Cash Flow Analysis

Cash Flow

Contract Cash Flow

How much is the total cost?
How to arrange for financing?

Cash Flow = Cash In – Cash Out

= Income – Expense

= Revenue - Cost
Cash Flow

Project Expenses

- The project cost types:
  - Fixed cost (equipment, ...)
  - Time-related cost (distributed over the duration of an activity, e.g., salaries, ...)
  - Quantity (Production)-related costs (costs per unit of materials or unit of resource usage)

- When these costs are paid, it is named expenses
Cash Flow

Project Expenses

- **The project S-Curve:**

  ![S-Curve Graph]

Project Income

- Project revenue is the summation of the activities prices
- Represents the payment made by the owner to the contractor
- Mostly, the contractor receive his payments after one month from submitting his/her invoice
- Retainage of 5 or 10 to ensure that no problems will arise during construction
- When the contractor receive his/her payments, it is called **Income**
Cash Flow

Example

- Consider the construction operation of a foundation activity
- Activity duration 8 weeks
- Labor cost of LE 1600 paid weekly
- Equipment cost of LE 4000 paid weekly after 2-month credit facility
- Material cost of LE 800 paid weekly after 3-month credit facility
- Subcontractor cost of LE 2400 paid weekly after 1-month credit facility

- When each payment by the contractor is due and how much?
## Cash Flow

### Example
- **Activity total cost = LE 8800**

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payments</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
</tr>
<tr>
<td>Total</td>
<td>1100</td>
<td>2200</td>
<td>3300</td>
<td>4400</td>
<td>5500</td>
<td>6600</td>
<td>7700</td>
<td>8800</td>
</tr>
</tbody>
</table>

## Cash Flow

### Expenses

<table>
<thead>
<tr>
<th>wk</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>-</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>S</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>T</td>
<td>-</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
</tbody>
</table>
Cash Flow

Contract Cash Flow

Cumulative cost (LE)

Expense
Overdraft
Income

Time

1 2 3 4 5 6 7 8

29/09/2016
Emad Elbeltagi
12
**Cash Flow**

*Contract Cash Flow - Admeasurements contract with advanced payment*

Cumulative Cost (LE)

Income

Expense

Advanced payment

0 1 2 3 4 5 6 7 8

Time

---

**Cash Flow**

*Contract Cash Flow – Lump sum contract with three payments*

Cumulative Cost (LE)

Expense

Income

0 1 2 3 4 5 6 7 8

Time

---
Cash Flow

Contract Cash Flow

Variables needed to calculate cash flow

- The project bar chart (project schedule)
- Activities’ direct and indirect cost
- Contractor method of paying his/her expenses
- Contractor’s markup
- Retention amount and its payback time
- Time of payment delay by owner
- Advanced or mobilization payment

Procedure to calculate cash flow

- The project bar chart (project schedule)
- Perform project schedule
- Draw bar chart based on early or late timings
- Calculate the cost per time period
- Calculate the cumulative cost
- Adjust the cost to produce the expenses
- Calculate cumulative revenue: revenue = cost \times (1 + markup)
- Adjust the revenue to produce the income
- Calculate the cash flow (cash flow = income − expense).
Cash Flow

Example

Example data: Mark up = 5%

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration (day)</th>
<th>Total Cost (LE x 1000)</th>
<th>Total Revenue (LE x 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>04.00</td>
<td>04.20</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>12.00</td>
<td>12.60</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>04.00</td>
<td>04.20</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>16.00</td>
<td>16.80</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>20.00</td>
<td>21.00</td>
</tr>
<tr>
<td>F</td>
<td>10</td>
<td>20.00</td>
<td>21.00</td>
</tr>
<tr>
<td>G</td>
<td>16</td>
<td>16.00</td>
<td>16.80</td>
</tr>
<tr>
<td>H</td>
<td>8</td>
<td>24.00</td>
<td>25.20</td>
</tr>
<tr>
<td>I</td>
<td>6</td>
<td>12.00</td>
<td>12.60</td>
</tr>
<tr>
<td>J</td>
<td>6</td>
<td>12.00</td>
<td>12.60</td>
</tr>
<tr>
<td>K</td>
<td>10</td>
<td>10.00</td>
<td>10.50</td>
</tr>
</tbody>
</table>
**Cash Flow**

