Option Strategies. Probability distributions. Performance

1.1 Market scenario undecided. Volatility undecided

1.1.1 Complete hedge using options

The payoff of the underlying asset (long share) can be completely hedged by selling a call, buying a put option and selling a riskless bond. This combination would behave like selling the underlying security.

1.1.2 Box Spread

Table 1. Box Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
Call	$-C_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$
- Call	$+C_2$	$+C_2$	$+C_2 -(S - E_2)$
Put	$-P_2 + E_2 - S$	$-P_2 + E_2 - S$	$- P_2$
- Put	$+P_1 - (E_1 - S)$	$+ P_1$	$+ P_1$
Total payoff	$-C + E_2 - E_1$	$-C + E_2 - E_1$	$-C + E_2 - E_1$

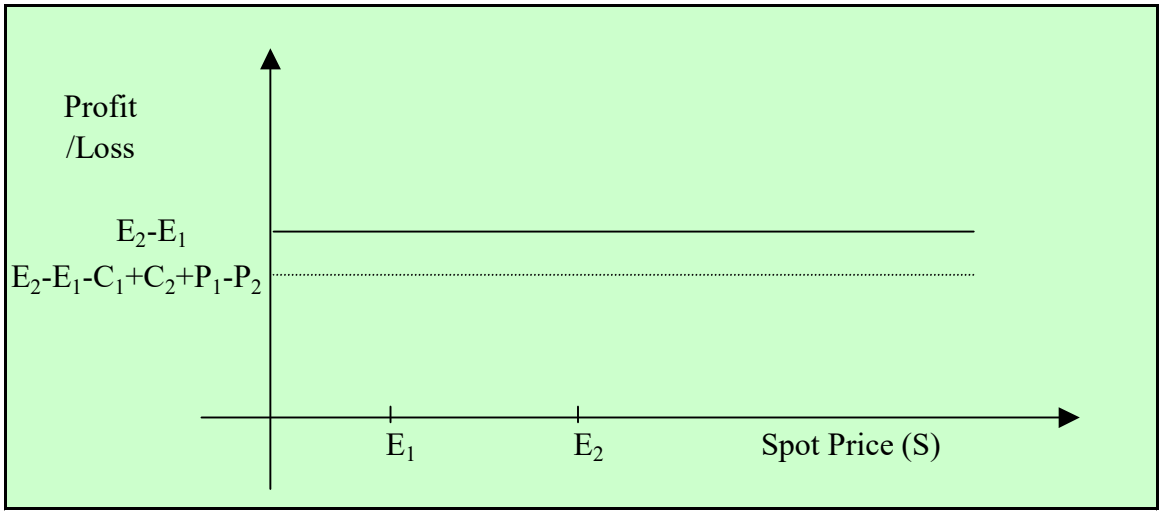

Figure 1. Box Spread

1.2 Market scenario undecided. Volatility rising

1.2.1 Long Straddle

Table 2. Long Straddle. The Value Matrix

	S<E	S>E
Call	$-C_0$	$-C_0 + S - E$
Put	$-P_0 + E - S$	$- P_0$
Total payoff	$+ E - S - C_0 - P_0$	$+ S - E - C_0 - P_0$

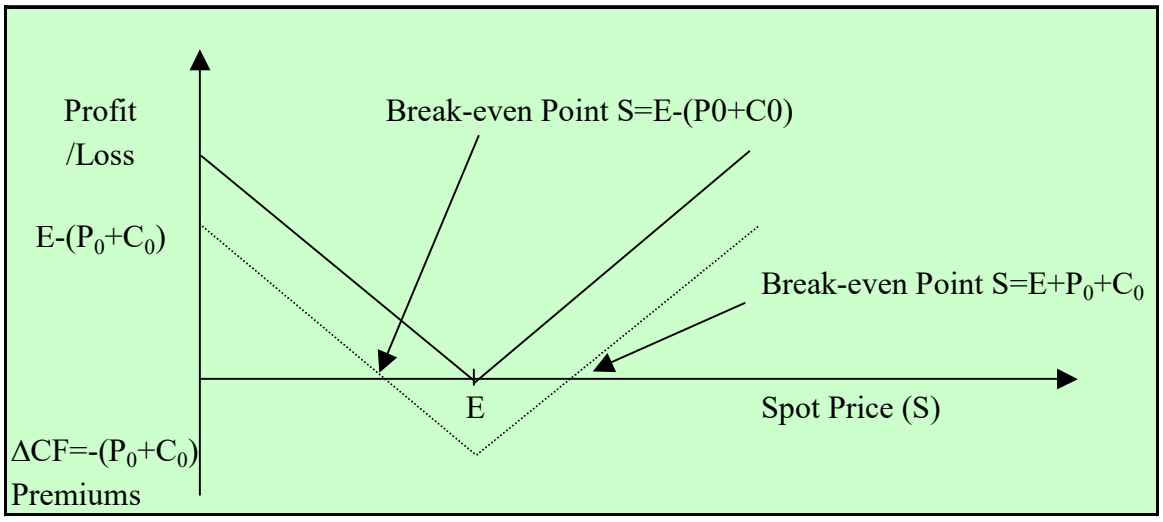

Figure 2. Long Straddle

1.2.2 Long Strangle

Table 3. Long Strangle. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
Put (E_1)	$-P_1 + E_1 - S$	$-P_1$	$- P_1$
Call (E_2)	$-C_2$	$- C_2$	$- C_2 + S - E_2$
Total payoff	$-P_1 -C_2 + E_1 - S$	$- P_1 - C_2$	$- P_1- C_2+ S - E_2$

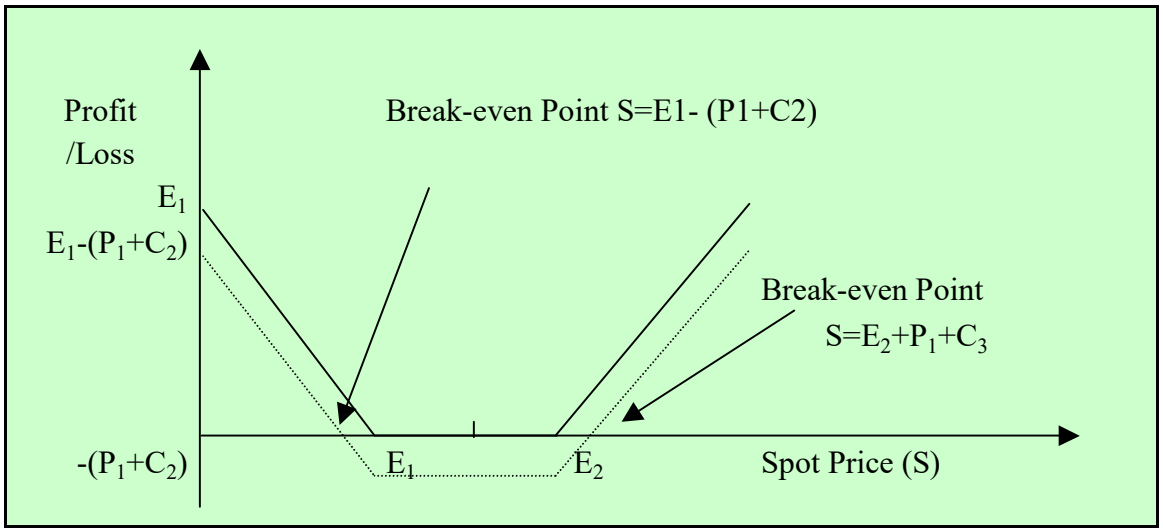

Figure 3. Long Strangle

1.2.3 Short Butterfly Spread

Table 4. Short Butterfly Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$E_2<S<E_3$	$S>E_3$
- Call (E_1)	C_1	$C_1 - S + E_1$	$C_1 - S + E_1$	$C_1 - S + E_1$
- Call (E_3)	C_3	C_3	C_3	$C_3 - S + E_3$
Call (E_2)	$-2C_2$	$-2C_2$	$-2C_2 + 2(S - E_2)$	$-2C_2 + 2(S - E_2)$
Total payoff		$-S + E_1$	$S - 2E_2 + E_1$	$-2E_2 + E_1 + E_3$
	$-2C_2 + C_1 + C_3$	$- 2C_2 + C_1 + C_3$	$- 2C_2 + C_1 + C_3$	$- 2C_2 + C_1 + C_3$

