

**Pacific Rim Real Estate Society (PRRES)
Conference 2001**

Adelaide, 21-24 January, 2001

**UNCERTAINTY IN MARKET VALUE ESTIMATES
- Implications for property performance measurement**

STELLAN LUNDSTRÖM
Professor in Real Estate Economics

Department of Real Estate and Construction Management
The Royal Institute of Technology
S-100 44 Stockholm
Sweden

Phone: 46-8-7908630, Facsimile: 46-8-4117436, E-mail: stellan@recm.kth.se

Keywords: Uncertainty, property index, valuation experiment

UNCERTAINTY IN MARKET VALUE ESTIMATES - Implications for property performance measurement

ABSTRACT

All nationwide return indices for direct owned property are based on valuations, which give a discussion of how well market value estimates reflect transaction prices and market movements. Two valuation experiments in relation to the Swedish Property Index give indications about the magnitude of the variation in estimated market values as well as variation in individual discounted cash flow parameters. The variation in market value estimates is found to be much dependent on the special market situation with fast escalating rents in Stockholm CBD. The results from the two experiments are discussed in relation to the variation found in other studies. One main conclusion is that valuation based performance measurement should be on an aggregated level and that several performance measures should be used for decision making. A challenge for further research is to develop tools that explicit expresses risk exposure.

PROBLEM FORMULATION

Portfolio management, executive compensation and information to the investment community are to an increasing extent based on information from nationwide property indices. All indices have one characteristic in common – the return figures are based on valuations. This special feature, in relation to transaction based stock and bond indices, has given raise to a long lasting discussion about uncertainty in valuations. The discussion is about how well valuations reflect transactions and how valuation based property indices can be used in strategic decision making (Geltner, 1989, Adair *et al*, 1996 and Brown *et al*, 1998)

A market value definition like “the most probable price...,” indicates that all valuations are more or less uncertain. The degree of uncertainty can be expected to be a function of the quality and quantity of market information. The market value itself is never direct observable, but it can be expressed as a central tendency in a distribution of valuations or transactions of identical/similar properties as described by Mallinson and French (2000).

Uncertainty in a market value estimate can be illustrated by that independent valuations of the same property at the same time will most probably result in a spread, a distribution of observations. Given an efficient market, which takes all new information into account, the spread will be reduced if new high quality information is presented to all actors. A lower spread in the market value estimates will most certainly increase the legitimacy of the valuers.

Valuation can be regarded as a service process with subsequent activities, see Brown (1991), Parker (1999) or Lundström (2000). Service quality can be enhanced if all activities are part of a systematic designed valuation process. The aim of the process

should, with a service management perspective, be to create quality in the eyes of the end user of information. Grönroos (2000) make a distinction between technical quality and quality in the service delivery. The technical quality in this context is built on value figures that are not smoothed, lagged or carry systematic errors. Quality in the service delivery is related to the behavior of the valuer as a professional service producer.

Performance measurement can be undertaken in different situations, with different means and aims, e.g.:

- Return and risk expressions are used for strategic portfolio allocation. The choice is between different locations (economic bases) and property types.
- Market value estimates, return and risk figures are used for asset allocations. The decision is about how to handle individual property – buy/sell, hold, modernize etc.
- Cost, net income, rental, market value, return and risk figures are used as benchmarks for different kind of bonus and incentive programs at different organizational levels.
- Cost, net income, rental and market value measures are used to evaluate in-house and outsourcing alternatives for property and facilities management.

The main problem is to find performance measures that; a) are stable over time and allows longitudinal benchmarking, b) allows proper cross-sectional benchmarking, c) make it possible to distinguish management contribution from general market trends, d) contain valid information about the risk exposure. With focus on performance measurement, the main questions is:

- What degree of uncertainty can be expected in the market value and return figure of an individual property?

And follows:

- On what level of aggregation can index figures be used given the assumption that valuation errors are random?
- In what situations should other kind of benchmarks be used in stead of, or complementary to return figures?

The aim of this paper is to discuss the effects of uncertainty in valuations on the uses of property index information for decision making. The paper is based on a brief literature review and two valuation experiments undertaken by the special Valuation group related to the Swedish Property Index.¹ The experiments are designed to illustrate the spread in cash flow assumptions and how variations in assumptions are reflected in variations of the market value estimates. The findings are discussed in relation to results from other valuation experiments. Finally are conclusions drawn about strategies for increasing the quality of index-related information and how techniques for performance measurement can be developed with respect to uncertainty.

