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**Spatial Relationships Between Determinants Of The
Capitalisation Rate**

*David RR Parker, BSc (Hons), Grad Dip, M Comm, ARICS, ASVA, FVLE, ASIA
PhD Graduand, University Of Technology, Sydney, Australia*

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Abstract: Following a brief review of the relevant literature, potential inter-relationships between determinants of the capitalisation rate for prime, CBD office investment property are proposed.

The results of a large sample survey of professional valuers in Sydney, concerning such inter-relationships, are analysed in multiple dimensions.

Single or unidimensional grouping, two or duodimensional matrix analysis and three dimensional analysis, using multidimensional scaling, are each undertaken and an extensive commentary provided on the respective inter-relationships observed.

Conclusions are then drawn and areas for further research identified concerning the implications of these findings for practitioners endeavouring to select capitalisation rates for use in the valuation of prime, CBD office investment property.

Introduction

Those determinants of the capitalisation rate of relevance for prime, CBD office investment property and which are considered in the valuation, appraisal and land economics literature have been previously identified (see, for example, Parker (1992), (1993) and (1994A)) and proposed (Parker (1996)) as, in alphabetical rather than any other order, the following:

Alternative Investments:	Equities, bonds, other property investment alternatives, etc;
Building Itself:	Services, features, reputation, etc;
Economic Situation:	International, federal, state, city levels;
Growth Prospects:	Potential for income growth and/or capital appreciation;
Legal Issues:	Freehold/leasehold, restrictive covenants, etc;
Location:	Situation, position, etc;
Planning:	Zoning, plot ratio, use limitations, etc;
Risk:	The possibility of events not occurring as anticipated;
Sentiment:	Towards property as an asset class;

Separable Characteristics Of	
Property As An Asset Class:	Long term nature, illiquid, etc;
State Of The Property Market:	Supply and demand for investors and occupiers; and
Tenant:	Security and regularity of income, etc.

Within that literature reviewed, it is suggested that certain of the above determinants may be related to others (see, for example, Cairns (1983)), with capitalisation rates considered to be a composite of many contributing factors being:

“single measures of a complex amalgam of the advantages and disadvantages of an investment” (Baum (1984))

Whilst suggestions may be found within the literature reviewed that the determinants of the capitalisation rate may be independent and inter-dependent (Brown (1984A)), be of differing weights or significance (Brown (1984A) and Brown (1992)), have a relativity to each other (Brown (1984A)) and be dynamic, varying over time, a detailed analysis of the spatial relationships between determinants of the capitalisation rate for prime, CBD office investment property was not found within that literature, by other authors, reviewed.

It does not, therefore, appear possible to ascertain from that literature by other authors which was reviewed the manner in which a given determinant may relate to another at a point in time. It is possible that certain determinants may be of greater significance than others and that several may be closely related to, whilst some may be unrelated to, others. Furthermore, it may be possible that such relationships differ over time from those relationships at a given point in time. An understanding of such spatial relationships may be of considerable assistance in the investigation and appreciation of the inter-dependency structure of the determinants of the capitalisation rate, if such a structure does indeed exist.

Parker (1994B) used a small sample survey of practising valuers of prime, CBD office investment property in Sydney to investigate spatial relationships between those identified determinants of the capitalisation rate, proposed above, in one dimension. Having required respondents to rank the determinants in order of relative importance, an order of proportionate importance was also derived by asking respondents to attribute a percentage to each determinant in respect of its proportionate importance in the capitalisation rate selection decision, such percentages summing to 100%.

It was found that one determinant, Tenant, accounted for 23% of the decision with 67% of the decision accounted for by a total of five determinants including Growth, State Of The Property Market, Building and Location. The remaining seven determinants were found to contribute only 33% of the decision with the least proportionately important determinant being Planning at 3%. Accordingly, a minority of determinants were found to dominate the capitalisation rate selection decision making process.

Parker (1994A) used a similar survey method to investigate the spatial relationships between those identified determinants of the capitalisation rate, proposed above, in two dimensions or duodimensional space. Respondents were asked to link with arrows those determinants on the list which they considered may be related and then, by summing the arrows in a matrix, it was found that every determinant except Legal exhibited a relationship with at least one other determinant. The highest level of relationship was found to be exhibited by the determinants of State Of The Property Market, Economic Situation, Growth and Sentiment, with Risk, Alternative Investments and Separable Characteristics exhibiting weaker relationships whilst Planning, Tenant, Location and Building exhibited the weakest relationships.

To aid interpretation, Parker (1995) continued such analysis proposing the following classification of determinants:

Property Generic

Being those determinants common to all CBD office investment properties:

State Of The Market	Economic Situation	Sentiment
Alternative Investments	Separable Characteristics;	

Property Specific

Being those determinants which may vary between specific CBD office investment properties:

Tenant	Location	Building
Legal	Planning;	

Risk; and

Growth,

finding that:

- Property Generic determinants exhibited no relationships to Property Specific determinants and vice-versa;
- Tenant was the only Property Specific determinant to exhibit a relationship with Risk and Growth, which otherwise only exhibited relationships with Property Generic determinants; and
- Risk did not exhibit a relationship with Growth.

