Problem 10.1. (5 points) Consider a non-dividend-paying stock with the initial price of \( S(0) = 100 \). Assume that the annual risk-free continuously compounded interest rate equals \( r = 0.05 \). Let the annualized standard deviation of the continuously compounded stock return, i.e., the volatility be \( \sigma = 0.25 \). Using a one-period forward binomial tree, calculate the price of a one-year at-the-money European call on this underlying asset.

(a) $11.07
(b) $12.46
(c) $13.38
(d) $14.58
(e) None of the above.

Problem 10.2. (5 points) Consider the one-period binomial option pricing model. Let \( V_C(0) > 0 \) denote the price of a European call on a stock which pays continuous dividends. What is the impact on the value of European call option prices if the company decides to increase the dividend yield paid to the shareholders?

(a) The call-option price will drop.
(b) The call-option price will increase.
(c) The call-option price will always remain constant.
(d) The impact on the price of the call cannot be determined using the binomial option pricing model.
(e) There is not enough information provided.

Problem 10.3. (10 points) Assume that one of the no-arbitrage conditions in the binomial model for pricing options on a non-dividend paying stock \( S \) is violated. Namely, let

\[ e^{r-h} \leq d < u. \]

Illustrate that the above inequalities indeed violate the no-arbitrage requirement. In other words, construct an arbitrage portfolio and show that your proposed arbitrage portfolio is, indeed, an arbitrage portfolio.

Problem 10.4. (20 points) Consider a two-period binomial model for the stock price with both periods of length one year. Let the initial stock price be \( S(0) = 100 \) and assume that the stock pays no dividends. Let the up and down factors be \( u = 1.25 \) and \( d = 0.75 \), respectively. Let the continuously compounded interest rate be \( r = 0.05 \) per annum.

Roger is interested in purchasing a chooser option with the provision that he can choose if the option is a put or a call after one year. The strike for this option is $100 and the expiry date is two years.

Using the above binomial tree, find the price of the chooser option.

Problem 10.5. (30 points) Let \( S(0) = 100, K = 95, r = 8\%, T = 1 \) and \( \delta = 0 \). Assuming that \( u = 1.3 \) and \( d = 0.8 \), construct a two-period binomial tree for a call option. Provide all the entries in the following table:
<table>
<thead>
<tr>
<th>Period</th>
<th>Stock movement</th>
<th>Option premium</th>
<th>$\Delta$</th>
<th>$B$</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>1</td>
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