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Discounted Cash Flow Analysis

Essential Elements of the DCF (An introduction to the DCF)

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DCF and Ratio Analysis

- My interest: a passion!
- DCF and Ratio Analysis are **models employed by investors** in the final stages of prospect investment appraisal to accommodate **changes in economic variables over time**
- Useful for analysing performance and options during ownership: eg.
  - Capital budgeting - annual (more regular) updates of projections
  - Loan calculations on financing alternatives - repayment amounts under various options (decrease principal repay.) capital recovery etc.
  - Investment funds - sinking fund management
  - Cost of capital - ROE (return on equity) v. ROI ([Expected] return on investment) etc.
  - Working capital management
  - Growth rate analysis

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Cash Flow Models

An introduction to Property DCF

- Discounted cash flow techniques have been around for decades
- Initially, they got a bad reputation
  - Generally a result of uninformed usage of the techniques - rather than because of shortcomings in the techniques themselves
- There is still a belief that the cash flow approach is much more complicated than the direct capitalisation approach
  - but this is also incorrect

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International Valuation Standards (IVS)

IVS 105 Valuation Approaches and Methods

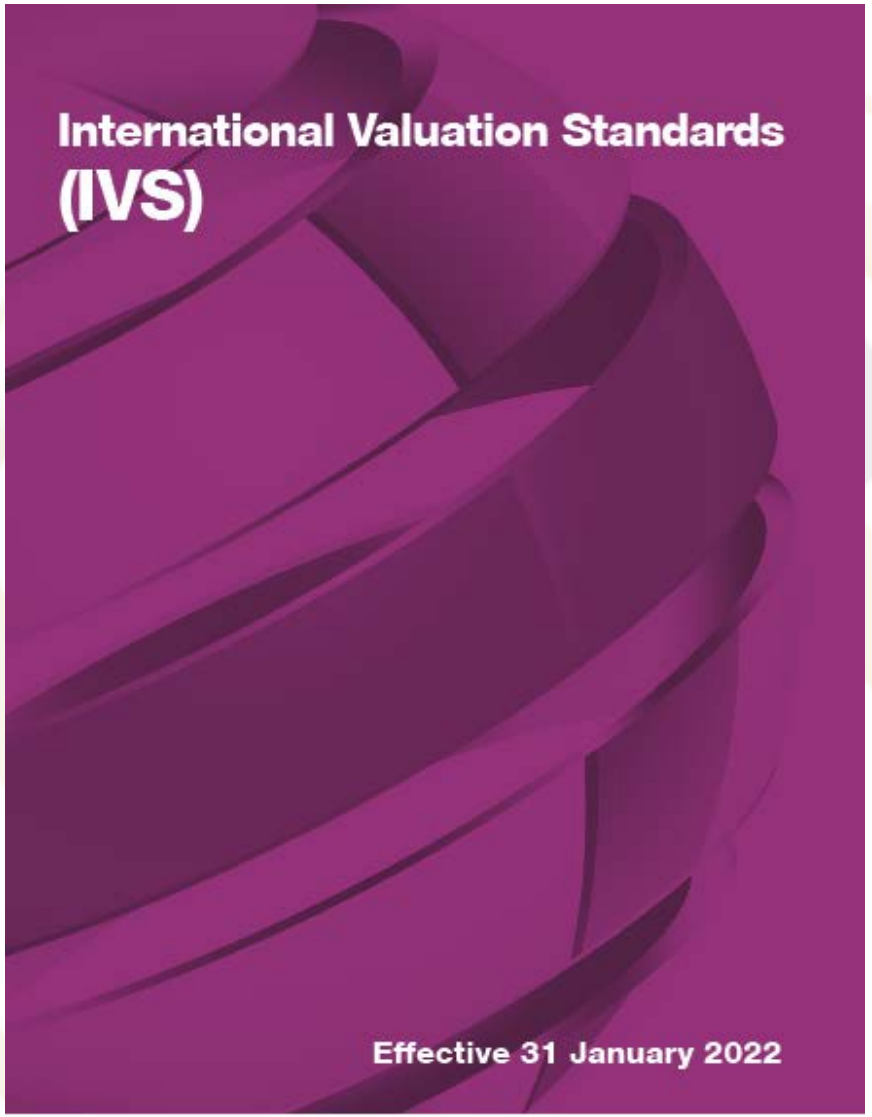
10.1 The principal valuation approaches are:

a) market approach

b) income approach

c) cost approach

- The income approach provides an indication of value **by converting future cash flow to a single current value**
- Methods under the income approach are effectively based on **discounting future amounts of cash flow to present value**
- These methods are all variations of the **Discounted Cash Flow (DCF) method** and DCF concepts apply in part or in full to all income approach methods.



International Valuation Standards Council

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DCF involves two fundamental calculations:

1. Forecasting (expected **NOI**) over a defined time period (investment **holding period**)
2. Calculating the **present value of this income stream** via discounting

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Time value of money

- **It's all about the time value of money** - how to analyse and compare amounts of money received or paid over several years
- Real estate investment analysis is a process of validating key assumptions such as those about income, expenses, financing, and resale
- The first step is to equate money received in the future with money today.
- BUT… as the old **GIGO principle** teaches, if you put garbage in your investment model, you get garbage out!

