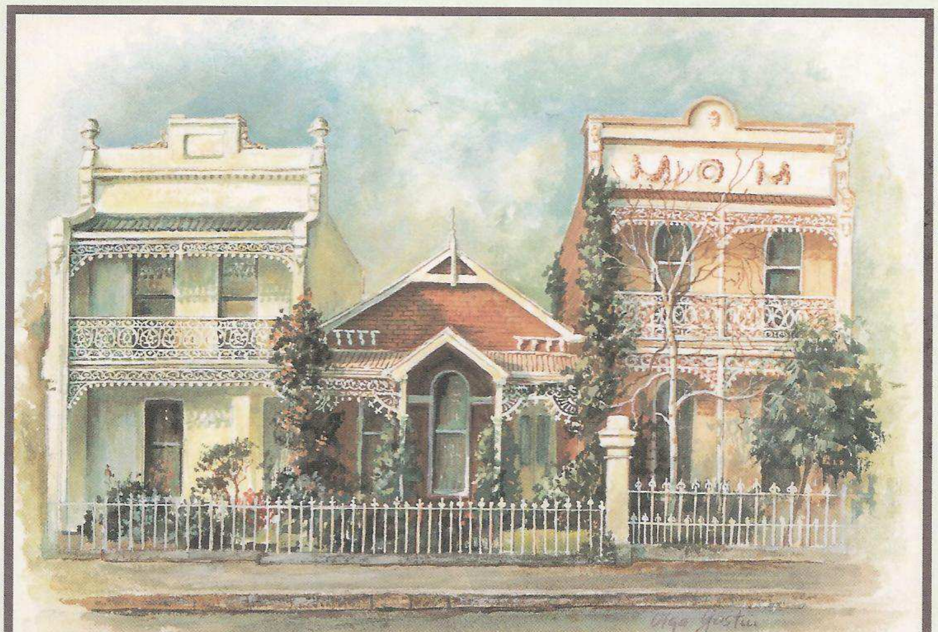
DOMINIQUE FISCHER

PROPERTY VALUATION

METHODOLOGY



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This text is a translation and Australian adaptation of a Canadian textbook: 'Evaluation Immobilière', by Dominique Achour-Fischer (1992)

Cover illustration 'Traditional Australian Houses - Series 1'

The small house wedged between two Victorian terraces makes a unique grouping. These houses were built in a concentrated twenty year period between 1870 and 1890.

Taken from original watercolours by Australian artist Olga Gostin.

The artist production can be found at www.allegria.com.au

This book was written, illustrated and produced with FrameMaker document publishing software. Some illustrations were treated in Adobe Illustrator and Photoshop. The book is set in Adobe Garamond.

Printed in Perth by Success Print.

In this text feminine and masculine pronouns are used randomly.
No gender bias is implied.

Contents

Targeting, sequencing and web site linking

1. This book is a textbook to be included in a sequenced program

This book is written for university undergraduate students with a professional interest in property valuation (real estate appraisal). It can also be used by property valuers as a reference text or a refresher.

Although there is no single path to study property valuation, this book assumes an implicit sequence: you start with the basic tenets (the three legs), move to a methodological assemblage (this book), and finish with applications, illustrations and refinements.

Thus, this text should be preceded by the typical 'three legs' courses:

— 'Real estate market analysis' where students become familiar with property markets, their segmentation and their quantitative/qualitative analysis. This corpus is required to deal with the 'market comparison approach' presented here in Chapter II.

— 'Construction and building costs' where students learn about the physical nature, construction procedures and costing of property assets. This unit is a natural prerequisite to the 'cost approach' presented here in Chapter III.

— 'Income property investment analysis' where students learn financial maths, financial analysis, property taxation and financing, performance analysis and the treatment of operating and financing risk. This material is covered in a previous textbook (Fischer, D 2000, *Income property analysis and valuation)*. The corpus of such a course is required to fully understand the 'income approach' presented here in Chapters IV and V.

Then the book could be followed by more specific valuation applications (business, statutory, rural, equipment and machinery, special properties, etc.) and buttressed by adequate courses in the various ancillary disciplines (economics, law, finance, urban planning, etc.).

2. This book is not a book, but 'half-a-book'

This printed version is the first 'half' of the textbook. It should be — more or less — permanent and thus, it does not try to keep up with market events, research trends or bibliographical references.

The other 'live half' of this book (the web component) will be updated continuously. It includes the required Excel tools and tutorials, presentation slides for lecturers, data bases, updated and complete bibliographical references, case studies and contributions from valuation practitioners. This companion web site will be referred to as the **PVM-Web** (for Property Valuation Methodology Web site).

The textbook relies on the assumption — unfortunately confirmed by experience — that undergraduate students do not read referenced material. Thus, the book is essentially self-contained and references (except for a limited set of citations) are compiled in a searchable bibliographical file in the PVM web site (in Endnote and HTML formats). This file will be regularly updated.

3. A one semester textbook to be used with the support of computer labs sessions

The book is designed to be covered in a single semester (approximately thirty-six contact hours as defined in Australian tertiary institutions). Accordingly, the PowerPoint presentations to be found in the PVM companion web site are structured in twelve lectures and tutorial or workshop sessions.

The tutorial sessions rely heavily on the 'learning-by-computing' approach. Consequently, the contact hours could be equally divided into lectures and computer lab sessions. Instructors and readers could work — in parallel — with the textbook and the Excel workbooks linked to each chapter. The Excel workbooks are not simple illustrations of the text's examples: they are templates to be used by students to practice all the required Excel functionalities and to rebuild all the computations. Some of the workbooks present additional techniques that may not be fully covered in the text. The Excel workbooks will be constantly upgraded and additional examples or new approaches will be added.

4. Brick valuation

The textbook's content is limited to basic methodologies applicable to micro-level valuations. Micro-level valuations — the domain of property valuers' professional activities — deal with 'brick properties' transacted on traditional property markets. The book does not cover the valuation of property portfolios nor does it deal with various 'paperised' forms of properties (syndicates, property trusts, securitised assets, obligations on collaterised assets and other various forms of 'off-balance sheet' property transactions). The pricing of paper properties has a strong influence on the pricing of brick properties but the required concepts and methodologies go beyond the level of this introductory textbook.

5. Stories and feedback

The book does not rely on realistic local stories. Instructors should illustrate the text with their own local cases in order to put some meat on the decidedly bare methodological skeleton.

Since this textbook is a pedagogical tool — comments and suggestions from my academic and professional colleagues would be very much appreciated.

6. Semantic and typographical options

This book is written mostly for Australian and South East Asian readers despite a vocabulary and set of concepts influenced by the dominant US-sphere[1] literature and the International Valuation Standards.

The US-sphere terms of 'Real Estate appraiser, appraisal and appraising' will be used synonymously with the UK-sphere terms of 'Property valuer, valuation and valuing'.[2]

Whilst the technical vocabulary may be somewhat US-biased, the spelling choices and typographical norms are based on Australian standards.[3] Less importantly, the position of dollars sign and number notation are based on European practices — just to keep some spice in the international linguistic pea soup.

Finally, since this book is a translation of my previous Canadian manual, the general style and tone of this text are irremediably French. Sorry!

7. Thanks, thanks, thanks ...

— Linda Browning

— Joelle Chan

— Carole Chan Hui Ling

— Dr John Hall

— Francine Payette

— Dr Graham Seal

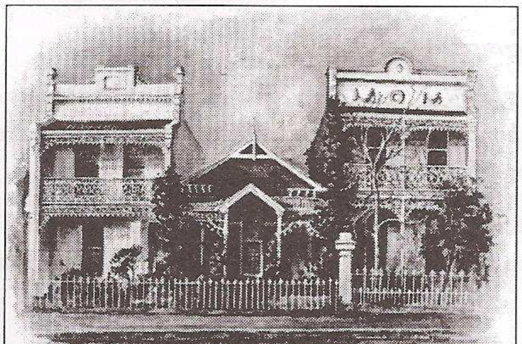
— Justin Travlos

They sure know why!

1. The Appraisal/Valuation world can be reduced to a US-sphere of influence that includes the US, Canada, South America, Japan and most of the countries that are not part of the UK-sphere of influence (UK, Australia, New Zealand, Singapore, Hong Kong, Malaysia, and a few others ...). The US-sphere is influenced by the Appraisal Institute, whereas the UK-sphere is controlled by the Royal Institution of Chartered Surveyors. This textbook opts generally — but not unconditionally — for standards defined in the **International Valuation Standards 2001 (IVS 2001)**. These standards are presented and discussed in the PVM-Web site.

2. Interestingly, the Malaysian legislation applies to a profession defined as 'Real estate valuers and appraisers'.

3. Spelling is based on *The Macquarie Dictionary* and typographical conventions are based on the Australian *Style manual* (John Wiley & Sons Australia, 6th edition, 2002).



PROPERTY VALUATION

METHODOLOGY

The PVM–Web site contains:

1. Twelve PowerPoint presentations of lectures and computer labs. Each session offers a 'Menu du Jour', a suggested detailed presentation outline, links to the relevant documents, references and Excel workbooks;
2. Bibliographical references in searchable EndNote and HTML formats. The selection of articles is based on the 'Five years back-tracking' principle: references are limited to the most recent five years and previous publications can normally be back-tracked from references quoted in listed articles.

A provisional description of the Excel workbooks and PowerPoint tutorials is presented on the following page.

Access to the PVM-Web is obtained

from the author at:

fischerd@bigfoot.com

PVM-Web site Excel workbooks content	
Excel Lego blocks	Writing dates, transforming text dates, CHOOSE, CONCATENATE, LOOKUPS, combining IF, ISNUMBER and LOOKUPs, etc. *This workbook is complemented by a PowerPoint presentation of the more important Financial Functions, Date functions, Logical functions and Text functions.*
Chapter II The market approach	General Sorting and Filtering procedures Detailed treatment of Armadale Filtering for Twins and Cousins Adjustments for financing conditions Adjustments for other variables (age, size, characteristics, etc.) Complete regression examples Other grid adjustment methods Full VGO data base (Western Australia)
Chapter III The cost approach	Depreciation models Computing land values coefficients Samuelson-McKean land valuation Simple development analysis Basic Yoyo development treatment More advanced development analysis Dynamic development analysis
Chapter IV The net income approach	Simple discounting Discounting growing NOI (the wrong way) Discounting growing NOI (OK) Treatment of variable NOI
Chapter V The discounted cash-flow approach	Detailed treatment of the Quintus Building Simple WACC Equivalent valuations (B of I, Akerson, Ellwood and Inwood) Calculate 'small y' Napkin valuation Myers's APV, Arditti-Levy WACC and traditional treatment
Appendix II Review of financial mathematics	The six functions of 1$ Calculation of effective rates Perpetuities General annuities Australian Mortgage Platypus NPV and IRR + *PowerPoint tutorials for financial calculators and for financial math*
Appendix V Residual techniques	The 3 depreciation models Land residual Building residual Property residual Weighted capitalisation rate including growth factors
Appendix VI Legal split	Single rate leased fee valuation Dual rate leased fee valuation Dual rate with above market rent Leasehold valuation Sub leasing

Introduction

Where the nature and nurture of property valuation are defined and where the theoretical forebears are introduced.

1. What?

Property valuation (real estate appraisal) is a professional practice that entails the determination of prices of real estate assets. This professional practice is based on various other disciplines that provide its theoretical and instrumental background.

Property valuation's traditional sources of theories, methodologies and instruments are:

— Economics:

Micro-economic analysis is the most direct forebear of appraisal since it explains price formation and diffusion. Micro-economic and macro-economic concepts and instruments are also used extensively in order to understand the very specific nature of real estate assets. The more general background to real estate appraisal is provided by land economics or, more precisely, by urban and regional economics.

— Law:

Property valuation relies on a legal framework that validates, facilitates and constrains the whole chain of real estate activities from land transactions, building construction, property transactions, leasing, taxation, disposition and financing. This legal framework and set of legal remedies are the fundamental rules of the property 'game' and are the pre-conditions of the establishment of property prices.

— Hard stuff:

The various disciplines of construction, architecture, design and town planning that provide the technical references required to describe and value property assets.

Many real estate appraisal textbooks or professional references attempt to cover all these fields. The scope of the present textbook is more limited, based on the premise that the coverage of all the pre-requisite and ancillary disciplinary fields would be too superficial to be of any use.

This text may occasionally allude to, but will not explore, the new disciplines that are slowly but surely opening new ways into the property world. Some of these disciplines have already permeated some strata of the profession and have led to important practical developments (e.g. geographic information systems); others are still far from taking off, but will eventually transform the way appraisers appraise (non-parametric treatments, auction theory, price diffusion in incomplete markets and asymmetrical information, pricing of derivatives, real options, multi-criteria algorithms, etc.).

These avenues will not be explored here since this slim textbook is limited to:

— The presentation of the traditional valuation paradigm;

— The description of current methods used by professional valuers;

— The suggestion of a more satisfactory theoretical framework and of methods that could solve some of the difficulties raised by the usage of various approaches.

As mentioned previously, this text is limited to the valuation of 'brick properties' (single asset valuation). The valuation of 'paperised' properties will be briefly illustrated in Chapter VI to emphasise the importance of linking property markets and capital markets.

2. Who?

Property experts represent a wide variety of professional actors whose function is to formulate, justify and transmit opinions on prices of real estate assets. This type of expertise is required from:

— Real estate appraisers (in the US-sphere) or property valuers (in the UK-sphere);

— Real estate agents and brokers;

— Financial analysts of real estate-based investment funds or portfolios;

— Mortgage lenders and property finance professionals;

— Accountants and insurers;

— Law professionals;

— Promoters and investors.

3. How?

By starting from the beginning …

Since property expertise is based on a fairly detailed set of procedures and definitions, the basic tools and jargon need to be mastered before progressing further. Later, the reader will be able to play with a variety of methods and techniques that should facilitate her understanding of valuation activities, and at least to understand the intent, content and limitations — yes, mostly limitations — of appraisal reports.

Those of you with investigative minds may want to devote some time to the appendices relegated at the end of the volume. These parts are certainly fascinating but can be overlooked by general readers without any loss of continuity. However — fair warning — these obscure parts are the author's favourite source of exam questions.

Chapter I

Principles and concepts of property valuation

Where the valuation paradigm is put together. Where we discover three approaches, thirteen 'principles' and a logical process that should lead to the determination of property prices. This neat construct may appear to be quite robust, but in Chapter VI we will appreciate its fragility.

1. Elements of the valuation paradigm

Valuation concepts and instruments are usually presented as a coherent construct based on a set of definitions and procedures. This construct is widely accepted by practising valuers and instructors — though with important national variations — and thus can be described as the valuation paradigm. This paradigm has now been 'globalised' and formulated in the International Valuation Standards.

The construct is made up of the following components:

1. A definition of market value;
2. Three approaches that may lead to this market value;
3. Thirteen (more or less) 'fundamental principles'[1];
4. A logical process that marshals all of these elements (value, approaches, techniques and principles) in order to reach an estimated value for a specific real estate asset.

The full construct is presented in Figure I.1.

2. Definitions of market value

The most widely quoted (US-sphere) definition of market value is:

> *The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after*

1. Note 1, 3, 13! Numerologists may be intrigued by the fact that we also have 3 types of depreciation, 3 ways to estimate value (Hoskold, Babcock, Inwood), 3 ways to adjust the overall capitalisation rate, and quite a few more recurrent trilogies.

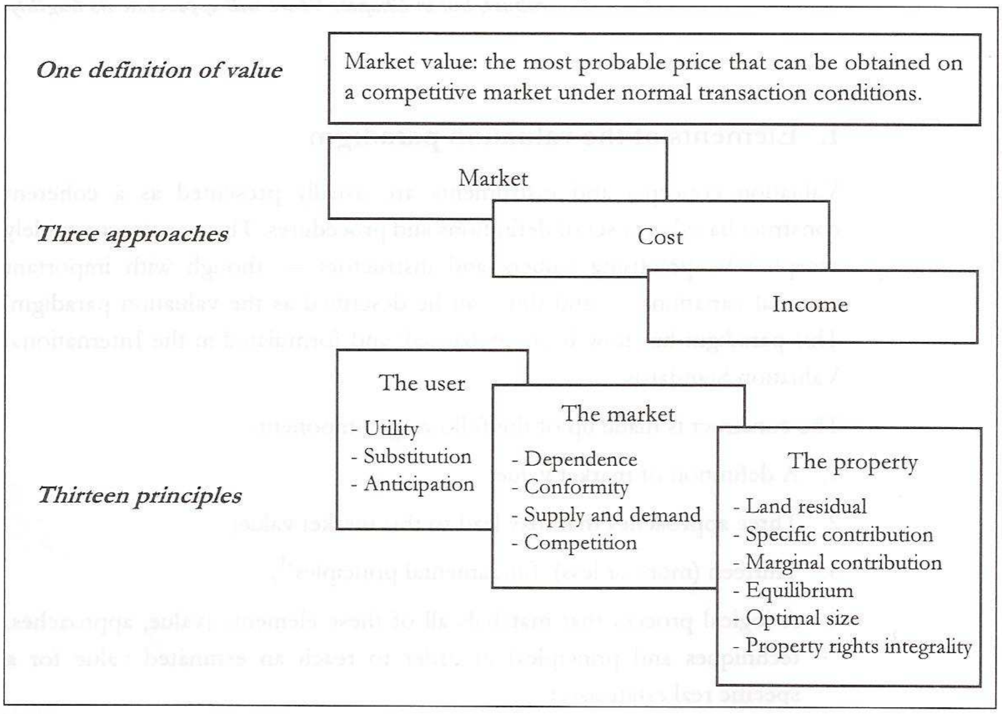
> *reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress.*
>
> Appraisal Institute 2000, *The appraisal of real estate.*

The accepted Australian definition of market value reads:

> *The estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion.*
>
> Australian Property Institute 2002, *Professional practice,* p. 26.

The Australian definition is a straight replication of the one adopted by International Valuation Standards. As you can see, this definition is not only more elegantly written but I will also argue later — in Chapter VI — that it has the further advantage of raising fewer thorny theoretical issues.

Figure I.1 The valuation paradigm



In summary:

— Value is defined as a 'probable price' (in the US-sphere) or an 'estimated amount' in the International Valuation Standards;

— The probable price or estimated amount are determined on a competitive market;

— The price is the result of a transaction between 'consenting adults';

— The transaction participants are equally and reasonably informed about the property's specific conditions and about the prevalent market conditions.

Value you say?

I can teach a complete course in economics without once mentioning the word value, said **Vilfredo Pareto** (a famous 19th century economist).

Values defined in the International Valuation Standard:

1. Market value
2. Insurable value
3. Book value
4. Investment value
5. Forced sale value
6. Assessed, rateable, taxable value
7. Special value
8. Liquidation value
9. Market value for the existing use
10. Reinstatement value
11. Potential value for the potential use
12. Net restricted value
13. Auction realisable value
14. Salvage value
15. Value to a special purchaser
16. Going concern value
17. Deprival value

Lusht (1997) recognises 5 definitions: Market value, Investment value, Use-value, Assessed value, Insurable value. Rings (1970) offers 30 definitions and, to top them all, McMichael (1944) had 50 definitions. I will argue in Chapter VI that we need only ONE definition of value.

3. Three property valuation approaches

A property value should be determined through the simultaneous application of three independent approaches.[1] These three approaches are simply introduced here and will be covered extensively in the following chapters.

The holy trinity!

• The market comparison approach that determines a property's probable price by comparing it with similar recently transacted properties. The various names for this approach are: market comparison, sales comparison, market adjustments, comparable sales, parity, etc.

• The cost approach that determines a property's probable price on the basis of the depreciated cost of production factors that have been used in the property's development and construction.

1. Methods, techniques or approaches are the more commonly used expressions. Their respective dictionary definitions mean 'how to do something …'. Even though a hierarchy between the various terms is not absolute, 'method' is considered more general than 'technique' and more convincing than 'approach'. Unfortunately the term 'approach' has been retained in the International Valuation Standards thus — reluctantly — I will use it here.

• The income approach that determines a property's probable price as the discounted value of expected flows of income.

Under competitive conditions and market equilibrium, the three approaches should lead to the same estimated probable price.

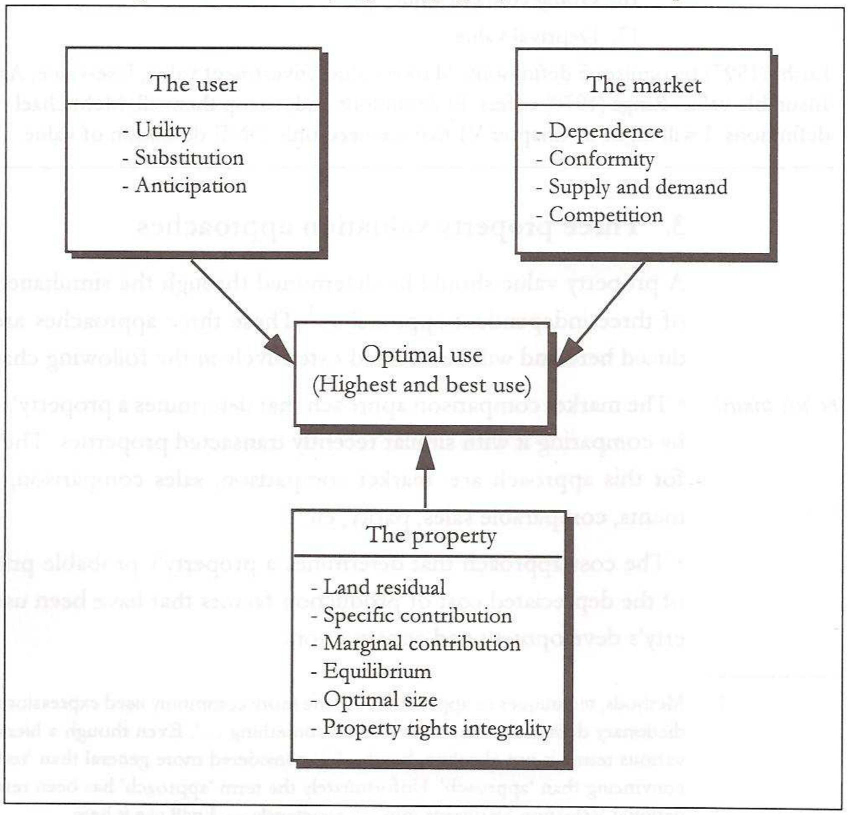
> ***How many approaches in the UK-sphere?***
>
> UK books and professional standards seem to recognise 5 valuation approaches:
>
> 1. The comparison approach
> 2. The income approach
> 3. The cost approach
> 4. The profit approach (used for business valuation)
> 5. The residual approach (used for development analysis)

4. Thirteen valuation 'principles'

The dirty dozen +1

Traditional appraisal textbooks seem to put great faith in the ritual enumeration of fundamental principles that are supposed to explain the whole story of property price formation. These 'principles' are presented in Figure I.2.

Figure I.2 Criteria to judge if a property transaction is 'optimal'



These principles may be useful if they are interpreted simply as criteria that could help decide whether a property is used optimally and if market conditions are sensibly close to competitive and equilibrium conditions. In fact I suggest that the term 'criteria' is much more appropriate than the ambitious term 'principles'.

One set of criteria is related to the property usage, another set bears on the property itself and, finally, a set is related to the appreciation of market conditions.

Highest and best use

The formal definition of highest and best use is:

> *The most probable use of a property which is physically possible, appropriately justified, legally permissible, financially feasible, and which results in the highest value of the property being valued.*
>
> API 2002, *Professional practice*, p. 26 and IVS 2001, p. 37.

This definition is not entirely satisfactory. It defines Highest and Best Use (HBU) in a probabilistic frame (most probable use) that is not in line with the API definition of value (see above) and that does not imply 'optimality' in the sense that most probable use may not be the most profitable one. Finally, the HBU cannot be defined as optimal if it does not take into account all private and public benefits.

In fact the whole issue is highly debatable … and debated. However, relax and enjoy the reassurance of the suggested definition.

4.1 User-related criteria

- **Utility criterion**

This criterion ensures that the property owner has or will have some effective or potential use of her property assets. This basic criterion is required in order to justify the expression of a demand for this asset and thus the determination of an exchange price. The utility derived from a property can be limited to tangible residential goods and services, or from the expectation of a flow of income, or even from the satisfaction of intangible property traits such as 'pride of ownership' or aesthetic satisfaction.

The utility derived from a property asset must be evaluated at a specific period and under specific local conditions. Property values are highly time and space dependent. Neighbourhoods can turn from slummy to posh, and from posh to grotty in a relatively short turnaround of urban conditions. More dramatically, whole towns and even cities can turn into ghost towns in surprisingly short periods. In fact, in the long range, the approximately 10 000 years long history of property values has been a litany of emergence and disappearance. The myth of property price perenniality is a favourite tenet of the property industry, but historically it is nothing but a myth.

- **Substitution criterion**

This criterion ensures that the rational user will not pay more for a subject[1] property than for an identical and substitutable property. The market price of such a 'twin' property should thus be taken as a maximum benchmark for the subject property. This criterion is the basis of the 'cost approach' of valuation since a rational investor will not pay more for a property than he would have to pay to build a new one.

- **Anticipation criterion**

You buy the future, never the past ...

According to this criterion, the value of any property is based on its future usage or future flow of income. The past usage, as glorious as it might have been, has no weight in the determination of a property value.[2]

This does not imply that the appraiser should be a 'price predictor', certainly not! It simply implies that under normal market conditions prices observed on property markets reflect the anticipations of market participants. This delicate and very important issue requires a much closer examination, to be tackled later.

4.2 Property-related criteria

- **Land residual contribution criterion**

Among production factors incorporated in a property asset (labour, land and capital) only land is immobile and thus its prices are fully determined by local market conditions. Since other factors are priced elsewhere (regionally, nationally or internationally), only land prices can take up the difference between the cost of other factors (labour and capital) and the full price of a property. That is why land values can be treated as residual values. The word residual in this sense implies that the value of land is the value that remains after remuneration of the other factors. This conception is coherent with the classical theory of land rent and is the basis of the so-called residual techniques (see Appendix V).

This criterion may help in the determination of lot values. Let us illustrate this point: it would be irrational to value an empty lot at 100000$ when residential properties erected in the same neighbourhood on identical land lots are selling for 200000$ and when, further, we know that full construction costs amount to 150000$. In this example, the justifiable residual value attributed to the land is more likely to be 50000$.

1. A semantic twist has imposed the expression 'subject property' to describe the **object** of the appraiser's analysis. The term 'object property' would be more logical, but here again, right or wrong, I'll stick to the jargon.

2. The glorious past of a property may turn into market value if this past is used to generate a flow of income from future visitors (castles, historical sites, museums, Madonna's beach house, etc.).

Beyond the obvious, this criterion should also remind you that land, in itself, has no intrinsic market value. Land has value only if, residually, it gains value through other usage (construction, agriculture or any other utility deriving activity).

- **Specific contribution criterion**

This criterion ensures that we take into account only the marginal contributions of each property's assets components. To value a property, you cannot add up the cost of each component, you must assess the whole package of components.

For example, the addition of a carport costing 15000$ to build will not add 15000$ to a house value. In fact if the carport design is shoddy it may even contribute to a decreased house value (a negative specific contribution).

The application of this criterion explains why and how to adjust price components in the implementation of the cost and market comparison approaches.

- **Decreasing marginal contribution criterion**

This criterion, related to the previous one, ensures that unit values of property components are not treated in a linear fashion. Translation: a 500 m^2 house is not worth twice a 250 m^2 house, or adding a fifth bathroom will not increase the value proportionally. Obvious ... but so often forgotten!

- **Component equilibrium criterion**

Here again, in the same vein, this criterion is used to verify that property components are in conformity with current practices and norms. The fifth bathroom described above contributes very little value to a two bedroom house, and similarly a 25 m swimming pool will contribute even less to the value of a 250 m^2 land lot. A tiny grotty house sitting on a huge Peppermint Grove[1] lot would be another illustration of a patent disequilibrium (and thus non optimal value).

- **Optimal size criterion**

This criterion is an application of the previous one. It means size, or more exactly relative size, matters. In the previous case the swimming pool was too long and the grotty house was too small.

Obviously, again, what is too long and too small has very different meanings in different markets. The qualification 'too small', 'too large' or 'too many' is a purely local judgement and will have very different meanings — and thus price effects — in Joondalup, Johannesburg or Jakarta.

1. It may useful to inform the non Perthians, that Peppermint Grove is a Perth neighbourhood where most of us would love to live, but can't.

- **Integrality of property rights criterion**

Property rights can be restricted (by covenants or zoning regulations, for example), can be variously split (with mortgagees or lessees), or can simply be shared (e.g. in a strata titled property). These various restrictions and subdivisions of property rights affect the value of the property package (also called the bundle of property rights). Thus, in any valuation exercise the appraiser must verify the level of integrality of the subject property's bundle of rights.

An important application of this criterion will lead — in Chapter V — to the detailed study of the discounted cash flow model wherein income flows are allocated between three 'partners' in the ownership of the bundle of rights: the equity owner, the lender and the taxation office.

4.3 Market-related criteria

- **Dependency criterion**

From this criterion the appraiser may want to verify whether external factors have been taken into account when estimating the market value of a property. These external factors (economic externalities) include location and accessibility. But they also include the whole bag of local elements that explain the value of urban assets, such as the distance to polluting activities, the proximity to public services, the provision of municipal services, the neighbourhood social composition, the local planning and building controls, etc.

This interdependence between the immediate environment and property values is one of the most significant — and interesting — idiosyncrasies of this special class of assets. It is also its main 'market failure' and the reason why we cannot, with a straight face, assume that we are really dealing with a by-the-book, pure-and-perfect competitive market.

- **Conformity criterion**

This criterion is also related to the previous one. It should be used to check if a given property fits in the neighbourhood picture.

A luxurious residence located in an industrial waste-land is probably not 'in conformity' and its value will be reduced accordingly. Conversely, our grotty shack in the heart of Peppermint Grove may get a serious price boost from its lack of conformity.

- **Supply and demand criterion**

This almost obvious criterion should be used to verify that properties are transacted in an effective market: that is, a market where there is a sufficient effective demand and effective supply to explain that transactions do take place. Price is the simple empirical result of a transaction: no transaction, no price; and, consequently, no price, no market valuation.

- **Competition criterion**

This last criterion comes as the last leg of the construct: it requires that assets are transacted in a reasonably competitive market. In such a market observed past prices may be an acceptable proxy for present prices. Conversely, in a non-competitive market prices revealed through transactions may not be used as an appropriate proxy of values. For example, a space supplier monopoly (e.g. a local developer controls all the new residential developments) or a rental monopsony (for example, the federal government is the only lessee in a particular state capital) will distort the formation of prices to such an extent that these prices cannot — without adjustments — be trusted to be a good indicator of market values.

How useful are these criteria?

You can now conclude that this impressive list of so-called principles is simply a set of criteria that help you determine:

— If transactions take place on a reasonably competitive market and;

— If the observed transactions are applied to 'normal properties' (i.e. properties that are approximately in the regular range of design, equipment and locational characteristics).

Under such conditions, property prices may reflect the 'highest and best use' (HBU) that would maximise consumers' satisfaction or investors' net returns.

Reduced to this summary, you recognise the habitual guiding criteria that should be used to define the level of optimality of transactions and markets. One may wonder why real estate appraisal manuals needed to develop such an exotic list of additional so-called principles.

Well, mostly because property assets are not widgets and lollipops; in other words, they are not ordinary economic goods. These criteria are thus useful to re-affirm this difference and to make sure that the valuation process takes into account the truly idiosyncratic nature of property assets, property users and property markets.

However, if these criteria define the necessary conditions to decide on the 'normality' of a transaction, they are far from being sufficient for defining a truly competitive transaction environment. A truly competitive property transaction environment also requires the existence of: competitive financial institutions, an adequate legal framework that ensures security of transaction and future tenure, an adequate set of legal remedies that will deal with market infractions, and a sufficient level of confidence in the probity and competence of various public officials at all levels of the decision chain.

Taken for granted (more or less) in developed countries, these conditions are far from being met in emerging economies. In such countries, the basic hypotheses supporting the establishment of property values simply do not apply.

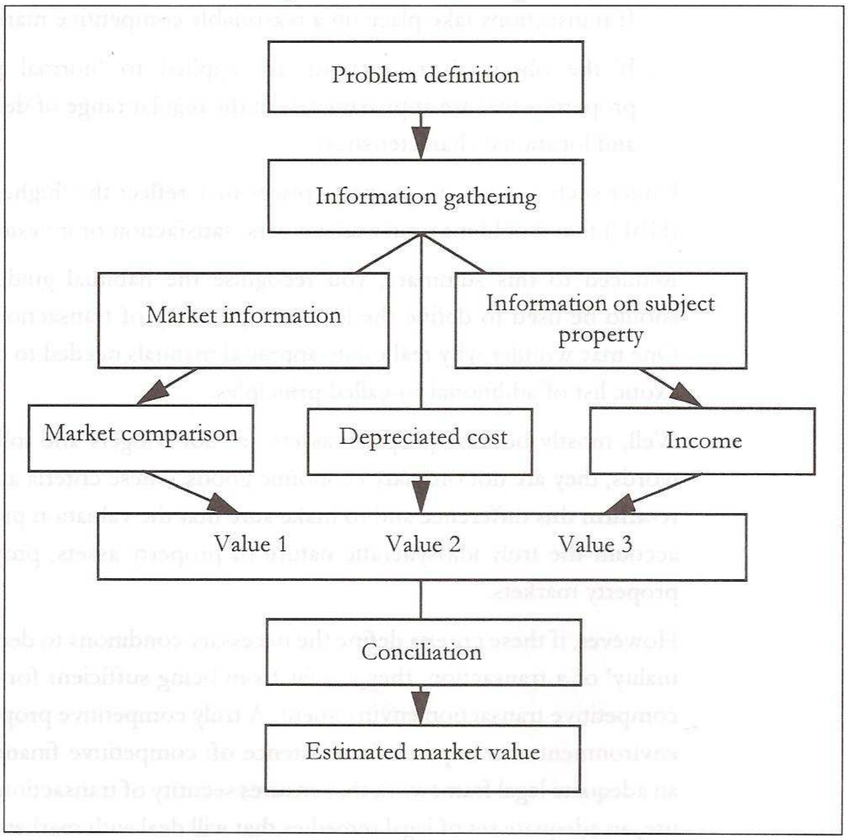
Thus, in the absence of the whole market apparatus, our thirteen criteria may be necessary conditions to the 'reading' of property markets; they are certainly not sufficient conditions to ensure that observed prices are a true proxy of 'market values'.

It is suggested, as a practical conclusion, to use the thirteen criteria as a checklist to include and briefly comment on in a valuation report. The systematic ticking off of each criterion is a good way to make sure that the valuer has considered each and every important characteristic of the property and its market. When several of the criteria are not met, then the whole valuation exercise is seriously compromised and there is limited reliability in the value estimates.

5. The valuation process

The process follows the logical steps described in Figure I.3.

Figure I.3 The valuation process



- **Problem definition**

Defining the valuation problem involves a full physical and legal description of the subject property, and clarification of the objectives of the valuation (insurance, transaction, taxation, financial planning, etc.). At this point the appraiser must also specify the date for which the valuation is established and the period for which the price estimate may be valid. The reference date for a valuation can be the present date (to support a transaction, for example), or in the past (for taxation purposes, for instance).

- **Information collection**

Detailed information on the property and on its market should be the starting point of any valuation exercise. This collection of information can be detailed when dealing with a complex income producing property, or conversely it may be quite simplified if the object is a standard property transacted in a very active market (say, a typical residential unit).

- **Using three independent approaches**

The derivation of a probable price is then obtained by the independent application of the three approaches (market, cost and income). More emphasis will be put on a particular approach, depending on the nature of the subject property. Obviously, on the one hand, the valuation of an income producing property will emphasise the importance given to the income approach. On the other hand, the valuation of a standard residential property may rely entirely on market comparison and eventually on the cost approach for brand new residential developments. I will argue in Chapter VI that, in reality, we should be dealing with one approach, not three. More about this divergence later.

- **Conciliation**

Since results obtained by the three approaches will not be exactly the same (if they were the same, one may want to question the valuer's probity) a certain compromise must be accepted:

> *We now have three value estimates resulting from the use of the three approaches. How shall these be rendered into one estimate? This is accomplished in step 6, in which the results of the three approaches are correlated each to the other. Each opinion is weighed in the light of the accuracy, importance, and relevancy of the data on which it is based, and these final opinions are compared and balanced.*
>
> May 1953, p. 28.

A good way to illustrate and appreciate the details of the valuation process is to analyse the recommended structure of the valuation report presented in Appendix VII.

6. Conclusion

The advantage of a paradigm is that it represents a consensus. A paradigm is known, recognised, validated by practices and courts, and taught through the educational circuits. However, the consensual nature of a paradigm is no guarantee of its exactitude and, as we shall see, this paradigm is highly contestable and is frequently subject to academic criticism.

This textbook will describe the paradigm as it stands now. This is the stuff that property valuers are made of: that is, what they have learned and, presumably, still practice.

However, in Chapter VI, I will suggest another paradigm that may facilitate the diffusion of your valuation expertise.

> Probably the greatest problem of the appraisal discipline is that it has not proposed a general theory of property values or urban land structure. By its very nature, appraisal is an *ad hoc* decision tool. In the hierarchy of academic order, *ad hoc* models are on the lower rungs of the prestige ladder.
>
> But ... a lack of prestige does not exclude a high level of utility. In fact the *ad hoc* nature in which appraisal is used is a direct result of the structure of real estate markets, the heterogeneity of real estate products, and the related problems.
>
> Terry V. Grissom and Hal C. Smith (1990).

Chapter II

The market comparison approach

Where, as often, we observe that the most important approaches are the simplest and most intuitive ones. In fact, they are the only reliable ones.

1. Setting the stage

Scenario 1: the 'twin' trick

> If my neighbour's house, perfectly identical to mine, was sold for 179000$ yesterday, my house should be worth around the same price.

This is the best and ideal application of the 'market approach'. Simple and cheap, this approach makes lots of sense and does not raise major theoretical issues. It simply confirms that comparable properties should command identical prices.

Essentially, this is how kilos of potatoes are sold on the local market and how shares are priced on the share market. A kilo of identical potatoes, transacted now, is priced as any other kilo sold at the same time. One share, transacted now, is priced as any other share transacted at the same time. One identical house transacted now …

One observed property transaction is sufficient to infer the probable value of a 'twin' property transaction. It cannot get any simpler … so simple in fact that one would hardly ever need the professional services of a superbly trained professional appraiser.

Fortunately, things are never that simple.

Scenario 2: the 'sibling' trick

> My neighbour's house, perfectly identical to mine, was sold for 179000$ yesterday. However his house has a carport, while mine does not. Thus my house should be valued a bit less. How much less?

In this case we need to adjust for a different trait (the carport) in order to bring both properties to the same level of comparison. When not dealing with twins — but mere siblings — the pricing requires some adjustments.

Scenario 3: cousins

> My neighbour's house (the one with a carport) was sold for 179 000$ one year ago. According to the real estate agent, neighbourhood prices have been growing rapidly during that one-year period. Thus, my house should be worth a bit less because of the absence of a carport, and a bit more because of the one year during which prices have risen.

Now things are getting a bit more interesting: you need to adjust (down) for the absence of a carport and also adjust (up) to take into account one year of price inflation.

Scenario 4: more distant cousins

> My neighbour's house (the one with a carport) was sold for 179 000$ one year ago. According to the real estate agent, neighbourhood prices have been growing rapidly during that one-year period. Then (from my nosy butcher) I also learn that my neighbour has facilitated his transaction by granting a favourable vendor's mortgage to his buyer.

Now you must adjust for the carport, for the passage of time (1 year), and for the favourable vendor's mortgage … not so much fun anymore!

These simplistic tales are sufficient to describe the nature of the 'market comparison approach' and to illustrate that the required adjustments may raise quite a few interesting difficulties. Let us now describe the general approach in more detail.

2. Principle

In a 'normal' market, goods that provide identical flows of services (or identical flows of income) have the same market value. An informed purchaser would not accept to pay more for a good than the price he would have to pay for an identical good. This was described above as the 'substitution criterion'.

Arbitrage

The price of a property cannot be higher or lower than the price paid for an identical available property. If the asking price were higher, then the potential buyer would purchase a 'twin' at a better price. If the price were lower, a purchaser could snap it up and sell it immediately at market price. This is an illustration of price arbitrage that is practised by 'arbitrageurs' on the stock market.

In practice, this arbitrage may take several steps before the proper market price is reached. Thus, the market, adjusting from one transaction to another, behaves as a rational filter: the 'off-the-range' transactions are filtered out. Sellers and buyers confront their respective expectations and their eventual errors of appreciation are rapidly corrected by other similar transactions.

With frequent and continuous arbitrage, a specific property will sell — thus should be valued — as any 'twin' property sold recently.

Steps and conditions required for the direct 'sales comparison' approach
— Identification of the subject property characteristics;
— Identification and clear understanding of the transaction conditions;
— Identification of the immediate relevant sub-market;
— Identification of all recent transactions that occurred in this relevant sub-market;
— Selection of the best sample of comparable properties;
— Adjusting prices of observed transactions to take into account the subject property characteristics;
— Weighting of the required adjustments.

3. Finding twins, siblings and cousins

• Where?

— In public data bases maintained by taxing authorities. In Western Australia the most exhaustive source would be the office of the Valuer General (Department of Land Administration);

— In private data bases maintained by private firms (These private firms collect their data from public data bases but they may package and partially treat the required information.);

— In property valuers' offices;

— From real estate brokers and inter-listing services;

— And yes, of course, from the neighbours and the nosy butcher!

Newspaper ads and real estate agents' galleries of 'for sale' properties cannot be trusted since they announce asking prices. The gap between the seller's expected price and the effective transaction price can be substantial. You do not care about sellers' estimation of values; you want to establish effective transaction prices in order to estimate probable market values.

• How many transactions should be collected?

Here we need to resort to the favourite economists' answer to most tricky question: 'it depends'.

It depends indeed on the specificity of the subject property and the homogeneity of the relevant sub-market. In fact a single transaction on a perfect twin should suffice and we will see in Chapter VI that fairly small samples are perfectly OK for most simple transactions.

In practice, valuers are usually happy to find and analyse ten or fewer comparable properties. However, the choice of deciding on the optimal size of the sample is now less agonising since the search for comparable properties entails the sorting and filtering of electronic data bases. The search effort is minimal and the analyst should include as many comparables as possible that are financially reasonable.

3.1 What are the relevant characteristics?

The most significant keys to use in search filters are:

— Localisation;

— Transaction date;

— Physical characteristics;

— Transaction conditions.

