

Quantitative Option Strategy

Strategic Research for Equity Derivatives - Europe

Pair Trade Ideas

- The trades are composed of a short call option position against a long call option position,
- Current couples are (Suez / Munich Re), (Accor / Volkswagen), (Crédit Agricole / Allianz), (Arcelor / HVB)

Trade Details

Prices shown in the table were observed on the market on 30 June 2004, at close. The number of options is computed for a €1m exposure.

5-year back testing (sample data)



Return/Vol 28.2% 11.0% Sharpe: 2.6

Strategy results (out-of-sample)



Return/Vol 12.5% 5.1%

Per annum 17.4% 6.1% Sharpe: 2.9

Underlying	% of capital	# of options	Strike	Maturity	Volatility	Div Price	% of spot	Cash flow
Short call								
AC FP Equity	25.00%	-7,207	34.69	11/08/04	21.70%	0.00	1.06	3.05%
ACA FP Equity	25.00%	-12,500	20	11/08/04	23.58%	0.00	0.66	3.31%
LOR FP Equity	25.00%	-18,116	13.8	11/08/04	30.08%	0.00	0.58	4.18%
SZE FP Equity	25.00%	-14,611	17.11	11/08/04	20.96%	0.00	0.51	2.95%
Sum	100.00%							33,745
Long call								
ALV GY Equity	12.50%	1,404	89.03	11/08/04	22.41%	0.00	2.80	3.15%
HVM GY Equity	12.50%	8,550	14.62	11/08/04	28.94%	0.00	0.59	4.03%
MUV2 GY Equity	12.50%	1,403	89.1	11/08/04	21.31%	0.00	2.67	3.00%
VOW GY Equity	12.50%	3,600	34.72	11/08/04	26.86%	0.00	1.30	3.75%
Sum	50.00%							-17,413
Net received		16,333						
In % of Nominal		1.6%						
Annualised premium		14.2%						

Source: Bloomberg, BNP Paribas. (*) Options are dividend-protected : they deliver, upon exercise, the underlying stock plus any distribution paid in the option period.

Rationale

- Strategies have 6 weeks maturity and involve short positions in at-the-money calls against long call positions.
- This strategy relies solely on a quantitative analysis performed on historical stock prices, as well as current option prices. It does not reflect our fundamental analysts' views about the underlying stocks.
- Positions are not hedged and are kept until maturity. The combination of the short and long option positions is providing a statistical hedge.
- The strategy back testing has shown a 2.6 sharpe ratio over 5 years.

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Selection process

To choose the candidates for the option strategy, we review couples of stocks within a universe of 80 stocks and indexes from the Euro-zone. Our criterion is based on the simple regression model. We use the regression analysis to select the option strategies that are the most likely (according to the regression model) to end in the money.

Option strategies are long / short 6-week maturity, at-the-money calls. Long/short ratios can differ from the ratio of underlying stock prices. However, the option ratio is constraint within 50% and 200% of the ratio of the underlying stock prices.

