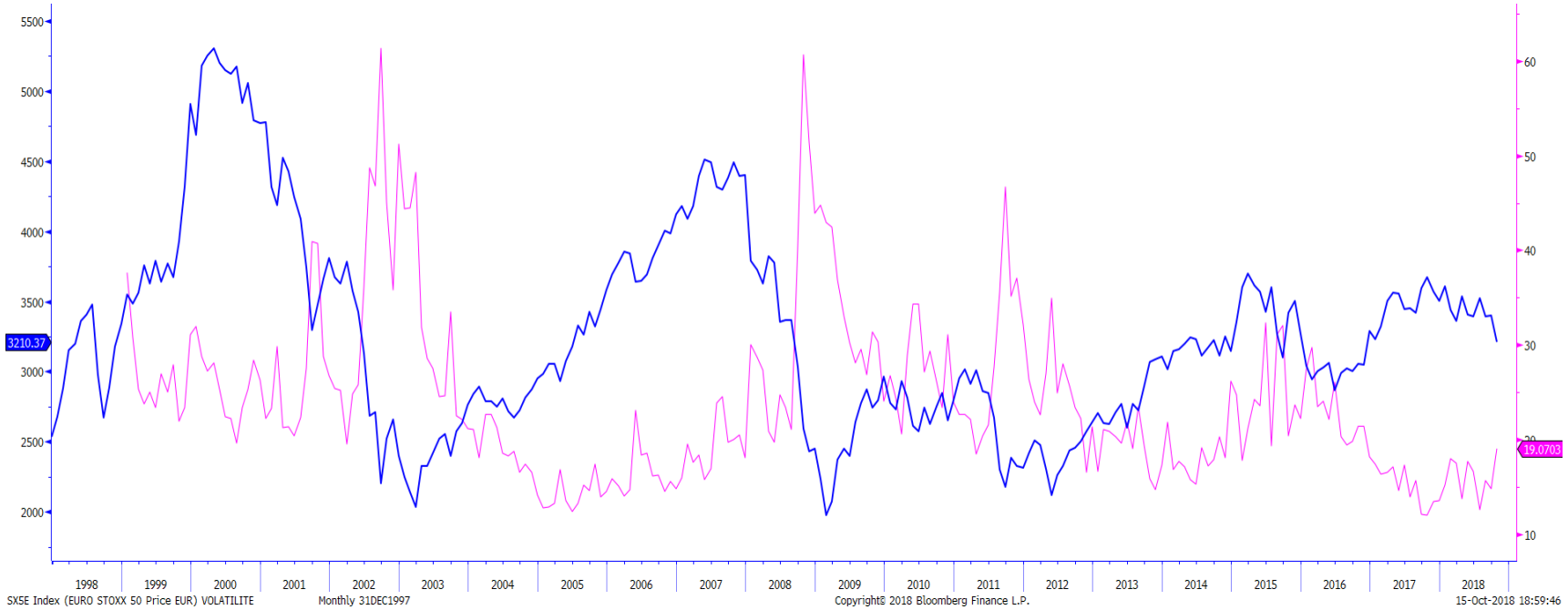
IRRATIONAL VOLATILITY



Cost of protection before and after a crash

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VOLATILITY FORMULA :

= ?