Furthermore, in another similarly structured survey of practitioners, {ref??} a more rigorous approach was adopted whereby such relationships were measured by asking respondents to attribute point scores between one and four, with the rising score representing an increase in the level of relationship. Though many structural aspects of the findings of this survey were broadly similar to those previous, there were several notable differences:

- some relationships were found between the Property Specific determinants of Tenant and Building and certain Property Generic determinants; and
- some relationships were found with Risk, Growth and Property Specific determinants as well as with Property Generic determinants;
- a very close relationship was exhibited between Risk and Growth.

Accordingly, whilst the author has previously investigated aspects of the spatial relationships between determinants of the capitalisation rate upon both an unidimensional and duodimensional basis, the findings were not entirely consistent and research into relationships in further dimensions was not undertaken.

For the real estate valuer and investor, the spatial relationships between determinants of the capitalisation rate may be of considerable potential use in the assessment of the implications of changes in the economy, real estate markets, office markets, individual building issues and so forth upon the relativity between capitalisation rates for prime, CBD office investment properties which may, potentially, benefit the capitalisation rate selection decision making process.

For example, if there is a change in an aspect of the Economic Situation as a determinant, it may be anticipated that other determinants such as Alternative Investments, State Of The Property Market, Growth Prospects or Risk may also be influenced - but the degree to which this may be the case (if, in fact, there is any such influence) and which of the other determinants may have sufficiently close spatial proximity to also be influenced does not appear to have been addressed in that literature reviewed.

Ascertaining which determinants are of the greatest significance within the capitalisation rate selection decision making process may contribute significantly to an understanding of capitalisation rate construction, as it may assist in focussing attention on specific determinants and indicating which others may be potentially disregarded during consideration by the real estate valuer or investor with little impact on the selection decision.

Accordingly, it may be contended that if a real estate valuer or investor were to be aware of the existence and nature of spatial relationships between the respective determinants of the capitalisation rate for prime, CBD office investment property, this may contribute to an improvement in the quality of the capitalisation rate selection decision.

Approach To The Identification Of Spatial Relationships

Previous research, referred to above, has investigated the spatial relationships between determinants of the capitalisation rate in unidimensional and duodimensional space, using a small sample survey of practising valuers of prime, CBD office investment property in Sydney.

Using a large sample survey of the same professional group, it is proposed to investigate the spatial relationships between determinants of the capitalisation rate for prime, CBD office investment property in Sydney in unidimensional, duodimensional and multidimensional space, seeking to compare and contrast the findings for the former with those of previous studies and to analyse the findings of the latter as an amplification of the former and an original contribution to knowledge.

Following a description of the research methodology, the findings of the analyses in unidimensional, duodimensional and multidimensional space will be considered respectively, prior to a summary of the findings being provided, conclusions drawn and areas for further research identified.

Research Methodology

To facilitate the analysis of spatial relationships between determinants of the capitalisation rate in unidimensional, duodimensional and multidimensional space, data was required to be collected concerning the proportionate importance of the respective determinants of the capitalisation rate for prime, CBD office investment property in Sydney and the extent to which certain of the respective determinants may affect or be affected by, or inter-relate with, others.

A practitioner survey questionnaire was constructed to collect such data (together with a wide range of additional information for other purposes) through completion by a panel of practising valuers in a seminar format. It was contended that valuers who specialise in the valuation of CBD commercial investment property are relatively numerous in Sydney, which is beneficial for sample size, being experienced in valuing to a standard definition of open market value and on prescribed assumptions which potentially minimises the problem of extraneous issues influencing survey responses.

To provide a context for that type of capitalisation rate for which respondents were to consider the spatial relationships between determinants, respondents were requested to make a series of assumptions by basing their responses on that capitalisation rate applicable to an hypothetical building with the following profile:

- a prime, CBD office property, fully leased to several tenants (such that no discount for bulk or single tenant risk is required);
- let at rentals which do not require an adjustment to reflect market levels through the capitalisation rate and with no shortfall in the recovery of outgoings;
- let on long, standard institutional leases with conventional rent review patterns; and with
- no extraneous problems such as limited car parking, onerous outgoings, etc.

Such assumptions were designed to remove the need to consider many of the problems facing valuers in practice in prevailing market conditions, so facilitating a focus on the spatial relationships between capitalisation rate determinants.

In October, 1994 a seminar was held to which 39 practitioners were invited (being the total number of identified valuers then actively specialising in the valuation of prime, CBD office property in Sydney) and 32 respondents completed the questionnaire, giving a response rate of 82% and sample size which were considered statistically satisfactory. Having regard to the size of the Sydney CBD office market and the limited number of valuers practising in the sector, it was particularly challenging to locate a sample which was not only large enough but also appropriate for the purposes of this type of research, with that sample identified being contended to be statistically significant.

