



## Research

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## Correlation and Volatility



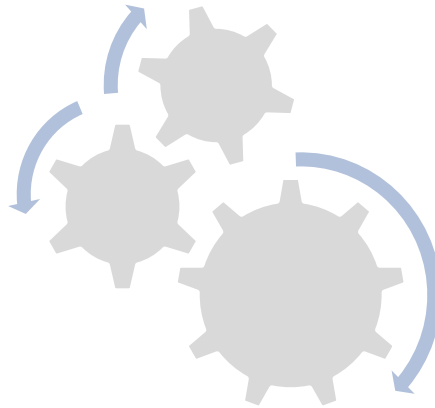
Implied Volatility

Absolute Volatility

Relative Volatility

Correlation

Risk Matrix



Long Future

- Delta 1
- Delta hedge

PS ATM

- Long to neutral Volatility
- Hedge first loss

Short Put

- Short Volatility
- Tactical Volatility

Short Call

- Short Volatility
- Strategic Trade

Long Put OTM

- Long Volatility
- Black Swan

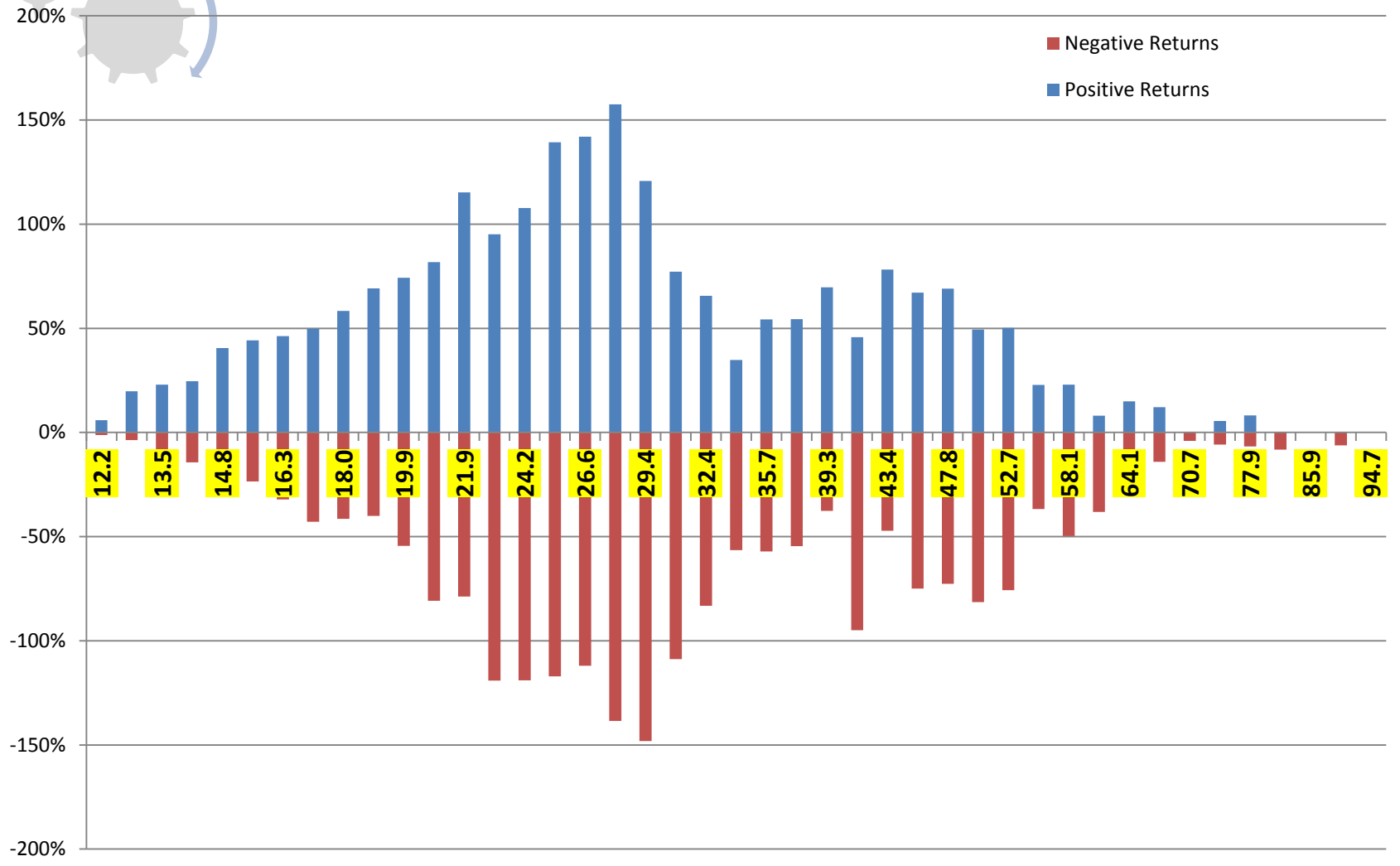
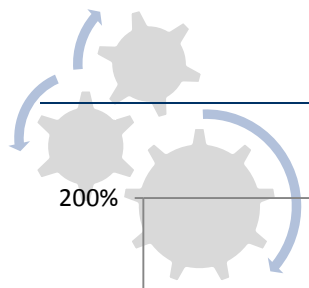
Long Butterfly

