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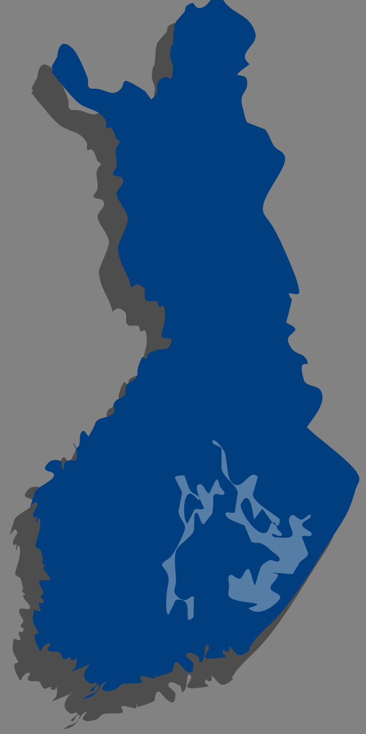

Orava Residential REIT – External Audit of Valuation Model

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16.9.2013

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Assignment

The object and contents of the external audit

- Orava Asuinkiinteistörahasto Oyj, also known as Orava Residential REIT, Orava Rahasto, Orava fund, or Orava, has requested an external audit statement from Realia Management Oy (Realia).
- The purpose of the audit is to ascertain independently the balanced and quality and the true and fair treatment of the data and the results in respect to all parties involved.
- Realia has also performed the previous external audit, dated 10.6.2012.
- The object of audit is the automated property valuation model by the Orava fund.
- The purpose of the automated valuation model is to define a market value for the properties owned by the Orava fund. The audit of the model is thus limited to the use of the model for the defining of market value for the afore mentioned portfolio at the time of the audit.
- The audit is based on the data and information obtained from Orava and other sources, in part verified against each other.

Contents

- The audit includes the processes from data collection to result reporting. The following are analysed: the quality of data and other source material; modification and imputing of data; models and their qualities; modelling; and result reporting.
- The audit is based on valuation Orava valuation model 2013:06. For a more thorough evaluation, previous model results have also been evaluated.

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About regression models

The Orava property valuation model is based on a hedonic regression using a transformed log-linear ordinary least squares method.

- When using any advanced modelling techniques with real world implications there are often trade-offs between model effectiveness and ease of understanding. In regression analysis, the use of linear-estimators (ordinary least squares) with their possible transformations is commonplace due to their established position in the scientific community.
- The use of linear estimators hinges upon several assumptions concerning the modelling data. Many of these assumptions are often violated to some degree for convenience. When estimating the quality of the model, much of the effort needs to be directed towards defining the degree and effect of these violations. These violations are also a reason why potential outliers should be treated with additional suspicion, as they may be an indication of a serious model specification error.
- In theory, the use of robust estimators provides superior results over industry standard linear or log-linear regressions in cases where data is suspect. However, those with even rudimentary skills in regression analysis will have a much better chance of recognising a good or a seriously faulty regression when it follows industry practice, and therein lies the power of (transformed) linear regressions over lesser known variants. Even those considered to be top professionals in the field appreciate the simplicity and ease of use and often rely on linear models due to the intuitiveness of the modelling, thus reducing the risk of human error in model specification.

In the case of Orava, the need for transparency outweighs the few benefits that alternative models can provide. Thus the currently used ordinary least squares model is considered to be the preferred form of the regression.

Furthermore, the following properties of the model can be considered important in evaluating a model:

- unbiasedness
- efficiency
- a reasonable level of coefficient of determination, or R^2
- a low level of heteroscedasticity
- a low level of autocorrelation
- reasonable variance of residuals

The above are key properties of the model in establishing the quality of the regression model. However, in the application of regression theory, one must also take into account the real world constraints. In real property modelling, the unquantifiable number of variables affecting price formation can prove challenging. Micro-locational aspects are particularly problematic, while some, such as the size property, are more easily quantifiable. Thus, many of the challenges in data collecting and its subsequent modelling are evident in the properties of the final regression model.

When the primary use for the model is price estimation, biasness is by far the most important property of the model. A non-biased model would suggest that a sample run for a set of typical properties is likely to achieve a figure, which, on average, is no higher or lower in value than their true price. Typically, a more obvious problem in real property modelling is heteroscedasticity, suggesting that there are variables that have not been taken into account in the model in their correct form or that there may be an underlying misspecification related to eg. error terms. Problems with heteroscedasticity can manifest themselves in unexpected ways. Nonetheless most of the problems related to heteroscedasticity are typically seen at the very far reaches of the modelling sets, ie. in properties with extremely large or small floor area, or properties with exceptional locational attributes.

