

## Cadastral Valuation Models

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**Abstract.** In accordance with legislative enactments cadastral or mass valuation shall be used for calculation of cadastral value, which is used for administration of real property tax. Cadastral valuation is based on the real property market information in market economics of European and other countries. There are some countries where taxes are calculated as a down payment area – expressed as a fixed amount per unit, depending on the land or buildings in use – the so-called normative value, but this practice is not common internationally, since the normative value does not describe the object, and it is not conducive to the economic development. The aim of the article is to survey the present cadastral valuation process in Latvia. The study provides the research results in the field of cadastral valuation, describes calculation of cadastral value reposing on base values and different models of cadastral valuation. The cadastral value shall be based on cadastre objects data of the State Cadastre of Real Property (hereinafter – Cadastre information system) as well as on the real property market information – information regarding purchases, lease, construction costs, real property market offer and demand, real property market activity, etc. Consequently, the cadastral valuation process can be implemented successfully implying the use of approved cadastral valuation models and proper data of cadastral objects.

**Key words:** real property, mass valuation, cadastral value, cadastre object.

### Introduction

In accordance with Immovable Property State Cadastre Law real property is an object of real property (a unit of land or a structure) or a set of these objects (a unit of land and a structure), which is registered in the Land Register as independent compartment. An apartment properties or apartments, artist's workshops, unoccupied premises, which have been given into ownership up to the privatisation of the residential houses, is also regarded as real property.

The concept of real property has always been associated with an ownership of a person or government and is an essential component of the national economy (A.Rausis, 1996.). Today, any state element in successful economic development is normal, world-standard real property market relations formation, and the value of the property may be used as an objective and reliable indicator to assess the tax payer – civil status and solvency of a particular period (V.Baumane, 2009).

The concept of generalised mean value of all things understood properties is expressed in monetary terms. Property owner's attitude affects the value of the property.

The value of real property may be determined by buying or selling in the calculation of the individual or the market value when calculating the compensation money in terms of loss of property or transfer the case when the real property registry, or a massive amount of tax, etc (Тарасевич Е.И., 1995). In any case, today's real property and property value are conceptual linked in economy.

The most common methods, specified in the standards for assessment of real property recognised in Latvia for determination of the value are:

- the method of comparing transactions;
- the income capitalisation method, and
- the method of costs.

Cadastral valuation of the property group is a systematic evaluation on a certain date, mostly on January 1, through the evaluation of standardised procedures and statistical analysis.

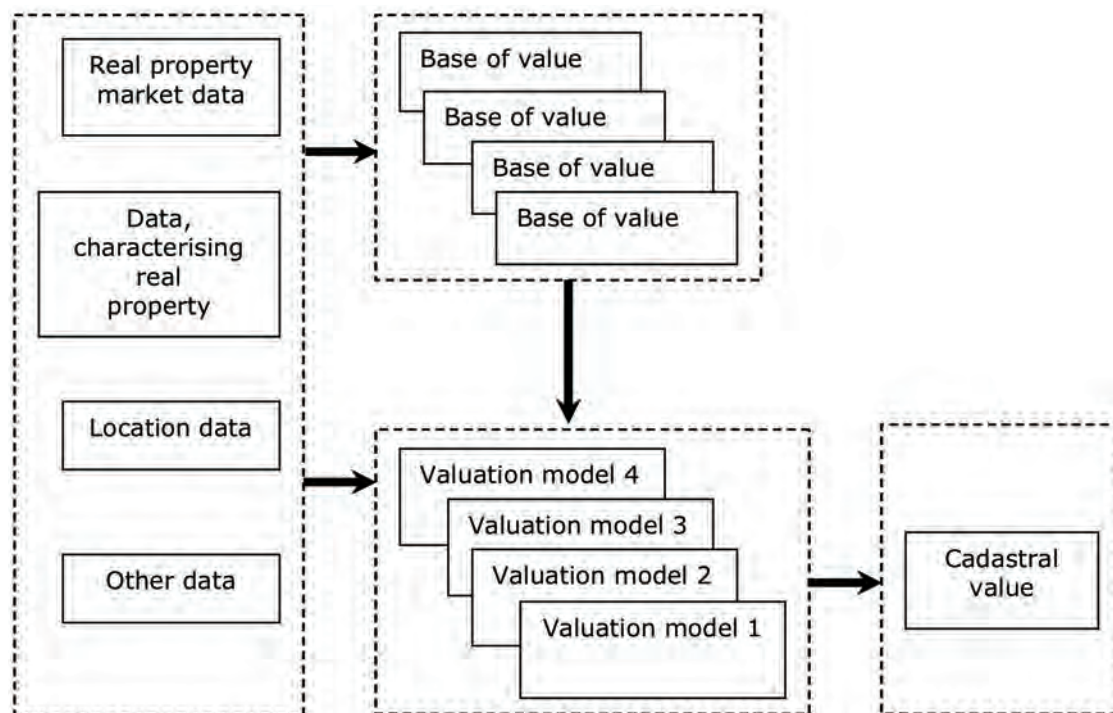
Cadastral value for real property tax shall be calculated in accordance with the information regarding transactions of real property at least for the last two years (Kadastralās vērtēšanas noteikumi, 2006).

