LIABILITIES: Current Liabilities

- Obligations that must be discharged in a short period of time (generally less than one year)
- Reported on balance sheet at **nominal value**
- Examples:
  - Accounts payable
  - Short-term borrowings
  - Current portion of long-term debt
  - Deposits
  - Warranties
  - Deferred Revenues / Income
LIABILITIES: Long-term Liabilities

- Obligations spanning a longer period of time (generally more than one year)
- Generally reported on the balance sheet at present value based on interest rate when initiated
- Examples:
  - Bonds
  - Long-term loans
  - Mortgages
  - Capital Leases
- How do we compute present values? And interest expense?
Time Value Of Money

Future value of $1.00 today = $1.00 \times (1+10\%) = $1.10 at the end of one year.

What is the present value of $1.10 to be received one year from now?

Present value of $1.10 one year from now = $1.10/(1+10\%) = $1.00

What is the present value of $1.00 to be received one year from now?

Present value of $1.00 one year from now = $1.00/(1.10) = $0.91
Time Value Of Money

Future value of $1.00 two years from now = $1.00 \times (1+10\%) \times (1+10\%)
= $1.00 \times (1.10)^2 = $1.21

Present value of $1.00 to be received two years from now
= $1.00 / [(1.10)^2] = $0.83

RECALL: PV of $1.00 to be received a year from now = $0.91
Calculating present values: An example

You have just won a lottery. The lottery board offers you three different options for collecting your winnings:

1. Payments of $500,000 at the end of each year for 20 years.
2. Lump-sum payment of $4,500,000 today.
3. Lump-sum payment of $1 million today, followed by $2,100,000 at the end of years 5, 6, and 7.

Assume all earnings can be invested at a 10 percent annual rate. Ignoring any tax effects, which option should you choose and why?
Future Value of Option 1: $500,000 at the end of each year for 20 years.

\[
\begin{align*}
\text{19 years} & : 0.5m \times (1.1)^{19} = 3.06m \\
\text{18 years} & : 0.5m \times (1.1)^{18} = 2.78m \\
\text{17 years} & : 0.5m \times (1.1)^{17} = 2.53m \\
\text{16 years} & : 0.5m \times (1.1)^{16} = 2.29m \\
\text{15 years} & : 0.5m \times (1.1)^{15} = 2.07m \\
\text{14 years} & : 0.5m \times (1.1)^{14} = 1.86m \\
\text{13 years} & : 0.5m \times (1.1)^{13} = 1.66m \\
\text{12 years} & : 0.5m \times (1.1)^{12} = 1.47m \\
\text{11 years} & : 0.5m \times (1.1)^{11} = 1.29m \\
\text{10 years} & : 0.5m \times (1.1)^{10} = 1.12m \\
\text{9 years} & : 0.5m \times (1.1)^{9} = 0.96m \\
\text{8 years} & : 0.5m \times (1.1)^{8} = 0.82m \\
\text{7 years} & : 0.5m \times (1.1)^{7} = 0.69m \\
\text{6 years} & : 0.5m \times (1.1)^{6} = 0.57m \\
\text{5 years} & : 0.5m \times (1.1)^{5} = 0.46m \\
\text{4 years} & : 0.5m \times (1.1)^{4} = 0.36m \\
\text{3 years} & : 0.5m \times (1.1)^{3} = 0.27m \\
\text{2 years} & : 0.5m \times (1.1)^{2} = 0.20m \\
\text{1 year} & : 0.5m \times (1.1)^{1} = 0.55m \\
\text{0 year} & : 0.5m \times (1.1)^{0} = 0.50m
\end{align*}
\]

\[\boxed{\text{Total} = 28.64m}\]
Future Value of Option 2: Lump-sum payment of $4,500,000 today

\[ \text{Future Value} = 4.5m \times (1.1)^{20} = 30.27m \]
Future Value of Option 3: $1m today, and $2.1m at the end of years 5, 6, and 7.

\[
\begin{align*}
\text{20 years} & \quad \Rightarrow \quad 1.0m \times (1.1)^{20} = 3.36m \\
\text{15 years} & \quad \Rightarrow \quad 2.1m \times (1.1)^{15} = 8.77m \\
\text{14 years} & \quad \Rightarrow \quad 2.1m \times (1.1)^{14} = 7.97m \\
\text{13 years} & \quad \Rightarrow \quad 2.1m \times (1.1)^{13} = 7.25m \\
\hline
\text{Total} & \quad \Rightarrow \quad 3.36m + 8.77m + 7.97m + 7.25m = 30.71m
\end{align*}
\]
Future Values

- If you invest all lottery receipts at 10% per year, how much will you have in 20 years?

