OptionMatrix

for version 1.4.3, 21 February 2016

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This manual is for OptionMatrix (version 1.4.3, 21 February 2016), which is a Financial Derivatives Calculator supporting GTK+, Curses and the Command Line.

Table of Contents

1 Overview

The OptionMatrix programs are financial derivative calculators distributed by `http://anthonybradford.com`. These calculators are real-time multi-model option chain pricers with analytics and interactive controls. `optionmatrix` is the GTK+ graphical user interface version and `optionmatrix_console` is the Curses version (Unix/Linux console, DOS).

Both programs feature: greeks, decimal date to real-date translations, real-date to decimal date translations, real-time time bleeding, configurable option expiration date engines, calendars, strike control systems, tickers and over 168 option models. `optionmatrix` also supports: spreads, bonds, term structures, cash flow editing, source code viewing and text exporting.

The OptionMatrix programs use financial model libraries. Models are included from QuantLib, Bjørn Augestad (Metaoptions), Anthony Bradford, Bernt Arne Ødegaard (Financial Numerical Recipes in C++) and Seth Pinsky. The code base can be easily extended to include new models.

The OptionMatrix programs are implemented in C++ and use Autotools for packaging. See Chapter 6 [Downloading and Installation], page 27, for source code and installers. These programs are protected by the GNU General Public License, users are free (in perpetuity) to share and change them.

OptionMatrix was written by Anthony Bradford.

2 Invoking the OptionMatrix Programs

2.1 Usage Options

The options for running the OptionMatrix programs are:

```
optionmatrix option ...
optionmatrix_console option ...
```

With no options, `optionmatrix` launches the GTK+ (GUI) version of OptionMatrix and `optionmatrix_console` launches the Curses (console, DOS) version.

`optionmatrix` and `optionmatrix_console` support the following options:

'`--help`'
'`-h`' Print an informative help message on standard output and exit.

'`--version`'
'`-v`' Print the version number and licensing information of OptionMatrix on standard output and exit.

'`--list`'
'`-l`' List the names of all financial models to standard output and exit.

'`--source`'
'`-s`' List source code file names of models not accessible by the application to standard output and exit. If a model's source code is accessible the `optionmatrix` program can display source code from the running application.

'`--debug`'
'`-d`' Force creation of debug log file '`optionmatrix.log`'

'`--price`'
'`-p`' Iterate through and test all models to standard output and exit.

'`--quiet`'
'`-q`' Iterate through and test all models in quiet mode and exit.

'`--model`'
'`-m`' Time test a specific model number to standard output and exit. 200000 executions of model are made and timed by default.

'`--iterate number`'
'`-i number`'
Set number of executions a model will be time tested for (default 200000)

'`--Directory`'
'`-D`' Set model source code directory. The GTK+ version of the application can display source code.

'`--datadir`'
'`-x`' Override the datadir variable used for the path to icons / images.

The option '`--debug`' ('`-d`') is the only option used by both `optionmatrix` and `optionmatrix_console` applications. The options '`--Directory`' ('`-D`') and '`--datadir`'

('`-x`') are exclusive to `optionmatrix`. The remaining command line options do not launch an interactive application and only create standard output and exit.

2.2 Examples

Try typing '`optionmatrix --version`'

```
optionmatrix 1.4.3

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This is free software; see the source for copying conditions.
There is NO warranty; not even for MERCHANTABILITY or
FITNESS FOR A PARTICULAR PURPOSE.

Written by Anthony Bradford.
```

Run and time model zero, Black-Scholes, at the default number of iterations (200000)

'`optionmatrix --model 0 `'

```
Model #: 0 Black-Scholes

200000 Calls calculated  Time 1.517541s
CPU time: 0.600000s

200000 Puts calculated  Time 1.416533s
CPU time: 0.560000s
```

Run and time model zero, Black-Scholes, at 1 million iterations

'`optionmatrix --iterate 1000000 --model 0`'

```
Model #: 0 Black-Scholes

1000000 Calls calculated  Time 7.890567s
CPU time: 2.870000s

1000000 Puts calculated  Time 7.357173s
CPU time: 2.780000s
```

Run the Curses version of OptionMatrix

'`optionmatrix_console`'

Run the GTK+ (GUI) version of OptionMatrix

'`optionmatrix`'

Run the GTK+ (GUI) version of OptionMatrix and define the model source code location.

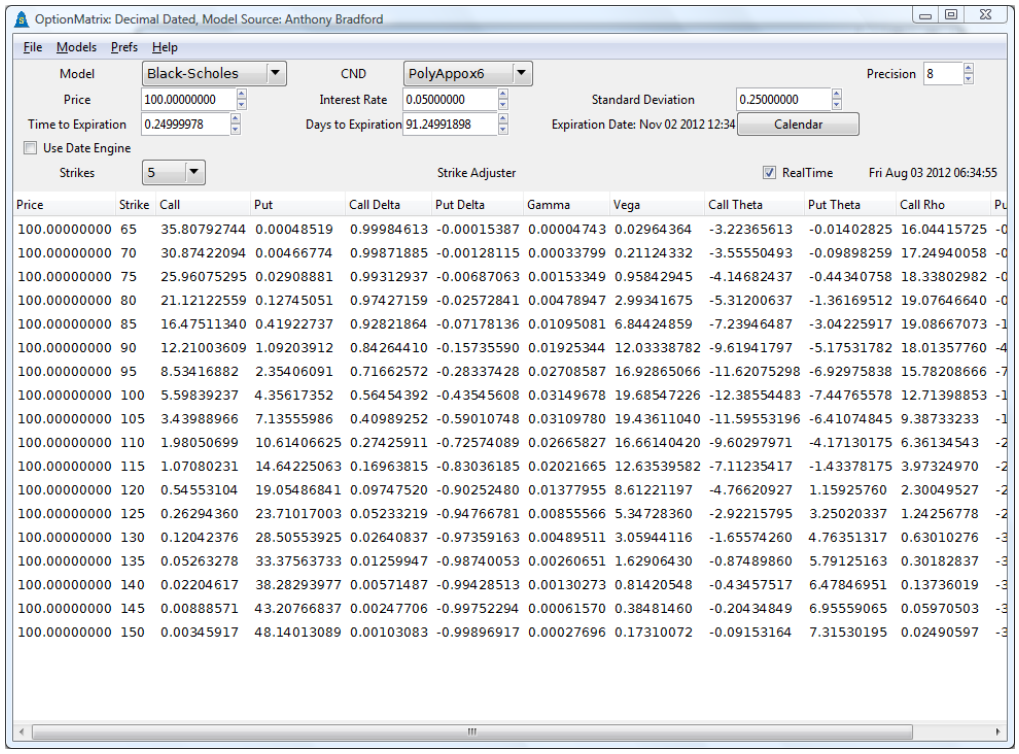
‘`optionmatrix --Directory src/c++/optionmatrix/optionmatrix-1.4.3`’

3 Graphical Application optionmatrix

3.1 Main Screen

Running `optionmatrix` with no arguments or just the '`--debug`', '`-d`' options will invoke the OptionMatrix GTK+ Graphical Application. The '`--debug`' or '`-d`' options will cause `optionmatrix` to create the debug log, '`optionmatrix.log`', in the users home directory or the current working directory of execution. This log file will be populated with diagnostic information while the program is executing.

The initial screen will appear. The default model is Black-Scholes. The option chain on display is being re-calculated every second. Price changes are the result of time bleeding between the current time and the expiration time.

