Pricing option strategies with FINCAD

Introduction

Investors use vanilla options to speculate and to hedge against movements in the underlying entity. Option *strategies* are formed from a combination of vanilla options of various strikes, positions (long/short), notionals and maturities. Strategies are often used to take a position in the volatility of the underlying, and in the structure of the volatility surface. The strategies have names such as *straddles*, *strangles*, *spreads*, *condors*, etc. This article compares the pricing of option strategies using the function aaBSG for each constituent vanilla option, with the function aaOption_LV_eu_p that can price a strategy in one go.

FINCAD functions

FINCAD has several functions that can be used to price option strategies. Single valuation functions such as aaBSG or aaBIN2 can be used on each constituent option to price whatever type of strategy is required. Alternatively, the aaOptions_LV functions allow the user to choose from several common trading strategies, or create their own strategy, and output the fair value and risk statistics. The advantage of the aaOption_LV functions is that there are 28 pre-defined strategies. Furthermore, the aaOption_LV functions can use one of a number of models, including lognormal (i.e., standard Black-Scholes), shifted lognormal, normal, or CEV processes.

The examples below will outline how one can price various strategies using FINCAD functions. The example also compares the aaOption_LV function with the single option function aaBSG.

Defining the strategies

The following is a description of the option trading strategies that are valued using the aaBSG and aaOption_LV_eu_p functions in the spreadsheet below:

Example 1:

Straddle – buy put, buy call at the same strike X

aaOption_LV_eu_p	STRADDLE	
underlying price	50	
payoff	10	straddle
strike table	See table_1218 below	
expiry date	1-Jul-2007	
value date	1-Jan-2007	
local volatility function	1	lognormal
parameters for the local volatility function	See table_1220 below	
discount factor curve - risk free	See table_43 below	
discount factor curve - holding cost	See table_43 below	
interpolation method	1	linear
statistic	1	fair value

table_1218 - strike table
exercise price straddle
40

table_1220 - parameters for the local volatility function
volatility
20.000%

table_43 - discount factor curve - risk free		
rate	quotation ba	accrual method
5.000%	1	1

table_43 - discount factor curve - holding cost		
rate	quotation ba	accrual method
3.000%	1	1

fair value	10.4818362

aaBSG		STRADDLE	
underlying price	50		50
exercise price	40		40
expiry date	1-Jul-2007		1-Jul-2007
value (settlement) date	1-Jan-2007		1-Jan-2007
volatility	20.000%		20.000%
rate - annual compounding	5.000%		5.000%
holding cost - annual compound	3.000%		3.000%
option type	1	call	2
statistic	1	fair value	1
accrual method - riskless rate	1	actual/365 (fi	1
accrual method - holding cost	3	actual/365 (fi	3
	call		put
fair value	10.35523		0.12661

Buy put, buy call at same strike 40

straddle 10.481836

Example 2:

Butterfly – buy call at strike X, sell two calls at higher strikes Y, buy call at even higher strike Z (X < Y < Z)

aaOption_LV_eu_p	BUTTERFLY		
underlying price	50		
payoff	13	butterfly	
strike table	See table_1218 below		
expiry date	1-Jul-2007		
value date	1-Jan-2007		
local volatility function	1	lognormal	
parameters for the local volatility function	See table_1220 below		
discount factor curve - risk free	See table_43 below		
discount factor curve - holding cost	See table_43 below		
interpolation method	1	linear	
statistic	At bottom of pasted example		
table_1218 - strike table			
exercise price butterfly			
40	42		
table_1220 - parameters for the local volatility function			
volatility			
20.000%			
table_43 - discount factor curve - risk free			
rate	**quotation ba**	**accrual method**	
5.000%	1	1	
table_43 - discount factor curve - holding cost			
rate	**quotation ba**	**accrual method**	
3.000%	1	1	
fair value	0.025110469	1	

aaBSG	BUTTERFLY					
underlying price	50		50	50	50	
exercise price	40		41	41	42	
expiry date	1-Jul-2007		1-Jul-2007	1-Jul-2007	1-Jul-2007	
value (settlement) date	1-Jan-2007		1-Jan-2007	1-Jan-2007	1-Jan-2007	
volatility	20.000%		20.000%	20.000%	20.000%	
rate - annual compounding	5.000%		5.000%	5.000%	5.000%	
holding cost - annual compound	3.000%		3.000%	3.000%	3.000%	
option type	1	call	1	1	1	
statistic	1	fair value	1	1	1	
accrual method - riskless rate	1	actual/365 (fi	1	1	1	
accrual method - holding cost	3	actual/365 (fi	3	3	3	
	call		call	call	call	butterfly
fair value	10.35523		9.44539	9.44539	8.56066	0.0251105

Buy call at strike 40, sell two calls at higher strikes 41, buy call at a higher strike 42

Example 3:

Iron condor – buy put at strike W, sell put at lower strike Z, buy call at strike X, sell call at higher strike Y (X < Y < Z < W)

aaOption_LV_eu_p	IRON CONDOR		
underlying price	50		
payoff	16	iron condor	
strike table	See table_1218 below		
expiry date	1-Jul-2007		
value date	1-Jan-2007		
local volatility function	1	lognormal	
parameters for the local volatility function	See table_1220 below		
discount factor curve - risk free	See table_43 below		
discount factor curve - holding cost	See table_43 below		
interpolation method	1	linear	
statistic	At bottom of pasted example		
table_1218 - strike table			
exercise price iron condor			
40	41	42	
table_1220 - parameters for the local volatility function			
volatility			
20.000%			
table_43 - discount factor curve - risk free			
rate	**quotation ba**	**accrual method**	
5.000%	1	1	
table_43 - discount factor curve - holding cost			
rate	**quotation ba**	**accrual method**	
3.000%	1	1	
fair value	0.920285478	1	

aaBSG	IRON CONDOR					
underlying price	50		50	50	50	
exercise price	42		43	40	41	
expiry date	1-Jul-2007		1-Jul-2007	1-Jul-2007	1-Jul-2007	
value (settlement) date	1-Jan-2007		1-Jan-2007	1-Jan-2007	1-Jan-2007	
volatility	20.000%		20.000%	20.000%	20.000%	
rate - annual compounding	5.000%		5.000%	5.000%	5.000%	
holding cost - annual compound	3.000%		3.000%	3.000%	3.000%	
option type	1	call	1	2	2	
statistic	1	fair value	1	1	1	
accrual method - riskless rate	1	actual/365 (fi	1	1	1	
accrual method - holding cost	3	actual/365 (fi	3	3	3	
	call		call	put	put	iron condor
fair value	8.56066		7.70664	0.12661	0.19287	0.9202855

Buy the call at at strike 42, sell the call at strike 43 and also sell the put at strike 40 and buy the put at strike 41

Conclusion

As can be seen in the example, users can price option strategies using FINCAD in multiple ways:

1. Calling single valuation functions such as aaBSG multiple times (for each call and put)
2. Using the LV functions with its pre-built strategies or ability for the user to define their strategy.

The example also shows that given the same inputs and exercise styles, both alternatives yield the same result.

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