UNCERTAINTY IN VALUATIONS

Uncertainty in valuations has over time been discussed in different contexts. Much of the early discussions were about court decisions and what “margin of error” could be accepted without accusing the valuer for negligence (Crosby *et al* 1998). The Hager and Lord (1985) survey is recognized as a starting point for a debate about valuation methodology and uncertainty that was given extra fuel in the Mallinson report (RICS, 1994). Several studies thereafter provide quantitative expressions to uncertainty, Adair *et al* (1996), Brown *et al* (1998) and Parker (1999). While studies like Ekelid *et al* (1998) analyze the way valuers express uncertainty in their value reports.

A clear distinction is made between valuation variation and valuation accuracy, see e.g. Adair *et al* (1996) or McAllister and Bowles (1997). Valuation variation is about the spread in valuations with no direct reference to market value or transaction price. Valuation accuracy is related to how close a reported value is to the market value or the transaction price, it is about the validity of valuations. Bias in valuations is the systematic over or undervaluing of a property, while valuation error expresses how the estimated value deviates from transaction price.

Both the valuer and the dart player want to have low variation with high accuracy. The dart player have an immediate feed back on both variation and accuracy, while the feed back to the valuer is more vague. Several studies of valuation error show a high degree of correspondence between estimated values and prices, Brown (1985), Matysiak and Wang (1995) and Cullen (1994). However, these findings are argued to partly be a product of the impact of the value report on price. Baum *et al* (1996) argues that the valuation impact on price is greater than generally supposed. Besides the value report itself will the uses of the same methods (DCF), and widely agreed parameter values, create a consensus about the market value.

Variation in valuations follows from the fact that valuers interpret information differently. Even given the same information will the valuers deliver different value opinions. However, common uses of modern and theoretical well-based methods will most probably increase accuracy and lower the spread in results. At the other hand is different expectations and different value opinions (user values and reservation prices) the driving force behind the property market (Geltner, 1997).

UNCERTAINTY AND PERFORMANCE MEASUREMENT

Problems related to variation and accuracy in valuation occurs when end users of information;

- Observe longitudinal relative changes in property values and return figures that motivate questions about the validity of performance measurement and the benchmarking process. Consistency in the valuation process is a form of quality guarantee, but even with consistency can there be serial-correlation that distort the index early warning effect (Brown and Matysiak, 1995).

- Recognize cross-sectional differences in value estimates that are systematic and not motivated with differences in basic assumptions about property management and the property market. This problem is related to uncertainty in a wider sense, both concerning the spread itself and valuation bias.
- Have a good reason to believe that valuations are smoothed and that the variations in return figures are no adequate expressions for risk. Misjudgment of risk will distort both systems for portfolio management and incentive systems based on return figures.

McAllister and Bowles (1997) simulate the effect of valuation error on performance measurement. They conclude, “*it is extremely likely that performance measures will contain some error and that the property fund manager should not accept performance measures uncritically*”. Two factors are argued to have an impact on the quality of performance measures: The portfolio size and the accuracy of valuations. However, even if the valuations are accurate will a high variation in valuations diminish the reliability of performance measures.

THE VALUATION EXPERIMENTS

The presented valuation experiments are designed to reflect the variation in valuation assumptions and results given that DCF is used as valuation method.² One major aim has been to check the whether applied DCF parameters have a proper relation to each other and are in line with index benchmark figures from property management and the property market. The experiments are undertaken as a tool to develop the valuation process for the Swedish Property Index. The results are analyzed and given as feed back to valuers, analysts, investors and property managers, see Lundström (1999 a, b).

The year 1999 survey

At the 1999 SFI valuation seminar 67 valuers, property analysts and investors were asked to individually give their opinion about central valuation parameters for a fictive and briefly described office property in Stockholm CBD at a well known address. The audience had not been informed in advance about the task and they had about 30 minutes to individually fill in their opinion about a set of questions:

General questions:

- The expected peak year for the currently fast rising office rents in Stockholm CBD
- Ranking – from a set of alternatives - of the most demanded new information from property management and the property market

Specific DCF related questions:

- Inflation rate as an average for the coming three years
- Nominal development of the market rent as an average for the coming three years
- The nominal discount rate on total capital as an average for the coming three years
- Expected cost of operations and maintenance for year 2 000 (internal maintenance and property tax excluded)

- The exit yield for the year 2002.