1. \(500K \times (1.10)^{19} + 500K \times (1.10)^{18} + \ldots + 500K \times (1.10)^{1} + 500K = \$28.64m\)

2. \(4,500,000 \times (1.10)^{20} = \$30.27m\)

3. \(1m \times (1.10)^{20} + 2.1m \times (1.10)^{15} + 2.1m \times (1.10)^{14} + 2.1m \times (1.10)^{13} = \$30.71m\)

\(\Rightarrow\) FV(Option 1) < FV(Option 2) < FV(Option 3)
Present Value of Option 1: $500,000 at the end of each year for 20 years.

\[ \begin{align*}
$0.5m \times (1.1)^{-1} &= $0.45m \\
$0.5m \times (1.1)^{-2} &= $0.41m \\
$0.5m \times (1.1)^{-3} &= $0.38m \\
$0.5m \times (1.1)^{-19} &= $0.08m \\
$0.5m \times (1.1)^{-20} &= $0.07m \\
\hline
$4.26m
\end{align*} \]
Present Value of Option 2:
Lump-sum payment of $4,500,000 today

$4.5m
Present Value of Option 3: $1m today, and $2.1m at the end of years 5, 6, and 7.

$1.0m \times (1.1)^0 = $1.00m

$2.1m \times (1.1)^{-5} = $1.30m

5 years

$2.1m \times (1.1)^{-6} = $1.19m

6 years

$2.1m \times (1.1)^{-7} = $1.08m

7 years

$4.57m
Present Values

- If all lottery receipts can be invested at 10% per year, what is the *present value* of each option?

1. \( 500K \times (1.10)^{-20} + 500K \times (1.10)^{-19} + \ldots + 500K \times (1.10)^{-2} + 500K \times (1.10)^{-1} = \$4.26m \)

2. \( 4,500,000 \times (1.10)^{0} = \$4.5m \)

3. \( 1m \times (1.10)^{0} + 2.1m \times (1.10)^{-5} + 2.1m \times (1.10)^{-6} + 2.1m \times (1.10)^{-7} = \$4.57m \)

\( \Rightarrow \text{PV(Option 1)} < \text{PV(Option 2)} < \text{PV(Option 3)} \)
Converting Present and Future Values

Present Values

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Present Value</th>
<th>Future Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4.26m</td>
<td>FV = 4.26 \times 1.1^{20} = 28.64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PV = 28.64 \times 1.1^{-20} = 4.26</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Option 2</th>
<th>Present Value</th>
<th>Future Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4.50m</td>
<td>FV = 4.50 \times 1.1^{20} = 30.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PV = 30.27 \times 1.1^{-20} = 4.50</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option 3</th>
<th>Present Value</th>
<th>Future Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4.57m</td>
<td>FV = 4.57 \times 1.1^{20} = 30.71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PV = 30.71 \times 1.1^{-20} = 4.57</td>
<td></td>
</tr>
</tbody>
</table>
Using PV and FV Tables (Appendix)

- **Table 1: Future Value of $1**
  - A one-time payment to be received now and held (reinvested) for \( N \) periods
  - Compounded at interest rate \( r\% \)
  - Multiply the dollar amount received by the factor in Row \( N \), Column \( r\% \)

- **Table 2: Present Value of $1**
  - A one-time payment to be received \( N \) periods from now
  - Discounted at interest rate \( r \)
  - Multiply the dollar amount to be received by the factor in Row \( N \), Column \( r \)
Time Value of Money Terminology

- Annuity: a stream of fixed-dollar payments made at regular intervals of time
  - **Ordinary Annuity** (annuity in arrears): payments occur at the end of the period
  - **Annuity due** (annuity in advance): payments occur at the beginning of the period

- Formulas:
  - \[ FV(a) = \left\{ \frac{((1+r)^N - 1)}{r} \right\} \times \text{Fixed Period Cash Flow} \]
  - \[ PV(a) = \left\{ \frac{(1 - (1+r)^{-N})}{r} \right\} \times \text{Fixed Period Cash Flow} \]
Using PV and FV Tables (Appendix)

- Table 3: Future Value of $1 ordinary annuity (annuity in arrears)
  - Regular payments to be received at **end** of year for N years and held (reinvested) until time N
  - Compounded at interest rate r\%
  - Multiply the dollar amount received by the factor in Row N, Column r\%

- FV of $1 annuity due (annuity in advance) = (FV of an ordinary annuity for N+1 years) - $1
Using PV and FV Tables (Appendix)

- **Table 4: Present Value of $1 ordinary annuity (annuity in arrears)**
  - Regular payments to be received at end of year for N years
  - Discounted at interest rate r\%
  - Multiply the dollar amount to be received by the factor in Row N, Column r

- PV of $1 annuity due (annuity in advance) = (PV of an ordinary annuity for N-1 years) + $1