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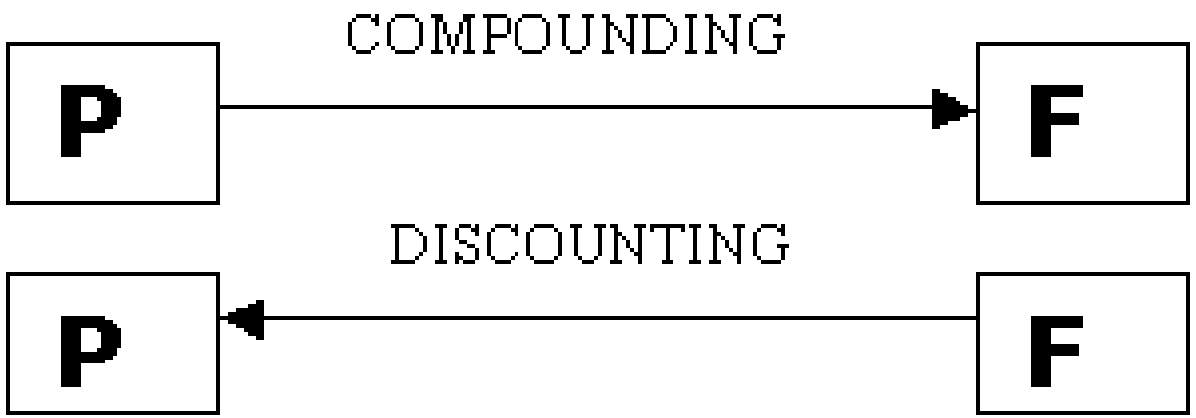
Time Value Concepts



It is simply a matter of terminology because we use the same variable "i" for the interest rate whether we are moving forward or backward in time.

DCF formulae

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots \frac{CF_n}{(1+r)^n}$$

$$DPV = \sum_{t=0}^{N} \left(\frac{FV_t}{(1+r)^t} \right)$$

$$FV = DCF \times (1+r)^n$$

$$DPV = \int_0^T FV(t) e^{-\gamma t dt} = \int_0^T \frac{FV(t)}{(1+r)t} dt,$$

- The conversion formulae may look frightening
- but the good news is that you do not need to remember the formulae, or even use them, because the calculator or computer will do that for you.
- What is important is that you understand what the formula is doing and that you can select the correct inputs into the formula.
- It is crucial that you do not get a mental blockage over the mathematics!

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Key steps in the DCF method

1. Choose the most **appropriate type of cash flow for the nature** of the subject asset and the assignment (i.e., pre-tax or post-tax, total cash flows or cash flows to equity, real or nominal, etc)
2. Determine the **most appropriate explicit period**, if any, over which the cash flow will be forecast
3. Prepare **cash flow forecasts** for that period
4. Determine whether **a terminal value is appropriate** for the subject asset at the **end of the explicit forecast period** (if any) and then determine the appropriate terminal value for the nature of the asset
5. Determine the appropriate **discount rate**, and
6. **Apply the discount rate to the forecasted future cash flow**, including the terminal value, if any

International Valuation Standards: General Standards – IVS 105 Valuation Approaches and Methods, 50.4.

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DCF inputs are often difficult to determine:

1. The discount rate
2. Rental & expense escalation or decline rates
3. Cap rate upon sale
4. Holding period + discounting intervals

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A solid DCF model?

- Changing the variables
- Cap rate of the net income
- Mortgage interest rate %
- Discount rate %
- LTV ratio %
- The “going out” (terminal) cap rate %
- Income streams $$$
- Vacancy factor %
- Income escalation factor (% or $)
- Outgoings / maintenance $

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DCF and Risk Assessment

- 2 levels of feasibility and risk analysis are typically considered:
  1. Basic Financial Feasibility Model (BFFM) – a ratio analysis
  2. DCF (most likely outcome)
- But there is a third level, sometimes ignored:
  3. **sensitivity analysis**
- Sensitivity analysis tests for the **impact of uncertainties** on likely investment performance.

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Three variable performance models is usual

Using Sensitivity analysis in risk assessment

1. **Most Probable** - the most-likely scenario
2. **Pessimistic** – worst-case scenario
3. **Optimistic** – best-possible outcome

- Additional analysis can also be undertaken:
    1. IRR Partitioning & Risk Absorption Analysis
    2. Risk Simulation

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Further Technical Information on DCF's

- **International Valuation Standards (IVS)**
  - Technical Information Paper - Discounted Cash Flow
  - Covers off definitions, when to use the method, forecasting, etc. and reporting
  - gives illustrative examples
- **Publications**
  - Bodie, Z., Kane, A., & Marcus, A. J. (2021). Investments (12th ed.). McGraw-Hill Irwin.
  - Brooks, C., & Tsolacos, S. (2010). Real Estate Modelling and Forecasting. Cambridge.
  - Brown, G. R., & Matysiak, G. A. (2002). Real Estate Investment - A Capital Market Approach. Prentice Hall.
  - McDonald, J. F., & McMillen, D. P. (2011). Urban Economics and Real Estate - Theory and Policy (Second ed.). Wiley.
  - Miles, E., Berens, G., & Weiss, M. A. (2007). Real Estate Development - Principles and Process (Fourth Edition ed.). Urban Land Institute.
  - Reed, R. G. (Ed.). (2007). The Valuation of Real Estate (The Australian Edition of the Appraisal of Real Estate 12th Edition ed.). Australian Property Institute.
  - Shapiro, E., Mackmin, D., & Sams, G. (2019). Modern Methods of Valuation (12th ed.). Routledge.

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Employing the DCF

Delivering the DCF

1. “In-house” corporate DCF model
   - Certain variables may be fixed by the organisation
2. Proprietary DCF modelling software
   - Examples include Argus Estate Master
3. Site unique DCF models
   - Typically, Excel spreadsheets with embedded macros
   - Useful for specialised properties

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Finish

Introduction to the DCF