Pricing an option. A start.

To price the option we're going to use the Expected Value (https://en.wikipedia.org/wiki/Expected_value) of the future payoff in a Monte Carlo Simulation. What does this mean!?

We know what the call payout is from above. And we know the put payout. So let's say we're at some date t before the expiration date T (so $t < T$). Then the value of the option is the present value of the expectation of its payout at the expiration date:

$$C_t = PV(E[max(0, S_T - K)])$$

where PV is the *present value*. Similarly for the put:

$$P_t = PV(E[max(0, K - S_T)])$$

Here's where it gets tricky. We assume what's called a risk-neutral valuation so that the asset (corn!) will earn the risk-free interest rate (on average). That is suppose you had a known price p and there's a fixed interest rate across the street at Busey. Then the value at expiration without risk is $C_T = e^{-r}$ and the value at some time t would be $C_t = e^{-r(T-t)}$. Putting this together gives us a PV:

$$C_t = e^{-r(T-t)}E[max(0, S_T - K)]$$

A short recap:

- K is a the strike price. It is known.
- r is a set interest rate. It is also known.
- T is a date fixed in the future.
- S_T is the asset price at this time in the future. We will simulate this.