

## MF850

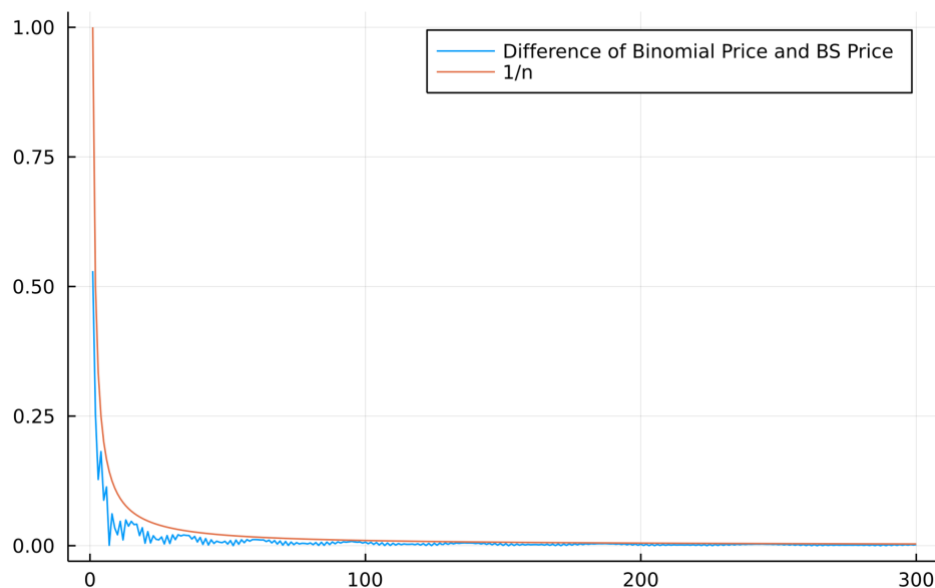
### Problem Set 1

**Problem1.1:(For the detail, See the code)**

(a) The approximation to the price of European put is about: **1.347**

(b) Here I plot the (Binomial\_Euro\_put – BS model Price) VS 1/n:

Convergence analysis for Euro-put



From the plot we can see that Binomial(n)-BS(n) converges to zero and it's under the bound of the  $e(n) = 1/n$ .

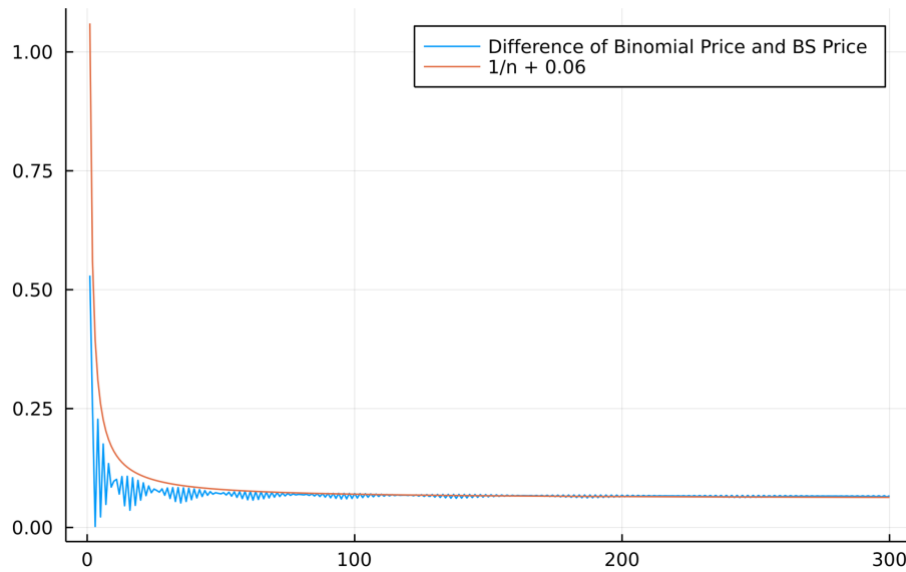
we can see that:

$$\lim_{n \rightarrow \infty} \frac{\frac{1}{n+1}}{\frac{1}{n^q}} = \lim_{n \rightarrow \infty} \frac{n^q}{n+1}$$

We get the order of convergence for  $q=1$ , so the convergence is linear. And the rate of the convergence obviously should be 1.

(c) We do the same things in American rules. The approximation of American put price is about: **1.4126**. And I also plot the same thing for American put options:

### Convergence analysis for American-put



From the plot we can see the path of American put converges to around 0.06. This value is the premium with respect to the European option. But they converge in a very similar way. Therefore, we just use the  $e(n)=1/n+0.06$  to describe its path. Because we just move the curve parallel. It should be also a linear convergence and the rate of convergence is 1.