Automated valuation

- The human intuition and the heuristic ability to weigh in important factors in value formation cannot be overlooked. In addition, while automated models are more likely to consider indications of micro-trends and typical market fluctuations as market evidence for a lasting trend, human intuition is more perceptual to the long-term trend and more likely to attribute weak evidence to a temporary fluctuation in the property cycle.
- The most obvious difference between automated valuation and traditional valuation is in cases of lacking market evidence. Professional valuers are more likely to define market value according to the latest strong market evidence. However, an automated valuation model will typically extrapolate the last known trend even if no such evidence exists.
- Strength of an automated valuation model is the ability to divide the value into smaller denominators, whereby value is created through sums of its parts through hedonic analysis. It is also better at modelling micro-trends that might otherwise go unnoticed.
- Regression analysis requires a functioning market in its typical state. In the event of exogenous events with considerable impact on the market dynamics, for example a severe recession, a traditional valuation is a more suitable method for the defining of market value.
- It is to be noted that the actual, eventual sales price is the market price. However, this market price can be either over- or underpriced compared to the market average. To understand the nature of a market value estimate one should not expect the sales price to be exactly the same as the estimated value as this would be a highly unlikely event due to natural variation in price. Therefore, single events of actual sales price cannot be considered a testament to the accuracy of the market value estimate. This is regardless of what valuation model has been used.
- According to IVS, the definition of 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 the parties had each acted knowledgeably, prudently, and without compulsion.

While both types of valuation are acceptable as long as certain quality criteria are met, they are ultimately alternative views on the same value. Depending on the area under analysis, quality of data and the state of the market, one or the other method may be more accurate. However, as both values are likely to be within acceptable bounds of valuation accuracy assuming a typical market situation, it is best to take both methods of market value estimation as supporting evidence of true market price.

Orava automated valuation model

- As Orava Residential REIT is a holder of assets that can be described as rather typical apartments in relation to the available database, the effect of a relatively small statistical population, possible heterogeneity and the failure in capturing value of potential outliers is somewhat mitigated.
- Due to theoretical and practical challenges in real property modelling and its testing, it is important that a benchmark is used. In the case of Orava Residential REIT, the portfolio is also valued by an independent valuer (Realia) to which the results can be compared giving opportunity to the discovery of potential problems.
- The Orava model is a relatively short spanning time-series analysis, a 2-year model, where the most recent data is given the sufficient emphasis by default.

Changes in models since previous audit

- A leased plot dummy variable has been included in the models:

  lot_ownership where 1 = leased, 0 = owned.
- Two dummy variables have been added representing 1km latitude and longitude radius of the subject property:

  radius * latitude and radius * longitude, where the radius is either 0.5 km or 1km depending on the number of observations (threshold <15 obs.)
- Inclusion specifications have been adopted. These pre-defined specifications are used to evaluate the need to employ specific variables.
- New assets in Kauniainen, Kotka, Lahti, Lohja, Salo, Tornio, Vantaa.

