MAT1856S/ APM466S

Mathematical Theory of Finance - Assignment 2

Due March 8, 2021

Gasoline prices are at $p_0 = \$1$/litre today, and each week i the price can go up by 10% to $p_{i+1} = p_i \cdot 1.1$ with probability 50%, or down to $p_{i+1} = p_i/1.1$ also with probability 50%.

Mr. Hamilton drives a car and each week consumes 50 litres of gasoline. He purchases price protection insurance in the form of a 4-upswing option with strike price \$1, which works as follows:

1 . On a given week, he can exercise one purchase option for 50 litres (no more nor less) at a fixed price of \$1/litre.

2 . He can exercise this purchase option a maximum of 4 times in a given year.

On the other hand, Ms. Curie runs a refinery, and produces 50,000 litres of gasoline every week, that she sells at market prices. She will purchase a price protection program in the form of a 4-downswing option which works as follows:

1 . On a given week, she can exercise one sell option for 50,000 litres (no more nor less) at a fixed price of \$1/litre.

2 . She can exercise this purchase option a maximum of 4 times in a given year.

In both cases, using recombining trees, calculate the price of the price protection plan in each case, as well as the optimal exercise nodes in the option trees.