Given the size of the survey sample, a seminar format was adopted to maximise attendance, optimise independence of responses and ensure maximum consistency in responses at a single, given point in time. By taking respondents out of their office environment and placing them in a controlled environment, it was anticipated that responses would not be adversely affected by either distractions or completion in stages over a period of time. Further, the identical explanation of the survey form to all respondents simultaneously was anticipated to be likely to significantly reduce the risk of mis-interpretation.

A central city location was adopted for convenience of respondents to maximise attendance and Jones Lang Wootton kindly donated the use of their auction room for the seminar. Further, the seminar was structured such that it would qualify for points within the AIVLE Continuing Professional Development Programme, which offered a further benefit to respondents, so encouraging attendance.

At the seminar, each respondent was provided with a copy of the practitioner survey form for completion independently and anonymously, with responses based solely on that information given upon the form and the respondents personal, professional knowledge. Discussion and the exchange of ideas and comments between respondents during the seminar was actively discouraged in an attempt to ensure the independence of responses.

The respondents were asked to complete a series of qualifying questions, in order to establish the appropriateness of the sample to provide responses concerning aspects of capitalisation rate construction for prime, CBD office investment property in Sydney. Based on responses to such questions, the individual practising experience of respondents was found to range

from 5 years to 30 years, with an average of 16.3 years, confirming that the respondents were all experienced valuers. 94% of respondents were professional members of the AIVLE with 19% also being members of the RICS and 9% being members of the SIA. Consistent with such experience and indicative of their seniority within the industry, the sample contained numerous office holders within both the AIVLE and the RICS which further supported the professional standing of the sample.

The total sample had completed approximately 2,350 investment valuations in the previous year (averaging approximately 76 such valuations per respondent) of which 536 or approximately 23% were of prime CBD office property, averaging approximately 17 per respondent. The valuations undertaken by the respondents ranged from \$200,000 to \$600 million though the majority fell within the range of \$5 million to \$300 million.

The respondents were clearly, therefore, not only experienced and highly qualified but also regularly involved in the valuation of a large number of high value, prime, CBD office investment properties in Sydney. As such, they were ideally situated to answer, with authority, questions on matters concerning the capitalisation rate for such properties and their views should be indicative of professional practice in Sydney.

Data Collection

Two separate questions were included in the practitioner survey to facilitate the collection of data to:

- identify unidimensional spatial relationships through an assessment of the proportionate importance of the respective determinants in the capitalisation rate selection decision; and to
- investigate duodimensional and multidimensional spatial relationships through an assessment of the relative significance of the relationship between each pair of determinants,

the results for each of which will be considered, sequentially, below.

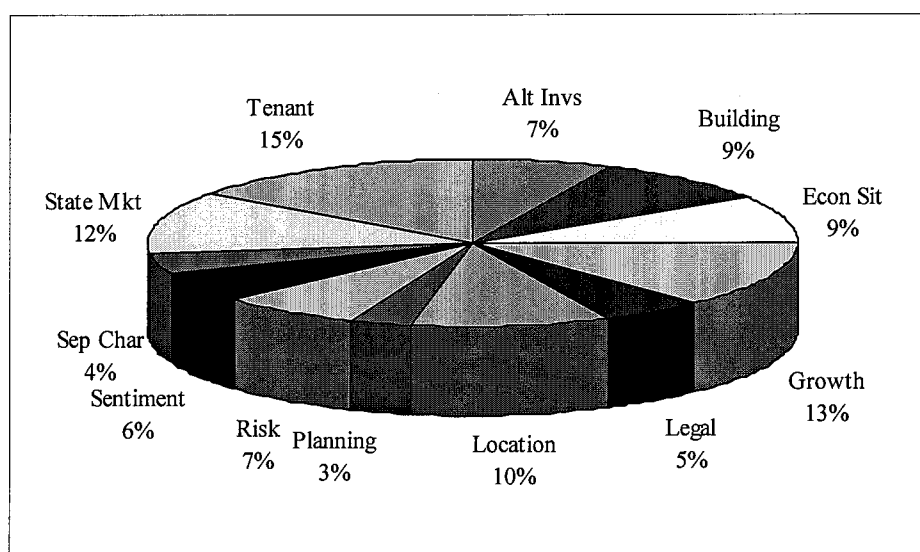
Unidimensional Spatial Relationships Between Determinants Of The Capitalisation Rate

As in the previous, small sample surveys, the unidimensional spatial relationships between determinants of the capitalisation rate were investigated through an assessment of the proportionate importance of the respective determinants, using the following question with the determinants listed upon the practitioner survey questionnaire in tabular format, in alphabetical order, beneath:

For such a hypothetically perfect prime CBD office investment property, please specify, in the boxes below, what percentage of the decision on the selection of the capitalisation rate is attributable to each determinant - please use the nearest 1%.

The question was intentionally styled to use ratings rather than rankings in order to ???????

Those percentages of the decision on the selection of the capitalisation rate attributed to each determinant by the respective respondents were summed and the totals for each determinant derived, being expressed relatively in Figure 1.



