Asset Accounts
(Application: Valuation)

SEEA Training Seminar for ESCAP

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Chiba, Japan

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Statistics Canada
SEEA view

- **Industries**
  - Industrial output of goods and services
  - Industrial intermediate demand
  - Environmental protection expenditures
  - Resource production by industries
  - Resource use by industries
  - Waste consumption by industries
  - Waste output by industries

- **Final demand**
  - Final demand
  - Environmental protection expenditures
  - Resource production by households/gov’t
  - Resource use by households/gov’t
  - Waste consumption by households/gov’t
  - Waste output by households/gov’t

- **Assets**
  - Financial and produced assets, opening balance
  - Natural resource assets, opening balance
  - Natural resource assets, closing balance
  - Gross fixed capital formation
  - Capital expenditures for environmental protection
  - Other changes in volume & holding gains/losses on financial & produced assets
  - Changes in and holding gains/losses on natural resource assets
  - Changes in natural resource assets
  - Financial and produced assets, closing balance
  - Natural resource assets, closing balance
  - Natural resource assets, closing balance
Physical stock accounts: an example for crude bitumen

Table 153-0122

Selected natural resource reserves
annual (data in thousands)

<table>
<thead>
<tr>
<th>Stock</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening stock</td>
<td>1,660,000</td>
<td>1,620,000</td>
<td>3,340,000</td>
</tr>
<tr>
<td>Additions</td>
<td>17,258</td>
<td>1,785,707</td>
<td>237,000</td>
</tr>
<tr>
<td>Depletion</td>
<td>57,258</td>
<td>65,707</td>
<td>77,000</td>
</tr>
<tr>
<td>Closing stock</td>
<td>1,620,000</td>
<td>3,340,000</td>
<td>3,500,000</td>
</tr>
</tbody>
</table>

The data below is a part of CANSIM table 153-0122. Use the Add/Remove data tab to customize your table.

Selected items [Add/Remove data]

Geography = Canada
Asset type = Established crude bitumen reserves (cubic metres)
### Monetary stock accounts: an example for crude bitumen

#### Table 153-0121

Value of selected natural resource reserves
annual (dollars x 1,000,000)

<table>
<thead>
<tr>
<th>Stock</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconciliation account opening stock</td>
<td>191,145.4</td>
<td>476,744.1</td>
<td>182,194.4</td>
<td>336,498.2</td>
</tr>
<tr>
<td>Reconciliation account additions</td>
<td>97,122.8</td>
<td>103.7</td>
<td>611.1</td>
<td>3,244.6</td>
</tr>
<tr>
<td>Reconciliation account depletion</td>
<td>8,426.2</td>
<td>3,733.8</td>
<td>7,618.1</td>
<td>10,571.1</td>
</tr>
<tr>
<td>Reconciliation account revaluation</td>
<td>196,902.1</td>
<td>-290,919.7</td>
<td>161,310.8</td>
<td>95,764.8</td>
</tr>
<tr>
<td>Reconciliation account closing stock</td>
<td>476,744.1</td>
<td>182,194.4</td>
<td>336,498.2</td>
<td>424,936.5</td>
</tr>
</tbody>
</table>
## Valuation exercise

### Asset account for Crude Bitumen: Quantity and value

<table>
<thead>
<tr>
<th>Year</th>
<th>Total revenues</th>
<th>Production costs</th>
<th>Depreciation</th>
<th>Net capital stock</th>
<th>Rate of return</th>
<th>Rate to capital</th>
<th>Total extraction costs</th>
<th>Resource rent</th>
<th>Opening Stock</th>
<th>Additions</th>
<th>Depletions</th>
<th>Quantity</th>
<th>Closing Stock</th>
<th>Reserve life</th>
<th>Discount factor</th>
<th>Net Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>10000</td>
<td>1000</td>
<td>100</td>
<td>10000</td>
<td>1.00%</td>
<td>100</td>
<td>1200</td>
<td>8800</td>
<td>...</td>
<td>10000</td>
<td>1000</td>
<td>99900</td>
<td>100</td>
<td>0.2453</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>10000</td>
<td>1000</td>
<td>100</td>
<td>10000</td>
<td>1.00%</td>
<td>100</td>
<td>1200</td>
<td>8800</td>
<td>...</td>
<td>10000</td>
<td>1000</td>
<td>99900</td>
<td>100</td>
<td>0.2453</td>
<td>216</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

1. Canadian Association of Petroleum Producers, Statistical Handbook, Table 04-258

2. Canadian Association of Petroleum Producers, Statistical Handbook, Table 04-138 (Operating costs in-situ + mining + upgraders + Operating column)

