Week 4

Financial Statement Analysis and Discounted Cash Flow Valuation

Lecture outline

- Annual report
- Financial statement analysis
- Time value of money
- Discounted cash flow valuation

Learning outcomes

- Gain a basic understanding of a firm's annual report

- Be able to perform financial statement analysis and use financial statement information

- Understand time value of money

- Be able to evaluate a project/investment based on discounted cash flow evaluation

Documents and Events

	Quarterly Disclosure		Other Documents & Events	

Year	Shareholder Meeting	Investor Events	Product Reveals	Other Events
2023	Annual Report & Webcast	2023 Investor Day 2023 Investor Day Presentation		
2022	Annual Report & Webcast		Tesla Semi Delivery Event	3-1 stock split Filing for 3-for-1 Stock Split AI Day 2
2021	Annual Report & Webcast		Tesla Model S Plaid Delivery Event	Tesla AI Day
2020	Annual Report & Webcast	Tesla Battery Day		5-1 stock split Filing for 5-for-1 Stock Split
2019	Annual Report & Webcast	Tesla Autonomy Investor Day	35K Model 3 Solar Roof	Maxwell Technologies, Inc. Transaction

Source: tesla.com

An annual report contains

- The statement of financial positions (balance sheet)
- The income statement
- The statement of cash flows

Balance sheet (1)

Current assets (e.g., cash, stock inventory)

Current liabilities (e.g., short-term debts)

Non-current assets:
- Tangible non-current assets (e.g., land, buildings, plants)
- Intangible non-current assets (e.g., trademarks, patents, copyrights)

Non-current liabilities (e.g., long-term debts)

Equity

Balance sheet (2)

- 3 important considerations:
  - Liquidity
  - Debt vs. equity
  - Value vs. cost

Income statement (1)

Summarizes performance over a specific period

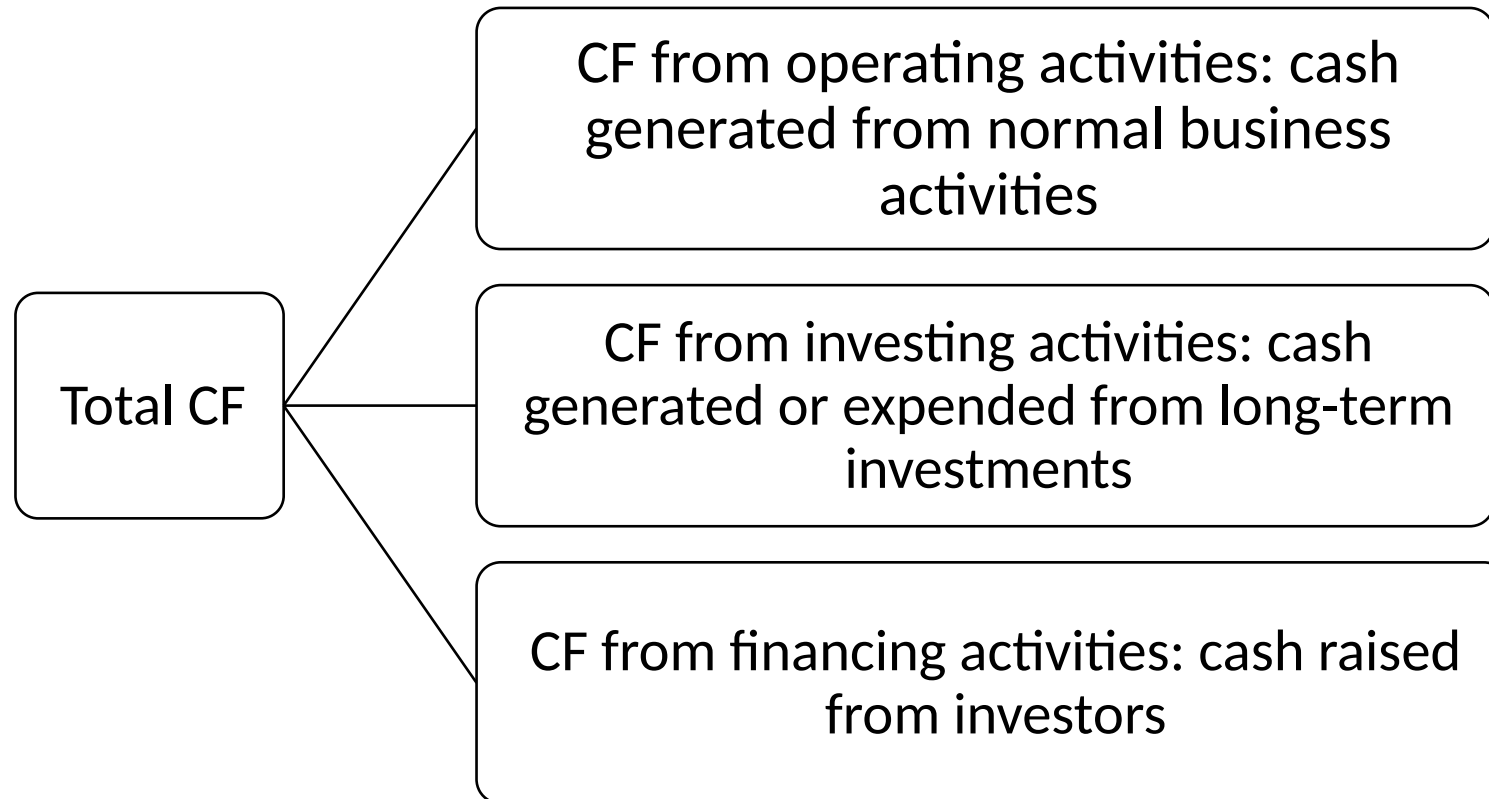Revenue - Expenses $\equiv$ Income

Income statement (2)