Cadastral valuation allows calculating cadastral value for large number of cadastre objects simultaneously. Standard calculation models are used, since expenses of calculation are low.

Cadastral valuation in accordance with the laws and regulations is a set of operations implemented with single principles of cadastral assessment on a certain date in accordance with the cadastre data in monetary terms, in order to specify the value of a cadastre object. The process of cadastral valuation includes development of a cadastral value base and calculation of cadastral value (Nekustamā īpašuma valsts kadastra likums, 2005).

The State Land Service is responsible for cadastral valuation. The Cabinet of Ministers has determined the procedures for cadastral valuation in Regulations No. 305, adopted on April 18, 2006 "Regulations Regarding Cadastral Assessment". The State Land Service shall register and analyse the prices of real property market and lease payments, and determine the price level for real property. The Cadastre information system shall maintain a database of the Real property market in order to accumulate and process information regarding the real property transactions.

The base of cadastral value is very important for calculation of real property tax. It is a set of data characterising the value necessary for calculation of the cadastral value – base values and correction



Source: made by the author according to the "Regulations Regarding Cadastral Assessment"

Figure 1. Cadastral valuation process

coefficients, which, on the basis of data analysis of the real property market, have been specified for the group of cadastre objects in terms of values within a relatively homogenous territory – zone. The Cabinet of Ministers shall approve the base of cadastral values.

The research hypothesis is that the qualitative study of cadastral valuation models is the basis for cadastral value of any real property.

The study provides understanding on cadastral valuation process, cadastral valuation models, along with appropriate data analysis. The following tasks are put forward to achieve the set aim: 1) to evaluate cadastral valuation process and cadastral valuation calculation models; 2) to analyse the data necessary for cadastral value; 3) to make recommendations for improving cadastral valuation process.

The data of Cadastre information system and database of the Real property market maintained by the Land State Service are used in this research.

Monographic method, method of analysis as well as the method of statistic analysis is used in the particular research.

## Results and discussion

Cadastral values in Cadastre information system are calculated automatically. It allows to exclude the human errors, and to save up human resources. Cadastral valuation process is shown in Figure 1.

Since calculation of the cadastral value is calculated automatically, the process of calculation ensures:

- the estimated value of topicality, taking into account changes in the rated object to the performance indicators;
- simultaneous mass converting of cadastral value for all cadastre objects after new base of cadastral value coming into force;
- the reliability of the cadastre data used for calculation of the cadastral value;
- the mutual comparability of cadastral value of cadastral objects in the frame of one group of objects (Kadastra objekta reģistrācijas un kadastra datu aktualizācijas kārtība, 2006).

Cadastral valuation system implemented in Latvia was developed in collaboration with Swedish, Finnish, and Danish experts in frame of various intergovernmental projects. The analysis of principles of cadastral valuation system of Latvia demonstrates its common similarity with corresponding valuation systems in other European countries:

- cadastral valuation is based on data of the Real property market information system – being developed zoning and the value of the base values;
- application of the methods of internationally recognised valuation;
- cadastral value is calculated using similar criteria in accordance with all cadastre objects.

