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Differences between initial and sale prices of Swedish forest properties

A statistical study and explanatory interviews

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Differences between initial and sale prices of Swedish forest properties - A statistical study and explanatory interviews

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Summary

The Swedish market for forest properties is on fire. The prices of forestland is increasing all over the country and in year 2015 record prices occurred in some parts of Sweden. A probable explanation is that forestland generates a relatively good yield from a stable investment. In addition, the interest rate is low which is facilitates for potential investors. It is predicted that 1,5 million hectares of forestland, with a value of approximately 77 billion SEK will change owner in the next five years.

The valuation of forest properties is a complex matter as they hold both monetary and non-monetary values. For example, the value depends on: standing volume, growth, geographic location, infrastructure, land consolidation, local capital density and recreational values. Previous studies have examined how both monetary and non-monetary values affect the prices of forest properties. However, there is a gap in the studies about factors affecting the price development from initial price to sale price. A possible explanation is the phenomenon underpricing which implies that brokers use an initial price below the estimated market value in order to attract many potential bidders. Hence, this phenomenon is investigated as one of the reasons for the potential differences between initial and sales prices.

The aim of this paper is to examine and explain potential differences between the initial and sale prices of pure forest properties in Sweden. Pure forest properties have neither arable land nor buildings. The aim is fulfilled by finding whether differences occur and how potential differences may be explained. A mixed methods design is used containing a quantitative part including data from the SLU Market Price database during the years 2011 to 2016. The data is reduced to 214 observations that is compiled and analyzed by a regression analysis. The study also contains a qualitative part where brokers are interviewed in order to aid the explanation of the quantitative results and to include another perspective to the study.

The findings display an average percentage difference between initial and sale prices in the Swedish market for pure forest properties of 8,1 percent. Neither the average percentage differences nor differences for the individual brokers indicates the use of underpricing. However, 21 percent of the properties sold in Sweden during the period have differences between initial and sale prices that may indicate underpricing. Further, 42 percent of the properties sold in Sweden have differences below 10 percent or no differences and 37 percent have differences between 10 and 25 percent. Capital density, county and the dummy variable “small property” are variables with a positive affect on the difference between initial price and sale price. Another variable affecting the difference positively is bidding neighbors. A variable that affects the difference between initial and sale price negatively is standing volume.

Sammanfattning

Den svenska marknaden för skogsfastigheter glöder. Priserna på skogsmark ökar i hela landet och i vissa delar av Sverige var priserna år 2015 rekordhöga. En trolig förklaring är att skogen ger en förhållandevis bra avkastning från en stabil investering samtidigt som räntan är låg. Det förutspås att 1,5 miljoner hektar skogsmark till ett värde av ungefär 77 miljoner kronor ska byta ägare inom de kommande fem åren.

Att värdera skogsfastigheter är komplext eftersom de har både monetära och icke-monetära värden. Dessa är exempelvis: virkesförråd, bonitet, geografisk position, infrastruktur, arrondering, kapitaltäthet på orten samt rekreationsvärden. Tidigare studier har behandlat både monetära och icke-monetära värdens påverkan på skogsfastigheters pris. Däremot finns det ett teoretiskt gap i studier kring faktorer som påverkar skogsfastigheters prisutveckling från utgångspris till försäljningspris. En tänkbar orsak är exempelvis fenomenet lockprissättning som innebär att mäklaren sätter ett pris lägre än det förväntade försäljningsvärdet för att locka många potentiella köpare. Således ska detta fenomen undersökas som en av orsakerna till eventuella skillnader mellan utgångspris och försäljningspris.

Syftet med denna studie är att undersöka och förklara potentiella skillnader mellan försäljningspris och utgångspris på rena skogsfastigheter i Sverige. Rena skogsfastigheter har varken åkermark eller byggnader. Syftet uppfylls genom att utreda huruvida skillnader finns och därefter förklara hur de potentiella skillnaderna kan uppstå. En mixad metod används innehållande en kvantitativ del byggd på data ifrån databasen SLU Marknadspris under åren 2011 till 2016. Denna data reduceras till 214 observationer som sammanställs och analyseras genom en regressionsanalys. Studien innehåller även en kvalitativ del där mäklare har intervjuats för att ge ett ytterligare djup och en klarhet i såväl teoretiska frågor som utfall från den kvantitativa metoden.

Resultatet från denna studie visar en procentuell genomsnittlig skillnad mellan utgångspris och försäljningspris på 8,1 procent. Varken denna skillnad eller skillnaden för enskilda mäklare indikerar att lockprissättning förekommer. Däremot har 21 procent av fastigheterna sålda i Sverige under tidsperioden skillnader mellan utgångspris och försäljningspris som kan indikera lockprissättning. Vidare har 42 procent av de sålda fastigheterna skillnader under 10 procent eller inga skillnader samt 37 procent har skillnader mellan 10 och 25 procent. Kapitaltäthet, län och dummy-variabeln ”liten fastighet” har en positiv påverkan på skillnaden mellan utgångspris och försäljningspris. En annan variabel som påverkar skillnaden positivt är bjudande grannar. En variabel som har en negativ påverkan på skillnaden mellan utgångspris och försäljningspris är virkesförråd.

Terms & abbreviations

Capital density = the product of average income and population density in a parish. The capital density is related to the distance between the forest property and the nearest population center.

Growth = the annual mean growth in the forest estimated by m^3f per year and hectare.

M^3f = forest cubic meter.

Productive area = the area suitable for forest production where the growth is more than one m^3f per year and hectare.

Small property = a property with a productive forest area of 21 hectares or less.

Standing volume = the volume of wood in a forest expressed in m^3f.

WTP = Willingness to pay.

Table of Contents

1 INTRODUCTION 1

1.1 BACKGROUND 1
1.2 PROBLEM 2
1.3 AIM 3
1.4 DELIMITATIONS 4
1.4 OUTLINE 5

2 LITERATURE REVIEW 6

2.1 REAL ESTATE ECONOMICS 6
2.2 VALUE THEORY 6
2.2.1 Valuation of forest properties 8
2.2 MARKET REGULATIONS 8
2.3 PRICE AFFECTING VARIABLES 9
2.4 SUMMARY OF THE LITERATURE REVIEW 11

3 THEORETICAL PERSPECTIVE 12

3.1 PRICING THEORY 12
3.1.1 The supply and demand equilibrium 13
3.2 AUCTION THEORY 13
3.2.1 Underpricing 15
3.3 SUMMARY OF THE THEORETICAL PERSPECTIVE 16

4 METHOD 17

4.1 RESEARCH DESIGN 17
4.1.1 Literature review 18
4.2 CHOICE OF TIME PERIOD 18
4.3 COLLECTION OF DATA 19
4.3.1 SLU Market Price database 19
4.3.2 Interviews with brokers 20
4.4 DATA ANALYSIS 21
4.4.1 Price data analysis 21
4.4.2 Regression analysis 22
4.4.3 Analysis of interviews 24
4.5 TRUSTWORTHINESS AND ETHICS 25

5 RESULTS 26

5.1 PRICE DATA 26
5.2 REGRESSION ANALYSIS 30
5.3 INTERVIEWS 33
5.3.1 Price affecting variables 33
5.3.2 Differences between initial and sale prices 34
5.3.3 Underpricing 34
5.3.4 Additional topics 35

6 ANALYSIS & DISCUSSION 36

6.1 PRICE DATA 36
6.2 REGRESSION ANALYSIS 37
6.3 INTERVIEWS 38
6.4 INTERVIEWS VERSUS PRICE DATA AND REGRESSION ANALYSIS 39
6.5 CRITICISM & FURTHER STUDIES 41

7 CONCLUSIONS 42

BIBLIOGRAPHY 43

APPENDIX 1: CODING OF COUNTIES 49

APPENDIX 2: COEFFICIENT VALUES FOR COUNTIES 49

APPENDIX 3: REGRESSION EQUATION FOR COUNTIES WITH SEPARATE COEFFICIENT 50

APPENDIX 4: QUESTION TEMPLATE 51

Table of figures

Figure 1. The different regions of forestland 2
Figure 2. Regional price statistics of forestland in SEK per hectare..... 2
Figure 3. The outline of the paper 5
Figure 4. The strategic pricing pyramid 12
Figure 5. The supply and demand equilibrium 13
Figure 6. The process of a quantitative method 17
Figure 7. CPI (inflation), stock exchange index and GDP growth 19
Figure 8. Percentage average difference in initial and sale prices in region 1-5 and Sweden . 26
Figure 9. Initial prices and percentage differences in region 1 27
Figure 10. Initial prices and percentage differences in region 2 27
Figure 11. Initial prices and percentage differences in region 3 28
Figure 12. Initial prices and percentage differences in region 4 28
Figure 13. Initial prices and percentage differences in region 5 29
Figure 14. The average difference between Sweden, region 1-4, region 2-4 and region 2-5 .. 30
Figure 15. Four-in-one residual plot for the quota of sale price through initial price..... 32
Figure 16. The percentage average differences and the “satisfactory range” 40

Table of tables

Table 1. The available variables from the SLU Market Price database and the reviewed authors’ use of these variables. 10
Table 2. Literature review summary. 11
Table 3. Theoretical summary. 16
Table 4. The five steps of data analysis. 21
Table 5. Number of sold properties and the average difference per broker 29
Table 6. Results from the backwards elimination regression model 31
Table 7. Findings from the interviews 33
Table 8. Distribution of sold properties in categories of percentage difference. 36

1 Introduction

This chapter provides the reader with a background and an insight to the problem addressed in this paper. Further, the aim and delimitations are presented as well as the structure of the paper.

