

1.60

Tie-ins to Finance

Probability in finance



Probability in Finance

Many of the assigned probabilities
are ballpark figures

Values are NOT
a 100% certain!

$E(P) > 0$



Option pricing

Option:

An agreement between two parties for the price of a stock or item at a future point in time



It allows one of the sides to decide

Google Example

Price
today

$\$1,100 \times 10 = \$11,000$

Google Example

10 stocks | \$1,100 each | in a week



40% → \$1,200

60% → \$1,000

Google Example

10 stocks | \$1,100 each | in a week



40% → \$1,200

60% → \$1,000

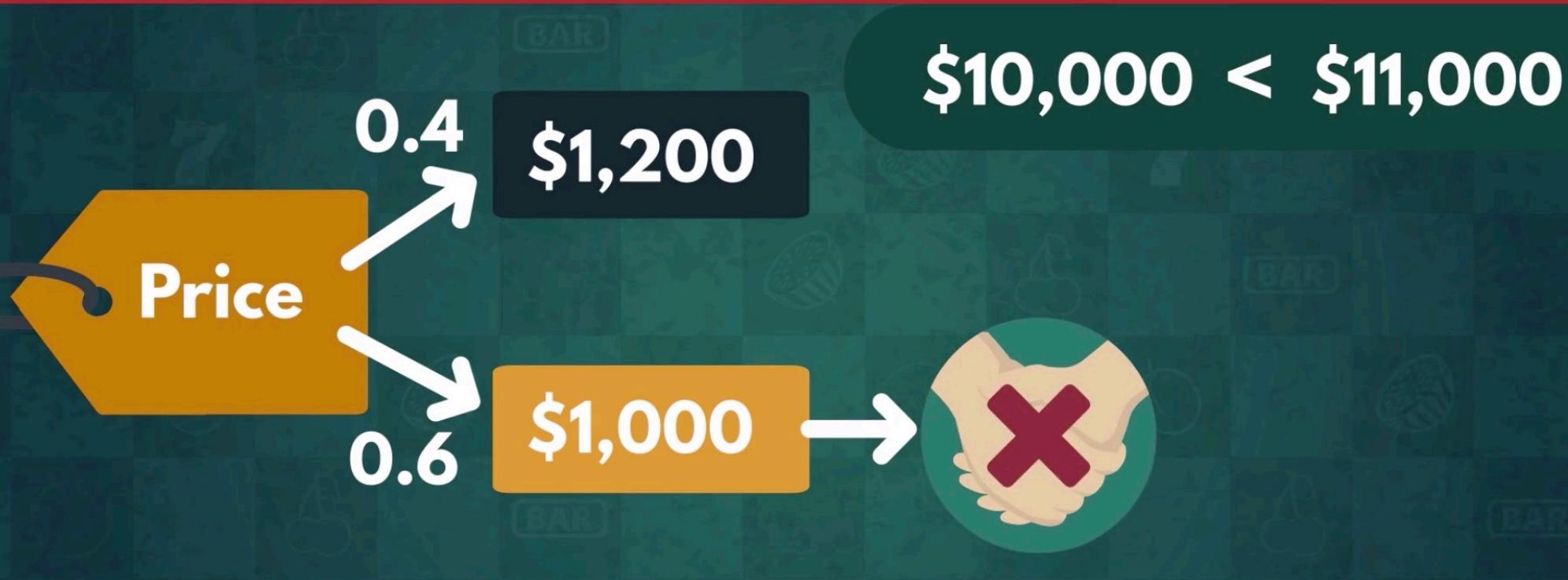
Google Example

Price
today

$\$1,100 \times 10 = \$11,000$

1.60

Google Example



Better off buying the 10 stocks at the market price

Google Example



You would take advantage of the deal you struck