- Short of Volatility
- Strategic hedging

Based on a dynamic process of risk management decisions developed from a quantitative Model

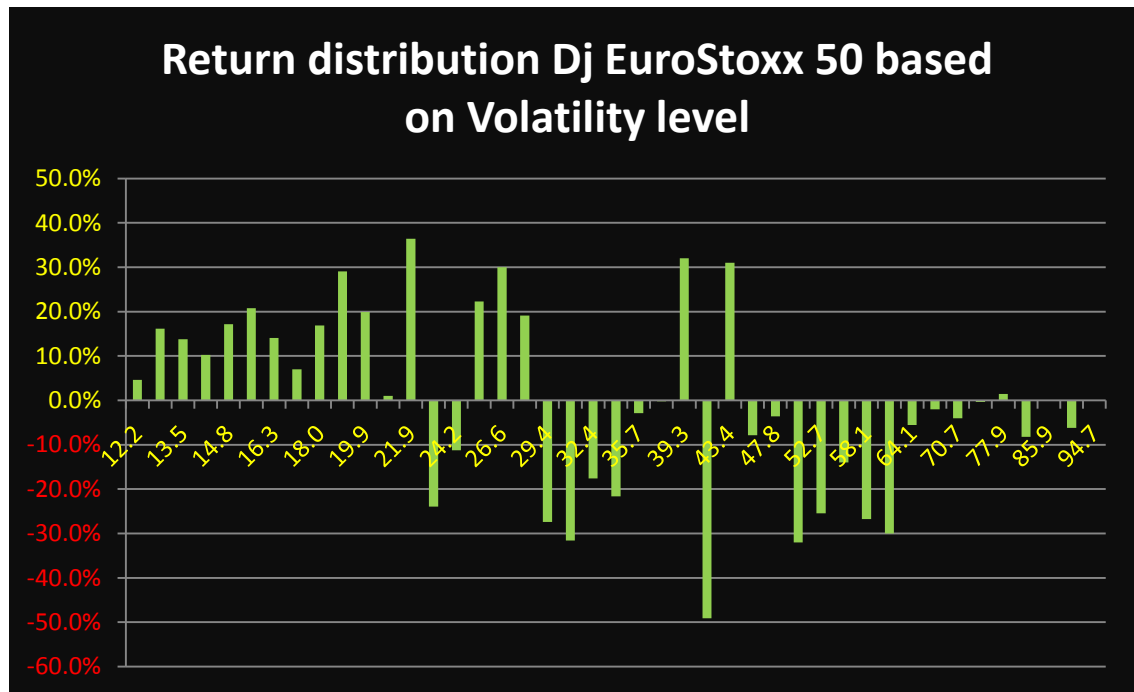
Dynamic and Systematic decision making supported by the model's interpretations of market absolute and relative volatility

