1 Call Options

$$P_{ask} = \$9.25$$
$$S = \$318.31$$
$$K = \$315$$

$$N = \frac{1000}{9.25} \approx 108\text{calls}$$

$$\text{Payoff: } (S-K)^+ = (318.31 - 315) = \$3.31,\ P\&L = \$3.13 - \$9.25 = -\$5.94$$

Total loss: $P\&L \times N = -\$5.94 * 108 = -\$641.52$

Bid price on Jan 24th: $P_{bid} = \$10.30$. Rate of return is therefore:

$$RoR = 100 \times \frac{P_{bid} - P_{ask}}{P_{ask}} = 100 \times \frac{\$10.30 - \$9.25}{\$9.25} \approx 11.4\%$$

2 Shares

$$P_0 = 313.29$$
$$S_T = 318.31$$

$$RoR = 100 \times \frac{S_T - P_0}{P_0} = 100 \times \frac{318.31 - 313.29}{313.29} \approx 1.6\%$$

Buying the **315-calls** was more profitable because they generated a rate of return of 11.4% when sold at bid price on January 24th.

3 Put Options

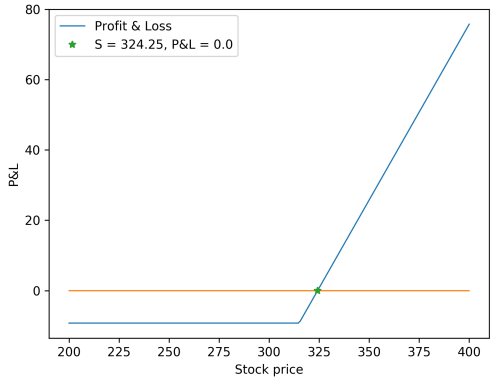
The payoff for put options is calculated as $(K-S)^+$. At the 24th of january the stock price exceeded the strike price, thus generating 0 payoff. Therefore, I would not have exercised the option.

$$P_{ask} = \$10.75 \qquad \text{January 14th}$$
$$P_{bid} = \$6.95 \qquad \text{January 24th}$$

$$RoR = 100 \times \frac{6.95 - 10.75}{10.75} \approx -35.3\%$$

The rate of return would be -35.3% if I sold the puts on Jan 24th.

4 Break Even



The call option provides the owner with the right to buy a share at the strike price at maturity, but **not** the obligation to do so. Therefore the call option owner only exercises the option if the stock price is lower than strike price. This leads to the payoff being positive, i.e $(S-K)^+ > 0$. A profit will be made if the payoff is greater than the initial price for the call option (P_0). The break even point (as illustrated in the plot above) is obtained when:

$$(S-K)^+ - P_0 = 0 \implies S = K + P_0 = 315 + 9.25 = \$324.25/share$$

5 Weather Derivatives

If the summer is predicted to be warmer than usual. UIUC could buy CDD (Cooling Degree Day) calls to hedge against the projected higher energy costs. A CDD follows the formula $MAX(0, \text{daily average temp. } - 65F)$, and therefore the value of the underlying "asset" rises in value when the weather is warmer. Thus the call option would generate more profit the higher the average temperature was for the given contract period.

If a very cold winter is projected, UIUC can hedge the utility costs by buying HDD (Heating Degree Day) ($MAX(0, 65F - \text{daily average temp. })$) calls. When the temperature decreases, and the utility bill increases, the value of the option's underlying asset increases and therefore the call otion becomes more valuable.