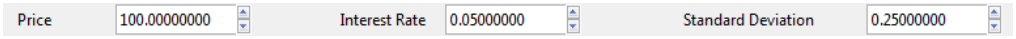


Price	Strike	Call	Put	Call Delta	Put Delta	Gamma	Vega	Call Theta	Put Theta	Call Rho	Pu
100.00000000	65	35.80792744	0.00048519	0.99984613	-0.00015387	0.00004743	0.02964364	-3.22365613	-0.01402825	16.04415725	-0
100.00000000	70	30.87422094	0.00466774	0.99871885	-0.00128115	0.00033799	0.21124332	-3.55550493	-0.09898259	17.24940058	-0
100.00000000	75	25.96075295	0.02908881	0.99312937	-0.00687063	0.00153349	0.95842945	-4.14682437	-0.44340758	18.33802982	-0
100.00000000	80	21.12122559	0.12745051	0.97427159	-0.02572841	0.00478947	2.99341675	-5.31200637	-1.36169512	19.07646640	-0
100.00000000	85	16.47511340	0.41922737	0.92821864	-0.07178136	0.01095081	6.84424859	-7.23946487	-3.04225917	19.08667073	-1
100.00000000	90	12.21003609	1.09203912	0.84264410	-0.15735590	0.01925344	12.03338782	-9.61941797	-5.17531782	18.01357760	-4
100.00000000	95	8.53416882	2.35406091	0.71662572	-0.28337428	0.02708587	16.92865066	-11.62075298	-6.92975838	15.78208666	-7
100.00000000	100	5.59839237	4.35617352	0.56454392	-0.43545608	0.03149678	19.68547226	-12.38554483	-7.44765578	12.71398853	-1
100.00000000	105	3.43988966	7.13555986	0.40989252	-0.59010748	0.03109780	19.43611040	-11.59553196	-6.41074845	9.38733233	-1
100.00000000	110	1.98050699	10.61406625	0.27425911	-0.72574089	0.02665827	16.66140420	-9.60297971	-4.17130175	6.36134543	-2
100.00000000	115	1.07080231	14.64225063	0.16963815	-0.83036185	0.02021665	12.63539582	-7.11235417	-1.43378175	3.97324970	-2
100.00000000	120	0.54553104	19.05486841	0.09747520	-0.90252480	0.01377955	8.61221197	-4.76620927	1.15925760	2.30049527	-2
100.00000000	125	0.26294360	23.71017003	0.05233219	-0.94766781	0.00855566	5.34728360	-2.92215795	3.25020337	1.24256778	-2
100.00000000	130	0.12042376	28.50553925	0.02640837	-0.97359163	0.00489511	3.05944116	-1.65574260	4.76351317	0.63010276	-3
100.00000000	135	0.05263278	33.37563733	0.01259947	-0.98740053	0.00260651	1.62906430	-0.87489860	5.79125163	0.30182837	-3
100.00000000	140	0.02204617	38.28293977	0.00571487	-0.99428513	0.00130273	0.81420548	-0.43457517	6.47846951	0.13736019	-3
100.00000000	145	0.00888571	43.20766837	0.00247706	-0.99752294	0.00061570	0.38481460	-0.20434849	6.95559065	0.05970503	-3
100.00000000	150	0.00345917	48.14013089	0.00103083	-0.99896917	0.00027696	0.17310072	-0.09153164	7.31530195	0.02490597	-3

3.2 Input Controls

3.2.1 Price, Interest Rate and Standard Deviation

Price, interest rate, and standard deviation can be configured via spin buttons.



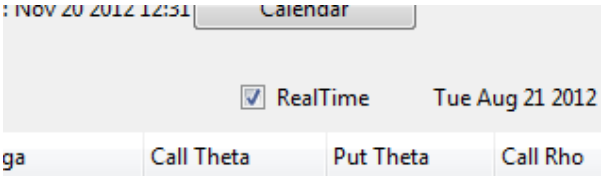
3.2.2 Time

Time can be entered by the "Time to Expiration" or the "Days to Expiration" spin buttons.

"Time to Expiration" displays time to expiration in years. "Days to Expiration" displays expiration time in days.

Input to either spin button updates both. An exact expiration date and time is calculated from the input, the option chain in the calculator's grid display will be update to the new expiration date. Date calculations are adjusted for leap day of leap years.

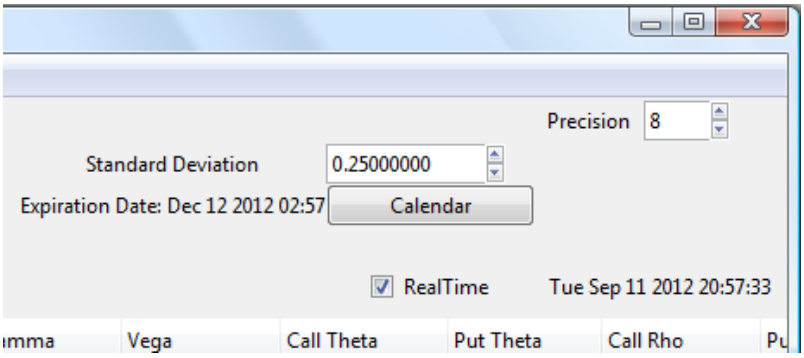
Both spin button's time value decreases every second as the expiration date approaches. This real-time updating can be toggled with the checkbox "RealTime".



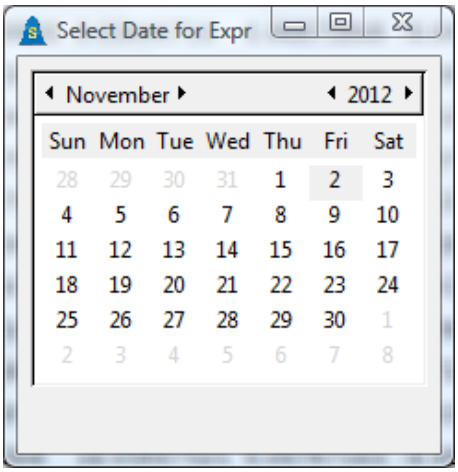
3.2.3 Calendar Picker

A specific calendar date can be selected with the Calendar Picker.

Calendar date selections will update both the "Time to Expiration" and the "Days to Expirations" spin buttons. Pressing the "Calendar" push button will invoke the Calendar Picker popup.



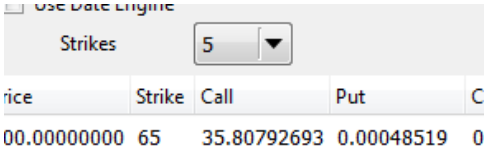
The popup features year, month and day calendar selections.



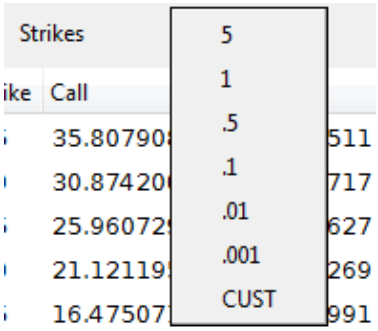
Select an expiration date and dismiss the popup. The popup does not feature a "OK" or "Cancel" button. The option chain in the calculator's grid display will be set to the new expiration date.

3.2.4 Strike Controls

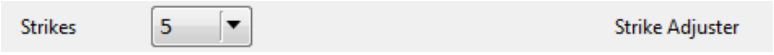
A drop down box "Strikes" changes the strike increments or allows custom strike mode.



Selections include: 5, 1, .5, .1, .01, .001 and CUST



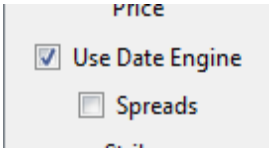
A scale button "Strike Adjuster" allows scrolling of strikes being displayed in the selected strike increments.



Selection of drop down item "CUST" allows entering of any strike in the Strike input box.

