Valuation Final Project

1. **The purpose of an up-and-out call (to check suitability of the transaction for the client)?**

The up and out call option will expire worthless if the price of the underlying goes above the knockout price. Up-and-out call are cheaper than the plane vanilla call option. Hence, up-and-out call are used by the client who think that the market is going to move up but not above a certain point and clients who want to hedge their short positions.

2. **The parameters chosen and how they were determined.**

The value of call depends on the underlying price(given – 393.28), the underlying rice is simulated using the Brownian motion. The parameters used in simulating the underlying price are: RFR(4.5) - which is determined by the current FED rate. Dividend yield(1.55) - is determined by the historical l dividend yield if the SNP500. Volatility(21.03 at 390) – is determined by the option chain given in the excel. Underlying initial price – given in the problem.

Regression to determine the call price we use the certain options present in the option chain as they are actively traded in the market. If the client asks for the updated price of the up and out call option we can input the price of the actively traded options and send the updated price.

3. **The approach you took to valuation**

In up and out option the value of the option goes to zero if in any time during the time of the call option the value of stock goes above the specific price level. To see when the price of the stock goes above the knock out, the price of the stock is simulated for every day between the start and maturity date. The stock price is simulated using the Brownian motion and 266 randomly generated values. If the value of the stock goes above 500 then the payoff is 0, if it goes below the strike the payoff is 0.

To determine the price of the call option we have to run a regression. If the client demands the value of the Up-and-out call option then instead of running the whole valuation again we can find the price of the Up-and-out call option using the regression which we have run using the underlying.

4. **The result of the valuation with maximum error range of no more than $1.00 (2 s.d.)**

	Valuation of Call	**Hedging Portfolio - 1**	**Hedging Portfolio – 2**
Price	10.43	8.92	15.79
Error	.42	.41	.46

5. **The static hedging strategy that you recommend for the trader.**

In Hedging portfolio – 2 I decided to use bull spread with long call of 390 strike and selling the call of strike 500. The risk of the bank was if the price of the underlying goes above 390 which will be hedged by the long call of 390. We can earn extra premium by selling the 500 call. The cost of this strategy is higher than the premium earned from writing the up and out call option. The premium earned is 10.43 and the cost to hedge using the hedging portfolio – 2 is 15.79.

In Hedging portfolio – 1 I decided to use the regression portfolio as my hedging portfolio because it is the exact replication of the up and out call option and cost is equal to the cost of the up and out call option. The cost of using the hedging portfolio – 1 is 9$ an the earning from selling the up and out call us 10.43$. Therefore, I recommend using hedging portfolio 2 where we long 390 call, long 490 call and short 500 call.

6. **A quantitative summary of the risks involved in the trade**

Risk involved in this trade are volatility of the market – if the volatility of the market rises then the probability of the call option expiring in the money rises. This will lead to the client exercising the call option and we have to face a loss.

Secondly, the risk arises due to the interest rate fluctuation. As we can see now the rate rise and rate cut of the interest rate by the fed causes the market to rise and fall respectively. If the FED started the rate cut early, it would lead the market to rise and this will increases the probability of the call maturing in the money.