1 RoR Analysis

Net Present Value (NPV)

Definition?

- The Net Present Value of a cash flow is a quantity of money, which if received today, would be equally desirable as the cash flow.
- "How much does a dollar in tomorrow worth today?"

Formula?

- in terms of interest rate \( i \)
  \[
  \text{NPV} := x_0 + \left(\frac{1}{1+i}\right)x_1 + \left(\frac{1}{1+i}\right)^2x_2 + \ldots = \sum_{k=0}^{\infty} (1 + i)^{-k}x_k
  \]

- in terms of discount factor \( \delta \)
  \[
  \text{NPV} := x_0 + \delta x_1 + \delta^2 x_2 + \ldots = \sum_{k=0}^{\infty} \delta^k x_k
  \]

Note.

(1) Actually, \( \delta := (1 + i)^{-1} = 1/(1 + i) \) in our case

(2) "present" is at time slot 0; \( x_0 \) is the amount of money which corresponds to either negative (investment) or positive (revenue)

(3) The formula is discounting \( x_1, x_2, \ldots \), i.e. all the future cash flow, into today.
(4) The summation is summing over all the future cash flow. In the above 2 formulas, it supposes that the cash flow happens forever. If a project only generate revenue for $n$ years, then the formulas will become

$$\text{NPV} := \sum_{k=0}^{n} (1 + i)^{-k} x_k = \sum_{k=0}^{n} \delta^k x_k$$

(5) Discount rate is an equivalent term of interest rate in some problems

Rate of Return (RoR)

**Definition?**

- The return on investment, or more commonly called the rate of return (RoR), is an inverse problem to computing the NPV.
- "What would the interest rate at the bank have to be in order for me to be neutral about investing in my project?"

**How to compute?**

- Formula

$$x_0 + \frac{1}{1+i} \cdot x_1 + \left( \frac{1}{1+i} \right)^2 \cdot x_2 = 0$$

- Meaning
  - $x_0$ is the amount money of your investment of the project, usually negative
  - $x_1, x_2, \ldots$ are the future revenues you’ll get from this project. $x_1$ is the revenue of 1st year from now, etc.
  - By setting the NPV of this kind of cash flow to 0, we will be neutral about investing since the NPV of the cash flow incurred by this project is 0.
  - Suppose the solution of RoR we computed is $i^*$.  
    1. If the interest in the bank, $i$, is great than the RoR, $i > i^*$, investing is not profitable since we could make more money by putting the money in bank;
    2. If $i < i^*$, investing in the project is preferable since the revenue generated by this project in the future is larger than the interest profit we might have by saving money in bank.
Quadratic formula

Usually, you will face a equation in the following form

\[ x_0 + (1 + i)^{-1}x_1 + (1 + i)^{-2}x_2 = 0 \]

To solve it, following steps below:

1. Let \( \delta = (1 + i)^{-1} \), and the equation becomes

\[ x_0 + \delta x_1 + \delta^2 x_2 = 0 \]

2. Using the quadratic formula

\[ \delta^* = \frac{-x_1 \pm \sqrt{x_1^2 - 4x_0x_2}}{2x_2} \]

(General form of quadratic equation/formula,

\[ ax^2 + bx + c = 0 \]

\[ x^* = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

3. Formula (\( \delta^* \)) will give you 2 roots of the quadratic equation. Drop the negative root (if any) since the discount factor we are computing here won’t be negative.

4. Remember back-substituting \( \delta^* \) into \( \delta = (1 + i)^{-1} \) and get the RoR as the REAL solution

\[ i^* = \frac{1}{\delta^*} - 1 \]

Note.

1. The goal of the RoR problem is to compute a \( i^* \) based the cash flow of a project given by the problem.

2. You should understand and follow the steps above to get the \( i^* \), the ROR of interest. Yet, the problem may also give you an interest rate offered by the bank, say \( i \) (or a minimum ROR requirement set by your boss as in homework).

3. Then you could compare this \( i^* \), the RoR, to the interest rate offered at the bank and see whether the project is lucrative.

   - If \( i^* = i \), then either saving the money in bank or invest it into the project will give you the same result (that’s exactly the meaning of ”being neutral of investing or not”);
   - If \( i^* < i \), then by saving money in the bank you could end up with more;
   - Otherwise (\( i^* > i \)), the project could give you more profit than saving your money in the bank.
2 IT History [Reader pp 1-25]

- What distinguished the Data Processing Era from the Micro-Era?
  - Data Processing Era (1960-1980)
    Mainframe, centralized data, hierarchical functional department structure
    PC on every desk, decentralized data, prevalence of PC

- What distinguished the Micro-Era from the Networking Era?
    Decentralized data, fragmented information systems, uncoordinated management of PCs
  - Network Era (1995-)
    Client/Server concept, Server hosted organizational data, no more fragmented

- Why did Data Processing Managers feel threatened in the Micro-Era?
  - Easier to manage one central mainframe than a huge amount of PCs
  - Data not centralized
    Replication of accounting/reporting functions Data inconsistency between different PCs
  - Security risks

Related stuff

- Data Processing Era (1960-1980)
  DP manager, annual/capital budgeting, benefits of DP Era for business