1.1 Background

Sweden's total land area is 40,7 million hectares, of this area 23,2 million hectares is productive forestland with a standing volume of three billion m^3f (Skogstatistisk årsbok, 2014). The distribution of the productive forestland by ownership classes is approximately 50 percent individual owners, 25 percent private sector companies, 14 percent state owned companies and eleven percent others (*ibid*). There are 329 500 individual forest owners who together own 229 000 production units (Skogsbarometern, 2015).

During the 21st century Swedish forest properties generated an annual average yield of seven percent (www, SVD, 2012). The return on forestland is higher than other alternative investments in the same risk class (Lundgren, 2005). The market is also less volatile than the stock market (www, SVD, 2012). These two factors indicate that investments in forest properties may lead to a good yield from a stable market (*ibid*). The economic value of forest properties is increasing and in year 2015, the prices in some parts of Sweden were record high (www, Land skogsbruk, 2016). This due to higher wood prices, a low interest rate, an unstable stock market and a low number of properties in the market (*ibid*). Further, LRF Konsult's statistics show a growth in value of forest properties by 41 percent in the recent ten years (www, LRF Konsult 1, 2015). According to Skogsbarometern (2015), 50 percent of the Swedish forest owners believe that the price on forestland will continue to increase, and 62 percent perceive that investing in forestland is profitable. When asked what they would do if they had one million SEK for investments, 63 percent of the responding forest owners would invest to increase their forest area (*ibid*). In addition, a trend towards forest owners increasing their ownership could be identified in the year of 2015 (*ibid*). It is predicted that 1.5 million hectares of forestland, with a value of approximately 77 billion SEK will change owner in the next five years (*ibid*).

The open market for forest properties in Sweden consisted during the years 2011 to 2016 of approximately 1 800 sold properties, which implies an average of 360 per year (www, SLU Market Price, 2016). Half of the sold properties had buildings and approximately half of the properties without buildings had arable land (*ibid*). Hence the number of pure forest properties during the period was approximately 500 properties or 100 per year (*ibid*). Two brokerage firms' stands out in number of sold properties in Sweden and one of them is the superior market leader. These two are followed by approximately ten brokerage firms with a substantially lower and fairly similar number of sold properties. In addition, there are approximately 50 active brokerage firms with a varied number of sold properties and approximately 40-50 inactive brokerage firms.

Forestland in Sweden have different characteristics and conditions depending on where in the country it is located (Seth & Tjäder, 2003). The forest statistics company Top-Skog have together with Norra Skogsägarna divided Sweden into five different regions of forestland (figure 1) (www, Norra Skogsägarna, 2016). As described in figure 1 the regions are categorized from 1 to 5 where region 1 represents the northern and northwest parts of Sweden. This area is characterized by a low population and long distances between the urban areas. On the contrary, region 5 represents the most populated areas in Sweden close to the four largest cities and the entire county of Skåne. Region 2 and 3 represent most of the east

coast of Sweden including Gotland and parts of Småland, Värmland and Dalarna. Finally, region 4 is the southern parts of Sweden except for the area around the four largest cities.

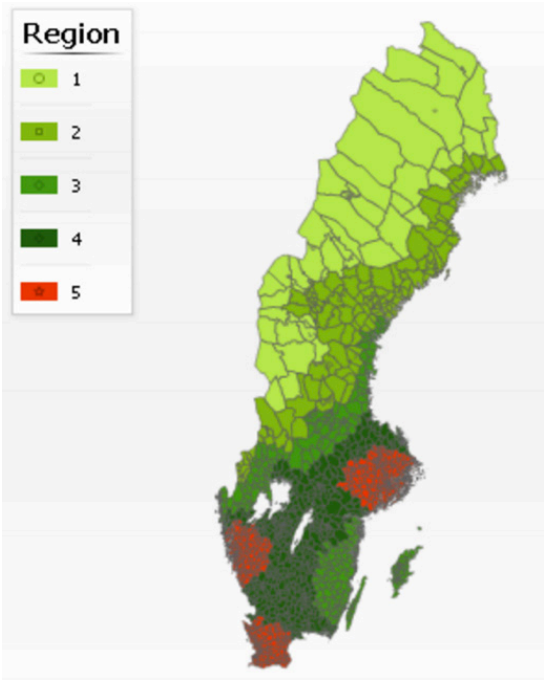


Figure 1. The different regions of forestland, Top-Skog & Norra Skogsägarna (www, Norra Skogsägarna, 2016).

The regions have differences in price as seen in figure 2. This is due to the characteristics and conditions of the different regions.

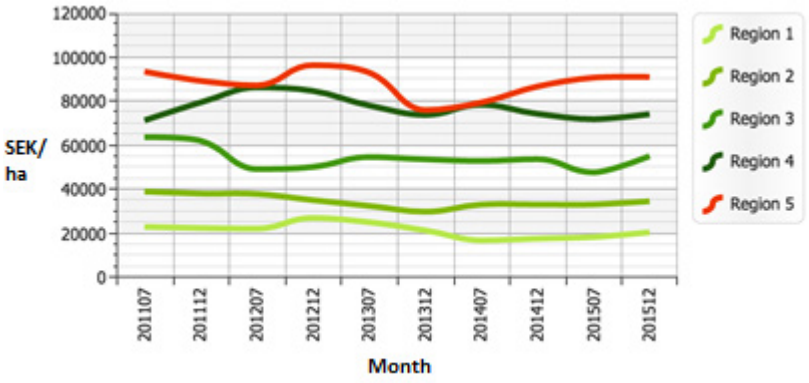


Figure 2. Regional price statistics of forestland in SEK per hectare. Top-Skog & Norra skogsägarna (www, Norra Skogsägarna, 2016).

Naturally, the prices around the urban areas are higher due to demand, WTP and wealth. The prices decrease from region 5 to region 1 and further explaining factors may be population density, availability and growth. The data is updated bi-annually and is based on all the forest properties sold on the open Swedish market (www, Norra Skogsägarna, 2016).

1.2 Problem

The valuation of forest properties is a complex process, which demand knowledge about both forestry and the market for equal properties (Seth & Tjäder, 2003). According to LRF

Konsult, prices on forest properties vary depending on location, forest quality, infrastructure, hunting etc. and therefore price statistics should not be used as the only valuation model for separate properties (www, MyNewsdesk, 2015). There are numerous factors that can make the sale price higher or lower than the initial price. Forestland prices do not only depend on variables related to the land but also depend on the buyer and seller characteristics (Aronsson & Carlén, 1999). Also capital density in the property area is a non-forest variable that affects the forestland price (Högberg, 2012).

Previous studies have examined how the price of forest properties in Sweden is affected by wood stock, growth, percentage of forest ready or close to harvest, seller characteristics, land consolidation, number of hectares, region, population density and non-monetary uses (Knutsson, 2015; Wretemark, 2014; Carlsson, 2012; Högberg, 2012; Arvidsson, 2009). There are also studies of how the valuation of forest properties differs between brokers (Karlsson & Toflvesgård, 2013). However, there is a gap in the studies about factors affecting the price development from the initial price to the final price.

In Sweden there is a debate about the use of underpricing, an initial price below market value, will attract a high number of potential buyers as a mean of attracting many potential buyers in order to drive up the price (Hungria-Gunnelin, 2013). The use of underpricing may also trick sellers to accept high brokerage fees as they often consist of a variable part when the price exceeds a certain level (Lind & Engström, 2015). Hungria-Gunnelin & Lind (2008) revealed the use of underpricing in condominium sales in Stockholm in the year 2007 as they found that the differences between initial and sale prices amounted to between 28,1 and 35,8 percent. Underpricing is believed to mislead customer, hence it is unlawful and banned by The Swedish Board of Supervision of Estate Agents (FMI) (www, Mäklarsamfundet, 2016). An investigation made by Mäklarsamfundet (the Swedish brokers community) shows that the gap between the sale and the initial prices is increasing and that this phenomena is not only occurring in the big cities but also in more rural areas (www, Mäklarsamfundet, 2015). Although the differences between initial and sale prices on housings have been widely discussed in Swedish media (www, SVD, 2012; www, DN, 2015; www, GP, 2015; www, DI, 2016) not much is said about the market for forest properties. Hence, in this study the differences between initial and sale prices is examined for forest properties sold in Sweden and the phenomenon of underpricing is included as a probable reason for these differences.

Given the availability of both initial and sale prices on forest properties sold in Sweden the differences between them can be examined. This information may indicate the proportion of the differences as well as the continuity of them. Top-Skog is an enterprise, with connection to the Swedish University of Agriculture Sciences and the economic association Norra Skogsägarna, who owns the SLU Market Price database containing these data. Therefore, this study will be carried out with support from Top-Skog. The contribution of the study is an increase of awareness of the factors that affect the price during the sale process.