Cost of protection before and after a crash

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PRICING

BINOMIAL TREES

RETURN DISTRIBUTION

VOLATILITY

SENSIBILITY

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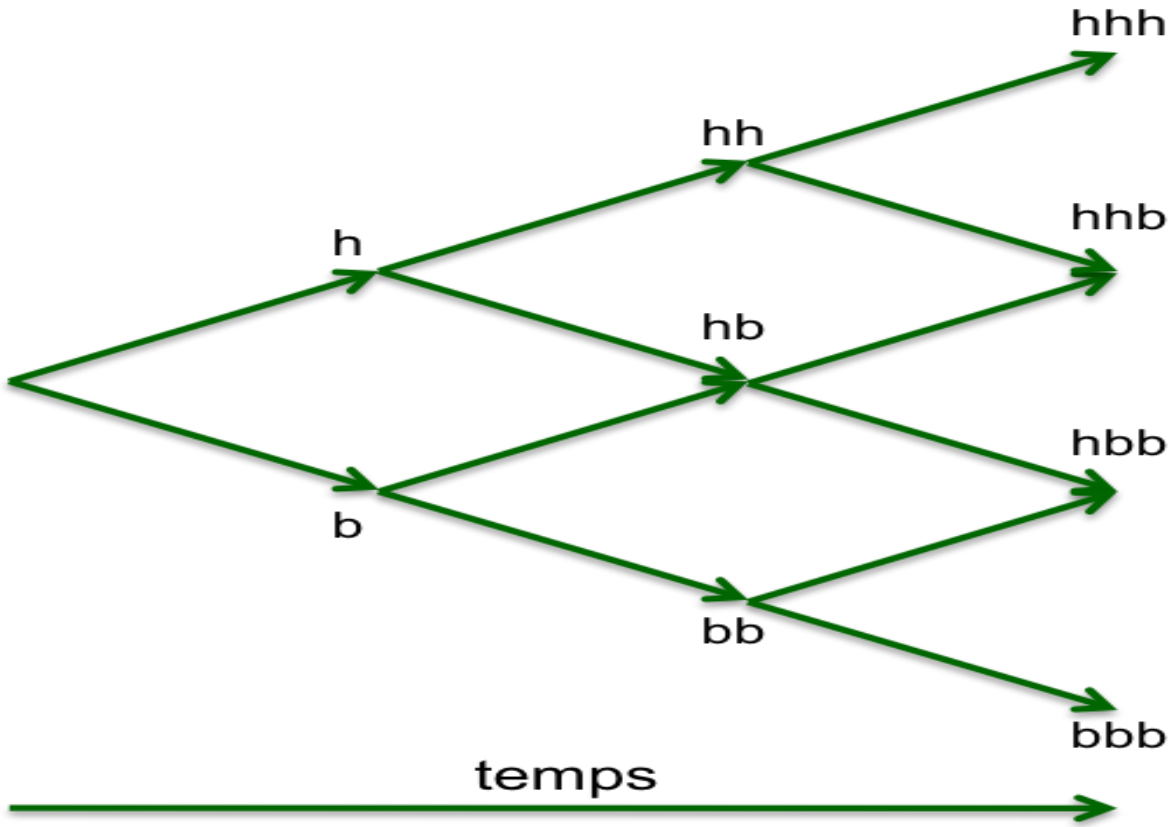
BINOMIAL TREE