The main aim of the survey was to see the spread in opinions, but also to check the average levels against benchmarks from property management and the real estate market.

The peak year for the rental market

In the since 1997 fast rising rental market for office space in Stockholm CBD most of the respondents (27) expected the peak to be in year 2001, see table 1.

Table 1 Expected peak year for office rents in Stockholm CBD by September 1999.

Expected peak year	Number of respondents
For market rent	
2000	12
2001	27
2002	19
2003	5
2004	3

The fact that analysts and valuers expect a property cycle is most of the time not reflected in valuations based on DCF. Almost all are aware that trends will change, but there are few explicit forecasts for break points in different trends.

Demanded information

25 out of 67 wanted, as their first priority to have more information from the rental market, e.g. in a format of a rental market index. 15 wanted to have more benchmark information about operations and maintenance cost³, while eight gave their first priority to a quarterly property index instead of the currently yearly index. It is evident that the actors in the market want to have more timely and detailed information about factors affecting risk and return.

Cash flow estimates

Table 2 shows the relative spread in opinions (coefficient of variation) for five DCF parameters. Development of the market rent is the parameter that shows the largest spread. This is also in good correspondence with the expressed demand for more and better information from the rental market. It is also a reflection of the fast changing rental market in Stockholm CBD.

Table 2 Average levels and coefficient of variation (standard deviation divided with the mean value) for cash flow parameters judged by 67 analysts and valuers in the year 1999 valuation experiment.

	Op. & Maintenance	Inflation	Rental development	Yield	Discount rate
<i>Average</i>	325 SEK/m2	1,7%	3,9%	5,8%	7,5%
<i>Coefficient of variation</i>	0,28	0,17	0,67	0,17	0,10

Interesting is that the coefficient of variation is relatively low for the year 2002 exit yield and the discount rate. From a theoretical point of view should uncertainty about the market rental development also be reflected in the exit yield. However, it seems to be a general market agreement about parameters like the exit yield and the discount rate. The low variation in the expected inflation can be explained by the widespread uses of the forecasts made by the Swedish National Bank. The level for operations and maintenance cost (325 SEK/m²) is about 20% lower than the average for similar properties within the SFI/IPD index.

The year 2 000 survey

Based on the experience from the 1999 survey 24 Stockholm based valuers (internal, external and bank-related) were asked to conduct a market valuation of a centrally located office property in Stockholm CBD. All were, independent of each other, given the same basic information. They had three weeks to conduct the value report, and they were told not to cooperate. The method used should be Discounted Cash Flow analysis, and all critical assumptions should be reported together with the market value. With reference to an existing freehold property all data were simplified as follows:

Location: Stockholm CBD, at a well-known address

Space uses: Office 9000 m² and an archive with 1000 m²

Standard: Built 1975 and renovated to modern standard 1996

Main content of lease contracts:

- a) 3 000 m², Financial institution, rent passing 2000 SEK/m², expires 2001/2002
- b) 3 000 m², Bank, rent passing 2200 SEK/m², expires 2002/2003
- c) 2 700 m², IT Company, rent passing 2400 SEK/m², expires 2003/2004
- d) 300 m², vacant for rent
- e) 1 000 m², archive, rent passing 800 SEK/m², expires 2002/2003

20 out of 24 valuers conducted the survey with the following results in summary:

Table 3 Average levels and coefficient of variation for market value and cash flow parameters in 20 DCF based valuations in the year 2000 valuation experiment.

	Market Value	Op. & Maintenance	Inflation	Expected market rent year 2 000	Exit yield	Discount rate
<i>Average</i>	532 mill SEK	291 SEK/m ²	1,9%	4 100 SEK/sqm	5,9%	7,9%
<i>Coefficient of variation</i>	0,12	0,14	0,08	0,11	0,05	0,04

Another way to express the spread in market value is that 11 out of 20 valuations are within +/- 10 per cent of the average. The spread between the highest and lowest market value estimate is 40 per cent of the average. The average operations and maintenance costs are about 20% lower than the mean reported from the SFI/IPD index.

The consensus about parameters like exit yield and discount rate make deviations in assumptions about market rent to be the most powerful explanation of variations in market value estimates, see diagram 1.