1.3 Aim

The aim of this paper is to examine and explain potential differences between the initial and sale prices of pure forest properties in Sweden. To be able to fulfill the aim, the following questions will be answered:

1. Do differences occur between initial and sale prices of pure forest properties in Sweden?
2. If differences occur, how may these differences be explained?

1.4 Delimitations

This paper is delimited to the Swedish market for forest properties and no conclusions are drawn regarding foreign markets. The SLU Market Price database only registers properties with forest management plans, they are usually the main tool for the valuation of properties (LRF Konsult, 2, 2016). Thus, unrecorded forest properties may have been sold during the period. Further limitations are that the properties analyzed are "pure" forest properties sold between the years 2011 and 2016. The properties have an initial price, and are without buildings or farmland as this increases the similarity of the data units and avoids extremities. This means that the sample of properties analyzed is comparatively smaller than it would have been without the excluded characteristics. The limitation implies that potential extremities may affect the result if not handled by statistical methods. The limitation also implies that the number of properties sold by each individual broker during the period is low.

Data achieved from Top-Skog's database does not include any information regarding the buyer characteristics. Hence, the buyer characteristics are not taken into consideration in the quantitative analysis. Moreover, as the data in the database has been collected by Top-Skog, the analysis is a secondary data analysis. A potential disadvantage is that the author cannot control the validity of the data. However, the use of secondary data may be considered as effective since the use of others efforts makes it possible for the researcher to concentrate on interpretation and analysis (Robson, 2011).

Much of the studied literature used in this paper focus on urban residential real estates as the range of relevant literature on sales of forest properties is limited. These types of properties are different as an object since the forest properties are more complex. Also the market for these types of properties are different compared in the market for urban residential real estate which is characterized by many potential buyers and quick decisions. The market for forest properties is characterized by rather few potential buyers and slow decisions. However, in both cases the sales mechanism commonly builds on a type of auction where bids are placed until no higher bid is placed and the winner of the auction is allowed to buy the property at the agreed price. Hence, even though the literature is not adapted to forest properties it may be considered relevant for this study as it captures the sales mechanism of auctioning.

1.4 Outline

In order to obtain a clear view of structure in the paper, the outline is illustrated in figure 3 and explained in the text below.

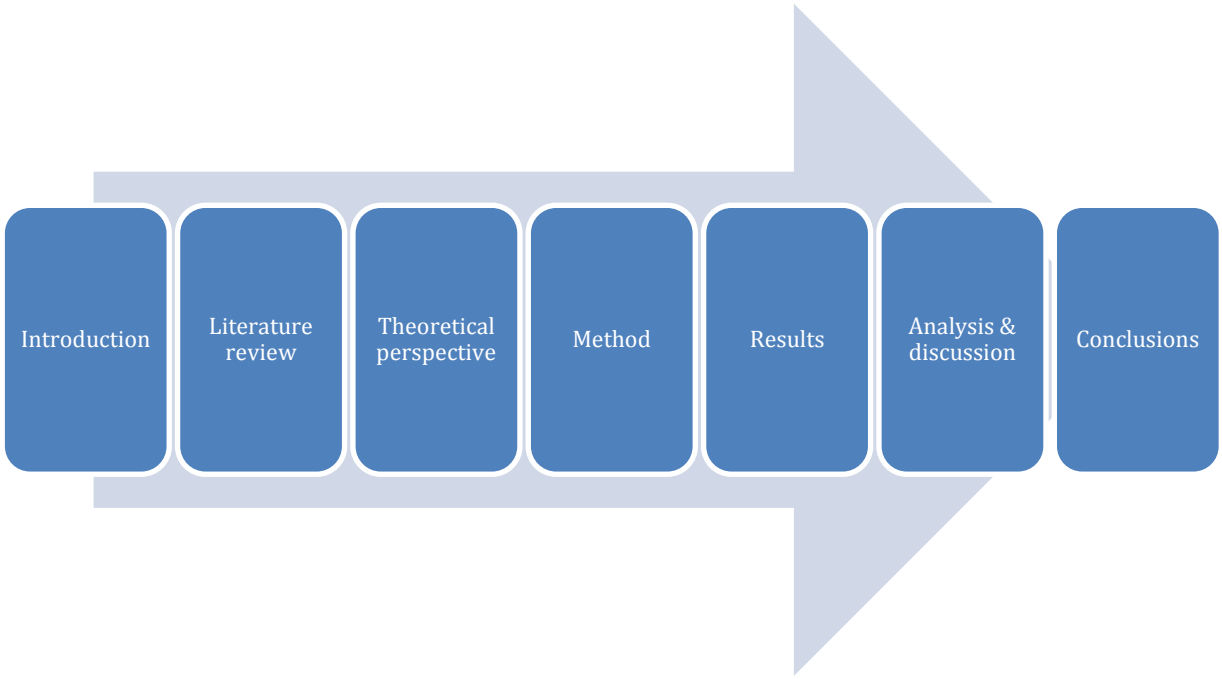


Figure 3. The outline of the paper (own processing).

The *Introduction* describes the background, problem, aim, research questions and delimitations. The following *Literature review* describes relevant literature, laws and previous studies regarding real estate economics, valuation, market regulations and price affecting variables. *Theoretical perspective* accounts for pricing theory and auction theory. The *Method* describes the research design, chosen time period, data collection, data analysis, trustworthiness and ethics. The *Results* display the findings from the quantitative data analysis, regression analysis and the interviews made. *Analysis and discussion* relate the results to the theories, answers the research questions and discusses criticism and further research. Finally, the *Conclusions* of the paper is presented.

2 Literature review

The following chapter presents the literature used to form both an understanding of the subject and a theoretical approach. *Real estate economics* explains aspects in the real estate market. *Value theory* and *valuation of forest properties* may be a necessary ground for explaining the reason for transcending prices. *Market regulations* are important as they affect the market. P*rice affecting variables* are explained in the end of the chapter as well as summary of the literature review (table 2).

2.1 Real estate economics

A natural presumption is that the seller of a property wants to sell at the highest possible price in the shortest possible period of time (Knight, 2002). Although, there is a certain contradiction between these wishes that makes the pricing strategy complicated. A higher initial price may lead to a higher sale price but a longer time-on-market (with higher holding costs as a side effect) while a lower initial price may result in the opposite (*ibid*). Knight (2002) identifies three uncertainties that the seller of a property faces. First, the property attributes are unique which makes the value uncertain. Secondly, it is difficult to predict the potential market for the property. Third, how the choice of initial price affects the potential buyer's perceptions and behavior.

Wilhelmsson *et al.,* (2006) investigated the offer price effect on transaction price and time-on-market of family houses. The authors examined whether brokers may use the initial price in order to influence the sale price. The model used was a hedonic price model with a sample of 704 single family houses in Stockholm County. Their findings indicate that initial prices lower than the expected price leads to a price higher than the initial price but lower than the expected price. Vice versa, an initial price higher than the expected price will lead to a price lower than the initial price but higher than the expected price. Furthermore, they also found that a high initial price led to a longer time-on-market. Despite this, they concluded that the best economic strategy for selling a family house seemed to be a high initial price compared to expected price (*ibid*).

Larsen & Park (1989) found a correlation between time-on-market and sale price, implying that the more days on market the lower the price of the property. They also found that sellers who priced their properties appealingly low to be able to sell quickly could achieve this goal and still recover some of the price reduction through negotiating a low commission. Jud *et al* (1996) found through a research on 2 285 housing transactions that no broker could generally sell properties faster than other brokers. Although, they found that a higher initial price in general led to a longer time-on-market, which was also found by Asabere & Huffman (1993). Hence, a lower initial price led to a shorter time-on-market. Lusht (1996) assumes that in an auction process bidders do not act independently but are in fact affected by the other bids. In other words, bidders change their valuation as a reaction due to other bidders' valuations.

2.2 Value theory

Bowman & Ambrosini (2000) argue that value has two components; perceived use value and exchange value. The perceived use value is subjective and defined by customers as the customer perception and use of the good determines its value. This can be measured in total monetary value, which is the customer WTP for the good (*ibid*). Exchange value arises when the good is sold and represents the price paid by the buyer. Thus, exchange value equals the buyer's perceived use value (*ibid*). Two additional concepts that are common in real estate markets are market value and market price. Market value is according to Lind (1998) the

value likely to be the price when the property is sold on an open and free market, where coercion or labor relations do not exist and where advertising is sufficient. Market price is similar to market value but differs by being the actual result of an observation of the market. Thus, market price is the price of a similar property (Lind, 1998).

There are many ways to appraise the perceived value or the market value of properties. One way is asset valuation theory that is based on wealth maximization for the investor (Claurietie & Sirmans, 1996). The value of the asset depends on the expected cash flow amount, timing and risk. The discounted cash flow model (equation 1) could be applied to all assets with the possibility to provide cash flows to the owner (Claurietie & Sirmans, 1996, pp 26).

$$\text{Present value} = \sum_{i=1}^{n} \frac{CF_i}{(1+r)^i} \qquad \text{(Equation 1)}$$

CF_i = cash flow for period
r = appropriate discount rate
n = number of cash flows

The present value is the asset value today depending on the future cash flows and discount rate as money is considered to be worth more today than in the future. The time variable implies that the sooner the cash flow is received, the higher the present value. The risk factor relates to the probability of receiving the cash flow. The basic principle is that a high risk demands a high discount rate and vice versa (Claurietie & Sirmans, 1996). This is a strict income based view without concern to other values such as recreational and sentimental values.