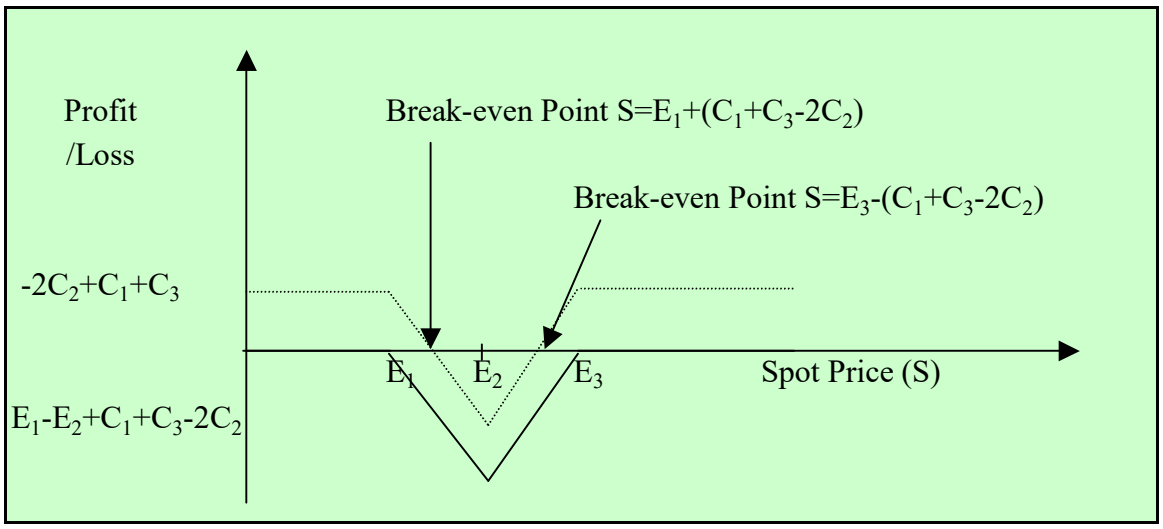

Figure 4. Short Butterfly Spread

1.2.4 Short Condor

Table 5. Short Condor. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$E_2<S<E_3$	$E_3<S<E_4$	$S>E_4$
- Call (E_1)	$+C_1$	$C_1 - (S - E_1)$	$C_1 - (S - E_1)$	$C_1 - (S - E_1)$	$C_1 - (S - E_1)$
Call (E_2)	$-C_2$	$-C_2$	$-C_2 + S - E_2$	$-C_2 + S - E_2$	$-C_2 + S - E_2$
Call (E_3)	$-C_3$	$-C_3$	$-C_3$	$-C_3 + S - E_3$	$-C_3 + S - E_3$
- Call (E_4)	C_4	C_4	C_4	C_4	$C_4 - (S - E_4)$
Total payoff	C	$-S + E_1 + C$	$-E_2 + E_1 + C$	$-E_3 -E_2 +E_1 +S +C$	$-E_3 -E_2 +E_1 +E_4 +C$

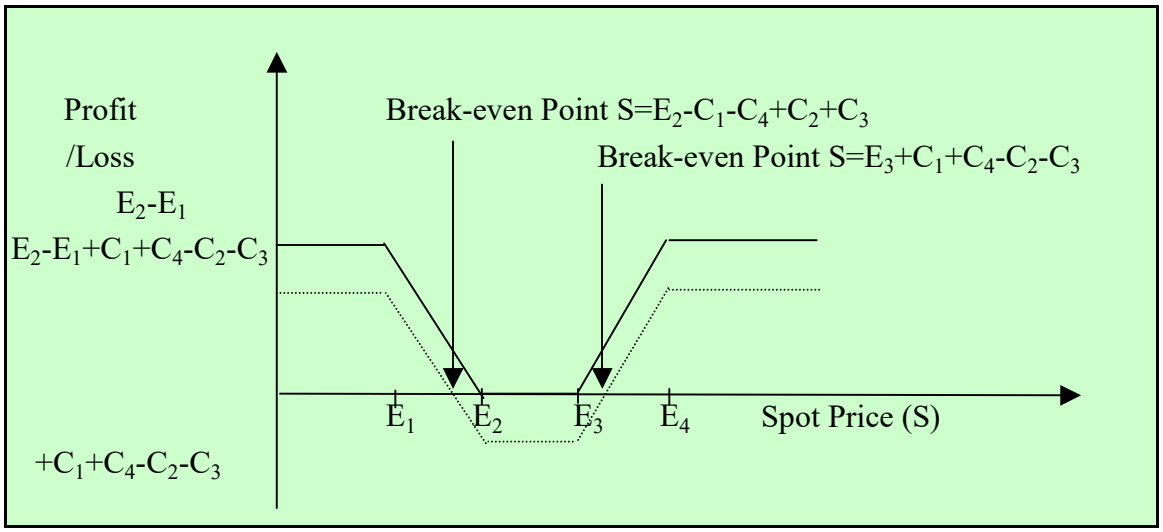

Figure 5. Short Condor

1.3 Market scenario undecided. Volatility falling

1.3.1 Short Straddle

Table 6. Short Straddle. The Value Matrix

	S<E	S>E
- Call	$+C_0$	$+C_0 - (S - E)$
- Put	$+P_0 - (E - S)$	$+ P_0$
Total payoff	$S -E +C_0 + P_0$	$E - S +C_0 + P_0$

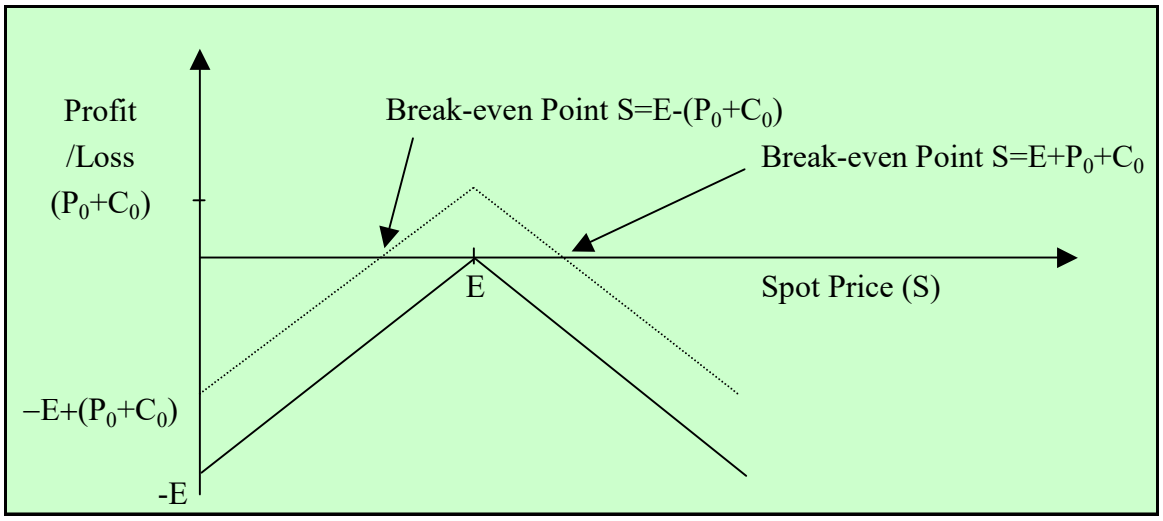

Figure 6. Short Straddle

1.3.2 Short Strangle

Table 7. Short Strangle. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
- Put (E_1)	$P_1 - E_1 + S$	P_1	P_1
- Call (E_2)	C_2	C_2	$C_2 - S + E_2$
Total payoff	$P_1 + C_2 - E_1 + S$	$P_1 + C_2$	$P_1 + C_2 - S + E_2$