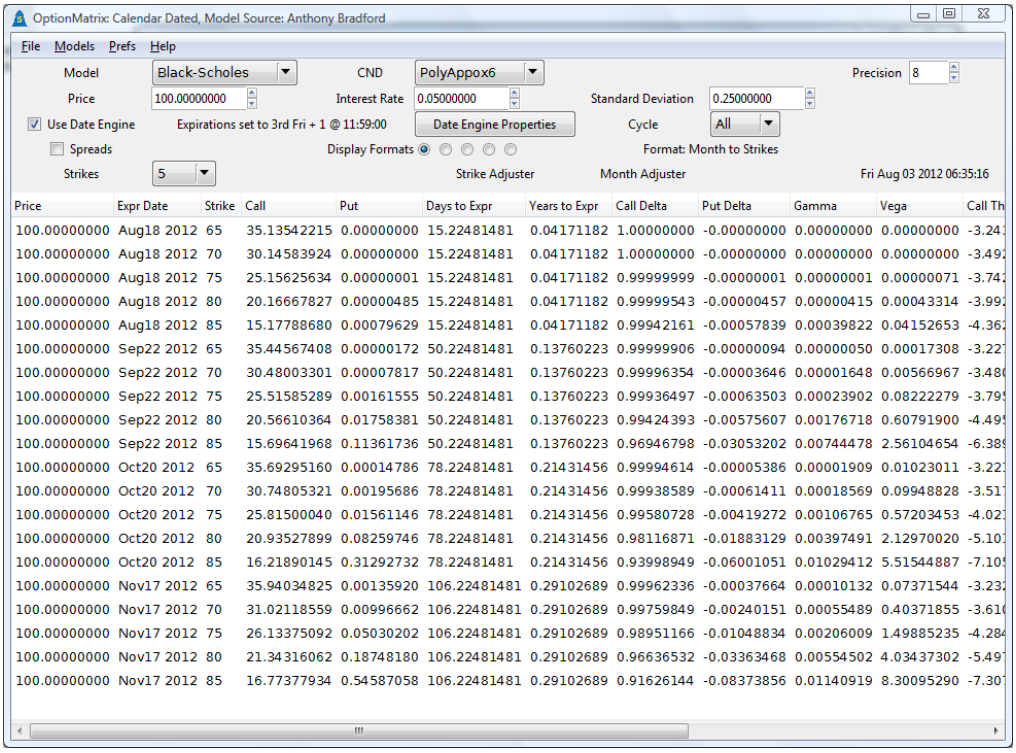
3.3 Date Engine

Selecting the checkbox "Use Date Engine" will invoke the Date Engine.



The Date Engine will map option expirations to a default of 3rd Friday+1 @11:59AM going into the future. This is the standard expiration for U.S. Exchange Traded Options. The Date Engine is configurable and can make any re-occuring date used by the options industry.

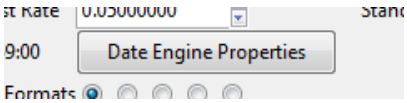
The option chain's pricing will be updated as time decreases between the current time and the expirations.



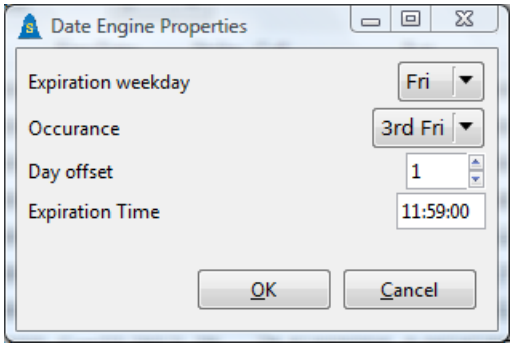
Price	Expr Date	Strike	Call	Put	Days to Expr	Years to Expr	Call Delta	Put Delta	Gamma	Vega	Call Th
100.00000000	Aug18 2012	65	35.13542215	0.00000000	15.22481481	0.04171182	1.00000000	-0.00000000	0.00000000	0.00000000	-3.24
100.00000000	Aug18 2012	70	30.14583924	0.00000000	15.22481481	0.04171182	1.00000000	-0.00000000	0.00000000	0.00000000	-3.49
100.00000000	Aug18 2012	75	25.15625634	0.00000001	15.22481481	0.04171182	0.99999999	-0.00000001	0.00000001	0.00000071	-3.74
100.00000000	Aug18 2012	80	20.16667827	0.00000485	15.22481481	0.04171182	0.99999543	-0.00000457	0.00000415	0.00043314	-3.99
100.00000000	Aug18 2012	85	15.17788680	0.00079629	15.22481481	0.04171182	0.99942161	-0.00057839	0.00039822	0.04152653	-4.36
100.00000000	Sep22 2012	65	35.44567408	0.00000172	50.22481481	0.13760223	0.99999906	-0.00000094	0.00000050	0.00017308	-3.22
100.00000000	Sep22 2012	70	30.48003301	0.00007817	50.22481481	0.13760223	0.99996354	-0.00003646	0.00001648	0.00566967	-3.48
100.00000000	Sep22 2012	75	25.51585289	0.00161555	50.22481481	0.13760223	0.99936497	-0.00063503	0.00023902	0.08222279	-3.79
100.00000000	Sep22 2012	80	20.56610364	0.01758381	50.22481481	0.13760223	0.99424393	-0.00575607	0.00176718	0.60791900	-4.49
100.00000000	Sep22 2012	85	15.69641968	0.11361736	50.22481481	0.13760223	0.96946798	-0.03053202	0.00744478	2.56104654	-6.38
100.00000000	Oct20 2012	65	35.69295160	0.00014786	78.22481481	0.21431456	0.99994614	-0.00005386	0.00001909	0.01023011	-3.22
100.00000000	Oct20 2012	70	30.74805321	0.00195686	78.22481481	0.21431456	0.99938589	-0.00061411	0.00018569	0.09948828	-3.51
100.00000000	Oct20 2012	75	25.81500040	0.01561146	78.22481481	0.21431456	0.99580728	-0.00419272	0.00106765	0.57203453	-4.02
100.00000000	Oct20 2012	80	20.93527899	0.08259746	78.22481481	0.21431456	0.98116871	-0.01883129	0.00397491	2.12970020	-5.10
100.00000000	Oct20 2012	85	16.21890145	0.31292732	78.22481481	0.21431456	0.93998949	-0.06001051	0.01029412	5.51544887	-7.10
100.00000000	Nov17 2012	65	35.94034825	0.00135920	106.22481481	0.29102689	0.99962336	-0.00037664	0.00010132	0.07371544	-3.23
100.00000000	Nov17 2012	70	31.02118559	0.00996662	106.22481481	0.29102689	0.99759849	-0.00240151	0.00055489	0.40371855	-3.61
100.00000000	Nov17 2012	75	26.13375092	0.05030202	106.22481481	0.29102689	0.98951166	-0.01048834	0.00206009	1.49885235	-4.28
100.00000000	Nov17 2012	80	21.34316062	0.18748180	106.22481481	0.29102689	0.96636532	-0.03363468	0.00554502	4.03437302	-5.49
100.00000000	Nov17 2012	85	16.77377934	0.54587058	106.22481481	0.29102689	0.91626144	-0.08373856	0.01140919	8.30095290	-7.30

3.3.1 Date Engine Properties

The Date Engine Properties popup is used to configure the Date Engine. It can be invoked by pressing the Date Engine Properties push button.

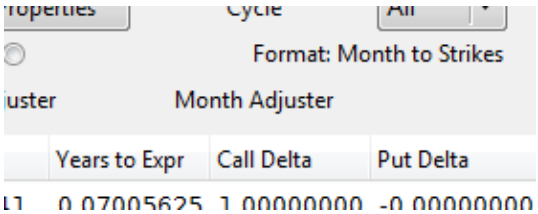


The default expiration setting of 3rd Friday+1 @11:59AM can be changed.



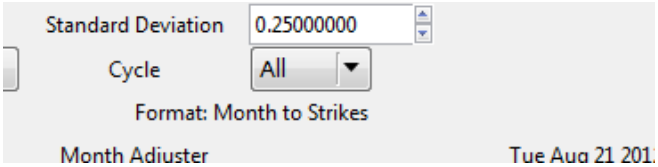
3.3.2 Month Adjuster

A scale button named “Month Adjuster” can adjust the Date Engine’s months forward.

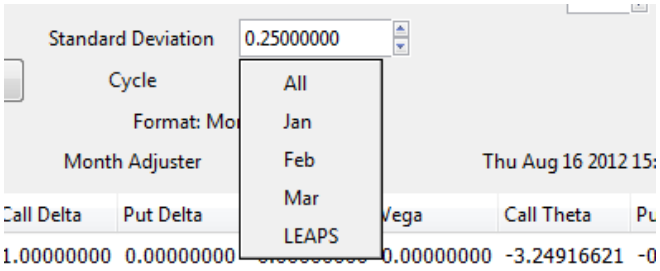


3.3.3 Option Cycles

The Date Engine supports option cycles. See drop down with label “Cycle”.



The Cycle drop down includes: All, Jan, Feb, Mar and LEAPS.

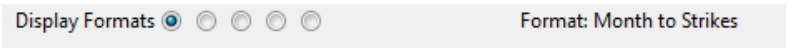


The default setting is "All" which displays all months.

3.3.4 Display Formats

The Date Engine supports many display formats for the option chain.

In the grouping of radio buttons labeled "Display Formats" each radio button changes the option chains display format.