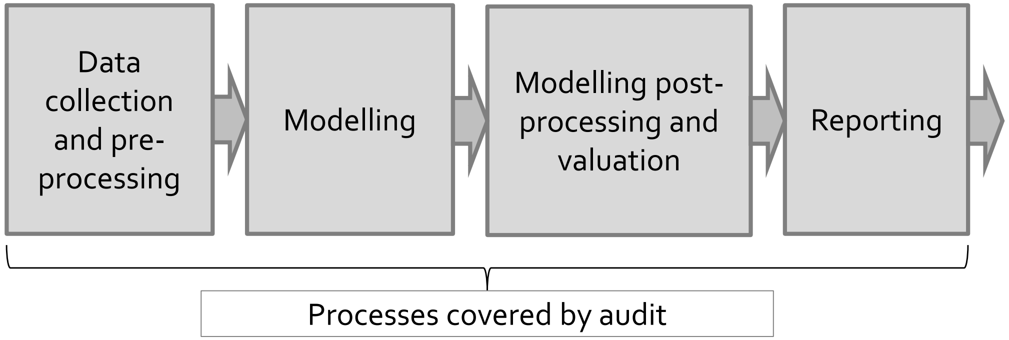
Information on Orava models

- There are sixteen assets (combinations of individual apartment assets) for which value is estimated through modelling. These assets reside in Hamina, Hämeenlinna, Kauniainen, Kotka, Lahti, Lohja, Nurmijärvi, Salo, Sipoo, Tornio, Vantaa. The audit covers the automated valuation of these assets in their respective areas.
- There are seventeen models one for each asset. The Sipoo asset has both row house and block of flats apartments and is thus modelled with separate models. There are multiple models for Tornio, Nurmijärvi and Lahti, as there are more than one asset located at these areas.
- The models employ ordinary least square linear regression model where the dependent variable has undergone a natural logarithm transformation. The dependent variable is price per square meter in all models.
- Independent variables are the following: size in square meters, age, condition, the existence of sauna, time of observation, lot ownership, type of building, location approximation based on postal codes and a square kilometre proximity dummy to the primary object of modelling. In addition, if single apartments have been sold from an asset, these are included as sales evidence adjusted by the prevailing bargaining range estimate.
- The models use asking price data from which an average asking price estimate can be formed.
- This asking price estimate is corrected by a bargaining range estimate. This results in a sales price estimate.

Data collection and data pre-processing

Processes and audit

The following depicts an approximation of the automated valuation process as followed by Orava Residential REIT.



Data collection and data pre-processing

- Orava Residential REIT has an agreement with Oikotie.fi for data sourcing.
- The data in question consist of information from real property display ads on Oikotie.fi, property related data from Population Register Centre and geocoding information from Oikotie.fi.
- The data is downloaded directly from Oikotie.fi, enabling updates as frequent as every hour.

It is possible to automate the data acquisition to remove many of the outliers and data entries with missing information. However, with the data available to Orava, this would lead to a severely truncated dataset with diminished regressional properties. For a sufficiently comprehensive dataset, data entries with missing information need to be imputed requiring additional labour and creating a potential source of bias.

- In pre-processing the data, majority of incomplete data is imputed when feasible. This is done with all modelled areas, but with additional vigour in Tornio where available data is scarce. As imputing data is a somewhat arbitrary process, there is a possibility that this would introduce bias if not done with the utmost care.
- Furthermore, unrepresentative data is removed by placing bounds for acceptable values and obvious outliers are identified and removed. Building year variable requires careful discretion as in the source data year is ambiguously referred to as building year, renovation year or extension completion year.

Observed issues

There may be multiple listings of the same apartment in the dataset. These observations are not removed and thus those properties that are typically overpriced and possibly re-listed will be overemphasised. The problem of multiple listing is due to dual challenges of labour intensity and the identification problem; it can be hard to specify whether a re-listed apartment is in fact the same apartment. The inclusion of multiple-listed properties is likely to introduce a bias towards a higher level of modelled asking price compared to the true asking price of the modelling population. The effect of the bias is mitigated by employing the bargaining range adjustment in the post-processing phase.

Audit notes

These process steps of data acquirement have been observed by the auditor on the computer owned by a member of the Orava organisation. The observing of the process covers data acquisition, data quality checking, imputation of missing data, removal of potential outliers, and finally data entry into the regression. The observation was done to the extent whereby it is possible to ascertain the quality, fairness and objectivity of practices. In particular, special attention was directed to areas where arbitrary measures can be taken.

Analysis of model

- There is weak evidence that some of the models may be biased by a slight margin due to model specification that is sensitive to sample restriction. However, there is no indication of any significant structural bias.
- A far greater potential problem than a bias of the model in relation to the dataset is the available dataset that may or may not be representative of the whole market that the model covers.
- The significance of the above-mentioned problem is greatly diminished by aggregating modelled asset prices at portfolio level where potential negative and positive biases will in part cancel each other out. The portfolio is further tested against independent valuation and no significant bias has been detected.
- Standard error of estimation is typical to real property price modelling with the given scope of the used dataset.
- There is strong evidence of some degree of heteroskedasticity in almost all the models. The effect of heteroskedasticity appears to be largely contained, but remains an additional source of uncertainty.
- Multicollinearity can be created when using variable polynomial transformation. However, with the introduction of latitude-longitude dummy there has been a marked increase in multicollinearity that may increase model instability. This, however, typically does not lead to biasness, and thus valuation at a portfolio level is expected to remain unaffected by multicollinearity.

Analysis of the independent variables

Model coefficient parameters are analysed. By significance or by p-value one refers to the probability of the hypothesis that the variable coefficient is zero. Typically, p-values ranging 0.05 to 0.20 are considered threshold values below which the coefficient should be for it to be considered non-zero with a sufficient probability.