Google Example

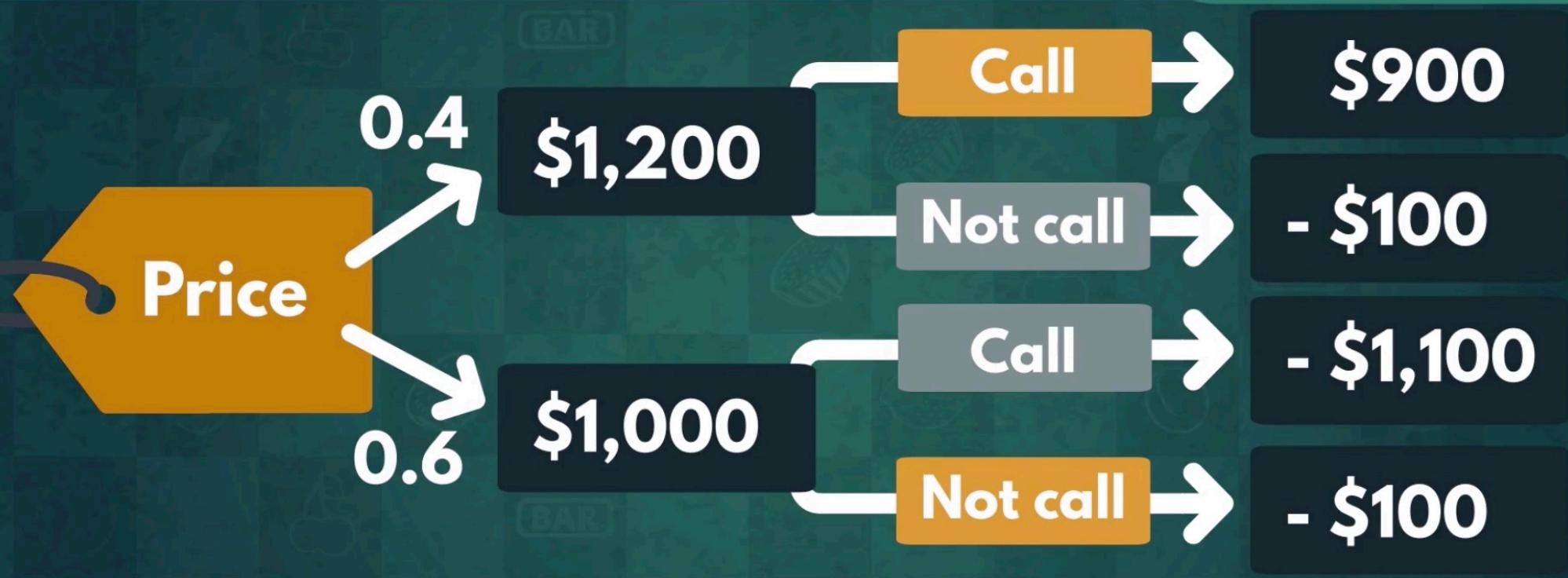


**Go through with the deal
and make a profit**

**You only lose the
premium you paid**

Decision Tree

Payoffs



We write losses as a negative number

Expected Payoffs

$E(P) < 0$

Disadvantageous
(Avoid buying this option)

$E(P) = 0$

"Fair deal"
(You expect to make as much as you paid)

$E(P) > 0$

Favourable
(Go through with the deal)

Google Example

Payoffs



$$\begin{aligned} E(P) &= 0.6 \times (-100) + 0.4 \times 900 = \\ &= -60 + 360 = \$300 \end{aligned}$$

Google Example

$$E(P) = \$300 > 0$$

Favourable → Buy the option

Pricing an Option

If the investor has the same information as you:

Fullscreen

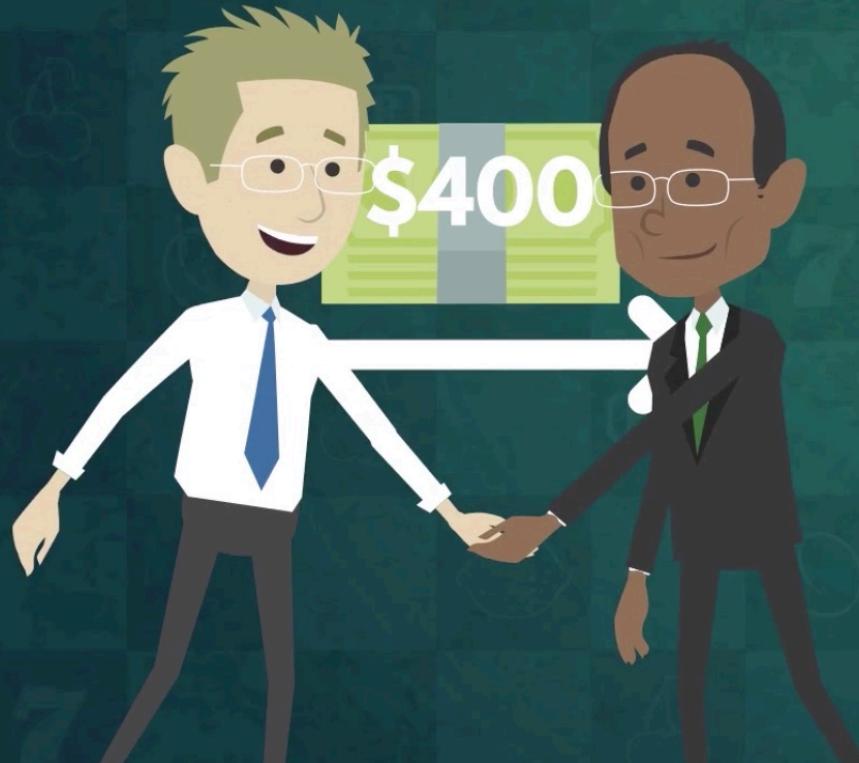
- Unfavourable deal for you
- "Fair deal" (Usually)