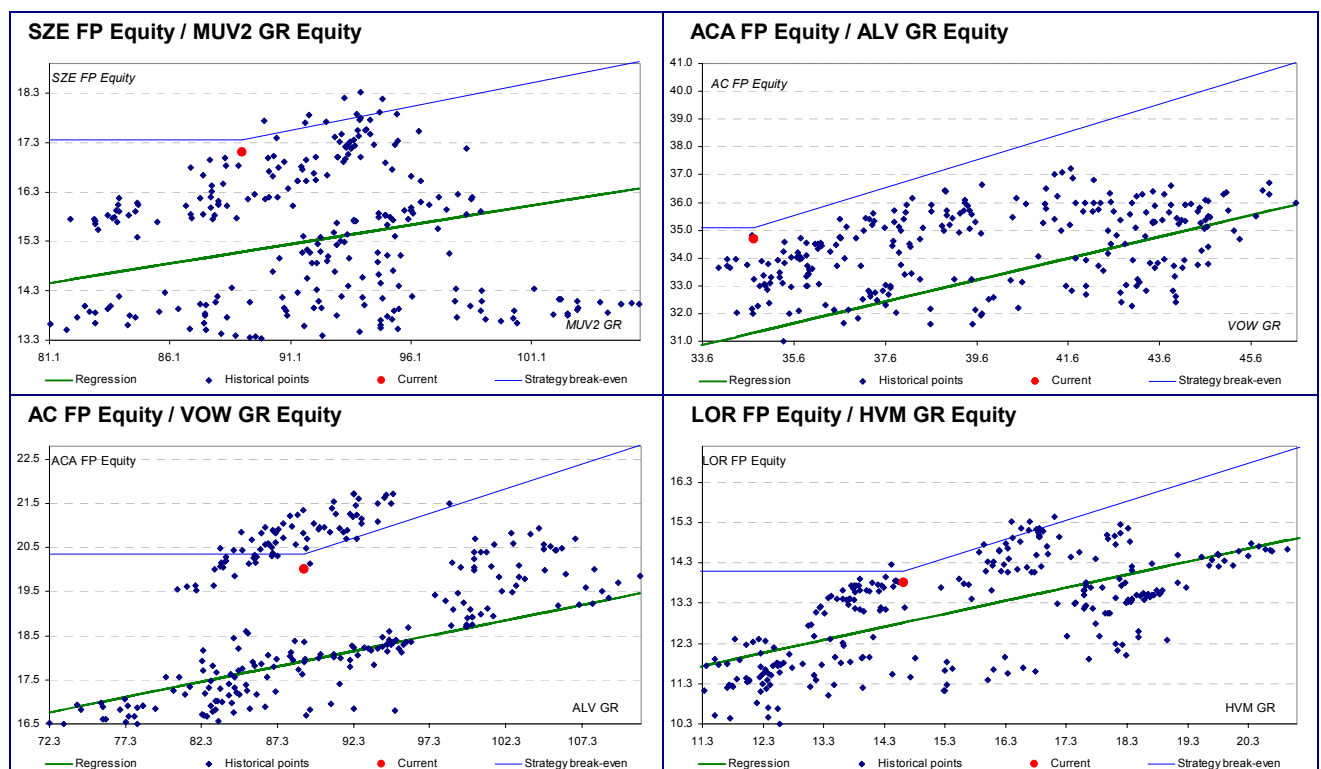
We also select option couples according to the net premium received (only positive net premium strategies are selected).

Finally, we select couples according to criteria aiming at improving the robustness of the statistical link, on the one hand, as well as on subjective elements.

Each daily strategies contains between two and four short option positions and between two and four long option positions. Stocks may appear on the short and the long side of the strategies, in which case we consider the net position.

Stock price history and strategy gain/loss area

In the following charts, we represent the points corresponding to the one-year history of underlying stock prices, as well as the regression line and the break-even curve of the option strategy. The individual option strategy would make money at maturity should the stock price couple end below the break-even curve (traced in blue).



Source – BNP Paribas Strategic Research for Equity Derivatives

Outstanding strategies and back testing

To measure the performance of our option recommendation system, we proceed in the following way:

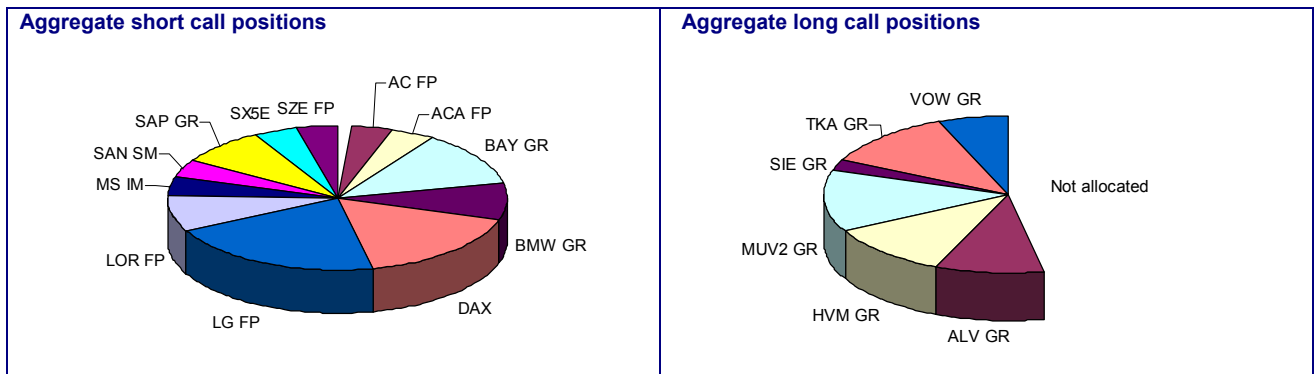
- Strategies have six-week maturity. They are built every week, for one sixth of the available capital (€1,000,000 initially).
- When a strategy matures, the proceeds are added to the available capital.