3. Statistics Canada: CANSIM Table 031-0002 (Current prices, Non-conventional oil extraction, Total Assets, Geometric)
   [http://www5.statcan.gc.ca/cansim/a23?lang=eng&retrieval=阳县&b=0310002&v=1&p=1&pattern=6&txtY=18&x=1&y=2&12&12=Modes=getDataTable&ei=de](http://www5.statcan.gc.ca/cansim/a23?lang=eng&retrieval=阳县&b=0310002&v=1&p=1&pattern=6&txtY=18&x=1&y=2&12&12=Modes=getDataTable&ei=de)

Steps to value a resource stock

- Estimate the physical stock
- Calculate the resource rent
- Calculate the net present value
Valuation — Estimate the stock

<table>
<thead>
<tr>
<th>Year</th>
<th>Total revenues</th>
<th>Total production costs</th>
<th>Depreciation</th>
<th>Net capital stock</th>
<th>Rate of return</th>
<th>Return to capital</th>
<th>Total extraction costs</th>
<th>Resource life</th>
<th>Opening Stock</th>
<th>Additions / Revisions</th>
<th>Depletion / Quantity of production</th>
<th>Closing Stock</th>
<th>Reserve life</th>
<th>Discount factor</th>
<th>Net Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10,000.00</td>
<td>4,000.00</td>
<td>100.00</td>
<td>10,000.00</td>
<td>0.02</td>
<td>200.00</td>
<td>4,300.00</td>
<td>5,700.00</td>
<td>..</td>
<td>100,000</td>
<td>1,000</td>
<td>99,900</td>
<td>99.90</td>
<td>0.25</td>
<td>139.67</td>
</tr>
</tbody>
</table>

**Reserves under active development**

**Physical accounts**

- Opening Stock
- Additions / Revisions
- Depletion / Quantity of production
- Closing Stock

**Discount factor**

\[ (E*F) = \frac{(C+D+G)}{(B-H)} \]

\[ (M-1) = (M-J+L) - AER ST98^4 \]

\[ (M/L) = (PV(N2, N##, -1/N##)) \]

\[ (I*N*O)/1000 \]

\[ 4.00\% = \text{Discount rate} \]
### Valuation — Estimate the rent

**Formula**

\[
RR_i = TR - C - (r_cK + \delta)
\]

**Where:**
- \( RR \) = resource rent (annual)
- \( TR \) = total annual revenue
- \( C \) = annual non-capital extraction cost (excluding taxes)
- \( \delta \) = annual depreciation
- \( r_cK \) = return to produced capital

**Table:**

<table>
<thead>
<tr>
<th>Physical accounts</th>
<th>Reserves under active development</th>
<th>Discount rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Total revenues</td>
<td>Total production costs</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>1</td>
<td>100,000</td>
<td>4,000.00</td>
</tr>
</tbody>
</table>

**Crude Bitumen — Reserves under active development**

- **Crude Bitumen**
- **Reserves under active development**
- **Discount rate**: 4.00%

**Sample Data:**

- **Total revenues**: 10,000
- **Total production costs**: 1,000
- **Depreciation**: 100
- **Net capital stock**: 100
- **Rate of return**: 1.00%
- **Return to capital**: 100
- **Total extraction costs**: 1200
- **Resource rent**: 8800
### Valuation — Numerical example

\[ NPV = \sum_{t=1}^{T} \frac{RR_t}{(1 + r_i)^t} \]

<table>
<thead>
<tr>
<th>Year</th>
<th>Total revenues $'000</th>
<th>Total production costs $'000</th>
<th>Depreciation $'000</th>
<th>Net capital stock $'000</th>
<th>Rate of return</th>
<th>Return to capital $'000</th>
<th>Total extraction costs $'000</th>
<th>Resource rent $'000</th>
<th>Opening Stock 1000 m³</th>
<th>Additions / Revisions $'000</th>
<th>Depletion / Quantity of production 1000 m³</th>
<th>Closing Stock 1000 m³</th>
<th>Reserve life years</th>
<th>Discount factor</th>
<th>Net Present Value $'000 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10,000.00</td>
<td>4,000.00</td>
<td>100.00</td>
<td>10,000.00</td>
<td>0.02</td>
<td>200.00</td>
<td>4,300.00</td>
<td>5,700.00</td>
<td>100,000.00</td>
<td>1,000</td>
<td>99,900.00</td>
<td>99.90</td>
<td>0.25</td>
<td>139.67</td>
<td>10,000.00</td>
</tr>
</tbody>
</table>

- \( CAPP^3 \)
- \( CANSIM 031-0002^4 \)
- Rate of return %
- Physical accounts
- Reserve life years
- Discount factor %
- Net Present Value $'000 000

\( A_E \) = Discount rate

\( A_R \) = Rate of return

\( A_P \) = Physical accounts

\( A_D \) = Discount factor

\( A_N \) = Net Present Value

12/02/2016 Statistics Canada • Statistique Canada
Questions?

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