Unidimensional Spatial Relationships Between Determinants Of The Capitalisation Rate - Proportionate Importance

Source: Author

Figure 1

The findings of the practitioner survey largely mirror those referred to above (from Parker (1994B)), with Tenant continuing to be that determinant of greatest proportionate importance, 68% (compared to 67%, above) of the capitalisation rate selection decision being accounted for by six determinants (compared to five, above), with the inclusion of Economic Situation as being of equal proportionate importance to Building as a determinant. The remaining six determinants (compared to seven, above) account for only 32% of the capitalisation rate selection decision (compared to 33%, above) and Planning remains the least proportionately important determinant accounting for only 3% of the decision.

Accordingly, there is considerable consistency in the levels of proportionate importance attributed to the respective determinants by practitioners over time, with the findings of the more rigorous, larger sample survey generally supporting those of the previous smaller sample surveys. Consistently, a minority of determinants were found to dominate the capitalisation rate selection decision making process.

However, though the overall spatial relationships between determinants exhibited a level of consistency, some notable differences were apparent for individual determinants. For example, Tenant had fallen from 23% to 15% and Growth from 14% to 13% in proportionate importance with, interestingly, the increases in proportionate importance comprising small rises for five determinants, the largest being a rise of 3% for Economic Situation.

Accordingly, though one determinant had fallen dramatically in proportionate importance, no single determinant had risen significantly but, instead, a range of determinants had all enjoyed small rises which suggests that the relationships between determinants of the capitalisation rate may exist in other dimensions, may vary over time and may be potentially very complex.

(Whilst it is beyond the scope of this paper to consider the reasons for the varying levels of proportionate importance of the respective determinants over time, it is interesting to briefly note that the Sydney office market in late 199{3} was very depressed with security of cash flow being a major issue in property investment for both valuers and investors, whereas in October 199{5} the economy was stronger, the property market was considerably more buoyant and a greater focus on the growth outlook was evident.)

There is, however, a clear unidimensional spatial relationship or hierarchy between the determinants of the capitalisation rate which, whilst it appears to be dynamic rather than static, exhibits a notable level of consistency over time.

Thus, by focussing only on the determinants of Tenant, Growth, State Of The Property Market, Location, Building and Economic Situation in the capitalisation rate selection decision, the practising real estate valuer or investor may potentially be capable of undertaking the capitalisation rate selection decision without particular concern for the contribution of the other half of the identified determinants of the capitalisation rate.

The unidimensional spatial relationship findings over time not only confirm that there are relationships in one dimension but also suggest that there may be relationships between the respective determinants in other dimensions which also contribute to the capitalisation rate selection decision.

To investigate the relationships between determinants of the capitalisation rate in other dimensions and the possibility of some form of inter-dependency, the second question, referred to above, in the practitioner survey sought to investigate duodimensional and multidimensional spatial relationships through an assessment of the relative significance of the relationship between each pair of determinants.

Respondents were provided with a matrix comprising the identified determinants of the capitalisation rate arranged along each axis, in alphabetical order, with a corresponding box for each pair of determinants in which respondents could write their response to the following question:

Do you consider any of the determinants affect/are affected by other determinants? If so, please assess the significance of the relationship between each pair of determinants by assigning a significance rating between 0 and 10, where:

0 = Not Significant

5 = Moderately Significant

10 = Most Significant

and write your assessment on the matrix below.

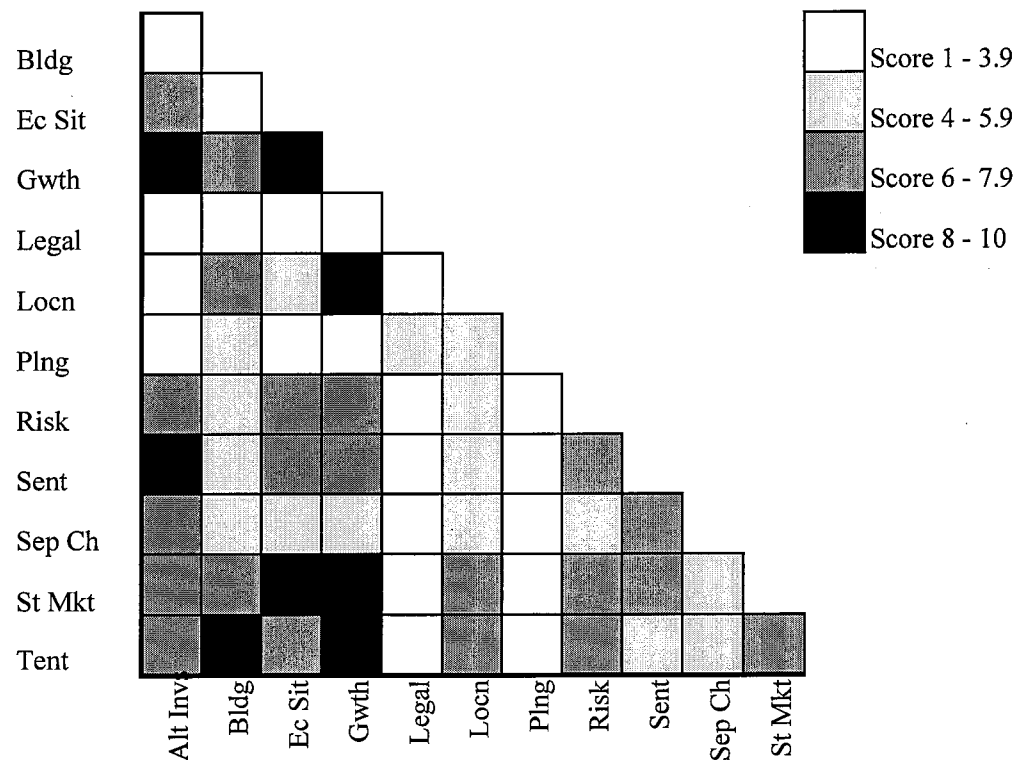
The question was intentionally styled to use ratings rather than rankings in order to ???? and to provide a quantified assessment, for further analysis, of the respondents perception of the strength of the relationship. Accordingly, respondents had to calibrate their view of the relationship between every pair of identified determinants of the capitalisation rate and were effectively unable to discard or fail to consider any.