In the following table are the description and valuation of the last six recommended option strategies outstanding. Blue font indicates the maturing strategy while green font represents the new strategy. Each strategy is the union of four pair trades (Short/Long in consecutive lines).

Strategy Date	Strategy Allocation	Option Allocation	Underl. Stock	Strike Price	Maturity Date	Number of Option	Capital Allocation	Last Price	Implied Volatility	Initial Premium	Current Price	P&L	Strat. P&L
19/05/04	183,775	25%	SAP GR	127.70	30/06/04	-360	4.33%	136.26	24.39	6.06	8.56	-899.1	
19/05/04	183,775	13%	HVM GR	13.79	30/06/04	1,666	2.15%	14.62	28.94	0.68	0.83	251.4	
19/05/04	183,775	25%	BAS GR	41.94	30/06/04	-1,095	4.25%	43.99	16.86	1.52	2.05	-577.8	
19/05/04	183,775	13%	AGN NA	9.58	30/06/04	2,398	2.10%	9.91	34.94	0.54	0.33	-506.9	
19/05/04	183,775	25%	BAY GR	22.95	30/06/04	-2,002	4.19%	23.70	22.37	1.16	0.75	830.4	
19/05/04	183,775	13%	ALV GR	83.75	30/06/04	289	2.27%	89.03	22.41	3.55	5.28	498.3	
19/05/04	183,775	25%	LOR FP	13.66	30/06/04	-3,363	4.21%	14.20	30.08	0.64	0.54	325.3	173.1
19/05/04	183,775	13%	HVM GR	13.79	30/06/04	1,666	2.15%	14.62	28.94	0.68	0.83	251.4	0.09%
26/05/04	184,948	25%	SAP GR	129.80	07/07/04	-356	4.28%	136.26	24.39	5.45	6.66	-429.4	
26/05/04	184,948	13%	HVM GR	13.74	07/07/04	1,683	2.17%	14.62	28.94	0.68	0.90	364.6	
26/05/04	184,948	25%	DAX	3867.52	07/07/04	-12	4.28%	4,052.73	19.37	125.63	188.42	-750.7	
26/05/04	184,948	14%	TKA GR	13.40	07/07/04	1,881	2.33%	14.01	22.06	0.57	0.63	116.0	
26/05/04	184,948	25%	BAY GR	22.95	07/07/04	-2,015	4.21%	23.70	22.37	0.93	0.81	240.9	
26/05/04	184,948	14%	ALV GR	84.96	07/07/04	297	2.33%	89.03	22.41	3.46	4.18	212.3	
26/05/04	184,948	25%	LG FP	70.70	07/07/04	-654	4.36%	75.60	22.56	2.75	4.94	-1,431.4	-1,099.4
26/05/04	184,948	13%	MUV2 GR	84.75	07/07/04	273	2.18%	90.35	21.31	3.53	5.65	578.5	-0.59%
02/06/04	186,446	25%	DAX	3888.31	14/07/04	-12	4.29%	4,052.73	19.37	135.24	177.57	-507.5	
02/06/04	186,446	13%	TKA GR	13.45	14/07/04	1,868	2.31%	14.01	22.06	0.50	0.62	236.5	
02/06/04	186,446	25%	SAP GR	130.41	14/07/04	-357	4.30%	136.26	24.39	4.89	6.55	-595.5	
02/06/04	186,446	13%	HVM GR	13.37	14/07/04	1,743	2.25%	14.62	28.94	0.58	1.28	1,217.9	
02/06/04	186,446	25%	DAX	3888.31	14/07/04	-12	4.29%	4,052.73	19.37	135.24	177.57	-507.5	
02/06/04	186,446	13%	HVM GR	13.37	14/07/04	1,743	2.25%	14.62	28.94	0.58	1.28	1,217.9	
02/06/04	186,446	25%	LG FP	69.10	14/07/04	-675	4.36%	73.30	22.56	2.56	4.38	-1,228.0	597.8
02/06/04	186,446	13%	MUV2 GR	83.50	14/07/04	279	2.19%	89.10	21.31	3.02	5.75	763.9	0.32%
09/06/04	187,141	25%	MS IM	9.18	21/07/04	-5,097	4.21%	9.37	18.9	0.29	0.29	0.6	
09/06/04	187,141	14%	TKA GR	13.53	21/07/04	2,000	2.47%	14.01	22.06	0.46	0.60	291.3	