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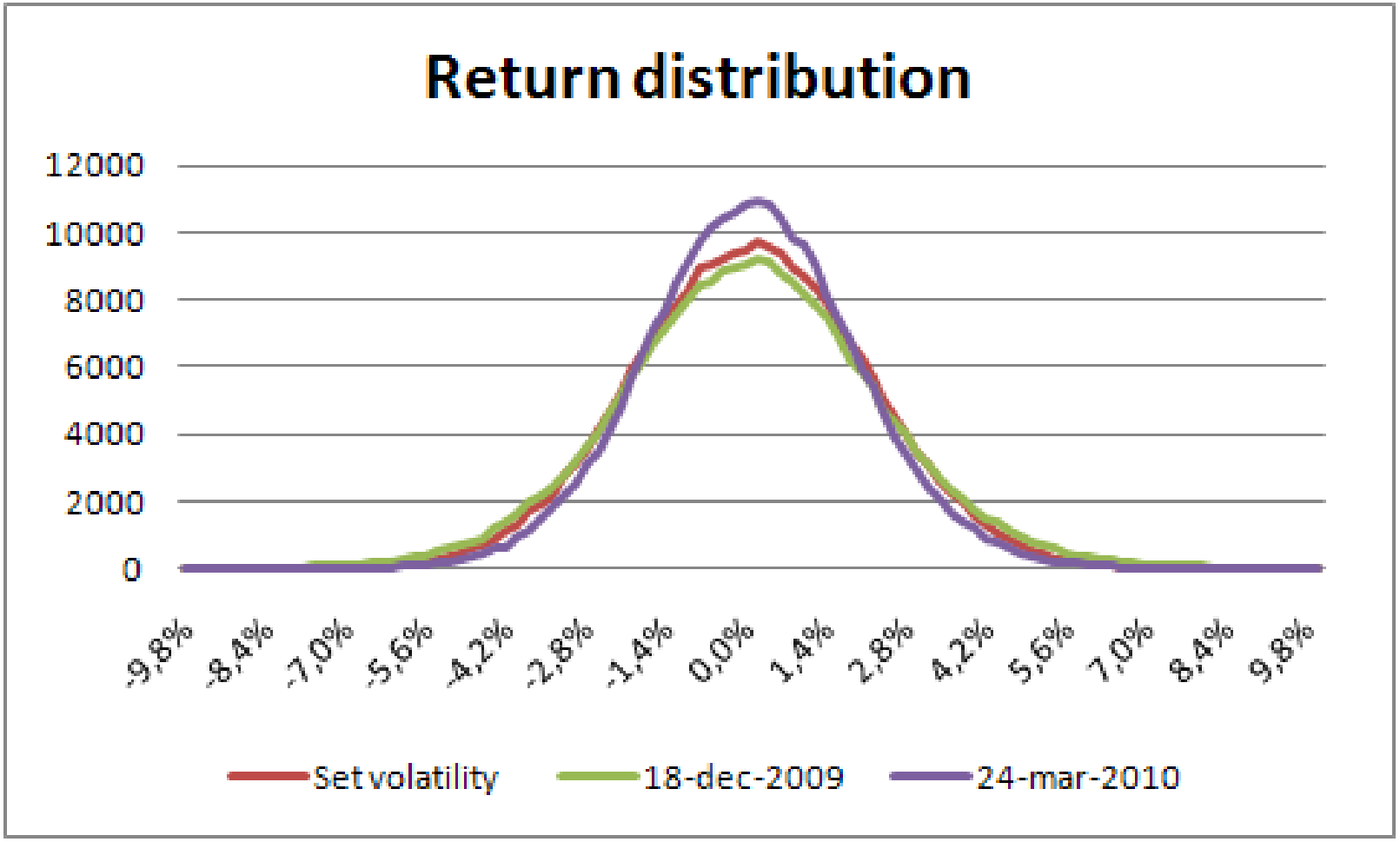
B&S PRICER

- L’actif sous-jacent suit le processus suivant:

