

FE14 Final Project

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Option Report Generator

Background Story

As a Financial engineering student, I have learned some theoretical method to calculate an option's price, and I have heard that people could make arbitrage through mispriced option. But in the real world, does mispriced option really happen? If so, does that happen a lot? And will these options go quickly because a lot of traders will try to buy as much as they can theoretically? These questions are among a couple of interesting things that I want to test for the option pricing. And I want to make a user friendly interface that not only could be able to test this problem, but also could be used as an easy tool that might help people who have only basic knowledge of excel finding out great deal on options efficiently if it is in the real business world.

Write-Up

The purpose of my project is to create a friendly user interface so that people have basic knowledge about excel could easily create a most updated option report of any specific stock that contains basic financial modeling result and potential arbitrage opportunity information. The project can be split into four parts: **User form and pulling data from yahoo finance; Financial analyzer to calculate several option hedge index values that are easily accessible online; Searching potential arbitrage opportunity; Financial report generator.** Under the discussion and help with our Professor Admin, along with our two group member's discussion, we solved a wide range of problem from the concept and the ideas of our project to the actual programming technique. There are still some improvement we could improve in the future, but we think we learn a lot of useful and practical skill from this final project.

Check the overall interface and related module of implement

Real-time Option Analyzer

Symbol IBM	Download Option Data
Volatility Bisection Implied Volatility Newton Implied Volatility Option Greeks Delta Gamma Theta Vega Rho Pricing(Seek Arbitrage) Black_schole Price	Option Data Analyze
Generate Report	Generate File

Please note: file saved in default path in your PC
After check out the file, please close for further operation like email send

Sender fe514xiaowan@gmail.com
Receiver1 wli25@stevens.edu
Receiver2 asaliqhe@stevens.edu
Receiver3 xluo8@stevens.edu
Receiver4 113437806@qq.com
CC 808@szetn.cn
BC jade.wanli15@gmail.com

Send Email

```
'Call option data via GetOptionChain function Module  
Private Sub CommandButton1_Click()
```

```
GetOptionChain  
MsgBox "Data Download Done "
```

```
End Sub
```

```
'Analyze data via analyze sub Module  
Private Sub CommandButton2_Click()
```

```
Analyze.Analyze  
MsgBox "Data Analyze Done"
```

```
End Sub
```

```
'Send email via SendNotificationEmail sub in Module1  
Private Sub CommandButton3_Click()
```

```
SendNotificationEmail  
MsgBox "Email Sent "
```

```
End Sub
```

```
'Create file via file_out sub in Module  
Private Sub CommandButton4_Click()
```

```
File_out
```

```
End Sub
```

Detail as below

1. Data imputing

a. User Form

Most of the fields in the user form are designed as textbox, which flawlessly pulling the data from the yahoo. For transferring user's input to website, the website are not too picky about the value user input, since we only require user to input one stock. However, one drawback of this user interface is that user have to input the exact correct stock index, we considered two way to improve this, one is insert a search engine, the other is drop down field.

b. Ease of use

- i. Pressing 'Download option data' tab, it opens up the 'Yahoo' spread sheet that shows the downloaded option for the assigned stock index, call and put. Since it took us a while to download and refresh the data, we added a message telling people when the downloading is downloaded.

The screenshot shows a user interface with a 'Symbol' input field containing 'AAPL', a 'Download Option Data' button, and a 'Yahoo' tab. Below the tab, a table of stock options is displayed. A 'Data Download Done' message box is overlaid on the table.

Symbol	Download Option Data	Console	Yahoo	Analyze
250	4084	135	AAPL180119P00135000	
352	34571	140	AAPL180119P00140000	
74			.180119P00145000	
238			.180119P00150000	
39			.180119P00155000	
785			.180119P00160000	
35			.180119P00165000	
323			.180119P00170000	
4			.180119P00175000	
2260			.180119P00180000	

- ii. Pressing 'Option Data Analysis' it analysis the data basic on the previously downloaded data and also automatically check the arbitrage possibility, and output the result in the sheet "Analyze"

Volatility	Option Data Analyze
Bisection Implied Volatility	
Newton Implied Volatility	
Option Greeks	
Delta	
Gamma	
Theta	
Vega	
Rho	
Pricing	
Black_schole Price	
Binominal Price	

- iii. Pressing 'Email Sender', excel generates the report generated in the Sheet "Analyze"

[mail.com](#)
[du](#)
[il.com](#)
[du](#)
[com](#)

Email Sender

2. Financial Analyzer

- a. Macro: Analyze
- b. What the macro does:
 - i. After obtaining the option the macro calculates the implied volatility by Bisection Method as well as Newton Method.
 - ii. Then it calculates it's Delta, Gamma, Vega, Theta, Rho by using the function under this macro: BSDelta, BSGamma, BSVega, BSTheta, BSRho, (Puttype, s, k(i), T(i), r, Bise_PIV(i), Put/Call)
 - iii. calculating option price by Black-Scholes, moneyless