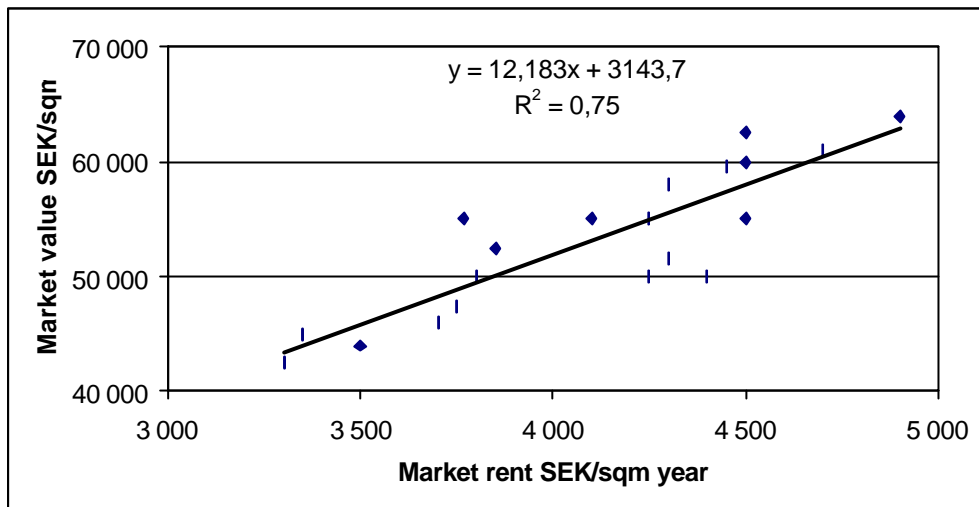


Diagram 1 Market value as a function of the expected market rent in the year 2000 valuation experiment.

75% of the variation in the market value estimates can be explained by the variation in assumptions about the market rent. Most of the variation in these assumptions can be explained by the recent very fast increase in market rental levels in Stockholm CBD. The increase is about 100% for office space in prime locations the last three years. The strong value impact follows from the fact that all lease contracts expires in a couple of years.

Observations and conclusions from the two surveys

The two studies - 1999 and 2000 – are quite different in format but are similar in one respect; they both reflect qualified opinions about important cash flow parameters related to property market and property management. Interesting is the comparatively low coefficient of variation in the year 2000 study for parameters like operations and maintenance, exit yield and discount rate. One possible explanation for this is that the respondents in the year 2000 study are a more homogenous group of professional valuers and analysts compared with the 1999 respondents.

The most important observations from the year 1999 and year 2 000 studies can be summarized as follows:

- Variations in market value estimates are in the year 2000 experiment to a great extent dependent on different assumptions about market rent. A fast changing rental market increase uncertainty in the market value estimates.
- Deviations in assumptions about the exit yield and the discount rate are in both experiments comparatively low.

- The average assumptions about operations and maintenance cost are about 20% lower than the actual outcome from property management measured by the Swedish Property Index.
- It is a much lower variation in the assumptions about the market rent level (year 2000) compared with the assumptions about the rental development (year 1999).

The two studies above are different in design and time, but there are two observations that opens up for further research about treatment of risk within DCF-analysis:

- The comparatively low variation in exit yield and discount rate can partly be explained by the fact that most valuers have access to the same market reports. These reports show a high degree of consensus about at least the exit yields. They also have automated relations between the exit yield and the discount rate in their spreadsheets. There is also a more or less general agreement about the expected inflation. However, there can still be a discussion about the exit yield and to what extent differences in risk perception could be cancelled out by differences in expected net income growth.
- The common notion in financial analysis is that differences in expectations about risk should be reflected in the discount rate (exit yield). When 20 valuers and analysts for the same property report discount rates within a small range it can be an expression for a consensus about risk. However, the conclusion can also be the opposite: The valuers individual perception about the risk related to the specific property is not reflected in the discount rate.⁴

THE RESULTS RELATED TO OTHER STUDIES OF VARIATION

Almost all studies of valuation variation or accuracy are different in design, information available, number of observations and statistical tools used. Straight comparisons are therefore difficult. Conclusions should therefore be drawn with some care.

To begin with is it a common behavior that the valuer qualifies the value estimate with an expression for uncertainty, e.g. 100 million SEK +/- 10%. The exact meaning of these +/- 10% is in a statistical sense unclear (Mallinson and French, 2000). The year 2000 experiment show that 11 out of 20 valuers have value estimates that are within +/- 10% of the mean value. This is the result when a group of 20 rather homogenous valuers and analysts value the same property in a situation with comparatively short lease contracts and fast raising market rents. The subject property is located in a sub market – Stockholm CBD – which contains the comparatively best property related information in the Swedish property market. The observed spread of market value estimates give a hint about the spread that could be expected in a situation with a more complicated property in a market with weak information.