  Starting from 1981, IBM introduced PC

- Network Era (1995-)
  Fragmented IT organization, CIO
  Internet Phenomenon, new ways of doing business
  Information Resource Management

- [Messerschmitt]
  - Centralized : a few big mainframes to automate business functions (eg. payroll, accounting)
  - Time-shared : terminals added for accessing mainframe
  - Decentralized : PCs on every desk Networked : applications could be geographically distributed
  - Networked: applications could be geographically distributed
3 O’Brien Chapter 2

- Porter’s Competitive Forces [Reader pp42]
  Bargaining power of customers Bargaining power of suppliers Rivalry of competitors (intra-industrial competition) Threat of new entrants Threat of substitutes

- Why is Porter’s Competitive Model useful?
  A way to evaluate competitive environment, internal processes

- Porter’s Competitive Strategies [Reader pp43]
  – Primary: Cost Leadership Strategy, Differentiation Strategy
  – Supporting: Innovation Strategy, Growth Strategy, Alliance Strategy

- Other Competitive Strategies
  – Lock in customers and suppliers [Reader pp44]
    Building valuable new relationships with customers and suppliers
  – Switching Costs [Reader pp45]
    Investment in information system technology can make customers/suppliers dependent on those convenient/efficient systems thus switching to others may cost
  – Barriers to Entry [Reader pp45]
    Increasing the investment/complexity of the technology required to compete in certain industry or market

- Porter’s Value Chain [Reader pp46]
  – A way of classifying a company’s activities and evaluating how they help to deliver values to customers.
  – Views a firm as a series, chain, or network of basic activities that add value to its products and services therefore adding marginal value to the firm
  – Highlight where competitive strategies can be applied
  – Developing strategic use of IS for basic process that add the most value to products/services
  – Ultimate objective is value to customer.

- Business Functions
  A group of people w/ related specialized skills eg. design, sales, etc

- Business Process (also in Messerschmitt 3.3.1)
  A designed succession of actions to the accomplish of some result in a business eg. Order fulfillment
• Business Process Re-engineering (also called Business Transformation in Messerschmitt 3.3.1)[Reader pp52]
  A fundamental rethinking and redesign of business processes Compared w/ streamlining the business process which means minor improvements to business processes

• Agile company [Reader pp55]
  can make a profit in markets w/ broad product ranges, short model lifetimes can produce orders in arbitrary lot size, support mass customization

• Virtual company [Reader pp57]
  an organization that uses IT to link people, assets and ideas

• Intranets, Extranets [Reader pp57, Messerschmitt 4.5]

• Knowledge vs. Information (refer to [Messerschmitt 2.3, pp 39-41]

• Knowledge Management [Reader pp58-59]

4 Messerschmitt 3.1, Overview and exmaples

• Organizational Applications [Messerschmitt pp60-72]
  – Departmental Applications
    supports a single functional dept.
  – Enterprise Applications
    supports enterprise-wide processes and goals
  – Commerce Applications
    supports organizations engaging in commercial relationships w/ one another

• Customer Care or Customer Relationship Management (CRM) [see slides]

• Batch transaction processing [see slides]
  Transactions are accumulated over a period of time and processed periodically

• On-line Transaction Processing(OLTP) [Messerschmitt 72-73]
  Transactions are processed immediately

• Workflow [Messerschmitt 73-75]

• Human Resource Management (HRM) [see assignment #3]
5 Messerschmitt 3.3, Enterprise Applications

- Operations
- Business Transformation (Business Process Re-engineering, [O’Brien Ch2]) [Messerschmitt pp77-78]
- ERP (Enterprise Resource Planning) [Messerschmitt pp79-81]
- Decision Support [Messerschmitt pp81]
- Knowledge Management (also in [O’Brien Ch2])

6 Messerschmitt 3.4, Electronic Commerce

- Electronic Commerce [Messerschmitt pp83-89]
- 3 types of e-commerce [Messerschmitt, Table 3.4, pp84]
- 4 steps in a typical e-commerce transaction [Messerschmitt, Table 3.5, pp85]
  - Matching Buyers and Sellers
    Catalog, Advertising, Intermediary Recommendation
  - Negotiating Terms and Conditions
    Auction, Fixed Price, Price Discrimination
  - Consummation
    Order, Fulfillment, Payment
  - Customer Service
- Consumer Commerce (B2C)
  eg. Amazon
- Inter-consumer Commerce (C2C)
  eg. eBay
- Inter-enterprise Commerce (B2B) [Messerschmitt, pp92-95]
  - Procurement
    one enterprise purchases goods/services from another
    * Direct Procurement [Messerschmitt, Table 3.7, pp92]
      obtain raw materials/parts that are directly incorporated into products and service ongoing, consistent and scheduled procurement focusing on long-term supply relationship
    * Indirect Procurement [Messerschmitt, pp 95]
      sporadic purchase of goods and services to support organizational objectives
Midterm Review Notes, (Bob)

– Supply chain Management (SCM)
– Mass Customization
eg. Dell, integrating business logistics.
– Electronic Data Interchange (EDI)
  replace paper invoices and purchase orders, together with FEDI (Financial EDI) automated
existing inter-enterprise business processes.