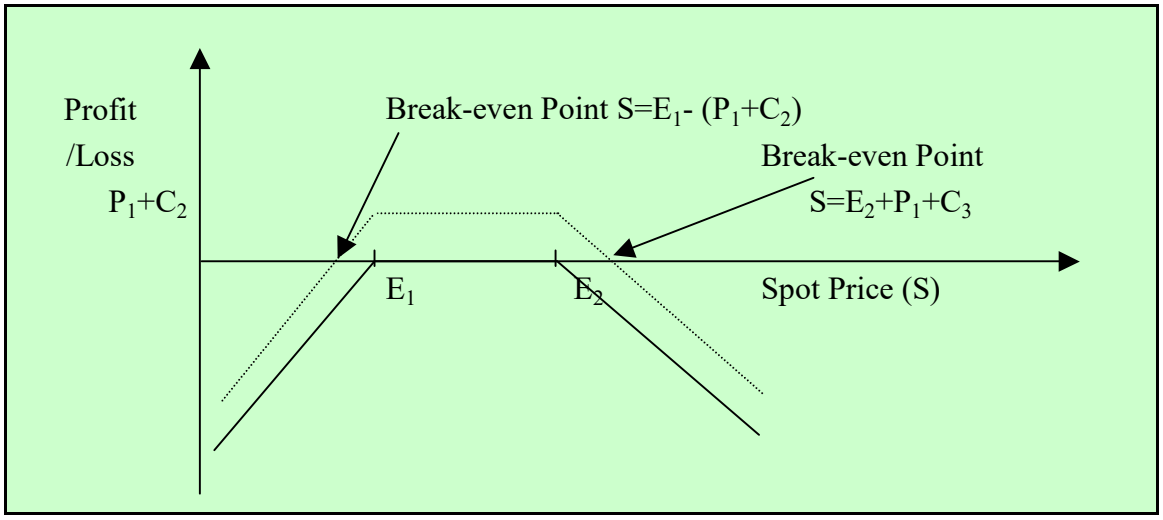

Figure 7. Short Strangle

1.3.3 Long Butterfly Spread

Table 8. Long Butterfly Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$E_2<S<E_3$	$S>E_3$
Call (E_1)	$-C_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$
Call (E_3)	$-C_3$	$-C_3$	$-C_3$	$-C_3 + S - E_3$
- Call (E_2)	$+2C_2$	$+2C_2$	$+2C_2 - 2(S - E_2)$	$+2C_2 - 2(S - E_2)$
Total payoff	$2C_2 - C_1 - C_3$	$S - E_1$	$-S + 2E_2 - E_1$	$2E_2 - E_1 - E_3$
		$+2C_2 - C_1 - C_3$	$+2C_2 - C_1 - C_3$	$+2C_2 - C_1 - C_3$

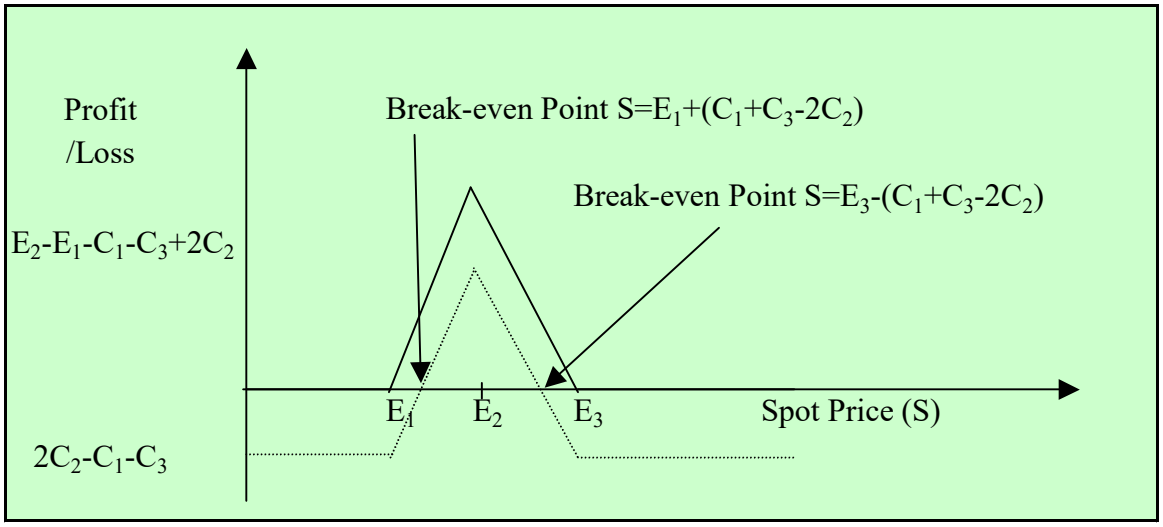

Figure 8. Long Butterfly Spread

1.3.4 Long Condor

Table 9. Long Condor. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$E_2<S<E_3$	$E_3<S<E_4$	$S>E_4$
Call (E_1)	$-C_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$
- Call (E_2)	$+C_2$	$+C_2$	$+C_2 - S + E_2$	$+C_2 - S + E_2$	$+C_2 - S + E_2$
- Call (E_3)	$+C_3$	$+C_3$	$+C_3$	$+C_3 - S + E_3$	$+C_3 - S + E_3$
Call (E_4)	$-C_4$	$-C_4$	$-C_4$	$-C_4$	$-C_4 + S - E_4$
Total payoff	$-C$	$S - E_1 - C$	$E_2 - E_1 - C$	$E_3 + E_2 - E_1 - S - C$	$E_3 + E_2 - E_1 - E_4 - C$

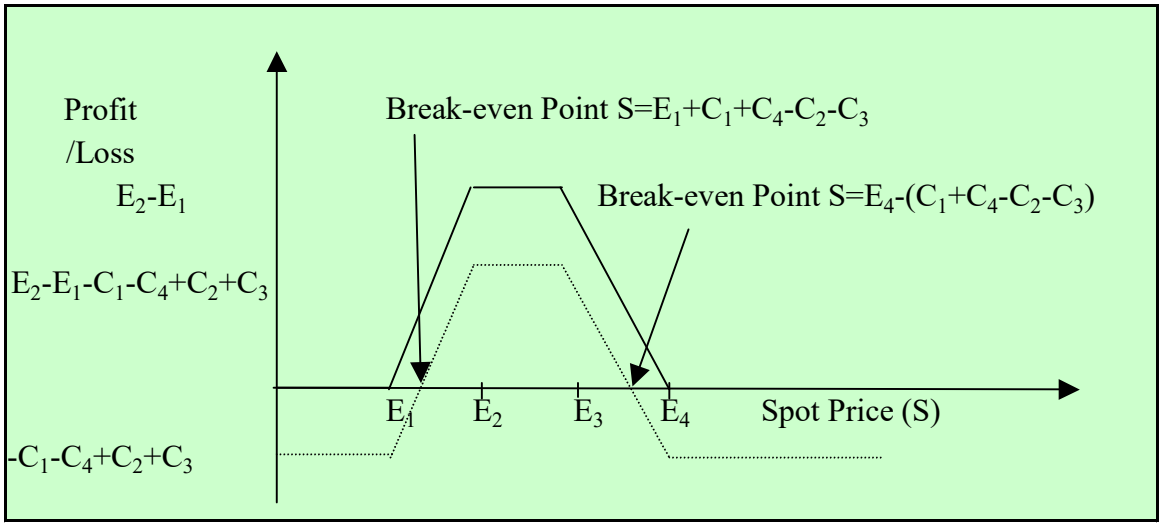

Figure 9. Long Condor

1.4 Market scenario bulish. Volatility undecided

1.4.1 Long Call + Short Put

Long call and short put replicates long share.