Another means of estimating the value of an investment is presented by Berk & Demarzo (2007, pp 289), the authors argue that the return from an asset is traditionally estimated with an equation based on yield and asset price (equation 2).

$$R_{t+1} = \frac{Div_{t+1}+P_{t+1}}{P_t} - 1 \qquad \text{(Equation 2)}$$

R_{t+1} = Return one year
Div_{t+1} = Dividend one year
P_{t+1} = Asset price at the time t

The equation shows a return in percentage that depends on the price of the asset today, the price of the asset in t years and the dividend during t years. Revenue from forest properties occurs in the form of income from timber sales together with changes in value of the property (Mills & Hoover, 1982).

According to Lantmäteriet & Mäklarsamfundet (2010) value theory is the theory of why values arise, which depends on terms like supply and demand. The value of a property depends on the specific property's condition. Although, there are some basic conditions that are crucial for the value of all properties (*ibid*). The property has to satisfy a *need*. When the need is satisfied, *value* arises. The property has to be *exclusive* and only disposable for the owner. When desired, the property should be able to *dispose* for another owner. Finally the property need some kind of *unique capacities*, the property type and the location is often unique (*ibid*).

The value experienced by the buyer is strongly dependent on the required real interest rate that the buyer has, for example the interest rate after-tax in solid monetary value (Hägg, 1983). Since all buyers invest given different economic conditions it is impossible to develop a valuation model that shows an accurate value for all buyers (*ibid*).

2.2.1 Valuation of forest properties

Several concepts are used to decide the value of a forest property (Seth & Tjäder, 2003). The *taxation value* of an agricultural unit is 75 percent of the market value and is divided into forestland, impediments, arable land, pasture, buildings and residential housings. *Return value* is calculated by the present value of all future revenue surpluses. The return value depends on the forest management plan for the property. *Market value* is the most probable price of a property sold in an open market. Market value is often determined by knowledge of similar properties sold in a certain geographic area. Although, a better assessment of the value of forest properties is achieved by relating the value to area and standing volume. *Revenue and value increase* depend on the property's growth, stock classification and age distribution. Knowledge of the growth, standing volume, age of the threes and tree width enables a calculation of the probable increase of volume. The rationale is that value increases as the volume of potential timber-stocks is growing, for example the wider the stock the more timber can be harvested and a higher revenue is generated (*ibid)*. The most crucial value-affecting factor is the amount of timber ready to harvest. Another factor is the price paid for timber in the geographical area. The differences can be substantial which is reflected in the differences of value of forestland in the northern of Sweden compared to the south. Further, the land consolidation affect the costs related to cultivation and harvest, it also contributes to better conditions for hunting (*ibid)*. Hence, a good land consolidation is believed to increase the value of a property. In some cases neighbors can also cause increase in value. The reason is that neighbors through buying the property can improve their own land consolidation that enhances their WTP. The value of the hunting is perceived by buyers to be included in the forest value (Persson, 2014; Alkrot 2012; Lundmark, 2012).

According to the brokerage firm Areal (2009) the market value of an agricultural property can be divided into two parts: return value and sentimental value (equation 3). The return value is the sum of all future returns minus future costs discounted with a rate of interest to today's value. Hence, the return value equals present value.

$$Market\ value = Return\ value + Sentimental\ value \qquad \text{(Equation 3)}$$

Sentimental values are non-monetary values or added values that comes with the acquisition of the property such as location, distance to water, hunting possibilities etc. Sentimental values differ for every individual and are therefore hard to estimate. No mathematical formulas exist for these values and they need to be estimated on a subjective basis, therefore, the experience of the valuator is of importance (Areal, 2009).

2.2 Market regulations

The land acquisition act (SFS 1979:230) is a Swedish law that exists for three purposes: to promote employment and settlement in the rural areas, to contain the balance between the owner categories legal entities and natural persons and to facilitate structural changes in re-parceling areas (Högberg, 2012). This law can affect the market of forest properties as it enables the county administrative boards to reject the application for land acquisition in cases where any of the purposes mentioned above can be threatened. However, a study by Nilsson (2011) on land acquisition applications in Norrbotten, Västerbotten, Jämtland and

Västernorrlands county shows that only 1,25 percent of the 3 198 applications were rejected during the period of year 2003 to 2008.

The broker shall consider both buyers' and sellers' concern. Within the frame of requirements due to "good brokers practice" the broker should particularly consider the patron´s economic concerns (Estate Agent Act, SFS 2011:666). Considering the collision of the buyer and seller interests this law can seem impossible to abide (Jingryd & Segergren, 2012). As the seller usually hires the broker he/she has a duty based on the agreement and law to be loyal to the seller and the seller's interests. Further, the broker shares the economic interests with the seller as he/she only are paid if a sale is carried out and that he/she usually get a provision depending on the sale price (*ibid*). Hence, it is natural that marketing of the object is presented in a favorable way and that the broker uses whatever allowable sales tactics that are beneficial. On the other hand, the broker is never allowed to withhold information from the buyer in order to secure the sale or to maximize the sale price (*ibid*). The new law from year 2011 does not regulate any form of limit in the difference between initial and sale price (Estate Agents Act, SFS 2011:666). Hence, theoretically brokers can use whatever initial price they think is appropriate. But if a broker systematically indicates initial prices that differ essentially from the sale prices the broker is breaching the "good brokers practice" as well as disregarding the duties of care towards the customer (www, FMI, 2011).

2.3 Price affecting variables

Roos (1997) investigated the relationship between characteristics of forest properties and sale prices in Sweden through a hedonic price model. The author's results indicate that forest property price depend on the three factors: proportion of productive forest land in relation to the total forest area, the mean standing volume and the mean growth. Further, population density in the county where the property is located displayed a positive relationship with the price. Even though forestry-related factors are of primary importance for the sale price, the effect of non-timber values cannot be rejected (*ibid*). Aronsson & Carlén (1999) tested whether the forestland prices are affected by buyer and seller choices and preferences. They used micro data to estimate forestland price. In their study the equilibrium price was described as the result of a buyer to seller trading game (*ibid*). Their findings implies that there are more determinants for forest land price than the land related variables such as growth, production area and standing volume. The buyer and seller characteristics income and wealth were also significant determinants (*ibid*).

Knutsson (2015) divided the sellers of forest properties into legal entities and natural persons and investigated how these owner categories affected the price on forest properties. He also included the geographic location as well as standing volume, growth, size, prime rate, population density and timber income. The method used was a regression analysis with two hedonic price models. His findings showed a positive correlation between price and owner category, standing volume, growth, population density and timber income. If the seller was a legal entity the price on the property rose. However, the interest rate revealed no significant correlation with the price (*ibid*). Carlsson (2012) investigated how the price of forest properties is affected by the factors: standing volume, growth, age distribution, area and number of sections on the property. The findings indicate that growth and age distribution had a non-significant impact on the property price. Although, standing volume was the factor with the most influence. Carlsson (2012) concluded that this result implied that different properties within the same region could be bought at the same price per m^3f but display substantial differences in potential economic growth. Högberg (2012) studied how land value is affected by different factors such as growth, size, capital density, population, land consolidation,

distance to nearby town and fragmentation. Capital density is an index value from 0 to 100 depending on the property location area's average income, population and distance to closest population center. The aim was to increase the understanding of the pricing of forest properties and to be able to develop a basis for forest land valuation (*ibid*). The method was a regression analysis. The findings indicate that capital density affected the price positively whereas fragmentation and size had a negative effect. Neither land consolidation nor growth showed correlation with the price (*ibid*).

Table 1 shows the variables that the SLU Market Price database holds information about. The reviewed author's use of the available variables is summarized and marked by an X in table 1 below.

Table 1. The available variables from the SLU Market Price database and the reviewed authors' use of these variables (own processing).

Variables/Authors	Roos (1996)	Aronsson & Carlén (1999)	Carlsson (2012)	Högberg (2012)	Wretemark (2014)	Knutsson (2015)
Number of parcels			x			
Net after harvest						
Width				x		
Buildings						
Parish						
Standing volume	x	x	x		x	x
Sale price						
Waste land						
Bare land						
Municipality						
Capital density		x		x		
County						
Length				x		
Land value				x		
Average growth	x	x	x	x	x	x
Brokerage						
Productive area	x	x	x	x	x	x
Region				x		
Arable land + buildings						
Forwarder distance to road				x		
Initial price						
Arable land						

Initial price can be referred to with a variety of synonyms such as price indication, introduction price, price idea, demanded price, sale price etc. Although initial price is the term used in this paper.

2.4 Summary of the literature review

The following table is a summary of the literature review. The table simplifies the use of the literature review in the analysis and discussion.

Table 2. Literature review summary (own processing).

