Pricing Exotic Options with Monte Carlo Simulation

1. (**American**) Consider an American-style call option with nine months to expiry. The stock price is 42, the strike price is 40, the risk-free rate is 4% per year, the dividend yield is 8% per year and the volatility is 35% per year. (5.2704)

2. (**Holder-Extendible**) Consider an extendible call with initial time to maturity six months, extendible for an additional three months. The stock price is 100, the initial strike price is 100, the extended strike price is 105, the riskfree interest rate is 8% per year, the volatility is 25% per year, and the extension fee is 1. (9.4029)

3. (**Writer-Extendible**) Consider a writer-extendible call on a stock with original time to maturity six months, that will be extended three months if the option is out-of-the-money at original maturity time. The stock price is 80, and the initial strike price is 90. If the option is extended, the strike price is adjusted to 82. The risk-free interest rate is 10%, and the volatility is 30%. (6.8238)

4. (**Forward Start**) Consider an employee who receives a call option with forward start three months from today. The option starts 10% out-of-the-money, time to maturity is one year from today, the stock price is 60, the risk-free interest rate is 8%, the continuous dividend yield is 4%, and the expected volatility of the stock is 30%. (4.4064)

5. (**Asian**) Consider an Asian currency put option with a time to expiration of six months. The spot price is 6.80, the strike is 6.90, the domestic risk-free interest rate is 7% per year, the foreign interest rate is 9% per year, and the volatility of the spot rate is 14%. (0.2237)

6. (**Chooser**) Consider a complex chooser option that gives the holder the right to choose whether the option is to be a call with six months to expiration and strike price 55, or a put with seven months to expiration and strike price 48. The time to choose between a put or call is in three months, the underlying stock price is 50, the risk-free interest rate per year is 10%, the dividend yield is 5% per year, and the volatility per year is 35%. (6.0508)

7. (**Lookback**) Consider a lookback call option with six months left to expiration. Assume it gives the right to buy the underlying stock index at the lowest price recorded during the life of the option and that the minimum stock index price observed so far is 100, the stock price is 120, the risk-free interest rate is 10%, the dividend yield is 6%, and the volatility is 30%. (25.3533)

8. (**Compound**) Consider a put-on-call option that gives the option holder the right to sell a call option for 50, three months from today. The strike on the underlying call option is 520, the time to maturity on the call is six months from today, the price on the underlying stock index is 500, the risk-free interest rate is 8%, and the stock index pays dividends at a rate of 3% annually and has a volatility of 35%. (21.1965)

9. (**Look-Barrier**) Look-barrier options can be regarded as a combination of a partial-time barrier option and a forward starting fixed-strike lookback option. Consider a look-barrier call option with one year to expiry. The option's barrier monitoring period starts at the option's starting date and ends at six months. If the barrier is not hit the barrier price 120 during the monitoring period, the fixed-strike lookback option will be initiated at the same time the barrier ceases to exist. The stock price and strike price are 100, the risk-free interest rate is 10%, and the expected volatility of the stock is 30%. (7.5509)

10. (**Double-Barrier Binary**) Consider a double-barrier knock-out binary option with a time to expiration of three months. The option pays off zero if the asset price touches the lower 80 or upper 120 barrier before expiration. The option pays off a cash amount 10 at maturity if the barriers are not hit during the lifetime of the option. The stock price is 100, the risk-free interest rate is 5%, the continuous dividend yield is 2%, and the expected volatility of the stock is 30%. (6.3272)