1.4.2 Bull Spread

Table 10. Bull Call Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
Call (E_1)	$-C_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$
- Call (E_2)	$+C_2$	$+C_2$	$+C_2 - S + E_2$
Total payoff	$C_2 - C_1$	$+ S - E_1 + C_2 - C_1$	$E_2 - E_1 + C_2 - C_1$

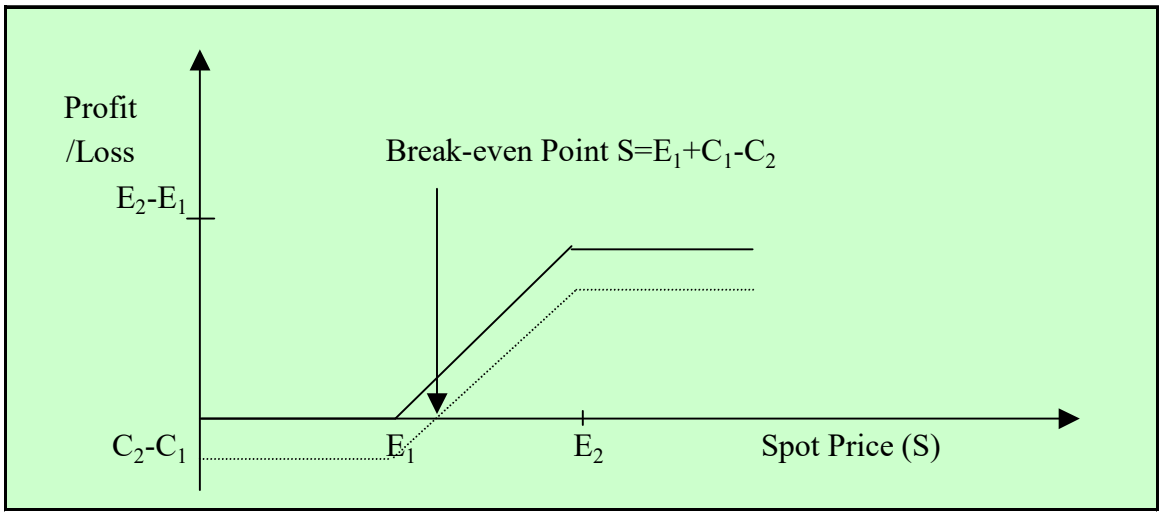

Figure 10. Bull Call Spread

1.4.3 Rotated Vertical Bull Spread

Table 11. Rotated Vertical Bull Spread. The Value Matrix

	S<E	S>E
Call	$-C_0$	$-C_0 + S - E$
- Put	$+P_0 - (E - S)$	$+ P_0$
Total payoff	$S - E - C_0 + P_0$	$+ S - E - C_0 + P_0$

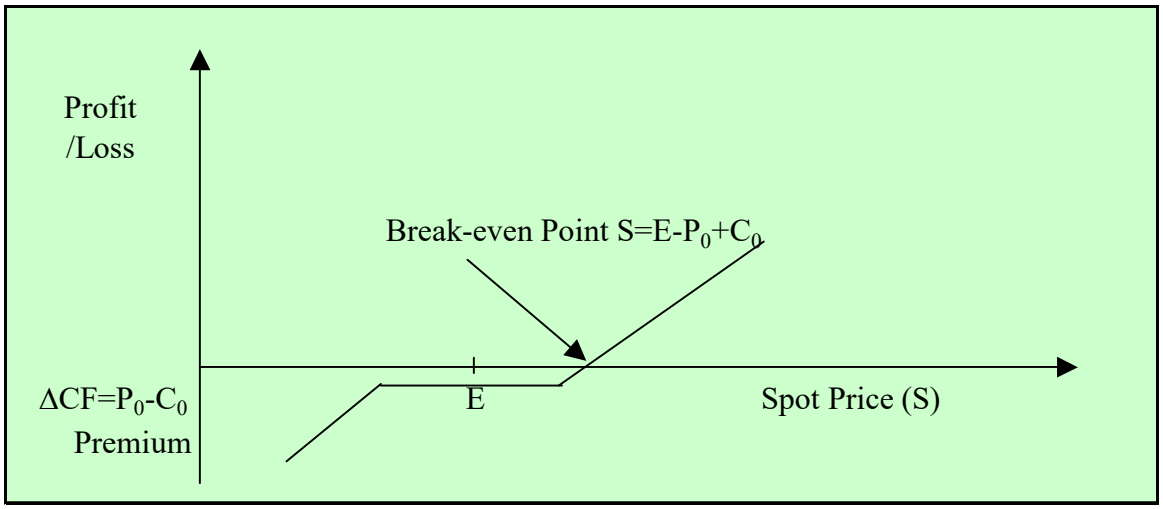

Figure 11. Rotated Vertical Bull Spread

1.5 Market scenario bulish. Volatility rising

1.5.1 Long Call

Long call is the simplest strategy for an investor expecting rise in prices and rise in volatility.

1.5.2 Protective Put

Table 12. Protective Put. The Value Matrix

	S<E	S>E
Long share	S	S
Put	$-P_0 + E - S$	$- P_0$
Total payoff	$E - P_0$	$S - P_0$

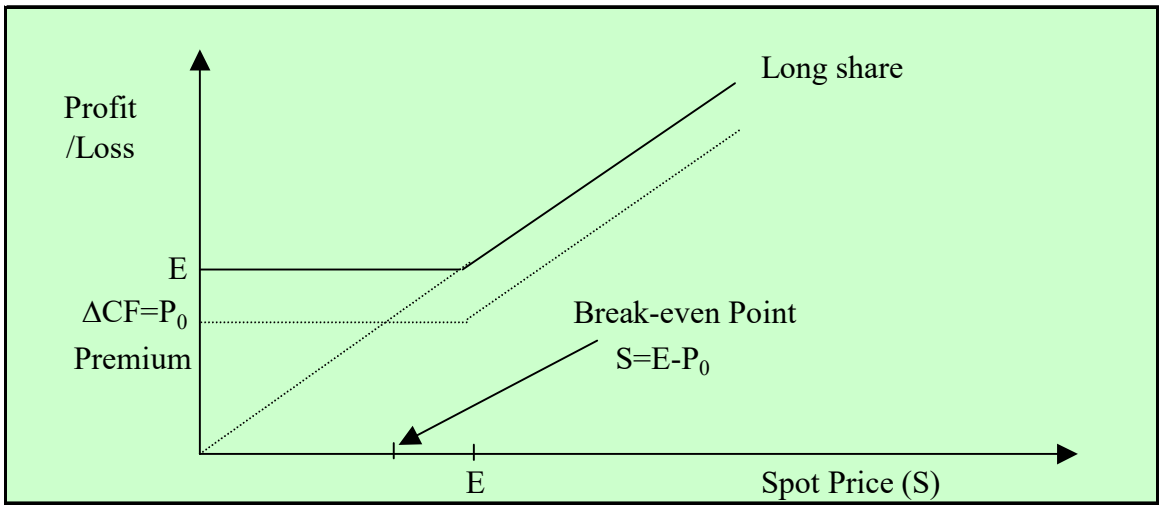

Figure 12. Protective Put

1.5.3 Call Ratio Back Spread

Table 13. Call Ratio Back Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
- Call (E_1)	$+C_1$	$+C_1 - S + E_1$	$+C_1 - S + E_1$
Two calls (E_2)	$-2C_2$	$-2C_2$	$-2C_2 + 2\,(S - E_2)$
Total payoff	$+C_1 - 2C_2$	$- S + E_1 + C_1 - 2C_2$	$S + E_1 - 2E_2 + C_1 - 2C_2$