Real Estate Economics	The natural presumption in real estate economics is that the seller strives for the highest possible price in the shortest possible time on market. A good economic choice when selling family houses is to set a high initial price compared to the expected price. At auction bidders can change their valuation of the object as a reaction of the other bidders' valuations.	Wilhelmsson *et al* (2006), Knight (2002), Lusht (1996), Jud *et al* (1996), Asabere & Huffman (1993), Larsen & Park (1989)
Value Theory	Value is a term that can be interpreted in many ways, for example value can arise when a need is satisfied or when a price paid for the exchange of the good. Further, a value can depend on expected cash flow, risk and timing. The revenue can be estimated by the yield and the asset price.	Lantmäteriet & Mäklarsamfundet (2010), Berk & Demarzo (2007), Bowman & Ambrosini (2000), Lind (1998), Claurietie & Sirmans (1996), Hägg (1983)
Valuation of forest properties	The value of forest properties are mostly determined by the standing timber volume and the area and the value can increase by favorable conditions regarding growth, stock classification and age proportion.	Seth & Tjäder (2003), Areal (2009)
Market regulations	The low number of rejections of applications for land acquisition imply that the land acquisition act is not considered to have an effect on the market. Brokers can use whatever initial price they think is appropriate. But brokers cannot systematically indicating initial prices with essential differences from the sale prices without disregarding their duties of care towards the customer.	Högberg (2012), Nilsson (2011), SFS 1979:230 Jingryd & Segergren (2012), SFS 2011:666
Price Affecting Variables	Research has been conducted on which variables affect the sale price of forest properties. The results from these studies confirm that the classic variables standing volume, productive area and growth are relevant but also notice that other factors such as capital density, forest age proportions, owner category and geographic location are important.	Knutsson (2015), Wretemark (2014), Carlsson (2012), Högberg (2012), Aronsson & Carlén (1999), Roos (1996)

The literature review is a foundation for understanding the matter addressed in this paper. It also serves as a means of finding relevant theory. Finally, it enables a discussion based on a comparison of the previous studies and the findings from this paper.

3 Theoretical perspective

The following chapter explain the theories chosen for this paper. *Pricing theory* addresses the matter of pricing and the intersection of buyer's and seller's will. *Auction theory* describes the principal for sales on auctions, which is a commonly used means of selling forest properties. Further, the phenomenon *underpricing* is described. Finally, a summary of the chapter is presented in table 3.

3.1 Pricing theory

Strategic pricing is essential to business success when the level of competition is high, the information available to the customer is plenty, and the products and services change in an accelerating pace (Nagle *et al*, 2011). If a pricing strategy is to be considered successful the customers must be willing to pay the price charged (Nagle *et al*, 2011). In value-based pricing the rationale is that customer WTP for a product should be close to the relative value of the product (*ibid*). Three assumptions can be made if the customer becomes unwilling to pay the charged price; the product does not offer the expected value, the customer do not understand the value, or the price is too high in relation to the value (Nagle *et al*, 2011).

In economic theory, prices are determined at a point on the demand curve where marginal revenue equals the marginal cost (Nagle *et al*, 2011). This equilibrium is explained in section 3.1. However, in reality this is seldom the case as there is an abundance of factors that affects the price (Nagle *et al*, 2011). A requirement for profitable pricing is to examine the demand curve in order to understand the monetary and psychological value that act as determinants to purchasing decisions (Nagle *et al*, 2011). The objective with strategic pricing is to achieve profitability (Nagle *et al*, 2011). Profitability can be achieved by using different pricing strategies. However, most of the successful strategies include three principles of pricing; value-based, proactive and profit driven (Nagle *et al*, 2011). *Value-based* imply that the price shall reflect the product value to customers. Hence, value-based changes in price reflect a change in customer value achieved from the product (Nagle *et al*, 2011). *Proactive* imply that companies develop strategies to deal with disruptive events such as customer negotiations, competition or changes in the market (Nagle *et al*, 2011). *Profit-driven* imply that companies evaluate the price management by looking at earnings in relation to alternative investments (Nagle *et al*, 2011).

The strategic pricing pyramid (figure 4) shows five different levels building on one another, involving each of these levels is a basis for achieving a good pricing policy (Nagle *et al*, 2011).

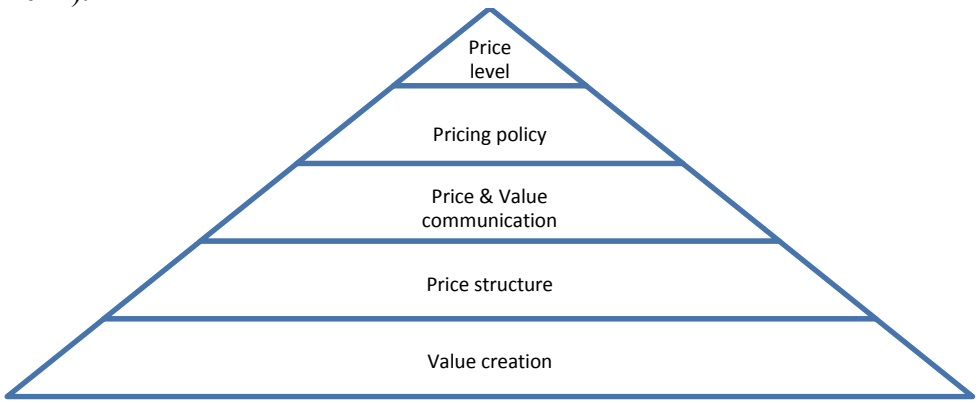


Figure 4. The strategic pricing pyramid (own processing based on Nagle *et al*, 2011).

The value creation level includes parameters such as the economic value of the product, the design of the offering and customer segmentation (Nagle *et al*, 2011). The price structure divides the price into different sub-prices that together form the full price. This is a way to control the customer behavior. The price and value communication describes how price and value is to be communicated to customers, including sales techniques (Nagle *et al*, 2011). The pricing policy concerns the habits that determine pricing in situations when value or cost is not the only deciding factor, this includes negotiation tactics and discounting. The price level is the price decided based on all the previous levels (Nagle *et al*, 2011).

3.1.1 The supply and demand equilibrium

According to classical economic theory of supply and demand the traditional way to select a price is to use the point when the buyers demand and the sellers supply intersect (Wagner, 2013). This is shown in figure 5 and implies that the price depends on the number of potential buyers and the number of objects for sale. At the supplied quantity Q* the buyers are willing to pay the price P* (Wagner, 2012).

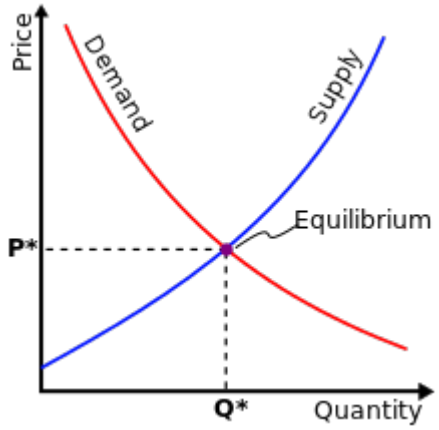


Figure 5. The supply and demand equilibrium (www, WikipediaCommons, 2006).

The natural rationale of a bargaining situation implies that both buyer and seller strive to maximize their own benefit (Wagner, 2012). The seller wants to maximize profits (equation 4) and the buyer wants to maximize net benefits (equation 5).

$$Max\ Profit = [P * Q] - TC \quad \text{(Equation 4)}$$

$$Max\ Net\ Benefit = B - C = B - [P * Q] \quad \text{(Equation 5)}$$

In equation 4 and 5 P and Q denotes price and quantity, C is opportunity cost, TC is total cost and B is the benefit achieved from purchasing the object. In the equations the seller revenue equal the buyer cost. A comparison between the equations and figure 5 shows that P* is the market price agreed by both buyers and sellers for the quantity Q*. Therefore, in a bargain of a forest property the equilibrium may be considered as the intersection where the buyer is satisfied with the benefit from the quantity of m^3f or hectares at the agreed price. Also, the seller is satisfied with the profit generated from sold quantity of m^3f or hectares at the agreed price after the costs of the sale process.

3.2 Auction theory

Auctions have been used as a sales mechanism since 500 BC where they worked as a mean for allocating different objects in Babylon (Chatterjee, 2013; Krishna, 2010). The reason for the use of auctions is that the seller is uncertain of the buyer's maximum WTP for the object

and therefore is unable to sell to the buyer with the highest valuation of the object (Krishna, 2010). Auctions can be defined either as a game of incomplete information or as a market clearing mechanism that equates demand and supply (Menenez & Monteiro, 2005). Auctions are often used when selling rare or unique objects as the market for these usually are thin (Menenez & Monteiro, 2005). Wherever there is a demand, auctions is the best way of selling when it comes to maximizing the seller profit (Hungria-Gunnelin, 2013). In Sweden, auctions have been the usual way for various types of sales including property sales since history (Hungria-Gunnelin, 2015). A requirement for all trading activity is communication between buyers and sellers (Cassing & Douglas, 1980). However, the institutional environment in which "the market" operates has a major importance on how the communication is done (*ibid*). Thus, depending on the type of commodity that is traded the variety of bidding types and sale acceptances are high (*ibid*). Using a competitive auction, a seller with a weak bargaining position may acquire an equal result as a seller with a strong bargaining position (Milgrom, 1987). Further, Bulow & Klemperer (2009) show that a seller gets higher revenue when using a simple competitive auction that he/she does if using a private negotiation. The success of an auction is primarily threatened by the possibility of collusion between the bidders (Chatterjee, 2013).