In some countries, for example in Sweden a unified model of valuation is used: the land together with buildings on it is valued as a common undivided property. In Latvia cadastral value is calculated separately for a unit of land, building, and engineering structure. Cadastral value of real property is calculated as a sum of the cadastral values of a unit of land, buildings, and engineering structures

forming a separate real property. The Western European countries (Sweden, Denmark), value-based design used for commercial real property rents in the country, as there exists firmly established arrangements for accounting of income from rents. Current information on the income from the rental of premises and buildings from natural and legal entities related to the leased items is not guaranteed in Latvia.

Four valuation models shall be used for calculation of the cadastral value of cadastre objects. Valuation models are accepted on the level of the Cabinet of Ministers by corresponding Regulations. These valuation models are developed for valuation of:

- rural land of the rural area;
- building land;
- buildings, incl. groups of premises;
- engineering structures (Kadastrālās vērtēšanas noteikumi, 2006).

#### Cadastral valuation model of rural land in the rural area

Cadastral valuation of agricultural and wooded land started in 1993. The method of calculation was based on the imitation of real property market, and it existed until the method of land valuation based on the real property market was implemented in 2008. New method prescribed the use of the following data of the unit of land registered in the Cadastre Information System for calculation of the cadastral value:

- the purpose of use and division by types of use of land;
- encumbrances which affect the land value and land areas covered by them;
- the quality assessment of the utilised agricultural land in points; and
- the quality assessment of wooded land in points.

The cadastral value for rural land is calculated using the following equation (1):

$$K_V = (P_{LIZ} \times Bv_{liz} + P_M \times Bv_M + (0,2 \times P_{p_z} + P^*_{p_D}) \times Bv^*_{LIZ} + b \times C_{maja}) \times K_{apgr} \times K_p \times K_T \quad (1)$$

where:

- $K_V$  – cadastral value in LVL;
- $P_{LIZ}$  – utilised agricultural land in hectares;
- $Bv_{liz}$  – base value of the utilised agricultural land zone in LVL per hectare;
- $P_M$  – wooded land area in hectares;
- $Bv_M$  – base value of the wooded land zone in LVL per hectare;
- $P_{p_z}$  – other land area in hectares;
- $P^*_{p_D}$  – area in hectares of the land under fish ponds and courtyards;
- $Bv^*_{LIZ}$  – base value of the utilised agricultural land of quality III group in LVL per hectare;
- $C_{maja}$  – constant of the affect of residential house;
- $K_{apgr}$  – correction coefficient of encumbrances;
- $K_p$  – correction coefficient of pollution;
- $b$  – feature of the residential house (b=1, if there is a residential house on the unit of land; b=0, if there is no residential house on the unit of land);
- $K_T$  – correction coefficient of market changes.

#### Cadastral valuation model of building land

The following data of the unit of land registered in the Cadastre Information System are used for calculation of the cadastral value:

- the purpose for use of the unit of land;
- encumbrances specified for the unit of land which affect the value of land and land areas covered by them.

The cadastral value for building land is calculated using the following equation (2):

$$K_V = \left( \sum (Bv \times P_{LM} \times K_{samaz} \times K_T) \right) \times K_{apgr} \times K_p \quad (2)$$

where:

- $K_V$  – cadastral value in LVL;
- $Bv$  – base value of the building land in LVL per square metre;
- $P_{LM}$  – land area under jurisdiction of the purpose of use in square metres;
- $K_{samaz}$  – area correction coefficient;
- $K_{apgr}$  – correction coefficient of encumbrances;
- $K_p$  – correction coefficient of pollution;
- $K_T$  – correction coefficient of market changes.

The value of building land substantially affects such indicators as security of communications, complex configuration of land unit and different allowed intensity of construction.

Online communications and building intensity factors are evaluated in part by setting the value of the border zone, but not all areas are completely homogeneous. A portion of text with fields and records shall be improved within the cadastral information system to evaluate the differences in one area. Part of the text shall supplement the data fields for each land unit to present the above figures and to evaluate the possibility of cadastral information system. Currently, automated information should be obtained only on the existence of built-up land communication unit, which houses a full cadastral survey.

### Cadastral valuation model of building

The latest cadastral survey (technical inventory) data registered in the Cadastre Information System are used for calculation of the cadastral value of the building:

- the building type;
- the indicator of the building volume;
- the physical status;
- encumbrances.