• *Localisation*

Same space

Ideally, comparable properties should be in the same location. Obviously no two properties can be located on the exact same spot[1] and thus we always need to approximate the locational comparability. At best, we can try to find properties that are influenced by the same locational factors such as:

— The street: ideally same side or same portion of the street;

— The orientation and the view;

— The suburb;

— The proximity to the suburb's specific facilities and amenities;

— The accessibility to major routes and nodes;

— The zoning constraints applicable to the specific area.

Broader locational criteria should also be quite useful in specific contexts. For instance, in Perth some other significant market divides are 'North or south of the river', 'Within sea breeze reach or not', 'Distance from the beach,' and all the various local idiosyncrasies.

This local illustration shows that ways to stratify markets — thus the way property prices are formed — are strongly influenced by strictly local conditions.

For income producing properties the same criteria would apply. However, other characteristics would need to be considered:

— Prestige level (Class A, B, C or worse[2]);

— Building name or banner;

1. Even multi-storey apartments located on the same site would exhibit price differences based on orientation and 'altitude' (the higher, the more expensive).

2. The Property Council of Australia ranks office buildings as: Premium, Grade A, Grade B, Grade C and Grade D. The ranking is based on building size and floorplate area, on appearance and on the nature of services provided.

— Parking conditions;

— Name of principal tenants;

— Name or nature of the management unit;

— Etc.

• *Transaction date*

Same time

In a dynamic market transactions may show considerable variations within short periods of time. Real baby twins are born simultaneously and 'twin' transactions should be as close as possible. In practice, the search for twins or cousins should not be extended beyond a single year. If the time span is greater, the analyst will have to perform some time adjustment: never such a simple matter.

But here, as with all the other criteria, the analyst must deal with what comes up. As I said previously, real twins are rarely available and 'creative fudging' is a necessary part of the game when transactions are rare or heterogeneous. One thing should always be kept in the appraiser's mind: 'poor data is much better than no data at all'.

• *Physical characteristics*

The most obvious physical characteristics of residential properties are the lot size, the house size and livable area, the number of rooms and their nature, the date of construction, the nature of roofing, and the presence of other components (garage, carport, swimming pool, granny flat, reticulation, water bore, etc.). Some of these variables are available in public data bases but some are not and may require further direct investigations.

For income producing properties, the physical characteristics to consider are quite different and may again include size, number of storeys, type of external coverage, lift system, IQ level[1], security systems, earthquake protection, etc. (This last 'etc.' is a typical author cop-out, since the list of relevant physical characteristics can be quite extensive and the theory is still very vague about the importance of such characteristics.)

I will argue later that the physical characteristics of an income producing property are much less significant that their 'cash-flow' characteristics. In principle, rent levels should directly reflect all the physical and locational characteristics and thus should suffice to determine a market value.

1. The IQ level of a building is its level of 'intelligence' = the level of information connectivity and gadgetry.

• *Transaction conditions*

It may be useful to come back briefly to the definitions (US and Australian) of value suggested in Chapter I:

> *The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress.*
>
> Appraisal Institute 2000, *The appraisal of real estate.*
>
> *The estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion.*
>
> Australian Property Institute 2002, *Professional practice,* p. 26.

Thus, both definitions require that the observed transactions must be 'normal' in the sense that they should take place between 'arm's length' actors (no wife, parents, business partners, linked firm, etc.) in an open market, and between symmetrically informed participants who are not acting under inordinate circumstances.

Fine ... but unfortunately this information is not available from the transaction data bases and is not easy to track for most common transactions. However, a valuer must apply her strong investigative zeal to try to find out the full transaction story when she has any doubt about the legitimacy of the reported transaction prices. Easier to write than to do ... granted.

Same deal

Financing consideration may also substantially alter the representativeness of observed transaction prices. For example, a vendor's mortgage at concessionary rates is likely to result in a higher transaction price.

We will see shortly how to adjust for such financing conditions. Once again, when the valuer has appropriate information on 'off the chart' financing conditions, he can proceed with the adjustments, or simply drop the transaction out of the sample.

3.2 How to adjust?

The most intuitive and commonly used procedure is the matched pairs process. The idea is simply to turn all comparables into quasi-twins — or at least as twin as possible — by comparing two properties and modifying (up or down) the price of a comparable property to bring it to the level of the subject property for each characteristic that may differ.

For example, if the comparable has two bathrooms and the subject has only one, you must reduce the price of the comparable by the appropriate amount. And not the other way around ... it may be worth insisting, since this is a fairly common mistake.

• Dollar or % adjustments?

— Adjusting in dollars requires a specific pricing for the adjusted trait. This adjustment thus is an absolute adjustment.

Story:
From your analysis you conclude that each extra square metre of residential construction is worth 500$ for a particular neighbourhood. Thus for a subject property of 200 m^2 and a comparable of 220 m^2, the observed transaction price of the comparable should be reduced by 10000$.

More formally we could write this simplistic example:

$$V_s = b X_s$$

The value of the comparable property V_c is only determined by its size X_c.

$$V_c = b X_c$$

The dollar adjustment is thus the difference between the two value determinants (here the house size) weighted by the marginal contribution of each unit of comparison (here 500$/m^2).

$$V_s - V_c = b (X_s - X_c)$$

The market value would thus be:

$$V_s = V_c + b (X_s - X_c)$$

$$V_s = 110000\$ + 500\$ (200 m^2 - 220 m^2)$$

$$V_s = 110000\$ - 10000\$$$

$$V_s = 100000\$$$

This absolute adjustment implies that the influence of a given characteristics is linear. A doubling of the surface implies a doubling of the price. But this is not generally the case since most traits have a decreasing marginal effect on prices.

Thus, in practice, the valuer should limit these adjustments to fairly small variations around the subject property characteristics.

— Adjusting in relative terms (in %) implies a proportional price effect of characteristics.

Story:

The subject property is a 3-bedroom residence. Market analysis reveals that an additional bedroom may increase market value by 15%. Our best comparable (same street, same side, same view and same adjoining fence) has only 2 bedrooms and sold yesterday for 100000$.

Solution:

$$V_c = 100000\$$$

$$V_s = ?$$

$$V_s = V_c + 0.15 \times 100000\$$$

$$= 100000\$ + 15000\$$$

More generally:

$$V_s = V_c + p \times (X_s - X) \times V_c$$

$$= V_c \times (1 + p\,(X_s - X_c))$$

If the comparable property had four bedrooms, the adjustment would have been positive.

We now embellish slightly our previous story by adding two features: the comparable has a closed garage and is located on a regular street. The subject has no garage but is located on a quiet cul-de-sac.

	Market % adjustment	Amount
Comparable (reference) transaction price		100000$
+ Adjusting for an extra bedroom	15%	+ 15000$
Adjusted price		115000$
– Adjustment for the lack of garage	5%	– 5000$
Adjusted price		110000$
+ Adjustment for the cul-de-sac effect	10%	+ 10000$
Resulting adjusted price		120000$

— The order of adjustments

Since every adjustment of trait assumes that the traits are independent (not a very realistic assumption) the order of computation may not be important. It would imply that there is no relationship between the size of the lot and the size of the house, or between the number of bedrooms and the number of bathrooms. In econometric jargon, we would say that the variables are orthogonal. Obviously here again, this assumption can only hold if the variations are small around the subject characteristics.

A suggested order for the comparative adjustments

1 - Adjustments on the transaction

- Nature of the property rights transacted
- Additional elements in the transaction
- Financing advantages
- Adjustments for the time of sale

2 - Adjustments on the property

- Locational elements
- Physical characteristics
- Functional characteristics

As with the assumption of linearity, we could try to apply most realistic models (logarithmic functions, square functions, multiple variations) but this may not be appropriate for such simplified trait adjustment models.

These trait manipulations are more adequately performed through multiple regression treatments (see Appendix I); however, we should admit that most of the important relationships are not very well known. When in doubt — remember — keep it simple!

Let us now review the principal traits and how to adjust for them.

3.3 Localisation

Location differences are the most delicate traits to deal with. Since location covers so many inter-related characteristics, it is quite unrealistic to try to adjust for location. The safest approach it to avoid making such adjustments by pin-pointing comparables that are physically as close as possible to the subject property.

A simplistic example can be seen in the following table of observed prices for single-family units, all located in the same suburb and on two parallel streets. The only difference is due to the existence of mature trees and bushes of bougainvilleas on one street, compared to the sandy drabness of the other. You guess which is which.

Addresses	Sale prices	Average	Standard deviation
1223 Greeny street	158230$		
1567 Greeny street	147600$		
1845 Greeny street	162400$	156077$	6231$
456 Grotty street	108800$		
787 Grotty street	112500$		
890 Grotty street	97760$		
934 Grotty street	103340$	105600$	5577$

Thus the average price difference due to 'trees + bougainvilleas' seems to be 50477$. The valuation of a Grotty street property should thus be reduced by approximately 50000$ with a margin of variation of ± 5500$ around the adjusted values.

Other more sophisticated answers have been suggested. They may seem more convincing when incorporated in multiple regression analysis. However, increased complexity does not guarantee increased reliability since we have very few satisfactory models to quantify location price differences.

In practice, once again, the best way to avoid the problem is to limit the scope of comparison. It is better to have a very small sample of close comparables than a larger sample of spread-out comparative units.

When you cannot find neighbouring twins, and have to rely on distant cousins, keep the adjustment as simple as possible.

3.4 Time of sale

Through price indexation, property prices can be adjusted in order to reflect the evolution of market prices. Indexation is done by a percentage adjustment and can be based on various publicly published indices.

Ideally, you should rely on 'property related' indices published by the Australian Bureau of Statistics (housing price indexes, construction prices, etc.). For simple treatments, the use of a general price index is quite acceptable.

For example, a 1% monthly increase of the housing price index would justify an 8% matched pair adjustment from a property sold 8 months ago.

For documented chains of transaction on a specific property, the pattern of previous transactions can also be used to determine value for the last year of the series of sales. The quite unrealistic example below illustrates the suggested approach.

Transaction date	Sale price (in dollars)	Annual compounded rate
1985	145000	
1989	161000	5.37%
1995	205000	4.95%
1996	262000	5.03%
2000	288500	4.94%
2002	**318000**	**hypothetical**

Here, the 2002 price could be deducted by applying an annual growth rate of 5% to the last observed transaction.

$$\text{Price}_{2002} = \text{Price}_{2000} \times (F/P\ ,\ 5\%\ ,\ 2\ \text{years})$$

$$= 318000\$\ \text{(or more precisely, } 318071\$)$$

This solution can also be applied if you have a reasonably reliable list of historical transactions for the neighbourhood or suburb where the subject property is located.

An exponential regression could also be used in this case. In this example such a regression would have a coefficient of 1.05 and a constant of 138507$.

The 2002 price would thus be:

$$\text{Price}_{2002} = b \times m^{17\ \text{years}}$$

$$\text{Price}_{2002} = 138507\$ \times 1.05^{17}$$

$$\text{Price}_{2002} = 317461\$$$

Obviously, a linear regression would not work since the annual rates are a compound rate of growth and the 2002 price would be underestimated.[1] Of course, for monthly adjustments within a single year a linear approximation is quite good enough.

3.5 Adjusting property characteristics with the cost approach

Adjustments for physical characteristics of a property can rely on matched pair comparisons, as illustrated above, or frequently such adjustments rely on construction costs of measurable differences such as square metres, an additional bathroom, a swimming pool, a carport, etc.

You may remember our first little story of 'cousin' matching at the beginning of this chapter when two houses only differed by the presence of a carport. It would be tempting to say: 'Well, why not simply deduct the construction costs of a carport from the comparable property?'

Indeed construction costs could be a valid indication of the maximum contribution of a component to the full value of the property. However, as will be explained in the next chapter, the cost approach of adjustments suffers from the same general flaws that handicap the cost approach of valuation.

The fundamental weakness of the cost approach is that there may be no relationship between the construction costs of the additional component and its market value once the component is incorporated in the property value.

The archetypal swimming pool is probably the most often cited example. Building a 15000$ swimming pool does not guarantee that property value is increased by the same amount. In some cases the presence of such a swimming pool could even decrease the property value. Many similar examples abound in the stories told by real estate agents and this should convince a sceptical seller that, after all, the specially designed giant pink Jacuzzi in the middle of the recreation room might not be worth its cost!

For income producing properties, physical characteristics are only significant to value if these characteristics increase the income generated by the property. Here again the link between construction costs and income generation can be quite tenuous, but at least a profit-minded owner should make sure that his

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1. The linear fit would give a slope of 10199 and a constant of 130705$. The linear 2002 price would thus be: $P = 130705\$ + 10199 \times 17 = 304093\$$.

costs are not expended in vain. For example, the construction of an additional apartment should generate a corresponding additional flow of rental income.

3.6 Financing conditions

If a transaction involves a financing advantage to the purchaser, this advantage is likely to be reflected in a higher effective price (and conversely).

Value adjustments for such situations are based on the idea that financing advantages should be evaluated at their present value. Two examples will illustrate this treatment.

• ***Assumption of mortgage***

If a buyer takes on his seller's favourable mortgage by transferring the loan, the financial advantage should be reflected in a higher transaction price as illustrated below:

Information:

Observed transaction price	100000$
Loan transferred to the purchaser	80000$
Purchaser cash payment	20000$
Rate on transferred mortgage (i)	3%
Amortised for 25 years with a 3 years term	
Market mortgage conditions (i_m)	8%

Solution:

Under the transferred favourable mortgage (3%), the monthly payments are:

$$PMT = 80000\$ \ (A/P\ ,\ 0.25\ ,\ 300)$$

$$= 379.37\$ \text{ per month}$$

At the end of the term, the outstanding balance will be:

$$OSB_{36} = 73252.03\$$$

Under market conditions (8%), such a flow of payment would be worth:

$$P^* = PMT \times (P/A\ ,\ p_m\ ,\ 36) + OSB \times (P/F\ ,\ p_m\ ,\ 36)$$

$$P^* = 379.37\$ \times (P/A\ ,\ 0.67\ ,\ 36) + 73252.19\$ \times (P/F\ ,\ 0.67\ ,\ 36)$$

$$P^* = 69774.35\$$$

Thus the implicit premium granted by the vendor to the purchaser:

$$\text{Premium} = P - P^*$$

$$\text{Premium} = 80000\$ - 69774\$$$

$$\text{Premium} = 10226\$$$

The observed transaction should thus be adjusted downward by the amount of the premium:

Transaction price	100000$
Required adjustment	– 10226$
Cash equivalent value	89774$

• ***Vendor's mortgage***

The treatment of a vendor's mortgage is very similar. The favourable conditions granted by the vendor must be calculated and treated as a premium that may be partially or totally reflected in the effective transaction price.

Information:

Contractual transaction price	100000$
First mortgage obtained by the purchaser	60000$
Cash contribution from the purchaser	10000$
Additional mortgage granted by the vendor	30000$
Rate on the vendor's mortgage for 3 years and interest only	4%
Market conditions	7%

Solution:

As in the previous case we compute the present value, at market rates, of the flow of mortgage payments computed at a concessionary rate[1]:

$$\begin{aligned} PMT &= P \times p_m \\ &= 30000\$ \times 0.33\% \\ &= 100\$ \\ OSB_{36} &= 30000\$ \end{aligned}$$

The vendor will thus receive 36 monthly payments of 100$ and the outstanding balance of 30000$ after 3 years. The market value of such a flow of payments is the present value discounted at the market rate, thus:

$$\begin{aligned} P^* &= 30000\$ \times (p_m) \times (P/A, p_m, 36) + 30000\$ \times (P/F, p_m, 36) \\ &= 100\$ \times (P/A, 0.58, 36) + 30000\$ \times (P/F, 0.58, 36) \\ &= 27571\$ \end{aligned}$$

The apparent discount for the purchaser is thus P – P* = 2428.98 $. It would be tempting to conclude that the vendor only received a cash equivalent value of 100000$ – 2429$ = 97571$.

1. Interest only loans are computed on the undiminished balance of the loan. The outstanding balance is equal to the initial amount (here 30000$) since no payments have been made.

Tempting, but probably inexact since the academic literature is still debating this issue ... let them debate[1] and apply this adjustment approximation whenever you have the appropriate information — quite rarely in real life.

4. Computing value

Putting humpty dumpty together again. Once you have calculated one-by-one all the required adjustments, you simply need to put them together. The following example illustrates a simple calculation.[2]

You have to value a simple single-family house in Balga (your subject property) and have collected information on four comparables and on the general neighbourhood background.

Information:

- Prices have been growing at a monthly rate of 1.65% (linear) during the previous year. Thus since the sale of comparable n° 1 took place 7 months ago, the % of adjustment would be 11.55%. Applying this % to the base price of 138000$, the dollar adjustment for comparable n° 1 is 15939$. Similar treatments will apply to the other three recorded transactions;
- The approximate value of a bedroom seems to be 12000$ for this type of house in this area and a full bathroom would appear to be worth 8000$;
- Prices of small land lots with a 20 metres front seem to be little affected by the depth of the lot. Presumably the depths are fairly standard and thus you will not have to provide an adjustment for lot depth;
- You do not have more specific information concerning the effect of additional living space. Thus, this adjustment needs to be calculated from the comparisons between sales n° 2 and n° 3.

Solution:

In comparing sales n° 2 and n° 3, the only difference is in liveable areas. After taking care of the time of sale difference, the area difference of 30 m^2 leads to a price difference of 13563$.

Information:

Comparable n° 2	112600$ + 7432$	= 120032$
Comparable n° 3	110000$ + 23595$	= 133595$
Difference		= 13563$

1. For more, see Fischer 2000, Chapter IV of *Income property analysis and valuation.*
2. Various spreadsheet forms and examples are to be found in the PVM-web.

You could infer then that one square metre of liveable area is worth 452$ (13563$/30). This square metre price can now be applied to the other comparables and to the subject property.

Subject property:

Value (in $)	?
Land lot (in m^2)	350
Liveable area (in m^2)	100
Bedrooms	2
Bathrooms	1

Adjustment table

The comparable	1	2	3	4
Transaction price (in $)	138000	112600	110000	146800
Land area (in m^2)	360	379	363	340
Recorded transaction	7 months previously	4 months previously	13 months previously	1 month previously
Liveable area (in m^2)	110	68	98	102
Number of bedrooms	3	2	2	3
Number of bathrooms	1.5	1	1	1
Adjustments ($)				
Indexation (for time of sale)	15939	7432	23595	2422
For bedrooms	– 12000	0	0	– 12000
For bathrooms	– 4000	0	0	0
For liveable area	– 4521	14467	904	– 904
Net adjustment	– 4582	21899	24499	– 10482
Adjusted prices	**133418**	**134499**	**134499**	**136318**

Beyond mechanical computations, the valuer should also use her professional experience in order to refine her estimates. For example, she prefers to limit her sample of comparables to properties for which the net adjustments do not amount to more than 20% of the initial price.

On this basis, comparable 3 should be eliminated from the sample even if most of the difference is due to the indexation element.

Now, since comparable 2 and 3 have exactly the same adjusted price, they could be considered as very good twin subjects even though the adjusted price equality comes from the difference in liveable areas.

After verification of the other comparative elements, the valuer could safely conclude that the price of the subject should not be far off the range of 133418$ and 134499$. An estimated value of 133500$ would be a nice round number to suggest.

5. Conclusion

The basic sales comparison approach is certainly the most immediate approach to apply for the valuation of residential properties. A greater degree of sophistication could be applied but most users would not gain a significant advantage by using more technical refinements.

In fact, as often, the performance of the best tools is essentially limited by the quality of the material used (the data).

For example, it is tempting — and sometimes feasible — to provide statistical validation by calculating confidence intervals for the various adjustments. Tempting, but rarely justified since to use the most basic tools of statistical inference you need samples that contain at least thirty valid comparables. Unfortunately, you will rarely if ever find such a large number of cases if, as suggested, you have filtered properly the observed transactions in order to concentrate your investigation to the very close neighbourhood.

Appendix I explains and illustrates the use of multiple regression analysis. This approach is often suggested as the 'best tool' to derive price parameters for each component of a property. However, in current practice, multivariate analysis of property data is still very far from being the valuers' most favoured instrument.

The PVM-Web site (Chapter II) illustrates the most practical and simple ways to deal with large data bases. A systematic and astute use of 'Filters' avoids most of the complexities of standard multivariate instruments and provides clear and solid ways to choose the proper twins and cousins.

Chapter III

The production costs approach

Where we discover the details of an approach whose mechanical neatness is more appealing than its economic soundness. However, this approach is still the only one to use to value special properties and, more importantly, to value assets in emerging economies.

Scenario 1:

You have just bought a land lot for 82000$ (including lot servicing). You have a nice neo-abyssinian style house built for 345000$. This amount, key-in-hand, includes all the house construction costs including the full package of additional goodies (swimming pool, atomic shelter and orchid hothouse).

On the day of delivery, you can reasonably assume that this house is worth 427000$: the total cost of land, construction and extra goodies.

Scenario 2:

Same property … twelve years later.

Now things are slightly more difficult: the house is older, the construction is no longer 'best-practice', atomic shelters are not hot, the neo-abyssinian style is a bit *passé* and it seems that very few people are interested in orchid cultivation. However, the local market has been quite dynamic and prices have been rising happily for the whole period.

Thus, on the one hand the house value should be reduced to take into account the aging of construction materials and the decreased attraction of your neo-abyssinian design, your atomic shelter and your hothouse. On the other hand, your land value should reflect the dynamism of the local market by an increase of your lot price.

This very simple story fully illustrates the ABC of the cost approach: the value of a property is the sum of the production costs[1] of its components (construction costs and land) adjusted by a probable depreciation of the construction components and, eventually, by the appreciation of the land component.

1. Thus this approach is also described as the 'summation approach'.

1. The general approach

The estimated property value can be written as:

$$V_p \quad = \quad V_L \quad + \quad \sum p_i X_i \quad \pm \quad \text{Depreciation}$$

Where:

V_L	Value of the land component, as vacant, based on comparison to similar land lots (same localisation, same orientation, same slope, same zoning, same ownership conditions, etc.). If the comparability conditions are not perfect, you may have, here again, to proceed with value adjustments as you did in the previous chapter.
$\sum p_i X_i$	The total production costs made up of the sum ($\sum$) of the product of each component (X_i) by its average production price (p_i).
Depreciation	Adjustments for the various forms of depreciation. The sign $\pm$ indicates that the adjustments could be positive (appreciation) or negative (depreciation).[1]

The obvious and fundamental flaw of this approach is apparent in the $\sum p_i X_i$ part of the formula. This sum of products means that value can be described as the sum of average production costs. All mainstream economists have rejected this concept since the 19th century. It is now recognised that in equilibrium and competitive markets, transaction prices are reflected by marginal production costs and not by their average costs. We will see also that the practical issues raised by the measurement of depreciation do not add to the reliability of this approach.

The rejection of the cost approach is not recent. The 1932 'Standards of Appraisal Practice of the National Association of Real Estate Board' were already stating that:

> *Such summation appraisals are condemned as unsound, inaccurate and misleading because this approach bases the opinion of values which may not simultaneously obtain, and ignores the effect of over, under and misplaced improvement, and disregards the interrelation between land value and the value of the improvement ... it is unethical for an appraiser to issue a report on a property in which the total reported value is derived by adding together the values of fractional parts of the property.*[2]

And a classic author in valuation theory wrote:

> *Our second reason for the discrediting of the cost less depreciation approach, namely, that investors simply do not use it and that any prediction of their behaviour, in the form of Vp (the market value), which is based on a formula which investors do not employ in their calculus, will be irrelevant and misleading.*[3]

1. Thus, the other alternative name of 'depreciated replacement cost approach'. This term is favoured by the International Valuation Standards. Unfortunately, their definition is not entirely satisfactory. See PVM-Web for a discussion of this point.
2. Babcock (1932).
3. Ratcliff (1965, p. 63).

While the criticism addressed to the cost approach is fully justified, we must admit that this approach is still the only alternative valuation approach in the absence of legible property markets. In developed countries property markets can occasionally be illegible when you deal with special properties or location, but they can be systematically indecipherable in developing economies. Thus, unfortunately, you still have to know everything you may not want to know about this maligned but essential approach.

As you might have guessed, the description of the cost approach will proceed in three steps:

— Estimation of the land component;

— Estimation of production costs;

— Estimation of adjustment costs.

Reproduce or replace: cloning or clowning?

Reproduction cost: building a clone

The estimated cost to construct at current prices, as of the effective date of the appraisal, an exact duplicate or replica of the building being appraised using the same materials, construction standards, design, layout, and quality of workmanship and embodying all the deficiencies, superadequacies, and obsolescence of the subject building.

Replacement cost: building an imitation

The estimated cost to construct at current prices, as of the effective appraisal date, a building with utility equivalent to the building being appraised using modern materials and current standards, design and layout.

These definitions, extracted from the *Dictionary of real estate appraisal* (Appraisal Institute, 1993), may appear quite clear; however, they still raise major interpretation difficulties (see Treadwell, 1988).

Reproduction costs are generally higher than replacement costs since most substituted materials are cheaper. Furthermore, the reproduction of all the subject idiosyncrasies can be difficult and costly, if not impossible.

In practice the replacement cost is the most acceptable concept; however, certain professional assignments may require the use of the 'reproduction cost'. This text will use 'construction cost' to describe both measurements.

And for the accountants ...

The Australian Accounting Standards Board (in accordance with the International Accounting Standard draft report forty) define an 'Investment Property' as a property held to earn rentals or for capital appreciation or both. Investment properties can be valued either on **'fair value' or 'cost'**.

For the international accounting standards a **fair value** is defined as 'the amount for which an asset can be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction'.

The **cost** being the depreciated replacement cost as defined in this chapter.

2. Valuing the land component

The land component is the 'raw' input. It must be valued as vacant, non-serviced and used at its highest and best use.

In the value summation formula presented above, the land component should then add all the expenses that are required before construction can start. It thus must include all the physical (grading, draining, cleaning) and professional services (surveying, designing, managing and legal servicing) required in the development process. When raw land is fully serviced and ready to be built, its value is commonly referred to as 'site value'.

Raw land value + Preparation costs = Site value

It is crucial to ensure that market comparisons are based on the same objects: you must compare raw land with raw land, and sites with similarly serviced sites. You can already guess that — as in Chapter II — adjustments may be required to make the land/site components comparable. The variables to take into account for such comparisons and adjustments are:

• ***The site's physical characteristics***

— Geological and pedological features need to be assessed in order to estimate probable preparation expenses such as drilling, subsoil analysis, land decontamination, structural reinforcement, drainage, rock removal, earthquake protection, etc.;

— Topography of the lot and surrounding lots must also be considered to estimate other improvement expenses such as filling, levelling, grading, slope stabilisation, etc.;

— Geometric shape of the parcels will also affect its value. Unusual shapes and unusual sizes tend to be discounted by the market. Non-standard configuration should be eliminated from the sample of comparables. However, the value of unusual sized lots — for example 'too small' — can be changed if the lots can be assembled under the existing zoning conditions (plottage), and the per m^2 value of 'too large' lots can also be changed by subdivision. Here again, assembly or subdivision potential must be considered when valuing comparable land parcels;

— Orientation is another crucial trait that has to be adjusted in order to find comparable land values. Orientation may mean orientation to the sun or, even more crucial, orientation toward a highly valued view;

— Accessibility to trunk services (water, sewerage, electric main lines) is another factor to consider. Absence of trunk services will add years to the realisation of lot values, and abnormal distance to the trunk services will add dollars to the servicing bills, etc.;

— The existence of improvement on comparable lots will also require adjustment since you want to compare plots of vacant land. Demolition of existing structure and clearing of the lots will be added to comparables that are not vacant. Alternatively, valuable existing features that can be maintained in future developments (for example mature trees, historical building facade) will need to be subtracted from the value of encumbered comparables.

Physical elements that may require adjustments

- Soil and sub-soil characteristics
- Topography
- Configuration
- Orientation and view
- Accessibility to trunk services
- Existing usage

• The site's legal characteristics

Here again comparables must be comparable in their legal and zoning characteristics. Thus the valuer will need to verify:

— That the comparable lots are subjected to the same zoning and local regulations (type of zoning, maximum density, set back, construction codes, etc.);

— That the comparables' values are not affected by private or public right of ways, flooding restrictions, view restrictions, or any other private covenant that may restrict usage.

• The site's economic characteristics

Lot and site prices are primarily determined by their location and by conditions prevailing on the local market environment. Two levels of economic influence must be considered:

— At the 'macro-local' level property prices reflect the broad economic and demographic environment observed for the nation, the region, the city or the village. National, regional and urban prices may not be fully synchronised, but they are usually coherent and reflect the macro level of wealth;

— At the 'micro-local' level property prices reflect the very specific influence of the immediate environment and the availability of public services, commercial services and private amenities.

Well understood intuitively, these effects are at the core of urban and regional economic research. Unfortunately, despite remarkable progresses in the last thirty years, we still may have found many more questions than answers.

However, the role of the appraiser is not to explain (even less to predict) price formation. Her role is limited to the observation (i.e. the reading) of market transactions. In this capacity she needs to collect a sufficient number of comparable transactions to infer the value of a given site. Proper readings should provide proper pricing. A consistent series of proper readings over previous periods will further provide evidences of market trends.[1]

You now have a clearer idea of the variables to consider in order to value and adjust land prices. You may also need some elementary approaches to assist you in the treatment of this information.

3. How to value land lots

Here again, you may be lucky and always find perfect market twins or at least siblings. Or you may not be so lucky and you have to deal with more or less distant cousins that will require adjustments and simplification.

3.1 Lot global value

This short-cut can only apply to very homogenous and identical residential lots in a tightly defined sub-market. Lot values are determined by observing modal[2] transaction prices on similar lots irrespective of the exact size of the lot. This treatment is coherent with typical household behaviour: they have a good idea of the price they are willing to pay for land, without really being too concerned about square metre exact pricing.

Example:
The modal price of lots recently transacted in a new development is 37000$. The valuer could, without further measuring and refinement, allocate a value of 37000$ to similar lots.

This is a straight shot application of the twin treatment: no fuss, no fiddling and no major risk of mis-valuation. Unfortunately, things are not always as simple.

3.2 Square metre prices

Almost as simply, you can deduct square metre prices from twins or siblings lots. (Approximate same size, same configuration, same orientation and potential usage.) Ideally you should compute the modal price, but most of the time you will choose the average price.

Example:
A typical 800 m^2 lot transaction has been priced at 40000$ in the last two months. If you have to value an 843 m^2 lot you conclude to a value of 42150$ (843$ $\times$ 40000$/800 m^2).

This obvious solution is probably the most commonly used in practice.

1. See in Chapter VI the reference to market 'reading, tracking or sticky tracking'.
2. See in Chapter VI why modal rather than average.

Three points still need to be kept in mind:

— It is advisable to use modal prices (the most frequently observed price) instead of average prices. An average includes the whole range of results, including some outliers that may not be representative. If the number of observations is large enough, modes and averages are very close and you can rely on the average (easier to compute). Alternatively, you could also decide to be selective and prune out the outliers before computing the price average;

— When lots have significantly different sizes, you should not rely on linear adjustments. You remember the principle of marginal contribution: the square metre value of a 4000 m^2 lot is not the same as the square metre value of 2000 m^2;

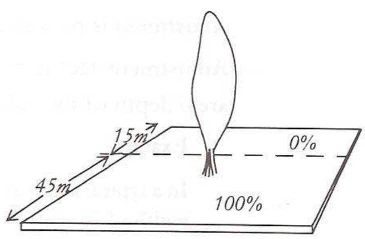
— Even when sizes are equal, you still have to take into account the lot shape, configuration and general orientation. Bizarre shapes decrease m^2 values, corner lots increase m^2 values, good views increase m^2 values, etc. Here, once more, at the risk of being repetitive: try to limit your comparables to twins or siblings.

3.3 Dealing with non-linearity

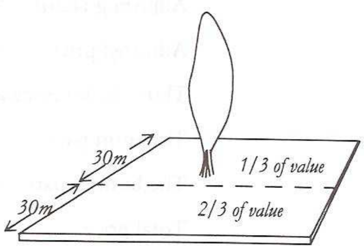
You already know that m^2 are not linearly priced. In other words all m^2 do not command the same price. Typically, the bottom end of a rectangular lot is less expensive that the front end. Some geometrical approximations are sometimes useful to take this 'depth' factor into account. Different rules apply to different countries and localities. In practice you may have to set up your own rules through a systematic observations of past transactions.

Some examples of such rules are:

— Neglect values beyond 45 m of depth (Lindsay-Bernard formula).



— Allocate 2/3 of the value to the first half of depth and only 1/3 to the second half. (This formula has been suggested in 1866 by Judge Hoffman in the US.)

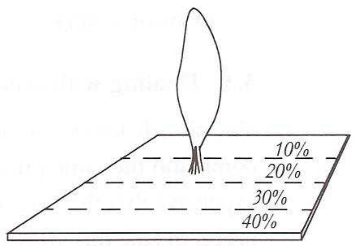


— This simple rule was then modified by Henry Neil and led to the Neil-Hoffman tables, from which the following entries are reproduced below. (The exaggerated precision of this table should justifiably raise your suspicion on its validity.)

Table III.1 Neil-Hoffman tables

Lot depth (in feet)	% of price at various depths
30	49.0%
75	84.8%
100	100.0%
150	127.3%
200	150.0%
300	191.0%
400	225.0%

An interesting variant is illustrated in the opposite graph. Here the lot is sliced in 4 and the values are respectively 40%, 30%, 20% and 10%. Predictably, this rule is described as the 4-3-2-1 rule (and you do recognise a simple quadratic function).



3.4 The square formula

— Another solution is to attribute less value to the excess land. The adjustment is provided by the 'square formula'.

— Adjustment factor = square root of the ratio (typical depth of lot in the area/depth of the subject lot).

Example:

In a typical residential development, the modal depth is 40 metres for a modal width of 25 metres. Such modal lots are sold for 62$ per m^2. Thus, you compute the price of a 60 metres/25 metres lot as:

Adjusting factor	=	Square root of (40/60)	=	0.8165
Adjusted price	=	$62\$/m^2 \times 0.8165$	=	$50.62\$/m^2$

Thus, the lot price is made up of:

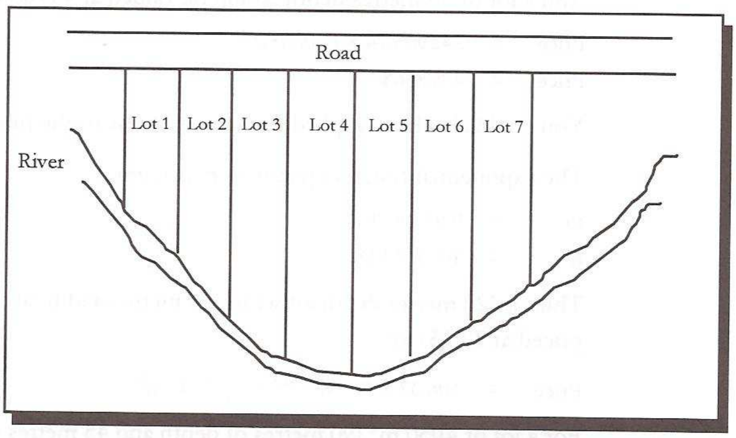
The front part	=	$62\$/m^2 \times 1000\ m^2$	=	62000$
The bottom part	=	$50.62\$/m^2 \times 500\ m^2$	=	25310$
Total price	=	87310$		

These short cuts are simplistic and may not apply at all to the particular market you have to survey. They have no theoretical justifications, but they are simple and could make intuitive sense. They should belong to the historical folklore of our discipline however, they still can be used as rough benchmarks in order to verify the derivation of the valuers' empirical observations of the market.

Empirical observations can be treated using simple graphical plotting, or simple regressions if the number of observations is large enough (see the companion Excel tables for examples).

Or they can be treated by simple coefficient computations when the number of observations is not sufficient. These computations are presented in the next example.

Seven lots' recent transactions are mapped below and the resulting prices and dimensions are presented in Table III.2.



You would like to derive a depth price rule to apply to similarly located land lots.

Table III.2 Depth rule empirical derivation

Depth in metres	Width in metres	Area in m^2	Sale price by m^2	Total sale price
110	45	4950	90$	445000$
120	43	5160	88$	452450$
125	52	6500	80$	520300$
148	48	7104	85$	602500$
150	50	7500	82$	615000$
172	51	8772	79$	690000$
198	49	9702	73$	712000$

The relation between sale price and depth can be written as an exponential function:

$$\text{Price} = b \times m^x$$

From the above data, you derive **m** = 1.00582918 and the constant **b** = 242905.24 for the 7 lots.

m = 1.00582918

b = 242905.24

These results can be calculated on the appropriate scientific calculator or, in Excel with the statistical function LOGEST (). You can test your results on PVM-Web, but note that LOGEST() is a bit tricky since it has to be used as an Array function.

With these coefficients you can now derive the value of a lot of 220 metres depth as 872470$.

$$\text{Price} = 242905.24 \times (1.005829)^{220}$$

$$\text{Price} = 872470\$$$

And a lot of 90 metres depth would be valued at 409836$.

$$\text{Price} = 242905.24 \times (1.005829)^{90}$$

$$\text{Price} = 409836\$$$

You could also have applied the same process to the pricing of m^2.

The exponential function parameters become:

m = 0.999962811

b = 107.0999182

Thus, a 220 metres depth lot with a 48 metres width (area = 10 560 m^2) can be priced at 72.3$/$m^2$.

$$\text{Price} = 106.37 \times (0.99)^{10\,560} = 72.3\$/m^2$$

For a lot of 4050 m^2 (90 metres of depth and 45 metres of width) the m^2 price would turn out to be 91.8$/$m^2$.

$$\text{Price} = 106.37 \times (0.99)^{4\,050} = 91.8\$/m^2$$

3.5 Land valued as a residual

This approach is favoured by developers and will be extended later in the full review of residual approaches (see Appendix V). The land component is derived by subtraction of all other components of a development project (construction costs, fees, financing expenses, profit margins).

• A single building example

A small office-building project is described below.

Building area	2000 m^2
Construction costs (hard and soft)	1500$/$m^2$
Expected promoter's profit	15% of total cost
Expected sales price	4200000$

Solution:	
Expected sales price	4200000$
Construction costs	3000000$
Profit	450000$
Residual land value	**750000$**

• *Development project example*

You can apply the same approach to the valuation of individual land lots in a development project. The following example is a common-sense example of a typical quarter-acre block redevelopment case. This type of 'static' treatment can only be applied if you have information on similar recent projects and if the development project does not take more than one year. Of course, if the development and marketing of any significant project takes well over one year you will need to introduce the value of time and the discounting of costs and revenues.

It may be worth repeating that the application of such a simple approach is limited to 'quick and dirty' analysis and should not be considered very reliable.

The valuation of land is more appropriately treated with a Samuelson-McKean pricing of optional development. This more advanced treatment is presented in the PVM-Web along with more traditional development models.

Table III.3 Residual value of survey strata[1] land lots

Number of residential units (single family houses)	4
Construction costs per unit	120000$
Expected promoter's profit	25% of sales
Expected sales price (per unit)	230000$
Solution:	
Total expected sales price	920000$
Production costs	480000$
Promoter's profit	230000$
Residual land value (in globo)	210000$
Residual land value (per lot)	**52500$**

1. Survey strata lots (WA Strata Titles Amendment Act, 1995) are titled lots on a land parcel without reference to a building even though a building exists or may be constructed on all parcels.

Now that you have dealt with the first part of the value equation (the land part), you need to move on to the second part: the construction component.

What should you think of these rules? … Not much.

- These rules of thumb can only be justified when they are supported by market evidence;
- But then, if you have market evidence, why should you use approximate short cuts when you can easily calculate the right parameters?
- And if you have no market evidence, then the rules of thumb cannot be validated and should not be used.

QED …

4. The determination of construction costs

4.1 Global determination by market comparison

Once again, if you can find an identical twin (or decent sibling) you can determine the construction costs of a property by simple analogy. If it costs x dollars to build this perfectly comparable property, then the cost of building the subject property will be the same. Obviously this global comparative pricing only applies to very simple and standardised buildings such as warehouses, motel rooms, common industrial buildings and simple residential units. This global costing can also, without much damage, be applied to important components such as a swimming pool, a granny flat or a carport.

When recent constructions are not available, a construction cost index can be applied to the cost of comparable properties built previously. A factor representing the percentage increase to the present time is multiplied by the original cost of the subject property.

4.2 Unit pricing

By representative full units

You can compare unit construction costs of similar units and determine a cost per hotel room, a cost per bed (for a hospital), per desk (for a school), or per cell (for a jail).

From these unit costs, you can then calculate adjustments to reflect the difference between your subject and the comparables.

> Example:
>
> The average construction costs of the franchised chain of MicDanold Motels has been 92500$ per room for the last six months in suburban Sydney. The construction costs component of a 52 room motel should thus be around 4810000$. You will then need to add the land and equipment component to these construction costs.

By square metre

The per unit cost of recently built comparable structures is applied to the size of the subject property. Then again, you must add the land and equipment component to these construction costs.

Individual significant components can also be costed separately. This component costing is a good way to verify market grid comparison information. Component cost information is available from commercial cost catalogues.[1] Table III.4 illustrates the format of presentation from Cordell's cost guide for various types of carport.

Table III.4 Costing per square metre

Attached single carport: standard specification; concrete floor; fibrecement lining; paint finish (6 m × 3 m)	
- Timber posts and	
Flat metal roof	465 $/m^2
Pitched metal roof	537 $/m^2
Pitched tile roof	535 $/m^2
- Brick piers and	
Flat metal roof	458 $/m^2
Pitched metal roof	520 $/m^2
Pitched tile roof	518 $/m^2
Attached double carport: standard specification; concrete floor; fibrecement lining; paint finish (6 m × 6 m)	
- Timber posts and	
Flat metal roof	334 $/m^2
Pitched metal roof	363 $/m^2
Pitched tile roof	363 $/m^2
Etc. for various other carport specifications.	

Source: Cordell Building Information Services 2001, p. 266.

The treatment can be much less detailed and construction costs catalogues can also be used to produce very simple but effective cost estimates. The following example illustrates the combined usage of Cordell's and Rawlinson's catalogues to value a simple single family home.

1. In Australia the most commonly used sources are: 1) Cordell's Building Information Services; 2) Rawlinson's catalogue of construction costs; 3) *The Building Economist* (The Journal of Australian Institute of Quantity Surveyors). These services provide different degrees of computer access and data updating. Unit costs are provided for new constructions and for renovation or refurbishing.