**Example**

**Example data:**

- Contractor expenses will be paid immediately
- Retention = 10% will be paid with the last payment
- Calculations made every 8 days
- Owner payment will be delayed one period
- First invoice after at the end of the period
- No advanced payment
### Cash Flow

**Example**

<table>
<thead>
<tr>
<th></th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>8</th>
<th>8</th>
<th>8</th>
<th>6</th>
<th>6</th>
<th>6</th>
<th>2</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cost/2 days x LE1000</td>
<td>46</td>
<td>52</td>
<td>32</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Cost each period x LE1000</td>
<td>46</td>
<td>98</td>
<td>130</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Cumulative cost x LE1000</td>
<td>46</td>
<td>98</td>
<td>130</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Cumulative Expense x 1000</td>
<td>46</td>
<td>98</td>
<td>130</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Revenue = row 3 x 1.05</td>
<td>48.3</td>
<td>54.6</td>
<td>33.6</td>
<td>21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Revenue - retention = row 5 x 0.9</td>
<td>43.47</td>
<td>49.14</td>
<td>30.24</td>
<td>18.90</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Retention x LE1000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Cumulative revenue x LE1000</td>
<td>43.47</td>
<td>92.61</td>
<td>122.85</td>
<td>141.75</td>
<td>157.50</td>
<td>157.50</td>
<td>157.50</td>
<td>157.50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9. Cumulative income x LE1000</td>
<td>-</td>
<td>43.47</td>
<td>92.61</td>
<td>122.85</td>
<td>157.50</td>
<td>157.50</td>
<td>157.50</td>
<td>157.50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10. Cumulative cash flow x LE1000</td>
<td>-46</td>
<td>-98/-54,53</td>
<td>-86.53/-37.39</td>
<td>-57.39/-27.15</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
<td>-27.15/±7.5</td>
</tr>
</tbody>
</table>

Area = LE 10,000 x 1 period (8-days)
**Cash Flow**

**Example**

![Graph showing cash flow](image)

**Minimizing Contract Negative Cash Flow**

- Loading of rates
- Adjustment of work schedule to late start timing
- Reduction of delays in receiving revenues
- Asking for advanced or mobilization payment
- Increasing the mark up and reducing the retention
- Adjust the timing of delivery of large material orders
- Delay in paying labor wages, equipment, material
Cost of Borrowing

- 24 unit areas, interest rate 1% per period
- Cost = 24 x 10000 x 0.01 = LE 2400

Project Cash Flow

- Time scale is much longer spans the whole life of a project
- Feasibility studies
- Execution
- Operation

Profitability indicators

- Payback period
- Maximum capital – maximum negative cash
- Profit
Cash Flow

Project Cash Flow

Project Cash Flow: Example

- Project net cash flow

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project A (LE x 1000)</td>
<td>-10</td>
<td>-40</td>
<td>-30</td>
<td>20</td>
<td>60</td>
<td>20</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Project B (LE x 1000)</td>
<td>-30</td>
<td>-80</td>
<td>30</td>
<td>50</td>
<td>10</td>
<td>20</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

- Project cumulative cash flow

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project A (LE x 1000)</td>
<td>-10</td>
<td>-50</td>
<td>-80</td>
<td>-60</td>
<td>0</td>
<td>20</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>Project B (LE x1000)</td>
<td>-30</td>
<td>-110</td>
<td>-80</td>
<td>-30</td>
<td>-20</td>
<td>0</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>
Cash Flow

Project Cash Flow: Example

Project A

Project B

29/09/2016 Emad Elbeltagi 29