- Size variable: the variable is significant in all of the models. This suggests that the size parameter has an effect on the price formation. However, the sign of the coefficients is consistent with the other models and the size-variable is accepted. There is some multicollinearity present in almost all of the models due to the cubic transformation and/or locational dummies. This may cause increased model instability to a small degree.
- Condition variable: excellent quality in all the models except Tornio and Sipoo. In Tornio and Sipoo some of the quality dummies are of the wrong sign, but coefficient and p-value suggests that the effect is limited. The problem is either in the wrong input in the dataset or the variable is capturing value from an unidentified or unintended source. In modelling, unexpected but non-significant coefficients can be replaces with a zero without repercussions.
- Age variable: a cubic transformation has been performed. In all the models, at least one of the age variables was significant. In most of the models all of the age variables, including the polynomial transformation pairs, were significant. There is multicollinearity present due to the cubic transformation, however it is generally lower than with the size variable.
- Sauna variable: Significant in all but Sipoo, Tornio and Nurmijärvi models. In Sipoo the sign is of a different type to the other models while the coefficient near zero. Non-significant variables suggest that a sauna has no effect on the property value.

- Time-variables: the significance is largely dependent on two factors. First is the amount of observations, second is the amount of change in value along the passing of time. The low significance may not be an issue.
- Latitude and Longitude variable: in many models these two dummies were insignificant. There were some considerable amount of multicollinearity in both Tornio models and Lohja model. These models should always be considered to have potentially more instability due to multicollinearity.
- Area-variable: due to the possible homogeneity of the areas, heterogeneity within areas, and a small number of observations, it is expected that not all area variables pass the significance test.
- Lot ownership: lot ownership has been added to the model to improve value formation due to the ownership status of the lot. In some models this dummy has been dropped according to pre-set inclusion specifications. In Hämeenlinna, Hamina, Kotka, Lohja and both Tornio models the variable was considered insignificant and the coefficient was near zero.

Other considerations related to the models.

In Sipoo M1, Nurmijärvi and both Tornio models, the R^2 is very high. Typically in real estate modelling achieving high R^2 is a very difficult task as prices have a certain amount of natural "noise" and a lot of the value factors a very hard to include in the model, eg. a subjective appreciation of the view, local development plans, state of the housing company etc. Some of the reasons for a higher R^2 than expected are the following:

- The samples have fewer of the parameters that are not explained through the model, ie. the properties in the model are the basis for which people are willing to pay for the property.
- There is less unexplained variance between prices while assuming the inclusion of all major value capturing modelling parameters, ie. there is less random variation which is not explained by the identified value factors used in the model.
- The market is more homogenous with a uniform land area and similar quality buildings.
- The criteria of omission of unrepresentative data has been less strict, ie. less suitable data has been removed to improve statistics where in other cases the data subset would have been included. Usually this will increase the accuracy and efficiency of the model, ie. give truer market values. It is also considered unethical, comparable to the method of cherry picking. However, to our knowledge, there is no evidence of so called "cherry picking".
- Badly specified variables and/or variables with multicollinearity issues can inadvertently begin capturing value factors not purposefully designed to be captured by the model. This may be a stability factor but should not create any bias, ie. one cannot say if this will increase or decrease estimated prices.

About calibration

- It is acceptable to have a coefficient calibration for the model to reach market valuation estimate. The only such coefficient used is bargaining range. The estimated model values are very close to market value valuation by Realia and as such no further level-correction is deemed necessary or appropriate.

Sensitivity analysis

With a limited number of observations, it can be challenging to pinpoint whether a price deviation shown by a valuation model is due to short-term price trends (property micro-cycles), or whether they are merely fluctuations made visible by an artificially restricted dataset. As the dataset at hand represents only a fraction of the true market, there is less room for price-trend interpretation, and more room for error. For the purposes of sensitivity analysis, it is identified that the model results are most sensitive to the number of observations, and here we consider the effects of individual observations on the price function formation. The sensitivity analysis is formed by running two random selections from the dataset. These groups will have only half of the observations, randomly assigned. Ten model runs were performed and subsequent analysis made.