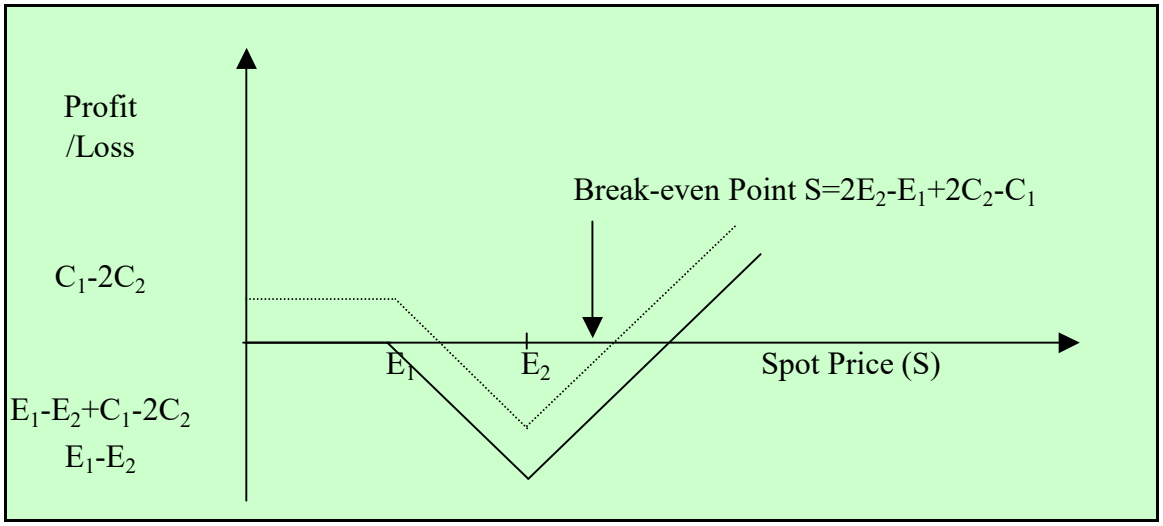

Figure 13. Call Ratio Back Spread

1.6 Market scenario bulish. Volatility falling

1.6.1 Short Put

Short put is the simplest strategy for an investor expecting fall in prices and fall in volatility.

1.6.2 Covered Call

Table 14. Covered Call. The Value Matrix

	S<E	S>E
Long share	S	S
- Call	$+C_0$	$+C_0 - (S - E)$
Total payoff	$S + C_0$	$E + C_0$

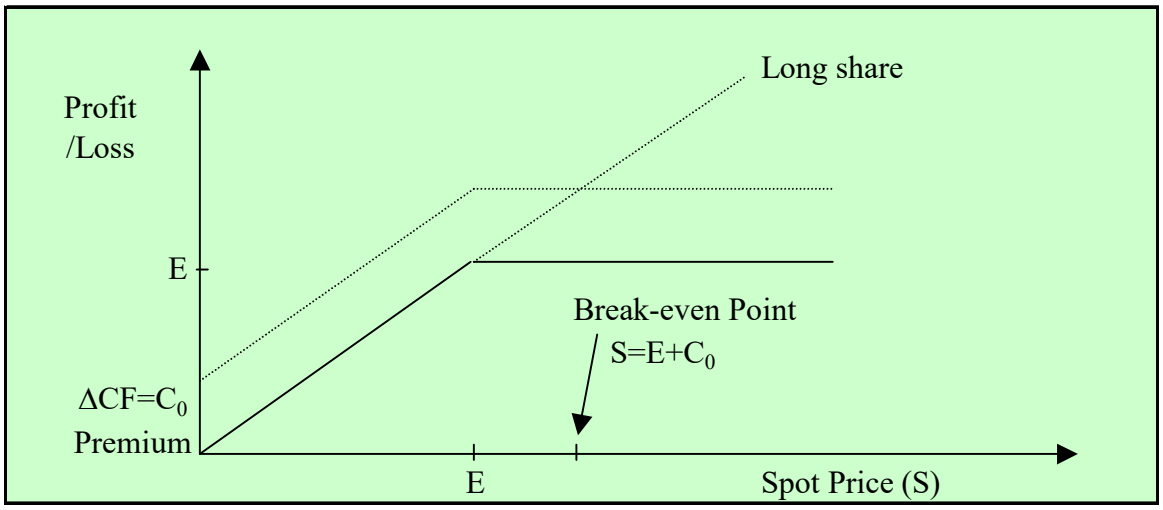

Figure 14. Covered Call

1.6.3 Ratio Call Spread

Table 15. Ratio Call Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
Call (E_1)	$-C_1$	$-C_1 + S - E_1$	$-C_1 + S - E_1$
Two short Puts (E_2)	$+2C_2$	$+2C_2$	$+2C_2 - 2(S - E_2)$
Total payoff	$-C_1 + 2C_2$	$+ S - E_1 - C_1 + 2C_2$	$-S - E_1 + 2E_2 - C_1 + 2C_2$

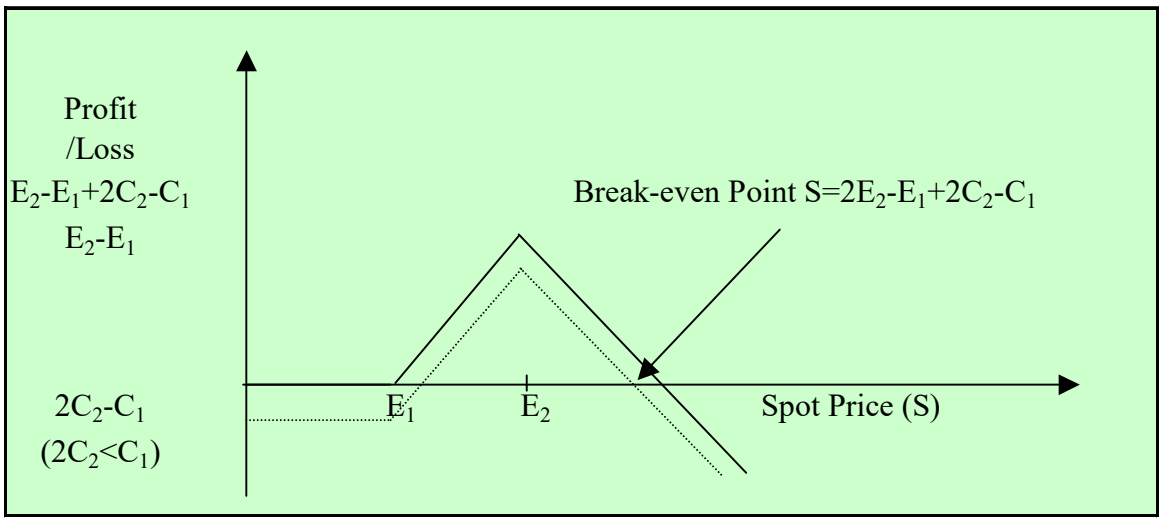

Figure 15. Ratio Call Spread

1.7 Market scenario bearish. Volatility undecided

1.7.1 Short Call + Long Put

Short call and long put replicates short share or short futures.