The scores attributed to the significance of the relationship between each pair of determinants by the respondents, respectively, were tabulated for inspection. A relatively extensive range of scores for a significant proportion of the relationships was evident with the modal score being a minority in the majority of cases, so rendering sub-optimal the use of modal scores

for further analysis. Accordingly, the scores were summed and averaged to provide the data for use in duodimensional and multidimensional analysis.

Duodimensional Spatial Relationships Between Determinants Of The Capitalisation Rate

The average score for relationship significance between each pair of determinants was placed on a matrix whose axes comprised the respective determinants. The average scores were then grouped and attributed a shade coding as shown in Figure 2. As none of the relationships achieved an average score of over 9 and only two of the relationships achieved average scores of less than 2, the highest and lowest shade codings are marginally wider than the intermediate shade codings.



Duodimensional Spatial Relationships Between Determinants Of The Capitalisation Rate

Source: Author

Figure 2

Though the arrangement of the determinants in alphabetical order on the axes constrains the ease of interpretation, certain determinants clearly exhibit higher levels of inter-relationship or duodimensional spatial relationship than others.

At an overall level, the observed relationships may be summarised as follows:

Significance Rating
Score
1 - 3.9

Number Of Observed Relationships
21

4 - 5.9	16
6 - 7.9	21
8 - 10	8

Allowing for two of the score ranges being wider, none of the score ranges was overwhelmingly dominant. Significantly, that range comprising the greatest significance rating scores showed the lowest level of observed relationships.

Allowing for the wider score ranges, the highest level of inter-relationship was evident in the 6 - 7.9 category which suggests a relationship which is slightly above "Moderately Significant". Interestingly, the next largest group comprised the 1 - 3.9 category which suggests a relationship level which is slightly above "Not Significant" with the balance arranged around "Moderately Significant".

Whilst duodimensional spatial relationships between determinants of the capitalisation rate clearly exist, the general level of relationship is relatively low. Accordingly, at a general level, changes in a given determinant may not necessarily be expected to result in a particularly significant change in other determinants.

However, such a general view should be tempered by the acknowledgment that several determinants exhibited higher levels of inter-relationship. If the significance rating scores for each determinant are summed and indexed, taking the lowest score as 100, the relativities of significance of inter-relationship levels are more apparent, as shown in Table 1.

Determinant	Index	Group
Legal	100	Not/Low
Planning	113	
Separable Characteristics	175	
Location	195	Limited
Building	199	
Alternative Investments	203	
Sentiment	204	Moderate
Economic Situation	205	
Risk	212	
Tenant	226	Most/High
State Of The Market	230	
Growth	245	

Index Of Significance Ratings Scores For Duodimensional Spatial Relationships Between Determinants Of The Capitalisation Rate

Source: Author

Table 1

Whilst the general level of relationship may be relatively low, Risk, Tenant, State Of The Market and Growth clearly exhibit far greater inter-relationship significance indices than the remaining determinants, being over twice that of the lowest, Legal. With the exception of the consistently high level of inter-relationship exhibited by State Of The Market and Growth,

the findings of the practitioner survey show only limited consistency with those previous, as referred to above.

However, given the greater rigour of this practitioner survey than those previous, referred to above, the findings of this survey may be contended to be likely to be of greater reliability. If the significance indices given in Table 1 are considered with the duodimensional spatial relationships shown in Figure 2, the relationships exhibited by those determinants showing significant levels of inter-relationship may be identified for further comment.

Of those determinants exhibiting higher levels of inter-relationship scores falling within the 8 - 10 category, Growth exhibited the highest number of inter-relationships (5 / 11) including those with Alternative Investments, Economic Situation, State Of The Market, Location and Tenant. Whilst the first three would appear relatively logical, a higher level inter-relationship between both Location and Tenant with Growth is more challenging to explain.

The three remaining higher level inter-relationships were between Sentiment and Alternative Investments, Building and Tenant and Economic Situation and State Of The Property Market, each of which appear logical. The absence of consistently high levels of inter-relationship between any of the determinants other than Growth is, however, contended to be of significance, supporting the comment above regarding the complexity of the inter-relationship structure between determinants.