- In estimating the accuracy of the Orava automated valuation model, a series of regression models were run on a truncated dataset (figure a). In addition, the subsets were further averaged by models 1-10, models 1-5, models 6-10 and finally by models 1-10 employing only one half of the randomised dataset (a or b), as seen in Figure b.
- The sensitivity analysis two purposes: one, it is an estimation of variance due to dataset restriction. Should the model price estimate vary considerably, this is usually a sign of the model being very susceptible to a lack of sales data. Second, the restricted runs provide and estimation of inherent biasness of the model. Should the average estimation value of the runs amount to other than the run of the whole dataset, there is a possibility of a misspecification that is susceptible to the extent of available data.
- The sensitivity runs have been produced using a different method and thus the results of 2013 and 2012 audits are not directly comparable.

Figure a.

	% max +/-10%	d(max)	d(min)	d(avg)
Aulangontie 39, Hämeenlinna	0,0 %	7,2 %	-9,5 %	1,0 %
Kirkkoniityntie 28, Sipoo M2	5,0 %	18,9 %	-9,9 %	-0,9 %
Kirkkoniityntie 28, Sipoo M3	20,0 %	28,9 %	-12,9 %	0,8 %
Kylmäojantie 15, Vantaa*	0,0 %	7,7 %	-3,6 %	-0,1 %
Aarnitie 7, Tornio*	35,0 %	25,0 %	-27,5 %	-7,9 %
Aarnitie 13, Tornio	10,0 %	15,9 %	-64,6 %	-6,0 %
Lähdehaankuja 2, Lohja*	15,0 %	23,0 %	-8,5 %	8,0 %
Rasinrinne 13, Vantaa*	0,0 %	7,7 %	-11,9 %	-0,8 %
Ristinkedontie 33, Salo*	20,0 %	-3,5 %	-19,5 %	-11,9 %
Venevalkamantie 3, Kauniainen*	0,0 %	6,0 %	-0,1 %	3,4 %
Vuoksenkatu 4, Lahti*	10,0 %	16,1 %	-3,8 %	3,3 %
Vuorenrinne 19, Kotka*	0,0 %	8,4 %	-0,6 %	3,2 %
Pihtikatu 5, Lahti	0,0 %	11,0 %	1,7 %	4,7 %
Poikkikatu 4, Lahti	0,0 %	-1,3 %	-8,9 %	-5,7 %
Puurata 15-17, Nurmijärvi	0,0 %	11,7 %	1,0 %	0,1 %
Lavatie 6, Hamina	0,0 %	10,9 %	-8,1 %	1,7 %
Total	0,0 %	2,2 %	-2,8 %	-0,3 %

Figure b.

	d(avg 1-10)	d(avg 1-5)	d(avg 6-10)	d(avg a)	d(avg b)
Total	0,4 %	0,6 %	0,2 %	0,4 %	0,4 %

Sensitivity analysis

Some of the models showed a possible slight bias based on data selection Due to data attrition, variance of the modelling run was particularly evident in areas with an already constrained dataset (Tornio, Salo). What is notable however is the average figure of the runs, which remains very close to that of the full set, or valuation by Realia (the portfolio average is -0,3 % split vs. whole). Thus, the model is not restricted to the good fit of the data as a whole, and is hence automatically corrected over time due to the relatively short temporal data span of the model (2 years).

While as a whole, the area data can be considered sufficiently extensive at this moment, the sensitivity nevertheless proves that the model is suffering from an inherent high sensitivity to the number of observation and lies close to the minimum observation boundary. Should the data quality be compromised, ie. by a reduction of samples, the dataset must be supplemented with additional sources. On a portfolio level, small changes in the extent of the data can be considered to have an acceptable impact on the quality of the valuation model.

Evaluation of accuracy against independent valuation

In order to evaluate the accuracy of the Orava model, the model results are compared to property valuations carried out by an independent party. The latest such independent valuations are desktop valuations by Realia Management Oy, where the date of value is 30.6.2013, with one exception (Lohja, 25.3.2013). For comparison purposes, the matching results are extracted from the 2013:06 Orava model. Models marked with an asterisk sign (*) are new additions when compared to the previous 2012 audit report.