09/06/04	187,141	25%	BMW GR	35.37	21/07/04	-1,323	4.25%	36.37	22.29	1.23	1.40	-220.9	
09/06/04	187,141	13%	VOW GR	35.40	21/07/04	661	2.02%	34.72	26.86	1.29	0.62	-447.2	
09/06/04	187,141	25%	BAY GR	23.00	21/07/04	-2,034	4.25%	23.70	22.37	0.97	0.95	59.1	
09/06/04	187,141	15%	ALV GR	87.15	21/07/04	315	2.48%	89.03	22.41	3.30	3.04	-79.8	
09/06/04	187,141	25%	LG FP	70.10	21/07/04	-667	4.32%	73.30	22.56	2.59	3.71	-746.5	-1,261.3
09/06/04	187,141	13%	MUV2 GR	87.78	21/07/04	266	2.10%	89.10	21.31	3.05	2.60	-117.7	-0.67%
16/06/04	187,132	25%	SAN SM	8.84	28/07/04	-5,292	3.98%	8.53	22.41	0.32	0.10	1,164.9	
16/06/04	187,132	13%	TKA GR	13.37	28/07/04	1,883	2.33%	14.01	22.06	0.49	0.76	508.2	
16/06/04	187,132	25%	BMW GR	35.33	28/07/04	-1,324	4.25%	36.37	22.29	1.16	1.54	-494.9	
16/06/04	187,132	13%	VOW GR	34.96	28/07/04	669	2.05%	34.72	26.86	1.33	0.94	-261.8	
16/06/04	187,132	25%	BAY GR	23.03	28/07/04	-2,031	4.25%	23.70	22.37	0.95	1.00	-100.2	
16/06/04	187,132	15%	ALV GR	86.73	28/07/04	322	2.53%	89.03	22.41	3.07	3.61	171.5	
16/06/04	187,132	25%	LG FP	71.50	28/07/04	-654	4.23%	73.30	22.56	2.51	2.92	-267.5	672.7
16/06/04	187,132	13%	MUV2 GR	88.29	28/07/04	265	2.08%	89.10	21.31	2.78	2.60	-47.6	0.36%
23/06/04	186,279	25%	DAX	3945.10	04/08/04	-12	4.22%	4,052.73	19.37	112.90	164.21	-605.7	
23/06/04	186,279	13%	TKA GR	13.36	04/08/04	1,794	2.22%	14.01	22.06	0.42	0.80	693.2	
23/06/04	186,279	25%	SX5E	2793.63	04/08/04	-17	4.14%	2,811.08	16.68	70.74	69.92	13.8	
23/06/04	186,279	13%	SIE GR	56.51	04/08/04	412	2.15%	59.11	24.88	1.79	3.45	684.8	
23/06/04	186,279	25%	LG FP	71.50	04/08/04	-651	4.21%	73.30	22.56	2.53	3.13	-393.3	
23/06/04	186,279	13%	MUV2 GR	86.97	04/08/04	268	2.11%	89.10	21.31	2.51	3.65	303.0	
23/06/04	186,279	25%	LOR FP	13.41	04/08/04	-3,473	4.23%	13.80	30.08	0.57	0.74	-582.6	1,058.0
23/06/04	186,279	13%	HVM GR	13.73	04/08/04	1,696	2.19%	14.62	28.94	0.53	1.09	944.9	0.57%
30/06/04	186,279	25%	SZE FP	17.11	11/08/04	-2,722	4.11%	17.11	20.96	0.51	0.51	0.0	
30/06/04	186,279	13%	MUV2 GR	89.10	11/08/04	261	2.05%	89.10	21.31	2.67	2.67	0.0	
30/06/04	186,279	25%	AC FP	34.69	11/08/04	-1,342	4.11%	34.69	21.7	1.06	1.06	0.0	
30/06/04	186,279	13%	VOW GR	34.72	11/08/04	671	2.05%	34.72	26.86	1.30	1.30	0.0	
30/06/04	186,279	25%	ACA FP	20.00	11/08/04	-2,328	4.11%	20.00	23.58	0.66	0.66	0.0	
30/06/04	186,279	13%	ALV GR	89.03	11/08/04	262	2.05%	89.03	22.41	2.80	2.80	0.0	
30/06/04	186,279	25%	LOR FP	13.80	11/08/04	-3,375	4.11%	13.80	30.08	0.58	0.58	0.0	0.0
30/06/04	186,279	13%	HVM GR	14.62	11/08/04	1,593	2.05%	14.62	28.94	0.59	0.59	0.0	0.00%
Previous cash				1,117,672	P&L of Outstanding Options				-32		In % of initial value		
Payoff received				173	Interests				15,296				
Current cash				1,117,845	Total value				1,133,109		113.31%		