# Returns for Volatility Levels



# Rate of return Vs Volatility distribution

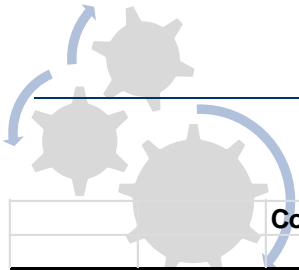
	>0	<0	UP	DOWN	NET	Net UP/Down
12.2	6%	-1.3%	11	5	4.6%	6
12.8	20%	-3.7%	34	12	16.1%	22
13.5	23%	-9.2%	47	33	13.8%	14
14.1	25%	-14.4%	49	40	10.2%	9
14.8	41%	-23.3%	61	43	17.2%	18
15.6	44%	-23.5%	68	45	20.8%	23
16.3	46%	-32.2%	81	73	14.1%	8
17.2	50%	-42.8%	80	75	7.0%	5
18.0	58%	-41.4%	91	70	16.9%	21
18.9	69%	-40.1%	99	59	29.1%	40
19.9	74%	-54.4%	80	77	19.9%	3
20.9	82%	-80.8%	107	109	1.0%	-2
21.9	115%	-78.8%	132	106	36.4%	26
23.0	95%	-119.1%	119	138	-24.0%	-19
24.2	108%	-118.9%	113	129	-11.2%	-16
25.4	139%	-117.1%	137	124	22.3%	13
26.6	142%	-112.0%	122	110	30.0%	12
28.0	158%	-138.4%	131	119	19.1%	12
29.4	121%	-148.2%	102	118	-27.4%	-16
30.8	77%	-108.8%	55	78	-31.6%	-23
32.4	66%	-83.3%	51	63	-17.6%	-12
34.0	35%	-56.4%	30	42	-21.7%	-12
35.7	54%	-57.2%	27	28	-2.9%	-1
37.5	54%	-54.6%	31	34	-0.2%	-3
39.3	70%	-37.7%	35	37	32.0%	-2
41.3	46%	-94.9%	30	48	-49.1%	-18
43.4	78%	-47.2%	42	26	31.0%	16
45.5	67%	-74.9%	31	41	-7.8%	-10
47.8	69%	-72.7%	28	35	-3.6%	-7
50.2	49%	-81.5%	18	31	-32.0%	-13
52.7	50%	-75.7%	21	28	-25.5%	-7
55.4	23%	-36.8%	7	13	-14.0%	-6
58.1	23%	-49.7%	9	17	-26.7%	-8
61.0	8%	-38.1%	3	11	-30.0%	-8
64.1	15%	-20.5%	5	6	-5.6%	-1
67.3	12%	-14.1%	3	4	-2.0%	-1
70.7	0%	-4.0%	0	1	-4.0%	-1
74.2	5%	-5.8%	1	2	-0.3%	-1
77.9	8%	-6.7%	2	2	1.5%	0
81.8	0%	-8.2%	0	1	-8.2%	-1
85.9	0%	0.0%	0	0	0.0%	0
90.2	0%	-6.2%	0	1	-6.2%	-1
94.7	0%	0.0%	0	0	0.0%	0