Model 2013:06

	Orava valuation	Realia valuation	Diff.
Aulangontie 39, Hämeenlinna	1 418 904	1 397 975	1.5 %
Kirkkoniityntie 28, Sipoo	2 036 554	2 087 635	-2,4 %
Kylmäojantie 15, Vantaa*	1 440 966	1 437 250	0.3 %
Aarnitie 7, Tornio*	929 302	1 100 900	-15.6 %
Aarnitie 13, Tornio	2 713 082	2 755 900	-1.6 %
Lähdehaankuja 2, Lohja*	4 092 108	3 813 688	7.3 %
Rasinrinne 13, Vantaa*	3 994 340	4 085 325	-2.2 %
Ristinkedontie 33, Salo*	3 415 388	3 868 500	-11.7 %
Venevalkamantie 3, Kauniainen*	2 908 501	2 811 050	3.5 %
Vuoksenkatu 4, Lahti*	806 246	805 950	0.0 %
Vuorenrinne 19, Kotka*	2 704 965	2 636 175	2.6 %
Pihtikatu 5, Lahti	1 928 909	1 869 000	3.2 %
Poikkikatu 4, Lahti	2 586 918	2 729 975	-5.2 %
Puurata 15-17, Nurmijärvi	3 700 111	3 556 800	4,0 %
Lavatie 6, Hamina	1 459 279	1 415 975	3.1 %
*new			
Portfolio level	36 135 574	36 372 098	-0.7 %

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Accuracy evaluation

Realia has set the criteria against which to test the accuracy. One can find the employed criteria to the right. As no sub-portfolios have been defined by Orava or allocated by Realia, the criteria for sub-portfolios can be ignored. For the June 2013 models, all defined criteria are met.

In addition, the results from Orava model from 2011:06 and 2011:12 were compared to the Realia desktop valuation of the same period. In the 2011:06 model, two assets were over the limits as set in the criteria. These were Poikkikatu 5, Lahti (-18.1 %) and Aarnitie 13, Tornio (+16.0 %). These properties combined will go above limit of 20 % weight in the total portfolio. The 2011:12 model meets the criteria. Comparing these previous models to the most current one (2013:06), it would appear that the models have been improved steadily.

Model 2011:06

	Orava valuation	Realia valuation	Diff.
Aulangontie 39, Hämeenlinna	1 751 095	1 900 000	-7,8 %
Kirkkoniityntie 28, Sipoo	2 968 788	3 300 000	-10,0 %
Aarnitie 13, Tornio	3 364 372	2 900 000	16,0 %
Pihtikatu 5, Lahti	2 577 900	2 600 000	-0,8 %
Poikkikatu 4, Lahti	3 274 011	4 000 000	-18,1 %
Puurata 15-17, Nurmijärvi	4 778 464	4 400 000	8,6 %
Lavatie 6, Hamina	1 549 757	1 400 000	10,7 %
Portfolio level	20 264 387	20 500 000	-1,1 %

Model 2011:12

	Orava valuation	Realia valuation	Diff.
Aulangontie 39, Hämeenlinna	2 157 309	2 000 000	7,9 %
Kirkkoniityntie 28, Sipoo	3 250 366	3 300 000	-1,5 %
Aarnitie 13, Tornio	2 913 157	2 900 000	0,5 %
Pihtikatu 5, Lahti	2 507 484	2 700 000	-7,1 %
Poikkikatu 4, Lahti	2 922 228	3 300 000	-11,4 %
Puurata 15-17, Nurmijärvi	4 616 415	4 300 000	7,4 %
Lavatie 6, Hamina	1 484 804	1 400 000	6,1 %
Portfolio level	19 851 763	19 900 000	-0,2 %

Comparison criteria

- For the whole portfolio, irrespective of the size of the portfolio, the sum of individual asset values must be within 5 % of the sum of asset values as valued by an independent valuer.
- For a sub-portfolio, the sum of values must be within 7.5 % of the sum of values as valued by an independent valuer.
- Single property assets (combination of multiple apartments at the same address) must be valued within 15 % of the equivalent valuation by an independent valuer. Of the entire set of property assets, at least 80 % must pass this criteria.

The criteria have been defined by Realia and accepted by Orava.

Presentation of model evaluation

- For ease of presentation, the evaluation criteria are presented in the table below.
- The object of the audit is to evaluate whether the automated valuation model is sufficiently accurate and objective for market valuation of the Orava Residential REIT portfolio, a matter of pass or fail. The portfolio valuation model, however, consists of several models and these models furthermore consist of different variables, each with their own properties.
- Thus, the evaluation of the automated valuation model is the evaluation of its parts giving emphasis to critical criteria.