$$E(P) \leq 0$$



Pricing an Option

Investors can charge a higher premium
to make a "fair deal"



Premium \uparrow \$300

$E(P)$ \downarrow \$300

Pricing an Option

Payoffs

Calculating $E(P)$ if there is no premium



$$E(P_1) = 0 \times 0.6 + 1,000 \times 0.4 = \$400$$

Pricing an Option

$E(P_1) = \$400$

**Maximum
price**

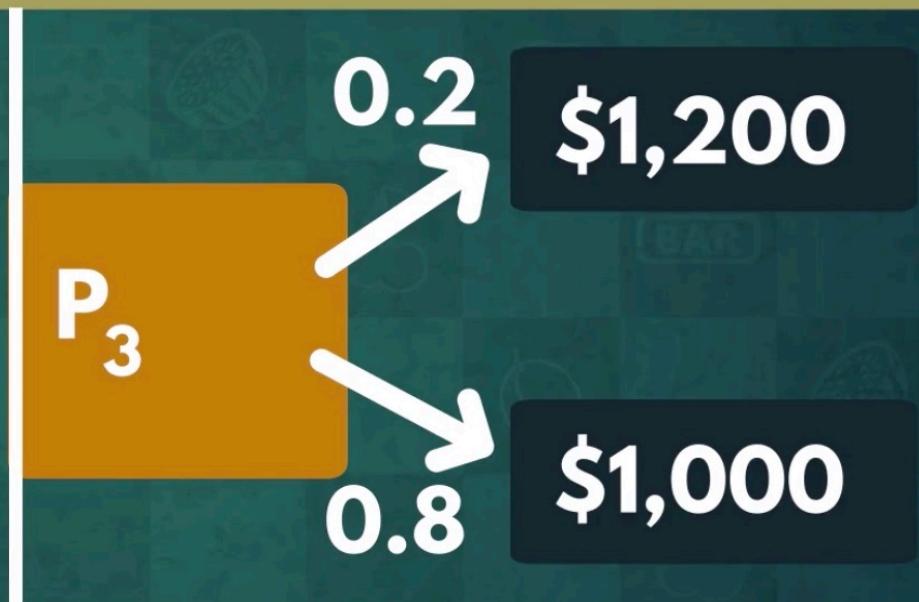
**matches highest premium
estimation from before**

Pricing an Option

What if the stock value only increases to \$1125?