The display formats are: Month to Strikes, Months to Strike, Months Across and "3 Call / 3 Put Columns".

Month to Strikes

"Month to Strikes" features sets of the same expiration month mapped to incrementing strikes.

Price	Expr Date	Strike	Call	Put	Days to Expr	Years to Expr	Call Delta	Put Delta	Gamma
100.00000000	Aug18 2012	65	35.01665844	0.00000000	1.87111111	0.00512633	1.00000000	0.00000000	0.00000000
100.00000000	Aug18 2012	70	30.01793986	0.00000000	1.87111111	0.00512633	1.00000000	0.00000000	0.00000000
100.00000000	Aug18 2012	75	25.01922128	0.00000000	1.87111111	0.00512633	1.00000000	0.00000000	0.00000000
100.00000000	Aug18 2012	80	20.02050270	0.00000000	1.87111111	0.00512633	1.00000000	0.00000000	0.00000000

Months to Strike

"Months to Strike" features sets of incrementing expiration months mapped to the same strike.

Price	Expr Date	Strike	Call	Put	Days to Expr	Years to Expr	Call Delta	Put Delta	Gamma
100.00000000	Aug18 2012	65	35.01665298	0.00000000	1.87049769	0.00512465	1.00000000	0.00000000	0.00000000
100.00000000	Sep22 2012	65	35.32747129	0.00000002	36.87049769	0.10101506	0.99999998	-0.00000002	0.00000001
100.00000000	Oct20 2012	65	35.57508290	0.00002774	64.87049769	0.17772739	0.99998801	-0.00001199	0.00000505
100.00000000	Nov17 2012	65	35.82224167	0.00055044	92.87049769	0.25443972	0.99982816	-0.00017184	0.00005214

Months Across

"Months Across" features sets of calls, puts, incrementing strikes and incrementing expiration month columns. The calls have the letter 'c' before the price while puts have the letter 'p' before the price.

Price	Strike	Aug18 2012	Sep22 2012	Oct20 2012	Nov17 2012	Dec22 2012
100.00000000	65	c 35.01664907	c 35.32746739	c 35.57507901	c 35.82223779	c 36.13271165
100.00000000	70	c 30.01792977	c 30.35266071	c 30.61986611	c 30.89001484	c 31.23790745
100.00000000	75	c 25.01921046	c 25.37803648	c 25.67011056	c 25.97919388	c 26.39316531
100.00000000	80	c 20.02049116	c 20.40726037	c 20.75336629	c 21.14485533	c 21.67498580

3 Call / 3 Put Columns

"3 Call / 3 Put Columns" features incrementing strikes with 3 Call Columns and 3 Put Columns.

Price	Strike	Call Aug18 2012	Call Sep22 2012	Call Oct20 2012	Put Aug18 2012	Put Sep22 2012	Put Oct20 2012
100.00000000	65	35.01664453	35.32746288	35.57507452	0.00000000	0.00000002	0.00002773
100.00000000	70	30.01792488	30.35265585	30.61986124	0.00000000	0.00000354	0.00058009
100.00000000	75	25.01920523	25.37803125	25.67010512	0.00000000	0.00018949	0.00658960
100.00000000	80	20.02048558	20.40725451	20.75335955	0.00000000	0.00422330	0.04560966

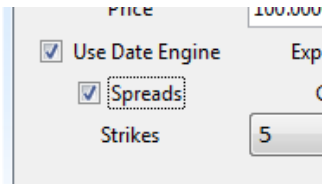
3.4 Greeks

Option analytics of Call Delta, Put Delta, Gamma, Vega, Call Theta, Put Theta, Call Rho, Put Rho are calculated. They can be seen on the row at the top of the option chain.

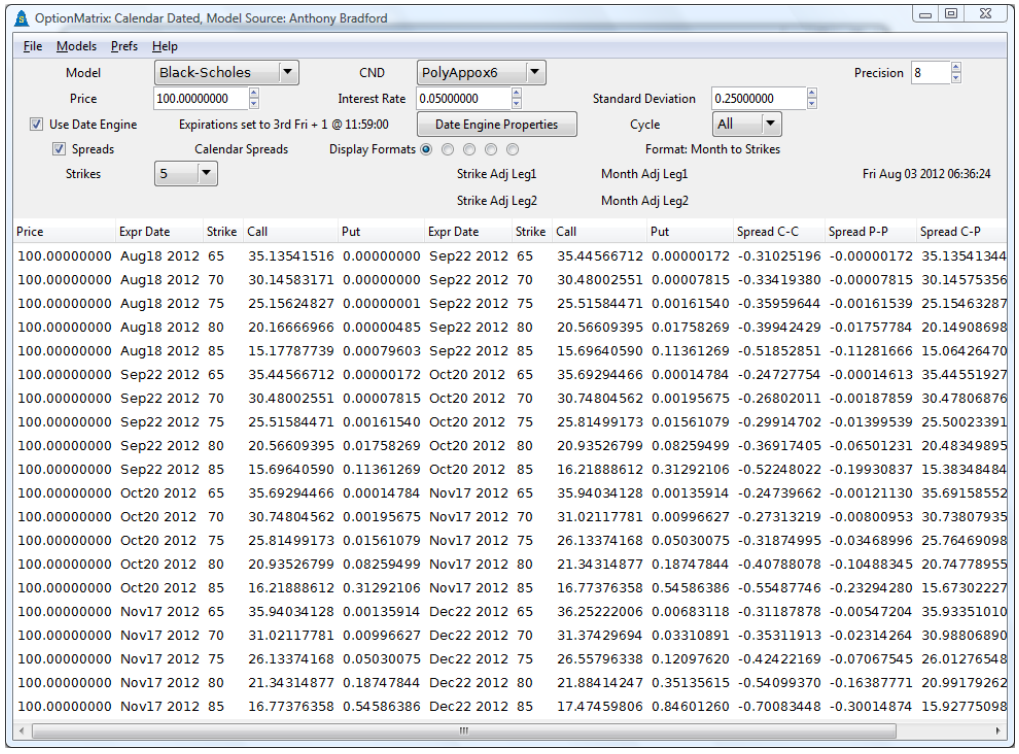
Call Delta	Put Delta	Gamma	Vega	Call Theta	Put Theta	Call Rho	Put Rho
0.99984631	-0.00015369	0.00004738	0.02960995	-3.22364990	-0.01401491	16.04135833	-0.00396278

3.5 Spreads

Selection of the checkbox "Spreads" will invoke the Spread Mode.

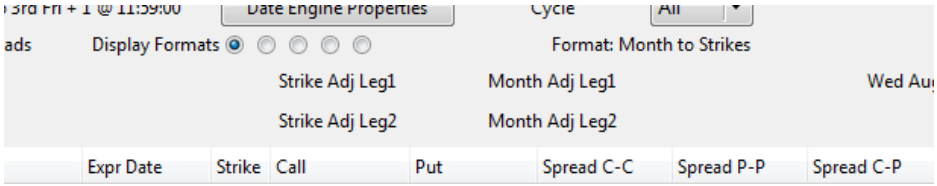


Spread Mode allows the individual leg information for a spread to be controlled.