Whilst none of the pairs of relationships between determinants scored zero, a significant proportion achieved low inter-relationship scores of between 1 and 3. Of the 21 pairs of relationships in this category, Planning and Legal account for the majority (eight and ten respectively) and may thus be contended to be those determinants closest to independence.

Of the balance of pairs of relationships, the frequency of observations is skewed towards the 6 - 7.9 category rather than the 4 - 5.9 category. Those determinants exhibiting the largest number of observations in the 4 - 5.9 category comprise Building, Location and Separable Asset Class Characteristics which may, therefore, only be expected to move modestly as a result of changes in other determinants.

Alternative Investments, Risk, Tenant, Sentiment, Economic Situation and State Of The Property Market, however, exhibit a majority of observations in the 6 - 7.9 category and so may be expected to change more significantly as a result of changes in other determinants.

Whilst previous surveys had suggested both a low level and a high level of relationship between Risk and Growth, Figure 2 shows a score in the 6 - 7.9 category suggesting a moderate but not high level of inter-relationship significance between them. However, as the indices in Table 1 show, Risk and Growth were both found to relate significantly to other determinants if not between themselves.

At the duodimensional level, further analysis of the data is limited and the results of the above may be summarised generally as follows:

Relatively Independent Determinants

Planning

Legal

Determinants Exhibiting Limited Inter-Relationships Levels

Building

Separable Asset Class Characteristics

Location

Determinants Exhibiting Moderate Inter-Relationship Levels

Risk	Alternative Investments
Tenant	Economic Situation
Sentiment	State Of The Property Market

Determinants Exhibiting High Inter-Relationships Levels

Growth

Interestingly, in the unidimensional analysis, Planning and Legal also exhibited low levels of proportionate importance, whilst Growth exhibited a high level of proportionate importance. The remaining two groups do not, however, show any consistency with the levels of proportionate importance observed above.

Whilst the duodimensional analysis suggests two relatively independent determinants and identifies Growth as a highly inter-related determinant, a level of ambiguity remains concerning the inter-relationship between the other determinants.

Given that the data was sourced from a highly specialist and focussed sub-group of the valuation profession, the range of scores attributed indicates the highly complex nature of the inter-relationship between determinants of the capitalisation rate. Though the real estate valuer or investor could potentially disregard Planning and Legal whilst maintaining a close focus on Growth in the capitalisation rate selection decision, how the remaining determinants should be viewed remains relatively ambiguous.

The mixture of inter-relationships observed suggests that the spatial relationships between determinants of the capitalisation rate might be more complex than is explicable in only two planes. Accordingly, further analysis is required to identify more clearly how the determinants lie in greater than duodimensional space, as those which lie close to others may be expected to inter-relate and potentially change more simultaneously. Such a mental picture of groupings may be both instructive for the researcher and easier for the practitioner to comprehend.

Multidimensional Spatial Relationships Between Determinants Of The Capitalisation Rate

Having established some parameters of inter-relationship, the spatial relativity of determinants may be more clearly apparent through analysis in more than two dimensions as may be provided through the use of a technique such as multidimensional scaling.

Manly (1986) notes that multidimensional scaling is a particularly useful technique where the relationships between objects are unknown but a distance matrix can be estimated, with the technique being designed to construct a map showing the relationships between a number of objects given only a table of distances between them.

Hair et al (1995) describe multidimensional scaling as transforming judgements of similarity or preference into distances represented in multidimensional space with Kruskal and Wish (1978) noting that this enables the analyst to uncover the hidden structure of the data base, as the location of points in a spatial configuration makes the data easier to comprehend, with the technique being widely used by psychologists, sociologists, anthropologists, economists, marketers and educational researchers.

Through the application of multidimensional scaling, each determinant is represented by a point in multidimensional space, reflecting its relationship with other determinants. Thus two

similar or closely related determinants would be close together in space and two dissimilar or unrelated determinants would be far apart in space. Further, such points are arranged in space in such a manner that distances between pairs of points have the strongest possible relation to the similarities between pairs of relationships.

Significantly, in the context of the assessment of relativities between determinants of the capitalisation rate by practising valuers, Hair et al (1995) note that the variables are relating in common perceptual space with Kruskal and Wish (1978) adding that such proximities in space may indicate either how similar or different two objects are or are perceived to be.

Accordingly, whilst the data collected represented respondent valuers perceptions of the relationships between the determinants, the perceptions of investors may differ and the actuality may differ from the perceptions of either or both.

Having regard to the findings of the unidimensional and duodimensional analyses, above, whilst Planning and Legal might be expected to be situated some distance in space from the other determinants, Growth might be expected to be relatively central. However, the expected location of other determinants in space is somewhat more challenging to contend other than to observe that they might be expected to be relatively close together in space.