The cadastral value of the building is calculated using the following equation (3):

$$\bar{E}_{KV} = \bar{E}_{Bv} \times A \times K_S \times K_{kor} \times K_{li} \times K_T \quad (3)$$

where:

- $\bar{E}_{KV}$  – cadastral value in LVL of the building to be assessed;
- $\bar{E}_{Bv}$  – base value of the building type complying with the building to be assessed in LVL per indicator of the volume;
- $A$  – size of the volume indicator of the building to be assessed in square meters or cubic metres;
- $K_S$  – correction coefficient of the physical state of the structure;
- $K_{kor}$  – correction coefficient of the volume effect;
- $K_{li}$  – correction coefficient of encumbrance;
- $K_T$  – correction coefficient of market changes.

The determination of the building type is necessary for cadastral valuation of the buildings. Usually it is done performing the cadastral survey (technical inventory) of buildings, taking into account their main type of use, materials used for construction, and technical indicators (number of above-ground storeys, volume, material of the external walls).

Since buildings with building cadastral survey are defined (assigned) only as one building type, a multipurpose cadastral evaluation value is calculated in some cases inadequately, for example, a shopping centre with a permanent multi-storey car parking lot. It is important to examine the question of the physical conditions of buildings and the effect of age

when determining the cadastral value. The residential development of the assessment is particularly timely now, due to the intention to levy property taxes.

The cadastral value for the group of premises is calculated from the cadastral value of the building proportionally to the area of particular group of premises. The following equation is used for this calculation (4):

$$TG_{KV} = \bar{E}_{KV} \times (TG_{kop.plat.} : \bar{E}_{kop.plat.}) \quad (4)$$

where:

- $TG_{KV}$  – cadastral value in LVL of the group of premises;
- $\bar{E}_{KV}$  – cadastral value of a building, where the group of premises is located;
- $TG_{kop.plat.}$  – total area of the group of premises in square metres;
- $\bar{E}_{kop.plat.}$  – total area of the building in square metres, where the group of premises is located.

The cadastral value of an apartment property is calculated as:

- cadastral value of the group of premises, and
- an undivided share of the cadastral value of the building, land, and structures functionally connected, which are included in the structure of the apartment property.

Apartment property cadastral value is calculated by taking into account an apartment owned indicators of land and buildings. Such an estimate is sufficient housing property located in buildings with one use or in areas with similar values for different intended uses of objects. Apartment property located in a building or a multi-functional area with different value levels between the different uses of the cadastral value calculation should be changed; and the cadastral value shall comprise the group of premises used. Similar principles shall be followed in the group of premises evaluation. Such a model can be calculated on the condition of the building where the cadastral information system is established, and full information – cadastral survey is carried out in buildings. The issue of property valuation apartment development is particularly acute now, since the apartment is planning to levy low property taxes – by developing a model to be made in equity between taxpayers.

### Cadastral valuation model of engineering structures

The latest cadastral survey (technical inventory) data registered in the Cadastre Information System are used for calculation of the cadastral value of the engineering structures:

- the engineering structure type;
- the engineering structure volume indicator;
- the engineering structure physical status.

The cadastral value of engineering structures is calculated using the following equation (5):

$$IB_{KV} = \left( \sum (IB_{Bv} \times A \times K_s) \right) \times K_T \quad (5)$$

where:

- $IB_{KV}$  – cadastral value of the engineering structure in LVL;
- $IB_{Bv}$  – base value of the engineering structure type;
- $A$  – size of the volume indicators of the engineering structure type to be assessed;
- $K_s$  – correction coefficient of the physical state of the building;
- $K_T$  – correction coefficient of market changes.

Engineering structures classification is unduly detailed from the value point of view. Evaluation of engineering structures is mainly based on the classification of engineering structures. This classification is very detailed, and it includes 752 types of engineering structures; thus creating problems for obtaining objective data.

The engineering structure type, in performing the cadastral survey, shall be determined in accordance with the following criteria: building design, a deed regarding acceptance of the structure into service, executive surveys of engineering communications, a deed of acceptance of works covered, a registration certificate of engineering structure, a passport of engineering structure, etc. The following aspects shall be taken into account to determine the engineering structure type, its main type of

use, materials used for construction, technical indicators, and its constructive solution. An engineering structure may have two or more types, and two or more volume indicators, where each of them is attached to a certain type of engineering structure and the base value of the type.