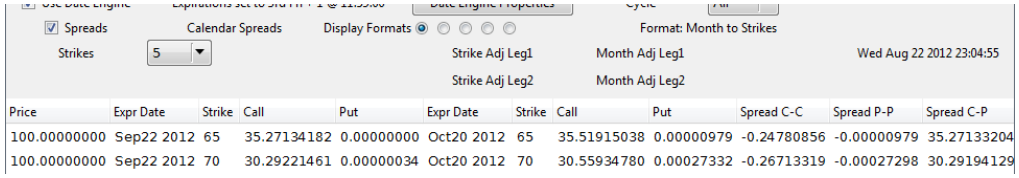


Price	Expr Date	Strike	Call	Put	Expr Date	Strike	Call	Put	Spread C-C	Spread P-P	Spread C-P
100.00000000	Aug18 2012	65	35.13541516	0.00000000	Sep22 2012	65	35.44566712	0.00000172	-0.31025196	-0.00000172	35.13541344
100.00000000	Aug18 2012	70	30.14583171	0.00000000	Sep22 2012	70	30.48002551	0.00007815	-0.33419380	-0.00007815	30.14575356
100.00000000	Aug18 2012	75	25.15624827	0.00000001	Sep22 2012	75	25.51584471	0.00161540	-0.35959644	-0.00161539	25.15463287
100.00000000	Aug18 2012	80	20.16666966	0.00000485	Sep22 2012	80	20.56609395	0.01758269	-0.39942429	-0.01757784	20.14908698
100.00000000	Aug18 2012	85	15.17787739	0.00079603	Sep22 2012	85	15.69640590	0.11361269	-0.51852851	-0.11281666	15.06426470
100.00000000	Sep22 2012	65	35.44566712	0.00000172	Oct20 2012	65	35.69294466	0.00014784	-0.24727754	-0.00014613	35.44551927
100.00000000	Sep22 2012	70	30.48002551	0.00007815	Oct20 2012	70	30.74804562	0.00195675	-0.26802011	-0.00187859	30.47806876
100.00000000	Sep22 2012	75	25.51584471	0.00161540	Oct20 2012	75	25.81499173	0.01561079	-0.29914702	-0.01399539	25.50023391
100.00000000	Sep22 2012	80	20.56609395	0.01758269	Oct20 2012	80	20.93526799	0.08259499	-0.36917405	-0.06501231	20.48349895
100.00000000	Sep22 2012	85	15.69640590	0.11361269	Oct20 2012	85	16.21888612	0.31292106	-0.52248022	-0.19930837	15.38348484
100.00000000	Oct20 2012	65	35.69294466	0.00014784	Nov17 2012	65	35.94034128	0.00135914	-0.24739662	-0.00121130	35.69158552
100.00000000	Oct20 2012	70	30.74804562	0.00195675	Nov17 2012	70	31.02117781	0.00996627	-0.27313219	-0.00800953	30.73807935
100.00000000	Oct20 2012	75	25.81499173	0.01561079	Nov17 2012	75	26.13374168	0.05030075	-0.31874995	-0.03468996	25.76469098
100.00000000	Oct20 2012	80	20.93526799	0.08259499	Nov17 2012	80	21.34314877	0.18747844	-0.40788078	-0.10488345	20.74778955
100.00000000	Oct20 2012	85	16.21888612	0.31292106	Nov17 2012	85	16.77376358	0.54586386	-0.55487746	-0.23294280	15.67302227
100.00000000	Nov17 2012	65	35.94034128	0.00135914	Dec22 2012	65	36.25222006	0.00683118	-0.31187878	-0.00547204	35.93351010
100.00000000	Nov17 2012	70	31.02117781	0.00996627	Dec22 2012	70	31.37429694	0.03310891	-0.35311913	-0.02314264	30.98806890
100.00000000	Nov17 2012	75	26.13374168	0.05030075	Dec22 2012	75	26.55796338	0.12097620	-0.42422169	-0.07067545	26.01276548
100.00000000	Nov17 2012	80	21.34314877	0.18747844	Dec22 2012	80	21.88414247	0.35135615	-0.54099370	-0.16387771	20.99179262
100.00000000	Nov17 2012	85	16.77376358	0.54586386	Dec22 2012	85	17.47459806	0.84601260	-0.70083448	-0.30014874	15.92775098

Scale buttons “Strike Adj Leg1” and “Month Adj Leg1” can be used to adjust strikes and months for Leg 1. Scale buttons “Strike Adj Leg2” and “Month Adj Leg2” can be used to adjust strikes and months for Leg 2.



Spreads are displayed on a per row basis.



Price	Expr Date	Strike	Call	Put	Expr Date	Strike	Call	Put	Spread C-C	Spread P-P	Spread C-P
100.00000000	Sep22 2012	65	35.27134182	0.00000000	Oct20 2012	65	35.51915038	0.00000979	-0.24780856	-0.00000979	35.27133204
100.00000000	Sep22 2012	70	30.29221461	0.00000034	Oct20 2012	70	30.55934780	0.00027332	-0.26713319	-0.00027298	30.29194129

The first set of column references to “Expr Date, Strike, Call, Put” is considered Leg 1. Use scale controls “Strike Adj Leg1” and “Month Adj Leg1” to adjust.

Price	Expr Date	Strike	Call	Put
100.00000000	Sep22 2012	65	35.27135712	0.00000000

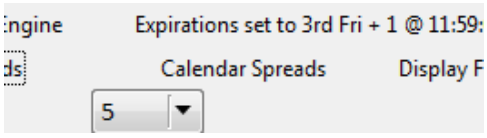
The second set of column references to “Expr Date, Strike, Call, Put” is considered Leg 2. Use scale controls “Strike Adj Leg2” and “Month Adj Leg2” to adjust.

Price	Expr Date	Strike	Call	Put	Expr Date	Strike	Call	Put
100.00000000	Sep22 2012	65	35.27135024	0.00000000	Oct20 2012	65	35.51915877	0.00000979

Four spreads are computed “Spread C-C” (Leg 1 Call minus Leg 2 Call), “Spread P-P” (Leg 1 Put minus Leg 2 Put), “Spread C-P” (Leg 1 Call minus Leg 2 Put) and “Spread P-C” (Leg 1 Put minus Leg 2 Call).

ı Adj Leg2			
Spread C-C	Spread P-P	Spread C-P	Spread P-C
-0.24778653	-0.00001107	35.27741828	-35.52521588
-0.26713335	-0.00029823	30.29847184	-30.56590342

Spread views are automatically labeled Vertical Spread, Calendar Spread or Vertical Calendar Spread.



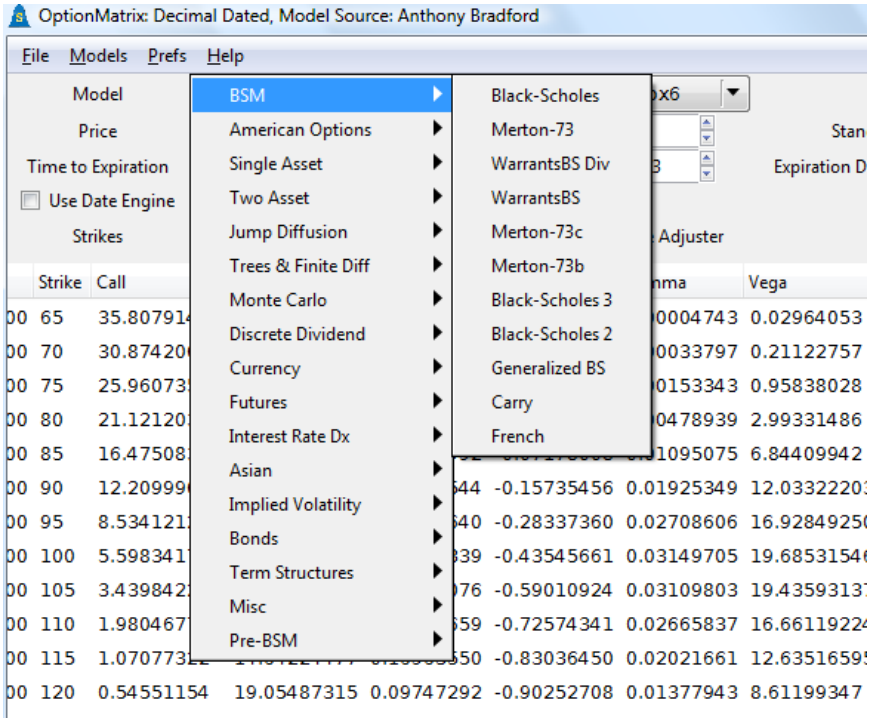
Vertical Spread indicates strike differences between Leg 1 and Leg 2 (expiration dates are the same). Calendar Spread indicates expiration date differences between Leg 1 and Leg 2 (Strikes are the same). Vertical Calendar Spread indicates strike and calendar date expiration differences between the legs.

3.6 Models

Over 168+ option models are featured in the OptionMatrix Calculator. Model numbers may vary between systems due to library and linker options.

