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# Options pricing

An option gives the buyer the opportunity to buy or set a particular asset (such as corn) at a certain price, which will happen at some point in the future. The option itself has a price and there are **many** models used to determine how to price options. Black-Scholes ([https://en.wikipedia.org/wiki/Black-Scholes\\_model](https://en.wikipedia.org/wiki/Black-Scholes_model)) is one that you may have heard of.

We'll be looking at so-called European options: options that can only be exercised or executed at a certain expiration date. We call this date  $T$ .

A different term, called a *call* gives the option to buy at a specific price. A call returns money if the price of the asset or stock at the expiration date, call it  $S_T$ , is above this specific price, called the strike price, or  $K$ . So

$$C_T = \max(0, S_T - K)$$

**Let's do an example. Set the strike price at \$40 and make a plot of return or payoff on the  $y$ -axis versus asset price  $S_T$  on the  $x$ -axis.**

```
call = lambda S: np.fmax(0, S - 40)
```

**Why did we use `fmax` here?** (Think about the type of input. Try `np.max`. Does it work?)

A similar expression holds for a *put* option: the opportunity to sell at a specific strike price. Here we have

$$P_T = \max(0, K - S_T)$$

So the put makes money when the asset lands below the strike price at the expiration date.

**Make a lambda function and plot of this one as well.**