ASSIGNMENT 7

JASON FENG

QUESTION 1

- Build 6 Greeks function with GBSM and finite difference
- Calculate the binomial function for American Option (with or without dividends)

		Call-GBSM	Call-finite diff	Put-GBSM	Put-finite diff
0	Delta	0.5007	0.5007	-0.4988	-0.4988
1	Gamma	0.0402	0.0402	0.0402	0.0402
2	Vega	19.7831	19.7766	19.7831	19.7766
3	Theta	-21.6286	-21.6286	-22.0903	-22.0903
4	Rho	N/A	-0.3558	N/A	-0.3596
5	Carry Rho	7.6091	7.6091	-7.3015	-7.3015

	GBSM	Binomial w/o Div	Binomial with div
Call	3.935701257793056	3.9683834268184377	3.8558587740512866
Put	3.9774563953463797	4.007520415586837	4.417108066684497

QUESTION 2

- Simulate Return
- Calculate Mean, VaR, ES
- The result are very similar with last week

Portfolio	PnL Mean	5% VaR	5% ES	5% VaR, Delta Normal	5% ES, Delta Normal
Call	1.463924	0.404872	0.493609	1.917504	3.535382
CallSpread	3.391540	-0.878051	-0.760532	0.078751	4.653264
CoveredCall	13.395477	-8.300323	-8.012009	1.831292	3.587795
ProtectedPut	2.074680	-0.328387	-0.243474	1.919471	3.534186
Put	-0.856873	1.905622	2.027395	-1.829325	5.813292
PutSpread	1.986405	-0.536829	-0.377449	-0.059001	4.737011
Stock	2.931552	0.294805	0.494382	3.748796	2.422035
Straddle	0.607051	-0.118608	-0.117298	0.088179	4.647532
SynLong	9.407051	-8.918608	-8.917298	3.746829	2.423231

QUESTION 3

- Calculate past years returns
- Plot each individual stock with corresponding values of each stock's annual return and risk
- Find the best allocation

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Maximum Sharpe Ratio Portfolio Allocation

Portfolio Annual Return: 0.1311
Portfolio Annual Std: 0.1299
Portfolio Sharpe Ratio: 0.9897


              AAPL    FB  UNH   MA  MSFT  NVDA     HD   PFE  AMZN  BRK-B   PG  \
allocation    5.28  4.05  0.0  0.0  6.46  1.34  13.62  8.13   0.0  31.18  9.7

               XOM  TSLA  JPM    V  DIS  GOOGL  JNJ   BAC  CSCO
allocation   12.29   2.0  4.9  0.0  0.0    0.0  0.0  0.33  0.73
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