In the Hager and Lord (1985) study a smaller group of valuers were given the same instructions for valuation of an office and a retail property. An expert valuer carried

out a control valuation. Nine out of ten valuations were within 10% of the control valuation for the office property, while the corresponding numbers for the retail unit was seven out of ten. The maximum variation in estimated value for the two properties was about 13%. This figure is much lower than the 40% noted in the year 2000 experiment.

Adair *et al* (1996) makes a more full-scale valuation experiment (446 observations) to illustrate valuation variation. They used a structured survey instrument with a standardized property description for 14 different main city locations. National valuers, and local valuers for the centers chosen, undertook the valuations.

The results are reported as average percentage variation from the mean market value and as standard deviation for the main results. In summary the Adair *et al* study give that the average absolute variation for all market value observations is 9.53%. The corresponding standard deviation is 8.55%. The mean percentage variation for all kind of properties is around 10%. The lowest mean variation (8,04%) is found for reversionary office property while the highest variation (12,0%) is for rack-rented industrial property.

Another observation from the Adair *et al* study is that most of the valuations are based on traditional yield methods. It is also a tendency that valuations conducted by local valuers have a higher degree of variation compared with national firms.

Crosby *et al* (1998) summarize several studies concerning valuation variation and valuation error (e.g. Brown *et al* 1996, Matysiak and Wang, 1995). The main finding is that a significant number of valuations will be outside the +/- 10% range from the actual sale price. In the year 2000 experiment 11 out of 20 valuations were within 10% of the mean. The corresponding numbers from the Adair *et al* study is in the range of 11 to 15 out of a total of 20.

Adair *et al* also reports variations (mean percentage variation) in rental values and initial yields. Their “average of average variation” for the rental value in 14 locations is some 5% with a spread between 1 and 15%. The corresponding number for the year 2000 study in Stockholm CBD is 11%. This 11% could best be compared with 1,27% for London West End in the Adair *et al* study. It is clear that a fast raising market in Stockholm CBD give a wide range of opinions about the market rental level.

Adair *et al* reports a mean percentage variation in *Initial yields* that varies between 1,65 to 8,24% for the 14 different locations. The average of these average numbers is about 4,3% to compare with 3,5% for *exit yields* in the year 2000 experiment.

CONCLUSIONS AND FURTHER RESEARCH

The two here presented surveys of valuation variation say nothing about valuation smoothing and lagging. But, together with other studies, they give a good indication of the magnitude of spread that could be expected in a normal valuation situation. It is also clear that the spread in valuations is much dependent of the situation; market liquidity, market depth and the valuers access to information.

With a complete disclosure of assumptions it is possible to track assumptions behind different market value levels. Explicit consideration in the cash flow model of the market rent, as in the year 2000 study, make it possible to qualify the reasons for deviations in value estimates. With a transparent use of the DCF method will the focus change from the reported market value to the assumptions about individual parameters. An explicit consideration of all DCF parameters will increase the possibilities for communication between investors, analysts, property managers and valuers. A full disclosure of all DCF assumptions will also make it impossible for the valuer to “hide behind” the market value estimate.

To summarize has the empirical surveys, together with the literature, given the following implications for the use of valuation based index information for strategic decisions:

- The observed degree of valuation variation makes it important to undertake benchmarking on an aggregated level.
- Valuation based performance measures on the individual property level is always uncertain and should always be regarded over a longer time period.
- Market value estimates as a basis for buy/sell decisions should be qualified with underlying assumptions.
- Bonus and incentive systems based on performance measures should be qualified with underlying valuation assumptions that reflect general market movements and levels of risk exposure.

More general will presence of valuation biases and systematic valuation errors distort all kind of benchmarking and reduce the creditability of information given to the investment community. Theoretically sound methods and a well-designed valuation process with full disclosure of all assumptions can reduce both valuation bias and valuation error.

The challenge for further research is to find out how:

- The valuation process can be developed to increase the information content of index figures.
- Traditional index information can be improved with new information from the rental, property and capital markets to support strategic property decisions.
- An information and benchmarking system can be built that explicit take account of risk exposure and customer satisfaction.

Much of the future property research will be about quality of information and how risk can be identified, expressed and controlled.