Criteria table

Criteria	Weight	Portfolio	M1	M2/3	M4	M5	M6	M7	M8	M9	M10:	M11:	M12:	M13:	M14:	15/16:	M17:
Observation n. criticality	●●●●●	93 %	100 %	88 %	80 %	65 %	90 %	85 %	100 %	80 %	100 %	90 %	100 %	100 %	100 %	100 %	100 %
Data quality	●●●	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Unbiasness	●●●●●	88 %	100 %	100 %	100 %	90 %	75 %	85 %	100 %	60 %	100 %	100 %	100 %	100 %	75 %	75 %	100 %
R^2	●●●	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Homoscedasticity	●●●	78 %	50 %	50 %	75 %	100 %	100 %	75 %	75 %	75 %	75 %	75 %	75 %	75 %	75 %	100 %	75 %
Other properties of model	●●●	84 %	90 %	90 %	90 %	70 %	70 %	60 %	100 %	75 %	90 %	90 %	75 %	90 %	90 %	100 %	75 %
Accuracy against independent	●●●●●	100 %	(Portfolio within 5% bounds.)														
Sensitivity	●●●●	80 %	(Sensitivity issues M2, M5, M6, M11. At portfolio level ok.)														
		Weight:	0,04	0,06	0,04	0,03	0,08	0,11	0,11	0,09	0,08	0,02	0,07	0,05	0,07	0,10	0,04
Weighted total criteria score		91 %															

Note: criteria include both quantitative and qualitative; 100 % suggests the absense of identified problems. Model criteria have been weigthed by their market values relative to the portfolio market valuation.

M1:	Aulangontie 39, Hämeenlinna	M10:	Venevalkamantie 3, Kauniainen*
M2/3:	Kirkkoniityntie 28, Sipoo	M11:	Vuoksenkatu 4, Lahti*
M4:	Kylmäojantie 15, Vantaa*	M12:	Vuorenrinne 19, Kotka*
M5:	Aarnitie 7, Tornio*	M13:	Pihtikatu 5, Lahti
M6:	Aarnitie 13, Tornio	M14:	Poikkikatu 4, Lahti
M7:	Lähdehaankuja 2, Lohja*	M15/16:	Puurata 15-17, Nurmijärvi
M8:	Rasinrinne 13, Vantaa*	M17:	Lavatie 6, Hamina
M9:	Ristinkedontie 33, Salo*		*new since last audit

Model evaluation summary

The criteria

- Critical limit for number of observation; whether the model is close to the minimum dataset for an accurate value estimate.
- Data quality; the existence of outliers, residual fit, etc.
- Unbiasness; whether the estimated value, on average, equals the full population average as implied by the dataset.
- R^2; how well the model captures value.
- Homoscedasticity; normality of error residuals.
- Other properties of model; such as multicollinearity, coefficient significance, residuals, goodness of fit.
- Accuracy against independent; see above.
- Sensitivity; see above.

Weighted criteria score

The weighted total criteria score has been defined at 91 %. The figure works as a benchmark and suggests that there are some issues with the model. One must understand that any of the evaluation criteria can become critical to the functioning of the model should the underlying quality be out of the ordinary to a considerable degree. Thus, the weighted score is merely for the reader's consideration and facilitation.

Comparison of the current model to previous audit

New variables have been added to the model. When using the results as the criteria, the current model's results follow closer to what is considered as market level pricing. From a technical aspect, these changes have had both positive and negative impact to the model parameters.

The addition of the latitude-longitude dummies has resulted in an increase of multicollinearity. This may increase general instability of the model, in Sipoo and both Tornio models especially. R^2 has improved as new variables have been added. These added variables have improved the model and are not considered inappropriate.

The use of sales dummies has proven to be ultimately a good guide towards more accurate pricing. The issue with the use of sales dummies is that should there be only a few of them, it may bring more stochastic qualities to the model. This is to say that should the observation be clearly under-/overvalued compared to the market average, it will also have an impact on the value of the portfolio. Also, there is a possibility that these dummies inadvertently capture value that relates to the bargaining range, ie. difference between actual sales price and asking price that has not been taken into account through bargaining range estimation. As it is not at the discretion of the modeller (Orava) to choose arbitrarily these observations due to reasons of transparency, these kinds of temporary value fluctuations are a regrettable, if a minor feature of the models. As more sales data are included, these over-/undervalued instances will be gradually averaged out bringing the model result closer to a market average value.

These technical issues can be challenging when looking at model results at asset level. However, there is evidence that these changes improve pricing ability of the models and thus the value estimate at a portfolio level. When multiple model results are combined, the current model is considered superior to the previous models.

Modelling post processing and valuation

The regressional value estimate is used to attain the asking price value of each apartment where the values of single apartments are aggregated without any corrections for quantity. Should a need arise to divest all apartments in one go it is likely that a corrective multiplier is required.