$$dS_t = \mu S_t\,dt + \sigma S_t\,dW_t$$

PRICING



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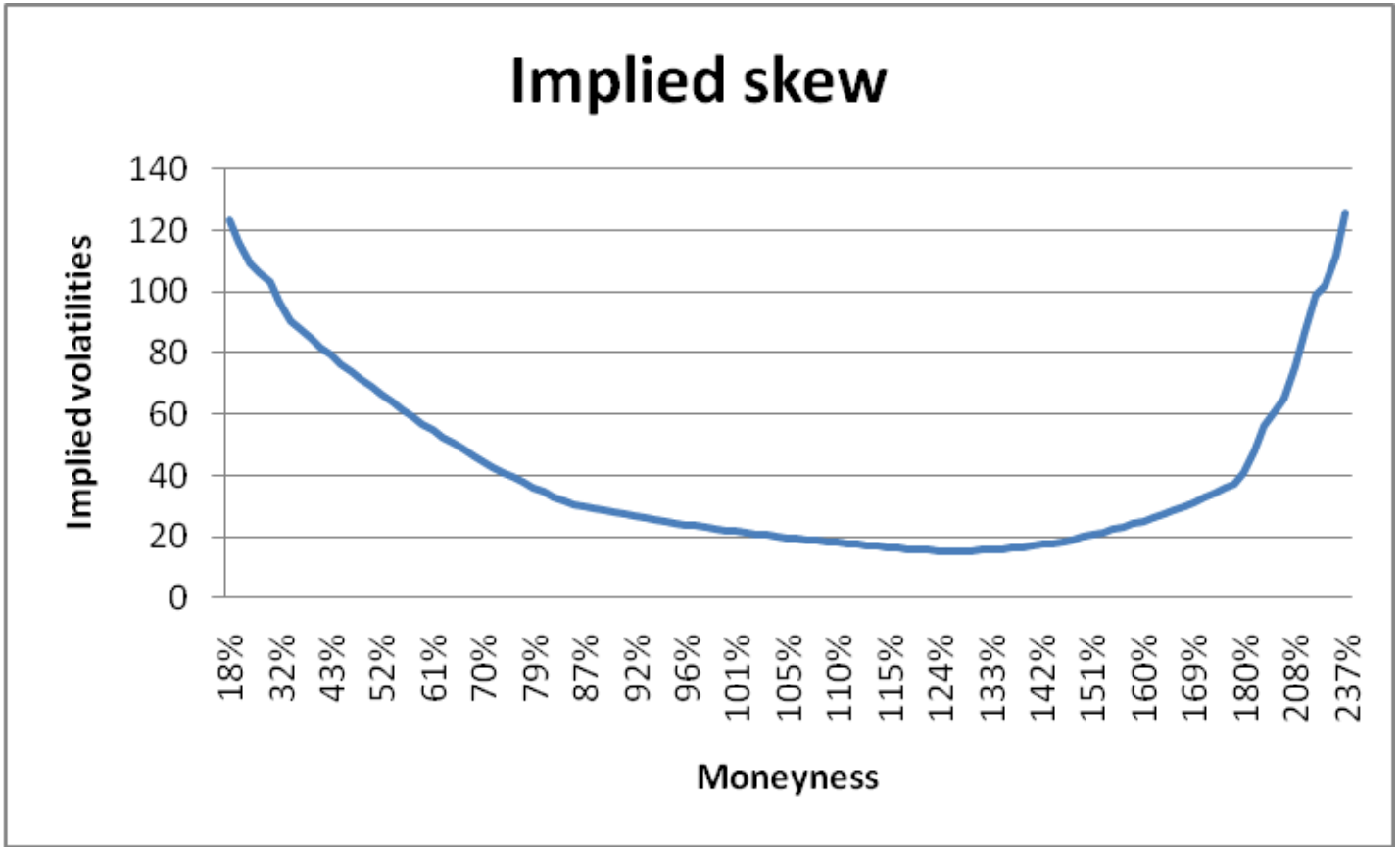
TECHNICAL factor: Smile