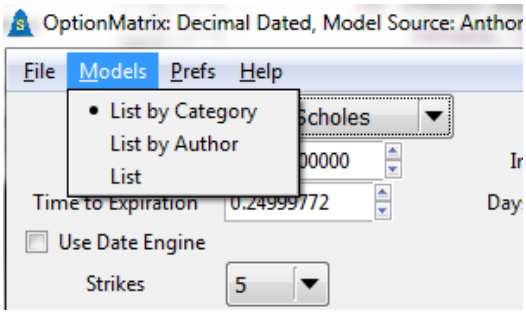
3.6.1 Changing Models

The current pricing model can be changed with the “Model” drop down. The models are listed as categorized folders in the drop down.

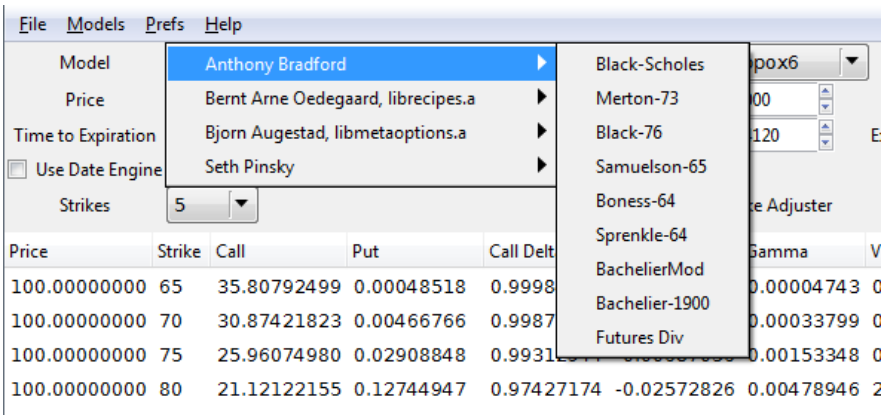


3.6.2 Model Categorization

The model drop down box categorization can be controlled via the menu item "Models". Options include: Models → List by Category, Models → List by Author and Models → List.



Models → List by Author, changes the categorization in the "Models" drop down to be based on author of the model.

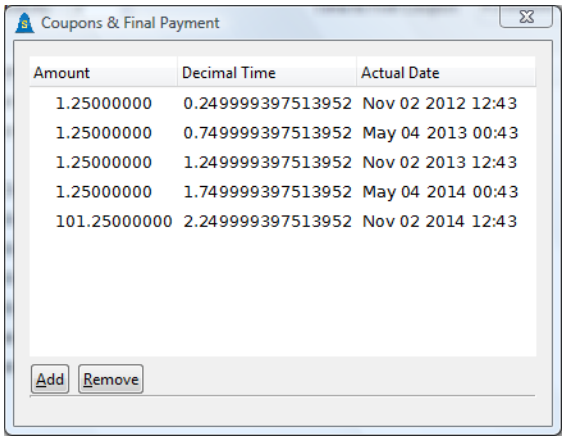


Models → List, creates no categorized folders. The "Models" drop down box becomes a list of all models.

Models → List by Category, is the default.

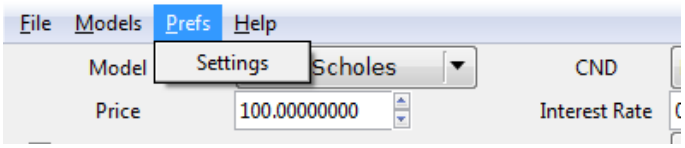
3.7 Cash Flow Editor

Some models have multiple dividends or coupons. `optionmatrix` provides a cash flow editor to add / remove these cash streams. The cash stream is ordered by time. If the "RealTime" checkbox is enabled the dividend or coupons time will bleed.

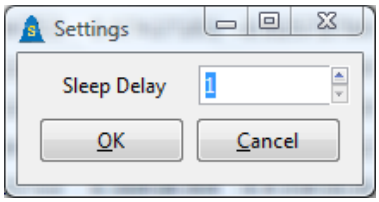


3.8 Re-calculations

Selection of Menu item Prefs → Settings will invoke the "Settings Popup".

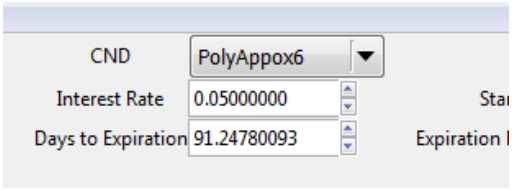


The setting "Sleep Delay" controls the time in between option chain re-calculations in seconds. The default setting is 1.

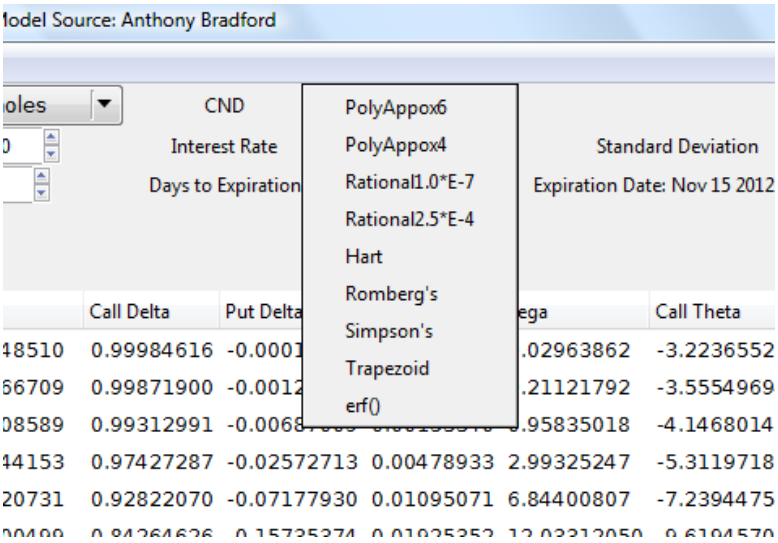


3.9 Cumulative Normal Distribution

The method of calculating the cumulative normal distribution is controlled with drop down named "CND".



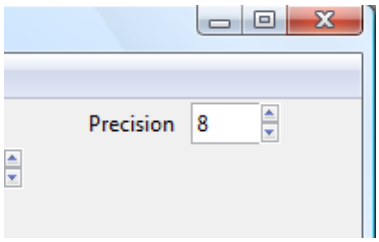
Methods include: PolyApprox6, PolyApprox4, Rational1.0*E-7, Rational2.5*E-4, Hart Equation, Romberg's Method, Simpson's Rule and Trapezoidal Rule.



PolyApprox6 is the default.

3.10 Precision

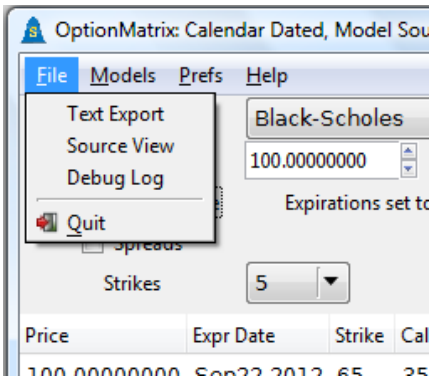
Decimal place precision can be adjusted with the spin button “Precision”.



Precision is defaulted to eight decimal places to show real-time time bleeding.

3.11 Exporting

Two menu export options are available.



File → Text Export, exports the current option chain to a text window.

File → Source View, exports the current option models C/C++ source code to a text window.