1.7.2 Bear Spread

Table 16. Bear Put Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
Put (E_2)	$-P_2 + E_2 - S$	$-P_2 + E_2 - S$	$- P_2$
- Put (E_1)	$+P_1 - (E_1 - S)$	$+ P_1$	$+ P_1$
Total payoff	$+P_1 - P_2 + E_2 - E_1$	$+ P_1 - P_2 + E_2 - S$	$+ P_1 - P_2$

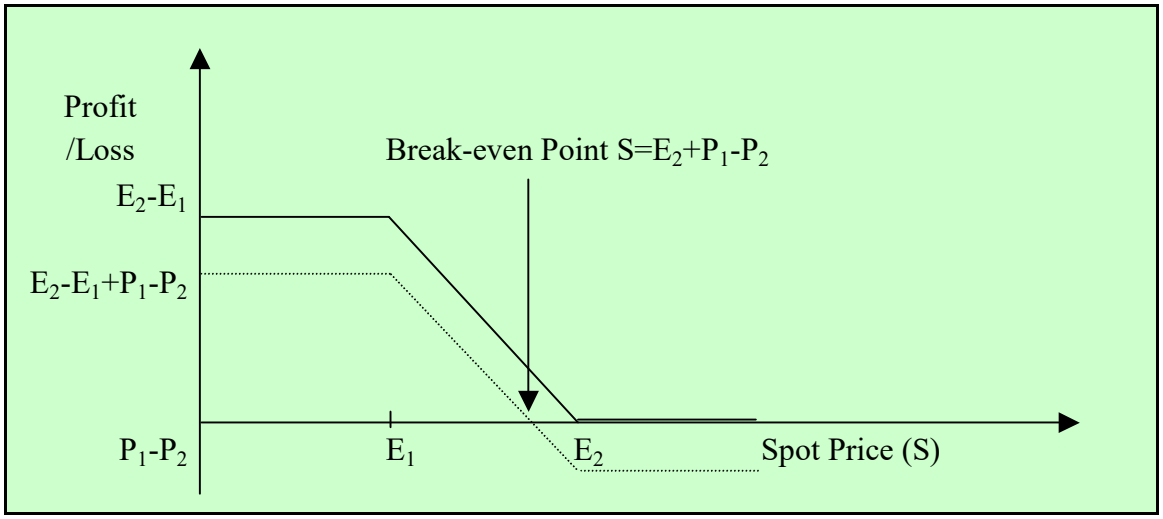

Figure 16. Bear Put Spread

1.7.3 Rotated Vertical Bear Spread

Table 17. Rotated Vertical Bear Spread. The Value Matrix

	S<E	S>E
- Call	$+C_0$	$+C_0 - (S - E)$
Put	$-P_0 + E - S$	$- P_0$
Total payoff	$E - S + C_0 - P_0$	$E - S + C_0 - P_0$

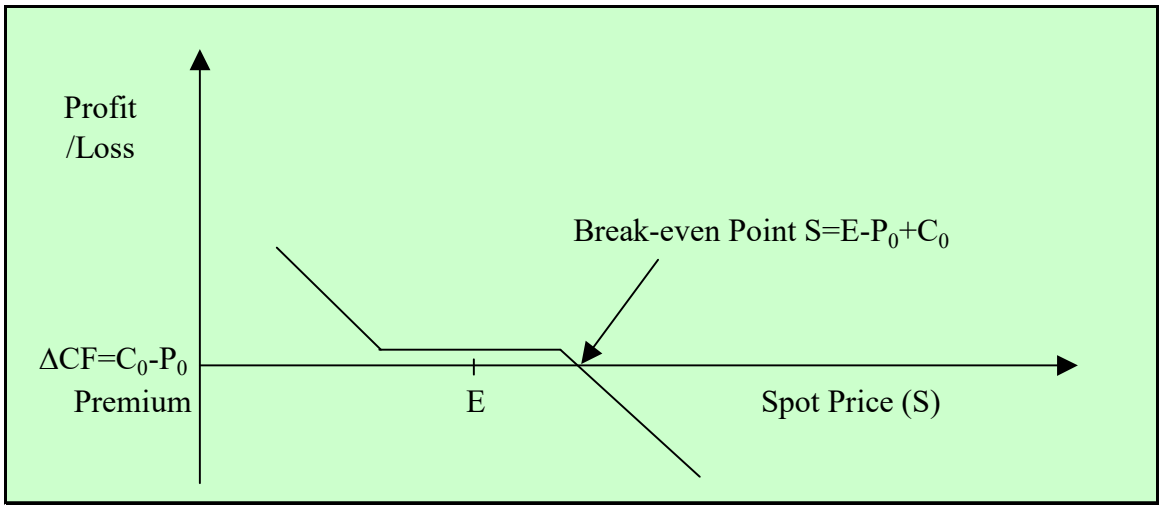

Figure 17. Rotated Vertical Bear Spread

1.8 Market scenario bearish. Volatility rising

1.8.1 Long Put

Long put is the simplest strategy for an investor expecting fall in prices and rise in volatility.

1.8.2 Put Ratio Back Spread

Table 18. Put Ratio Back Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
Put (E_1)	$-2P_1$ $-2(S - E_1)$	$-2P_1$	$-2P_1$
- Put (E_2)	$+P_2$ $-E_2$ $+S$	$+P_2 - E_2 + S$	$+P_2$
Total payoff	$-2P_1 + P_2 - S - E_2 + 2E_1$	$-2P_1 + P_2 - E_2 + S$	$-2P_1 + P_2$

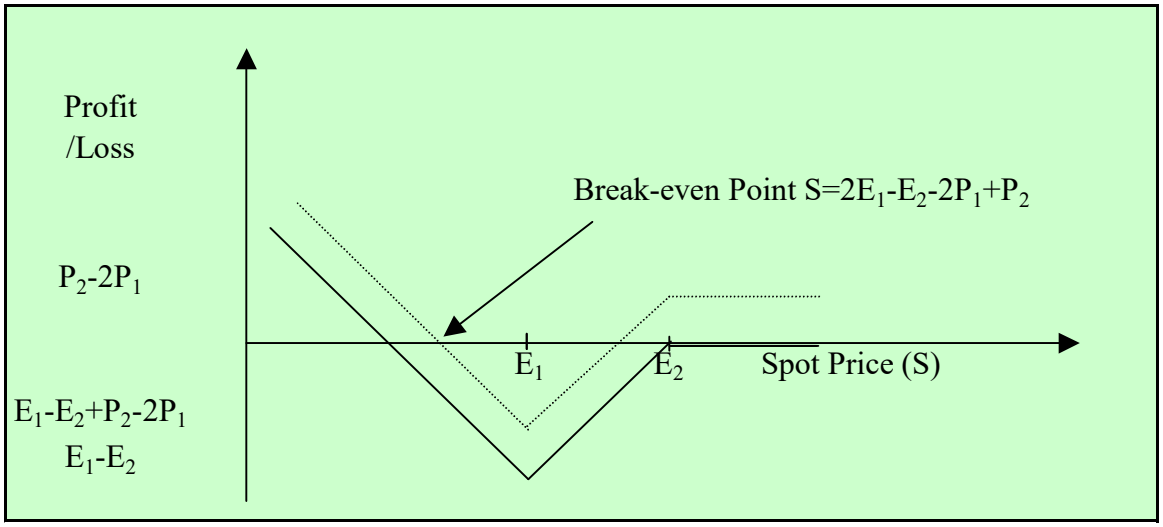

Figure 18. Put Ratio Back Spread

1.9 Market scenario bearish. Volatility falling

1.9.1 Short Call

Short call is the simplest strategy for an investor expecting fall in prices and fall in volatility.