- 3 important considerations:
  - Non-cash items: expenses charged against revenues that do not directly affect cash flow (e.g., depreciation)
  - Time
  - Costs

Statement of cash flows (1)

CF from assets	CF from creditors
	CF from shareholders

Total CF

CF from operating activities: cash generated from normal business activities

CF from investing activities: cash generated or expended from long-term investments

CF from financing activities: cash raised from investors

Statement of cash flows (2)

- 3 important considerations:
  - Operating cash flows
  - Cash flow is NOT the same as profit
  - Free cash flow: cash flow available after all taxes have been paid and after all positive <u>net present value</u> projects have been financed

Financial statement analysis

- Ratio analysis
- The Du Pont Identity
- Choose a Benchmark

Short-term solvency ratios (liquidity ratios)

- Determine the firm's ability to pay its bills over the short run without undue stress

Long-term solvency ratios (financial leverage ratios)

- Determine the firm's long-term ability to meet its obligations, or, more generally, its financial leverage

Turnover ratios (asset management ratios)

Profitability ratios

Market value ratios

Du Pont identity

$$ROE = \frac{Net\ income}{Sales} \times \frac{Sales}{Assets} \times \frac{Assets}{Total\ equity} = ROA \times \frac{Assets}{Total\ equity}$$

After calculations: Choose a benchmark

Time Trend Analysis

- Look at the same ratio over years

Peer Group Analysis

- Compare ratio with similar firms
- Companies in same industry

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Everything we have discussed so far is directly related to cash flows (in/out). In the next part, we will discuss how to determine the value today of a cash flow expected in the future.

Time value of money: A "simple" concept

£100 received on your birthday this year ≠ £100 you will receive on your birthday next year

Notations

FV	Future value
PV	Present value
r	Interest rate or discount rate
t	Number of periods

Time value of money: The single-period case

Example 1

- You are offered the following opportunity:
    - Today, you will pay £400,000 for an artwork.
    - In 1 year from now, I will buy back the said artwork at the price £480,000
- The bank interest rate is 25%. Will you accept my offer?

Example 2

- Suppose you deposit £100 for 1 year at an interest rate of 10%.
- How much will it amount to in 1 year?

- How much will it amount to if you leave it in the account for another year, assuming the interest rate stays the same?

- This process of leaving your money and any accumulated interest in an investment for more than one period, and thereby reinvesting the interest, is called **compounding**

- **Compounding** the interest means earning interest on interest

- **Compound interest** = interest earned on both the initial principal and the interest reinvested from prior periods

- Simple interest = interest earned only on the original principal

Time value of money: The multi-period case

Example 3 (1)

Suppose we had an investment that was going to pay £1,000 at the end of every year for the next 5 years. Interest rate is 6%. What is the PV of these cash flows?

- PV calculated by discounting each cash flow separately:

Example 3 (2)

PV calculated by discounting back one period at a time:

NPV of multiple cash flows: The Algebraic formula

Compounding periods

Sometimes interest is charged more frequently than once per year

Semi-Annually (2 times a year)	Quarterly (4 times a year)	Monthly (12 times a year)	Weekly (52 times a year	Daily (365 times a year)	Continuous

Compounding more than once a year over many years

where

- C_0 is the initial investment
- r is the **stated annual interest rate** (the annual interest rate without consideration of compounding) – also called quoted interest rate, nominal interest rate
- m is the number of times the investment is compounded in a year
- t is the number of years

Example 4

Mr. Bean is investing £5,000 at a stated annual interest rate of 12% per year, compounded quarterly, for five years. What is his wealth at the end of five years?

Continuous compounding

$$FV = C_0 \times e^{rt}$$

Simplifications

Perpetuity

- A constant stream of cash flows that never ends

Growing Perpetuity

- A stream of cash flows that grow at a constant rate infinitely

Annuity

- A constant stream of cash flows that last for a fixed number of periods

Growing Annuity

- A stream of cash flows that grow at a constant rate for a fixed number of periods

Perpetuity and Growing Perpetuity

- Perpetuity

- Growing perpetuity

where *g* is the growth rate (assume g<r)

Annuity

Growing Annuity

Assume g<r

Quiz 1

Mrs. Brown has just won a competition paying £50,000 a year for 20 years. She is to receive her first payment a year from now. The competition organizers advertises this as the Million Pound Competition because £1,000,000 = £50,000 $\times$ 20. If the interest rate is 8%, what is the true value of the prize?

Quiz 2

Mr. Bean has just been offered a job at £80,000 a year. He anticipates his salary increasing by 9% a year until his retirement in 40 years. Given an interest rate of 20%, what is the present value of his lifetime salary?

Quiz 3

Solve for the unknown interest rate in each of the following cases

Present Value	Years	Interest Rate	Future Value
$ 242	4		$ 307
410	8		896
51,700	16		162,181
18,750	27		483,500

Quiz 4

Solve for the unknown number of years in each of the following cases

Present Value	Years	Interest Rate	Future Value
$ 625		9%	$ 1,284
810		11	4,341
18,400		17	402,662
21,500		8	173,439

Quiz 5

Compute the future value of $1,900 continuously compounded for

a. 7 years at a stated annual interest rate of 12%

b. 5 years at a stated annual interest rate of 10%

c. 12 years at a stated annual interest rate of 5%

d. 10 years at a stated annual interest rate of 7%

Quiz 6

Conoly Co. has identified an investment project with the following cash flows. If the discount rate is 10%, what is the present value of these cash flows?

Year	Cash flow ($)
1	960
2	840
3	935
4	1,350