# Volatility frequency data

	1998-2014	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014			
	4129	130	256	255	254	253	253	259	257	255	253	256	255	257	257	257	253	170	Tot	%Tot	
5%																					
10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
10.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
11.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
11.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
12.2	15	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	15.0	0%
12.8	45	0	0	0	0	0	0	1	42	1	0	0	0	0	0	0	0	0	1	45.0	1%
13.4	76	0	0	0	0	0	0	6	54	10	0	0	0	0	0	0	0	0	6	76.0	2%
14.1	89	0	0	0	0	0	0	4	39	28	11	0	0	0	0	0	0	1	6	89.0	2%
14.8	100	0	0	0	0	0	0	6	31	43	9	0	0	0	0	0	0	5	6	100.0	2%
15.5	113	0	0	0	0	0	0	9	29	38	10	0	0	0	0	0	0	14	13	113.0	3%
16.3	154	0	0	0	0	0	0	22	18	39	20	0	0	0	0	3	29	23	154.0	4%	
17.1	154	0	0	0	0	0	0	26	16	20	22	0	0	0	0	8	29	33	154.0	4%	
18.0	165	0	0	0	0	0	0	30	9	13	32	0	0	0	0	12	36	34	166.0	4%	
18.9	157	0	0	0	0	0	0	47	4	13	30	2	0	4	3	6	35	14	158.0	4%	
19.8	148	0	1	9	8	2	2	30	0	9	22	6	0	4	10	5	28	12	148.0	4%	
20.8	215	0	10	25	18	3	7	25	0	13	24	8	0	18	22	11	23	8	215.0	5%	
21.8	236	4	19	11	26	6	10	13	0	9	8	25	0	21	24	21	30	8	235.0	6%	
22.9	262	5	23	24	26	9	13	14	0	8	8	20	1	30	32	31	15	3	262.0	6%	
24.1	236	10	33	15	19	8	10	8	0	3	9	26	10	25	22	30	5	3	236.0	6%	
25.3	257	4	31	26	18	30	17	4	0	6	15	24	14	28	13	26	1	0	257.0	6%	
26.5	233	4	26	30	19	15	26	8	0	0	15	11	28	23	5	21	2	0	233.0	6%	
27.9	265	6	31	36	26	20	29	1	0	2	8	14	39	22	8	23	0	0	265.0	6%	
29.3	218	9	19	40	23	16	19	4	0	0	5	14	15	25	8	21	0	0	218.0	5%	
30.7	138	11	12	21	13	4	13	0	0	0	1	10	16	17	7	13	0	0	138.0	3%	
32.3	118	3	15	13	5	3	14	1	0	0	2	11	22	8	9	12	0	0	118.0	3%	
33.9	74	4	6	4	5	0	16	0	0	0	1	10	13	6	1	8	0	0	74.0	2%	
35.6	53	8	2	1	4	6	4	0	0	0	1	3	5	8	7	4	0	0	53.0	1%	
37.3	66	17	7	0	3	9	1	0	0	0	0	2	10	4	11	2	0	0	66.0	2%	
39.2	70	9	13	0	7	10	3	0	0	0	0	3	9	3	13	0	0	0	70.0	2%	
41.2	76	4	6	0	10	9	7	0	0	0	0	6	14	2	18	0	0	0	76.0	2%	
43.2	70	7	2	0	7	7	8	0	0	0	0	5	18	4	12	0	0	0	70.0	2%	
45.4	74	3	0	0	5	13	21	0	0	0	0	2	18	2	10	0	0	0	74.0	2%	
47.6	63	5	0	0	6	15	18	0	0	0	0	1	6	1	11	0	0	0	63.0	2%	
50.0	50	4	0	0	1	15	6	0	0	0	0	4	9	2	9	0	0	0	50.0	1%	
52.5	50	6	0	0	3	23	7	0	0	0	0	6	4	0	1	0	0	0	50.0	1%	
55.2	21	3	0	0	1	4	2	0	0	0	0	7	3	0	1	0	0	0	21.0	1%	
57.9	25	3	0	0	1	14	0	0	0	0	0	6	1	0	0	0	0	0	25.0	1%	
60.8	15	1	0	0	0	8	0	0	0	0	0	6	0	0	0	0	0	0	15.0	0%	
63.9	10	0	0	0	0	4	0	0	0	0	0	6	0	0	0	0	0	0	10.0	0%	
67.0	8	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	8.0	0%	
70.4	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1.0	0%	
73.9	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2.0	0%	
77.6	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5.0	0%	
81.5	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1.0	0%	
85.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0%	
89.9	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1.0	0%	
94.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0%	
R <sup>0</sup>	-6.8%	-1.9%	46.7%	-2.7%	-20.2%	-37.3%	15.7%	6.9%	21.3%	15.1%	6.8%	-44.4%	21.1%	-5.8%	-17.1%	13.8%	17.6%	2.4%			

# The risk structure of correlation and volatility



## Correlation General Data:

<b>N° data:</b>	4,129
<b>Daily Correlation</b>	<b>-0.73</b>
<b>N° of days positive correlation:</b>	852
<b>% of days positive correlation:</b>	34%

## Rolling correlation based on number of data :

<b>Days;</b>	<b>22</b>	<b>18</b>	<b>15</b>	<b>10</b>	<b>5</b>
<b>Min. Correlation:</b>	-0.97	-0.98	-0.98	-0.99	-1.00
<b>Max. Correlation:</b>	-0.12	0.06	0.35	0.67	0.87
<b>Average Correlation:</b>	-0.78	-0.78	-0.77	-0.77	-0.75

## Correlation Vs Volatility

<b>Data Analysis, Correlation and Volatility:</b>			
<b>*Volatility for correlation below -0.78</b>			
<b>Volatility:</b>	<b>0</b>	<b>10-26</b>	<b>26 - 100</b>
<b>N° Days Above Aver. Corr.:</b>	2,444.00	1,493.00	951.00
<b>% Correl. Below -0.78:</b>	59.5%	36%	23%
<b>Min. Vol:</b>	11.72		
<b>Max. Vol:</b>	87.51		
<b>Average Volatility:</b>	26.352475		
<b>% over total 2444:</b>		61.1%	38.9%