4 Curses optionmatrix_console

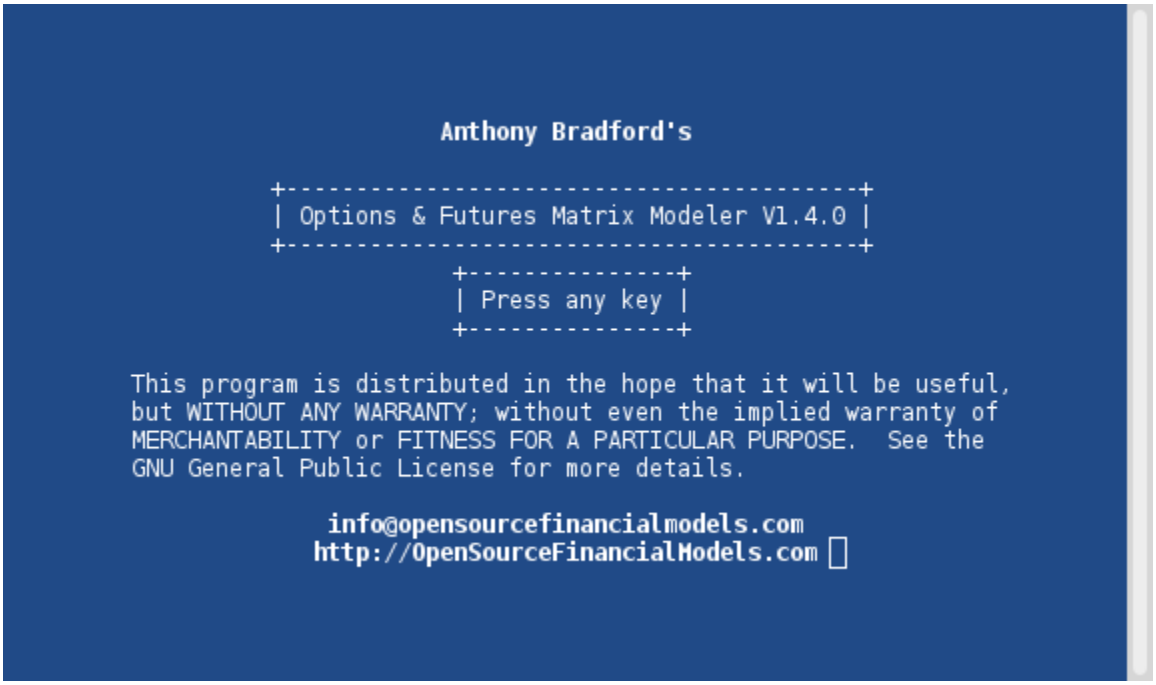
4.1 Running

Running optionmatrix_console with no arguments or just the '--debug', '-d' options will invoke the OptionMatrix Curses Application. The Curses Application is a text application with no graphical user interface. The '--debug' or '-d' options will cause optionmatrix_console to create the debug log, 'optionmatrix.log', in the users home directory or the current working directory of execution. This log file will be populated with diagnostic information while the program is executing.

The Curses Application typically runs from a UNIX like console or DOS prompt, it can be associated with a start menu or desktop icon. The Curses Application responds to keyboard events. See Chapter 3 [Graphical Application optionmatrix], page 5, for optionmatrix with a graphical user interface.

4.2 Welcome Screen

A welcome screen will appear with author, version, license, e-mail and website information. Press any key to continue to model selection screen.



4.3 Model Selection

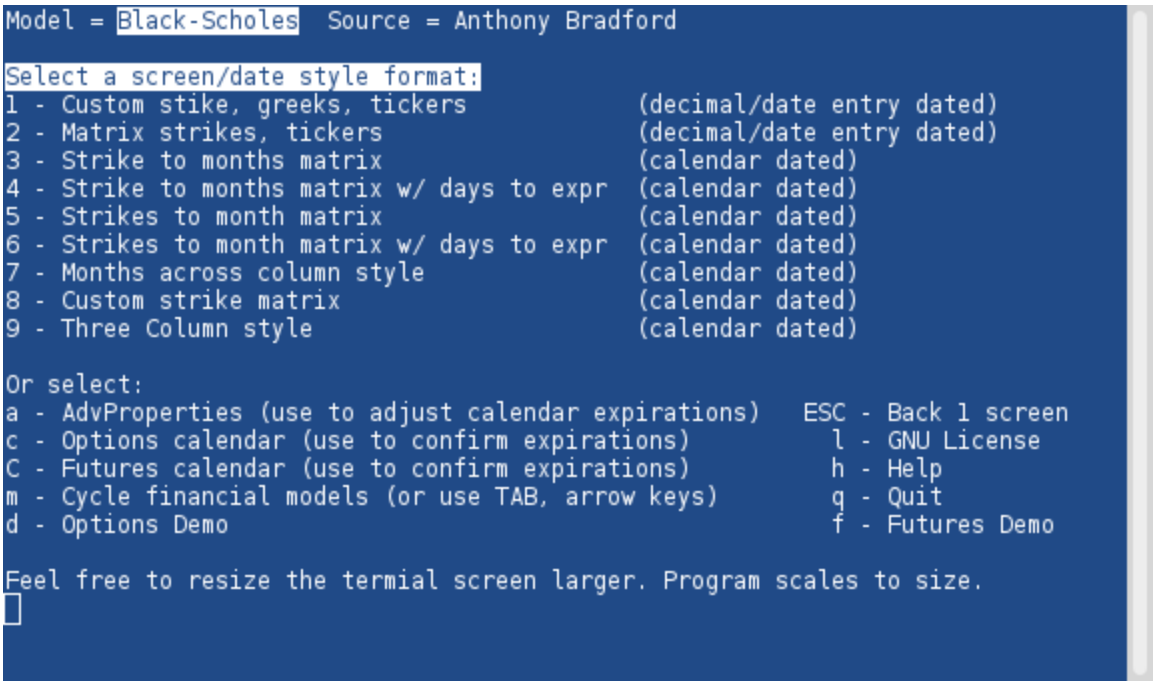
Choose a model on the Model Selection screen by typing in its number and pressing RET.

The arrow down and arrow up keys can be used to scroll and view more models. The listing of models exceeds the screen size.

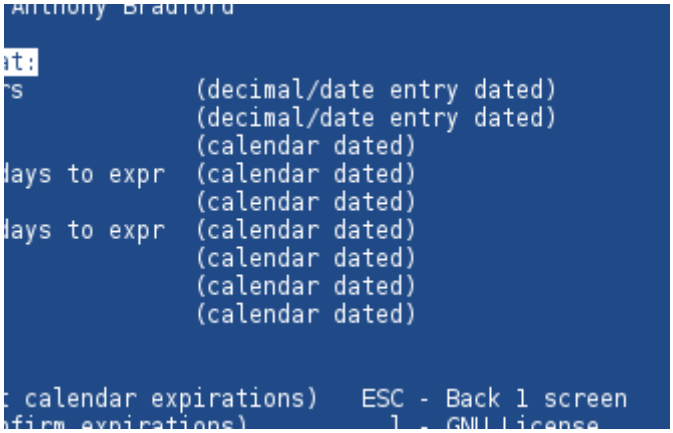
Once a model is selected the Format Selection screen will appear.

4.4 Format Selection

The Format Selection screen displays the model's name, models source, display formats and miscellaneous selections. Key selection of *1 - 9* will select a display format for the option's chain.



Formats are categorized as "(decimal date/date entry dated)" or "(calendar dated)". See column on the right of the screen.

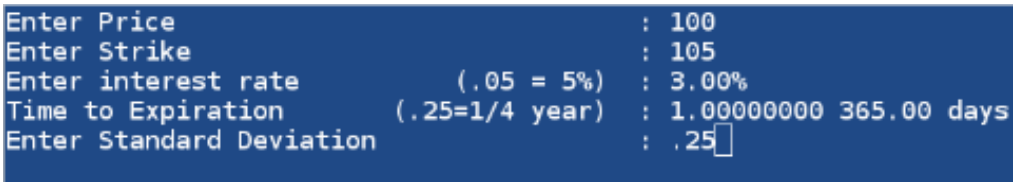


The "(decimal date/date entry dated)" formats allow the user to enter the time to expiration as a decimal date (Example: .5 years away) or enter an explicit date (Example: 1/20/14 - read: Jan 20 2014). The "(calendar dated)" formats set option expirations using a date engine which has a default setting of 3rd Friday+1 @11:59AM going into the future. The Date Engine can be configured to match most industry used option expirations.

Selection of any key *1 - 9* to proceed to the Inputs Screen.