Klemperer (2004) argues for four basic auction types: The *ascending-bid auction* is the oldest and most common auction (*ibid*), also known as the English auction (Krishna, 2010). The function of the ascending-bid auction is that the bids increase until only one bidder remains with the highest bid. There is a time frame in which other bidders can bid, but when that is over the highest bid wins the auction (Klemperer, 2004). This is a transparent form of auction where the bidders know the identity of the others and when they act. This form of auction is generally applied in the sales of houses, arts and antiques (*ibid*). *The descending-bid auction* or Dutch auction (Krishna, 2010), is the opposite since there is a highly set initial price which is successively lowered until a bidder accepts the announced price and wins the auction (Klemperer, 2004). In example fish-, flower- and tobacco markets are known for applying this form of auction (*ibid*). The third model is the *first-price sealed-bid auction* where the bids are submitted without knowledge of the other participants' bids. The highest submitted bid wins the auction. Usually, this form of auction is used when selling rights and real estates (*ibid*). Finally, *the second-price sealed-bid* auctions are similar with the distinction that the winner (the highest bid) will pay the price equal to the second highest bid. This form is used when buying stamps, foreign exchange and share repurchases (*ibid*).

Further, auctions are generally divided into two categories depending on whether information of the auctioned object is symmetric or asymmetric (Hungria-Gunnelin, 2015). If the value of the auctioned object is different depending on the bidder's preferences then the auction is an *independent private-value model.* Implicitly, one bidder's valuation does not influence the valuations made by the other bidders (*ibid*). However, if the value of the auctioned object is the same for all the bidders then the auction is a *pure common-value model*. Although the bidders have different private information about the object's actual value and need to use this information in the value estimation (*ibid*). It is common that these two models are combined in a design described as the *almost common-value model* (*ibid)*. An example of this is that the value of an object depends mostly on the bidder's information and preferences. But the value is also affected by the competition's information and preferences since they have to be outbid in order to win the auction. The almost common-value model is usual in the residential real estate market (*ibid*).

3.2.1 Underpricing

According to Hungria-Gunnelin (2015) there is a belief among brokers that the so called "underpricing strategy", consisting in announcing the properties for a list price below market value, will attract a high number of potential buyers. However, since it is impossible to observe the exact value of a property it is hard to prove the use of underpricing strategies (Hungria-Gunnelin, 2013). Hungria-Gunnelin & Lind (2008) argue that the use of underpricing is possible if the difference between initial and sale price is of considerable magnitude. This implies that brokers override their duties of care as well as the "good brokers practice" (*ibid*). The authors decided that the limit for considerable importance is when the difference is 25 percent or more. In a study Hungria-Gunnelin & Lind (2008) found that the differences between initial and sale prices from a sample of 3627 condominiums in Stockholm was between 28,1 percent and 35,8 percent. In a following survey brokers defend the underpricing strategy by arguing that brokers commonly use it and that it attracts a large number of potential buyers. Thus, there is a belief among Swedish brokers that many bidders generate a higher sale price. Hungria-Gunnelin (2013) found statistically a significant relationship between sale price and number of bidders on condominiums in Stockholm. Hence, this supports the belief amongst Swedish broker's that many attracted bidders will result in a higher sale price.

Stevenson *et al* (2010) account for the increased attention given to the sales mechanisms impact on sale prices on residential properties. The authors examine if the choice of sales mechanism have an impact on the sale price. The empirical findings support the hypothesis that underpricing is used to aid the marketing of a property by attracting additional potential bidders.

3.3 Summary of the theoretical perspective

The following table is a summary of the theory. Theories is used both as a base for the method and as explanations for the results. The table simplifies the use of theories in the analysis of the results.

Table 3. Theoretical summary (own processing).

Theory	Description	References
Pricing Theory	Strategic pricing is essential to business success as the competition is high, the information available to the customer is plenty, and the product and services change in an accelerating pace. Understanding of the monetary and psychological value is required for profitable pricing. A thoroughly considered price level can be found by the use of the price level pyramid that is designed to give a broad understanding of the product, market, sales techniques and policies.	Nagle *et al* (2011)
Supply and demand equilibrium	Classic economic theory claims that the intersection of the supply and demand curve determines the price. However this is seldom the case as there are numerous other factors that affect the price.	Wagner (2012)
Auction Theory	Auctions are an ancient but yet modern sales mechanism that build on the uncertainty of buyer and seller information. There are four basic auction types divided into two categories depending on whether the information of the auctioned object is symmetric or asymmetric. The almost common-value model is a mix of the two categories and is a widely used model in which the value of an object depends both on bidders and the competitive bidders' information.	Hungria-Gunnelin (2015, 2013), Chatterjee (2013), Klemperer (2011), Krishna (2010), Menenez & Monteiro (2005)
Underpricing	Some brokers believe that the "underpricing" strategy attracts a high number of potential buyers and that this leads to higher sale prices. If the difference between initial and sale price consequently exceed 25 percent, the use of underpricing may be suspected.	Hungria-Gunnelin (2015, 2013), Stevenson *et al* (2010), Hungria-Gunnelin & Lind (2008)

The theoretical perspective is used in the analysis and discussion as a means of answering the second research question. Pricing theory may be used in this paper as an explanation of why similar properties are differing in initial price. These differences may in turn be an explanation of the differences between initial and sale prices. The supply and demand equilibrium explains the theoretical view of how buyer and seller make an agreement of price. Auction theory is a more specific description of the mechanism used by buyer and seller to come to an agreement. Differences in the auction mechanism may affect sales prices. Finally, underpricing is a phenomenon which is a direct explanation for differences between initial and sale prices.

4 Method

The following chapter accounts for the methodology of this paper. The chapter begins with a review of the research design. Thereafter, a motivation for the chosen time period is presented. This is followed by an explanation of how data was collected and analyzed. Finally, the trustworthiness and ethics of the paper are discussed.

4.1 Research design

The two most common research methods are qualitative and quantitative methods (Robson, 2011). The determinants of which method to choose are the research questions, the role of the researcher and the purpose of the study (*ibid*). A qualitative method normally presents findings and accounts in a verbal form (*ibid*). The studied situations are described from the perspective of the involved people. Context and understanding of a phenomenon are more important than identifying it. With qualitative methods, objectivity is not valued and generalizability of the findings is not the aim (*ibid*). A quantitative method is characterized by collection of data turned into numbers by accurate statistical measurements (Robson, 2011, Jacobsen 2002). A deductive logic is common and measured data are tested towards existing theories (Robson, 2011). The aim is that the result will be reliable, valid, objective and replicable (*ibid*). A common process of a quantitative method is displayed in figure 6.

Figure 6. The process of a quantitative method (own processing based on Jacobsen, 2002, pp 143).

The differences between initial and sale price may depend on non-monetary values. The non-monetary values are hard, or even impossible, to measure which means that the quantitative part of this study cannot address that matter. Therefore, the study also includes a qualitative part. Hence, the research method used in this paper is a mixed method also referred to as a **multi-strategy research** (Robson, 2011). The research has a sequential explanatory design that enables the author to use primarily a quantitative method, which is given highest priority, and then continue with a qualitative method to aid the explanation of the quantitative data (*ibid*). When using a multi-strategy research design it is crucial to justify the ground for why both quantitative and qualitative methods is used and in what way this is more beneficial than using only one method (*ibid*). In studies where one of the methods is used as an ornament to the main study the benefits from the ornamental method are superfluous (*ibid*). In this study, the qualitative study helps to clarify the results from the quantitative study as well as giving another perspective on the matter. Therefore it contributes towards a greater understanding.

Robson (2011) accounts for a thesis about incompatibility between qualitative and quantitative research methods as they are too unlike and therefore not compatible. However, he rejects this thesis and explains the potential benefits and claims that this is a method which is likely to be of increased importance. Multi-strategies come with a lot of potential benefits (*ibid*). For example triangulation that may increase the validity of the study due to the combination of quantitative and qualitative data. The same reason also gives the researcher a more comprehensive image (*ibid*). A common argument against multi-strategy design is that it demands that the researcher is competent in both quantitative and qualitative research methods. Especially if alone, the researcher must ask whether he/she has the necessary skills or assistance to collect, analyze and interpret the different data sets (*ibid*). In this study the

researcher has experience of both quantitative and qualitative studies as well as support from expert supervisors.

4.1.1 Literature review

A literature review is made in the beginning of the process to immerse in what has already been done in the subject (Robson, 2011). The search tools used is databases such as Primo, Google Scholar, Uppsatser.se and the Uppsala University Library search service. Key terms like pricing, real estate, auction, bidding, forest property, value theory etc. is used. The articles referred to in this paper are predominantly "peer reviewed" articles which imply that they have gone through a process of source and reference criticism to ensure the quality and validity of the article and the journal publishing it (www, Elsevier, 2016). Also, previous master theses in the subject are referred to in the literature review.

Notable is that *value theory* is not placed in chapter 3 (Theoretical perspective) but in chapter 2 (Literature review). Value theory is important for the knowledge of how the value of forest properties can be estimated. However, this paper does not concern the valuation of forest properties but how differences between estimated value and market price occur. Therefore, value theory is important for the understanding of the matter but is not included in the analysis, and thus, placed in the literature review.