Table III.5 Example of the summary cost approach applied to a single family home

	m^2	\$ per m^2	\$ total	\$ Totals
Replacement costs				
Main living area	250	630.00	157500.00	
Double garage under main roof	30	205.00	6150.00	
Verandah	15	125.00	1875.00	
Total construction costs				165525.00
Less				
Depreciation rate of 2%				– 3310.50
Depreciated replacement costs				162214.50
Other improvements				
Paving			2500.00	
Landscaping and reticulation			3800.00	
Fencing			2900.00	
External Jacuzzi			8000.00	
Total for other improvements				+ 17200.00
Total depreciated value (building and improvements)				179414.50
Add				
Land value				+ 100000.00
Add				
Chattels				
Window treatments			3500.00	
Dual air conditioning			8500.00	
Floor coverings			7500.00	
Lighting fixtures			3000.00	
Total chattels				+ 22500.00
Total value (depreciated improvements chattels and land)				**301914.50**
Approximated to				302000.00

The detailed cost summation of construction elements

The approach is summarised by the formula used previously:

$\Sigma p_i X_i$ Estimation of total production and delivery costs as a sum (Σ) of each of the construction components (X_i) at their replacement or reproduction prices (p_i)

This treatment requires the identification of each and every component of a construction and information on unit costing of these components. Once more, unit costing must be derived from similar types of construction in similar localisations. Let us insist: it is only by referring to local market pricing of construction inputs (material, labour, profit margins, etc.) that you can derive reasonably accurate construction costs.

Beyond the above general principles, the main practical concern is the level of detail you want to achieve and, of course, the access to appropriate sources.

Production and delivery costs of a construction

For the purchaser, the production and delivery costs include all the construction costs and the promoter profit margins and marketing expenses. This full cost should be the basis for the determination of comparable costs since it is the price revealed through transactions records. If the promoter or builder keeps and manages his property, his profit and promotion margins are imputed and should also be included in the total cost.

Production costs include direct construction costs (also called structural or hard costs) and indirect costs (also called service costs or soft costs).

- Direct (hard) costs include:

Construction materials, labour, rental of equipment and site costs. They also include the profits of all the various sub-contractors who have been involved in the project.

- Indirect (soft) costs are:

Professional fees for architects, engineers, quantity surveyors, appraisers, accountants, lawyers.

Financing charges for land and building. These charges include interest payments, brokerage fees and all associated costs and fees.

Local taxes and insurance costs during construction, marketing costs, real estate brokers' commissions and leasing incentives.

Since the production and delivery of most projects may take many months, or even years, all the costs should be brought back to a single time period. This time period could be the start of the effective construction of units, or the time of the beginning of commercialisation (or any convenient arbitrary time).

All the costs incurred before the chosen period should be capitalised (brought forward) and all the costs incurred after this period should be discounted (brought backward).

• *Summation of broad components: 'the unit-in-place' approach*

The cost of the various components are estimated separately and added together. All of the components are identified and measured and the current production costs are applied. Once more, the cost information may come from the valuer's own database or from published catalogues. The identification of the various components[1] may vary from source to source and the level of details may also be adjusted according to the valuer's needs.

1. Rawlinson's cost guide identifies the following components:
Preliminaries, Substructure, Columns, Upper floors, Staircases, Roofs, External walls., Windows, Internal walls, Doors, Internal partition and screens, Wall finishes, Floor finishes, Ceiling finishes, Fitments, Plumber and drainer, Electrical, Mechanical, Lifts and escalators, Fire protection, Siteworks

Cordell's cost guide provides detailed costs for:
Preliminaries, Demolition, Excavation, Piering & piling, Concrete in-situ, Concrete formwork, Concrete reinforcement, Concrete composite rates, Concrete precast, Masonry - Brickwork, Masonry - Blockwork, Stonework, Structural steel, Metalwork, Carpentry, Insulation, Joinery, Glazing, Hardware, Access floors, Partitions, Rooting, Roof Plumbing, Suspended ceilings, Windows, Doors, Mastering, Tiling, Paving/ Floor coverings, Painting, Plumbing, Electrical services, Mechanical - Air Conditioning, Mechanical - Lifts/Escalators, Landscaping/Fencing/Roads, Awnings/Blinds/Curtains, Fire protection, Shopfitting, Sundry appliances, Plant hire - Earth moving, Plant hire - General

At the more general level of costing you can rely on 'elemental costs' as illustrated in Table III.6.

Table III.6 Industrial warehouses: low bay — owner occupation — brick walls

	$/m^2	%
Preliminaries	31.00	7.2
Substructure	61.50	14.3
Superstructure		
Columns	19.00	4.4
Roof	98.50	23.0
External walls and windows	65.00	15.1
External doors	9.25	2.2
Internal walls	10.50	2.4
Internal screens	1.00	0.2
Internal doors	6.00	1.4
Finishes		
Wall	3.75	0.9
Floor	9.75	2.3
Ceiling	7.00	1.6
Fitting		
Fitments	5.75	1.3
Services		
Plumbing	24.5	5.7
Mechanical	1.00	0.2
Fire	4.25	1.0
Electrical	56.00	13.0
External services	5.50	1.3
Contingency	10.75	2.4
Total (Mean Cost, Sydney)	430.00	100
Cost Range		
Adelaide	365–425	
Brisbane	380–440	
Melbourne	390–450	
Perth	330–390	
Sydney	400–460	

Source: Rawlinson Publishing Pty 2002, p. 81.

Or, alternatively, you may want to cost the components in much greater detail. For example, the level of detailing tiling costs is illustrated below.

Tiling, non resilient	Unit	Perth
Floor tiling		
Mosaic / glazed		
Tiling in sheets, in main areas		
61mm × 61 mm	m^2	67.50
100 mm × 100 mm	m^2	71.00
Add extra for:		
Small areas	m^2	20.00
Pointing with acid resisting grout	m^2	4.50
Patterned work	m^2	10.00
Terra cotta		
Natural terra cotta tiles, in main areas		
300 × 300 mm	m^2	79.00
Add extra for:		
Acrylic surface	m^2	10.50
Etc.		

Source: Rawlinson Publishing Pty 2002, p. 409.

A complete example of a unit-in-place estimation of a Perth townhouse is provided hereafter (Table III.7). This example illustrates the application of an estimation dedicated software.

- ***Detailed summation of each and every component: the Quantity Survey approach***

This solution requires a complete breakdown of each input and the time required to install each component. This approach is typically the one practised by quantity surveyors or construction economists. It requires a very detailed knowledge of construction techniques and of the local construction industries.

This detailed knowledge is usually beyond the expertise of property valuers who may prefer to sub-contract this part to qualified professionals if they need to provide this level of detail. Increasingly, quantity surveyors or building engineers rely on computer software directly linked to updatable data bases. Valuers or valuation firms may not have access to this expertise and type of instruments and thus should not be expected to provide this type of analysis.

We have now dealt with the first two parts of the value equation: the determination of land value and the determination of construction costs of an 'as new' building. We must now treat the last — and most problematic — element: the depreciation.

Table III.7 A computer treatment of elemental costing: EVEREST software

Short Description	Yellow Submarine Residential Town houses
Size	Gross Floor Area: 130 m^2
Estimate Date	25 March 2002
Building Cost Index	119.20
Locality Index	100.00 (Perth Zone)
Location	Liverpool Avenue, Fremantle
Client	Mr & Mrs Beatle, 18 Dr Pepper Drive
Number of Storeys	2
Building Description	Living room, dining room, kitchen, laundry, double carport and store, three bedrooms, bathroom, ensuite, walk-in wardrobe

Description	Unit Quantity	Unit Rate	Elemental Cost	Cost/m^2	% Major Group
PRELIMINARIES	12 500.00				
SUBSTRUCTURE	*64 m^2*	*93.75*	*6 000.00*	*46.15*	*4.37*
COLUMNS			1 900.00	14.62	1.38
UPPPER FLOORS	64 m^2	150.00	9 600.00	73.85	7.00
Concrete slab					
STAIRCASES			6 900.00	53.08	5.03
Concrete including carpet to treads and landing					
ROOF			11 500.00	88.46	8.38
Tiles including insulation					
EXTERNAL WALLS	139 m^2	133.09	18 500.00	142.31	13.49
Rendered brickwork					
WINDOWS					
Aluminium Windows and Frames	11 m^2	354.55	3 900.00	30.00	2.84
Including insect and security screens and locks					
Curtains and blinds (slimline venetians)	27 m^2	62.96	1 700.00	13.08	1.24
WINDOWS (Total)			5 600.00	43.08	4.08
EXTERNAL DOORS					
Timber Framed Glazed Doors	2 m^2	450.00	900.00	6.92	0.65
Including security door					
Aluminium Framed Glazed Doors	17 m^2	352.94	6 000.00	46.15	4.37
Including insect screen and security doors					
EXTERNAL DOORS (Total)			6 900.00	53.08	5.03
INTERNAL WALLS	84 m^2	50.00	4 200.00	32.31	3.06
INTERNAL SCREENS & BORROWED LIGHTS			1 200.00	9.23	0.87
Shower screens and doors					
INTERNAL DOORS	13 m^2	138.46	1 800.00	13.85	1.31
SUPERSTRUCTURE			*68 100.00*	*523.85*	*49.67*
WALL FINISHES	300 m^2	20.00	6 000.00	46.15	4.37
FLOOR FINISHES					
Carpet	77 m^2	35.06	2 700.00	20.77	1.96
Ceramic Tiles	35 m^2	74.29	2 600.00	20.00	1.89
FLOOR FINISHES (Total)			5 300.00	40.77	3.86
CEILING FINISHES			3 200.00	24.62	2.33
FINISHES			*14 500.00*	*111.54*	*10.57*
FITMENTS			6 000.00	46.15	4.37
Kitchen cupboards, vanity cupboards, shelving, mirrors, bathroom fittings, etc.					
SPECIAL EQUIPMENT			2 400.00	18.46	1.75
Wall oven, gas cooktop, range hood, built-in dishwasher					
FITTINGS (Total)			*8 400.00*	*64.62*	*6.12*

Description	Unit Quantity	Unit Rate	Elemental Cost	Cost/m²	% Major Group
SANITARY PLUMBING	8 no.	1 250.00	10 000.00	76.92	7.29
Not Elsewhere Inc. in PD SPA BATH including associated equipment, electrical connection and plumbing services			3 000.00	23.08	2.18
SANITARY PLUMBING (Total)			13 000.00	100.00	9.48
WATER SUPPLY Electric storage hot water system			900.00	6.92	0.65
GAS SERVICE Gas bayonet			300.00	2.31	0.21
VENTILATION Exhaust fans			400.00	3.08	0.29
AIR CONDITIONING Reverse cycle ducted system			7 500.00	57.69	5.47
ELECTRIC LIGHT AND POWER Excluding light fittings			6 300.00	48.46	4.59
COMMUNICATIONS Telephone connection			300.00	2.31	0.21
SPECIAL SERVICES Security alarm system			1 000.00	7.69	0.72
SERVICES			*29 700.00*	*228.46*	*21.66*
Proportion of PRELIMINARIES			10 385.00	79.88	7.57
BUILDING COST			***137 085.00***	***1 054.50***	***100.00***
SITE PREPARATION	139 m²	5.04	700.00	5.38	
ROADS, FOOTPATH AND PAVED AREAS Brick paving	72 m²	40.28	2 900.00	22.31	
BOUNDARY WALLS, FENCING AND GATES			3 000.00	23.08	
OUTBUILDINGS AND COVERED WAYS			0.00	0.00	
Car Ports, including walls and gates	36 m²	350.00	12 600.00	96.92	
Stores Store/Workshop	12 m²	350.00	4 200.00	32.31	
OUTBUILDINGS AND COVERED WAYS			16 800.00	129.23	
LANDSCAPING AND IMPROVEMENTS			500.00	3.85	
SITEWORKS			*23 900.00*	*183.85*	
EXTERNAL STORMWATER DRAINAGE			700.00	5.38	
EXTERNAL SEWER DRAINAGE			1 200.00	9.23	
EXTERNAL SERVICES			*1 900.00*	*14.62*	
Proportion of PRELIMINARIES			2 115.00	16.27	
NET PROJECT COST			***165 000.00***	***1 269.23***	
LAND COSTS (not included)			0.00	0.00	
LOOSE FURNITURE AND EQUIPMENT (not included)			0.00	0.00	
PROFESSIONAL FEES (not included)			0.00	0.00	
GROSS PROJECT COST			165 000.00	1 269.23	
GOODS AND SERVICES TAX			16 500.00	126.92	
GRANT TOTAL PROJECT COST			***181 500.00***	***1 396.15***	

This is a typical Replacement Capital Valuation (RCV) for a town house produced on the 'Everest' elemental measurement system. RCVs are 'opinions of probable costs' and not 'estimates' that builders produce for tendering. The 'Everest' program was used to measure building areas as well as quantities for the various elements. The rates for pricing quantities were selected from a database of analyses for similar type buildings. The data base is made up of actual costs from past projects automatically updated to current and local values.

Everest is a computer program produced by CSSP (www.cssp.com.au). This project has been submitted by Mr. Gerry Postmus FAIQS ICECA (postmus@iinet.net.au) who cannot be held responsible for the adaptation.

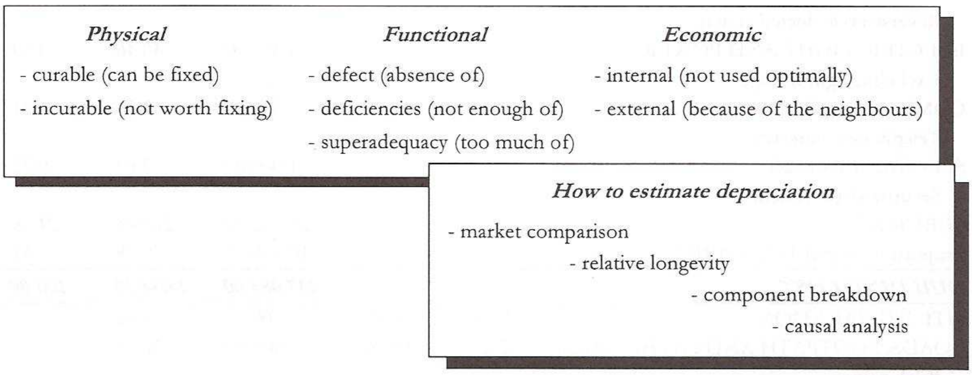
5. Depreciation: definitions and typology

Accumulated depreciation can be defined as:

> *The difference between the reproduction or replacement cost of an improvement on the effective date of the appraisal and the market value of the improvement on the same date.*[1]

More simply said, accumulated depreciation is the drop in value due to the passing of time. The decreased value of a building (improvement) can result from wear and tear (physical depreciation), from technical obsolescence (functional depreciation), or from economic dysfunctionality or external market conditions (economic obsolescence).

Figure III.1 Depreciation sources and treatments



5.1 Physical depreciation

Physical depreciation may result from the aging of a structure and from the deterioration of its material or its equipment. Two forms of physical depreciation can be identified:

• Curable depreciation

Repairs or replacement of certain elements can remedy such depreciation. For example, the depreciation of a building can be compensated for by its repainting or its re-roofing.

To be treated as depreciation, these repair expenses are part of a property's regular maintenance program and should not contribute to an increase in value. An increase in value would occur in case of renovations and improvements that would then overcompensate the amount of physical depreciation.

A curable depreciation is justified if the necessary expenses are likely to be recovered when the property is resold. In comparing the expenses incurred now

1. The *Dictionary of Real Estate Appraisal*, 1993, 3rd edition, p. 96. Note that this definition of depreciation differs from the accounting concept based on the difference with historical cost (the cost of the property when it was built). In valuation, we consider the cost of the property as if it were built today.

and the potential future disposition price, this future price must be discounted to the time of the repair expenditures.

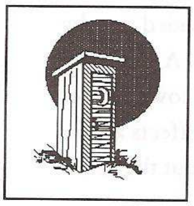
• *Incurable depreciation*

Depreciation is incurable if the required expenses could not be recouped from an immediate sale of the property. The rebuilding of a full foundation, the complete reconstruction, or the complete gutting and rebuilding of a structure are common examples of incurable depreciation.

5.2 Functional depreciation

Depreciation may result from the obsolescence of property components. Such obsolescence may not be caused by physical deterioration but simply by the reduction of utility of a building or its components. Obsolescence may occur because some of the components are not providing the services that more recently built components could provide (deficiency); or, on the contrary, because components are oversized and over-provided (superadequacies); or, finally, because components are simply not provided at all (defect).

Functional deficiency



A backyard dunny would be 'deficient', a twelve metre high ceiling would be 'superadequate' for a bungalow, and the absence of Internet connection could nowadays be considered as a 'defect' in a modern office building.

• *Obsolescence by deficiency*

— Functional deficiencies can be remedied if the required expenses are justifiable (can be recouped on disposition). The modernisation of a bathroom or a kitchen could be considered as justifiable compensation for functional depreciation.

— Functional deficiencies may not be remedied when these deficiencies apply to structural elements, configuration or orientation of components of a building. Too-high ceilings, a wrong orientation to the sun or view, and poor organisation of space division are common examples of an incurable functional depreciation.

Obviously, the degree of justifiable compensation will depend on market conditions. The 'curability' of a deficiency is essentially not technical but economic. A bathroom or kitchen modernisation can be fully justified in a dynamic residential market and can be a total waste in a declining market. Once more, local conditions matter, and the valuer should always keep in mind the various cost/benefit ratios of potential improvements that are applicable in his specific locality.

• *Obsolescence by superadequacies*

A specific form of depreciation may result from situations that could be described as 'the wrong size at the wrong time', or as 'too much of a good thing is a bad thing'. The earlier example of our neo-abyssinian bungalow equipped with an atomic shelter and an orchid hothouse would be a caricatural example of superadequacies.

Here again, superadequacies are not based on technical criteria but are sanctioned by the verdict of the market: obsolescence is viewed as a cause of depreciation if it reduces the probable resale value or increases the carrying charges on the property.

5.3 Economic depreciation

Economic depreciation can be internal (intrinsic) or can be caused by external factors (externalities):

- ***Internal factors***

Depreciation of a property may result in the reduction, division or reallocation of the bundle of rights applicable to the property. You may remember, from Chapter I, that optimal value was defined with respect to the integrality of property rights. If property rights are reduced (e.g. by a restrictive covenant, encroachment of a right of way, a height zoning limit, etc.) or subdivided (e.g. by leasing or subdivisions) the value of the property will be reduced. A more detailed treatment of this situation is provided in Appendix VI. However, we must admit that the full understanding of these 'bundle-of-rights' effects are far from being complete. The same admission could also be made about the effect of externalities.

- ***External factors***

External factors in the immediate environment can alternatively decrease or increase the value of a property or even of a whole neighbourhood.

Restrictive zoning, increased local taxes, construction of a noisy highway, and extension of an airport are examples of negative external factors that will cause some external economic depreciation. Such depreciation is incurable since its causes and remedies are beyond the control of the property owner.

The development of local amenities, the lifting of zoning restrictions, and the construction of a new highway that increases property accessibility would be examples of positive external factors that would contribute to an increase in the value of the property.

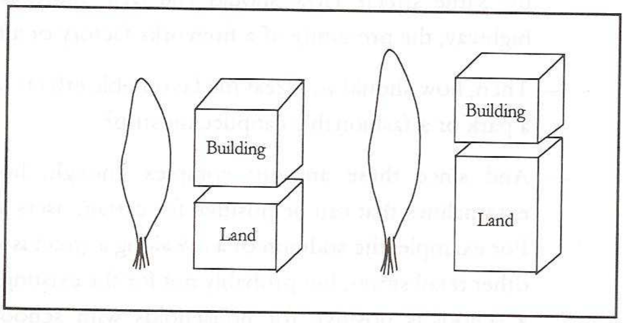
Such external factors will be reflected in the value of the land component. If you recall that:

$$V = \text{Land value} + \text{Building value} - \text{Accumulated depreciation}$$

You observe that the net result on total value can be positive if the positive economic externalities more than compensate the negative effects of the building depreciation. This 'negative depreciation' — thus this net appreciation — is typically observed in fashionable old neighbourhoods that enjoy location and amenity externalities that overcompensate the aging of the residential stock (e.g. Subiaco).

A simple example will illustrate this 'negative depreciation' effect:

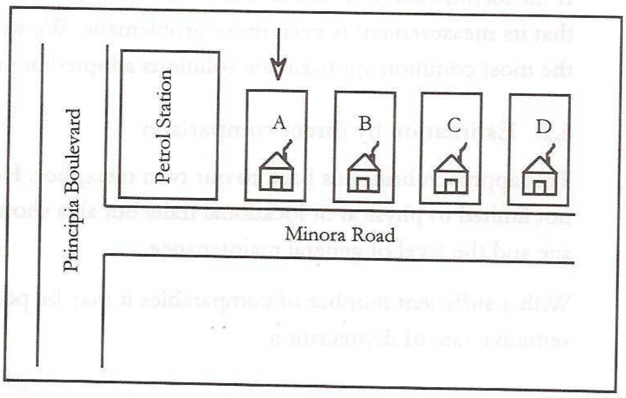
	1990	2000	Appreciation/Depreciation
Land value	100000$	250000$	+ 150000$
Building value	125000$	85000$	– 40000$
Property value	225000$	335000$	+ 110000$



It may be true that external effects will affect land values neighbourhood wide and be reflected in market prices, but external effects may be differential and may, in some cases, not be reflected in local market prices.

For example, in the following illustration, the presence of a petrol station at the corner of a residential street will affect lot values differentially. In this example, the contiguous lot (A) will be worse off than the more distant lots (B, C, D). Market information may not detect this differential effect, but a good valuer could and should.

Local externalities



We have defined externalities — positive or negative — as effects that influence values in a property's immediate environment. But, what do we mean by 'immediate', and how narrowly or widely should the property price halo be defined?

Externalities or market effects?

— The increase of the unemployment rate in a city will affect property prices for the whole city. This is a clear market effect.

— At the opposite, the petrol station nuisance effect described previously is an externality applying to a specific property.

— However, how should you treat the nuisance effect on the other houses in the same street? How should you treat the nuisance effect of a noisy highway, the proximity of a fireworks factory or a high power line?

— Then, how should you treat the favourable effects of proximity to a school, a park or a fashionable cappuccino strip?

Economic obsolescence -the fudge factor

— And since these are not complex enough, how can you deal with externalities that can be positive for certain users and negative for others? For example, the addition of a *café* along a street is a positive externality for other retail stores, but probably not for the existing cafes. The proximity of a school is positive for households with school-age children but less enviable for a retiree household. The proximity of a busy highway is vital to a shopping centre and quite annoying for a residential development.

All these external factors have diffuse effects: they may affect a broad market or be limited to a narrowly delineated area. Distinguishing between market effects (that affect all properties) and external effects (that affect only some properties) is still a fuzzy exercise. Urban economic theory does help ... but not much. We are still far from being able to count on hard and clear rules to measure properly depreciation (or appreciation) due to externalities.

6. Estimation of depreciation

If the identification of various forms of depreciation is difficult, you may guess that its measurement is even more problematic. We will present here some of the most common approximate solutions adopted in practice.

6.1 Estimation by direct comparison

This approach brings us back to our twin metaphor. Here the comparability is not limited to physical or locational traits but also should bear on the property age and the level of general maintenance.

With a sufficient number of comparables it may be possible to derive a representative rate of depreciation.

Example:

Recent sales of buildings in a suburban industrial park provide the following information.

Table III.8 Estimation of depreciation by direct comparison

Number of transactions	12
Average sale price per m^2 for comparable buildings	250$
Construction costs (as new) of these buildings (per m^2)	285$
Average depreciation per m^2	35$
Size of the subject property	3250 m^2
Estimated depreciation	113750$
Building:	
Construction costs (as new) of subject	926250$
Accumulated depreciation	113750$
Depreciated costs	812500$
Land:	
Land lot price (obtained from market)	135000$
Total adjusted value	**947500$**

6.2 Estimation by age/life measures

Let us first define the jargon:

Table III.9 Measuring age/life differences

Common term	Definition	Concept
Economic life	The number of years during which a property will continue to be usable.	Productive longevity
Remaining economic life	The number of years between the valuation date and the estimated economic life.	Residual longevity
Chronological age	Number of years that have elapsed since construction was completed.	Actual age, or historical age
Effective age	The age indicated by the conditions and utility provided by a property. The effective age may be more than the chronological age if the property is not maintained properly, or it can be less than the chronological age if it has had better-than-average maintenance, a good design, or a favourable location.	Apparent age

Relative longevity approach

The relative longevity approach (age/life approach) determines depreciation as a % of remaining economic life. Simply said, a property that has reached its mid-economic life point should be depreciated by 50%.

Or, generally, keeping in mind the above definitions:

Depreciation = Construction costs × (Effective age/Economic life)

Example:

Appraising a rental residential property (6 units, no lift, average standard, centre of town).

	Replacement costs
Building	240000$
- Economic age	40 years
- Apparent age	22 years
- Remaining economic life	18 years
% Applicable (1)	55%
Depreciation (2)	– 132000$
Depreciated costs (3)	= 108000$
Land lot	
Market price for comparable lots	35000$
Total adjusted value	**143000$**

(1) 22 years/40 years

(2) Thus 240000$ × 55%

(3) Thus 240000$ – 132000$

This simple treatment assumes that the effect of age is linear and global. For individuals, as for properties, this assumption is an oversimplification. Neither human bodies nor buildings deteriorate in a linear fashion (an extra year is not equal to the previous extra year) and it does not affect all the components to the same degree. Some components deteriorate very fast (external paint) and some may age more gracefully (an art-deco entrance statement).

The approach also ignores the remedial options (renovation or refurbishment) that may have been applied to the curable elements of a structure.

Relative longevity approach adapted for remediation

An adapted version of the previous relative longevity approach may reduce these difficulties.

Example:

Building	240000$
Curable depreciation (amount of required expenses)	– 53000$
Net depreciated costs	= 187000$
- Economic age	40 years
- Compensated age (1)	15 years
- Residual life	25 years
% Applicable (2)	37.5%
Depreciation (3)	– 70125$
Depreciated costs (4)	= 116875$
Land lot	
Market price for comparable lots	35000$
Total adjusted value	**151875$**

(1) The 'cure' reduces the apparent age to 15 years (residual life is increased).

(2) Or: 15 years/40 years

(3) Thus 187000$ × 38%

(4) Thus 187000$ – 70125$

6.3 Breaking down depreciation

In the same fashion that construction costs were decomposed in all their Lego components, depreciation could also be applied — Lego wise — to each component. The apparent good sense of this approach is masking its major drawback: depreciations are not additive, they are synergetic, that is, the depreciation of one element (e.g. the plumbing) has direct and indirect effects on most other components (walls, insulation, painting, structure, etc.).

However, with the proper expertise, and limited ambitions, this approach may provide adequate answers.

Example:

The element-by-element construction costs of a rental property are presented below. The land value is estimated at 18000$. The structure apparent age is 15 years. Its global economic life is estimated at 50 years but each component has different life spans, as indicated in the 3rd column.

	Construction costs (as new)	Economic life (years)	% of economic life (for an apparent age of 15 years)	Required expense to cure the depreciation
Direct construction costs				
Foundation	5920$	50	30.00%	1776$
Roof structure	7400$	15	100.00%	7400$
Exterior walls	44400$	50	30.00%	13320$
Floor and covering	29600$	18	83.33%	24667$
Plumbing and electricity	26640$	20	75.00%	19980$
Landscaping	5920$	50	30.00%	1776$
Indirect costs and margin	28120$			
Total cost	**148000$**			
Total depreciation				**68919$**

6.4 A causal treatment of depreciation

Since depreciation (and eventually appreciation) may come from various sources and may require different remedies, the next approach will distinguish the various sources and try to identify the expenses required to cure depreciation. The following table (Table III.10) summarises the various options applicable to different sources of depreciation.

Table III.10 Available estimation approaches

Causes	Curable	Incurable
Physical	Evaluate the replacement expenses	Apply age/life % to each component
Functional		
- From defect	Evaluate the cost of providing the missing component	Present value of the income lost because of the lack of a component
- From deficiency	Evaluate the replacement or modification expenses	Present value of the income lost because of the diminished utility
- From superadequacies	Cost of remedying the inadequacy	Present value of supplementary costs or loss in resale value
Externalities		Present value of disadvantages or advantages

Let us once more try to illustrate a simplified treatment.

• *Step 1: Estimate the curable physical depreciation*

In the first step you estimate the expenses that are required to remedy the identified physical deterioration. These expenses must be justifiable and should not increase the property value beyond market benchmarks.

	Construction costs (as if new)		Required expenses
Foundation	5920$		
Roof structure	7400$		3000$
Exterior walls	44400$		2500$
Floor and covering	29600$		500$
Plumbing and electricity	26640$		
Landscaping	5920$		
Depreciation			6000$
Indirect costs and margin	28120$		
Total cost		148000$	
Curable physical depreciation		– 6000$	
Balance of adjustment at the end of step 1		142000$	

• *Step 2: Estimation of incurable physical depreciation: age/life %*

Incurable physical depreciation will be estimated by using a relative longevity %. Ideally, you could try to read the market and find similar recently transacted properties (same age and characteristics). You could also combine both approaches in order to validate your estimations.

Value from step 1	142000$
Physical depreciation based on age/life 142000$ × (15 apparent years/50 years longevity)	– 42600$
Value at the end of step 2	99400$

• *Step 3: Estimation of the curable functional depreciation*

The required expenses can be broken down further and identified by their object and nature. Again, these expenses must be justified by market benchmarks.

Value from previous step	99400$	
Replacement costs for windows		12000$
Replacement of electrical panel		3000$
Curable functional depreciation	– 15000$	
Value at the end of step 3	84400$	

• *Step 4: Estimation of incurable functional depreciation*

With concepts that will be reviewed in later chapters, steps 4 and 5 require the estimation of the present value of rental losses caused by various functional deficiencies (rooms too small, poor ventilation, noise level, etc.) or (in step 5) the losses due to externalities (poor localisation, unfavourable neighbours, poor view, etc.).

You realize that this treatment requires a certain leap in faith of your capacity to evaluate the losses or advantages and to find the appropriate discount rate to value these streams of losses or benefits. The concept may be appealing; however, its application is quite problematic.

Value at the end of step 3	84400$	
Present value of the rental loss due to the apartment's loss of functionality (a loss of 1200$ capitalised at 10%).		12000$
Incurable functional depreciation	– 12000$	
Value at the end of step 4	72400$	

• *Step 5: Estimation of depreciation for externalities*

Result from step 4	72400$	
Present value of rental loss due to unfavourable localisation (400$ a year capitalised at 10%)		4000$
Depreciation for externalities	– 4000$	
Final result (Step 5)	68400$	

Summary:

Direct construction costs	119880$	
Indirect costs and margins	28120$	
Total costs	148000$	
Depreciation sources		Estimated expenses
Curable physical depreciation		6000$
Incurable physical depreciation		42600$
Curable functional depreciation		15000$
Incurable functional depreciation		12000$
Depreciation from externalities (incurable)		4000$
Accumulated depreciation		79600$
Adjusted depreciated value of the building	68400$	
Land value	18000$	
Total adjusted price	86400$	

7. What to think of the cost approach?

Beyond the difficulties mentioned at the beginning of this chapter, the cost adjustment approach is plagued with other problems and misconceptions.

7.1 Maximum price?

It is frequently stated that the cost approach provides a reliable benchmark for the maximum price for a property. Wrong!

Eventually the cost approach may produce a maximum reproduction or replacement cost at the end of the two first steps (land + construction), since no informed buyer would be willing to pay more for a property than it would cost to build a new one. However, the third step (from depreciation adjustments) may be so fraught with uncertainties and fuzzy calculations that the final result may be, or may not be, the maximum price.

Furthermore, this 'max. price' benchmark could, eventually, be valid in markets in equilibrium where supply can adjust immediately to demand. However, the substitution principle does not work when buyers are willing to pay market premiums to purchase now instead of waiting for the full construction or development time.

Property markets are notoriously sluggish: supply lags or precedes demand by variable intervals of time. The prediction of property cycles and adjustments is more akin to astrology than to science. In our property markets disequilibria are the norm rather than the exception and any approach that assumes a smoothly adapting production and pricing process is likely to be vulnerable.

7.2 Penny wise and pound foolish

Quantity surveying and construction costs estimates can be quite accurate (even very accurate); with some effort, various estimates of remediation costs can also be satisfactory. But, you have observed how vague the computation of functional and economic depreciation can be. Justifiably, you probably had to swallow hard to accept the measurements provided to measure external economic externalities. This was even more difficult to justify when the net effect of the economic 'depreciation' was in fact an overriding 'appreciation' of the property.

Practically all these external elements are extremely difficult to quantify. The theory is still vague on most important issues concerning externalities, and their empirical measurement goes far beyond traditional professional capabilities.

The question now is: why fake apparent precision on some minor elements (penny wise) when most of the most important valuation factors are so fuzzy (pound foolish)?

7.3 Rubbery calculations

According to the schematic valuation process presented in Chapter I, the valuer should, independently, apply the three approaches (market, income and cost) and then she should conciliate the independent results.

This conciliation usually bears on the 'weakest link' of the valuation process: the measurement of depreciation:

— If the value resulting from the cost approach is far above market benchmarks, then she may twiddle a bit her physical depreciation and serve large dollops of economic externalities.

— If, on the other hand, market prices are far above her cost estimate, then no problem: she increases land values to take into account all the wonderful economic-positive externalities.

Practising valuers will readily concede that, yes indeed, depreciation and cost adjustments are performed with a rather rubbery measuring tape. Thus, why should you trust — and invest your time and money — in such an elastic standard of measurement?

7.4 If you have good markets, then you don't need the cost approach!

We have stated, *ad nauseam*, that the validation of cost adjustments should be based on market comparison. This 'market reading' is the only source that can be invoked to support your land values, your evaluation of building component replacement costs, your estimate of margins and promoter's profits, your guesstimate of the various sources of depreciation.

Thus, it may be worth considering the paradox: if you have good market benchmarks, why should you rely on a dubious adjustment procedure? This answer is fairly clear: if you have a market, you don't need to rely on the cost approach.

The corollary is almost as clear: if you do not have market information, then the cost approach cannot be validated and should not be used.

This paradox is particularly interesting when compared to the general opinion that the cost approach works better for the valuation of homes. Interesting because it is justified by the fact that residential markets are more homogenous and that they provide more reliable information on transaction prices. Thus, again, the question is: if you have such good market information on residential transactions, why bother?

7.5 Then what?

It seems that the cost approach is not very comforting when used beyond the first two steps: the valuation of land and the estimation of construction costs. The rest of the process is much too fuzzy to provide any convincing support.

Thus, the approach should be limited to the following remedial situations:

- ***In desperate situations (orphans[1])***

— When properties are completely singular or located in 'empty' markets, the cost approach may, by default, be the only way to get some numbers. (Any number is certainly better than no numbers at all and, in practice, the valuer may not have any other choice.) In such cases, a careful application of the cost approach will be quite acceptable, particularly if the subject property is new or just recently built.

> *The depreciated replacement cost (DCR) methodology for valuation, which may not be fully supported by market data ... is considered an acceptable methodology to arrive at a surrogate for the Market Value of specialised property or property with a limited market.*
> International Valuation Standards 2001, p. 316.

- ***To validate other intermediate results***

— To bracket and validate market adjustments obtained from matching pair comparisons;

— To bracket and validate coefficients obtained from statistical analysis.

- ***In emerging markets***

— In emerging markets[2] — where 'market legibility' is very reduced — the cost approach is still the best and only starting point to establish price maps. The transformation of cost-based values to market values requires a set of institutional changes that may require quite a long time. In the meantime, it is better to start with reasonable cost (building and land) approximations than with very dubious transaction readings.

The International Valuation Standards add the following sentence to the previous citation:

> *DRC is a particularly helpful method in emerging markets where transactional data is scarce and where information on construction costs may be more readily available.*
> International Valuation Standards 2001, p. 316.

- ***And of course ...***

Applying the cost approach forces the valuer to make a complete and detailed examination and measurement of the subject property. It is often cynically affirmed that this may be the only good reason why this approach still deserves to be part of the valuers' toolbox.

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1. 'Orphans' could be: 1) 'limited' market properties that, because of their specificities, are rarely traded; 2) special purpose properties (also called Specialised Properties in the IVS) that are designed for a limited range of users and are usually only sold as part of a business; and 3) public or institutional buildings that may have no transaction value.

2. The International Valuation Standards devote a special note to 'emerging markets' valuation particularities. The major IVS points and my comments are included in the PVM-Web site.

8. Conclusion

It is suggested here that the 'cost approach' should be shed of its weakest link: the estimation of depreciation. It should be limited to 'construction costs' measurements and — if used beyond simple residential properties — it should be outsourced to cost experts (quantity surveyors, building engineers, project managers, etc.). The instrument, supported by robust software, fits well in their toolbox. When it is adulterated by fuzzy adjustments it does not fit so very well in the appraiser's toolbox!

However — by default — the depreciated cost approach remains the last resort solution to the valuation of 'orphans' and to the transitory valuation of assets in emerging economies.

The income capitalisation approach: valuing income flows

Where we clarify the different levels of property incomes and the appropriate discount rates that should be used to value these streams of income. Where we also rehabilitate the often maligned capitalisation approach but dismiss the summation approach.

This chapter presents the different branches of the income approach family and traces the very strong filiation between these approaches and the investment model that is used in income property analysis.

1. Introduction: the income approach family tree

In a perfectly transparent and efficient property market, the definition of value would never be a problem: the analyst would simply 'read' the market (as a share broker does constantly) and apply dutifully all the neat little formulas developed in financial analysis. In other words, he would simply apply the market comparison approach. Typically, on the share market, every share of Apple Computer Inc. has the same price, and if you read the price of a particular share you can derive the price of any other share by a 'market comparison'. However — fortunately for the valuation profession — the property market is neither perfectly efficient nor, even less, perfectly transparent and we do need some complementary approaches to help us establish a value when the price is not clearly tagged to the subject property.

The different approaches belonging to the income approach family are based on one of the principles enunciated in Chapter I: the value of an asset is the present value of the future flow of income: an investor does not buy past mortar and bricks, he buys future incomes.

The valuation approaches to be discussed now only differ from the standard discounted cash flow model[1] in their choice of the appropriate stream of

1. Presented in D. Fischer's textbook (2000): a prerequisite reading for this and the following chapter.

incomes to be discounted and, consequently, in the choice of the appropriate discount rates. Whereas, in after-tax cash flow analysis, you discount after-debt and after-tax streams of payments at the expected rate (**k_e**), you will now discount operating incomes (gross or net) at composite expected rates of return on the total value of the asset. The most important lesson to be drawn from this chapter is that the discounted cash flow approach will reach exactly the same conclusion as the valuation income approaches **if** the same operating and reversion assumptions are applied and **if** the discounted rates are adjusted properly. In other words: the different income approaches to be described shortly are simply different (and simpler) shades of the same general approach developed in full-fledged property investment analysis.

The genealogical tree of the income approaches family is presented below (Figure IV.1). Four branches can be identified:

1. The simplest approaches capitalise (i.e. discount) a single and perpetual flow of gross or net income;

2. The so-called residual approaches involve the 'physical splitting' of the value into two different components: the value of the building and the value of the land;

3. The mortgage-equity approach involves the 'financial splitting' of the total value into the value of the debt and the value of the equity;

4. Finally, in the last approach, the total value is split 'legally' in order to value separately the different components of the bundle of rights (the fee estate value and the leasehold value).

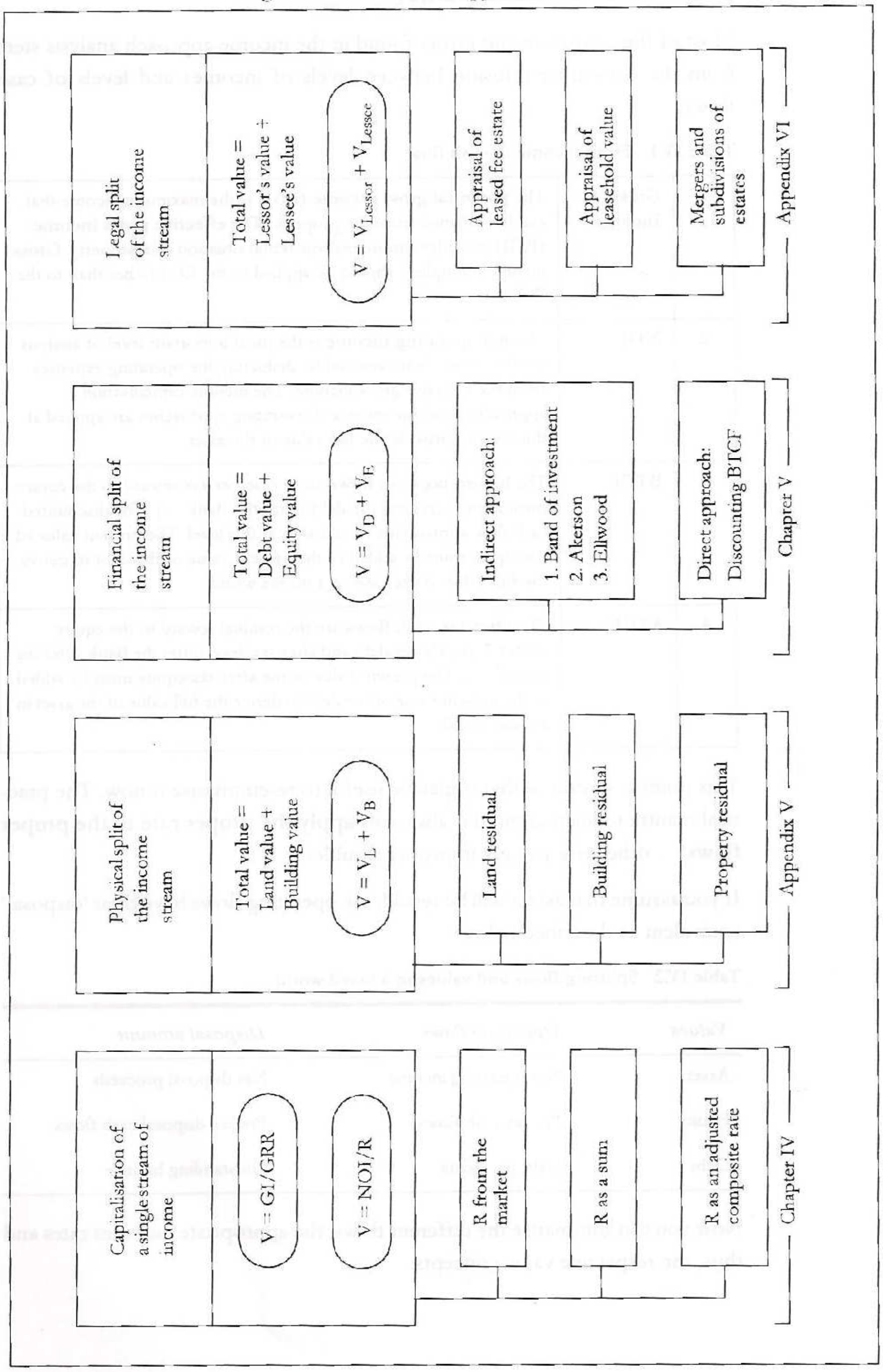
In this and the next chapter only two branches of the same family will be covered[1]:

1. The capitalisation and discounting of flows of gross or net income: this branch will be described generally as the **discounted net income approach or DNI** (Chapter IV).
2. The discounting of before or after-tax cash flows to take into account the 'financial' split between the equity investor and his lender (mortgage-equity split): this will lead to the standard **discounted cash flow approach (DCF)** and, incidentally, to the traditional but now largely useless mortgage-equity capitalisation tools (Chapter V).