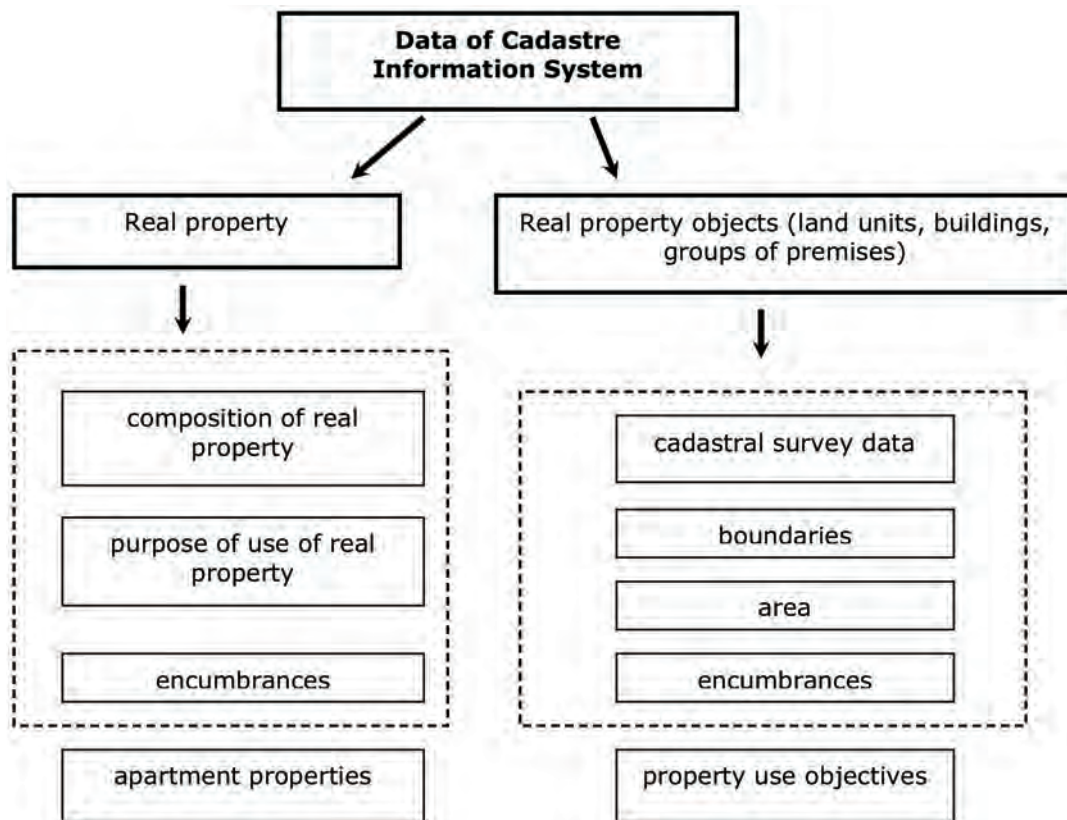
Valuation models are created from:

- market data – data on sales, cost information, income data, etc.;
- data characterising real property – data on land, buildings, groups of premises, location, etc..

The country needs computerised information on cadastral objects and characterising data, reliable information on transactions with real property, laws and regulations concerning special assessment procedure, and calculation models to implement the cadastral valuation. The study has confirmed that Latvia has met the necessary requirements:

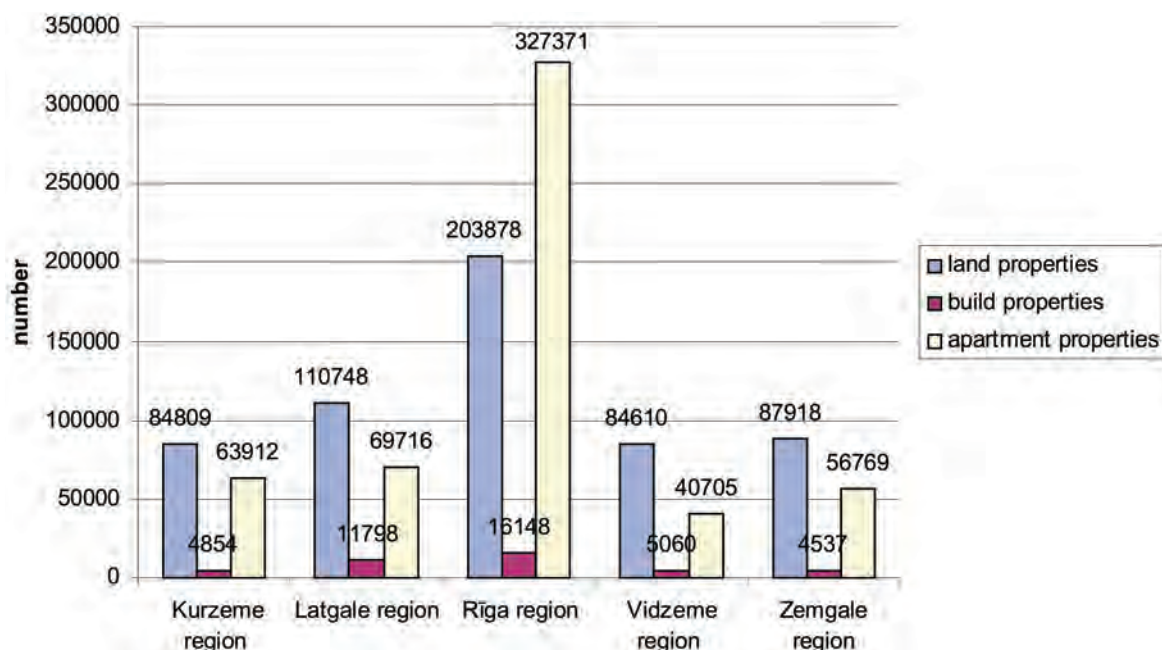
- information on cadastral objects is registered in Cadastre Information System (Figure 2);
- information on real property market transactions is registered in the database of the Real Property Market;
- the Parliament and the government have adopted the necessary legislative enactments.

In order to use the data (qualitative and quantitative indicators) of the Cadastre Information System for the development of cadastral valuation models, these data should be objective and



Source: made by the author according to the "Regulations Regarding Cadastral Assessment"

Figure 2. Cadastre information system data mainly used in cadastral valuation models for calculation of cadastral value



Source: made by the author according to the date of the State Land Service

Figure 3. Number of real properties registered in the Cadastre information system (on November 1, 2009)

Table 1

#### Changes of agricultural land prices in Latvia

Indicators	2000	2001	2002	2003	2004	2005	2006	2007	2008
Average price	139	143	161	187	206	492	563	797	962
Increase of the price compared with the base year (2000), in LVL	-	4	22	48	67	353	424	658	823
Increase of the rate compared with the base year (2000), in %	-	2.9	15.8	34.5	48.2	254.0	305.0	473.4	592.1

Source: author's calculations according to the date of the State Land Service

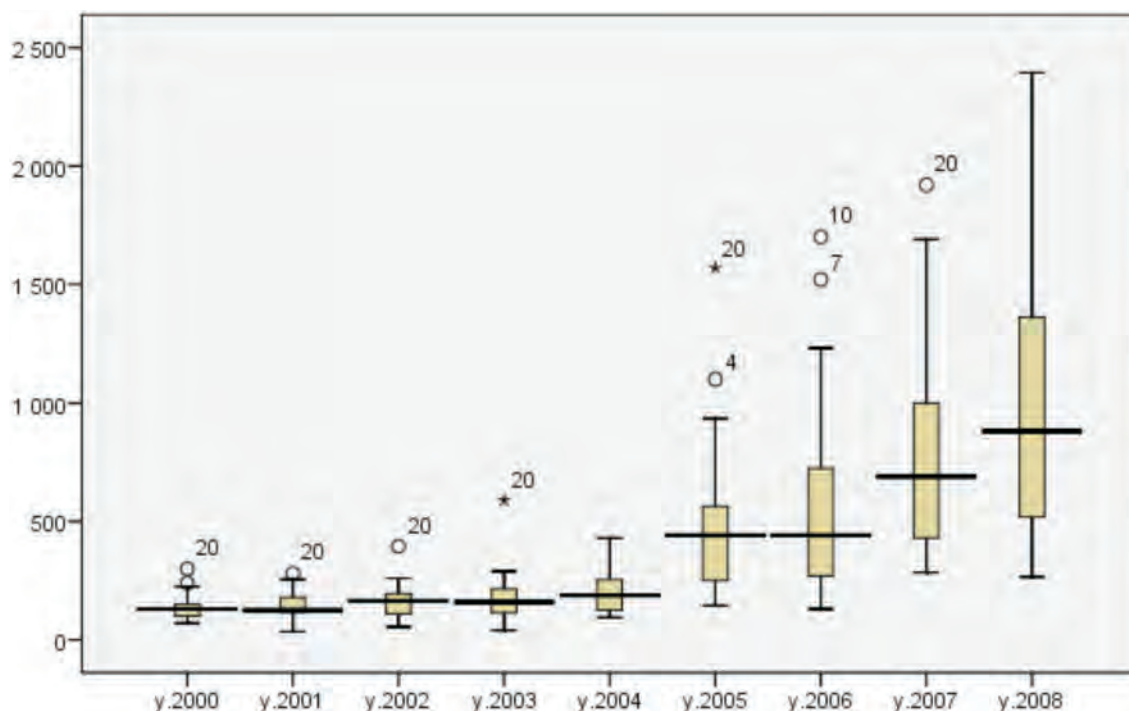
reliable on each real property and its object. On November 1, 2009 approximately 1.5 million real properties and 5 million real property objects were registered in the Cadastre Information System. The largest number was registered in Riga region (Figure 3). The tendency of increasing in the number of properties is in progress due to the subdivision of real property objects. It means that more objects will be involved in valuation process. For this purpose the data of good quality are necessary.