Adopting the matrix of inter-relationship data derived from the findings of the practitioner survey, a multidimensional scaling analysis was undertaken using SPSS software and the graphical output is included as Figure 3. The considerable assistance of Dr Basil de Silva, of the Royal Melbourne Institute Of Technology, in undertaking this analysis is gratefully acknowledged.

**Multidimensional Spatial Relationships Between
Determinants Of The Capitalisation Rate**

Source: Author

Figure 3

By analysing the data for the similarities or dissimilarities in relationships between determinants as distances or proximities to give points in perceptual space, the relative

position of such points in space is unchanged by rotation or reflection or by the magnification or contraction of scales (Manly (1986)). Accordingly, using the co-ordinates produced by the multidimensional scaling analysis and through a rotation and reflection of the axes, the results may be alternatively expressed as shown in Figure 4, which is contended to be easier to comprehend.

**Alternative Expression Of Multidimensional Spatial Relationships
Between Determinants Of The Capitalisation Rate**

Source: Author

Figure 4

The three dimensional cube shown in Figure 4 may be considered as eight quadrants and has been rotated so as to make Quadrant I invisible as no points lay within this space.

Significantly, that hemisphere of the cube containing Quadrants I to IV inclusive was found to contain each of the Property Specific determinants (with the exception of Tenant), whilst that hemisphere containing Quadrants V to VIII inclusive was found to contain each of the Property Generic determinants as well as Tenant, Risk and Growth.

Overall, the multidimensional analysis confirmed the findings of the duodimensional analysis that the general level of relationship or spatial proximity, between determinants, was low.

The twelve determinants or points in perceptual space may be considered in terms of Quadrants as follows:

Quadrant II Legal

To find Legal occupying a point far apart in space from the other determinants was consistent with the findings of the unidimensional and duodimensional analyses, confirming its limited relationship with other determinants and potential for relative independence.

Quadrant III Planning

Similarly, to find Planning occupying a point far apart in space from the other determinants was consistent with the findings of the unidimensional and duodimensional analyses, confirming its limited relationship with other determinants and potential for relative independence.

Quadrant IV Location, Building

Both of these determinants were found to have a relatively high proportionate importance, in the unidimensional analysis, but only limited inter-relationship in the duodimensional analysis. These findings are confirmed in the multidimensional analysis where Location and Building are closely related to each other but of limited apparent relationship with the remaining determinants.

Quadrant V Separable Asset Class Characteristics, Sentiment

Separable Asset Class Characteristics occupies a point in space some distance from each of the other determinants, suggesting limited relationship with other determinants and potential for relative independence, such a finding being consistent with those for the unidimensional and duodimensional analyses, above.

Conversely, Sentiment occupies a point in space close to State Of The Property Market and Economic Situation suggesting close relationship with such determinants, which would appear logical. Though of low proportionate importance in the unidimensional analysis, Sentiment exhibited moderate levels of inter-relationship in the duodimensional analysis, the nature of which is potentially clarified in the multidimensional analysis.

Quadrant VI Alternative Investments, Risk

Alternative Investments occupies a point in space some distance from each of the other determinants, suggesting limited relationship with other determinants and potential for relative independence. Such a finding is consistent with that for the unidimensional analysis, above, though the duodimensional analysis, above, suggested a limited to moderate level of inter-relationship.

The point in space occupied by Risk was found to be quite fascinating, being very close to Tenant but relatively distant from other determinants. The next closest points in space were Economic Situation and Alternative Investments. Whilst Tenant and Economic Situation were significant in the unidimensional analysis, Alternative Investments and Risk were not though each of the determinants exhibited moderate to high levels of inter-relationship in the duodimensional analysis.

Tenant and Risk comprise those determinants most centrally located in the whole space, being generally surrounded by, though not relatively close to, each of the other determinants. Accordingly, it would appear that Tenant and Risk are principally related to each other, with each of the other determinants having a limited though apparently existent relationship in some form.

Quadrant VII Economic Situation, Tenant

Economic Situation occupies a point in space close to State Of The Property Market and Sentiment suggesting close relationship with such determinants, which would appear logical. Economic Situation was found to be of significance in the unidimensional analysis and to exhibit a moderate level of relationship in the duodimensional analysis, such that it is consistent to find the determinant located close to other determinants in multidimensional space.

Tenant was briefly considered above in relation to the position of Risk in multidimensional space. Whilst Tenant might have been expected to have been located within that space occupied by the other Property Specific determinants within Quadrants I to IV inclusive, it may be contended, potentially, that it was drawn into

Quadrant VII by its relationship with Risk and Risks relationship with those other determinants situated within Quadrants V to VIII inclusive.

Whilst Tenant was of significance in the unidimensional analysis and exhibited moderate to high levels of inter-relationship within the duodimensional analysis, Risk was of limited significance in the unidimensional analysis and of only moderate inter-relationship level in the duodimensional analysis. Accordingly, to find each so close in the multidimensional analysis is very interesting.

Both the limited relationship between Tenant and the other Property Specific determinants and the very close relationship within space between Tenant and Risk are contended to be particularly significant findings of this analysis.