   Appendix IV tries to shed light on the pervasive confusion between the discounted net income approach (DNI) and the discounted cash flow (DCF) that is still present in the International Valuation Standards.

1. The physical split is presented in Appendix V and the legal split is presented in Appendix VI.

Figure IV.1 The income approach family tree



2. Income … what income?

Most of the confusion and errors found in the income approach analysis stem from the constant confusion between levels of incomes and levels of cash flows.

Table IV.1 From income to cash flow

1	**Gross Income**	The **potential gross income (PGI)** is the maximum income that can be obtained from the property. The **effective gross income (EGI)** provides a more realistic rental situation of a property. Gross income multipliers should be applied to the EGI rather than to the PGI.
2	**NOI**	The **net operating income** is the most important level of analysis for the valuer. It is obtained by deducting the operating expenses from the effective gross income. The income capitalisation approaches and the income discounting approaches are applied at this level to provide the full value of the asset.
3	**BTCF**	The **before-tax cash flows** are the before-tax reward to the equity owner after servicing the debt (after the Bank …). The discounted cash flow approaches should start at this level. The present value of the equity must be added to the present value of the debt to derive the full value of the asset in a no-tax world.
4	**ATCF**	The **after-tax cash flows** are the residual reward to the equity owner. It is an 'after-debt and after-tax' level (after the Bank, after the Queen …). The present value of the after-tax equity must be added to the present value of the debt to derive the full value of the asset in a taxed world.

This point is so crucial that it may be useful to re-emphasise it now. The practical mantra to keep in mind is always to **apply the proper rate to the proper flows** … otherwise you get in proper trouble.

If you assume that assets will be resold, the operating flows have their 'disposal' equivalent as described below:

Table IV.2 Splitting flows and values in a taxed world

Values	*Operation flows*	*Disposal amount*
Asset	Net operating income	Net disposal proceeds
Equity	Pre-tax cash flows	Pre-tax disposal cash flows
Debt	Debt payments	Outstanding balance

Now you can summarise the different flows, the appropriate discount rates and thus, the respective value concepts.

Table IV.3 What to discount? At what rate? To do what?

Flow level	*Discount rate*	*Value*	*Usage*
Effective gross income	Gross rate of return	Total asset value	Mostly used for real estate sale information.
Net operating income	Net rate of return or capitalisation rate	Total asset value	This is the ideal level of analysis for 'fat market' valuation. (Information on comparables is abundant and reliable.)
Before-tax cash flows	Expected before-tax return on equity (k_c*)	Non-taxed value of the equity	Mostly useful for 'thin market' valuations and summary investment analysis. Also the appropriate level for non-taxed investors.
After-tax cash flows	Expected after-tax return on equity (k_c)	Taxed value of the equity	The 'motherhood' approach for 'thin market' investment analysis and various forms of financial expertise.

3. The income capitalisation approach: a review

The general 'capitalisation' model will now be dissected in order to clarify its implicit assumptions. Then you will have to decide whether or not these assumptions can be taken seriously enough to warrant the quasi-universal professional acceptance of this simplified form of analysis.

3.1 The general formulation

In a standard corporate finance textbook, the financial story of an income producing property in a tax-free world would be written as the present value of a stream of incomes: income from operation (NOI) and income from disposition (NIREV). These annual amounts are discounted at a composite rate: the weighted average cost of capital (WACC) noted below as $\mathbf{k_a}$. This WACC is a weighted average of the respective costs of the mortgage capital and the equity capital.

$$V = \frac{NOI_1}{(1+k_a)^1} + \frac{NOI_2}{(1+k_a)^2} + \frac{NOI_3}{(1+k_a)^3} + \ldots + \frac{NIREV_n}{(1+k_a)^n}$$

NOI_t	Net operating income in year t = 1, 2, 3, … , n
$NIREV_n$	Net income proceeds at disposition (reversion) in year n
k_a	A composite discount rate (the weighted average cost of capital)

By contrast, the favourite tool of the valuation profession is a condensed version of the standard model described above.

The most general valuation formula is written:

$$V = NOI/R$$

V	Property value
NOI	A 'normalised' net operating income that should reflect the normal and optimal use of the property
R	The overall capitalisation rate: a composite discount rate to be discussed more fully shortly[1]

Thus, in this compact form, the second model assumes that the annual operating income is constant and that the property is held indefinitely: no disposition proceeds appear in the valuation formula.

It may be important to insist on the orthodoxy (in the eyes of the corporate finance theorists) of this simple valuation model. You are not dealing here with a theoretical renegade but with a very acceptable scion of the financial paradigm. The only departure from the 'realistic' normal treatment is due to the fact that you do not need to include the tax consequences of the investment.

If the reader needs to refresh her memory, she would do well to convince herself that this general (V = NOI/R) format is in keeping with the nature of the perpetuity concept.

Value of perpetual flow of annuity: PV = Annuity/i = A/i

The analogy should now be clear:

$$PV = A/i \text{ --------- } Value = Income/Rate \text{ -------- } V = NOI/R$$

The numerator NOI is a 'normalised' (i.e. smoothed, stabilised) annual income and the denominator **R** is a composite rate that should incorporate an annual yield and a recovery factor.

R should reflect the expected return **on** the investment and **of** the investment. In fact this composite rate can be viewed as an amortisation factor (A/P , k , n) since the amortisation factor is also a composite of a yield (**k**) and the recovery of the capital advanced by the investor over **n** years:

(A/P , k , n)	=	k	+	(A/F , k , n)
Annuity factor		Yield		Sinking fund factor

1. UK-sphere texts seem to infer that the income to be capitalised should only be the first year income. This treatment is inappropriate since the capitalisation process implies perpetuity. If you assume a perpetual flow of incomes, you must try to find an income measure that reflects the most representative level of 'normal' incomes. This is why US texts advocate the used of 'stabilised', 'normalised' or 'smoothed' net operating income.

The same interpretation can now be given to the overall capitalisation rate **R**:

R = an annual yield + a 'sinking fund' capital recovery

Or also:

R = a return on capital + a return of capital

Since this composite nature of the capitalisation rate will take various forms in the different income models, it may be useful to insist on the generality of this format and thus to clarify the semantics of the adjective 'overall' included in the valuers' expression: the overall cap. rate.

Depending on the chosen model, 'overall' may mean a weighted average return **on** and **of** physical (land and building) or financial (debt and equity) components or it may even include appreciation, depreciation and equity buildup factors. The various interpretations are summarised below:

Figure IV.2

$$R = k + \Delta V$$

R Overall cap. rate	*Rate of return*	*Value adjustment*
On total NOI	$\mathbf{k_a}$ on the total investment value	0 in perpetuity
Land and building weighting	**k** on land and building	To account for physical depreciation
Debt and equity weighting	$\mathbf{k_e^*}$ on equity (before-tax), also noted **Y** in Ellwood's notations	To account for economic appreciation or depreciation

3.2 The implicit hypothesis of the basic capitalisation model

To appreciate the simplifying elegance of valuation formula V = NOI/R, let us now proceed with a theoretical striptease that will take you from the fully dressed equity model to the bare bones compact model.

1. The maximum bid price for a property can be written as the summation of the debt element and the equity element discounted at the after-debt and after-tax expected rate of return $\mathbf{k_e}$:

$$V_1 = \text{debt} + \sum \frac{ATCF_t}{(1+k_e)^t} + \frac{ATREV_n}{(1+k_e)^n}$$

2. If you shed the taxation conditions, you could use a before-tax expected rate of return $\mathbf{k_e^*}$ to discount before-tax cash flows:

$$V_2 = \text{debt} + \sum \frac{BTCF_t}{(1+k_e^*)^t} + \frac{BTREV_n}{(1+k_e^*)^n}$$

3. Let us now drop the financing characteristics of our investment and use the unlevered discount rate $\mathbf{k_0}$:

$$V_3 = \sum \frac{NOI_t}{(1 + k_0)^t} + \frac{NIREV_n}{(1 + k_0)^n}$$

4. If now you assume constant annual incomes and no disposition, you can reduce the previous formula to a simple annuity:

$V_4 = NOI \times (P/A, k_0, n)$

5. And finally, if this annuity is treated as a perpetuity (n ⟶ infinity), you may write:

$V_5 = NOI/R$

Should we worry about the apparent limitation of our assumptions?

Let us illustrate this analytical process with a few examples in order to evaluate the importance of each critical assumption. Here I will proceed backward from the simpler to the more complex and examine the different levels of simplification.

1. the perpetuity issue
2. the constancy of the net operating income
3. the neglect of financing considerations
4. the neglect of taxation conditions

1. A perpetual stream of net operating income

If a property yields a perpetual net operating income of 100000\$ per year and if the expected rate of return on net operating income is 10%.

NOI = 100000\$/year

R = 10%

The value of this property would be 1000000\$:

V = 100000\$/0.10

= 1000000\$

When you write V = NOI/R, you implicitly assume that the NOI is constant and infinite and thus, you also assume that the reversionary value of the building is not taken into account. Does it matter? Let us observe the next example.

Table IV.4 Simple net income discounting, no Bank, no Queen!

NOI	100000$	
Expected rate of return on the NOI	10%	
Resale value (computed on year 6 at the expected rate of return on the NOI)		
Year	Net operating income	Present values
1	100000$	90909$
2	100000$	82645$
3	100000$	75131$
4	100000$	68301$
5	100000$	62092$
disposal in year 5	1000000$	620921$
6	100000$	
Property value	1000000$	1000000$

If the analyst assumes that potential buyers are rational investors, she must conclude that the value to such an investor will also be the present value of the future cash flows as for the existing owner.

Thus the maximum bid price offered by the rational investor will be 1000000$ (100000$/0.10) and the seller will receive a 5 years annuity of 100000$ and a reversion price of 1000000$.

The present value of this stream of payments could be written:

V	=	NOI (P/A , i , n)	+	REV (P/F , i , n)
V	=	100000$ (P/A , 10% , 5)	+	1000000$ $(1 + 0.10)^{-5}$
		Present value of a 100000$ annuity discounted at 10% over 5 years	+	Present value of the reversion price to be received in 5 years
V	=	379080$	+	620921$
V	=	1000000$		

Thus the results obtained by discounting the operation and disposition incomes can be short-circuited by applying the appropriate capitalisation rate:

V = 100000$/10% = 1000000$

You could (but do you need to?) continue this tale for all the subsequent investors. Each of them will, *ceteris paribus*, pay for the same future stream of income and an eventual disposition value which, in turn, will also reflect the same future incomes.

You can conclude that the disposal value reflects the potential value of a property: the seller will always buy the perpetual value of such a potential of future incomes. Therefore, the fact that the disposition value is not made explicit in the V = NOI/R capitalisation formula should not concern you.

Neither should you worry too much about the quasi-theological problem of defining what I mean by 'perpetual'. Of course, you understand that buildings (even when perfectly maintained, restored and recycled) are not eternal but you should also realize that eternity is a very relative concept in our financial time scale. The following example (Table IV.5) illustrates the effects of prolonging the life of a stream of income on the value of its source.

Table IV.5 To be or not to be eternal (at the rate of 10%)

NOI($)	Holding period	Present value at the discount rate of 10% ($)
100000	35 years	964415
100000	50 years	991481
100000	100 years	999927
100000	infinity	1000000

No … life does not start after 50.

Thus, if economists vaguely state that in the long term we are all dead, property analysts can be more precise and announce that nothing really matters after 50 years. Conveniently enough, the economic life of buildings is generally assumed to be 50 years. Thus, when applying the NOI/R valuation formula, you are simply assuming that the property will be held by one owner or a succession of owners until the end of the building's economic life.

2. The constant NOI issue

Don't we know that the world is not a static one, that rents go up (less frequently down) and that inflation (deflation) pervades all real estate activities? Indeed a property's net operating income is rarely, if ever, constant for more than one year and so the 'constancy hypothesis' should be a lethal blow to the acceptability of the capitalisation model. But is it so bad? Not really, and a simple example will illustrate that the constancy assumption is not as damaging as you may have believed.

Let us compare our previous story of a constant and perpetual NOI of 100000$ at a discount rate of 10% to a similar story where the value of a perpetual flow of NOI grows at a compound annual rate of 5% (of course such a perpetual growth rate does not make much sense, but I shall ignore this for the moment).

If this specific property enjoys a growth rate of 5%, you may assume that similar comparable properties enjoy the same ride either because of the general inflationary trend or for reasons specific to the particular market in which these properties are transacted. Thus the 'market' cap. rate obtained from the observation of recent transactions should reflect the same expected income pattern. Now, how should you adjust the capitalisation rate in such a world of growing NOI?

In corporate finance textbooks, the Gordon[1] formula is offered to solve the equivalent problem of finding the value of a share whose constant dividend increases at a constant average rate of **d** when the 'market' discount rate is **i**:

$$V = \text{dividend}/(i - d)$$

You could adapt this formula to deal with a property whose constant NOI increases at an average rate of **d** when the market 'inflationary' capitalisation rate is denoted R*.

$$V = NOI/(R^* - d)$$

And you could derive R*:

$$R^* = (NOI/V) + d$$

Thus the inflationary (R*) is equal to the non-inflationary R (NOI/V) plus the expected NOI rate of growth:

$$R^* = R + d$$

In our example:

$$R^* = 0.10 + 0.05$$

$$R^* = 0.15$$

And, according to Gordon's formula:

$$V = NOI/(R^* - d)$$

$$V = 100000\$/(0.15 - 0.05)$$

$$V = 1000000\$$$

Thus if the 'market' capitalisation rate properly reflects the anticipated inflation, the growing stream of income will be discounted at a lower rate and the adjusted discount rate (R = R* – d) will bring the property value back to the same level. Thus, here again, you should not worry too much about this constancy hypothesis as long as you 'apply the proper rate to the proper level of income'.

Of course, this conclusion applies whether you deal with a perpetuity or with a shorter period, as illustrated hereafter.

1. To derive the Gordon formula you write the present value of a flow of income growing at the constant rate g and discounted at R as:

$$V = \frac{NOI}{(1+R)^1} + \frac{NOI\,(1+g)^1}{(1+R)^2} + \frac{NOI\,(1+g)^2}{(1+R)^3}$$

which is the formula for a geometric progression whose first term is NOI/(1 + R) and the growth factor (1 + g)/(1 + R). At infinity, the sum of this progression is: V = NOI/(R – g).

Table IV.6 The NOI grows at a constant rate over 5 years

NOI	100000$	
Expected return on the net	15%	
Net income multiplier	6.67	
NOI annual growth	5%	
Capitalisation rate	10%	
Year	Net operating income	PV
1	100000$	86957$
2	105000$	79395$
3	110250$	72491$
4	115763$	66188$
5	121551$	60432$
6	127628$	
disposal in year 5	1276282$	
Present value of NOI flows		365462$
Present value of disposal flow		634538$
Property value		1000000$

V = Present value of NOI + Present value of disposal

V = 365462$ + 634538$

V = 1000000$

This result should not be too surprising since you already know (from above) that perpetuity and short detention are equivalent when you assume that the resale value is the discounted value of all the future incomes.

Here again you observe that you can use our short cut trick and apply the appropriate capitalisation rate to the first year income:

$$V = NOI_1/R$$

$$= 100000/(15\% - 5\%) = 1000000\$$$

Beyond its simplistic nature, this example is critically important since it clarifies the 'true nature' of the capitalisation rate.

Let us repeat what you observe here:

- The expected return on the NOI is 15%, because the investor is aware of the inflationary market conditions.
- The capitalisation rate is still 10%, precisely because the market takes into account the 'Gordon type' adjustment.
- The cap. rate is not the expected rate of return on the NOI, it is a 'growth' adjusted measure of the return. This point will be expanded later but, in this simple form, we must recognise the importance of the difference.

Accordingly, the common UK-sphere practice of equating the capitalisation rate to some kind of risk adjusted Bond rate is misleading and should be avoided.

But now, what happens beyond this point ... when the NOI does not grow at a constant rate?

Unfortunately, in this case you cannot apply your easy little capitalisation tricks and you need to perform a standard discounting treatment of the net operating and disposal income. The following example will show that this more realistic treatment is still a simple and straight application of the discounting approach.

Table IV.7 Discounting variable NOI and disposal

NOI		100000$	
Expected return on the net		15%	
Capitalisation rate		10%	
	Year	Net Operating Income	PV
	1	100000$	86957$
	2	101000$	76371$
	3	103500$	68053$
	4	117000$	66895$
	5	123000$	61153$
	6	142000$	
	disposal in year 5	1420000$	
Present value of NOI flows			359429$
Present value of disposal flow			705991$
Property value			1065420$

V = Present value of NOI + Present value of disposal

V = 359429$ + 705991$

V = 1065420$

Two important issues need to be addressed before we leave the 'no-debt-no-tax' world:

1- In Australia and other countries of the UK-sphere, the previous exercise is termed a 'Discounted Cash Flow' treatment. This nomenclature is inappropriate and particularly confusing compared to the US-sphere academic and professional literature. Obviously, here you are not discounting flows of cash, you are discounting flows of net incomes (operation and disposition net income). A cash flow is not a net income ... except in the very trivial case of non-levered flows. Unfortunately, this definitional mix up leads to confusion in the choice of the appropriate discount rates.[1]

1. See Appendix IV.

2- It is not because you are now able to discount variable flows of income that you are rid of your beloved cap. rate. After all, you still need it to compute the resale value. Resale values could be derived in many ways but the most common approach is still to capitalise next year's NOI at the 'appropriate cap. rate'.

This is precisely why it is still so important to have a crystal clear comprehension of the misunderstood cap. rate.

3. and 4. The financing and the taxation issues

These two last hypotheses are more difficult to handle in a simple way since, as you may know, the problem of the relationship between financing, taxes and value has not yet received a completely satisfactory answer.[1] As the reader may guess, one of the problems here is that financing and taxation are intimately related.

The empirical answer to our problem is nevertheless quite straightforward:

— If the discount rate **R** is obtained from the observation on non-levered and non-taxed properties (e.g. a superannuation fund portfolio) then the cap. rate and thus the value of the property will not reflect the financing and taxing characteristics of the asset.

— If the discount rate **R** is obtained from comparably levered and taxed investments (other similar properties with the same typical financing conditions) then obviously the value NOI/R will reflect the financing and taxation structures since **R** is a composite rate of the relative cost of the different sources of capital (debt and equity).

— Unfortunately, this is not the end of the story since, as you shall see in Chapter V, you need to further adjust your **R** rate to take into account the variation of the equity component.

3.3 Finding R: the overall discount rate

• The market **R** and the search for the elusive 'twins'

Ideally, **R** should be extracted from a sample of recently transacted similar properties. Admittedly, this concept of similarity is rather vague but some minimal comparability conditions should be considered:

— since the overall **R** discounts the income flowing from the land component and the building component indiscriminately, the sample of similar properties should have approximately the same land/building value ratio as the subject property;

1. See Appendix VI.1 in Fischer (2000) for a brief discussion of the issue.

— since **R** is also a composite made up of a yield rate and an amortisation rate, the sample of similar properties should consist of properties of similar ages and located in similar markets so that the appreciation (or depreciation) of the properties is comparable; and

— since the **R** does reflect the yield expected by the investor, this yield should reflect the relative riskiness of the property and thus the comparative sample should be made up of properties that have approximately the same risk characteristics. Thus, the comparable properties should have approximately the same financing structure (as measured by the D/V ratio), the same operating ratio (as measured by the NOI/EGI), the same type of management, the same general location, the same fiscal and legal environment, etc.

Of course under such restrictive comparability conditions the search for the proper sample of recently transacted similar properties represents a major challenge. Quite often the choice is, by necessity, limited to a very small number of properties (five or so) and the representativeness of such a limited sample would not make a statistician very happy.

However, since this is an inescapable aspect of the problem, a fair amount of 'creative fudging' has to be tolerated. Most of the time, siblings or distant cousins will replace the ideal identical 'twin property'. This approximation may not be too damaging since, after all, the reliability of the results can be continually tested by the verdict of the market.

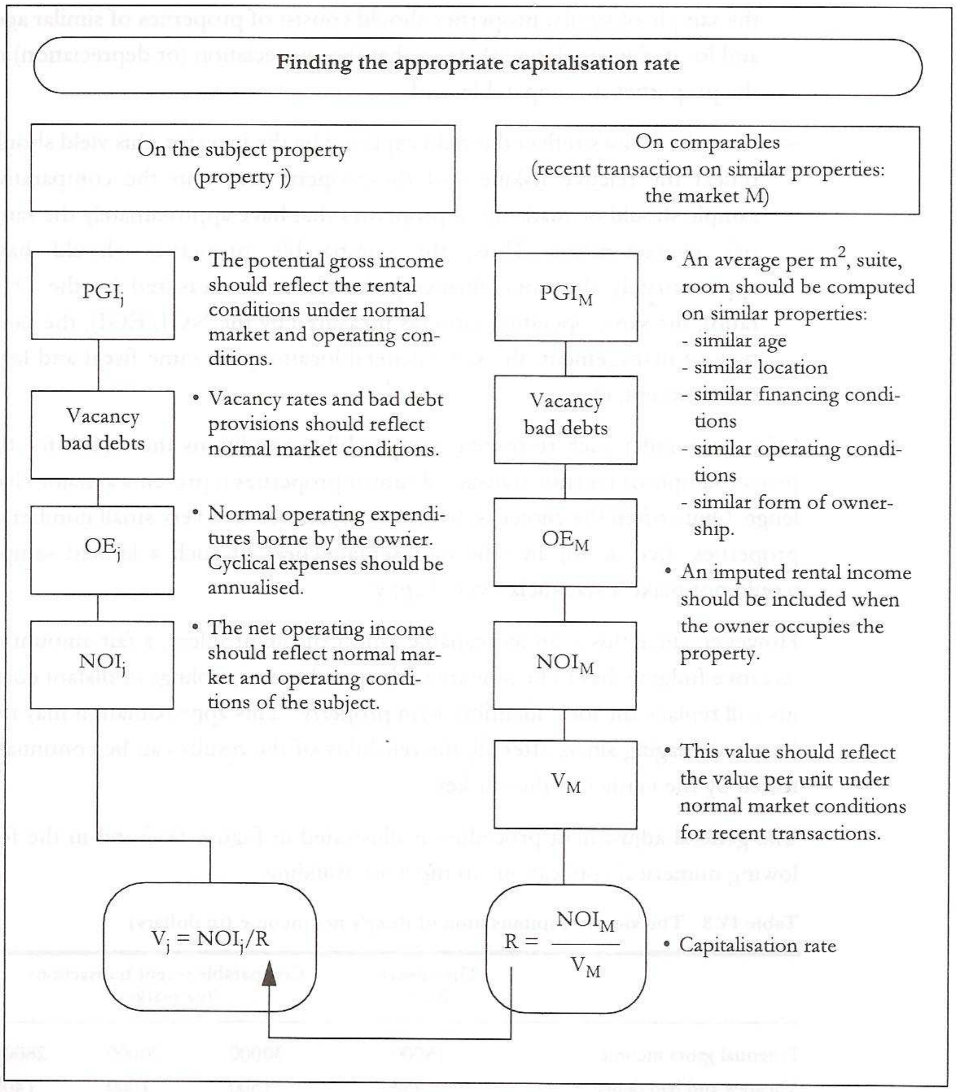
The general adjustment procedure is illustrated in Figure IV.3 and in the following numerical application[1] to the Rosy Building.

Table IV.8 The simple capitalisation of Rosy's net income (in dollars)

	The subject (Rosy)	Comparable recent transactions 'the market'		
Potential gross income	15000	30000	20000	28000
Vacancy and bad debts	750	1500	1000	1400
Operating expenditures	5250	12000	8200	9100
Net operating income	9000	16500	10800	17500
Observed selling price		153450	111240	162750
Overall cap. rate		10.75%	9.71%	10.75%
Average cap. rate			**10.40%**	
Rosy appraised value	V = 9000/0.104 = 87000$ approx.			

1. The reader may recognise the Rosy Building used as a continuous example in Fischer, D 2000, *Income property analysis and valuation*. The full example is provided in the companion PVM-Web site.

Figure IV.3 Adjusting the capitalisation rate through comparisons



Despite the empirical difficulty and the statistical flimsiness of this approach, the capitalisation of a single stream of income with a properly observed market rate is the simplest, cheapest and, after due consideration, the best approach to use when a reasonably decent sample of comparable properties can be found.

Dealing with orphans

When the valuer cannot rely on an acceptable empirical observation of the market (i.e. no twins, no siblings, nor even distant cousins ...), he may have to make up a cap. rate. Two avenues are open to him: the summation approach and the composite adjusted rate approach. The first one is easy but wrong, the second one is less wrong but not easy. The choice is yours.

The summation will be briefly described and dismissed here and the composite adjusted rate (mortgage-equity rate) will be covered separately in Chapter V and Appendix III.

• **R** as a summation

Here an estimate of the appropriate capitalisation rate is built up through a rough and intuitive decomposition of the elements of the discount rate. Some risk premium is added to the expected rate of return on a riskless asset to take into account the additional risk borne by the subject property (illiquidity, locational constraints, quality of management, etc.). Thus, the composite discount rate obtained in this *ad hoc* fashion deflates the value of the asset to allow for the margin of risk as it is perceived by the valuer.

A hypothetical example may illustrate the principle (and fuzziness) of the summation approach:

Table IV.9 The summation of rate components

Risk free return (e.g. Treasury Bills)	10%
Premium for illiquidity	3%
Premium for high transaction costs	2%
Premium for management troubles	5%
Aggregate capitalisation rate (**R**)	20%

In this example, the value of a riskless asset that generates a 10000$ flow of NOI would be 100000$ (10000$/0.10: where 10% is the riskless rate) whereas a risky real estate asset generating the same 10000$ stream of revenues would be worth only half as much (10000/0.20).

This approach of capitalisation, though intuitively appealing, is fraught with dangers.

— The first weakness of the summation approach is that the *ad hoc* premiums cannot be substantiated by anything more reliable that the valuer's 'best professional judgment'. Such risk premiums are often illustrated but rarely justified in professional literature. Presumably, they reflect the risk premiums on vaguely similar financial instruments (non-callable bonds, yields on thinly traded assets, or returns on shares of very cyclical industries), but the operating and management characteristics of such assets are not comparable to the characteristics of real estate assets and the exercise is quite futile.

— The second weakness of this approach is the unacceptable risk-padding amplification effect of compounding rates. This effect is numerically demonstrated in the companion PVM-Web.

This crude summation approach of risk adjustment may have been justified when alternative approaches were unavailable but since better (though not simpler) approaches now exist, the summation approaches should not be used in a professional context. In fact, it should be banned.

• **R**: a composite adjusted cost of capital

This last format, which is based on the mortgage/equity composition of the property value, will be dissected, *ad nauseam*, in the following chapter.

4. Conclusion

The apparent simplicity of the V = NOI/R formula led us to a few interesting surprises:

— The implicit assumptions of the simple valuation model are perfectly reasonable when properly understood;

— The model is not fundamentally different from models used in traditional corporate finance. In fact, the most useful discovery was the similarity between the Gordon formula and the general adjustment procedure;

— Certainly the most important conclusion is that the simple **V = NOI/R** model should be preferred to any other valuation model to value income properties when a satisfactory market **R** can be observed from similar recent transactions (fat market environment).

Only in the absence of a decent market sample (thin market environment) should we rely on other approaches where a capitalisation rate must be constructed on the basis of various financing and equity growth assumptions. These more complex approaches are covered in the next chapter.

However, once again, complexity should not be confused with sophistication. There is more behind the apparent elegant simplicity of our capitalisation model than meet the eye.

Chapter V

The DCF approach: valuing cash flows

Where, in the absence of reliable market rates, we attempt to fashion a composite rate that takes into account the capital structure and the equity variation of the property. Where, finally, we insist on the strong filiation between the discounted cash flow model and its Inwood-Akerson-Ellwood ancestors.

1. Splitting income flows: mortgage and equity

The so-called mortgage-equity valuation approaches were developed in the USA in the late fifties to account for the highly levered and inflationary environment of the postwar real estate markets. Under such conditions, the appraising profession wanted to be able to deal with the new reality: a 'growing income - levered - fluctuating value' world. Not coincidentally, this conceptual transition was eased by a technical one: the development of financial adjustment tables (the Ellwood tables).

Here, you will first review the conceptual basis of mortgage-equity approaches. Then four alternative mortgage-equity approaches will be presented and the matter of choice among those approaches will be raised. Most of the material covered in this chapter should be linked directly with the previous textbook (Income Property Analysis and Valuation), since you are using, simultaneously, the discounted cash flow and capitalisation of income concepts of value. The difference resides in the fact that here you discount before-tax cash flows and that you use a composite-adjusted rate of capitalisation. This composite rate will account for the financing conditions and the property appreciation or depreciation.

In a non-taxed world, the income and thus the asset value can be sliced up as shown in Table V.I.

Table V.1 Splitting flows and values in a non-taxed world

Values	*Operation flows*	*Disposal amount*
Asset	Net operating income	Net disposal proceeds
Equity	Pre-tax cash flows	Pre-tax disposal cash flows
Debt	Debt payments	Outstanding balance

You could write the two flows separately:

Equity = PV of before-tax cash flow + PV of before-tax disposal cash flow

$$\text{Equity} = \sum_{t=1}^{n} \frac{(BTCF_t)}{(1 + k_e{*})^t} + \frac{BTEDISP_n}{(1 + k_e{*})^n}$$

The discount rate $\mathbf{k_e}$* used to find the present value of the equity flows is the investor's expected before-tax rate on similar forms of equity investments.

The other component is the stream of debt payments:

Debt = PV of periodic debt payments + PV of the outstanding balance of the loan

$$\text{Debt} = \sum_{t=1}^{n} \frac{(PMT_t)}{(1 + k_d)^t} + \frac{OSB_n}{(1 + k_d)^n}$$

The discount rate $\mathbf{k_d}$ used to find the present value of the debt flows (PMT and OSB) is the effective cost of debt (effective financing costs).

And, you add the two flows to obtain the full asset value:

$$\text{Value} = \sum_{t=1}^{n} \frac{(PMT_t)}{(1 + k_d)^t} + \frac{OSB_n}{(1 + k_d)^n} + \sum_{t=1}^{n} \frac{(BTCF_t)}{(1 + k_e{*})^t} + \frac{BTEDISP_n}{(1 + k_e{*})^n}$$

$$\text{Value} = \sum_{t=1}^{n} \frac{(PMT_t)}{(1 + k_d)^t} + \sum_{t=1}^{n} \frac{(BTCF_t)}{(1 + k_e{*})^t} + \frac{OSB_n}{(1 + k_d)^n} + \frac{BTEDISP_n}{(1 + k_e{*})^n}$$

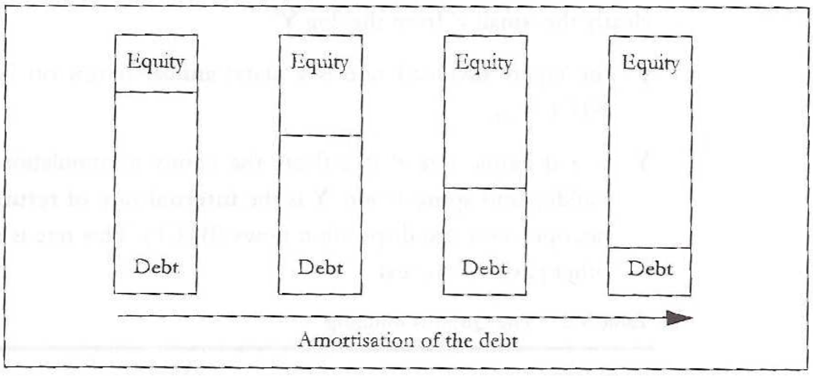
And since the NOI is the sum of debt payments and cash flows, you can write:

$$\text{Value} = \sum_{t=1}^{n} \frac{(NOI_t)}{(1 + k_a)^t} + \frac{NDISP_n}{(1 + k_a)^n}$$

The discount rate $\mathbf{k_a}$ used to find the present value of the net income flows (NOI_t and $NDISP_n$) is the expected rate of return on 'twin assets' (identical twin assets should have the same traits: same risk exposure, same financing and operating leverages, same land-to-value ratio, same location (time and space location), same age, same form of management and ownership, etc.).

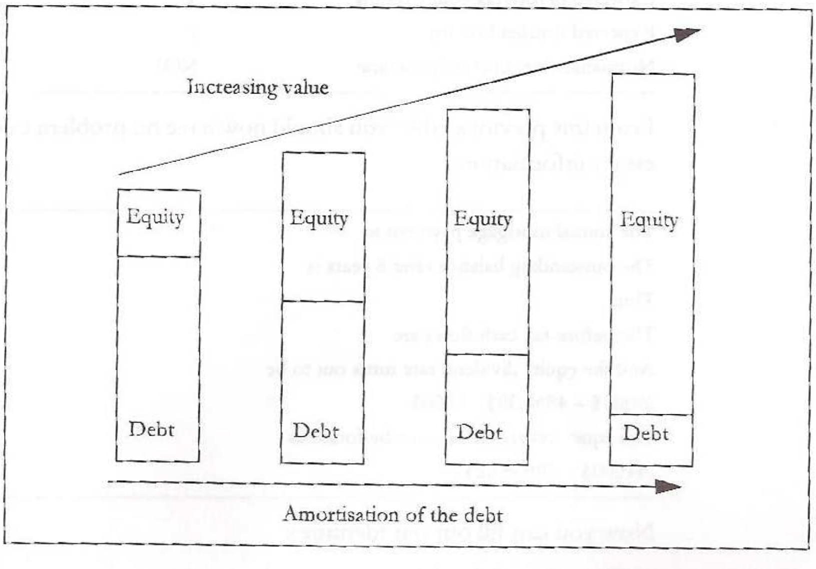
This identity is valid at any point during the holding period since any decrease in the liability on the property will be translated into increased equity. When the debt decreases (through principal amortisation or prepayments), the accumulated equity increases: the equity builds up. Conversely, any increase in debt financing (refinancing) will lead to a decrease in accumulated equity. This variable split of value can be illustrated below (Figure V.1).

Figure V.1 When debt decreases, equity increases



If, furthermore, the total value of the property increases, the equity will be correspondingly increased and added to the equity buildup (and conversely), as illustrated in Figure V.2.

Figure V.2 When value increases, equity increases



2. The direct summation of split flows

The direct summation of discounted debt and equity before-tax cash flows will now be illustrated with the Quintus Building. The required information is presented in Table V.2. Most variables should be self-explanatory but for the y rate. y is the 'equity dividend rate' also described as the 'cash on cash ratio': $BTCF/E_0$. This is a static return that does not take into account the possible appreciation or depreciation of the property. The y notation is used here to coincide with the notation traditionally used in the US-sphere appraisal literature. For the same reason, we will replace our before-tax equity rate k_e* (an internal rate of return on the before-tax operation and disposition cash flows) by Ellwood's **Y**. Inconvenient as it may be, you will have to distinguish clearly the 'small y' from the 'big **Y**'.

y the equity dividend rate is a static annual return on before-tax equity: $BTCF/E_0$;

Y is a dynamic rate that reflects the equity accumulation through equity buildup and appreciation. **Y** is the **internal rate of return** on the before-tax operation and disposition flows (BTCF). This rate is also noted k_c* in other parts of the text.

Table V.2 The Quintus building

Initial value	V	40000$
Initial debt	D	32000$
nominal rate ($i_{1,1}$)	k_d	15%
amortisation	n	25 years
Net disposal price after 8 years	V_t	44000$
Expected before-tax equity return	Y	18.056%
Expected dividend return	y	13.12%
Normalized net operating income	NOI	6000$

From this previous table, you should now have no problem calculating the necessary information:

The annual mortgage payment is	4950.39$
The outstanding balance after 8 years is	29935.62$
Thus:	
The before-tax cash flows are	1049.61$
And the equity dividend rate turns out to be (6000$ – 4950.39$)/8000$	13.12%
The equity reversion can also be found as (44000$ – 29935.62$)	14064.38$

Now you can fill out our identities:

1. The value of the debt component[1]:

Debt	=	PV (PMT)	+	PV (Balance in t)
D	=	PMT $(P/A, k_d, t)$	+	OSB_t $(P/F, k_d, t)$
D	=	4950.39$ × 4.4873	+	29935.62$ × 0.3269
D	=	22213.99$	+	9786.01$
D	=	32000.00$		

2. The value of the equity component:

E	=	PV (BTCF)	+	PV (BTER)
E	=	BTCF × $(P/A, k_e^*, t)$	+	BTER × $(P/F, k_e^*, t)$

1. You may need to refresh your memory on financial maths notation: see Appendix II.

$$E = (6000\$ - 4950.39\$) \times (P/A\ ,\ 18.056\%\ ,\ 8) + (44000\$ - 29935.62\$) \times (P/F\ ,\ 18.056\%\ ,\ 8)$$

$$E = 1049.61\$ \times 4.0705 + (14064.38\$) \times 0.265033$$

$$E = 8000\$$$

Putting together Quintus' values you get:

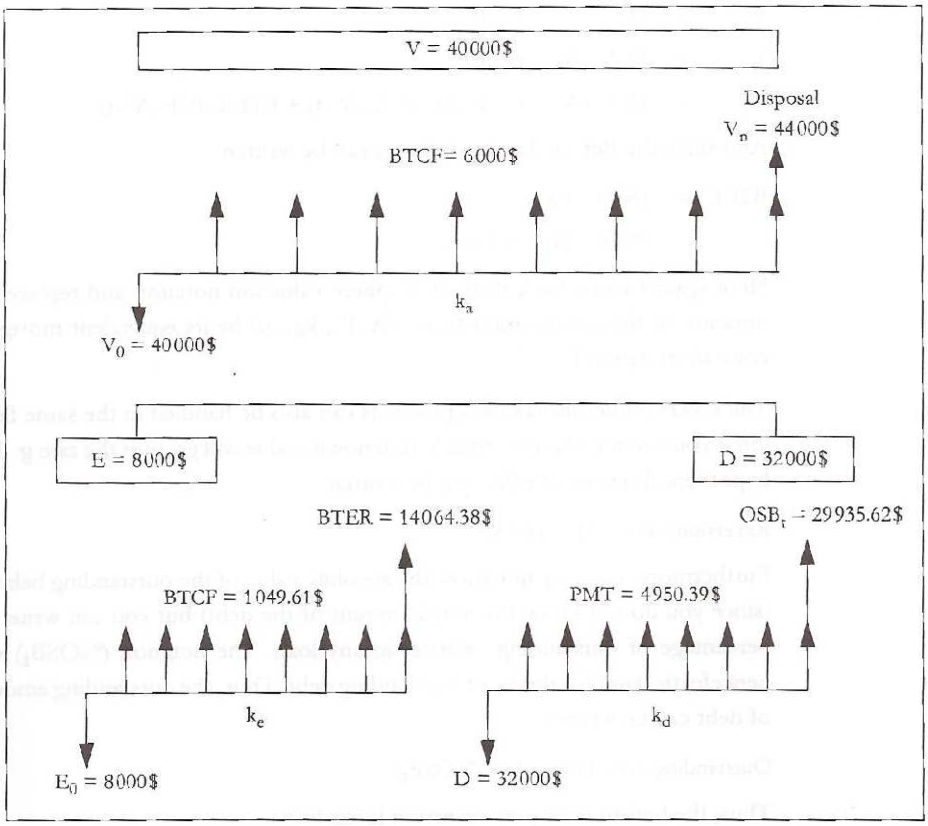
$$V = PV\ (Debt) + PV\ (Equity)$$

$$V = 32000\$ + 8000\$$$

$$V = 40000\$$$

This decomposition-reassemblage process can be depicted in Figure V.3.

Figure V.3 Adding Quintus' debt and equity



Or, in a numerical form, in Table V.3.

Table V.3 Splitting Quintus' debt-equity components of value

		Years 1 to 8		Year 8 (disposal)	
Debt (D)	32000$	PMT	4950.39$	Balance	29935.62$
Equity (E)	8000$	BTCF	1049.61$	BTER	14064.38$
Value (V)	40000$	NOI	6000.00$	REV	44000.00$

But, let us now admit that this impressive display has been perfectly tautological since I started from the (known) value of 40000$ to proudly reconstruct the same value of 40000$.

Valuers do not usually have such an easy life. They do not know the initial value; they are paid precisely to find it. So now you need to prove that your direct summation approach can indeed be used as a valuation instrument and that you can apply the same technique without knowing V initially. The only information (or assumption) required is the debt-to-value ratio (D/V).

When, as in a typical valuation context, V and thus D are unknown, you can transform the value identity as shown below:

$$V = D + E$$

$$V = D/V \times V + E$$

$$V = D/V \times V + BTCF\,(P/A, Y, t) + BTER\,(P/F, Y, t)$$

And since the Before-Tax Cash Flows can be written:

$$BTCF = (NOI - PMT)$$

$$= (NOI - D/V \times V \times f)$$

Here again I come back to the US-sphere valuation notation and replace the notation of the amortisation factor $(A/P, k_d, n)$ by its equivalent mortgage constant notation **f**.

