UNIVERSITY OF TEXAS AT AUSTIN

Problem Set 3
Payoff. Profit.

3.1. Static portfolios.
Step #1. Remember the **bottom-line approach** from *theory of interest.* Decide who your **protagonist** is!
Step #2. Set up the **timeline** (on paper or mentally):

This is how we will talk about **profit**:
- If **Profit**> 0, then we call it a **gain**.
- If **Profit**< 0, then we call it a **loss**.
- If **Profit**$= 0$, then we say that we **break even**.

3.2. **Riskless assets.**

Example 3.1. Investing in a zero-coupon bond

Example 3.2. Taking a loan

3.3. **Risky assets.**

Example 3.3. Outright purchase of a stock

Problem 3.1. Let the current price of a non-dividend-paying stock be \$40. The continuously compounded, risk-free interest rate is 0.04. You model the distribution of the time-1 price of the above stock as follows:

$$S(1) \sim \begin{cases} 45, & \text{with probability } 1/4, \\ 42, & \text{with probability } 1/2, \\ 38, & \text{with probability } 1/4. \end{cases}$$

What is your expected profit under the above model, if you invest in one share of stock at time-0 and liquidate your investment at time-1?

<u>*Goal*</u>. To study the payoff and the profit as **functions** of the **final asset price**.

<u>*Introduce*</u>. s ... an independent **<u>argument</u>** taking values in $[0, \infty)$ which will stand for the **final asset price**, i.e., it will be a "placeholder" for the random variable $S(T)$

Problem 3.2. To plant and harvest 20,000 bushels of corn, Farmer Jayne incurs total aggregate costs totaling \$33,000. The current spot price of corn is \$1.80 per bushel. What is the profit if the spot price is \$1.90 per bushel when she harvests and sells her corn?

   (a) About \$3,000 gain

   (b) About \$3,000 loss

   (c) About \$5,000 loss

   (d) About \$5,000 gain

   (e) None of the above