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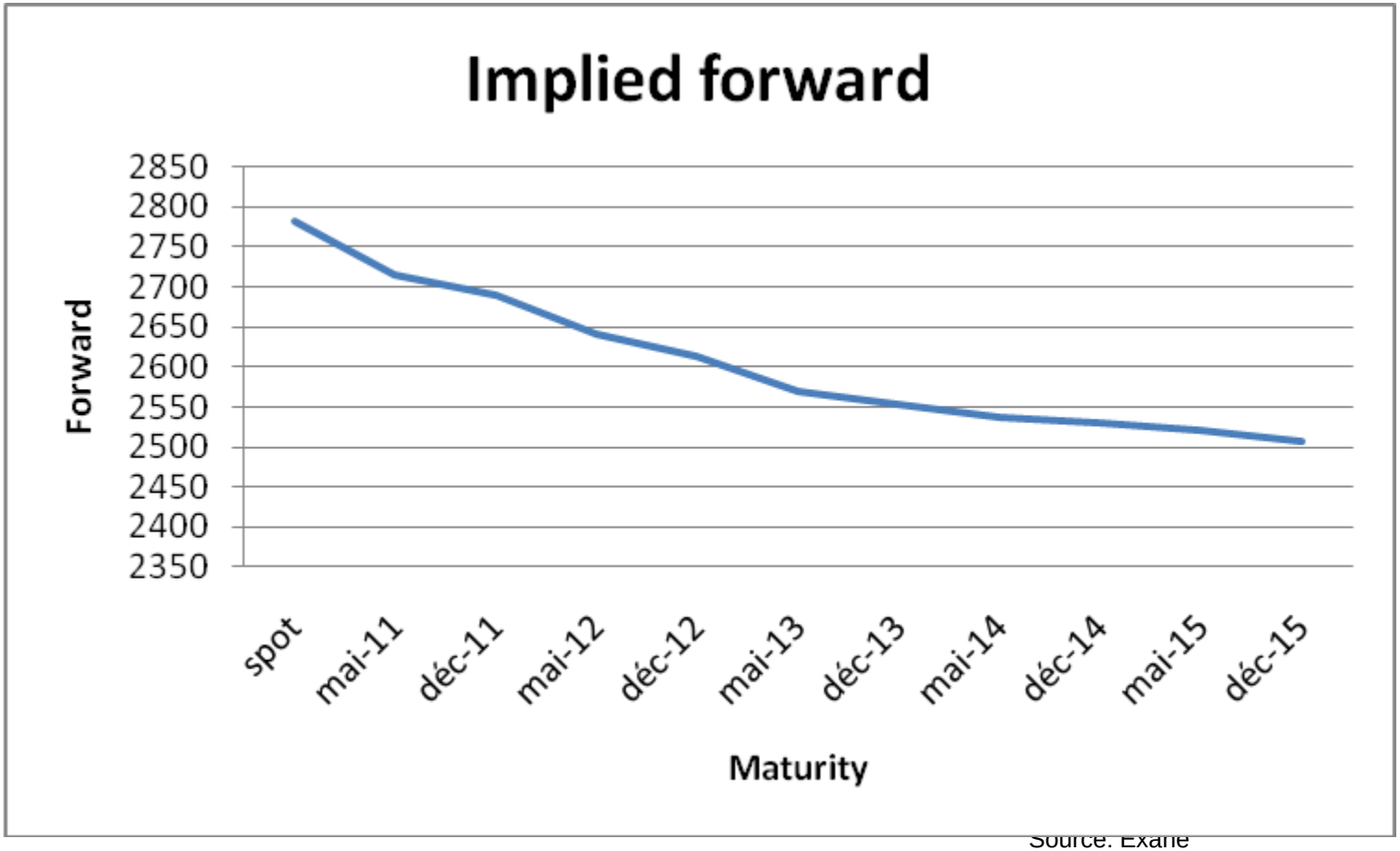
TECHNICAL FACTOR: lower forwards on Eurostoxx50



Source: Exane

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SENSIBILITY

Parameters :	CALL	PUT
Volatility ↗	↗	↗
Maturity ↗	↗	↗
Strike Price ↗	↘	↗
Interest rates ↗	↗	↘
Underlying ↗	↗	↘