The reversion before-tax cash proceeds can also be handled in the same fashion if you assume that the initial V (unknown) value will grow at the rate **g**. The hypothetical reversion value can be written:

Reversion value $= (1 + g) \times V$

Furthermore, you may not know the absolute value of the outstanding balance (since you do not know the initial amount of the debt) but you can write the percentage of outstanding balance on any loan. The notation $(\%OSB_t)$ will henceforth stand for this % of outstanding debt. Thus, the outstanding amount of debt can be written:

Outstanding debt: $D/V \times V \times (\%OSB_t)$

Thus, the before-tax equity reversion looks like:

$$BTER = V_n - OSB_t$$

$$= (1 + g) \times V - D/V \times V \times (\%OSB_t)$$

And, if you piece the equity and debt elements together and turn them into present values, you have:

$$V = D/V \times V + (NOI - D/V \times V \times f) \times (P/A, Y, t) + \left[(1 + g) \times V - D/V \times V \times (\%OSB_t)\right] \times (P/F, Y, t)$$

Or, in the Quintus example:

$$V = 80\% \times V + (6000\$ - 80\% \times V \times \mathbf{0.1547}) \times 4.0705 + [\mathbf{1.10} \times V - 80\% \times V \times 0.93549] \times 0.2650$$

Which boils down to:

$$V = 0.38942 \times V + 24423.15\$$$

$$V \times (1 - 0.38942) = 24423.15\$$$

and *(enfin!)*:

$$V = 40000\$$$

This reassuring result should convince you that this direct valuation approach does indeed work. Just to make sure, you could check the computation by re-introducing V in the full equation:

$$V = 80\% \times 40000\$ + (6000\$ - 80\% \times 40000\$ \times 0.1547) \times 4.0705 + [(44000\$ - 80\% \times 40000\$) \times 0.9354] \times 0.2650$$

$$V = 32000\$ + (6000\$ - 4950.39\$) \times 4.0705 + (44000\$ - 29935.62\$) \times 0.2650$$

$$V = 40000\$$$

The value can be obtained on the basis of a minimal set of information and hypothesis: one information on the net income and three hypotheses on anticipated appreciation (or depreciation) rates and the financing factors and ratios.

This approach is called the 'direct' approach since it requires only the summation of present value flows. It is also called the traditional approach because it relies on the standard corporate finance model. It may (and should) also be called the Inwood approach to emphasise its venerable ancestry (William Inwood, 1820).

What matters most here is that this direct valuation formula is not essentially different from the Equity Model used in financial analysis. The direct Inwood-valuation solution is a mere simplification of the discounted equity flow model and differs only in the assumption of constant net incomes and of a no-tax world. You are indeed on a very familiar terrain.

3. Capitalisation at a composite adjusted R

In Chapter IV the virtues of the cap. rate treatment were demonstrated and applied to the discounting of a single flow of constant normalised income. Here you split the pie again but still apply the parsimonious valuation model:

V = NOI/**R**

The main problem now is to adjust your discount rate **R** to account for the composition and evolution of the debt and equity components.

Four alternative solutions will be suggested to match the increased complexity of our hypothesis. From the simple 'perpetuity' hypothesis, you will move, stepwise, to a solution that will include the amortisation of the debt and the appreciation (or depreciation) of the asset.

3.1 The non-adjusted R: discounting perpetual flows

If debt repayments and equity flows are considered constant and perpetual (i.e. the debt is not amortised and the property value does not increase nor decrease), then the discount **R** is written exactly as the 'weighted average cost of capital' of corporate finance textbooks:

$$R = D/V \times k_d + E/V \times y$$

Here k_d is the annual cost of debt and **'y'** is the static cash-on-cash rate (a.k.a. the Equity Dividend Rate: EDR) commonly used in the US-sphere valuation literature. Let us apply this formula to the Quintus example:

Table V.4 The non - adjusted Quintus R

	Relative weight	Rate	Weighted factor
Debt (D)	D/V	k_d	D/V . k_d
Equity (E)	E/V	y	E/V . y
Weighted rate			R
Appraised value			(NOI/R)
Debt (D)	0.80	0.1500	0.1200
Equity (E)	0.20	0.1312	0.0262
Weighted rate			0.1462
Appraised value			6000$/0.1462
V			41028$

Or, algebraically:

$$\begin{aligned} R &= 0.80 \times 0.15 + 0.20 \times 0.1312 \\ &= 0.1200 + 0.02624 \\ &= 0.1462 \\ V &= 6000\$/0.1462 \\ &= 41028\$ \end{aligned}$$

Thus it does not work! You do not come close enough to our Quintus value of 40000$ and you cannot invoke rounding errors to justify this discrepancy.

Of course it does not work[1] (the opposite would have been more of an embarrassment). The discounting at the weighted average cost of capital works only

1. The use of the weighted average cost of capital to discount the NOI is still widely advocated in UK-sphere textbooks and even in some US articles (Kincheloe, 1988). It cannot work: the maths are wrong and the standard corporate finance treatment does not apply here (Fischer, 2000).

for perpetuities since it assumes a constant D/V ratio. Here, it cannot be used with an amortised loan. The difference would be even greater if you had chosen a shorter amortisation period (try it!). Thus, you must tinker with our previous formulation to account for this debt amortisation.

3.2 Adjusting R to account for debt amortisation

Here you have to modify the debt component of your weighted average and replace the $\mathbf{k_d}$ rate by the amortisation factor **f,** which stands for (A/P , k_d , n):

$$R = D/V \times \mathbf{f} + E/V \times \mathbf{y}$$

Let us test our new **R** formula (also called — for mysterious reasons — the 'band of investment' formula):

Table V.5 Adjusting R for amortisation of the debt

	Weight	Rate	Factor
Debt (D)	D/V = 0.80	f = 0.1546	D/V × f = 0.1237
Equity (E)	E/V = 0.20	y = 0.1312	E/V × y = 0.0262
Adjusted rate			0.15
Appraised value	(NOI/R)		40000$

Now it does work: our **R** of 15% does give a value of 40000$.

But, surprisingly, it works despite the fact that you still have not taken into account the variation of the equity component. Strange!

Well, not so strange if I admit that I have fudged the rate **y** of 13.12%. Of course I did not formulate **y** as an *a priori* hypothesis (the attentive reader may have wondered about this inordinately precise rate) but I had to compute it backward from the knowledge of the expected rate of return **Y**.

Through this devious choice of assumptions I hope to illustrate once more the fundamental difference between **y** and **Y**. And this is worth repeating … and repeating again. In your Quintus case, the internal rate of pre-tax return **Y** of 18.056% reflects the increased value of the equity, whereas the static **y** of 13.12% does not. In fact, as you shall see later, the relationship between **Y** and **y** is written:

$$\mathbf{y} = \mathbf{Y} - V/E \times (\text{Equity adjustment})$$

The so-called band of investment formula is generally presented as if the **y** rate could be picked up from 'the market' as an expected dividend rate. But unfortunately, it does not work that way since there is no 'market reading' of **y** and no reliable way to know the normal expected cash-on-cash rate of return. Most investors explicitly or implicitly may be shooting for an expected **Y** … never for an expected **y** that depends so heavily on the financing conditions. This is why you must now further adapt the adjustment procedure to include this equity adjusted dynamic rate of return **Y** to replace our elusive **y**.

3.3 R adjusted for the variation of equity

This elegant procedure was introduced in 1959 by LW Ellwood who published pre-calculated adjustment tables and formulated the complete theoretical analysis of most of the problems that are discussed here.

Unfortunately, Ellwood's prose and notation were not models of pedagogical clarity and his contribution remained largely misunderstood and unrecognised outside the appraising profession. Here I prefer to use the presentation offered in 1970 by CB Akerson who tried to simplify Ellwood's somewhat obscure explanations. Nevertheless, for the sake of coherence, I will retain most of the notational conventions that have been used previously.

3.3.1 The adjusted R à la *CB Akerson*

Let us first clarify the meaning of this equity adjustment. What happens to your investor's equity in the Quintus case? The initial down payment of 8000$ grows to 14064.38$ after disposition and full repayment of the outstanding balance (44000$ – 29935.62$ = 14064.38$). This residual cash remaining in the investor's pocket comes from two different sources:

- from the equity built up through the process of principal amortisation; and

- from the 10% appreciation of the property (from 40000$ to 44000$).

• The equity buildup (EBUP) can be calculated as the difference between the initial loan and the balance outstanding at disposition:

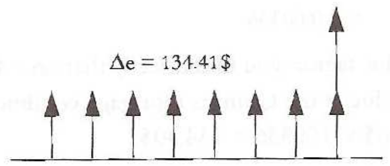
$$\begin{aligned} EBUP &= D - OSB_t \\ &= 32000\$ - 29935.62\$ \\ &= 2064.38\$ \end{aligned}$$

This amount will be pocketed only at disposition (in 8 years), but you could annualise it in order to have the equivalent annual increase. You have previously performed the same annualisation trick with the help of the sinking fund factor. Here you will annualise at the **Y** rate, that is, the implicit expected return on the equity investment (Y = 18.056%). This annualised equity buildup will be noted Δe (an annual variation in equity buildup).

$$\begin{aligned} \Delta e &= (D - OSB_t) \times (A/F, Y, t) \\ &= 2064.38\$ \times (A/F, 18.056\%, 8) \\ &= 2064.38\$ \times 0.06511 \\ \Delta e &= 134.41\$ \end{aligned}$$

A schematic illustration may be helpful to clarify the process (Figure V.4).

Figure V.4 Quintus' equity buildup



Equity build up from the amortisation of the loan annualised at the Y rate of 18.05% over 8 years

Thus, the 2064.38$ equity built up (EBUP) over 8 years is equivalent to an annual amount (Δe) of 134.41$ accumulated at 18.05%.

In percentage form, the same expression can be written:

$\%\Delta e$	=	$(1 - \%OSB_t)$ Accumulated equity	×	$(A/F, Y, t)$ Sinking fund factor

The notation $\%OSB_t$ again stands for the % of outstanding balance (or the outstanding balance on a 1$ loan). It can be expressed as the present value of all the remaining payments between the end of the debt amortisation period (n = 25 years in this example) and the end of the analysis (t = 8 years). The residual period is thus equal to n – t (17 years here).

$\%OSB_t$	=	$(A/P, k_d, n)$ Amortisation annuity (PMT) at the mortgage rate k_d over the n amortisation period	×	$(P/A, k_d, n-t)$ Present value of all remaining payments till the end of the full amortisation period

In the Quintus example, this balance factor can be illustrated as follows:

$$\%OSB_t = (A/P, k_d, n) \times (P/A, k_d, n-t)$$
$$= (A/P, 15\%, 25) \times (P/A, 15\%, 17)$$
$$= 0.154699 \times 6.0471$$
$$= 0.9354$$
$$\%\Delta e = (1 - 0.9354) \times (0.06511)$$
$$= 0.00420$$

Thus, for example, on a 1000$ loan the annualised equity accumulation is 42$. On a 32000$ loan, the annualised equity is indeed 32000$ × 0.0042 = 134.40$. And since you do not know either D or V (but you assume D/V), you can transform the annual equity factor into a general ratio form:

$$\%EBUP = D/V \times \%\Delta e$$
$$\%EBUP = D/V \times (1 - \%OSB_t) \times (A/F, Y, t)$$

Or again with numbers:

$$\%EBUP = 80\% \times 0.0042$$
$$= 0.00336$$

From this factor, you find directly that on a 40000\$ property, financed to 80% of its value at the Quintus mortgage conditions, the annualised equity buildup is 40000\$ × 0.00336 = 134.40\$.

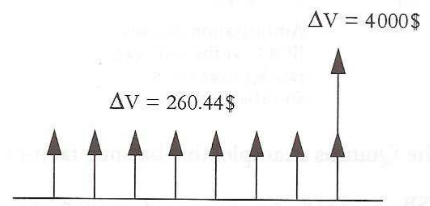
Let us now handle the equity appreciation element in a very similar manner.

• For Quintus, the value increase ($V_t - V_0$) is 4000\$ (a 10% appreciation over 8 years). This rate will be noted **g** and here again, as in Chapter IV, you note carefully that this is the total appreciation over the holding period and not the annual average. This anticipated amount will not be received before 8 years and again you must find its annual equivalent (Δv) through the sinking fund factor at the expected equity rate **Y**:

$$\Delta v = g \times V_0 \times (A/F, Y, t)$$
$$= 0.10 \times 40000\$ \times (A/F, 18.05\%, 8)$$
$$= 4000\$ \times 0.06511$$
$$= 260.44\$$$

Figure V.5 illustrates this annualisation.

Figure V.5



Equity build up from the appreciation annualised at the Y rate of 18.05% over 8 years

And since you still do not know V_0 (that's what you are looking for) the appreciation annuity can also be written as a factor:

$$\% \Delta v = g \times (A/F, Y, t)$$

Now you could restate the complete formulation of the residual equity (the reversion cash flow) at disposition:

BTER = Initial equity + equity buildup + appreciation

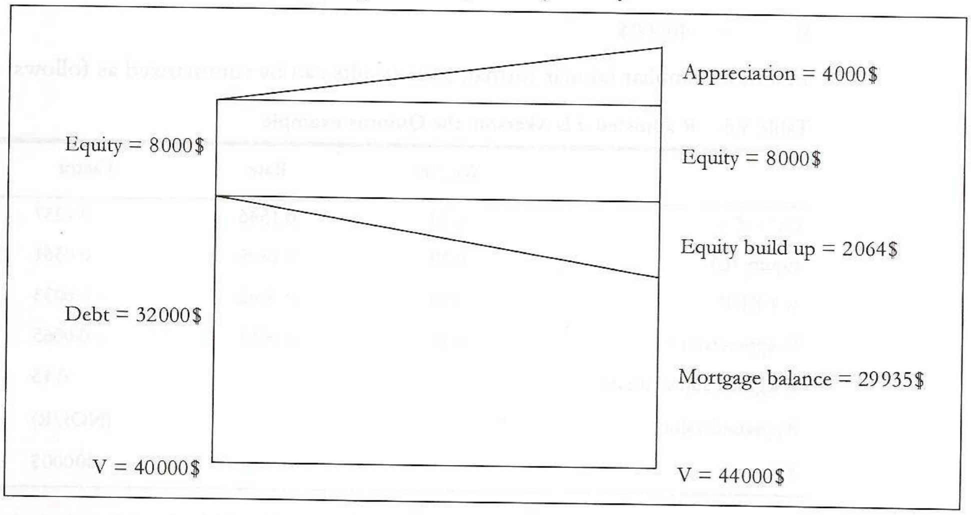
$$BTER = E_0 + D \times (1 - \%OSB_t) \times (A/F, Y, t) \pm V \times g \times (A/F, Y, t)$$

A final graphic representation will reinforce this concept of equity transformation (Figure V.6).

In most applications, the final equity is increased because part of the loan is re-paid (equity buildup) and the property value increases (appreciation). In some cases, however, the final equity may increase even when the property value drops as long as the equity buildup more than compensates for the property depreciation.

Clearly, the final equity may also decline when the equity buildup is negative (a refinancing situation) and/or when the property value decreases. The reader must satisfy himself that the general formulation still applies to these situations but that the adjustment factors will have different signs. Any **increase in value** is reflected in a lower **R** (remember V = NOI/R) and thus by **negative adjustment** factors. Conversely, any decrease in value is reflected by a higher **R** and thus by positive adjustment factors.

Figure V.6 Quintus' geometry



In the case of appreciation and amortisation of the debt, the internal rate of return (the dynamic rate Y) will be greater than the annual equity dividend static y. This relationship is proportional to the relative importance of equity compared to the total property value: the larger the initial equity, the greater the 'equity effect'.

$$Y = y + V/E \times (\text{Equity adjustment factor})$$

Or, if you prefer:

$$y = Y - V/E \times (\text{Equity adjustment factor})$$

So the 'band of investment' formula for **R**:

$$R = D/V \times f + E/V \times y$$

Can be transformed if y is replaced by its equivalent:

$$R = D/V \times f + E/V \times [Y - V/E \times (\text{Equity adjustment factor})]$$
$$R = D/V \times f + E/V \times Y - (\text{Equity adjustment factor})$$

Now, to make the equity adjustment factor explicit, you write:

$$\begin{aligned} R &= D/V \times f + E/V \times Y \\ &- D/V \times (1 - \%\, OSB_t) \times (A/F, Y, t) \\ &- g \times (A/F, Y, t) \end{aligned}$$

Let us now plug in our Quintus numbers:

$$\begin{aligned} R &= 80\% \times 0.1546 + 20\% \times 0.1805 \\ &- 80\% \times (1 - 0.935) \times 0.06511 \\ &- 0.10 \times 0.06511 \\ R &= 0.15 \end{aligned}$$

And now you can derive the expected result:

$$\begin{aligned} V &= NOI/R \\ &= 6000\$/0.15 \\ V &= 40000\$ \end{aligned}$$

In a more familiar tabular format, your results can be summarized as follows:

Table V.6 R adjusted *à la* Akerson: the Quintus example

	Weight	Rate	Factor
Debt (D)	0.80	0.1546	0.1237
Equity (E)	0.20	0.1805	0.0361
% EBUP	0.80	0.0042	– 0.0033
% appreciation	0.10	0.0651	– 0.0065
Weighted adjusted rate			0.15
Appraised value			(NOI/R)
V			40000$

Beyond these calculations, one major conclusion should be kept in mind: the direct summation of pre-tax cash flows (Inwood technique) and the indirect discounting by the adjusted **R** (Akerson-Ellwood) will lead to exactly the same results. The two approaches are conceptually and mathematically equivalent.

With such an error-prone type of computation, a verification is highly recommended. The litmus test of validity here will be the rediscovery of our initial y rate from the appraised value just obtained.

The reader should now be able to go through these steps without further guidance:

$$\begin{aligned} y &= BTCF/E_0 \\ &= (NOI - PMT)/E_0 \\ &= (NOI - D/V \times V \times f)/(E/V \times V) \\ &= (6000\$ - 0.80 \times 40000\$ \times 0.1546)/(0.20 \times 4000\$) \\ y &= 0.1312 \end{aligned}$$

3.3.2 Mortgage-equity approaches: a matter of choice

Our seemingly naive exercise of splitting the value 'financially' turned into a set of four solutions which should lead to equivalent results.

Table I.7 Equivalent formulations: Band of investment, Akerson, Ellwood and Inwood

A. Indirect solutions: calculating a cap. rate R and then finding V = NOI/R

1. R Weighted and adjusted for the debt amortisation over n periods (Band of Investment)

$$R = D/V \times f + E/V \times y$$

2. R Weighted and adjusted for debt and appreciation (Akerson) over the term t

$$R = D/V \times f + E/V \times Y - D/V\,(1 - \%OSB_t) \times (A/F, Y, t) - g\,(A/F, Y, t)$$

3. R Weighted and adjusted for debt and appreciation (Ellwood) over the term t

$$R = Y - D/V\,\{Y + (1 - \%OSB_t)\,(A/F, Y, t) - f\} - g\,(A/F, Y, t)$$

Or, with Ellwood's notation

$$R = Y - M\,\{Y + PV \times 1/s_{\overline{n}|Y} - f\} \begin{matrix} + \\ - \end{matrix} \begin{matrix} \text{dep} \\ \text{app} \end{matrix}\,(1/s_{\overline{n}|Y})$$

B. Direct solutions: finding V directly with the discounted constant pre-tax cash flows (Inwood technique)

4. $V = (D/V)\,V + (NOI - D/V \times V \times f) \times (P/A, Y, t) + \{(1+g) \times V - D/V \times V\,(\%OSB_t)\} \times (P/F, Y, t)$

Faced with this plethora of formulas, you now have a dilemma: which one should be used? Since all four approaches lead to the same results, the choice is solely a matter of computational convenience, information requirements and flexibility. Let us in turn discuss each of these criteria.

• *Computational convenience*

On this basis, the use of Ellwood's tables can be ruled out despite their strong nostalgic appeal. The tables are not always in your back pocket when you need them; they are awkward to use; they require interpolations for intermediate values of the variables and may not cover the full range of variations.

On a hand calculator or a microcomputer, the choice between Ellwood's and Akerson's formulas is a matter of personal taste. Akerson's presents a pedagogical advantage, whereas Ellwood's has seniority.

Inwood's discounted cash flow direct approach is intuitively more appealing and the computations require no more time or sweat than the Ellwood-Akerson formula. In any case, this computational convenience should not be a serious obstacle any more: machines are very good at performing computations and the programming requirements are trivial.

The 'band of investment' formula is the favourite of the paper and pencil analysts since the formula is compact and extremely simple. Its apparent superiority is so obvious that the reader may wonder why you had to go through so much finagling with the Ellwood-Akerson's formula. A review of the information requirements should help us answer this pertinent question and to clarify why the 'band of investment' formula is practically unworkable.

• Information requirements

The four mortgage-equity valuation approaches require the same minimum information:

— the normalised net operating income;

— the financing conditions (the D/V ratio, the mortgage rate, maturity and term);

— the anticipated holding period; and

— the expected appreciation and depreciation over the holding period.

Three of the approaches (Inwood, Akerson and Ellwood) require some 'market' information on the expected return on the total investment yield rate **Y**. If **Y** cannot readily be picked up from the market (only **R** can be so observed), it can be deducted from the investors' behaviour and introspection. **Y** can also be compared with the return on other alternative investment and, at least notionally, can be adjusted to take into account the investment traits of real estate properties.

Only the modified weighted average cost of capital ('band of investment') equation requires the equity dividend rate y and there lies our serious empirical problem. This dividend rate cannot be confidently obtained from the analysis of market transactions since it varies so widely with financing conditions and even with the timing of the transaction. Even the most cursory empirical analysis reveals that y varies much more widely than the expected internal rate of return Y and is quite often negative (particularly for residential income producing properties).

Furthermore, don't forget that this whole business of reconstruction and adjustment of **R** with the mortgage-equity approach should be used only as a last resort in the **absence of decent market information.** If you could get y and thus **R** directly from the observation of transactions, you would not have to go through this lengthy song and dance.

Let us repeat, y cannot really be observed (no market reading), nor really inferred (too volatile) from similar transactions.

Therefore, the more likely validity of a reasonably expected yield **Y,** opposed to the uncertainty about **y,** is the strongest argument in favour of the three more complex approaches by opposition to the simpler one, which relies on a non-observable equity dividend rate.

• Flexibility

Finally we should, very briefly, comment on the flexibility of the different models. In this respect Inwood's direct discounted cash flow model presents the distinct advantage of being structurally analogous to the equity model that is the cornerstone of modern real estate analysis.

From this analogy you can see that the direct mortgage-equity formula is easily adaptable to deal with variable net operating income as well as with more complex financing schemes, and even to handle the last outrage: the introduction of taxation considerations.

The Ellwood-Akerson formulas are not so easily transformed, though some improvements have been suggested.[1] However, you may not see much usefulness in further tampering with an already-too-complex model when the same results can be obtained directly with a well known close cousin of the standard model of investment analysis.

The only *raison d'être* of adjusted capitalisation approaches was that — in pre-computer times — they made computations feasible thanks to the publication of precomputed tables. This justification is no longer sufficient. Valuers and analysts are adapting rapidly to this evidence and thus they should concentrate more and more on the much more transparent discounted cash flow approach.

4. The only difficult problem

Life has been quite easy so far. Most of the computations — though a bit technical at times — did not raise too many difficult issues. However, you still have to deal with the remaining clincher of finding the required discount rates.

4.1 Finding k_a and finding k_e

When expected returns on the full investment (k_a) can be derived from observable capitalisation rates: no problem, life is still easy. This is the ideal situation described in Chapter IV. Observed capitalisation rates are equal to overall expected rate of return on net income (k_a) when adjusted for observed value variation (positive adjustment for growth in value and negative adjustment for decrease in value).

$k_a = R \pm$ asset value variation

Such observable rates of returns do take into account most of the factors that may influence investors' decisions (cost of debt, financing structure, anticipated growth and even taxation status). Thus, a good cap. rate will take care of your estimation anxieties.

However, in most challenging situations of thin markets and poor information, you need to build up a capitalisation rate as demonstrated in this chapter. To build such a composite rate you need the find our the cost of debt (not too difficult) and the cost of equity (noted k_e* or Y).

1. Introduction of a Fisher J and a Fisher G to account for a growing NOI (Fisher, January 1979). Introduction of a geometric growth rate for NOI in pre-calculated tables (Mason, 1981). Introduction of taxation variables (Fisher, July 1979).

Finding Y means that you have to decipher the inner stories of the property investor who has to decide, implicitly or explicitly, how much return she expects on her equity investment.

It should be obvious to the reader that my suspiciously accurate rate of Y = 18.056% did not make much sense. Obviously, I was cheating to get nicely rounded results and 'goal seeked'[1] my way to the appropriate discount rate. Cheating or not, you will conclude later that this devious solution may be the only practical way to solve this very real problem.

4.2 The general problem of finding expected returns

One of the most common approaches to the estimation of expected return is based on the capital asset pricing model (CAPM) that has been used extensively to explore the relationship between risk and returns. A simplified analysis may go along the following lines.

Expected return on an equity investment (k_e) = expected return on a risk free investment (k_{rf}) + compensation for additional risk borne by the investment.

Compared to other non-property assets, the extra risks borne by property investments are related to their illiquidity, their immobility, their high transaction costs, their high level of leverage, their high load of operating expeditures, their exposure to unexpected inflation, etc.

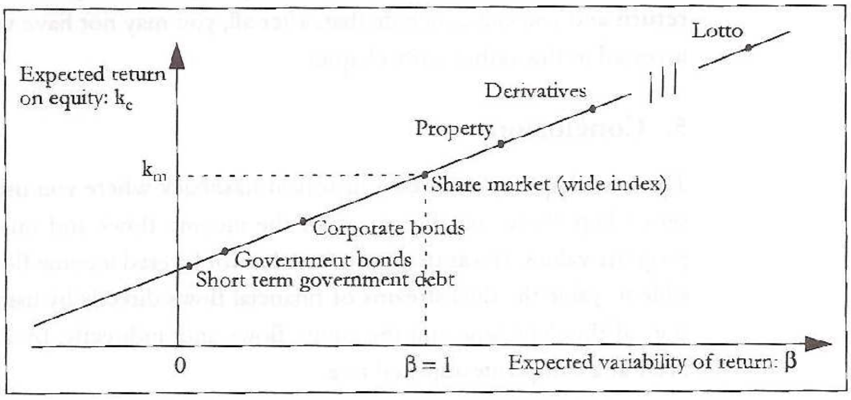
Part of these risks can be diversified away by investing in a basket of various properties (a portfolio of assets) in order to compensate for individual risk characteristics (specific risks). A perfectly diversified basket of assets would be immunised (i.e. protected) against individual asset risks, but would not protect the investors against general market risks (systematic risks) affecting the whole economy.

The analysis is quite fruitful in exploring the relative performance of securitised real estate (e.g. listed property trusts) or large institutional portfolios of property assets; however, the model is not convincingly applicable to the treatment of individual property assets (thus to the valuation of such assets). The reason is of course that, by definition, individual investments are not diversified and thus cannot escape their burden of specific risks described previously.

At least the CAPM formulation is the most rigorous modelisation of the investor's mantra: 'if I expect more return variability, I should expect more returns on my equity investment'. Thus it can be helpful in setting broad comparative return benchmarks as caricatured hereafter.

1. Neo-verb coined from the 'goal seek' spreadsheet function in Microsoft's Excel. The goal seeking procedure is a single variable iterative calculation (trial and error). Alternatively, you can — and sometimes must — use the more flexible Excel function 'Solve' (a bounded multi-variable iterative procedure).

The risk-return mantra: if you expect more risk, you should expect more returns



4.3 A practical solution: backward computations

In practice, when you need to find some reasonable estimation of the expected rate of return on equity investments, you may do as I did in this chapter: you cheat. In Excel spreadsheet computations, you 'goal seek' a reasonable k_e from relevant market observations on similar properties. Remember, you need to find k_e when you cannot rely on decent comparables; however, you must remember that investors are investors … they always compare their return on equity investment between alternative investments. Thus, even if you do not have good comparables, you should still have similar implicit rates of returns on equity investments on other property assets.

The 'goal seek' procedure is equivalent to computing backward the k_e rate of return that would satisfy observable market capitalisation rates on properties transacted in the same local market. The best way to clarify this procedure is to 'goal seek' your way through the Excel tables to be found in the PVM-Web.

Using reasonable market assumptions on the cost and amortisation of debt, the debt-to-value ratio, and the expected growth in value, you derive, instantly, the required k_e. You may have to tinker with your assumptions, but eventually you may be satisfied that, under realistic assumptions, what turns out as a resulting Y, is indeed the market's verdict on expected equity returns. For instance, it appears (in Perth, 2002) that a reasonable expected equity return on office building investment is around 25%.

Since this Y is a before-tax return on a fairly risky business (the Perth office market tends to be thin and jumpy), this return is indeed reasonable. You may want to test the same procedure on your own markets and in your own conditions and decide on the realism of your returns. Normally, you should not be very far off an intuitively satisfactory result.[1]

---

1. Except when you choose a high expected rate of growth (g) on a short period. If this rate is larger than the weighted cost of funds, then the denominator becomes negative and the results become absurd. This is a classical warning when using a Gordon-like formulation. Just try it to see how far you need to push your **g** factor.

In practice, **there are not any other easy ways to find your desired rates of return** and you can conclude that, after all, you may not have wasted the time invested in this rather curly chapter.

5. Conclusion

This last chapter presented a historical flashback where you used a simplified set of hypotheses on the nature of the income flows and on the growth of property values. It was demonstrated that for levered income flows, it was possible to value the dual streams of financial flows directly by using the summation of the debt flow and the equity flows and, indirectly, by discounting the NOI at a composite adjusted rate.

It was also demonstrated that the often recommended use of the simple weighted average cost of capital is either wrong (for amortised debt and growing values) or useless for the trivial no-debt-no-growth case.

Finally, an alternative adjusted weighted cost of capital was presented in order to prove that direct capitalisation was an alternative (though not simple) solution to the valuation of dual flows.

You should admit, once more, that such approaches are not terribly useful nowadays: you can do better, faster and cheaper with the fully explicit discounted cash flows model dissected in my *Income Property Analysis and Valuation*.

So why bother?

— Because this material is a very rich mine of quizzes and exam questions for property students who may be tempted to skip this fascinating part of their curriculum.

— And mostly, because the full understanding of the composite adjusted cap. rate is still the best, and probably the only, way to appreciate what is behind a market capitalisation rate. As I have now repeated *ad nauseam,* the market cap. rate is the most important instrument in the valuer's toolbox ... but, unfortunately, its true nature is not always clearly understood. Thus, I submit that this nostalgic detour through the Akerson-Ellwood adjusted rate can still be a very useful methodological *promenade.*

Now, for most of you who, at this point, have probably lost track of this intricate story, I suggest keeping in mind a very compact synthesis of Chapter V:

Capitalisation rate	=	**Relative debt cost**	+	**Relative equity cost**	±	**Equity variation rate**

Chapter VI

Appraising appraisal

Where, with some misgivings, we are compelled to discuss the concept of value, and to conclude that the existing valuation paradigm may require an alternative formulation. We also conclude that this alternative paradigm may not be such a surprise to valuers and that it could make their 'legal' life easier.

1. A counter paradigm

At the outset of this textbook, I expressed reservations concerning the whole valuation methodological montage. It may now be time to explain this reticence and — more usefully — to suggest an alternative presentation.

I will conclude that the whole methodological montage can be reduced to one alternative definition of value, a single approach, a single technique, and a single principle.

Figure VI.1 A counter paradigm

A value definition	The most representative transaction price read from similar transactions.
A single method	Market reading.
A single technique	Adjustment technique.
A single principle	Prices reflect all advantages and disadvantages perceived by market participants.

2. Defining value

Value you say?

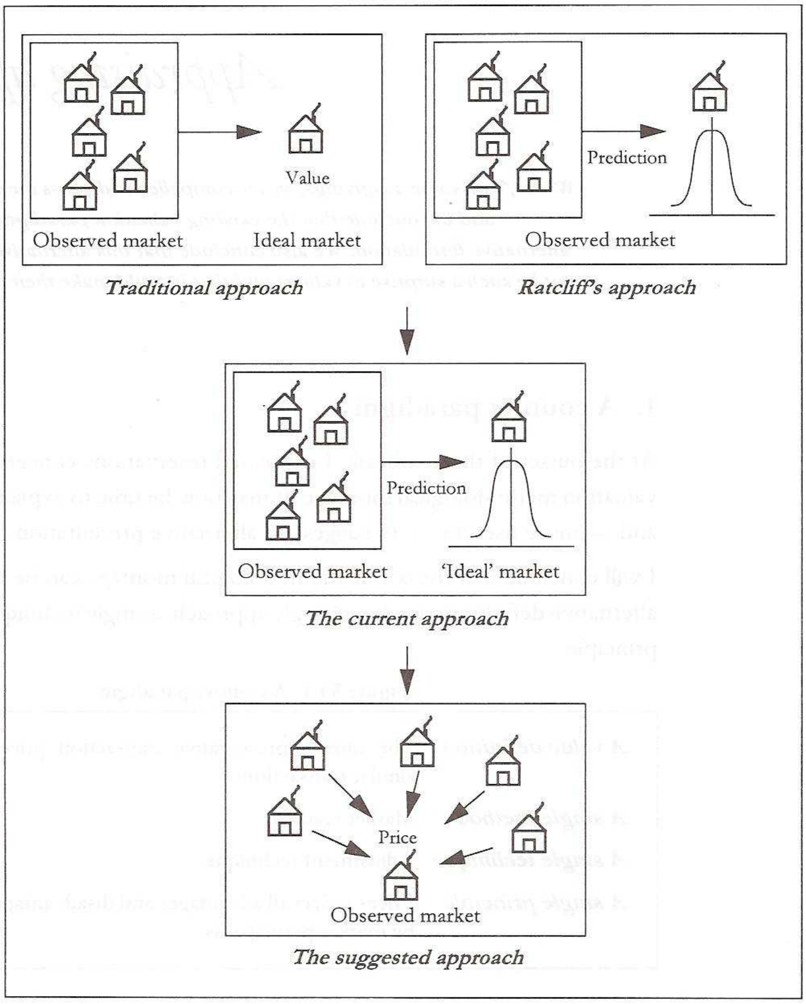
I can teach a complete course in economics without once mentioning the word value, said Vilfredo Pareto the famous 19th century Italian economist.

I wish I could do the same, but it would be quite difficult since a large chunk of the professional literature is still devoted to this exercise in logomachy.[1]

1. Earlier in the introduction you may remember that McMichael (1944) suggested 50 definitions of values. Not surprisingly, he then concluded: 'Value of real estate is so varied and at times so intangible in character that the appraiser must keep in mind specific definitions of the kind of value he is asked, or decides, to establish.' Long ago, Zangerle (1924) rightly noted: 'These fifty-seven varieties of appraisal, to suit the purchaser, are not calculated to elevate the profession.'

Arguably, this exercise has been dragging down the property valuation profession from its very beginning; when, by contrast, this obsolete concept has been dropped from the mainstream economic literature since the 19th century.

Figure VI.2 Value definition evolution



Appraisers do not have to find 'values'. At best, they have to determine transaction prices if transactions have occurred, or, eventually, to suggest notional prices if transactions have not yet occurred. We will also conclude that this notional price is not the result of a vote — from valuers or market participants — on 'the most probable' price, but the result of an auction.

For the time being, a simple dictionary definition of value should be sufficient:

> *Value: the worth of a thing as measured by the amount of other things for which it can be exchanged. (Macquarie dictionary)*

Interestingly, the same Macquarie also offers the word 'value' as an obsolete synonym for the word 'price'.

The US-sphere definition *(The most probable value …)* presented in Chapter I raises difficulties on two fronts: the use of the concept of probable price, and the restrictive conditions that values are determined on open and competitive markets (ideal markets). This latest US-sphere definition is the result of a compromise reached in the 70s between the traditional legal definition and the academic variant suggested by Ratcliff (1965).

— The traditional definition was:

> *Market value* ***is the highest price*** *estimated in terms of money which the land would bring if exposed for sale in the open market, with reasonable time allowed in which to find a purchaser, buying with knowledge for all the uses and purposes to which it is adapted and for which it was capable of being used.*[1]

This definition implies that you could find an 'ideal' value to be read from an open, competitive and transparent market.

— The new version reads:

> *The* ***most probable price****, as of a specified date, in cash or in terms equivalent to cash or in other precisely revealed terms, for which the specific property rights should sell after reasonable exposure in a competitive market under all conditions requisite to fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest and assuming that neither is under undue duress.*

This definition has been modified under Ratcliff's influence and his position is clarified below:

Ratcliff dixit

> *Value, for appraisal purposes is actually a price in its literal sense, the price at which a property would probably sell in an actual transaction. As a market determined price, this amount is not necessarily what any one buyer or seller thinks a property is worth; the price is a product of the market forces of supply and demand, it may be lower than the buyer would have paid if necessary, and higher than the seller would have taken …* ***to judge the most probable price … the appraiser must make a prediction or forecast*** *based upon his assumptions with respect to the productivity of the property, real estate market conditions and prospects, and the behaviour patterns of buyers and sellers. (Ratcliff, op. cit. p. 6.)*

Thus, Ratcliff says (rightly) that prices should be read from the market — any market — and then he affirms (wrongly) that the appraiser must make a 'prediction' and thus forecast prices.

— The US-sphere definition: the wrong compromise

The adopted definition (the most probable price in a competitive market) is thus a compromise between Ratcliff's probable price and the traditional definition's requirement of open and competitive markets.

---

1. Sacramento Southern R. R. Co. vs Heilbron. This famous judgement from a California court in 1909 has long been the basis of value definition: in the professional bible: *The appraisal of real estate* until its 7th edition in 1983.

Unfortunately, the new amended text is based on the two wrong parts of both definitions: first, the notional 'open and competitive' market; and second, Ratcliff's requirement of prediction.

A value is a price, period

A little story could help illustrate this idea that a value is a price — nothing less, nothing more.

> Saturday, 3 am. During one of your frequent bouts of insomnia you start meditating on the value of a 15 points Argyle diamond (Intense Pink, Piqué I). Your thoughts are crassly mercantile: you wonder how much you are expected to pay tomorrow morning to purchase this diamond for your partner's birthday.
>
> Yesterday the same diamond (same weight, same colour, same clarity) went for 10000$. Thus you would conclude that:
>
> — The price you would have to pay (today) will probably be 10000$.
>
> — You know that you cannot expect any favours, such as a major stock sell off or a sudden bankruptcy of Argyle Mining.
>
> — You say that the price will 'probably' be 10000$ since you cannot be certain that some market event has not occurred (or will not occur) between yesterday and today when you are ready to purchase the diamond. Indeed, anything could happen: a new tax on luxury goods, the discovery of a new source of pink diamonds, or, worse, the announcement that Russell Crowe has just offered a similar stone to Meg Ryan!

Now, since you have a solid training in economics (and Latin), you conclude that, *ceteris paribus*, the market value of your 15 points Argyle diamond is 10000$. This price is not absolutely certain (something may happen), but it is the regular price (no favour, no sell-off, no Argyle bankruptcy) and you know perfectly well that this price is not the result of an open and competitive market since Argyle has a world-wide, absolute monopoly for pink diamonds and that their prices reflect this monopolistic situation.

• *Prices are formed in many types of markets*

Property prices are formed in fairly competitive markets (single family homes in large towns) or in monopolistic markets (housing in company towns, units in a geographically isolated development fully controlled by a single developer, office buildings in small urban centers, etc.). In fact prices can be formed in any type of market situation or market mood: equilibrium or disequilibrium, monopoly, oligopoly or perfect competition, economic panic or perfect serenity.

In any type of market you may observe transaction prices (an objective result) but you never observe so-called values (a subjective concept). However, the definition of value implies that there is a 'normal' value that could be different from observed prices formed on non-ideal market conditions. (Non-ideal by opposition to transactions on an open and competitive market between symmetrically informed and fully consenting adults.)

> … *after reasonable exposure in a* **competitive market** *under all conditions requisite to a fair sale, with the* **buyer and seller each acting prudently, knowledgeably,** *and for self-interest, and assuming that neither is under undue duress. (The Appraisal of Real Estate, 1987, 9th edn, op. cit. p. 19.)*

A contrario, you should thus conclude that if you do not have this ideal situation, then you couldn't find a value. Not a very satisfactory corollary indeed.

And then, to addle the whole riddle, Ratcliff affirms:

> *To judge the most probable price …* **the appraiser must make a prediction or forecast** *based upon his assumptions with respect to the productivity of the property, real estate market conditions and prospects, and the behavior patterns of buyers and sellers. (Ratcliff, op. cit. p. 6.)*

• All prices are 'probable' prices in commonsense terms

In commonsense terms, all prices are probable prices whether you want to purchase a diamond, a bar of soap, a Ferrari or a bungalow in Balga. Prices observed 'yesterday' are always an imperfect indicator of the prices to be paid 'today'. The level of uncertainty may vary between goods and markets; however, you can generally infer today's price from yesterday's observation without having to specify that this is only a probable price.

In fact, I would not even argue with the use of the word 'probable' if it was meant — as in the common sense — the price that I am **likely** to pay for a particular good. However, Ratcliff's position is quite different. According to him, the appraiser must predict. He must predict the asset productivity, market conditions, transaction circumstances and investors' behaviours. Thus, he must determine a value based on his estimations of this complex future. The objective result of such a predictive exercise — a so called value — would be the subjective anticipation of a specific valuer instead of being a simple reading of observed transaction results between market participants.

This last point deserves to be emphasised: transaction prices result from negotiations. The transaction results from the confrontation of the seller's and the purchaser's subjective 'inner stories'. However, for a transaction to occur the subjective anticipations of the participants (their inner stories) must be different. Sellers and buyers must evaluate different future streams of utility. If both had exactly the same inner story, the seller would not sell and the buyer would not purchase.

From the confrontation results a price. The price is an observable result of unobservable inner stories from both parties to the transaction. On this point Ratcliff rightly suggested:

> *As a market determined price, this amount is not necessarily what any one buyer or seller thinks a property is worth; the price is a product of the market forces of supply and demand, it may be lower than the buyer would have paid if necessary, and higher than the seller would have taken.*

An appraisal is nothing but an observation

In any case, the appraiser has nothing to do with all this. She does not care about subjective inner stories. She does not even care about the full circumstances of the transaction. She simply observes, simply witnesses, simply notes the results. She has nothing to say about the future. She even has nothing to speculate about the 'probable' price that would be obtained 'after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, blah, blah, blah.'

The valuer has nothing to predict — she leaves this to astrologers[1] — she only has to take note of the results of market participants' anticipations, but she certainly does not have to think the future in their place.

A valuation is not a prediction

Valuers do not provide future prices. Sometimes they may have to provide **past prices**. For example:

— Valuations for local taxation rolls are based on values that are, at least, one year passed;

— Valuations for the purpose of income taxation are meant to determine the market value for any date in the past in order to compute capital gains;

— Valuations of the assets of listed property trusts are based — at best — on the previous term or semester.