All cases of real property sales for which the information is compiled from the Land Book are recorded in the database of the Real Property Market. One of the problems associated with the handling of this information is presented in the price of sales contracts – it often tends to be lower than actually paid, since the parties of the transaction seek to avoid paying high state taxes when strengthening the property rights in the Land Book (state fee of 2% of property value). At relatively high property prices,

the amount of stamp duty is high, which encourages the contractual parties to produce false bids. One possible solution would be to change the calculation base and the strengthening of ownership in the Land Book stating that fee is calculated from the cadastral value determined by the same principles to all properties.

Analysing the real property market data, it was observed that the prices of agricultural land will continue to grow compared with other real property prices. Assessing the price rises by the regions of Latvia, more uniform prices are observed in Vidzeme and Latgale; while a sharp rise is seen Kurzeme and Zemgale regions, where land has received the highest land quality assessment.

Analysing the average agricultural land prices in Latvia, a price rise is observed on the basis of the reference year 2000. The calculations show that the fastest rates were observed from 2004 after joining the European Union. In 2005 they reached an average price of 200% over the previous year (Table 1).



Source: made by the author according to the date of the State Land Service

Figure 4. The number and price increases in transactions of agricultural land properties in Latvia

It is necessary to make sure that the information used is objective and comparable when carrying out calculations using the approved cadastral models. The data shall be objective for each property item. The data having sharp differences cannot be included in the cadastral valuation models. Therefore, various market data analysis tools are used; one example is shown in a box diagram of Figure 4 (Betts Richard M., Ely Silas, 2004). The box includes 50% of the data on average; the median reflects the average value of each reporting year, which can be seen on a farmland price growth trend.

The caste chart released:

"Outliers" – points more than 1.5 box heights above or below box (circles);

"Extremes" – points more than 3 box heights above or below box (asterisks).

The analysis of agricultural land prices has shown both the divergent points of both extreme values. It can be concluded that unusual transactions with agricultural land have been concluded in the period of 2000-2003 and the period of 2005-2007. The use of cadastral valuation models should be excluded, since such data do not reflect the overall trend.

The cadastral valuation system, including development of valuation models shall meet several prerequisites – people, time and financial resources are required to develop the software for obtaining and updating the data required for the development of models.

## Conclusions

1. Cadastral values in the Cadastre information system are calculated automatically; thus

excluding human errors and saving up human resources.

2. The set of cadastral data is sufficient for calculation of cadastral value and it ensures the implementation of particular valuation model.
3. Cadastral valuation model comprises not only the necessary parameters, mutual obligations and real property market situation, but also data collection and updating.
4. The solution could be to change the base of calculation of state fee and to use cadastral value for excluding untypical prices in documents of transactions.
5. It is necessary to evaluate the possibility to accumulate engineering structures technical data in the Real Property State Cadastral Information System.
6. Cadastral or mass valuation is very important to ensure right real property taxation, and therefore the principles of equality have to be taken into account for the development of cadastral valuation models.

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