4.2 Choice of time period

The choice of time period in the research may affect the outcome as an effect of historical events. Therefore, a motivation of the chosen time period is given. Due to availability of data and the recent 20 years trend towards increasing property prices (www, MyNewsdesk, 2015) a time limit is set to include price data from the last five years. Hence, the period chosen for the analysis is year 2011 to 2016. Another argument for this time period is that the new estate agent act (SFS 2011:666) started to apply year 2011. An analysis of macro factors is conducted in order to justify this period. One suitable method for this type of analysis is the PEST-analysis that covers political, economic, social and technological factors (Grant, 2005). The two factors that affect the market of properties to the greatest extent are economic and social factors. Hence, this analysis focuses on them.

Figure 7 illustrates the trend for consumer price index (**CPI**), stock exchange index and gross domestic product (**GDP**) that is discussed below. GDP is one of the most important socio-economic measures that describe a country's economy and the changes over time. Sweden's GDP has increased steadily since 1950 with a few short decreases of which the biggest was during the Lehman Brothers-crash in 2008 to 2009 (www, SCB 1, 2016). In the year of 2010 the decrease due to the Lehman Brothers-crash was temporarily recovered just to start decreasing again until year 2012. But since year 2012 the GDP has continued to grow steadily. The line without circles in figure 7 shows GDP growth during the period. The inflation in Sweden is usually measured with the CPI (www, Riksbanken, 2011). CPI is calculated by a comparison of the price over time of the same or equivalent products (the line with filled circles in chart 1). The annual average CPI in Sweden has been stable since year 2011 with a growth from 311.43 to 315.70 in the beginning of year 2016 (www, SCB 2, 2016). The stock exchange index in Sweden was 193 in the beginning of 2009 (www, SCB 3, 2016). Since that the growth has been relatively stable, with the exception of year 2011, and the average annual increase is 9 percent (the line with empty circles in chart 1).

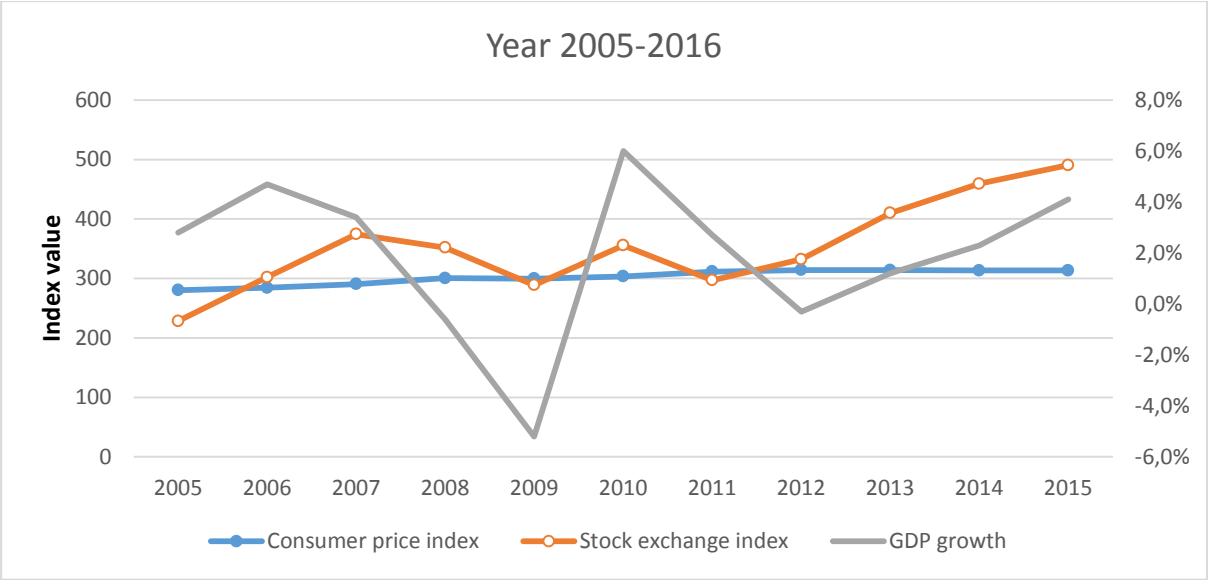


Figure 7. CPI (inflation) (left scale), stock exchange index (left scale) and GDP growth (right scale), (own processing based on www, SCB, 1, 2, 3, 2016).

The unemployment rate in Sweden in the last eleven years has been on average 7.56 percent (www, SCB, 4, 2016). The period's lowest rate was 6.1 percent in year 2007 and the highest 8.6 percent in year 2010. Since year 2010 the unemployment rate has decreased to 7.4 percent in year 2015 (www, SCB 4, 2016). The average disposable income was 387 500 SEK in year 2011 with an increase of 8 900 SEK in year 2012, 10 500 SEK in year 2013 and 20 000 SEK up to 426 700 SEK in year 2014 (www, SCB 5, 2016). Hence, the mean annual growth during the period was approximately 13 000 SEK annually and no drastic differences occurred during the period.

The interpretation of the macro analysis is that during the chosen period of years 2011 to 2016 no economic or social factors are believed to have affected the market for pure forest properties to a notable extent.

4.3 Collection of data

4.3.1 SLU Market Price database

The data selection process is based on some criteria that the examined objects should fulfill. The first criteria is that the properties are sold within the chosen time period of year 2011 to 2016. Also the investigated properties are "pure" forest properties, consequently without buildings and farmland. This is due to the fact that buildings and farmland make the property more complex, more difficult to valuate and increases the risk for sentimental values, which can result in prices that are difficult to explain.

In this paper the method used for the collection of the data is retrospective (Montgomery *et al*, 2012) and uses data from all the sold properties fulfilling the criteria above. This method uses previously collected data and thus is a cost effective method. However, retrospective studies also have some limitations like missing data, questionable quality of data and not specifically adjusted data (*ibid*). In this paper the data is received from SLU Market Price which is a database containing data on every sold forest property with a forest management plan since the second half of year 2010. A list of all properties sold in the recent five years was downloaded in an Excel-file. The number of properties in the file was 1812 but since many of them have buildings or farmland the sample is reduced to 550 properties. An examination of the 550

properties prospects is performed and 221 is chosen as they have an initial price. The rest are either sold by bidding only or had no information about the terms of sale. A statistical study is made on the 221 properties to find maximum-values and minimum-values in order to find and possibly exclude extremities. The criteria for extremities are that the properties on their own have a substantial effect that may distort the results. Seven extreme values are excluded as they had percentage differences above 150 and alone affects the result substantially. Hence, the quantitative data used in this paper contains 214 "pure" forest properties sold in the recent five years without buildings or farmland.

4.3.2 Interviews with brokers

Qualitative semi-structured telephone interviews are made with brokers dealing with forest properties. The purpose of the qualitative interviews is to further explain the findings from the quantitative analysis as well as generate a broader understanding of the differences between initial and sale prices.

Qualitative interviews focus on the respondent's perspective and are commonly used when trying to get information that is hard to measure or observe (Patton, 2002). The variation of qualitative interview types is wide (Bryman & Bell, 2013). One type is the semi-structured interview in which the interviewer is guided by pre-written questions but has the opportunity to restructure the order of the questions, skip them if needed or even adjust them to the situation (*ibid*). The respondent can speak relatively free about the questions although the interviewer guides in the desired direction (*ibid*). Telephone interviews are a common data collection method in today's social science research (Denscombe, 2010). The reasons for this are amongst others that telephone interviews are an inexpensive and timesaving way to obtain information and that it is assumed that respondents answer as honest as they would have done in face-to-face interviews (Robson, 2011; Denscombe, 2010). In any types of interviews it is crucial to record the interviews, which is preferably done by a sound recorder (Saunders *et al*, 2012). In the present study the interviewees is asked permission for the author to record the conversation.

The question template is written based on the literature review and theory as well as the results from the quantitative findings. The choice of respondents for the interviews is based on statistics of sold forest properties during the recent years. The six most commonly hired brokerage firms in Sweden are chosen and local representatives in Uppsala County are contacted and interviewed for approximately 25 minutes. The reason for the geographic limitation is that the respondents should be able to answer on the same premises as they are working with the same market conditions as each other. The respondents are anonymous, as naming them or their firms would not contribute to the aim. Also, anonymity may be argued to encourage honest answers (Bryman & Bell, 2013).

4.4 Data analysis

The analysis of research data tends to be a five-step process shown in table 4 below (Denscombe, 2010). The steps include different actions depending on what type of data it is.

Table 4. The five steps of data analysis (own processing based on Denscombe, 2010, pp 324).

	Quantitative data	Qualitative data
Organizing the data	Coding, **categorizing of data and control of data**	**Categorizing text, put text in suitable computer software**
Initial data research	**Search for obvious trends or relations**	**Search for recurring themes, comment on data, note ideas**
Analysis of data	**Statistical testing, connecting data to research questions or hypotheses**	Coding, **group codes to categories or themes, search for concepts that summarizes the categories**
Presentation of data	**Tables, diagrams, written interpretation of the statistical findings**	**Written interpretation of the findings,** illustration of key points, usage of visual models, diagrams and tables
Validation	Extern norms, internal agreement**, comparison with alternative explanations**	**Data- and method triangulation**, respondent validation, comparison with alternative explanations

The bold actions in table 4 or similar actions are used in the data analysis conducted in this paper. A further description of the qualitative- and quantitative data analyses is presented in the following sub-chapters.