This retrospective interpretation of such values is 'if this property had been sold at a specific date (in the past), the resulting price would have been … '

Sometimes the valuer may have to provide **present prices,** for example for insurance quotes, for transaction purposes, or for financing. The interpretation of such a present price is 'If the property was sold today, the price could be.'

Prices are based on past or present information. If they are based on predictions, they are wagers. Values defined as predicted probable prices are no more credible than simple bets.

An appraisal is not a vote

This ambiguity about the proper interpretation of 'probable price' is reinforced when Ratcliff insists on the probabilistic interpretation of prices.

> *Because this prediction must be made under conditions of uncertainty where many of the important factors cannot be measured, the appraiser must express his prediction in terms of the probabilities of its actual realization, as a range of values or in terms of the probability that the actual price will hit each price within the range of possibilities. (op. cit. p. 6)*

This position has led to the interpretation of 'the most probable price' as being the central point of a distribution of the opinions of all the market

1. The appraiser may have to predict a disposition value of an income property. But, in doing so, she reproduces for tomorrow the conditions of markets observed today, these conditions being represented by today's capitalisation rates. This cap. rate reflects current investor's anticipations, never the valuer's anticipations.

participants.[1] This central point would thus represent the measure of a consensus of all the subjective opinions revealed in the market. Thus, such a price would be the result of a vote on the appropriate value.

Unfortunately, this interpretation is in contradiction with what we know about price formation.

Again, a little story may help.

> You wish to sell your house. In order to find an appropriate price you survey your neighbours (via a questionnaire) and ask them to express their opinions on the probable value of your house. You provide them with perfect information on your property, and since they are your neighbours, they are quite familiar with local market conditions.
>
> You compile the results of your survey and plot the various price opinions. If you had a large enough number of responses you are likely to obtain a distribution of opinions that may, roughly, be represented by a normal bell curve. On the basis of Ratcliff's definition, the central value of this distribution (the mean) would be the appropriate value: the central point of the 'vote' on value expressed by the market participants.
>
> But should you read this central value as a 'probable price'?

Certainly not! To convince you, let's finish our story.

> Since you now have a better idea of the value of your property, you decide to sell it through an auction.[2] All your neighbours attend this auction since they are quite interested in purchasing your house. The bidding starts and ends up with a winner.

Who is the winner?

The winning price cannot be the central price obtained from the survey. If it was the central price it could not be the winning bid. Prices do not reflect the most probable opinions of participants, they represent the opinion of the marginal purchaser: the bidder who offers the highest price for the property.

In fact, things are a bit more complex than this simple auction analogy. Transactions are more akin to multiple-player games. Such games are more difficult to model; however, theory — and common sense — confirm that transaction prices are much more similar to the results of an auction than to the results of a vote. In fact, prices are closer to the 'highest price' of the old definition than to the 'probable price' concept of the existing definition.

The difficulty now is not to read past winning bids (this information is in the public domain), but to decide if this price is the most representative price that could apply to a similar transaction on your subject property. Let's try to tackle this problem in two stages.

1. The opinions of market participants or the opinions of valuers polled to express their predictions on probable values. This simulation of a 'vote' is a story now often found in the literature on the measurement of valuation error.

2. It may be added — for non Australian readers — that auctions are a very common way to sell property in Australia.

2.1 The most representative price

Prices are not the average of non-revealed opinions on values. Nor are they the average of 'highest prices' observed from recent winning bids; they are the most representative prices. In other words, the price of your subject property is likely to be the modal price of transactions on similar recent transactions.

A brief statistical detour

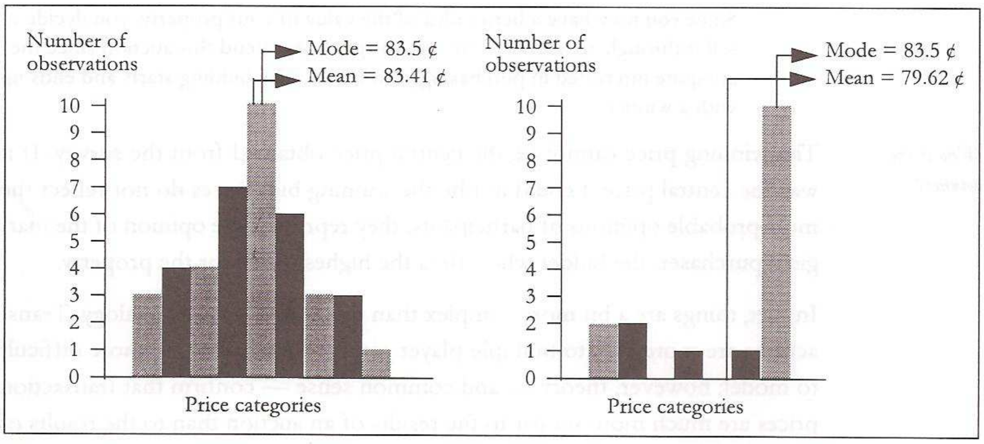
The **arithmetic mean** is equal to the sum of all observed values divided by the number of observations. This mean is very sensitive to the number and spread of observations. Extreme measures will strongly influence the mean. Furthermore, the mean — the result of a computation — may not represent the price of a real transaction.

The **mode** is the value most often encountered. The mode is not sensitive to outliers and it represents a real price observed on the market.

The mode should be the favoured indicator for market comparisons: it describes the most representative transaction; it is not influenced by extreme results; it represents a true transaction; and its validity does not require a large number of observations.

The following graphics illustrate the frequency distributions of prices for a litre of petrol in two different localities. You have 41 observations from a 'large town' and 16 observations in a 'small town'.

Figure VI.3 Petrol prices distribution in two different localities



You may want to confirm that:

- The mode is equal (or close) to the mean if you have a good approximation of a normal bell curve. You may obtain such a curve from a large number of random observations. In our 'large town' sample the mean price per litre is 83.41 ¢ and the mode is 83.5 ¢ from 41 observations.
- If prices are not random and the number of observations is limited, the mode will be different from the mean. In our 'small town', the mean is 79.62 ¢, whereas the mode is 83.5 ¢ from the sample of 16 observations.
- The mode of 83.5¢ is a real price observed in both samples: it represents an effective transaction price. By opposition, the means of 83.41¢ or 79.62 ¢ are not observable values. They are calculated values that do not represent effective transactions.

In practical terms, you can rely on means if you have a large number of good comparables (for example, for the purpose of property tax rating). However, for smaller samples and less homogeneous commercial properties the mean of observed values may be quite misleading. You need to rely on modal values.[1]

In fact, the use of a modal value facilitates the search for comparables: you do not need a large number of observations to determine a modal value. Even a single observation — of the perfect twin — could suffice to conclude on price.

Furthermore, the choice of the most representative transaction does not imply that this transaction must take place in an 'open and competitive' market, or that the participants are well informed, or that the property has been on the market for a 'sufficient' period of time. Actually, the concept of most representative transaction does not require any of the limitations imposed by the usual definitions.

The only constraint is that the subject transaction must be similar to the observed comparable transactions.

— If the subject is part of a very thin, non-competitive market — a shopping centre for example — the very few observed similar transactions will be the basis of your valuation;

— If the subject office building is located in a dying company town, with a very high unemployment and vacancy rate, the most representative transactions will be similar transactions on distressed properties that owners are trying to unload;

— Finally, if your subject property is a standard residential property, in a standard neighbourhood, under optimal exposure conditions etc. then, good for you, the most representative transaction is likely to be more or less the central value of observed similar transactions.

2.2 Similar transactions

— Twins, siblings and cousins

Our initial twin story was fairly straightforward. You can infer the probable price of a property based on the comparison with a strictly identical recent transaction. In fact, this perfect twinning is the only easy situation you may encounter. Then, you have learned that when the similarity is not perfect (with siblings, cousins and worse ...) you need to 'adjust' all sorts of factors. The more you adjust, the less confident you become in the validity of your fiddling around. In fact, without market verifications the adjustments, and thus the resulting value, become fuzzier and fuzzier. But you still have a comforting family feeling of acceptable comparable references.

1. In fact it would represent the modal interval of values since prices would need to be regrouped in representative price categories. For example, categories of 5000$ ranges for residential properties, or of 25000$ for office buildings, etc.

— Orphans

However, with orphans, you lose this comforting set of references. You deal with properties that are either unique or very occasionally transacted. This less enviable situation is the one you are likely to face when valuing some industrial or unique commercial assets, public properties, heritage buildings or, more generally, any 'market less' property. In this situation you have no choice but to use remedial techniques that rely on other markets such as the capital market (to build a capitalisation rate in the income approach), or to rely on information on the construction and labour market (to apply the cost approach).

2.3 What about the Australian definition of value?

With the previous logomachy behind you, what do you think of the definition suggested by the International Valuation Standards and now adopted in Australia?[1]

> *Market value is the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein each of the parties has acted knowledgeably, prudently and without compulsion.* (API 2002, *Professional practice*, p. 26)

At least this definition is de-Ratcliffied: good! However, it still imposes the restrictive 'ideal market' conditions that were discussed previously. Thus, though still not completely convincing, this definition is certainly better than the 'most probable' US-sphere format and — not a minor point — much more elegantly written.

Unfortunately, some other parts of the same text are reintroducing confusion in this self-defeating exercise in value definition. One particularly embarrassing admission is formulated as:

> *Value is not a fact, but an estimate of the likely price to be paid for goods and services at a given time in accordance with a particular definition of value. (op. cit. p. 24)*

2.4 Defining market value

Despite the fact that, like Pareto, I would prefer to avoid even mentioning the word value, a general definition may still be useful at this stage:[2]

> *The value of a property is the most representative transaction price read from similar property transactions.*

- Being rid of the 'probable' value — in Ratcliff's probabilistic parlance — you do not have to be overly concerned by sample size. With twins, siblings and close cousins very few comparables are acceptable price references.

1. Adopted from the most recent version of the International Valuation Standards.
2. In fact, this is not really a definition of value but a simple paraphrase to reaffirm that a value is a price … period.

- Neither do you have to philosophise about the various hues and nuances of the definition of value. Finding so-called insurance values, net realisable value, deprival value, value in use, or any of the myriad of definitions of values[1] is not part of the valuer's brief. Her brief is to read observable transactions on the subject's market. If her client needs to adapt this basic information to his own purpose, that is his problem, not hers. Tax persons, insurance companies, mortgage lenders may have their own criteria to adjust the level of value provided by the valuer. Fine … they are perfectly entitled to do so according to their own criteria. An appraiser may simply assist her client by providing observable market information or – – in the absence of legible property markets — justifiable approximation derived from information on other markets (capital markets, labour and construction material markets).

2.5 Market value and investment value

Observed prices reflect investors' perceptions and inner stories. These prices — paid by presumably rational investors — encompass their anticipations, their taxation status, the prevailing financing conditions and their perceptions of local risk and systematic risks.

If you accept that markets act as rational filters *(efficient market hypothesis)*, you must accept then that observed prices — thus observed capitalisation rates — reproduce the most representative behaviour of 'winning' investors. When you read market values, you do read 'investment' values set by the marginal investors and it is fallacious to distinguish two different kinds of values. Other potential investors (intramarginal bidders) may have lower investment values: but they do not win the bid, thus their 'values' are not read on the market.

2.6 Prices and values, for the last time

You may not need a complex definition of value, but you certainly need a solid understanding of price formation. This understanding comes from the existing microeconomics corpus of knowledge. Price theory has a strongly established paradigm that helps to understand price formation and diffusion in all sorts of competitive and non-competitive markets, on goods more or less homogeneous, and on negotiation conditions that may not involve perfectly and symmetrically informed actors. After all, real estate markets are not the only markets where goods are heterogeneous, where competition is imperfect, where markets can be extremely thin, and where information is asymmetrical.

Finally, before you forget about your diamond anxieties: what is the ***'value'*** of an Intense Pink Pique diamond? Come on … seriously?

1. The concept of 'non market values' listed in the IVS is discussed in the PVM-Web site.

3. A single valuation approach: market reading

Reading markets, as you have seen, requires the direct observation of transactions of similar assets or, eventually, the indirect observation of ancillary information from capital markets, land markets and construction markets.

3.1 How to choose between three (or more) approaches? Wrong question!

The valuation process described in Chapter I requires the use of three independent approaches. However, the following table illustrates why the three approaches cannot be independent since each of them requires the same reference to market readings.

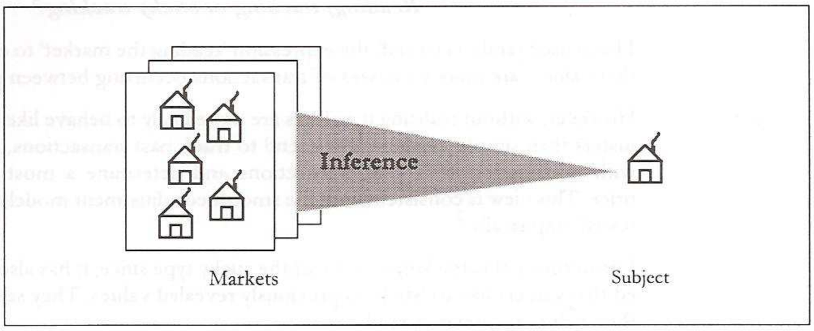
The rows show how each approach relies on others. For example, the second row illustrates that the 'cost approach' relies on the 'market approach' to find land values, to calculate functional depreciation and to calculate economic obsolescence.

	Market approach	*Cost approach*	*Income approach*
Market approach		Validation of matching pair comparisons Validation of regression coefficient Obligatory inspection of the subject property	Adjustments for financing conditions Adjustments for physical traits that may affect cash flows
Cost approach	Estimation of land value Adjustments for functional depreciation Adjustments for economic depreciation Estimation of input costs Estimation of profit margins		Adjustments for externalities Adjustment to value the lost income from functional deficiencies
Income approach	Cap. rate determination k_e determination Residual methods Net income normalisation		

Thus, the above matrix illustrates that the only general method is indeed the market comparison approach: the other approaches are only ancillary. They simply serve as supporting sources of information that may be used to confirm or simulate market transactions.

Such a simplified perception of the valuation methodology facilitates the valuation process and emphasises the complete dependence on appropriate market information.

Figure VI.4 Reading markets



The general approach requires two steps:

— Market reading of transactions on comparable properties;

— Inference of the subject's value.

This inference should not be interpreted in its statistical sense but, more commonly, as a simple pricing analogy:

> *The optimal use of transaction information in inferring the price at which other similar properties would be sold is the technique of appraisal. (Quan and Quigley, 1989)*

From market and comparable information, you infer the subject's price by a sequential process of adjustments. The use of systematic adjustment is in fact the most common appraisal technique.

Criteria for representativity of comparables

- transaction prices
- transaction participants
- transaction's legal nature and instruments
- transaction's taxation conditions
- transaction's financing conditions
- comparable buildings' physical conditions
- substitutable buildings' physical conditions
- economic conditions of comparable properties
- immediate environment's physical characteristics
- immediate environment's economic characteristics
- general market conditions

Reading, tracking or sticky tracking?

I have used (and over-used) the expression 'reading the market' to convey the idea that valuers are mere witnesses of transactions occurring between participants.

However, without realising it, valuers are more likely to behave like 'Bayesian'[1] adjusters than simple 'readers'. They tend to **track** past transactions, combine them with information on recent transactions and determine a most representative price. This view is consistent with the smoothed adjustment models suggested and tested empirically.[2]

Furthermore this tracking may be of the sticky type since, it has also been suggested that valuers like to 'stick' to previously revealed values. They seem to **anchor**[3] their values to previous readings.

3.2 A single technique: adjusting

As usual, let us stick to a simple dictionary definition:

> *Adjusting: to change so as to match or fit; cause to correspond, to bring into proper relationship, to adapt or conform, accommodate.*
> *The Macquarie Dictionary*

Indeed most of the various activities described to finesse our three valuation approaches have been based on this objective of 'adapting, matching or conforming'.

Three types of general forms of adjustments have been presented:

— Adjustment of transaction prices by comparing prices of similar transactions on real estate assets (in the market comparison approach);

— Adjustment of depreciated construction costs from information on the construction and development industry (in the cost approach);

— Adjustment of net income and capitalisation rates from information on real estate and capital markets (in the income approach).

In fact, all these forms of adjustments must be combined and are interdependent, as illustrated in the previous matrix of relationships among the three approaches.

3.3 A single principle

> *Asset prices are established on the basis of all the perceived advantages or disadvantages that can be derived from the asset.*[4]

1. Bayesian statistics refer to a world where a priori knowledge and new information are used to determine future probabilities of occurrence.
2. Quan and Quigley (1989), Hamilton and Clayton (1999) and Childs, Ott and Riddiough (2002).
3. This 'anchoring' behaviour has been suggested by Northcraft and Neale (1986) and also by Diaz and Wolverton (1998).
4. This formulation is not far from: 'The economic concept of value reflects a market's view of benefits that accrue to one who owns the goods or receives the services as of the effective date of valuation' (API, *Professional Practice*, p. 25).

— The price of a residential property reflects the household's estimation of utility to be derived from the property and, eventually, the potential for redevelopment, capital gain or bequest potential.

— The price of an income-producing property reflects the investor's discounted valuation of future cash flows. The applicable discount rate encompasses all the fiscal and financing advantages or disadvantages that are perceived by the investor. The same principle would apply to land values, to the value of a dam, to the value of a brand new City Hall or a translucent Bell Tower.[1]

For markets to reflect accurately all the preferences and discounting of market actors, and not only the conditions set on competitive markets, you simply need to assume that markets act as rational information filters. Markets function as rational information filters when actors are able to incorporate all the available information in their decisions (and thus in their pricing negotiations).

With an ideal competitive market you need to assume that actors are small enough not to influence prices, informed enough to have the full information on both sides of any transaction, and mobile enough to be able to enter and exit the market at will.

By contrast, with markets behaving as rational filters, your assumptions are much less demanding: you simply require that economic actors incorporate all available information in their prices. In corporate finance this rational filter assumption is equivalent to the generally accepted concept of 'market efficiency'. Fundamentally, this assumption is based on the principle of rational expectation that is consistent with a generally accepted paradigm in economic theory.

This condition of rational filtering is much less restrictive than the requirement of competitive markets; competitive markets act as rational filters but the inverse is not true. Efficient markets do not need to be competitive.

Thus, you do not need thirteen (or more) principles to define market optimal representative transactions: the single principle of rational filtering is sufficient for the appropriate pricing of property assets.

Sufficient and necessary principle

This market efficiency principle is sufficient and absolutely necessary. If you do not accept this fundamental principle, then you are dead in the water ... you cannot infer values from market reading; thus, you cannot value anything. In fact, without this principle, there is not much to say about finance and economic theory.

1. This last one is strictly meant for Perthians.

The value of 'paperised' properties

To illustrate once more, the fragility of the traditional definition of 'value', you may want to give some thoughts to the evolution of prices when 'brick' properties are transformed in 'paper' properties. A simplistic example will be used as an illustration.

> A 'brick property' generates a constant stabilised net operating income of 100$ per period.
>
> The applicable capitalisation rate k_a is 12% based on the following capital cost weighting of debt and equity: $k_a = k_d \times (D/V) + k_e\ (E/V)$
>
> With the cost of debt $k_d = 8\%$, the expected return on equity $k_e = 16\%$ and the components relative weights being $D/V = E/V = 50\%$. From this information you would conclude that the property is worth (833.33$ = 100$/0.12). This value reflects the relative level of risk expected by both lenders and investors and is comparable to prices observed on the current 'brick properties' markets.

Now let's assume that the same property is 100% financed by debt.

> In this case the capitalisation rate becomes equal to the cost of debt (8%) and the property values moves up to V = 1250$.
>
> (The formula shrinks to $k_a = k_d \times (D/V)$ with $D/V = 1$).

Now let's assume further that the 'traditional mortgage debt is replaced by well structured collaterised tranches of Bonds and wrapped up with a variety of enhancements that guarantee the level of net income and resale value of the property.

> The risk level of this combination of tranched-up Bonds and Insurance belts and suspenders is even lower and priced – by Bond pricing agencies – to a yield of 6.5%.
>
> Oh! miracle! Our 'brick property' – now 'paperised' – is worth:
>
> $V = 100/6.5\% = 1539$ $

Thus the bidding price for this asset went from 833$ to 1539$. Who is to convince you that this is not this property's true market value? Is this example completely zany? Not at all. Similar – and not less juicy – transactions are now part of the growing practice of structured financing as collaterised commercial obligations.

The traditional definition of value cannot account for this increasingly important modification of our property markets. My definition ('the most representative transaction price read from similar transactions') copes better as long as 'similar transactions' include paperised properties transacted on the capital markets and not simply brick properties transacted in traditional markets.

4. Conclusion

The alternative valuation paradigm can now be summarised:

— Market value is the most representative price observed from similar transactions;

— The only appraisal method is the method of market reading of observed transactions on comparable markets and assets;

— The only technique is the technique of adjustments that allows inferring prices from comparable (but not necessarily identical) transactions;

— The only necessary but sufficient principle is that actors price assets on the basis of all available information and considering the net advantages and disadvantages of a transaction.

By contrast, the existing dominant paradigm is more complex and is largely tautological.[1] Tautological in the sense that the application of the three methods is only applicable if the definition of value is valid, and then the three methods repeat the same conditions that are found in the definition. Thus, once more, you are faced with the typical three-approaches-Catch-22:

> If, as by the definition of market value, market actors were perfectly informed and transacting in a competitive market, then you would not need three approaches, one should suffice. *A contrario*, if the definition's conditions do not obtain, then two of the methods are inapplicable.
>
> In other words, if the definition does not fly, then the rest of the methodological montage does not fly either. With a simpler and more robust definition, and a reduced set of conditions and methods, the chances of having a stronger methodology are clearly better.

Does this alternative paradigm changes anything in real life valuation? Well, not really! Even assuming that this last chapter is ever read by practicing valuers, they would readily admit that — in their daily professional activities — they have already 'been there and done that'.[2]

1. 'Tautology: a needless repetition of an idea, especially in other words in the immediate context, without imparting additional force or clearness', Macquarie's definition.
2. This comforting feeling should be reinforced by the last point made in 'Why this basic dissidence on value definition?' (see next page).

Why this basic dissidence on value definition?

A strong 'anti-predictive' stance sustains my attempt to define value. This bias affects the conception of the valuer's role and accountability. In a Ratcliff's world – and through various parts of the International Standards – the valuer is supposed to be a normative price predictor: he must predict prices and must exercise his best judgment to decide what the 'value' should be.[1] In this conclusion, I adhere to a much more conservative view. Or rather, implicitly, I distinguish two clearly different professional functions:

— the valuer's function is to read the market ... now! This is the recurrent theme of this textbook on property valuation methodology;

— the property analyst's function is to use his market knowledge in order to advise on future values, future cash flows and anticipated returns. This was the recurrent theme of my textbook on income property analysis.

Trained professionals may very well wear two hats: a valuer's hat and a property analyst's hat. Similarly – by a stretched analogy – medical doctors must perform diagnostics and occasionally they must proffer prognosis. The standards of accountability are not the same for those two different functions. Performance standards are much stricter for diagnostics ('reading' the patient existing condition) than for prognosis ('predicting' how the patient will react in the future).

When writing valuation reports, property professionals should offer 'diagnostics' not 'prognosis' and they must carefully avoid becoming victims of a pernicious *'mélange des genres'*.

Acting as valuers, like accountants, they must stick to facts, to things they can measure and ultimately to numbers they can defend in a Court of Law. Opinions and forecasts do not weight heavily as evidenciary support. Only facts, collected and treated with 'a reasonable standard of professional care' will be retained in Court.

In most fields and in economic domains in particular, predictors are constantly proven wrong. When valuers are expected to predict prices, their performance is far from spectacular. With the recent increased litigiousness and decreased confidence in professional infallibility, I submit that a 'protect-your-backside' stance is the only sustainable one. This stance is not recent: it has been reinforced by too many years of observing an increasing level of unjustified professional hubris.

A recent Australian article[2] confirms that valuers do not appear to be very accurate predictors and I submit again that after all, they should not be expected to be. When valuers are meticulous price readers (as they often are) they conform to 'reasonable standards of professional care'; this is the limit of their professional level of accountability and – in Australia – the required standard of practice.

1. The best treatment of the probabilistic concept of value is to be found in the recent Geltner and Miller (2001) textbook in chapters 12, 23 and 25.

2. Boyd and Irons (2002). The article illustrates that, to the taste of Australian Courts, normally accepted range of errors are not acceptable and that valuers are required to apply 'reasonable standards of professional care' (the admonition is from M. R. Bingham in 'Banque Bruxelles Lambert SA v. Eagle Star Insurance Co. Ltd. (1995) QB 375).

General conclusion

This textbook describes the generally accepted professional paradigm that has recently been reinforced by the publication of the International Valuation Standards. This corpus of definitions, approaches, techniques and principles form the general framework used by appraisers and — sometimes — by the courts.

This background — despite its numerous oddities and weaknesses — must be perfectly mastered by the reader who wants to practice property valuation. This mastery is required to deal with daily practical professional assignments and eventually, used to critically re-examine these practices.

For any profession to evolve and grow, practices must constantly be reviewed and updated. This re-examination could follow at least three tracks:

— A theoretical track would lead to a revamping of the paradigm as indicated in this textbook. The theoretical linkage should not be the traditional neo-classical economic model, but, more productively, the more modern price theory approaches based on imperfect information, non-competitive equilibrium and auction theory.

— A practical track that requires massive 'dollars and brain' investment in the construction and maintenance of up-datable geographic databases.

— A 'political' track that would push for the practice of property value self-assessment for the purpose of local and state property taxation. Such a continuous process would reveal prices that are perceived by house and business owners, instead of obtaining market readings based on 'transaction' prices (transactions represent only a small sample of the full property base). Under such a regime, valuers would act as advisers and auditors.

Property valuers often display some methodological unease with the most hairy parts of their own paradigm. Thus, not too surprisingly, a US survey of appraisers' practice[1] confirms that a majority of appraisers do not follow the

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1. Diaz 1990.

This stream of behavioural research has been extended by J. Diaz and others (See the PVM-Web bibliography under Diaz).

'paradigmatic' instructions of their trade. A similar survey has not been conducted in Australia; however, casual observation suggests it would lead to a similar conclusion.

This does not imply that property valuers do not do their job properly. On the contrary, they are usually quite competent, remarkably thorough and they may display their methodological unease by adapting their practices whenever the paradigm does not work as it should. When the theory does not provide answers, valuers are quite good at devising empirical short-cuts.

Property valuation, neither art nor science, is more akin to a craft. Like most craftsmen, valuers do their very best to deal with a resilient material and with tools that are not as sharp as they could be. They perform this task surprisingly well.

However, they must remain careful not to emulate the middle age craftsmen who were washed up by the industrial revolution because they were trapped in sterile and obsolete rules of the trade.

Property self assessment

Is it possible to assume that households could self-value their property assets?

The answer is yes … for at least two reasons.

— Common sense would tell us that if householders and business people can successfully handle the nightmarish task of filling in annual income tax reports and business activity statements there is no reason to assume that they could not perform the much simpler task of reasonably valuing their own property. After all, they are the actors who interact on the property market. This market is first established by these actors (the primary price makers) and then deciphered by appraisers (the secondary price readers).

— For a long time now, academic research has consistently confirmed that self-appraisal provides very satisfactory results:

Kish and Lansing *(Journal of the American Statistical Association, 1954)* evaluate to 4% the gap between self-valuations and professional valuations. This gap is not influenced by the nature of the property (residential or commercial).

Kain and Quigley *(Journal of the American Statistical Association, 1972)* observe that owners tend to overvalue their properties by around 2%. Here the gap does not seem to be influenced by race, education nor localisation.

Robbins and West also compared professional valuations with 'amateur' self-appraisal. They could not find any significant difference *(Journal of the American Statistical Association, 1977)*.

Northcraft and Neal buttress these results with a strong support from cognitive theory. ('Experts, amateurs and real estate: an anchoring-and-adjustment perspective on property pricing decisions', *University of Arizona, 1986*.)

Kiel and Zabel provide the most convincing verification in 'The accuracy of owner-provided house values: the 1978-1991 American housing survey', *Real Estate Economics*, vol. 27, Summer 1999. The authors report that owners overvalue their house by 5.1% and that their valuation are not related to particular characteristics of the house, occupants or neighbourhood. (A 5.1% accuracy is half the error commonly accepted from professional valuers.)

Multivariate treatment of comparative sale analysis

1. The price function

Traditional econometric instruments can be applied usefully to the treatment of large databases of property transactions. Multivariate models can be used either to determine values or to measure the influence of specific property traits.

We have already established that the value of a given property is determined by its widely defined set of characteristics.

Value	=	function of characteristics
V	=	f (characteristics)
V	=	$f(X_i)$

Where X_i is a general notation to describe all the possible physical, legal, financial or environmental characteristics (or traits, or attributes, or features, etc.).

1.1 A linear model

In Chapter II you have implicitly used such a simplified function when performing additive adjustments in the pair matching exercise. The formal relationship could have been written[1]:

V	=	$f(X_i)$
V	=	$b_0 + b_1X_1 + b_2X_2 + \dots + b_iX_i + b_nX_n$
V	=	market value
X_i	=	characteristic i with $i = 1, \dots, n$
b_i	=	marginal contribution of characteristic i to Value (V)

For statistical estimation, the model should be formulated as:

V	=	$b_0 + b_1X_1 + b_2X_2 + \dots + b_iX_i + b_nX_n + e$
V	=	market value: our dependent (or explained) variable
X_i	=	independent (or explanatory variables) $(i = 1, \dots, n)$
b_0	=	a constant
b_i	=	the estimated coefficient for variable i
e	=	the error term

1. Colwell, Cannaday and Wu (1983), Kang and Reichert (1991) have shown that multiple regression formulations are essentially equivalent to sale comparison grids.

With a single dependent variable, such a model would be described as a linear regression model. With more than one variable, you are dealing with multiple regression models.

The regression procedure allows you to fit your 'model' to your observations in order to minimise the error term by adjusting the coefficient for each characteristic.

b_i : Coefficients b_i measure the effects of a variation of each X_i on the Value V. This represents the marginal contribution of each characteristic on the dependent variable V.

b_0 : Constant b_0 is the value of the dependent value when all the explanatory variables are equal to zero.

e : The error term e represents the residual effect of variables that have not been included in the model.

Multiple regression models can be used in appraisal to determine values or, more simply, to facilitate comparative sales adjustments.

1.2 Determining values

Multiple regressions have been used extensively in the last thirty years to estimate prices from a limited number of independent variables. This approach has been used extensively; for example, to establish assessment values for taxation purposes.

A simplified presentation could be:

$$V = b_1L + b_2F + b_3A \qquad \text{(Equation 1)}$$

with:

L = Location traits

F = Lot frontage

A = Livable area

If all the selected properties are located in the same immediate neighbourhood, the location traits are the same for all the units; therefore, the term b_1L can be dropped and variable L becomes the constant.

If you obtain the following estimation results:

$$V = 50000 + 900\,F + 450\,A \qquad \text{(Equation 2)}$$

You could conclude that the value of a 150 m^2 house located on a 20 m frontage lot is:

$$V = 50000 + 900\,(20) + 450\,(150) \qquad \text{(Equation 3)}$$

$$V = 135500\$$$

This result should not be presented without reservations, of course. But this is a fairly straightforward illustration of the way to derive value estimations.

1.3 Measuring the implicit price of each characteristic

Regression models have also been used extensively to measure the implicit price that purchasers are willing to pay for each specific trait of the 'housing package' (hedonic models).

Here, in contrast with the previous case, the values are known and we try to estimate the coefficients of each trait b_i.

$$V \longrightarrow b_1X_1 + b_2X_2 + \dots + b_nX_n + e$$

This technique can assist in the measurement of required adjustments in the sale comparison exercise. Each b_i coefficient indicates the marginal contribution of the variable to the value of the residential package when all other variables are held constant.

One advantage of this technique is to provide, with the help of indicators of statistical performance, some measure of confidence in your coefficients' estimations. This is more reassuring than our rough adjustments in the 'matched pair' technique.

1.4 Sampling

The procedure starts with the collection of a sample of a large number of good comparables (i.e. transactions on comparables that respect the criteria described in Chapter II). In Chapter II language, good comparables are either twins, siblings or at least close cousins. As much as possible, you must get rid of the 'freaks' (i.e. outliers).

Basic descriptive statistics can be used to facilitate the pruning of the sample: mean, standard deviation and range measures are used to eliminate atypical cases. Common sense and the following simple rules of thumb should be used at this first stage:

— Dichotomic variables[1] (0-1) should be kept only if they represent at least 5% of the sample. Thus, at least 5% of a given variable must be coded 1 in order to keep this variable.

— For scale variables (size, price, etc.), another rule of thumb is to eliminate results that are more than 2 standard deviations away from the mean (thus outside about 95% of the distribution if the variable is approximately normal). For example, in a sample of 250 properties with a mean area of 150 m^2 and a standard deviation of 50 m^2 you would eliminate all properties larger than 250 m^2 (150 m^2 + 2 × 50 m^2) and all properties smaller than 50 m^2 (150 m^2 – 2 × 50 m^2).

However, in practice, you do not have the choice to write the 'ideal' explanatory model. You are constrained by the availability of independent variables

1. See note at the end of this appendix.

included in the database and by the way the variables are coded. Most of the time you can't afford the luxury to recode your full database.

1.5 Illustration of a multiple variable determination of residential values

A multiple regression on a sample of 350 observations of residences in StatCity gives the following results:

V =	5312	+ 40 LA	+ 14106 BR	+ 10861 FP	+ 13362 UG
	(0.67)	(7.21)**	(3.79)**	(3.75)**	(2.77)**
	+ 48987 SW	+ 11309 CP	– 18761 GR	+ 45114 MSC	+ 68389 WSC
	(5.48)**	(2.66)**	(– 0.45)	(8.20)**	(12.11)**
	– 18460 ESC	– 9937 Y1	+ 47222 Y2	+ 1.82 VM	
	(– 0.74)	(– 1.94)*	(8.05)*	(4.15)**	

R^2 = 0.766 F = 101

R^2 adjusted = 0.759 n = 350

Se = 34913

Where:

LA = livable area

BR = number of bathrooms

FP = fireplace

UG = variable 0-1 for a finished basement

SW = variable 0-1 for a swimming pool

CP = variable 0-1 for the presence of a carport

GR = variable 0-1 for the presence of a garage

MSC = variable 0-1 for a location in metro StatCity

WSC = variable 0-1 for a location in West StatCity

ESC = variable 0-1 for a location in East StatCity

Y1 = variable 0-1 for a sale in 1980

Y2 = variable 0-1 for a sale in 1982

VM = Present value of a below market vendor's mortgage

The values in bracket are t-values (see below)

* = 0.05 significance level

** = 0.01 significance level

1.6 Reading the results: the score and the variables

The performance of a model and thus the choice of variables can be scored with the help of well-known measurements.

• Coefficient of determination

R^2 the coefficient of determination indicates the overall explanatory power of the independent variables (aka. the goodness of fit). The higher R^2 the more appropriate are the chosen independent variables to explain the property price.

Here R^2 of 0.766 signifies that 76.6% of house values can be explained by the selected variables.[1]

• Fisher F

The Fisher F test is a ratio of standard errors. The higher the F ratio, the higher the significance of the regression results. Here, with a Fisher statistic of 101 we can safely reject the null hypothesis that the chosen variables have no effect on the level of prices. Translation: rejecting the null hypothesis means that we accept that, yes indeed, our selected variables are 'explanatory'.

Other translation: high F = good news (the model works …)

• Se

The Se, the standard deviation of errors, indicates the range of variation around the independent variable. Here with an Se of 34913 (thus, about 25% of the mean value of 138759$) we must admit that the range is quite large and that the model could certainly be inproved.

Translation: high Se = bad news … we do not explain enough of the variation.

• t-values

A t-value is the ratio of the coefficient b_i to the standard error on this coefficient ($t = b_i/se\ (b_i)$). The smaller the denominator (standard error) the larger the t ratio and thus the more significant is the variable i.

As a rule of thumb, a t-ratio greater that 2 is good news (the null hypothesis cannot be retained).

Thus, in this case we have fairly good news about most coefficients (with the exception of the variable 'garage' and 'West StatCity').

1. When the number of observations is small (in relation to the number of independent variables), you will have to use an adjusted R^2 in order to take into account the reduced number of degrees of freedom (i.e. the required number of data points that are not used by the independent variables). In this example the adjusted R^2 is equal to 0.759. The adjusted R^2 is always smaller than R^2. The difference is minimal with a large sample and few variables. It can be significantly different when, on the contrary, you have a small sample and a large number of variables.

• Interpretation of the variables

Most of our explanatory variables exhibit the right sign: for example, a positive 'livable area' (LA) coefficient confirms that the relationship between price and area are positive (the larger, the dearer).

Interestingly the variable 'garage' has a negative sign. This type of result is not uncommon: it seems to indicate that some 'expensive' traits are not in demand and thus that purchasers are not willing to pay for these characteristics. We will see later that another interpretation could be offered.

The interpretation of the negative sign for year 1980 (Y1) can be misleading. The negative coefficient does not indicate that the prices dropped in 1980, but simply that 1980 prices are lower than 1981 prices. Keep this in mind when dealing with 'date' variables.

The positive coefficient 1.82 for the favourable mortgage illustrates once more that any 'goodies' are generally capitalised in the transaction price. Here favourable mortgages are reflected (capitalised) in higher property prices.

1.7 Too few or too many?

• Multicollinearity or too many variables

One basic assumption of multiple regression models is that variables are independent, that is, the variation of one variable is not related to the variation of another one. In econometric jargon, the variables are supposed to be orthogonal: the vectors representing the variables are forming a 90-degree angle with each other.

If the variables are not orthogonal, the vectors are getting closer and closer: they are getting collinear. Thus, with an extreme case of multicollinearity the variables would appear to be bunched in a tightly packed quiver of arrows.

When variables are not independent, it becomes difficult to identify their specific effects. Typically, housing package variables can be quite interrelated: the size of the house is related to the number of rooms, the lot size is related to the house size, the number of bathrooms related to the number of rooms, etc.

Since we cannot assume complete orthogonality, we still have to try to reduce the problem by selecting our variables in order to avoid explanatory redundancy, that is, two or more independent variables that have the same influence on our dependent variable.

One of the simplest ways to screen out the redundant variables is to check the matrix of correlation between each pair of variables.

Partial matrix of correlation

	LA	FP	SW	CP	GR	MSC	ESC
LA	1.000	0.417	0.215	0.163	0.151	0.333	– 0.437
FP	0.417	1.000	0.007	0.191	0.147	0.198	– 0.367
SW	0.215	0.007	1.000	0.098	0.052	0.254	– 0.136
CP	0.163	0.191	0.098	1.000	– 0.449	0.316	– 0.311
GR	0.151	0.147	0.052	– 0.449	1.000	– 0.099	0.017
MSC	0.333	0.198	0.254	0.316	– 0.099	1.000	– 0.399
ESC	– 0.437	– 0.367	– 0.136	– 0.311	0.017	– 0.399	1.000

You will note that the two non-significant variables (with a poor t-test) are strongly correlated with the other variables (a high correlation is anything close or above 0.5). Thus, the apparent non-performance of these two variables could be explained by their redundancy.

In this case, you could not get rid of the location variable ESC but you could certainly eliminate the garage variable.

• ***High residuals or not enough variables***

Econometricians are never a happy lot. If they have too many independent variables, they have to deal with multicollinearity and fuzziness in the interpretation of the coefficient.

If they do not have enough independent variables, they will get a poor explanatory score (low R^2) and they have strange looking coefficients. If an important explanatory variable is missing (by design or by necessity), the explanatory power of the equation will be poor and, quite likely, you will get bizarre results on the remaining variables. Some coefficients will be much too large, some will have the wrong signs, and some will be non-significant.

In situations when crucial variables are missing from the equation, their effect is borne by the included variables, with quite unexpected effects.

The inspection of the residuals (the variation not explained by the model) is the easiest way to detect this pathology. In a properly specified model, the residual should be randomly distributed. If one or more important variable is missing, the residual distribution will exhibit a regular pattern.

The solution to this problem is quite straightforward: add the required variables, if you can (i.e. if they are part of your database).

2. Conclusion

Multivariate property models have been around for more than thirty years. They are quite fallible (in theory); however, under our limited econometric ambitions they can be used fruitfully (though carefully).

— They may be used to compute adjustments in the matching pair technique. In particular they can be used to deal with tricky variables such as property taxation and environmental variables;

— They could be (and are ...) used to establish property tax rolls. An industry has developed around the technique of mass appraisal;

— They could be (but far from being ...) used to control the results of self-valuation that was discussed and suggested in the general conclusion.

Note: Dichotomic variables

In a property transaction database you will normally find nominal variables (suburb, street name, certificate of title, etc.) and scale variables (land area, sale price, livable area, year of construction, etc.). Some nominal variables will be coded as dichotomic variables (0-1) to denote, for example, the presence or absence of a carport.

Some other nominal variables can be coded as categorial variables, such as (1-2-3) to denote, for example, three different locations. Such categorial variables are best transformed in dichotomic variables since the use of a scale 1-2-3 may produce coefficients that lead to misinterpretation of the location effect (such as: a score of 3 would imply 3 times the value).

For example, the following equation describes the influence of 3 different locations (this is a partial explanatory model).

Properties in location A are coded 1 and coded 0 if not in A. Then properties are coded 1 if they are located in B and coded 0 if they are not.

$$V = b_1SA + b_2SB + b_3SC \quad \text{(Equation 4)}$$

SA, SB and SC are dichotomic (0-1) variables for location A, B and C.

Thus the location specific contribution to value of each location A, B and C will be measured by the estimate of coefficients b_1, b_2, b_3. Such coefficients could thus be used to adjust for differences in location when performing a matching pair comparable sale analysis.

You should select a base case (for example location A) and keep only two location variables and C, their coefficients being interpreted as the specific location effect with respect to the base case A (the measured effect of A would be captured by the constant term).