Roh	BS Call	BS Put	possible_arb_c	possible_arb_put		
-5.48488E-16		0	0	N		
0		0	0	Y		
-3.64939E-12	20.54999246	8.78075E-13	N	N		
0		0	0	Y		
0		0	0	N		
-1.29836E-07		4.02793E-08	Y	N		
0		0	0	Y		
-2.61087E-05		9.95108E-06	N	N		
-0.011356266	15.65000256	0.010008925	N	N		
-0.022041145		0.020008167	N	N		
-0.025513609		0.020009071	N	N		
-0.037343525		0.029996624	N	N		
-0.058533276		0.049994504	N	N		
-0.072952982		0.060007703	N	N		
-0.112469871		0.099998136	N	N		
-0.147643879	2.379990764	0.12999551	N	N		
-0.21693924	1.959990758	0.210009207	N	N		
-0.285752641	1.550007983	0.280000165	N	N		
-0.386261876	1.190000119	0.409999333	N	N		
-0.503388269	0.869999326	0.580005414	N	N		
-0.633359658	0.610006706	0.810009081	N	N		
-0.766392738	0.400008759	1.089999828	N	N		
Moneyness	Symbol		Bisection IV	Newton IV	Dleta	C
0.84849724	AAPL160429C00083000		0%	18%	0.500000001	
0.858720098	AAPL160429C00084000		0%	0%	0.500000001	
0.868942956	AAPL160429C00085000		333%	333%	0.715104213	0.0095
0.879165815	AAPL160429C00086000		0%	0%	0.500000001	
0.889388673	AAPL160429C00087000		0%	0%	0.500000001	
0.899611531	AAPL160429C00088000		0%	0%	0.500000001	
0.90983439	AAPL160429C00089000		0%	0%	0.500000001	
0.920057248	AAPL160429C00090000		0%	21265%	0.500000001	
0.930280106	AAPL160429C00091000		292%	292%	0.650363628	0.0118
0.940502965	AAPL160429C00092000		0%	686771655%	0.500000001	

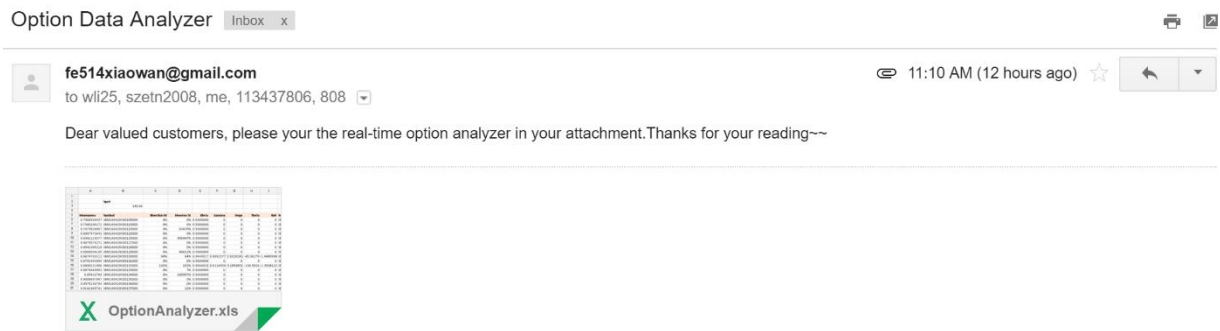
3. Arbitrage finder

- At the beginning, we are not sure if we can really find several option that their theoretical price are different from the actual price, so we design the Arbitrages macro that compare the actual option price and the theoretical option price, if their difference is greater than 0, the arbitrage indicator column will say "Y" in green, otherwise "N" in red.
- Also, any possible arbitrage option has "Y" indicator marks the corresponding symbol in green, in order to make user easy to identify
- Theory we based on: Pull-Call Parity theory
 - $C - P = S - K \cdot e^{-rt}$
 - If $C - P < S - K \cdot e^{-rt}$, you would buy the call, sell the put and sell short the stock. You would then invest the proceeds at the riskless rate and end up with a riskless profit at maturity
 - If $C - P > S - K \cdot e^{-rt}$, you would sell the call, buy the put and buy the stock. You would earn more than the riskless rate on a riskless investment.
 - We always buy low, sell high

4. Financial Reporter Generator

- Macro: File_out sub
- What does this Macro does: It generates our option report and automatically attached onto an email we pre designed. We used for loop to generate the email receiver and

send out our report to them. We declare email subject , email receiver, email sender as string to store our email list and email information



5. Things we could improve

- a. We could improve the search engine to make user easier to search any stock index from a company, vice versa.
- b. We could create a multiple option report page so that we could implement multiple option report at once.

6. What we learned

From this project, we learned how to put all the things to learn into together. The project is difficult than we expect. Even though the idea of this project is simple, however, to create a such a user interface is far more difficult than we expect, especially the part that we need to control and analysis different sheet together. At the end we want to thank our instructor, this lab course is definitely one of the most practical and useful course we got, from basic coding to sorting algorithm, data analysis algorithm, we benefit a lot from them.