REFERENCES

- Adair, A., N. Hutchison, B. MacGregor, S. McGreal and N. Nanthakumaran. 1996. An analysis of valuation variation in the UK commercial property market. Hager and Lord revisited. *Journal of Property Valuation & Investment*. Vol 14, pp.34-47.
- Baum, A. E., N. Crosby and B.D. MacGregor. 1996. Price formation, mispricing and investment analysis in the property market. *Journal of Property Valuation & Investment*. Vol 14pp.36-49.
- Brown, G. R. 1985. Property investment and performance measurement: a reply. *Journal of Valuation*, Vol 4, pp.33-44.
- Brown, G. R. 1991. Property Investment and the Capital Markets. *E & FN Spon*, London.
- Brown, G. R and G. A. Matysiak. 1995. Using Commercial Property Indices for Measuring Portfolio Performance. *Journal of Property Finance*. Vol 6, pp. 27-38.
- Brown, G. R, G. A. Matysiak and M.C. Shepherd 1998. Valuation Uncertainty and the Mallinson Report. *Journal of Property Research*. 14, pp. 1-13.
- Crosby, N., A. Lavers and J. Murdoch. 1998. Property Valuation Variation and the 'Margin of Error' in the UK. *Journal of Property Research*, Vol 15, pp. 305-330.
- Cullen, I. 1994. The Accuracy of Valuations revisited. *The Cutting Edge Conference 1994*, The Royal Institute of Chartered Surveyors. pp. 91-101.
- Ekelid, M. H. Lind. E. Persson and S. Lundström. 1998. Treatment of uncertainty in appraisal of commercial properties: Some evidence from Sweden. *Journal of Property Valuation and Investment*. Vol 16, pp. 386-396.
- Geltner, D. 1989. Bias in Appraisal-Based Returns. *Journal of the American Real Estate and Urban Economics Association* Vol 17, pp. 338-352.
- Geltner, D. 1997. The Use of Appraisals in Portfolio Valuation and Index Construction. *Journal of Property Valuation & Investment*. Vol 15, pp.423-447.
- Grönroos, C. 2000. Service management and marketing: A customer relationship management approach. *Wiley*, Chicester.
- Hager, D. and D. Lord. 1985. The Property Market, Property Valuations and Property Performance Measurement. *Institute of Actuaries, London*.
- Lundström, S. 1999a. Valuation standards for performance measurement. *Paper presented at the IPD Conference in Wiesbaden*.
- Lundström, S. 1999b. Ett värderingsexperiment. (A Valuation Experiment). *WP 1999-10-08, Stockholm*.
- Lundström, S. 2000. Quality Assurance of the Valuation Process for Property Index. *Paper presented at the PRRES Conference in Sydney*, January 2 000.
- Mallinson, M. and N. French. 2000. Uncertainty in property valuation. The nature and relevance of uncertainty and how it might be measured and reported. *Journal of Property Investment & Finance*, Vol 18 (1): 13-32.
- Matysiak, G.A. and P. Wang. 1995. Commercial Property Market Prices and Valuations: Analysing the Correspondence. *Journal of Property Research*. Vol 12, pp. 181-202.
- McAllister, P. and G. Bowles. 1997. Simulating the effect of Valuation Error on Property Investment Performance Measurement. *The Cutting Edge Conference*. The Royal Institution of Chartered Surveyors.
- Parker, D. 1999. A note on valuation accuracy: an Australian case study. *Journal of Property Investment & Finance*, Vol 17, pp. 401-411.
- Royal Institution of Chartered Surveyors. 1994. *Report of the President's Working Party on Commercial Property Valuations*. (The Mallinson Report). RICS, London.

¹ The Swedish Property Index (SFI) is managed by the Investment Property Databank (IPD). The index is known and marketed as the SFI/IPD Swedish Property Index. For the year 2000 will there be about 3 700 properties included in the index with a total market value of some 250 billion SEK. (1USD =10 SEK). The members of the Valuation group are professional valuers, internal analysts and academics. The Valuation group is responsible for the ongoing development of the valuation guidelines, including quality controls and feedback to the he valuers as well as the rest of the investment community.

² 85% of valuations undertaken for the SFI/IPD-index at the end of 1999 were based on Discounted Cash Flow. 6% were using yield methods and 9% some kind of more direct sales comparison methods.

³ The high priority for more information about operations and maintenance costs can be explained by the fact that most of these are included in the rent.

⁴ The exit yield, in the year 2000 experiment, regressed against the assumed market rent show a very weak correlation with the assumed market rental level, which indicate that a higher rental level is not reflected in a higher risk