Mathematics of finance: brief review and notations

1. The six basic factors

Six basic time translations can be performed on money[1]: the discounting or compounding of single amounts, the discounting or compounding of flows of payments, and the accumulation or depletion of amounts through a regular flow of payments or withdrawals. Each of these will be treated in the following paragraphs:

1.1 The compounding of a single amount

1.2 The discounting of a single amount

1.3 The compounding of a regular flow of payments

1.4 The discounting of a regular flow of payments

1.5 The compounding of a regular flow to build up a future amount

1.6 The discounting of a present amount into a flow of payments

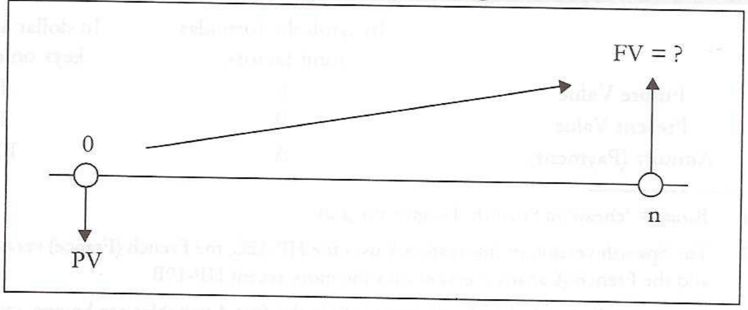
1.1 The compounding of a single amount

The future value FV of a present amount PV compounded at the rate i over n periods is written:

$$FV = PV\,(1 + i)^n$$

Graphically the compounding of a single amount looks like this:

Figure 1 Compounding of a single amount



1. Extracted and summarised from D. Fischer, *Income property analysis and valuation*, Chapter III.

Symbolically the compounding factor $(1 + i)^n$ could be written:

$(FV/PV , i , n) = (1 + i)^n$

Or, when using factors of 1$ we will be noting, as in the initial Ircnson and Grant notation:

F = Future, instead of FV

P = Present, instead of PV

Thus, the symbolic notation will be:

(F/P , i , n)

(**Unknown value**/Known value , i% , n periods)

This notation reads: what is the future value (F?, unknown) of a current 1$ (P, known) compounded at i% over n periods?

The notation FV and PV will be reserved for $ amounts.

La Barata[1]

The simplest and cheapest of all calculators will be used as the model of all financial instruments based on the 5 financial functions. For the sake of commercial neutrality,[2] this paper model will represent the standard procedure applicable to all computations. This procedure is perfectly analogical with the notation of our symbolic formulas where 3 variables are known and we compute the missing fourth.[3]

(**Unknown variable**/Known variable , i% , n periods)

Thus, in the case of the computing of a single amount, the process is illustrated below with La Barata:

N	%i	PV	PMT	FV
35	10	-5000	0	?

The unknown variable FV is computed to be 140512.18$.

It should be noted that the PV value is entered as a negative number (disbursement) to obtain a positive FV value (to be received) and conversely: a +PV would result in a –FV. This sign convention is typical of most calculators but may be different on the simplest models of Texas Instrument tools.

Notations

	In symbolic formulas (unit factors)	In dollar amounts and keys on calculators
Future Value	F	FV
Present Value	P	PV
Annuity (Payment)	A	PMT

1. *Barata* = 'cheap' in Spanish. Forgive the pun …
2. The Spanish version of this textbook uses the HP-12C, the French (France) version uses the BA.54 and the French (Canada) version uses the more recent HP-19B.
3. Later we will also deal with situations where the first 4 variables are known and we compute the missing fifth variable.

Example: what is the future value of 5000\$ deposited today at 10% for 35 years?

FV	=	PV	×	(F/P , i , n)
	=	5000\$	×	(F/P , 10% , 35 years)
	=	5000\$	×	28.1024
FV	=	140512.18\$		

On a financial calculator, we simply enter 5000 for PV, 10 for i and 35 for n; the resulting FV is the future value we are looking for. Let's stress the analogy between our symbolic notation and the way we enter the information into the calculator:

Unknown variable

(F/P , i , n)

Known variables

1.2 The discounting of a single amount

Suppose we turn the question around and want to find the present value of a sum to be paid or received at some time in the future. Predictably, the formula is the mathematical inverse of the preceding factor:

$$PV = FV \times \frac{1}{(1+i)^n} = FV(1+i)^{-n}$$

Symbolically:

$(P/F , i , n) = (1 + i)^{-n}$

And reads: what is the present value (P?) of a future 1\$ (F) to pay or receive in n years if the discount rate is i%?

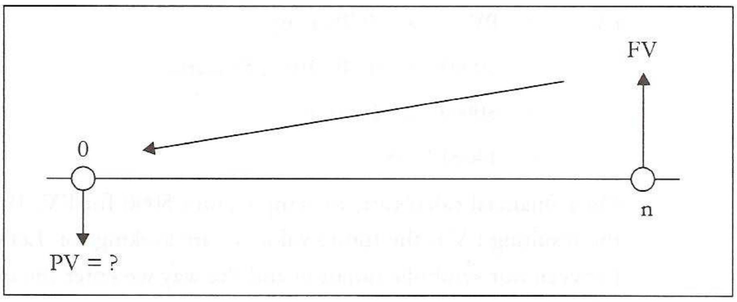
Example: Present value of 1000\$ to be received in 3 years if i = 10%?

PV	=	FV	×	(P/F , i , n)
	=	1000\$	×	(P/F , 10% , 3)
	=	1000\$	×	0.75131
PV	=	751.31\$		

N	%i	PV	PMT	FV
3	10	?	0	1000

Graphically, the discounting of a single amount looks like this:

Figure 2 Discounting of a single amount



When dealing with non-annual conversions (in compounding or discounting) one must carefully adjust the periodic rate (entering the $\mathbf{p_c}$ rate, not the nominal annual rate) and the proper number of periods (entering **n** as conversion periods and not as years). This warning is mostly important for spreadsheet model building since HP calculator models do not require this precaution. Once the number of compounding periods has been chosen, you simply need to enter the nominal rate and the periodic rate will be computed directly.

1.3 The compounding of annuities

Annuities are regular streams of payments. Strictly speaking, an annuity should consist of payments made once annually, but the term also applies to any regular stream of monthly, quarterly or semiannual payments. In the symbolic formula, we use A = Annuity and reserve the notation PMT to the dollar amounts. Thus, the compounding of an annuity is written as:

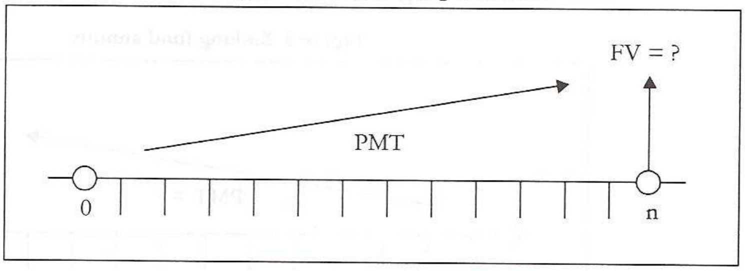
$$(F/A\,,i\,,n) = \frac{(1+i)^n - 1}{i}$$

Example: If you deposit 100$ at the end of each year for 20 years to earn compound interest at 10% per annum, how much will you have on deposit at the end of the period?

$$\begin{aligned} FV &= PMT \times (F/A\,,i\,,n) \\ &= 100\$ \times (F/A\,,10\%\,,20) \\ &= 100\$ \times 57.2749 \\ FV &\doteq 5727.49\$ \end{aligned}$$

N	%i	PV	PMT	FV
20	10	0	–100	?

Figure 3 Compounding annuities



1.4 The discounting of an annuity

This time we want to establish the present value of a stream of regular payments; that is, we discount an annuity.

The discounting of an annuity is written:

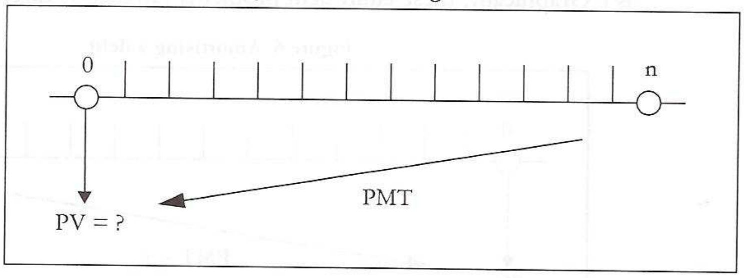
$$(P/A, i, n) = \frac{1-(1+i)^{-n}}{i}$$

Example: what is the present value of 15 000$ to be received at the end of each year for 20 years if the annual interest rate is 10%?:

PV = PMT × (P/A , i , n)
= 15 000$ × (P/A , 10% , 20)
= 15 000$ × 8.5135
PV = 127 703.46$

N	%i	PV	PMT	FV
20	10	?	-15000	0

Figure 4 Discounting annuities

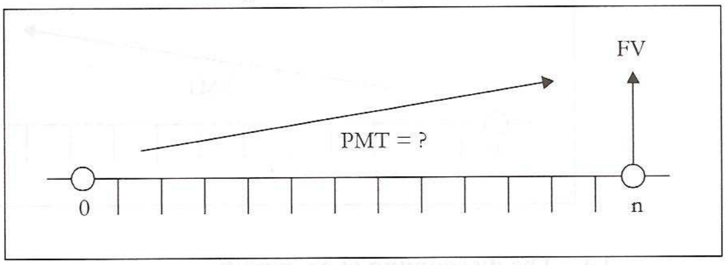


1.5 The sinking fund annuity

What would be the annuity required to built up a future amount of F over n periods if each deposit earns interest at the compound rate of i? The annuity factor allows us to solve this problem.

Graphically, a sinking fund accumulation resembles:

Figure 5 Sinking fund annuity



And in its mathematical guise:

$$(A/F, i, n) = \frac{i}{(1+i)^n - 1}$$

Example: what is the annuity required to accumulate 100 000$ in 30 years if annual deposits earn 10% per year?

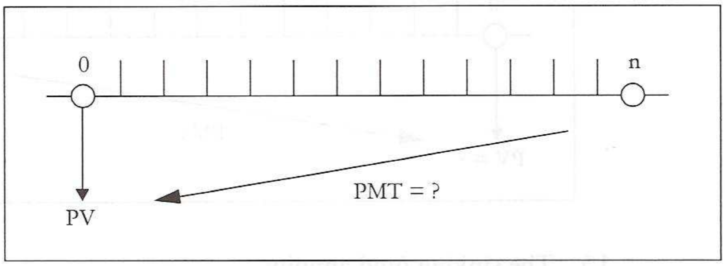
$$\begin{aligned} PMT &= FV \times (A/F, i, n) \\ &= 100\,000\$ \times (A/F, 10\%, 30) \\ &= 100\,000\$ \times 0.006079 \\ PMT &= 607.92\$ \end{aligned}$$

N	%i	PV	PMT	FV
30	10	0	?	100000

1.6 The amortisation factor

A present amount of PV$ can be depleted by regular withdrawal of annuities. A loan of PV$ will be similarly amortised over n periods if the rate of interest is i. Graphically, these equivalent problems can be portrayed as:

Figure 6 Amortising a debt



This amortisation factor (one of the most important for our purposes) is written:

$$(A/P, i, n) = \frac{i}{1 - (1+i)^{-n}}$$

Example: what would a Property Professor's annual salary be (over 20 years) if it were financed by a 1 000 000$ one-time endowment earning 10% a year? (no hints intended)

$$\begin{aligned} PMT &= PV \times (A/P, i, n) \\ &= 1000000\$ \times (A/P, 10\%, 20) \\ &= 1000000\$ \times (0.117460) \\ PMT &= 117459.62\$ \end{aligned}$$

N	%i	PV	PMT	FV
20	10	−1000000	?	0

For future reference, the reader should prove that:
$(A/P, i, n) = i + (A/F, i, n)$

The intuitive interpretation of this identity is that the annual repayment of a debt is made up partly of interest (i) and partly of a periodic repayment of some of the principal (A/F , i , n) sufficient to reach the amount (FV) by the end of n periods and so dissolve the entire debt.

The following table condenses our six factors and its layout is meant to illustrate the intuitive and mathematical symmetry and reciprocity of these time factors.

Table 1 The six time factors of one dollar

	Compounding →	Discounting ←
The time transformation of a single amount	$(F/P, i, n) = (1+i)^n$	$(P/F, i, n) = \frac{1}{(1+i)^n}$
The time transformation of an annuity	$(F/A, i, n) = \frac{(1+i)^n - 1}{i}$	$(P/A, i, n) = \frac{1-(1+i)^{-n}}{i}$
The sinking fund and amortisation factors	$(A/F, i, n) = \frac{i}{(1+i)^n - 1}$	$(A/P, i, n) = \frac{i}{1-(1+i)^{-n}}$

2. Varia

2.1 Perpetual annuities (or perpetuities)

Some bonds entitle the investor to a stream of fixed value coupons for an indefinite period: these are perpetual annuities whose value is found through a little manipulation of our initial (P/A , i , n) formula:

$$(P/A, i, n) \xrightarrow{\text{when } n > \infty} = A\,\frac{1 - 1/(1+i)^n}{i}$$

When n tends towards infinity, the $(1 + i)^n$ factor becomes very large and its inverse, $1/(1 + i)^n$, vanishes. Consequently, the perpetuity formula boils down to:

$$(P/A, i, n) \xrightarrow[\text{—> } \infty]{\text{when n}} = A / i$$

Example: The present value of a perpetual annual dividend of 10 000$ bearing i = 15% is:

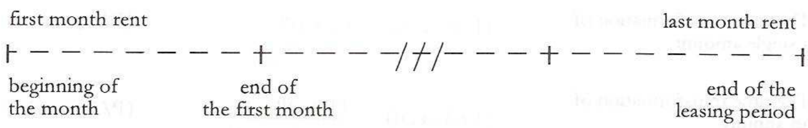
$$P = \frac{10\,000\ \$}{0.15} = 66\,666.66\ \$$$

The reader may be disappointed to realize that 'eternity' is no big deal in financial matters since, for example, the present value of the same stream of dividends over 30 years hardly differs from the value of an infinite stream:

PV = 10 000$ × (P/A , 15% , 30)
PV = 65 659.79$

2.2 Annuities due

So far our assumption has been that payments or deposits were made at the end of each period, but we may be required to perform similar computations when payments or deposits are made at the beginning of each period: these beginning-of-the-period type of annuities are called annuities due. For example, rents are paid at the beginning of the month so this payment is compounded during the first month, as illustrated below:



The formulation must now take into account this extra compounding period:

PV = Rent × (P/A , i , n) × (1 + i)

Alternately, we could take the first month and add the discounted value of the n – 1 following periods:

PV = First month rent + Rent × (P/A , i , n – 1)

Better yet, we can use the calculator's special choice of the BEGIN function.

In property analysis practice, by convention and for simplicity's sake, we choose to assume that rent and all other payments are made at the end of the period. Greater precision becomes futile given the shakiness of other information and hypotheses. Forecasting always means putting up with a fair deal of fuzziness.

3. Present value, net present value and internal rate of return

We now have all the Lego blocks needed to assemble the most useful of the analyst's tools. Let's proceed step by step.

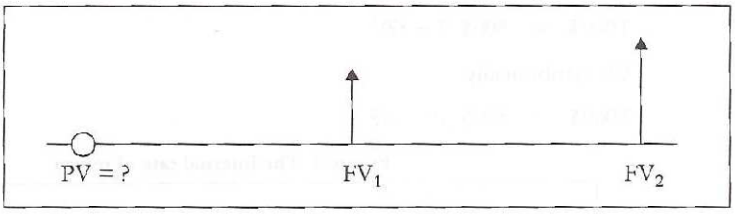
3.1 The present value of two amounts

• What is the present worth of 1000$ receivable in one year and of 1500$ to be received in 2 years if the discount rate is $i_{1,1}$ = 10%?

Mathematically we could write:

$$PV = FV_1/(1+i)^1 + FV_2/(1+i)^2$$
$$= 1000\$/(1+0.10)^1 + 1500\$/(1+0.10)^2$$
$$= 909.09\$ + 1239.67\$$$
$$PV = 2148.76\$$$

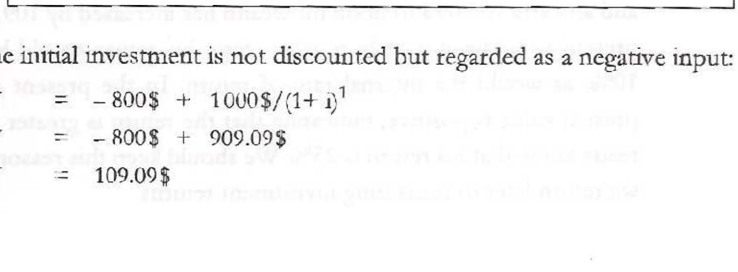
Figure 7 Present value of two amounts FV_1 and FV_2



• What is the present value of an 800$ investment returning 1000$ at the year's end if the discount rate is 10%?

Suppose the 800$ investment is made at the beginning of the year and the promised 1000$ is due at the very end. By convention, negative amounts (outlays) are represented by a downward pointing arrow, whereas positive amounts (incomes) are represented by an upward pointing arrow. Our little story can be depicted as:

Figure 8 A simple case of net present value



The initial investment is not discounted but regarded as a negative input:

$$PV = -800\$ + 1000\$/(1+i)^1$$
$$PV = -800\$ + 909.09\$$$
$$PV = 109.09\$$$

The result is called the **Net Present Value** (NPV) of the investment. This is the most important concept in investment analysis: simple but crucial.

3.2 The internal rate of return

We could immediately press the key IRR and wait to get the result 25.00 after a few seconds. This is the internal rate of return on our 800$: the discount rate which equates the present value of the year end 1000$ income with the current outlay of 800$. In other words, it is the discount rate that reduces the investment's net present value to naught.

N	%i	PV	PMT	FV
1	?	–800	0	1000

In our very simple story, we could have asked:

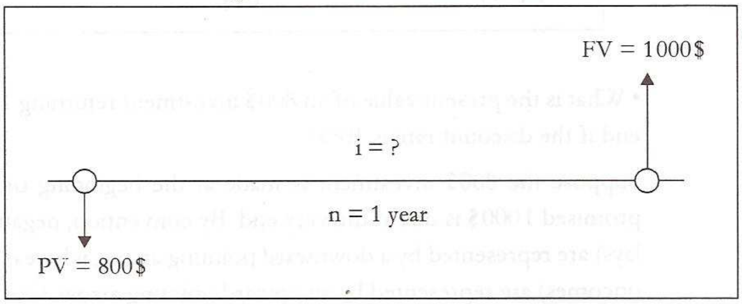
$$FV = PV\,(1 + i?)^1$$

$$1000\$ = 800\$\,(1 + i?)^1$$

Or symbolically:

$$1000\$ = 800\$\,(P/F\,,\,i?\,,1)$$

Figure 9 The internal rate of return



In this form, it becomes apparent that the internal rate of return is that discount rate that satisfies the identity. The calculator reacts sluggishly when computing an IRR (in more complex cases it may take several seconds to obtain the result); in fact the machine iterates: it proceeds through trial and error, testing different discount rates and checking whether the result is positive, negative or null. Once it has homed in very close to zero, it stops and displays the closest approximation of the internal rate of return.

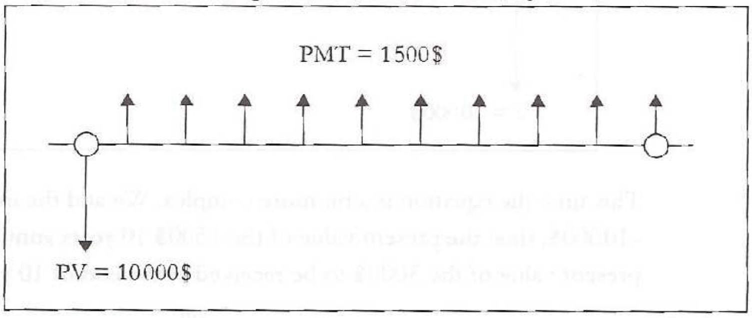
Let's mull over our results. The 10% discount rate has given us a net present value of 109.09$. That is, the investor earns a return of 10% on his investment and an extra 109.09$ to boot: his wealth has increased by 109.09$. Had the net present value been exactly equal to zero, his return would have been exactly 10%, as would the internal rate of return. In the present example, the net present value is positive, indicating that the return is greater than 10%: we already know that his return is 25%. We should keep this reasoning in mind until we return later to measuring investment returns.

3.3 Present value, internal rate and annuities

• What is the net present value (given a 10% discount rate) and the internal rate of return of a 10000$ loan calling for 10 annual payments of 1500$?

To the lender, this loan would consist of an outlay (the 10 000$ loaned) followed by a stream of income (1500$ per year for 10 years).

Figure 10 Return on an annuity



To obtain the net present value, we simply have to solve the following equation where the initial (negative) investment is added to the present value of an annuity of 1500$ over 10 years at a rate of 10%:

$$NPV? = -10\,000\,\$ + 1\,500\,\$ \times \frac{1-(1+0.10)^{-10}}{0.10}$$

To get to the internal rate of return we solve for IRR:

$$10\,000\,\$ = 1\,500\,\$ \times \frac{1-(1+IRR?)^{-10}}{IRR?}$$

Or, consistent with our notation:

$$\begin{aligned} NPV? &= -PV + PMT \times (P/A, i, n) \\ &= -10000\$ + 1500\$ \times (P/A, 0.10, 10) \\ &= -783.15\$ \end{aligned}$$

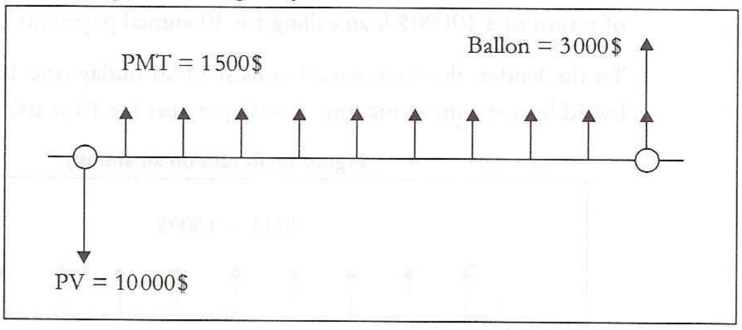
N	%i	PV	PMT	FV
10	?	-10000	1500	0

And the IRR (i%) will be 8.14%.

• What is the net present value (at a discount rate of 10%) and the internal rate of return on a loan of 10000$ refundable by 10 annual payments of 1500$ and a final "balloon" (a single extra payment) of 3000$?

Now the picture would be:

Figure 11 Using 4 keys: PV, n, PMT and FV to find the 5th



This time the equation is a bit more complex. We add the initial investment of –10000$; then the present value of the 1500$ 10 years annuity and, finally, the present value of the 3000$ to be received at the end of 10 years:

$$NPV? = -10\,000\,\$ + 1\,500\,\$ \times \frac{1-(1+0.10)^{-10}}{0.10} + 3\,000\,\$ \times (1+0.10)^{-10}$$

And the IRR equation is now:

$$10\,000\,\$ = 1\,500\,\$ \times \frac{1-(1+i?)^{-10}}{i?} + 3\,000\,\$(1+i?)^{-10}$$

Our notation allows us to express this more elegantly as:

$$\begin{aligned} NPV? &= -PV + PMT \times (P/A, i, n) + FV \times (P/F, i, n) \\ &= -10000\$ + 1500\$ \,(P/A, 0.10, 10) + 3000\$ \,(P/F, 0.10, 10) \\ &= -783.14\$ + 1156.63\$ \\ NPV? &= 373.48\$ \end{aligned}$$

To find the IRR we write and solve:

$$\begin{aligned} PV &= PMT \times (P/A, i?, n) + FV \times (P/F, i?, n) \\ 10000\$ &= 1500\$ \,(P/A, i?, n) + 3000\$ \,(P/F, i?, n) \end{aligned}$$

On the calculator, we know four of the variables and we need to find the fifth:

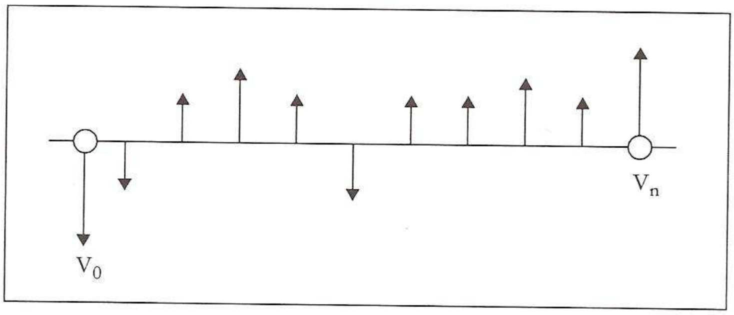
N	%i	PV	PMT	FV
10	?	–10000	1500	3000

And the resulting IRR is 10.77%.

We can even double check our definition of the IRR: the rate for which the net present value equals zero. If we do discount the previous stream of payments at 10.77%, we will obtain a NPV equal to zero. And, to make sure, we may recompute the net present value at a rate of 10%. The resulting net present value will indeed be 373.48$.

• Now we are all set to describe any investment as an initial outlay of (V_0) followed by a stream of expenditures or revenues (A_t) and, eventually, the disposition of the asset (V_n). The investment could as well be a building, a dam, a hospital or a space shuttle.

Figure 12 A stream of income and expenses



The following equations symbolise the information contained in Table 2:

$$NPV = -V_0 - \frac{A_1}{(1+i)^1} - \frac{A_2}{(1+i)^2} + \frac{A_3}{(1+i)^3} + \frac{A_4}{(1+i)^4} + \frac{V_5}{(1+i)^5}$$

$$NPV = -V_0 - A_1\,(P/F, i, 1) - A_2\,(P/F, i, 2) + A_3\,(P/F, i, 3) + A_4\,(P/F, i, 4) + V_5\,(P/F, i, 5)$$

Table 2 The NPV and IRR of the Tertius project

Years		Expenses and incomes	Discount factor (for a rate of 12%)	Present value at 12%
0	V_0	– 8000	$(1 + 0.12)^{-0} = 1.00$	– 8000.00$
1	A_1	– 500	$(1 + 0.12)^{-1} = 0.89$	– 446.43$
2	A_2	– 200	$(1 + 0.12)^{-2} = 0.79$	– 159.44$
3	A_3	800	$(1 + 0.12)^{-3} = 0.71$	569.42$
4	A_4	100	$(1 + 0.12)^{-4} = 0.69$	63.55$
5	V_n	17000	$(1 + 0.12)^{-5} = 0.63$	9 646.26$
Net present value				1673.36$
Internal rate of return				16.23%

This table can be constructed step by step using the calculator as outlined here, or, preferably, with the help of the NPV and IRR keys. When computations become more complex, it is much wiser to use spreadsheets offering NPV and IRR functions.

Appendix III

R *Adjusted* à la *Ellwood*

The Akerson formulation was a pedagogical improvement over the initial solution offered in 1959 by LW Ellwood, an innovative chief valuer for the New York Life Insurance Company. His contribution has had a considerable influence on the appraising profession and was remarkably modern in some aspects of financial theory.

Ellwood's precomputed adjustment tables were a practical breakthrough in the pre-computer and pre-calculator days. Now the technique is less appealing but it still retains its aficionados among traditional US-sphere valuers.

Since we have been through Akerson's adaptation of Ellwood's method, the conceptual roadblocks have all been removed and we presently only have to deal with different notations and a slightly different organisation of the formulas.

Let us first reorganise Akerson's formula to match Ellwood's:

$$\mathbf{R} = D/V \cdot \mathbf{f} + E/V \cdot Y - D/V\,(1 - \%OSB_t)\,(A/F, Y, t) - \mathbf{g}\,(A/F, Y, t)$$

$$\mathbf{R} = Y - D/V\{Y + (1 - \%OSB_t) \cdot (A/F, Y, t) - f\} - \mathbf{g}\,(A/F, Y, t)$$

Now we simply introduce Ellwood's notation (Table 1).

Table 1 Notation equivalence

Ellwood	Our notation	Definitions
Y	Y or IRR_e^* or k_e^*	Before-tax equity return or equity yield rate
I	k_d	Mortgage rate
f	f or $(A/P, k_d, n)$	Amortisation factor
M	D/V	Debt to value ratio
PV	$(1 - \%OSB_t)$	% of paid up loan at disposition time t
app.	g.V	Appreciation (g > 0)
dep.	g.V	Depreciation (g < 0)
C	{Y + PV. (A/F , Y , t) – f}	Mortgage coefficient
d	NOI	Net operating income (normalised)
R	**R** (or k_a when $\Delta E = 0$)	Weighted and adjusted discount rate (the capitalisation rate)

The equivalence should now be written:

Akerson:

$$R = Y - D/V\,\{Y + (1 - \%OSB_t)\,.\,(A/F\,,Y\,,t) - \mathbf{f}\} - \mathbf{g}\,(A/F\,,Y\,,t)$$

Ellwood:

$$R = Y - M\,\{Y + PV\,.\,(A/F\,,Y\,,t) - f\} \; {}^{+\,dep.}_{-\,app.}\,(A/F\,,Y\,,t)$$

And we are back to Ellwood's famous formula (here we borrow the traditional sinking fund notation $1/s_{\overline{n}|Y}$):

$$R = Y - M\,C \; {}^{+\,dep.}_{-\,app.}\; 1/s_{\overline{n}|Y}$$

Nostalgic valuers would be happy to go, for one last time, through Ellwood's table and the following example is therefore dedicated to them:

Table 2 The Ellwood Building

Required information	
NOI	10000$
D/V	2/3
Y	15%
k_d ($k_d = i_{12,12}$, over 25 years)	8%
t	15 years
g	+10%

The following steps are indicated in the accompanying table adapted from Ellwood, 1959, p. 35 (Table 3).

1. Choose the appropriate table (here D/V = 2/3, n = 25 years and t = 15 years);
2. Choose the appropriate k_d ($i_{12,12}$ = 8%) column;
3. Choose the Y = 15% line;
4. Find the appropriate factor at the intersection of columns k_d = 8% and line Y = 15%:

   The result would be 0.1067;
5. Apply the sinking fund factor to the appreciation rate: $g \times 1/s_{\overline{Y}|15}$; or g × (A/F , 15% , 15 years) according to our notation:

   The result is 0.10 × (0.0210) = 0.00210;
6. Subtract (since we assume an appreciation) the step 5 result from the step 4 result:

   R = 0.1067 – 0.00210 = 0.1046;
7. Determine the appraised capitalised value:

   V = 10000$/0.1046 = 95602$

Table 3 Capitalisation rates (assuming 2/3rds of purchase price financed by mortgage)

25 YEARS AMORTISATION: 6.25% TO 8%

2

Interest rate			6.25%	6.5%	6.75%	7%	7.5%	↓ 8%	
Annual requirement (f)			.07920	.08112	.08292	.08484	.08868	.09264	$\frac{1}{s_{\overline{n}\rceil}}$
Coverage, min. rate			.05280	.05408	.05528	.05656	.05912	.06176	
Projection	Balance (b)		.586539	.592238	.601439	.608024	.622532	.635506	+ DEP. – APP.
	Equity	Yield	Basic rate before depreciation or appreciation						
	4%	.04	.0524	.0539	.0553	.0569	.0599	.0629	.0500
	5%	.05	.0567	.0581	.0597	.0611	.0641	.0672	.0464
	6%	.06	.0609	.0624	.0639	.0653	.0683	.0713	.0430
	7%	.07	.0652	.0666	.0681	.0695	.0725	.0754	.0398
	8%	.08	.0693	.0707	.0722	.0736	.0765	.0795	.0368
15 Years	9%	.09	.0734	.0749	.0763	.0777	.0805	.0835	.0341
n = 15	10%	.10	.0775	.0789	.0803	.0817	.0845	.0875	.0315
	11%	.11	.0815	.0829	.0843	.0857	.0885	.0914	.0291
	12%	.12	.0854	.0868	.0882	.0896	.0924	.0953	.0268
	13%	.13	.0893	.0907	.0921	.0935	.0963	.0991	.0248
	14%	.14	.0932	.0945	.0959	.0973	.1001	.1029	.0228
3 →	15%	.15	.0970	.0984	.0997	.1011	.1039	.1067	.0210 ← 4 and 5
	Balance (b)		.337601	.341202	.350564	.355788	.368747	.379565	+ DEP. – APP.
	Equity	Yield	Basic rate before depreciation or appreciation						
	4%	.04	.0513	.0527	.0541	.0555	.0583	.0612	.0336
	5%	.05	.0561	.0575	.0589	.0603	.0631	.0659	.0303
	6%	.06	.0608	.0621	.0635	.0649	.0677	.0705	.0272
	7%	.07	.0654	.0667	.0681	.0695	.0722	.0750	.0244
	8%	.08	.0699	.0711	.0725	.0739	.0766	.0794	.0219
20 Years	9%	.09	.0742	.0755	.0769	.0782	.0809	.0837	.0196
n = 20	10%	.10	.0785	.0797	.0811	.0824	.0851	.0879	.0175
	11%	.11	.0826	.0839	.0851	.0865	.0893	.0920	.0156
	12%	.12	.0867	.0880	.0893	.0906	.0933	.0961	.0139
	13%	.13	.0907	.0920	.0933	.0946	.0973	.1000	.0124
	14%	.14	.0946	.0959	.0972	.0985	.1012	1039	.0110
	15%	.15	.0985	.0998	.1011	.1024	.1050	.1077	.0098
	Balance (b)		none	none	none	none	none	none	+ DEP. – APP.
	Equity	Yield	Basic rate before depreciation or appreciation						
	4%	.04	.0501	.0514	.0526	.0539	.0565	.0591	.0240
	5%	.05	.0555	.0568	.0580	.0593	.0618	.0645	.0210
	6%	.06	.0607	.0619	.0631	.0644	.0669	.0696	.0182
	7%	.07	.0656	.0669	.0681	.0694	.0719	.0745	.0158
	8%	.08	.0703	.0717	.0729	.0741	.0767	.0793	.0137
25 Years	9%	.09	.0749	.0762	.0774	.0787	.0813	.0839	.0118
n = 25	10%	.10	.0794	.0807	.0819	.0831	.0857	.0883	.0102
	11%	.11	.0837	.0849	.0861	.0874	.0900	.0926	.0088
	12%	.12	.0878	.0891	.0903	.0916	.0941	.0968	.0075
	13%	.13	.0919	.0931	.0943	.0956	.0982	.1008	.0064
	14%	.14	.0958	.0971	.0983	.0996	.1021	.1048	.0055
	15%	.15	.0997	.1009	.1021	.1035	.1060	.1087	.0047

We could now check our results with Akerson's table.

Table 4 Akerson checks Ellwood

	Weight	Rate	Factors
Debt (D)	2/3	0.0077182 × 12	0.0617
Equity (E)	1/3	0.1500	0.0500
% EBUP	2/3	0.3638 × 0.0210	– 0.0050
% appreciation	0.10	0.021017	– 0.0021
Rate **R**			0.1046
Appraised value			(NOI/R)
V			95 602 $

It works!

Appendix IV

Methodological dissonance

The application of apparently similar techniques is far from being 'paradigmatic' between the US and the UK spheres. The divergences between the two spheres are quite numerous, but the discussion is now limited to some of the tenets of the income approach to valuation. Oddly enough, the dissonance seems to be of a linguistic nature since crucial expressions are used differently in both spheres and this dissonance leads to serious misconceptions on standard techniques and rates.

From an Australian perspective, you could believe that everything is fairly standardised:

> *Regarding the harmonization of valuation standards, it is fair to comment that unlike other professions, the strong influence over the decade and throughout the world of the British legal system, has promoted a relatively uniform approach to the valuation/appraisal discipline. Except for some deflection in the American scene, valuation techniques have developed in a relatively compatible manner.* (McNamara, 1997)

This amusing quote could make you believe that there is a 'relatively uniform' global professional paradigm. Except of course that:

— Around 80% of the body of knowledge (articles, textbooks, standards and reports) in our valuation/appraisal discipline come from the 'deflected' American scene.

— The rest of the world, as defined by the author, seems to exclude some minor countries such as Canada, Mexico, most South American countries, Japan, China and thus some thousands of property academics and valuers world wide who, unforgivably, apply the general US 'deflected' approach and, sacrilegiously, shirk the 'strong influence of the British legal system …'

— Most of the techniques from the 'deflected branch' came into use almost 100 years ago (Fisher, 1906) and were developed at a fairly sophisticated level more than 50 years ago (LW Ellwood, 1947). They have been taught in Universities and Business Schools for more than 25 years and have integrated modern financial models and theories for at least 15 years. Whereas, even in the last decade, most textbooks and articles produced under the 'strong influence of the British System' still largely rely on elementary treatments that were dropped from US and Canadian Universities' curriculums at least 15 years ago.

1. Valuing income flows

From Chapters IV and V you have learned that income generating properties can be valued using two general techniques:

1) The direct capitalisation of a single income information;

2) The discounting of streams of incomes during a limited number of years of analysis.

In turn, the discounting stream of incomes has at least two variants: the property model and the residual equity model.

1) Property models (or full asset models) discount a flow of net operating and disposal incomes. Property models can be pre-tax or post-tax and apply to levered or unlevered assets;

2) Equity models discount the residual operating and disposal cash flows going to the equity investors. Equity models, of course, are relevant for levered assets but can be presented in pre-tax or post-tax formats.

1.1 The fault line

UK-sphere textbooks[1] and professional standards[2] limit the valuation exercise to direct capitalisation and to the discounting of pre-tax net income. They do not take explicitly into account the financial split between mortgage and equity and consequently they mix up the concepts of net operating income and cash flow.

1. Textbook contents are the best indicators of the level of development of a paradigm since they are used to teach the tools of the trade. Thus, we can compare the different sources of practices by comparing the principal textbooks that have been used in the last 25 years to define and propagate the paradigms through the tertiary education programs. The dating of the introduction of concepts and models is not exact since it takes quite a few years before theories are turned into teachable textbook material, but the following examples provide an approximate benchmarking of the national differences.

   To avoid *ad hominem* undiplomatic confrontations of specific contents we will generally oppose the UK-sphere and the US-sphere streams admitting, obviously, that this dichotomy may be an oversimplification of the exact content of curriculums.

   The content of the UK-sphere paradigm is best described by the generally quoted texts such as Richmond (1985), Isaac and Steley (1991), Enever (1995), and Baum and Crosby (1995).

   The Australian texts seem to have followed most of the UK traditions (Millington, 1994) though, other texts, in various degrees, integrate some elements of both worlds: Robinson (1989), Whipple (1995) and Rowland (1997).

2. Royal Institution of Chartered Surveyors 1995, *Appraisal and valuation manual, Practice statement.*

US-sphere textbooks[1] and professional standards[2] define the discounted cash flow general format as a pre-tax or post-tax after debt cash flow.

Thus, unfortunately, we are dealing with two different discounting models:

— The UK-sphere mislabelled DCF is reduced to the discounting of pre-tax net incomes from operation and disposition. It should be labelled a discounted net income model (DNI).

— The US-sphere DCF is an after-tax equity residual model that, indeed, discounts cash flows (i.e. after debt flows).

This modelling divergence could be treated as a minor linguistic quirk that is so common in US versus UK English, but unfortunately the fault-line goes deeper and has more disturbing implications.

— Methodologically, the simple DNI model is wrong. Wrong in its maths and wrong in its use.

— Pedagogically and professionally, the DNI model is needlessly limiting.

1.2 Simplified discounted flows of income

In UK-sphere texts, the prescription would be to discount the NOI and Net disposal results at the weighted average cost of capital. Presumably, such a weighted average should reflect the initial implicit splitting between the debt and the equity flow. However, the examples presented in Chapters V and VI have illustrated that using a straight weighted average cost of capital as a capitalisation rate cannot work with amortised loans and variable equity.

— Discounting at the weighted average cost of capital is inappropriate since it assumes a constant debt/value ratio over the holding period. Of course this is not the case when we deal with an amortised debt and variable incomes. The case becomes even less tractable if the same DNI was applied to a taxed property since the composite discount rate should also deal with the variable tax sheltering of interest and depreciation deductions. Thus, the UK-sphere maths are wrong and the applicability limited when used for property investment analysis and financial expertise.

— This approach is also flawed when used as a valuation tool. The objective of a valuation is to find a 'value' that should mimic, as closely as possible, asset prices read on a comparable market. Such a market is made up of all

1. Specific academic property studies started in the US at the end of the sixties and the first typical textbook was Wendt and Cerf (1969). Later Jaffe and Sirmans (1982) integrated most of the now accepted elements of modern corporate finance. This general approach was then propagated through a large number of US textbooks, Canadian texts (Achour-Fischer, 1987), Mexican texts (Achour-Fischer and Castañeda, 1993) and French texts (Achour-Fischer and Coloos, 1993, Hoesli and Thion, 1994).

2. *The appraisal of real estate,* 11th edition, 1999.

sorts of transactions and the only observable results of these transactions are capitalisation rates. It happens that specific financing conditions mimicked by the choice of a weighted average cost of capital have usually very little to do with the observable cap. rates.

Capitalisation rates are providing exogeneous information about market conditions. They are the valuers' best friends. The same could not be said about the WACC. The traditional capitalisation technique, when properly applied, is a better valuation instrument than the UK-style DNI.

— On the other hand, the US-sphere's equity model does not rely on a composite rate to 'replicate' the leverage effects. It discounts the two different flows at their respective rates. It can also deal explicitly with variable financing conditions, refinancing and, mostly, with the tax implications of interest and depreciation deductions. At least the maths are OK[1], the applicability is wider for investment analysis purposes, and the model is not less suitable than the previous one for straightforward valuation.

2. Conclusion: does it really matter?

This appendix explains that a UK-style DNI model is not a DCF model at all. Further, it also asserts that the US-DCF has more theoretical and practical oomph.

By simplifying the DNI treatment to the discounting of net operating and disposal flows, we eliminate most of the really interesting stories. Interesting stories are being told at the financing and at the tax level.

Most UK-sphere textbooks have no, or very few, chapters dealing with mortgage financing and property taxation. Most US textbooks have complete chapters (and separate textbooks) dealing with such issues. The tax and financing angles are central to the US-sphere texts: they are the juiciest part of any undergrad course in property investment.

The simple fact of dealing explicitly with taxation and financing forces the academics and practitioners to develop a greater expertise in these areas. In fact, increasingly, property expertise is a financing and taxation expertise. This cannot occur when the paradigm is limited to the DNI framework. The limitation of the field may explain why the property profession is under such intense competition from neighbouring professions such as accounting and finance. Large chunks of professional practices are abandoned by lack of adequate weaponry.

1. OK … but not necessarily formally 'right' either. The right model should take into account a variable k_c. Although some variable risk models have been suggested, none has been successfully applied to the property field. They could present a technical improvement at the cost of a greater complexity and no real serious gain in practicality.

The psittacious argument that valuation should not be concerned with taxation is a solid component of the paradigm (in both spheres). But this position is wrong. Wrong and in contradiction with the mantra of the income valuation methodology: capitalisation rates and other returns should be derived from the observation of market transactions.

But, when we think about it, market cap. rates are set by tax paying investors. When a tax paying investor pays V for a given stream of NOI or a given stream of cash flows he obviously takes his tax conditions into account. Thus the cap. rate implicitly discounts 'tax influenced' financial flows. If the tax payers' investors make the market, their resulting cap. rates are determining the asset class market values.

