1. **(30)** Price a 2y 5.3% semi-annual pay bond, callable at 102. Assume annual rate volatility is 15% and yields are as below. Once you have priced this bond, calculate its annualized yield to call.

T y(0,t) 0.5 1.2% 1.0 3.2% 1.5 4.5% 2.0 5.3%

1. **(10)** You are a trader and are incented to maximize profit within the risk policy that your firm allows. (1) *Determine* and (4) *justify* the 99VaR and 95VaR you prefer from the following lists:
   1. List One: 99VaR (determine and justify)
      1. 99VaR, with a Standard Normal assumption
      2. 99VaR, with a Student t assumption
      3. 99VaR, with a historical assumption
   2. List Two: 95VaR (determine and justify)
      1. 95VaR, with a Standard Normal assumption
      2. 95VaR, with a Student t assumption
      3. 95VaR, with a historical assumption
2. **(10)** You are a market maker and a client purchases a call option from you.
   1. How do you, as market maker, hedge first-order underlying price risk?
   2. Assuming you have hedged first-order underlying price risk, how would you describe

theta and gamma exposure?

1. **(30)** Calculate and plot delta and gamma for the trading strategies below (for expiries of 6m, 3m, 1m, 1w and 1d) then explain what you observe in terms of the strategy’s payoff and first and second order mathematical derivatives.
   1. Butterfly (write two ATM calls and – symmetrically around the written calls – long one OTM call and long one ITM call)
   2. Bull Risk Reversal (long ATM call, short ATM put)