Global position

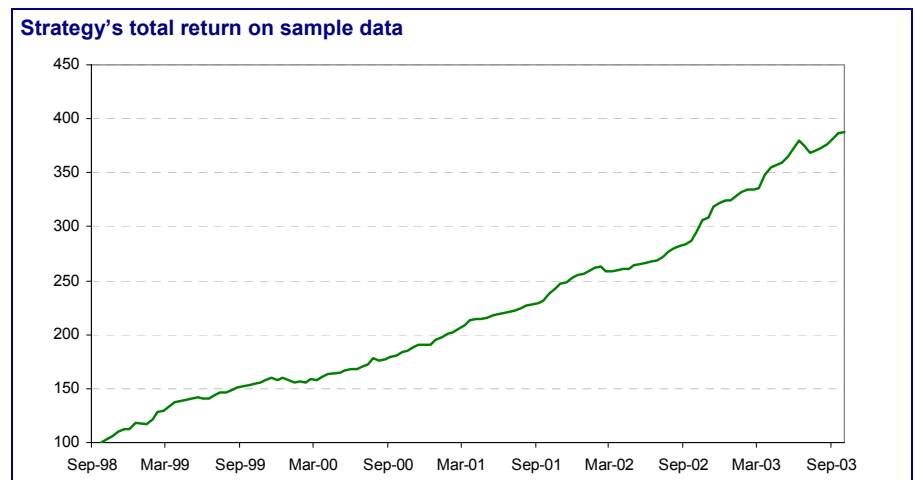
The following chart is an aggregation of the short and long option positions generated by the outstanding strategies:



Back Testing

The implementation of our strategy selection system relies on various parameters. We have chosen the parameters that maximise the Sharpe ratio of the strategy over 5 years.

The resulting strategy performance is shown on the following chart:



Source – Strategic Research for Equity Derivatives

The average return has been 28%, for a 11% volatility, or a 2.5 sharpe ratio. Keep in mind that this result has been obtained by a maximisation over a sample. It doesn't provide any assurance that future performance will keep the same pace. However, the strategy has been run from 1 October 2003 and has provided significant positive results since (see strategy return graph on first page).

It is noticeable that, although the strategy generally involves more short call than long call positions, the global results seem quite insensitive to cash market returns. For other sets of parameters, however, the strategy recorded negative results during the 1999 bull markets, while keeping a satisfactory behaviour over the whole 1998-2003 period.

ABB: BNP Paribas was co-manager in the convertible bond issue in August 2003, and was co-lead manager in the capital increase (rights issue) in November 2003

ACCOR: BNP Paribas was sole book runner for the sale of 2.9 million treasury shares in June 2003, and was joint lead manager and joint bookrunner in Accor's Oceane (bonds convertible into new shares and/or exchangeable into existing shares) issue in October 2003

AHOLD: BNP Paribas was co-manager for the capital increase in December 2003

AXA: BNP Paribas was joint bookrunner and joint lead manager in the capital increase through warrants in September 2003

BOUYGUES: BNP Paribas was joint bookrunner in the issue of Artemis exchangeable bonds into Bouygues shares in May 2003

FRANCE TELECOM: BNP Paribas was advisor to France Telecom in the tender offer by FT to acquire all of the outstanding shares in Wanadoo in March 2004

SIEMENS: BNP Paribas was co manager in the convertible bond issue in May 2003

SCOR: BNP Paribas was joint global coordinator and joint bookrunner in the capital increase in November 2004

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