Of course, when the clientele is made up of non-tax paying investors (such as superannuation funds) the market prices will be set by them and the cap. rate will reflect their tax exempt status.

Market prices are not set by the average investors. In Chapter VI, I explained why market prices are not the 'most probable' prices that could be offered by the typical investors. Market prices are set by auction winners. The winning bidders make the market, they set the maximum price that is appropriate for their financing and taxation conditions. I have also illustrated that maximum property prices can very well be 'marked to market' in a completely different world (the Bond market) favoured by a growing clientele (see in Chapter VI the note on the 'paperisation' of property transactions).

Thus the distribution of prices and return indicators read on property markets and capital markets are isomorphic to the distribution of clienteles of market makers subjected to their respective tax and financing conditions.

A detailed knowledge of what influences the behaviour of these clienteles is the essence of the valuation and property professions. If over-simplified analytical models rub off these behaviours, the model must be discarded.

Appendix V

Residual techniques

1. Splitting the value physically

Hitherto, you were satisfied with a unitary flow of income without worrying about its 'physical' origin; now you must ask: should I allocate my income to the land or to the building?

Most of the time this issue is irrelevant; however, in some particular cases, you may want to split the NOI and thus estimate separately the building and the land values.

Let us write this separation:

$$V = V_{Building} + V_{Land}$$
$$V = V_B + V_L$$

Why should you treat these two components separately? Essentially, because both do not depreciate in the same manner.

Now, if you want a rate of return of **k** on the land component, you would normally want a higher return on the building component. Why? Because you want also to be compensated for the depreciation on the building. On the building component you expect a return of k + a certain rate that should represent the decreasing value of the building.

- Buildings depreciate with time at the annual rate Δv. The investor wants a return **on** and **of** the capital invested, thus she requires a higher global rate in order to obtain an annual **k**[1] rate of return on her investment, and an annual recovery of the capital invested (Δv), so that the full undepreciated value V is restored at the end of the period of analysis.
- On the other hand, land does not depreciate and the rate of return on this component must only remunerate the capital invested at the rate **k** without accounting for capital recovery.

1. The notation k will apply to the total return on building and land. This return could be different from the return noted k_a in previous chapters to denote the return on a levered asset.

The general principle behind the residual techniques is that if the value of one of the components is known, then the remainder (the residual) is the contribution of the other components to the value of the whole.

These techniques being of limited utility, we shall proceed with a summary presentation supported by a simple — not particularly realistic — example. However, before presenting the three residual techniques you must become familiar with the three forms of depreciation used to model the annual variation of value – Δv.

1.1 The various depreciation assumptions: Babcock, Hoskold, Inwood

• *Linear depreciation (Babcock's formulation[1])*

Buildings are assumed to depreciate at the rate of 1/n during their lifetime of n years. Thus the annual rate of recovery of the capital invested (on the value of the building) will be:

$\Delta v \quad = \quad V_B/n$

• *Sinking fund depreciation (Hoskold's formulation[2])*

The recovery of depreciated capital is treated as a sinking fund accumulation at the safe rate **r** (for instance, the rate on a term deposit). During the n years of the building's life, the accumulated annuity will amount to the value of the building.

$\Delta v \quad = \quad V_B \times (A/F\ ,\ \mathbf{r}\ ,\ n)$

• *Depreciation by annuity (Inwood's formulation)*

Here the recovery of capital invested is calculated using the annuity method, which accumulates at the same rate as the return on capital invested (**k**). Thus, the return on capital invested and the recovery of the capital invested are made at a unique rate **k** for the annual amount of:

$\Delta v \quad = \quad V_B \times (A/P\ ,\ \mathbf{k}\ ,\ n)$

This third solution is simpler and more convincing. Indeed, for a rational investor it is difficult to justify the use of a safe rate lower than the opportunity cost of funds.[3]

You could now observe how the choice of depreciation formulation will affect the building value. If NOI_B is the part of net income attributable to the building, you can deduct the value of the latter by capitalising the NOI_B at the cap. rate **R**. The cap. rate combines the return on capital invested (**k**) and the recovery of capital invested at an annual rate that can be calculated under three methods of depreciation.

1. Babcock, FM 1932.
2. Hoskold, R 1905.
3. Note that when k = r then you can demonstrate that $(A/P\ ,\ k\ ,\ n) = k + (A/F\ ,\ k\ ,\ n)$.

Let us write the general formulae:

$V_B = NOI_B/R$

With, alternatively, $R = k + 1/n$, $R = k + (A/F, r, n)$ or $R = (A/P, k, n)$

Under the three depreciation hypotheses, we thus have alternative values as illustrated below:

Determination of the value of the building V_B

NOI_B	=	6000$	the net operating income attributed to the building
n	=	20 years	the economic life of the building
k	=	12%	return on capital invested
r	=	10%	sinking fund safe rate

	Babcock (linear)	Hoskold (sinking fund)	Inwood (annuity)
	$\frac{NOI_B}{k + 1/n}$	$\frac{NOI_B}{k + (A/F, r, n)}$	$\frac{NOI_B}{(A/P, k, n)}$
V_B	6000/(0.12 + 0.05)	6000/(0.12 + 0.01745)	6000/0.1338
V_B	**35294$**	**43649$**	**44817$**

1.2 The three residual techniques

Now that you are equipped with your trinity of depreciation, you can handle the trinity of residual techniques. The choice between the three techniques depends on the available information:

— If you know the value of the building, then you will deduce the value of the land (residual land technique).

— If you know the value of the land, you deduce the value of the building (residual building technique).

— If you can estimate the resale value of the whole property, you will then be able to deduct the value of the components (residual property technique).

Finally, I will present a fourth technique, based on the weighted average capitalisation rate that is very similar to the income discounting technique used in Chapter V.

1.3 The land residual technique

The four stages of calculation are as follows:

1. You estimate (or you know) the value of the building V_B.
2. Then, you allocate the net income between the two components NOI_B and NOI_L.
3. You obtain V_L by capitalising the income from the land at the rate **k**.
4. Finally, you obtain the total value by adding the two components:

   $V = V_B + V_L$

Example:

V_B = 40000$ (obtained from the cost approach)

k = 12%

r = 10%

n = 20 years

The following table illustrates only the depreciation by annuity (Inwood).

Land residual technique with annuity depreciation

	Income	Values
Value of the building		40000$
Total net income	7000$	
Net income attributed to the building (A/P , 12% , 20 years) × 40000$ 13.38% × 40000$	5355$	
Net residual income allocated to the land	1645$	
Value attributed to the land 1645$/k		13707$
Total property value		53707$

* You can break up this rate of 13.38% into a return rate of 12% plus a recovery rate of 1.3878% on the value of the building.
You may remember the decomposition: (A/P , k , n) = k + (A/F , k , n).

The step-by-step procedure was illustrated for the Inwood (annuity) depreciation. You could now apply the two other depreciation models (noted a, b, c, below) in a more compact form:

a. $NOI_B = V_B (k + 1/n) = 40000\$ \times (0.12 + 0.05) = 6800\$$

b. $NOI_B = V_B (k + (A/F , r , n)) = 40000\$ \times (0.12 + 0.01745) = 5498\$$

c. $NOI_B = V_B (A/P , k , n) = 40000\$ \times (0.13387) = 5355\$$

Thus, you can calculate net income attributed to the land (NOI_L) according to each formulation:

$NOI_L = NOI - NOI_B$

a. $NOI_L = 7000\$ - 6800\$ = 200\$$

b. $NOI_L = 7000\$ - 5498\$ = 1502\$$

c. $NOI_L = 7000\$ - 5355\$ = 1645\$$

In a third stage, you capitalise NOI_L at the return rate on capital invested and you obtain three alternative solutions:

a. $V_L = 200\$/0.12 = 1667\$$

b. $V_L = 1501.61\$/0.12 = 12513\$$

c. $V_L = 1644.85\$/0.12 = 13707\$$

At the fourth stage, you find the three alternative total values:

	V	=	V_B	+	V_L		
a.	V	=	40000$	+	1667$	=	41667$
b.	V	=	40000$	+	12513$	=	52513$
c.	V	=	40000$	+	13707$	=	53707$

The last result could be obtained directly by writing Inwood's formulation as:

$$V = V_B + (NOI - V_B\,(A/P\,,k\,,n))/k$$

$$V = 40000\$ + \frac{7000\$ - 40000\$ \times (0.13387)}{0.12} = 53707\$$$

1.4 Applicability of the land residual technique

Since this procedure requires the initial knowledge of the building value, you must rely on a cost approach valuation for the building. This valuation can be adequate for recently built buildings; however, for older properties, the apparent precision of the land residual technique will be marred by the rather vague determination of V_B. Still, you can justify the use of this technique whenever the building represents a small proportion of the total value (for instance a golf course or a cemetery … your choice). In such cases, an error on V_B will have negligible effects on the total value.

1.5 The building residual technique

This procedure can be illustrated with the compact formula. The steps are as follows:

1. Initially, you know the land value (V_L), probably from market information;
2. You allocate NOI between the two components NOI_L and NOI_B;
3. Then you deduct the building value V_B through capitalisation at the composite rate (k and depreciation);
4. And, finally, you obtain the total value by adding land and building value.

Example :

V_L = 2000$

NOI = 7000$

k = 0.12

r = 0.10

n = 20 years

a. Linear depreciation hypothesis:

$$V = V_L + (NOI - V_L \times k)/(k + 1/n)$$

$$= 2000\$ + (7000\$ - 2000\$ \times 0.12)/(0.12 + 0.05)$$

$$= 2000\$ + 39765\$$$

$$V = 41765\$$$

b. Hoskold hypothesis (sinking fund):

$$V = V_L + (NOI - V_L \times k)/(k + (A/F, r, n))$$
$$= 2000\$ + (7000\$ - 2000\$ \times 0.12)/(0.12 + 0.01745)$$
$$= 2000\$ + 49178\$$$
$$V = 51178\$$$

c. Hypothesis of Inwood (annuity):

$$V = V_L + (NOI - V_L \times k)/(A/P, k, n)$$
$$= 2000\$ + (7000\$ - 2000\$ \times 0.12)/(0.13387)$$
$$= 2000\$ + 50493\$$$
$$V = 52493\$$$

Applicability of the building residual technique

The only realistic application of this technique is in the case of land under lease. For such a case, you know the rent on land (thus NOI_L) and then you can identify the value of the building separately.

1.6 The property residual technique

1. You know the total property NOI;
2. You deduct (by capitalisation of the NOI flow) the initial property value noted V*;
3. Then, you assume a resale value for the land (without the building);
4. Finally, you adjust the initial value of V* by adding the present value of the land's resale price.

Example :

NOI = 5000$ for each of the 3 years (before the demolition of the building)

k = 0.12

r = 0.10

n = 3 years

V_L = 50000$ (resale value of the land anticipated in three years)

a. Under the linear depreciation, the direct solution will be:

$$V = NOI/(k + 1/n) + V_T \times (P/F, k, n)$$
$$= 5000\$/(0.12 + 0.3333) + 50000\$ \times 0.71178$$
$$= 11029\$ + 35589\$$$
$$V = 46618\$$$

b. With the Hoskold (sinking fund) formulation:

$$V = NOI/ k + (A/F, r, n)) + V_T \times (P/F, k, n)$$
$$= 5000\$/(0.12 + 0.3021) + 50000\$ \times 0.71178$$
$$V = 47434\$$$

c. And with the Inwood (annuity) model:

$$V = NOI/(A/P\,,k\,,n) + V_T \times (P/F\,,k\,,n)$$
$$= 5000\$/(0.4163) + 50000\$ \times 0.71178$$
$$= 12009\$ + 35589\$$$
$$V = 47598\$$$

Applicability of the property residual technique

This solution can only be applied to redevelopment projects where the existing building does not represent an optimal use of the site. A building may generate a temporary income but you anticipate its future demolition and you want to have a rough idea of the potential value of the land.

This general technique can also — and more interestingly — be used to analyse development projects starting from scratch. These applications are illustrated in the PVM-Web linked to Appendix V.

2. Conclusion on the residual techniques

These techniques take more space in traditional appraisal textbooks than they have in realistic appraisal practice. Their operational requirements are too rigid and the arbitrary choice of the depreciation model raises serious doubt on their credibility. (Just compare the great amplitude of the variations obtained for the values according to three depreciations.)

A final technique can be suggested when you really need to differentiate the respective contribution of the building and the land.

3. Discounting at a weighted average rate of return on land and building

• ***Calculation of R when we know V_B/V***

When the respective proportions of the land and the building values are known, we can directly calculate a global **R** by weighting the respective rates applied to the two components. Let us take the same example again with an assumption of values: 80% for the building and 20% for the land. We shall stick to the depreciation by annuity whilst noting, however, that the two other solutions could also have been used.

• ***Calculation of the value by the average weighted rate 'building-land'***

Hypothesis of depreciation of Inwood at the rate of 12% over 20 years

Components	Ratio		Discount rate		Weighted average rate
Building	80%	×	13.39%	=	10.71%
Land	20%	×	12.00%	=	2.40%
Weighted **R**					13.11%
Net Income					6000$
Total value (6000$/0.1311) =					**45765$**

This result is as acceptable than the previous ones; it is more immediate and — last advantage — its mode of calculation is very similar to the one used to build the weighted 'debt-equity' rate. Moreover, as with the mortgage-equity method, you can use assumptions on the increase or decrease in the building resale price, as illustrated now.

• ***Taking into account value variations***

Let us modify the previous example to simulate a 6% annual growth rate on land and 2% on building over 5 years (building growth of 6% less a linear depreciation of 4%). The expected return on capital invested is the same: k = 12%. The total average growth rate $\Delta V/V$ will be noted **g**. The **g** rate is positive when the building value increases and conversely.

Weighting the respective growth rates

Components	Ratio		Growth factors		Products
Building	80%	×	(F/P , 2% , 5 years)	=	0.8833
Land	20%	×	(F/P , 6% , 5 years)	=	0.2676
Average weighted factor (g = $\Delta V/V$) of growth:					**1.1509**
(hence a growth rate of 15.08% for the period)					

Transform this 5 years rate into an equivalent annual rate and calculate the equivalent rate of accumulation using the sinking fund factor (A/F , k , n):

Annualised equivalent rate = 0.1509 × (A/F , k , n)
= 0.1509 × (A/F , 12% , 5 years)
= 0.1509 × 0.1574
= 0.023754 (hence 2.3754%)

This rate of appreciation must then be deducted from the average return rate **k** to obtain a composite adjusted building-land weighted rate :

R = 0.12 – 0.023754 = 0.0962 (hence 9.62%)

Now, you capitalise the net income flow of 6000$ at this adjusted rate to obtain the present value of the asset:

V = 6000$/0.096245
= 62340$ (to the nearest decimal point)

Now, you may want to check your computation:

Initial present value	62340$	
Resale value in 5 years (at the growth rate of 15.08% over five years)	71748$	
Net annual income	6000$	
Present value of NOI (capitalised at the rate of 12%)		21628$
Present value of the resale value (P/F , 12% , 5 years)		40712$
Total value (to the nearest decimal point)		**62340$**

Here you adjust R down from 12% to 9.62% by **subtracting** the effect of annual growth (**R** = 0.12 – 0.1508 × 0.1574). You would add a percentage if you anticipated a decrease in the value ΔV.

Another intuitive way to understand the calculation is to consider that the investor accepts a lower return rate (9.6% instead of 12%) since she expects a superior value at resale. The profit made at the resale would increase the global return to 12%.

In a compact format, you could write:

V = NOI/(k – ΔV/V × (A/F , k , n))
= NOI/(k – **g** × (A/F , k , n))
= 6000$/(0.12 – 0.1508 × 0.1574)
V = 62340$

This amount of 62340$ would be the maximum bidding price that an investor would be ready to pay without debt and taxes.

• ***Resale scenarios and the desired return rate***

The preceding technique can be used to illustrate an interesting application. An investor would like to know what would be his return rate k under various resale assumptions. The problem consists in solving the following equation with respect to k:

V = NOI/(k ? – ΔV/V × (A/F , **k ?** , n))

Hard by hand ... but easy with Excel 'goal seeking' function.

To find k: various assumptions of increase or decrease at resale

Assumptions:	Purchase price	=	45000$
	NOI	=	6000$
	n	=	5 years

Growth ΔV/V g	Resale Value V (1+ g)	Corresponding rate of return: k?
– 10%	40500$	11.75%
– 5%	42750$	12.55%
0%	45000$	13.33%
5%	47250$	14.08%
10%	49500$	14.82%

The same Excel iterative procedure can be applied to the treatment of the Akerson-Ellwood valuation technique.

Appendix VI

Splitting property rights

The freehold bundle of rights on a property can be split up among various participants: between mortgagor and mortgagee, between local government and owner and between owners and their tenants.

This appendix is limited to the latter treatment. In this case, you view the value — in terms of the allocation of revenues — as being split between a lessor (L for the Landlord) and a lessee (T for the Tenant).

V	=	$V_{Landlord}$	+	V_{Tenant}
Value		Leased fee value		Leasehold value

1. The valuation of leased fee estate

For normal short term (one year) leases, the leased fee value is equal to the present value of expected income under regular market conditions. However, longer-term leases (commercial leases) may not reflect market rents fully and such leases may reduce (or increase) a property stream of income and thus affect its resale value.

When the contract rent is inferior to what the owner could obtain on the market, the lessee has an advantage (a leasehold value). This advantage could be seen as an implicit saving, or the tenant could also sub-let at market rent and derive an explicit advantage.

Let us examine two symmetrical situations:

• ***The contract rent is below market rent***

$LC < LM$

With LC = lease at contract rent

And LM = lease at market rent

For instance, a 5 years lease signed for 10000$ net per year, whereas market rents for comparable properties are leased at 12000$/year. You assume that the rents will be brought back to market levels at the end of the present lease.

For the owner, this lease can be valued as:

$V_L = 10000\$ \times (P/A\ ,\ k\ ,\ t) + (12000\$/k) \times (P/F\ ,\ k\ ,\ t)$

With a discount rate of k = 12% (expected return on NOI) the leased fee value is:

V_L = 10000\$ × (P/A , 12% , 5) + (12000\$/k) × (P/F , 12% , 5)

V_L = 36048\$ + 56743\$

V_L = 92790\$

By contrast, at full market rent, the leased fee would be worth:

LM/k = 100000\$

You may be tempted to conclude that the lessee enjoys a saving of 7210\$ (100000\$ – 92790\$ = 7210\$), that turns out to be the value of the owner's disadvantage.

The full property value now reverts to:

$V = V_{Landlord} + V_{Tenant}$

V = 92790\$ + 7210\$

V = 100000\$

However, after due consideration, you may also realise that it is not justified to use the same discount rate of k = 12% for both the 'below market rent' and the potential future market rent.

Since the below market rent is 'safer' than the market rent, you should use a lower rate — a safe rate — noted **sr** (assumed to be 7% for the time being).

You could now re-value your leased fee interest as:

V_L = 10000\$ × (P/A , sr , 5) + (12000\$/k) × (P/F , k , t)

V_L = 10000\$ × (P/A , 7% , 5) + (12000\$/12%) × (P/F , 12% , t)

V_L = 41002\$ + 56743\$

V_L = 97745\$

Now, you conclude that the owner's disadvantage is reduced to 2255\$ (100000\$ – 97745\$). When using a safer discount rate, you essentially reallocate part of the tenant's advantage to the lessor: his leased fee value is now higher (97745\$ instead of 92790\$).

Well ... why not? However, you realise that your choice of a safe rate of 7% has been quite arbitrary. Why not 8% or 4%?

How can you refine your safe rate assumption? You could at least determine a floor safe rate by finding the discount rate for which the owner's disadvantage is reduced to zero.

In order to find this rate you would equate the present value of a below-market rate at **sr** and the present value of the market rate discounted at **k**.

You would write:

$$LC \times (P/A, sr, t) = LM \times (P/A, k, t)$$

$$10000\$ \times (P/A, sr?, 5) = 12000\$ \times (P/A, 12\%, 5)$$

Or also:

$$(P/A, sr?, 5) = (12000\$/10000\$) \times (P/A, 12\%, 5)$$

$$= 4.325\$$$

Hence,

Minimum safe rate (sr) = 5.03%

(Calculator procedure: PV = 4.325 \$, PMT = 1, FV = 0, n = 5 and find i%. In Excel, use the goal seeking function to bring the 'disadvantage' to zero by modifying the sr rate.)

Now you can conclude that the safe rate should be somewhere between 5.03% and 12%. You could apply the biblical Solomon solution and split it right in the middle with a safe rate of 8.5%.

You could also take into account the gap between rates to interpolate your result:

$$\text{Implicit safe rate (sr)} = \text{Minimum safe rate} + LC/LM \times (k - sr)$$

$$= 5.03\% + 0.833 \times (12\% - 5.03\%)$$

$$= 5.03\% + 5.80\%$$

$$= 10.83\%$$

Hence, a leased fee value of:

$$V_L = 10000\$ \times (P/A, sr, 5) + (12000\$/k) \times (P/F, k, t)$$

$$V_L = 10000\$ \times (P/A, 10.83\%, 5) + (12000\$/0.12) \times (P/F, 0.12, 5)$$

$$V_L = 93852\$$$

This result is to be compared to our seat-of-the-pants value of 92790\$. Was it worth the trouble? Hard to decide, however the student reader should be convinced that it is at least worth a good exam question.

• ***The contract rent could be higher than market rent***

LC > LM

With LC = lease at contract rent

And LM = lease at market rent

Now you could assume that a non-adjustable contract was signed when market conditions were better (LC = 15000\$), whereas the market has dropped to LM = 12000\$. Now the owner has an advantage and a positive leased fee position.

The same analysis will apply here except of course that the discount rate to apply to this 'above market' rent will be higher than the market rate. An above market rent may make your tenant a bit jittery and he is more likely to look elsewhere. Thus the flow of above-market rent is less certain (more risky).

V_L = 15000\$ × (P/A , rr , 5) + (12000\$/k) × (P/F , k , t)

V_L = 15000\$ × (P/A , 15% , 5) + (12000\$/12%) × (P/F , 12% , 5)

V_L = 50282\$ + 56743\$

V_L = 107025\$

Thus, our lessor (landlord) now enjoys a premium of 7025\$ and, symmetrically, the lessee (tenant) 'enjoys' a negative leasehold value of 7025\$.

Once again, the choice of a risky rate of 15% was arbitrary and this time we could compute the ceiling for this higher risky rate **rr**.

LC × (P/A , rr , t) = LM × (P/A , k , t)

15000\$ × (P/A , rr , t) = 12000\$ × (P/A , k , t)

(P/A , rr , 5) = (12000\$/15000\$) × (P/A , 12% , 5)

(P/A , rr , 5) = 0.80 × 2.88 = 2.030\$

Hence,

$rr_{maxi.}$ = 21.67%

[Find rr with PV = 2.030, PMT = 1, n = 5 or again using the 'goal seek' function in Excel.]

The interpolation solution would also provide an acceptable intermediate risky rate:

rr = rr maxi – LM/LC × (rr maxi. – k)

rr = 21.67% – 12000\$/15000\$ × (21.67% – 12%)

rr = 13.93%

At this discount rate, the value to the landlord is now:

V_L = 15000\$ (P/A , 13.93% , 5) + 12000\$/0.12 (P/F , 12% , 5)

V_L = 108320\$

Compare this with the market rental value of 100000\$.

2. Valuing a leasehold

By symmetry you could be satisfied with the idea that the leased fee value seen as disadvantageous to the lessor (because of a below market lease) is — in reverse — an advantageous position of the lessee.

However, this advantage is temporary since it disappears at the end of the lease and you should take into account a depreciation of the tenant's advantage.

Again, this leasehold value could be virtual if the tenant remains in the premises or it could be real (and transacted) if the tenant sub-leases or transfers her lease, as we shall see in the next section.

You know how to deal with the straight lease advantage valuation:

$V_T \quad = \quad (LM - LC) \times (P/A , k , t)$

Furthermore, you may remember having seen the decomposition of the amortisation factor into a return on and a return of investment.

$(A/P , k , n) \quad = \quad k \quad + \quad (A/F , k , n)$

Annuity return *(return on)* *(return of)*

Hence, you can write:

$(P/A , k , n) \quad = \quad 1/(k + (A/F , k , n))$

Applying the 'annuity factor' to the stream of rental advantage, you take into account the expected return k and the depreciation of the leasing advantage at (A/F , k , n).

With the previous example you could now write:

$V_T \quad = \quad (LM - LC)/(k + (A/F , k , t))$

$V_T \quad = \quad (12000\$ - 10000\$)/(12\% + 15.74\%)$

$V_T \quad = \quad 2000\$ \times 27.74\%$

$V_T \quad = \quad 7210\$$

Alternatively, it would make much more sense to go straight to:

$V_T \quad = \quad (LM - LC) \times (P/A , k , t)$

$V_T \quad = \quad 2000\$ \times (3.60)$

$V_T \quad = \quad 7210\$$

The advantage of the 'sinking fund' format is that you may decide to choose a different (safer rate) to capitalise the sinking fund. Is it worth the trouble? ... Not really.

3. Subleasing a favourable lease

The lucky tenant of the previous story (10000\$/year lease), immediately subleased his space to a less lucky sub-tenant for 13000\$/year.

If we keep the same basic initial information, the leased fee value for the owner is still the same:

$V_L \quad = \quad 10000\$ \times (P/A , 12\% , 5) + 12000\$/k \times (P/F , 12\% , 5)$

$V_L \quad = \quad 36048\$ + 56743\$$

$V_L \quad = \quad 92790\$$

The value of the sublease to the initial tenant (lessee 1) is now:

$$V_T = (13000\$ - 10000\$) \times (P/A, 12\%, 5)$$

$$V_T = (3000\$) \times (3.064)$$

$$V_T = 10814\$$$

Unfortunately, the value of the sub-lessee (stuck with an above-market rent) is negative:

$$V_{SL} = (12000\$ - 13000\$) \times (P/A, 12\%, 5)$$

$$= -3605\$$$

And if you want to put humpty dumpty together again, the value equation still obtains:

V = Value to the lessor + value to the initial tenant + value to the subtenant

$$= V_L + V_T + V_{SL}$$

$$= 92790\$ + 10814\$ - 3605\$$$

$$V = 100000\$$$

Here again, we could play all sorts of smart little games with safe and risky discount rates without changing the final results. Only the allocation of advantages and disadvantages would be different.

You are invited to experiment with the various PVM-Web spreadsheets to convince yourself.

4. Conclusion

I hope that, by now, you have developed a healthy scepticism when confronted with this mental gymnastic on discount rates. The presentation of these leased fee and leasehold valuation techniques was meant to illustrate potential applications of simple or dual capitalisation models. In fact constant rent leases are almost extinct and nowadays, realistic lease valuation requires the use of appropriate discounted variable flows.

Although the computer can take care of all sorts of such variable flows, the simple principles developed in this appendix should be kept in mind in order to adapt standard spreadsheet valuation instruments.

Appendix VII

The valuation process and report

1. The valuation process

The valuation process is a straightforward exercise in which three questions must be answered: a 'What?', a 'How?' and finally a 'How much?' question.

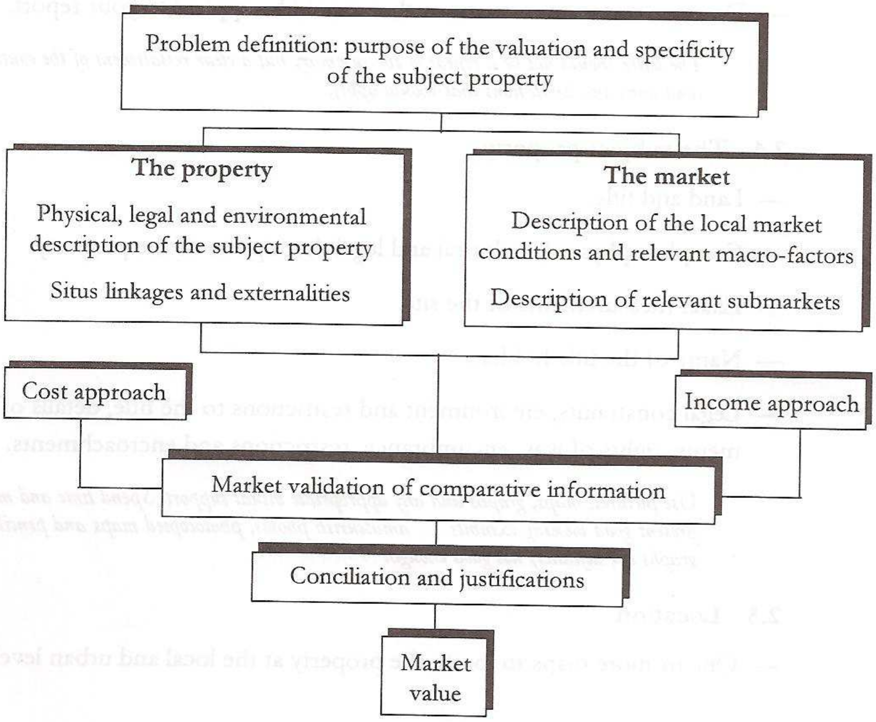
— The **'What?'** stage requires a description of the valuation problem, of the object of the analysis and, most importantly, of the market conditions in which the valuation is taking place.

— The **'How?'** stage requires a clarification of the methodology and the justification of the various hypotheses employed.

— The **'How much?'** stage (the only one the client is really interested in …) is the qualified answer to the initial valuation brief.

The various stages are illustrated in the following figure.

The valuation process



2. The valuation report

The presentation of a valuation report should follow the logic of the valuation process. The required steps and components are described in the following template in order to assist in the organisation and presentation of a useful document.

2.1 Executive summary

This one page summary provides a general description of the property, the method used to value it and your valuation results. Brief comments about optimal usage and market conditions should also be included in the summary.

> *Make it short, sweet and to the point: no if, no but ... just the facts. The reader wants an answer right here and now. If she wants the rest of the information, she will read the rest of the report.* ***One page ... just one page!***

2.2 Table of contents

> *Must be quite detailed with the exact page numbers. The table of contents should also include the list of exhibits and various annexures.*

2.3 Letter of transmittal

— Definition of the valuation problem and date of the valuation.

— Restate the nature of your contractual position with the client.

— Emphasise the specificity of the problem.

— Describe the main restrictions that should be applied to your report.

> *The letter should not be a repeat of the summary but a clear restatement of the contractual conditions and limitations that should apply.*

2.4 The subject property

— Land and title.

— Complete physical, cadastral and legal description of the property.

— Exact measurements of the site.

— Name of the title holder.

— Legal constraints, environment and restrictions to the title, details of easements, rights of way, encumbrance, restrictions and encroachments.

> *Use pictures, maps, graphs and any appropriate visual support. Spend time and money to present good looking exhibits ... amateurish photos, photocopied maps and pencil drawn graphs are definitely not good enough!*

2.5 Location

— One or more maps to locate the property at the local and urban level.

— Locational information: accessibility maps and analysis, proximity of other urban functions (situs scanning).

— Immediate environment: views, other developments, general appearance of the adjoining properties.

For out of state and international readers you may have to add a regional or national map. Do not overestimate their geographical knowledge of your region or community.

2.6 Site description and planning constraints

— Nature and characteristics of the site and the services attached to the site.

— Potential site vulnerability: for example, flooding, noise level, odour and other potential site problems (or advantages).

— Planning present conditions: detailed zoning, development codes, construction codes, conformity and non conformity.

— Information relevant on anticipated planning modifications and projects.

— Environmental, heritage or cultural issues that may affect the property or its immediate situs.

2.7 Statutory valuation and charges

— Documentation on valuation and assessment (past and present).

— Provide all the rates and local charges.

When feasible, again some comments on the Council planning and taxing philosophy or behaviour could be appropriate.

2.8 The property: physical conditions

— Complete physical, cadastral and legal description of the property.

— Building materials and general style.

— Property components that are valued (fixture, chattels, other elements).

— Exact measurements: building, lettable areas, etc.

— Age of the building and date of the various alterations, refurbishment and other modifications.

— Precise description of possible functional or economic obsolescence: adverse structural elements, poor design, deterioration, design specificities, etc.

— Comment on the specialised nature of the property and potential alternative usage.

— Identify any construction and security non-compliance. Eventually you may have to evaluate the compliance feasibility and costs.

— Identify the potential for environmental hazard, contamination and any other form of negative externalities.

Here again use pictures, maps, graphs and any appropriate good quality visual support.

2.9 The property: economic conditions

— Depending on the nature of the property, all the elements required to value the income generating potential should be described here.

— Tenancy details and accurate rent rolls: rent levels, remaining terms of the leases, renewable conditions, letting-up allowances and incentives, periodicity and history of the rental reviews, rental history (arrears, non payments, leasing conflicts).

— Comparison with standard market conditions and evaluation of the feasibility and sustainability of rental conditions.

— Detailed operating expenditure analysis: shares of the expenditures assumed by the tenants (sharing formulas should be described). Again, a comparison with market conditions and realism of the declared expenses would be required.

2.10 Market conditions

— Basic data on the urban area: size, nature, economic base, employment structure, demography and other pertinent information (political and institutional).

— Basic analysis of the neighbourhood: type and level of activities, price history and comparisons with other parts of the city.

— Description of the market conditions of the particular sub-market: for example, office buildings, shopping centres, residential rental.

— Description of the major market actors for this specific type of property (small investors, owners, property trusts, institutions, etc.).

— Choice of appropriate comparable properties and explanation of the selection.

— Analysis of comparable properties and required adjustments to the subject property.

— Comparable sales analysis for sites (land value) or property.

— Adjustment grid when required.

— Cap. rates derivation when appropriate.

It is now the time to display all the skills and jargon learned in various property economics or urban economics courses.

2.11 The choice of valuation method

— Justification and very brief description of your methodology.

— Comments on the method limitations and relevance.

— Validation of results if accessory methods are used.

— Conclusion on the derived market value or range of values.

Please … be brief: do not rewrite a valuation textbook for each of your reports.

2.12 Conclusion and comments

General conclusion

— Conclusion on the value, on the property and its optimal usage, on market conditions and market comparability.

— Comments about the method chosen and its interpretation or limitation.

Qualification and disclaimers

— Qualification as to the intended use and time validity of the conclusions.

— Disclaimers required by the valuer's professional insurer should be included.

— Other qualifications and opinion protection.

A template (In Office Word) of a typical valuation report is provided in the PVM-Web.

Prof. Fischer's typographical ten commandments

Why spend so much time, money and effort in an extensive valuation research if this results in an amateurish looking document? Unfortunately, many professional reports do not look very professional because report writers ignore some of the basic document design rules.

Your computer is not a typewriter

The presentation style that was imposed by the use of the typewriter is not appropriate any more. With word processing you can present a report that can and should look like any published book. Published books rely on fairly standard typographical conventions that are the result of years of research and experimentation by professional typographers and book designers.

You do not need to become a typographer, but at least you should try to apply some of their basic tricks in order to imitate the good appearance of printed books.

I have selected the ten most annoying bad habits found in commonly produced documents: my 'top ten' list of typographical concerns.

In order of importance:

1. Capital letters deserve capital punishment!
2. Underlining is an insult to the reader's intelligence.
3. When you need space between paragraphs … do not cheat!
4. Use tabs and indents —- no faking with the space bar please!
5. Never, ever use two spaces after full stops. One is enough!
6. Use real quotation marks and apostrophes not the straight ones.
7. Hyphens and dashes are not the same thing.
8. Protect widows and orphans.
9. Serif or Sans serif — it does matter!
10. Do not use too many type faces.

Capital letters deserve capital punishment!

Words in capitals are VERY MUCH HARDER TO READ THAN words in lower case and MORE TIRING TO THE EYES. Apart from an initial capital for a noun or at the beginning of a sentence, capitals need never be used.

If you want to draw attention to a heading or emphasise the content **embolden** the text, use *italics* or (within limits) use a different font.

Underlining

Underlining looks clumsy and tends to bump into those letters that hang below the line (as this typed underlined example shows). Underlining was OK with a typewriter since you had no other choice. If you want to draw attention to a portion of text, try using bold type, or perhaps a different font altogether.

If you want to produce an underlined look, draw a line from your paint or draw program.

Paragraph spacing

You should never use 'returns, returns, …' in order to space your paragraphs. The spacing is not appropriate and it makes your document very difficult to arrange properly.

You should use the 'space before' and 'space after' function in the menu 'Format, paragraph'. Typically the space before should be twice the space after and the appropriate spacing will depend on the size and type of font.

To make your life easier, of course, you should define all your spacing requirements by creating a **style sheet**. Check your Word Manuals or Help if you do not know about styles … this is a huge time saver function that you should get familiar with.

Use tabs and indents — no faking with the space bar please!

Creating space with the space bar is a self-defeating process. It cannot work properly.

You must use Word's Tab facility to the left of your horizontal ruler (ruler must be in view); you click on the Tab icon and select which type of Tab you require (left, centre, right or decimal). These tabs will then be ready for you to use at any stage during your document.

When you want to indent your paragraph, Ctrl+t will align the whole paragraph to the first tab marker. Repeat Ctrl+t to align to the second tab marker and so on. Ctrl+q clears them all when you are finished. Alternatively, you could simply latch onto your hanging indent marker on the left hand side of the ruler, and move it wherever you need it.

Never, ever use two spaces after full stops. One is enough!

This practice is a typical typist tradition. In order to show a clear separation between sentences, typists used to insert two spaces. And the result may look like:

> . . . is a typical typist tradition. In order to show a clear separation between sentences, typists used to insert two spaces.

Nowadays, with word processing most type faces use proportional characters. That means each character takes up a proportional amount of space; that is, the letter i takes up about one-fifth the space of the letter m. So the separation of sentences is much more obvious and extra spaces are no longer necessary.

Quotation marks and apostrophes

In Word you are in luck – the apostrophe and quotation marks automatically curl in the correct direction. However, this may not apply to other types of software. (For example, it does not apply to Framemaker: the advanced word processor I am using right now.)

Microsoft Word automatically changes straight quotation marks (' or ") to curly (smart or typographer's) quotes (‘ or “) as you type. You might not want curly quotes in some cases; for example, if you're using quotation marks to designate feet and inches. To turn this feature on or off, use the Menu Tool, then Auto correct, and then Auto Format.

You must remember a few rules when using them:

— commas and full stops are always inside the quotation – unless of course, you are quoting something within a sentence;

— if a question mark or an exclamation mark belongs to the quoted material, they should be placed inside the quotation marks;

— if you are quoting more than one paragraph, quotes are only needed at the beginning of each paragraph, and at the end of the final paragraph only;

— double quote marks are an American deviant behaviour from the cleaner looking Australian norm of using simple marks (except if you need to quote a word within a quote).

Hyphens and dashes

A hyphen gets used to join two words that are related (i.e. twenty-three) or when a word is split during a line break.

There are two types of dashes, however — an **em** dash and an **en** dash. An **em** dash is twice as long as an **en** dash and is used when a more emphatic break than a comma is desired within the sentence. An **en** dash is longer than a hyphen but shorter than an **em** dash and is used when you would otherwise use the word 'to', for instance: August – September, 6 – 3 am and so forth.

Widows and orphans

The typographical term widow refers to a lonesome short word (less than seven characters) that is left at the end of a paragraph on a new line. The word orphan refers to the odd word or couple of words which may be carried over to the next page or next column.

It might be necessary to rewrite the paragraph or perhaps delete a word or two to avoid this. If you want to be very professional, you could read the paragraph on Columns in your Word manual.

Serif or sans serif ?!?

A serif is the ending to a stroke of a letter. *Sans* (French for 'without') serif means without shaped ending.

For example: T (serif) and **T** (sans serif)

Garage Sale (sans serif) Garage Sale (serif)

Legibility studies have shown that long sentences and texts are much easier to read with 'serifed' fonts. The letters flow together and the eye follow the links.

On the other hand, a sans serif type stands out more than text in serif; that is, it is more visually arresting and thus more appropriate for posters, advertising and for report titles or even for headings.

Type faces

One sans serif type face is usually quite sufficient for most reports. Eventually, you may want to use two — a sans serif one and a serif one.

If you succumb to using too many type faces, your document will look tacky and unprofessional — unless you are an experienced design artist. You should avoid the fancy looking fonts and coloured fonts. Finally — a very subjective choice — avoid also the universal (and boring) Times New Roman.

And, yes ... please, to make your intensive report-writing life easier, learn how to use Word Styles functions.

For more on computer typographical applications:

The excellent book on Australian standards:

> *Style manual for authors, editors and printers,* 6th edn, 2002, John Wiley & Sons Australia Ltd.

And the delightful book whose title I recycled here:

> Robin Williams 1996, *The PC is not a typewriter,* Peachpit Press, Berkeley, California.

If you need more ideas on document presentation in general you may want to consult various design web sites.

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Professor Dominique Fischer has taught, studied and practiced real estate investment, valuation and property economics for thirty years in the US, Canada, Europe, Mexico, China and Australia. He is the author of thirteen books and numerous articles and software packages in real estate, valuation theory, urban economics and local finance. He is now the Professor of Property Studies at Curtin University, Perth (Western Australia).

This book is a textbook to be included in a sequenced program

This book is written for university undergraduate students with a professional interest in property valuation (real estate appraisal). It can also be used by property valuers as a reference text or a refresher.

This text can be used as a property valuation primer, however – in a normal pedagogical sequence – it should be preceded by core units in property market analysis, income property analysis and construction economics. It would normally be followed by specialised and practice – oriented valuation units.

This book is not a book, but 'half-a-book'

This printed version is the first 'half' of the textbook. The other 'live half' (the web component) will be updated continuously. It includes the required Excel tools and tutorials, presentation slides for lecturers, updated bibliographical references, case studies and contributions from valuation practitioners. The companion web site will be referred to as the PVM-Web (for Property Valuation Methodology Web site).

Brick valuation

The textbook's focus is on basic methodologies applicable to micro-level valuations. Micro-level valuations – the domain of property valuers' professional activities – deal with 'brick properties' transacted on traditional property markets. The book does not cover the valuation of property portfolios nor does it deal with various 'paperised' forms of properties (syndicates, property trusts, securitised assets, obligations on collaterised assets and other various forms of 'off-balance sheet' property transactions).

The valuation paradigm

This textbook describes the set of approaches and techniques generally endorsed in the International Valuation Standards and – broadly speaking – it reflects the paradigm diffused in the US-sphere professional and academic literature.

However, the book also suggests an alternative theoretical perspective. The suggested framework may facilitate the diffusion of the property valuation expertise and – certainly – should clarify the valuer's professional accountability and legal responsibility.

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