4.5 Inputs

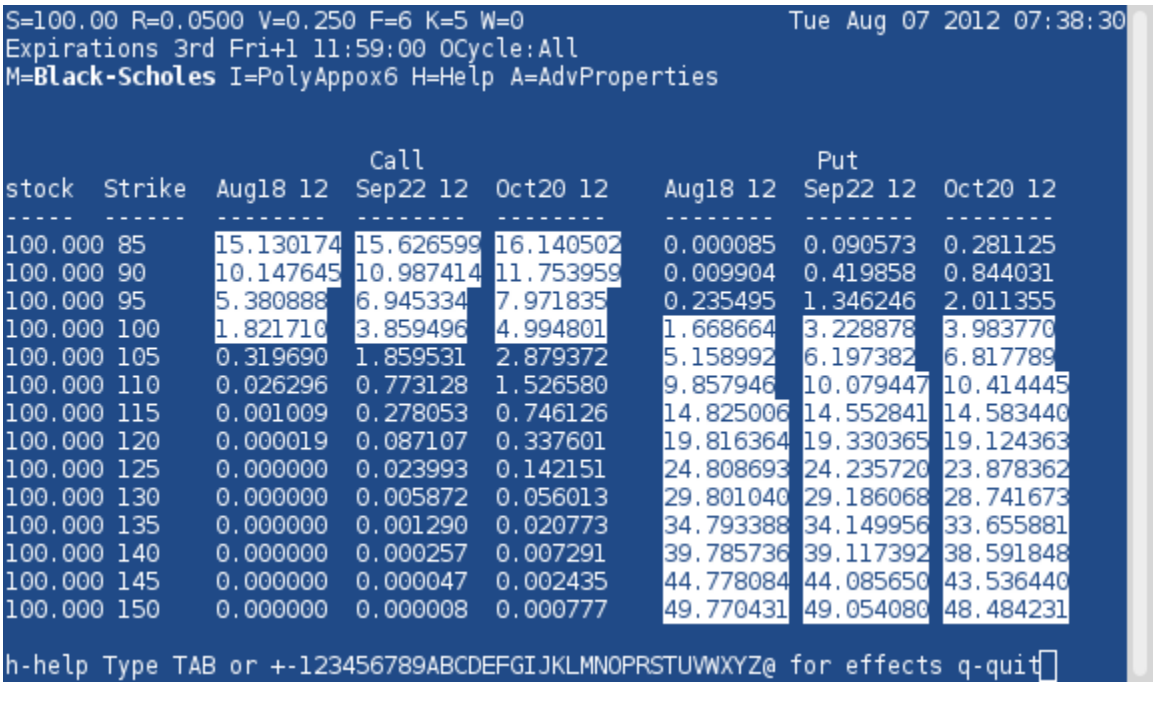
The Input Screen is customized on a per model basis. The user will be prompted for specific inputs for the selected model.



The Pricing Screen will follow.

4.6 Pricing Screen

The option model will begin pricing. The updating pricing changes are the result of time bleeding between the current time and the expiration times. Inputs can be adjusted while the model is pricing. Try typing: *S, s, X, x, R, r, V, v* or the arrow keys.



At the money, in the money options are highlighted by default.

Pressing the `TAB` key will switch to another display format screen. Type `ESC` to go back to the Model Selection Screen. Type *h* or *?* for help. Type *q* or *Q* to quit.

5 Models supported

The OptionMatrix programs support the following models:

5.1 BSM

- Black-Scholes
- Merton-73
- Generalized Black-Scholes
- French
- Carry
- Warrants Black-Scholes
- Warrants Black-Scholes Dividend

5.2 American Options

- American Barone-Adesi Whaley
- Black-Scholes American
- American Perpetual
- American Put Approx Johnson
- American Put Approx Geske-Johnson
- Barone-Adesi Whaley
- Bjerksund Stensland

5.3 Single Asset Options

- Executive
- Time Switch Option
- Extendible Writer
- Forward Start Option
- Standard Barrier
- Double Barrier
- Soft Barrier
- Binary Barrier
- Discrete Adjusted Barrier
- Look Barrier
- Partial Time Barrier
- Asset-or-Nothing
- Cash-or-Nothing
- Gap Option
- Super Share
- Simple Chooser

- Complex Chooser
- Floating Strike Lookback
- Fixed Strike Lookback
- Partial Fixed Lookback
- Partial Float Lookback
- European Lookback
- Extreme Spread
- Calls on Options
- Puts on Options

5.4 Two Asset Options

- Spread Approximation
- Two Asset Cash or Nothing
- Two Asset Correlation
- Options on The Max Min
- Partial Time Two Asset
- Two Asset Barrier
- American Exchange Option
- European Exchange Option
- Exchange Exchange Option

5.5 Jump Diffusion

- Merton Jump Diffusion

5.6 Trees & Finite Differences

- Heston
- American Cox Ross Rubinstein
- American Equi
- European Cox Ross Rubinstein
- European Equi
- Cox Ross Rubinstein Binomial
- 3D-Binominal
- American Binomial
- American Binomial Dividend
- European Binomial
- European Binomial 1 Period
- European Binomial M Period
- Generic Binomial
- Bermudian Binomial

- American Finite Difference Explicit
- European Finite Difference Explicit
- American Finite Difference Implicit
- European Finite Difference Implicit
- Trinomial Tree
- American Trinomial
- Heston Semi-Analytic
- Binomial Jarrow-Rudd
- Additive Equiprobabilities
- Trigeorgis
- Tian
- Leisen-Reimer
- Joshi
- Bates Semi-Analytic
- Integral
- Finite Differences Bermudan

5.7 Monte Carlo

- Simulate European Option
- Simulate European Generic Option
- Simulate European Option Generic with Control Variate
- Simulate European Option Generic with Antihetic Variate
- Simulate Price Path
- Simulate Price Path Control Variate
- MC (Crude)
- QMC (Sobol)
- MC (Longstaff Schwartz)

5.8 Discrete Dividend

- Roll-Geske-Whaley
- Black-Scholes Dividends
- American Proport Dividends Binomial
- Black-Scholes Coupon Bond

5.9 Currency

- Quanto
- Garman-KohlHagen
- Foreign Equity Option Struck in Domestic Currency
- Equity Linked Foreign Exchange Option

- Takeover Foreign Exchange Option
- Currency American Binomial
- Currency European

5.10 Futures

- Black-76
- Miltersen Schwartz
- Futures Option American Binomial
- Futures
- Futures Dividend

5.11 Interest Rate Derivatives

- Swap Option

5.12 Asian

- Turnbull Wakeman Asian
- Levy Asian
- Geometric Average Rate
- Asian Geometric Average

5.13 Implied Volatility

- Bisection
- Newton Raphson
- Barone-Adesi Whaley Bisection
- Black-Scholes Bisection
- Implied Volatility Black-Scholes Newton
- Implied Bisections

5.14 Bonds

- Vasicek Bond Price
- Vasicek Bond Option
- Convertible Bond
- Bond Zero Black
- Bond Zero Vasicek
- Bond American Binomial
- Bond Call Rendleman Bartter
- Bond Flat
- Bond with Term Structure
- Bond with Principal

5.15 Term structures

- Term Structure Flat
- Term Structure Cir
- Term Structure Vasicek
- Term Structure Nelson Siegel
- Term Structure Svensson
- Term Structure Cubic Spline
- Term Structure Interpolated

5.16 Misc

- PV / IRR
- Log Normal Random

5.17 pre-BSM

- Bachelier-1900
- Bachelier Modified
- Sprenkle-64
- Boness-64
- Samuelson-65

6 Downloading and Installation

6.1 Installers

Windows and Mac OS X installers can be found at
http://sourceforge.net/projects/optionmatrix/?source=directory

6.2 Unix / Linux Autotools Package

OptionMatrix source code can be downloaded from
http://sourceforge.net/projects/optionmatrix/?source=directory

Type the following on the console in the directory of the download to install.

```
tar xfz optionmatrix-1.4.3.tar.gz
cd optionmatrix-1.4.3
./configure
make
sudo make install
```

7 Documentation

PDF and EPUB documentation can be found at
http://sourceforge.net/projects/optionmatrix/?source=directory

8 Reporting bugs

To report bugs, suggest enhancements or otherwise discuss optionmatrix, please send electronic mail to info@anthonybradford.com.

For bug reports, please include enough information for the maintainers to reproduce the problem. Generally speaking, that means:

- The version numbers of optionmatrix (which you can find by running '`optionmatrix --version`') and any other program(s) or manual(s) involved.
- Hardware and operating system names and versions.
- The contents of any input files necessary to reproduce the bug.
- The expected behavior and/or output.
- A description of the problem and samples of any erroneous output.
- Options you gave to `configure` other than specifying installation directories.
- Anything else that you think would be helpful.

When in doubt whether something is needed or not, include it. It's better to include too much than to leave out something important.

Patches are welcome; if possible, please make them with '`diff -c`'. Please follow the existing coding style.

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Version 1.3, 3 November 2008

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