• Customer Relationship Management (CRM)
  find users w/ similar interests/purchases/visits recommend products based on similarities between
customers

• Intermediaries
  the role of intermediaries in e-commerce, B2C/C2C/B2B

7 Messerschmitt 4, Information Technology

• Data vs. Information [Messerschmitt pp108-112]
  – Data
    BIT (BInary digiT): 0/1 Data: collection of bits
  – Information
    * text, numbers, as well as other media.
    * From application perspective, Information is defined from user’s perspective as patterns
      or meaning that influence the user in some recognizable way.
    * Within the context of Information Technology, Information is defined more narrowly, as
      ”structure and interpretation added to data”.

• Information represented as data
  – Information \(\rightarrow\) Data : Representation
  – Data \(\rightarrow\) Information : Data Processing
    Data processing is based on presumed structure and interpretation imposed on data, otherwise
the information could not be recover (at least correctly) from the data.

• Regeneration
  – Make a precise copy of the data (copy bit by bit). If the structure and interpretation (so-called
"Representation") is known, then the information is actually replicated as well along w/ the data
  – Several implications (see slides)
8 Messerschmitt 4.3, System Architecture

- System/Subsystem
  - System: a composition of subsystems that cooperate to accomplish some purpose
  - Subsystem: an element within the system that performs some well-defined action on behalf of that system

- System Architecture Elements [Messerschmitt pp115, Table 4.2]
  - Decomposition: partitioning the whole system
  - Functionality: specialized capabilities assigned to each subsystem
  - Interaction: subsystems cooperate together to support the system’s goal

- Why architect systems in this way?
  - Divide & conquer reduce complexity
  - Reuse components
  - In accordance w/ industry structure, etc.

- Emergence [Messerschmitt pp116]
  Higher-order behavior emerges because the subsystems are composed.

9 Messerschmitt 4.4, Networked Computing Infrastructure

- Infrastructure Software Layering [Messerschmitt pp120-121, Figure 4.7]

- What is the benefit of architecting software with layers?
  - Achieves additional capacity by incrementally adding to a specific layer without affect other layers.
  - The implementation of one layer is hidden from all other layers.
  - Both of the above simplify the initial design and implementation (Divide and Conquer) and further expansion.

- Operating System
  Hide equipment details from layers above

- Middleware
  - Sits between Application/Operating System.
– Isolating an application partitioned across hosts from differences among various operating systems of their host.
– Hide OS details from applications.

• File System
  – File
    * A collection of data managed for the benefit of the application
    * Size known, structure & interpretation is unspecified (which depends on the corresponding application)
  – A file system is part of every OS.
  – Provides standard services related to files, such as creating, accessing, etc.

• Database Management System
  – Database: a file containing interrelated data w/ specific predefined structure
  – DBMS: manage multiple databases, basis of OLTP

• Network Functions [Messerschmitt pp122]
  Allows hosts (computers connect to network) to communicate authorization/authentication; Message ↔ packets.

10 Messerschmitt 4.5, The Internet

• internet
  “Inter-connected networks”, a network of networks standard ways to interconnect networks

• Internet
  A specific internet the major global internet

• intranet private internet, for exclusive use within an enterprise

• extranet
  – Composed of intranets connected through an unprotected domain (typically the Internet)
  – Using encryption and other security technologies to protect confidentiality

11 Case Studies

Please read the case studies in the Reader and summarize answers for those question by yourself.
Frito-Lay Case

- What was the HHC?
  Hand Held Computer, for each salesperson to carry around, log sale transaction data

- *What are the benefits of the HHC project?*
  Improve accounting; Reduce paper work; Segmentation and Miro-marketing; Replace optical scanners (stopped support by IBM).

- What were the main reasons why Frito Lay deployed the HHC?

- What changes in marketing strategy did Frito-Lay believe the HHC data would help enable?
  Micro-marketing (manage small brands, negotiate shelf space)

- How might the HHC project change Frito-Lay’s competitive position with its direct competitors, new entrants, and its customers?

Cisco ERP

- What are some of the actions that Cisco took that contributed to the successful deployment of their ERP?
  Top personnel, cross-functional group; Consulting KPMG; Locate “hungry” vendors; Priority management policy; Rapid Iterative Prototyping.

- What mistakes did Cisco make?
  Poor testing strategy; Inadequate hardware (yet, they’ve got a favorable hardware contract); Substantial modifications later, more requirements than the vanilla version supported.

- What are the most important lessons that another company that wants to deploy ERP could learn from Cisco’s experience?

Alibris Case

- How did Alibris plan to change Interloc’s revenue model?
  Eliminate the listing fee of Interloc, yet, mark-up the price of the books.

- What were the potential benefits and risks of this change?

- How did Alibris plan to avoid becoming dis-intermediated?
  More quality control; *Order fulfillment facility.*

- Why did Alibris abandon Thunderstone software, and why did it choose to switch Oracle?

- What made Alibris’ IT challenge particularly difficult compared to what other E-commerce companies faced?