1.9.2 Ratio Put Spread

Table 19. Ratio Put Spread. The Value Matrix

	$S<E_1$	$E_1<S<E_2$	$S>E_2$
- Put (E_1)	$2P_1 + 2(S - E_1)$	$2P_1$	$2P_1$
Put (E_2)	$-P_2 + E_2 - S$	$-P_2 + E_2 - S$	$-P_2$
Total payoff	$2P_1 - P_2 + S + E_2 - 2E_1$	$2P_1 - P_2 + E_2 - S$	$2P_1 - P_2$

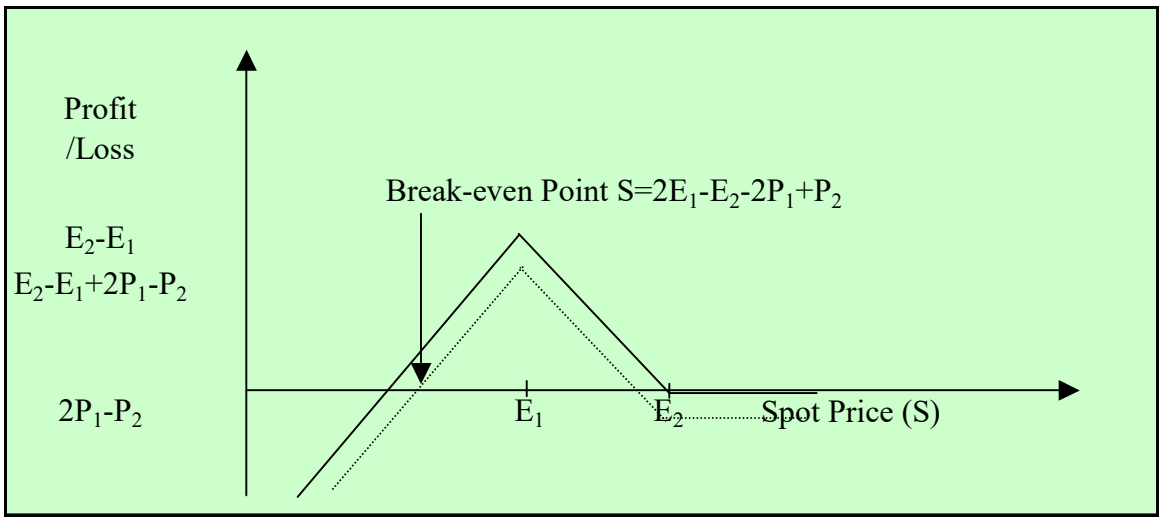

Figure 19. Ratio Put Spread

Table 20. Option Strategies. Risk and Return.

		5 perc.	μ	σ	μ/σ	(μ-r)/σ
1	Long Share + Short Forward 100%	0%				
2	Short Share + Long Forward 100%	0%				
3	Parytet Put-Call	-1%	0%	0%	-0,31	
4	Parytet Put-Call	-1%	0%	0%	0,31	
5	Box Spread	-1%	0%	0%	-1,25	
6	Long Straddle	-71%	242%	258%	0,94	0,92
7	Long Straddle* = Long Futures +2 Long Puts	-3%	8%	9%	0,94	0,36
8	Long Straddle* = Short Futures + 2 Long Calls	-3%	9%	9%	0,94	0,39
9	Long Strangle	-100%	351%	417%	0,84	0,83
10	Long Strangle* = Long Futures + 2 Long Puts	-3%	7%	9%	0,84	0,27
11	Long Strangle* = Short Futures + 2 Long Calls	-3%	8%	10%	0,84	0,32
12	Short Butterfly Spread (Calls)	-92%	69%	63%	1,09	1,01
13	Short Butterfly Spread (Puts)	-92%	69%	63%	1,09	1,01
14	Short Condor (Calls)	-56%	59%	61%	0,98	0,89
15	Short Condor (Puts)	-56%	59%	61%	0,98	0,89
16	Long Strip	-73%	256%	305%	0,84	0,82
17	Long Strap	-77%	229%	286%	0,80	0,78
18	Short Straddle	-745%	-242%	258%	-0,94	-0,96
19	Short Straddle* = Long Futures + 2 Short Calls	-27%	-9%	9%	-0,94	-1,48
20	Short Straddle* = Short Futures + 2 Short Puts	-25%	-8%	9%	-0,94	-1,52
21	Short Strangle	-1173%	-351%	417%	-0,84	-0,85
22	Short Strangle* = Long Futures + 2 Short Calls	-27%	-8%	10%	-0,84	-1,37
23	Short Strangle* = Short Futures + 2 Short Puts	-25%	-7%	9%	-0,84	-1,42
24	Long Butterfly Spread (Calls)	-100%	-69%	63%	-1,09	-1,17
25	Long Butterfly Spread (Puts)	-100%	-69%	63%	-1,09	-1,17
26	Long Condor (Calls)	-100%	-59%	61%	-0,98	-1,06
27	Long Condor (Puts)	-100%	-59%	61%	-0,98	-1,06
28	Short Strip	-876%	-256%	305%	-0,84	-0,85
29	Short Strap	-822%	-229%	286%	-0,80	-0,82
30	Long Share	-25%	0%	15%	-0,03	-0,37
31	Long Share + Short Forward 50%	-25%	0%	15%	-0,03	-0,37
32	Long Futures	-25%	0%	15%	-0,03	-0,37
33	Long Futures (Split-Strike)* = Long Call + Short Put	-5974%	-99%	3590%	-0,03	-0,03
34	Long Futures (Split-Strike)* = Long Call + Short Put	-1202%	26%	743%	0,04	0,03
35	Bull Call Spread	-100%	-6%	86%	-0,07	-0,12
36	Bull Put Spread	-100%	-6%	96%	-0,07	-0,12
37	Bull Spread* = Long Futures + Short Call + Long Put	-4%	-1%	2%	-0,37	-2,46
38	Collar	-6%	0%	5%	-0,07	-1,17
39	Rotated Vertical Bull Spread	-13342%	-76%	7645%	-0,01	-0,01
40	Long Call	-100%	205%	450%	0,46	0,45
41	Long Call* = Long Futures + Long Put	-2%	4%	9%	0,46	-0,13
42	Long Call* = Short Futures + 2 Long Calls +Short Put	-2%	4%	9%	0,46	-0,11
43	Protective Put	-2%	4%	9%	0,46	-0,13
44	Call Ratio Back Spread	-143%	277%	427%	0,65	0,64
45	Call Ratio Back Spread* = Short Futures + 2 Long Calls + Short Put	-3%	3%	6%	0,49	-0,39
46	Short Put	-1478%	-288%	563%	-0,51	-0,52
47	Short Put* = Long Futures +Short Call	-23%	-4%	9%	-0,51	-1,09
48	Short Put* = Short Futures + Long Call + 2 Short Puts	-23%	-4%	8%	-0,51	-1,10
49	Covered Call	-25%	-4%	10%	-0,37	-0,86
50	Ratio Call Spread (upside)	-1238%	-277%	427%	-0,65	-0,66
51	Ratio Call Spread* = Short Futures + Long Put + 2 Short Puts	-15%	-3%	5%	-0,49	-1,44
52	Short Share	-25%	0%	15%	0,03	-0,31
53	Short Share + Long Forward 50%	-25%	0%	15%	0,03	-0,31
54	Short Futures	-25%	0%	15%	0,03	-0,31
55	Short Futures* = Short Call + Long Put	-5978%	99%	3590%	0,03	0,03
56	Short Futures* = Short Call + Long Put	-1324%	-26%	743%	-0,04	-0,04
57	Bear Call Spread	-90%	6%	86%	0,07	0,01
58	Bear Put Spread	-100%	6%	96%	0,07	0,01
59	Bear Spread* = Short Futures + Long Call + Short Put	-2%	1%	2%	0,37	-1,72
60	Rotated Vertical Bear Spread	-13705%	76%	7645%	0,01	0,01