Quadrant VIII State Of The Property Market, Growth

These determinants are almost identically located in space, suggesting an extremely close relationship which is consistent with the high levels of proportionate importance for each found in the unidimensional analysis and the high levels of inter-relationship exhibited by each in the duodimensional analysis.

Whilst, as was expected, Growth is located almost centrally in the Property Generic determinants hemisphere of Quadrants V to VIII, inclusive (being almost equidistant between Economic Situation and Sentiment), it is not located centrally in the total space.

Significantly, Risk and Growth are located relatively far apart in multidimensional space, being closer to quite distinctly different groups of determinants than to each other which generally supports but further qualifies the findings of the duodimensional analysis.

The use of multidimensional scaling proved to be very useful in the identification of the relative positions of the respective determinants in perceptual space, suggesting which determinants lie close together in space and so may be expected to inter-relate with each other and which lie far apart and so may be expected to be relatively independent.

For the real estate valuer or investor seeking to apply the above findings in the capitalisation rate selection decision, the following summary may be proposed:

Planing, Legal, Alternative Investments and Separable Asset Class Characteristics are relatively independent determinants;

Location and Building relate to each other but are otherwise relatively independent of the balance of the determinants;

Growth exhibits the closest inter-relationship with and so is potentially most influenced by State Of The Property Market, with Economic Situation and Sentiment also being significant influences;

Risk is most closely related to and so is potentially most influenced by Tenant, with Economic Situation and Alternative Investments also being of some influence.

Thus, the application of multidimensional scaling served to provide not only a three-dimensional picture of the relative position of the respective determinants in space which was

easy to comprehend, but also provided considerable further insight into the spatial relationships between determinants which complemented and permitted further interpretation of the findings of the unidimensional and duodimensional analyses.

Summary

The application of unidimensional, duodimensional and multidimensional analyses to original data collected by practitioner survey facilitates a detailed analysis of the spatial relationships between determinants of the capitalisation rate for prime, CBD office investment property at a point in time not found in the literature by other authors.

As those respondents to the practitioner survey comprised a highly specialist and focused sub-group of the valuation profession, being not only experienced and highly qualified but also regularly involved in the valuation of a large number of high value, prime, CBD office investment properties in Sydney, the findings of the above analyses may be contended to be both authoritative and indicative of professional practice in Sydney at the time of the survey.

At the unidimensional level, a clear spatial relationship or hierarchy was found to exist with a minority of determinants appearing to dominate the capitalisation rate selection decision. Interestingly, however, at the duodimensional level, whilst relationships were found to exist, the general level of relationship was found to be low which questions the level of inter-dependency likely to exist between the determinants generally. Such a generally low level of relationship or spatial proximity was confirmed by the findings of the multidimensional analysis, which also clarified the findings of previous surveys and illuminated the findings of the unidimensional and duodimensional analyses by enunciating both those relatively independent determinants and those groupings of related determinants.

Conclusions

As suggested in that literature reviewed, the findings of the practitioner survey confirm that the determinants of the capitalisation rate for prime, CBD office investment property exhibit not only a relativity to each other, with both independent and inter-dependent determinants, but also differing weights or significance at a point in time.

It was contended that, for the real estate valuer or investor, ascertaining which determinants are of the greatest significance within the capitalisation rate selection decision may contribute significantly to an understanding of capitalisation rate construction, allowing the practitioner to focus attention on specific determinants and indicating which others may be potentially disregarded with little impact on the selection decision.

The above analysis suggests that, at the time of the practitioner survey, the real estate valuer or investor in Sydney may have been well advised to give greatest consideration to the following determinants in the capitalisation rate selection decision:

Tenant	State Of The Property Market
Economic Situation	Sentiment

with Risk and Growth being potentially addressed through the consideration of each of these determinants.

Accordingly, by having regard to the security and regularity of the income stream and through an assessment of participants perceptions of the current state of and potential direction of change in the economy and the CBD office property market, the real estate valuer

or investor may have addressed the key issues for consideration in an assessment of the relativity between capitalisation rates for prime, CBD office investment properties.

By focussing attention on specific determinants which are of significance in capitalisation rate construction and selection whilst indicating others which may be potentially disregarded with little impact upon the selection decision, the above research findings and conclusions may benefit and potentially improve the quality of the capitalisation rate selection decision making process by real estate practitioners.

Areas For Further Research

Whilst the literature reviewed suggested that the relationships between determinants of the capitalisation rate may be dynamic and vary over time, the above analysis was undertaken at a point in time such that further research into temporal changes may be worthwhile. Similarly, the above analysis only offers a very limited insight into the inter-dependency structure of the determinants of the capitalisation rate, an area which is worthy of considerable further research.

As previously noted, the data reflected the perceptions of the respondent sample of practising valuers and further research to compare these findings with those for the perceptions of investors and of both groups to that for actuality may be very illuminating.

Whilst the findings of the above analysis further contribute to an appreciation of the role of Risk and Growth in capitalisation rate construction and selection, they also serve to further substantiate the apparently complex nature of these particular determinants and the need for considerable further research in order to better understand their role in the capitalisation rate selection decision making process.

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