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Greek Letters

- Delta
- Gamma
- Vega
- Theta
- Rho

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HEDGING

	BUY CALL	SELL CALL	BUY PUT	SELL PUT
DELTA	+	-	-	+
GAMMA	+	-	+	-
VEGA	+	-	+	-
THETA	-	+	-	+

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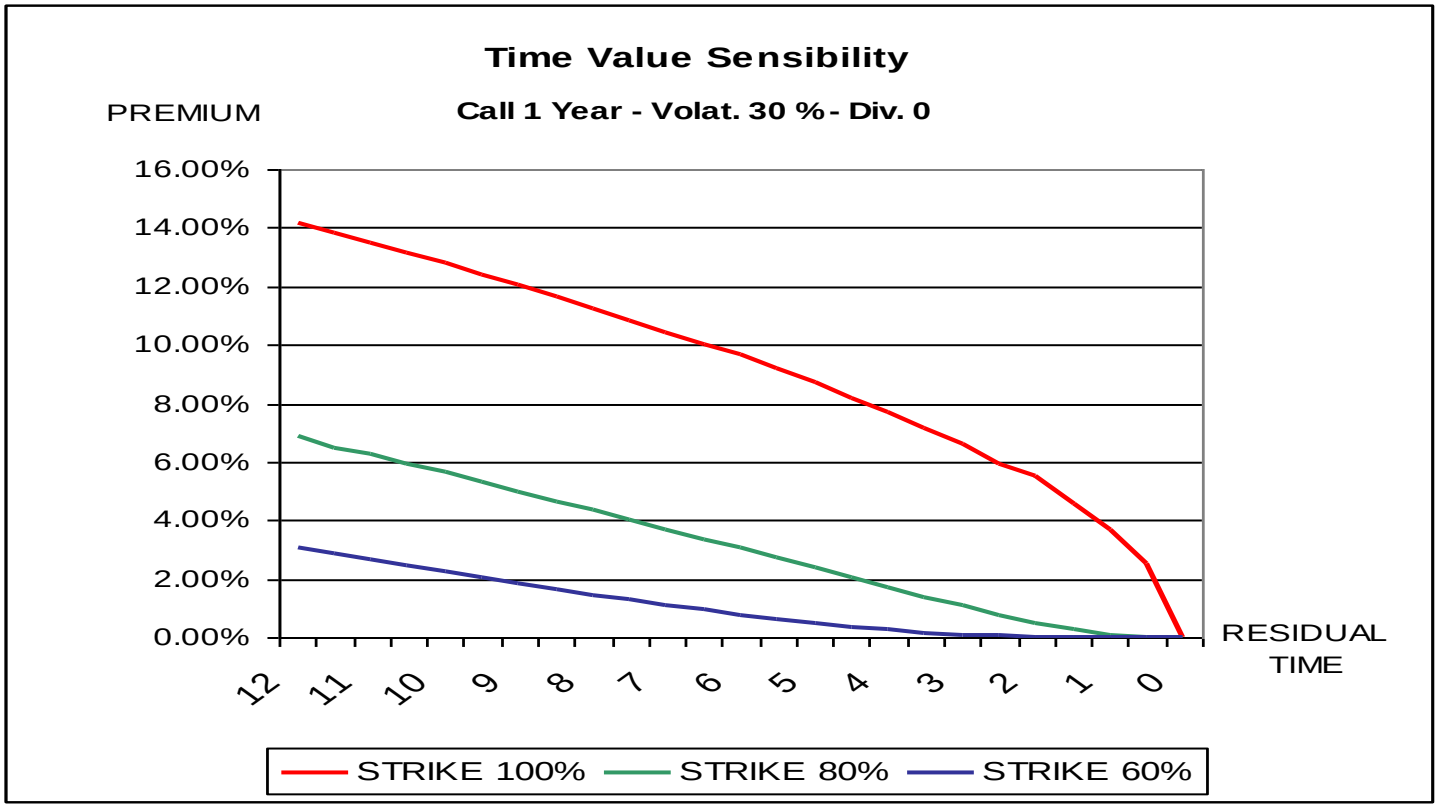
Time Value Sensibility



Time value is important at money spot and decreases quickly at the end

“Derivatives are weapons of mass destruction.”

Warren Buffet

“Between 2005 and 1Q 2008 trough Berkshire Hathaway, Warren Buffett sold index put options totalling approximately $40bn notional amount, receiving almost $5bn in premium.”

Exane