61	Long Put	-100%	288%	563%	0,51	0,50
62	Long Put* = Long Futures + Short Call + 2 Long Puts	-2%	4%	8%	0,51	-0,08
63	Long Put* = Short Futures +Long Call	-2%	4%	9%	0,51	-0,06
64	Put Ratio Back Spread	-121%	262%	388%	0,68	0,66
65	Put Ratio Back Spread* = Long Futures + Short Call + 2 Long Puts	-3%	3%	6%	0,47	-0,41
66	Short Call	-1185%	-205%	450%	-0,46	-0,47
67	Short Call* = Long Futures + 2 Short Calls + Long Put	-24%	-4%	9%	-0,46	-1,02
68	Short Call* = Short Futures + Short Put	-23%	-4%	9%	-0,46	-1,04
69	Covered Put	-23%	-4%	9%	-0,46	-1,04
70	Ratio Put Spread (downside)	-1107%	-262%	388%	-0,68	-0,69
71	Ratio Put Spread* = Long Futures + 2 Short Calls +Long Call	-17%	-3%	6%	-0,47	-1,28

Table 21. Option Strategies. Sensitivity Measures

		Delta	Gamma	Theta	Rho	Vega
1	Long Share + Short Forward 100%					
2	Short Share + Long Forward 100%					
3	Parytet Put-Call			0,01	-0,08	
4	Parytet Put-Call			-0,01	0,08	
5	Box Spread			0,00	-0,01	
6	Long Straddle	0,09	0,18	-0,06	0,00	0,23
7	Long Straddle* = Long Futures +2 Long Puts	0,09	0,18	-0,04	-0,08	0,23
8	Long Straddle* = Short Futures + 2 Long Calls	0,09	0,18	-0,07	0,09	0,23
9	Long Strangle	0,45	0,13	-0,05	0,04	0,16
10	Long Strangle* = Long Futures + 2 Long Puts	0,45	0,13	-0,03	-0,05	0,16
11	Long Strangle* = Short Futures + 2 Long Calls	0,45	0,13	-0,06	0,11	0,16
12	Short Butterfly Spread (Calls)	0,03	0,09	-0,03	0,00	0,11
13	Short Butterfly Spread (Puts)	0,03	0,09	-0,03	0,00	0,11
14	Short Condor (Calls)	0,30	0,07	-0,03	0,03	0,09
15	Short Condor (Puts)	0,30	0,07	-0,03	0,03	0,09
16	Long Strip	-0,36	0,28	-0,08	-0,03	0,34
17	Long Strap	0,64	0,28	-0,09	0,05	0,34
18	Short Straddle	-0,09	-0,18	0,06	0,00	-0,23
19	Short Straddle* = Long Futures + 2 Short Calls	-0,09	-0,18	0,07	-0,09	-0,23
20	Short Straddle* = Short Futures + 2 Short Puts	-0,09	-0,18	0,04	0,08	-0,23
21	Short Strangle	-0,45	-0,13	0,05	-0,04	-0,16
22	Short Strangle* = Long Futures + 2 Short Calls	-0,45	-0,13	0,06	-0,11	-0,16
23	Short Strangle* = Short Futures + 2 Short Puts	-0,45	-0,13	0,03	0,05	-0,16
24	Long Butterfly Spread (Calls)	-0,03	-0,09	0,03	0,00	-0,11
25	Long Butterfly Spread (Puts)	-0,03	-0,09	0,03	0,00	-0,11
26	Long Condor (Calls)	-0,30	-0,07	0,03	-0,03	-0,09
27	Long Condor (Puts)	-0,30	-0,07	0,03	-0,03	-0,09
28	Short Strip	0,36	-0,28	0,08	0,03	-0,34
29	Short Strap	-0,64	-0,28	0,09	-0,05	-0,34
30	Long Share	1,00				
31	Long Share + Short Forward 50%	0,50				
32	Long Futures	1,00				
33	Long Futures (Split-Strike)* = Long Call + Short Put	1,00		-0,01	0,08	
34	Long Futures (Split-Strike)* = Long Call + Short Put	0,64	0,05	-0,02	0,05	0,07
35	Bull Call Spread	0,75	-0,02	0,00	0,06	-0,02
36	Bull Put Spread	0,75	-0,02	-0,01	0,07	-0,02
37	Bull Spread* = Long Futures + Short Call + Long Put	0,36	-0,05	0,02	-0,05	-0,07
38	Collar	0,75	-0,02	0,01	-0,02	-0,02
39	Rotated Vertical Bull Spread	0,25	0,02	-0,01	0,02	0,02
40	Long Call	0,55	0,09	-0,04	0,04	0,11
41	Long Call* = Long Futures + Long Put	0,55	0,09	-0,02	-0,04	0,11
42	Long Call* = Short Futures + 2 Long Calls +Short Put	0,55	0,09	-0,05	0,13	0,11
43	Protective Put	0,55	0,09	-0,02	-0,04	0,11
44	Call Ratio Back Spread	0,19	0,14	-0,05	0,02	0,18
45	Call Ratio Back Spread* = Short Futures + 2 Long Calls + Short Put	-0,24	0,02	-0,02	0,06	0,02
46	Short Put	0,45	-0,09	0,02	0,04	-0,11
47	Short Put* = Long Futures +Short Call	0,45	-0,09	0,04	-0,04	-0,11
48	Short Put* = Short Futures + Long Call + 2 Short Puts	0,45	-0,09	0,01	0,12	-0,11
49	Covered Call	0,85	-0,06	0,02	-0,01	-0,07
50	Ratio Call Spread (upside)	-0,19	-0,14	0,05	-0,02	-0,18
51	Ratio Call Spread* = Short Futures + Long Put + 2 Short Puts	0,24	-0,02	-0,01	0,11	-0,02
52	Short Share	-1,00				
53	Short Share + Long Forward 50%	-0,50				
54	Short Futures	-1,00				
55	Short Futures* = Short Call + Long Put	-1,00		0,01	-0,08	
56	Short Futures* = Short Call + Long Put	-0,64	-0,05	0,02	-0,05	-0,07
57	Bear Call Spread	-0,75	0,02	0,00	-0,06	0,02
58	Bear Put Spread	-0,75	0,02	0,01	-0,07	0,02
59	Bear Spread* = Short Futures + Long Call + Short Put	-0,36	0,05	-0,02	0,05	0,07
60	Rotated Vertical Bear Spread	-0,25	-0,02	0,01	-0,02	-0,02

61	Long Put	-0,45	0,09	-0,02	-0,04	0,11
62	Long Put* = Long Futures + Short Call + 2 Long Puts	-0,45	0,09	-0,01	-0,12	0,11
63	Long Put* = Short Futures +Long Call	-0,45	0,09	-0,04	0,04	0,11
64	Put Ratio Back Spread	-0,06	0,13	-0,04	0,00	0,16
65	Put Ratio Back Spread* = Long Futures + Short Call + 2 Long Puts	0,26	-0,01	0,01	-0,06	-0,02
66	Short Call	-0,55	-0,09	0,04	-0,04	-0,11
67	Short Call* = Long Futures + 2 Short Calls + Long Put	-0,55	-0,09	0,05	-0,13	-0,11
68	Short Call* = Short Futures + Short Put	-0,55	-0,09	0,02	0,04	-0,11
69	Covered Put	-0,55	-0,09	0,02	0,04	-0,11
70	Ratio Put Spread (downside)	0,06	-0,13	0,04	0,00	-0,16
71	Ratio Put Spread* = Long Futures + 2 Short Calls +Long Call	-0,26	0,01	0,01	-0,10	0,02