$$E(P_2) = ?$$

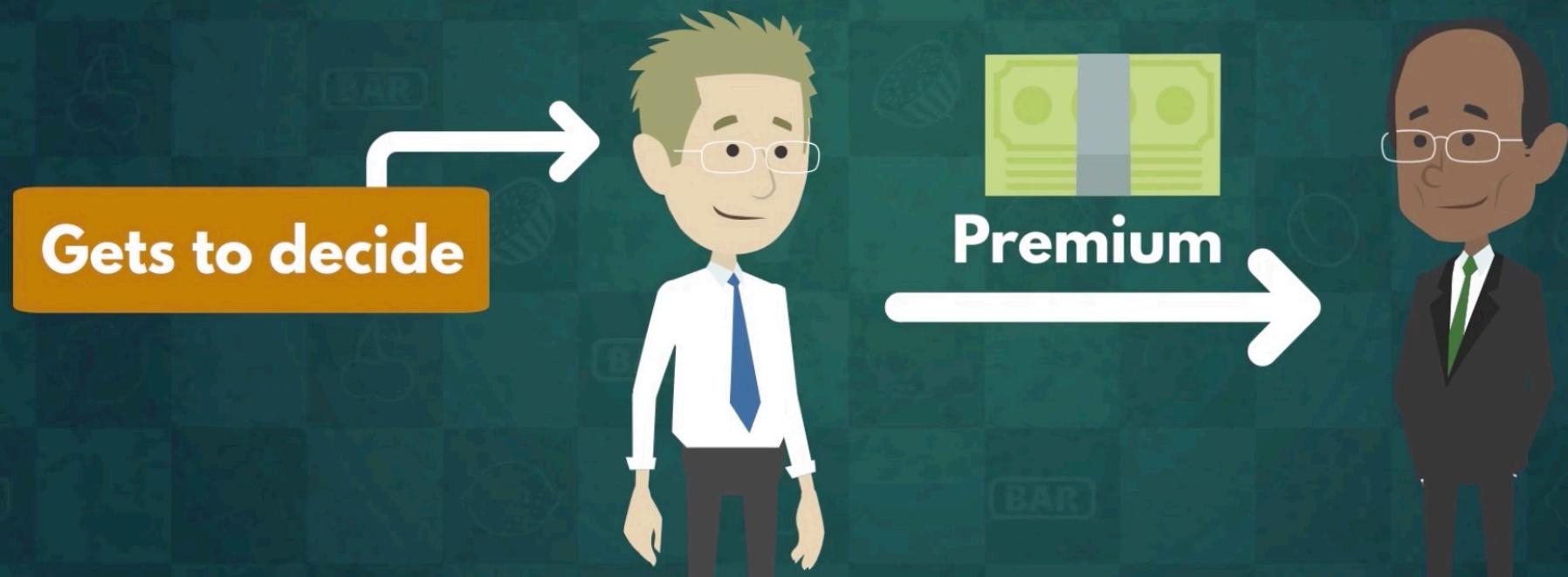


$$E(P_3) = ?$$

1.60

Option pricing

One of the parties at a clear disadvantage



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Option pricing

**How much we are willing to pay to receive that pact?
(Highest premium)**



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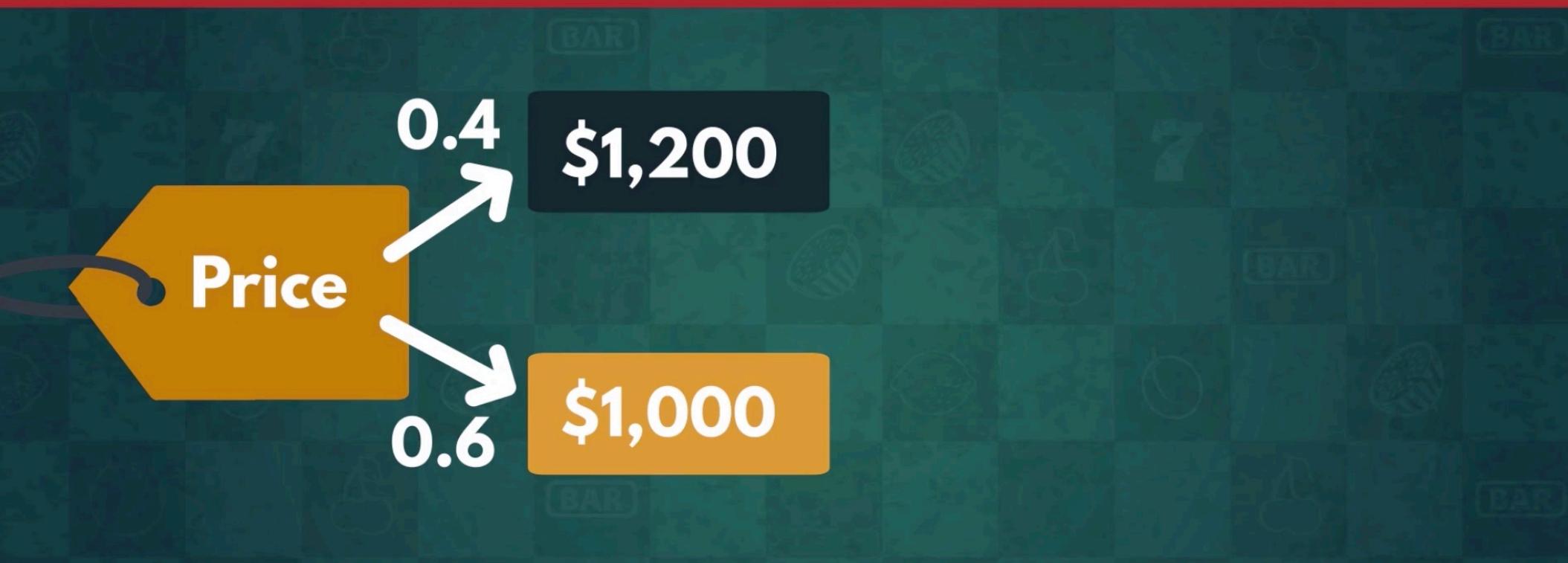
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