The estimated value is the asking price estimate, including the implied bargaining range. The implied bargaining range is removed by using an estimate of the range, which is then subtracted from the asking price estimate. This estimate of bargaining range has been produced by comparing actual transaction prices from Statistics Finland and data from Oikotie.fi, which are then adjusted by two months for improved match.

After correcting for bargaining range, no further value modifications are made apart from possible rounding.

Considerations related to the bargaining range

- The bargaining range is the price difference between the asking price and the price for which the property eventually sells for.
- In the model it was identified that there is a potential source of bias in the asking price level related to multiple listings. However, this is mitigated by the estimated bargaining range. The bargaining range is calculated using the modelled asking price and actual sales data for the area. Thus, whatever bias is introduced in the asking price level will be largely removed through employing the bargaining range correction for actual market value. However, care should be taken as this bargaining range is implied and these computational values are applicable to the Orava valuation model only.
- The bargaining range is a considerable source of uncertainty. Should the bargaining range be known with considerable precision, the time-period sufficiently short to mediate changes, and the area divided into relatively homogenous areas and applied only within these areas, many potential problems should not manifest.
- Optimally, the bargaining range would be estimated for each homogenous area. Due to the restrictions imposed by the data quality, the area data is aggregated and subsequently divided into two groups: large cities and smaller cities or towns.
- For each area model, one of the two bargaining correction ranges is used. The use of averages does not pose problems in valuing at the whole portfolio level.
- In model valuation of multitenant apartment blocks (multi-storey), only asking price data for multi-storey is used. Should the property under valuation be of any other type, data for terraced houses and semidetached and detached houses is added to the dataset.

The source for the used data for the estimation of bargaining range is Oikotie.fi and Statistics Finland.

REALIA

Reporting and list of attachments

Reporting

From the point of view of this audit, the purpose of reporting is to convey the market value as objectively and accurately as possible at the level of detail and depth deemed suitable considering the audience.

The following must be stated clearly and objectively:

- The process in its rudimentary form how the market value estimate is attained.
- Market value, per individual asset (a combination of apartments at a single location), per portfolio, in local currency and as %-change.
- Historical data of market value to the extent where potential fluctuations in estimated short-term price trends can be discerned.
- The current and historical bargaining range estimations.
- Applicable, easy-to-understand indicators of model quality and their explanations, such as standard errors and goodness of fits.
- In addition, the inclusion of an audit summary, if available and deemed suitable.

The auditors have gone through the materials. Orava Residential REIT are committed to reporting objectively and accurately and are in line with the afore mentioned reporting criteria.

List of attachments

The inclusions of the following attachments are at the discretion of Orava Residential REIT:

- Employed models
- Extensive set of statistical tests, descriptions and analyses
- Detailed process of bargaining range estimate formation
- Input data description sheet
- Summary of the audit statement in Finnish

Audit statement

- We have audited the automated valuation model of Orava Residential REIT as of 16th of September 2013 and the related data, processes, reporting and work methods at the time of audit.
- A prerequisite for applicability of the model is a normal and functioning market. For the purposes of this audit, a normal and functioning market is defined as a market situation where predictability to a conventional degree is possible. Should the market observations be atypical in their quantity or quality, or the market situation is considered volatile, predictability cannot be considered conventional.
- There are certain issues in the used models. These are covered in the previous sections of the audit. In the current form of the automated valuation model, with comparable data, the valuation of the Orava portfolio is sufficient in accuracy, balance and fairness in valuing market value at complete portfolio level.
- The audit is based on examining and testing the functioning of the valuation model, reviewing the model forming process and studying work methods in in detail. The conclusions are based on the data and information obtained from Orava and other sources, in part verified against each other.
- While Realia's responsibility is to offer a statement based on the audit, the final responsibility of the automation valuation model lies with Orava Residential REIT.
- The audit covers data acquisition, data pre-processing, modelling, model post-processing and reporting of result.
- We have found the processes, methods and work practices in forming the automated valuation model to be of sufficient standard to attain an objective measure of market value within standard valuation accuracy.
- We have found the extent and quality of data to be sufficient quality for the formation of the models as at 16.9.2013. Should the quality of data, as a whole, remain at the same level, and employing equal practices, we have reason to believe that future models will continue to provide a fair and balanced estimate of market value.

The auditors have independently ascertained the quality, balance and the true and fair treatment of the data and the results in respect to all parties involved.

The auditors have found the processes and models to follow good practices, to be of reasonable accuracy for the purposes of market value estimation, and the result reporting to be objective and fair in nature.

Helsinki 16.9.2013

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