4.4.1 Price data analysis

Data is sorted by region and the percentage differences between the sale prices and the initial prices for the properties in the sample are described (figure 9 to 13). The average difference is computed as the average of all the separate differences. An alternative to this calculation of the average differences is to find the quota of the sum of all sale prices and the sum of all initial prices. Although, this alternative is deselected as the many big differences in low priced properties would be insignificant in relation to the few high priced properties. Due to a relatively small sample from region 1 and 5 a comparison was made between the average in Sweden and the average of region 1 to 4, region 2 to 4 and region 2 to 5 (figure 14). This comparison may show whether the "small samples" skew the result or not. When presenting quantitative data the researcher's task is to use available technical aids so that data is presented in a clear, exact and informative way (Denscombe, 2010). One way is by using visual effects as figures, tables and charts (*ibid*). Hence, figures are presented in chapter 5 showing the differences between initial price and sale price in the different regions and the total for Sweden. These figures also contain the initial price to provide a perspective on the monetary effect of the differences. These visualizations are used to capture the meaning and

significance of the data (Denscombe, 2010). Further, brokers who during the period sold more than five properties, are identified to find potential patterns depending on region, brokerage or individual behaviors. The brokers' average difference, region, brokerage and number of sold properties are presented in table 5.

The findings from the quantitative data analysis are presented in chapter 5.1. The following sub-chapters 4.4.2 and 4.4.3 explain the regression analysis and the analysis of the interviews. These research methods are conducted as an attempt to explain the findings from the quantitative data analysis.

4.4.2 Regression analysis

A regression analysis is a statistical tool used to investigate relations between different variables and measure the strength of the relation (Montgomery *et al*, 2012; Andersson *et al*, 2007). A multiple regression analysis is an appropriate type of regression analysis enabling the researcher to analyze the relationship between one dependent variable and several independent variables (Hair *et al.,* 2011). The design of the multiple regression method is that multiple independent (explanatory) variables also labelled regressors are tested on how much they affect one dependent variable (regressand) (Gujarati & Porter, 2009; Andersson *et al*, 2007). If the dependent variable (y) and independent variables (x_i) have a linear relation the following regression equation 5 can express this relation (Andersson *et al*, 2007).

$$y = \alpha + \beta_1 x_1 + \ldots + \beta_n x_n + \varepsilon \qquad \text{(Equation 5)}$$

α = Initial value
β_1 = Constant for first independent variable
x_1 = Value of first independent variable
β_n = Constant for n independent variable
x_n = Value of n independent variable
ε = Normally distributed stochastic variable

Two general conditions apply when doing a regression analysis (Hair *et al.,* 2011). First, the data must be either numeric or categorical. Secondly, the researcher must decide, before estimating the regression, which variable that is dependent and which that is independent (Hair *et al.,* 2011). It is important to carefully choose the independent (explanatory) variables when building a regression analysis model (Gujarati & Porter, 2009). In the case when a high number of variables are included the problem of multicollinearity may occur (*ibid*). This means that the independent variables have a relation to one another and therefore makes it difficult to identify their individual effect on the dependent variable (Gujarati & Porter, 2009). Even though a regression analysis can help in identifying relationships between variables, it can never be the only base for claiming the relationship (Montgomery *et al*, 2012). Hence, further facts than the sample are needed to be able to establish causality, for example theoretical implications (*ibid*). Given this perspective the regression analysis itself is not necessarily be the primary aim of the study but could generate an understanding and insight contributing to the aim.

In the following section some expressions used in the paper is explained in order to aid the understanding of the results.

R2 (r-square) shows the coefficient of determination, which is a measure on the proportion of variation in the y-variable that is explained by the x-variables (Montgomery *et al*, 2012; Wahlin, 2011). This measure explains how well the regression equation fits the data (Wahlin,

2011; Gujarati & Porter, 2009; Newbold *et al*, 2003). The coefficient of determination is usually expressed in percentage terms builds on values between zero and one. The closer to 100 percent the better fit between regression line and data (Wahlin, 2011; Gujarati & Porter, 2009).

Mallows' C_P is another way of estimating the fit of the model and the data (Gujarati & Porter, 2009). When using Mallows C_P the intention is to have a C_P value close to the chosen number of variables as this imply a good fit to the data (*ibid*).

The **null-hypothesis** is usually described H_0 and assumes that the independent variable do not have any effect on the dependent variable, thus no phenomena exists that needs an explanation (Wahlin, 2011). Rejection of the null-hypothesis implies that statistical significance has been achieved and that the independent variable has an effect on the dependent variable (Wahlin, 2011).

Significance level is the level chosen to determine whether to reject the null hypothesis or not (Gujarati & Porter, 2009; Newbold *et al*, 2003). A usual choice of significance level is 0.05 which means that if the p-value is lower than 0.05 the null hypothesis can be rejected and vice versa (Newbold *et al*, 2003).

P-value can be described as the lowest significance level at which rejection of the null hypothesis can be done (Gujarati & Porter, 2009; Newbold *et al*, 2003). If the p-value is less than the chosen significance level then the null-hypothesis is rejected (Wahlin, 2011; Gujarati & Porter, 2009; Newbold *et al* 2003).

Backward elimination regression is a type of regression analysis in which all chosen regressors are included in the model at the first step (Montgomery *et al*, 2012). For each step the regressors with higher p-value than the chosen significance level is removed. This is repeated until all remaining regressors have p-values lower than the chosen significance level. Hence, all the remaining regressors have a statistically significant effect on the regressand (*ibid*). Although, it is also important that the coefficient of determination (r-square) remain high if the study is to be considered as good (*ibid*).

Dummy variables is a means of classifying data into subgroups by giving them a value of 1 or 0 (Gujarati & Porter, 2009). It may be used either to introduce qualitative variables in regression models or to group quantitative variables (*ibid*). For example a dummy variable may be used to see if a specific classification have a relation to the dependent variable.

A **four-in-one residual plot** is an indicator of how well a regression model fits the data (www, Support Minitab, 2012). Before accepting the results of the model, it is recommended to verify the following three assumptions about the errors in the data: they are random, they do not deviate in a substantial form the normal distribution and they have a constant variance (*ibid*).

In this paper the dependent variable in the regression analysis is the *quota of sale price through initial price* (equation 6).

$$Quota = \frac{sale\ price}{initial\ price} \qquad \text{(Equation 6)}$$

The independent variables are chosen based on table 1 and assumptions made below. The independent variables are **number of parcels**, **standing volume**, **municipality**, **capital density**, **county**, **average growth**, **brokerage**, **productive area**, **region** and **"small property"**. One additional variable **broker** is included to indicate whether the choice of broker affect the difference. It is assumed that individual brokers have different working methods which may affect differences between initial and sale prices. **Number of parcels** is a term that partly describes the land consolidation of a property. It is generally preferred to have one or a small number of parcels as this may simplify the harvesting of the property. **Standing volume** is the volume of wood in a forest expressed in m^3f. When harvesting, forest owners are paid in relation to the harvested volume. Therefore it is probably the most important term from an economical view. **Municipality** is interesting as the smallest geographic variable available. If any relation between municipality and differences is found it gives a precise geographic indication. **Capital density** describes the population density and the average income in a parish. The capital density is related to the distance between a forest property and the nearest cities. An assumption is that a larger population and a higher average income increases the demand and WTP for forest properties.

County is a geographic variable sized between municipality and regions. **Average growth** is the annual mean growth in the forest estimated by m^3f per year. Growth is directly related to economic growth as the economic value growth with the increase in m^3f. **Brokerage** represents the different firms that were involved in the property sales. This variable is chosen with the purpose of finding potential differences in pricing policy. **Productive area** is the area suitable for production where the growth is more than one m^3f per year and hectare. **Region** represents the five regions that can describe the forestland in Sweden. The regions vary in parameters such as growth, distance to cities, population density etc. which affect the price levels in the regions. The last independent variable **"small property"** is a dummy variable including properties with a productive area of 21 hectares or less as they are considered as "small properties". Properties larger than 21 hectares is not considered as small and are therefore excluded. This variable is chosen based on the assumption that small properties are attractive for neighboring forest owners due to the possibility to improve the land consolidation. Therefore, small properties may attract many bidders.

The findings from the regression analysis are presented in chapter 5.2.

4.4.3 Analysis of interviews

Qualitative interviews tend to generate an extensive and often unstructured mass of text material, which can lead to difficulties in the analysis (Bryman & Bell, 2013). Hence, a primary step in the analysis is to categorize the material into different categories of analysis derived from theory and literature (Esaiasson *et al*, 2012; Saunders *et al*, 2012; Denscombe, 2010). Thereafter, these categories are filled with appropriate sections of text material. According to Esaiasson *et al* (2012), the data material from interviews must be reduced as some parts do not fit in or are irrelevant for the study. Through thorough reading the essentials of the data material may be identified and used in the paper (*ibid*). It is from these essentials that conclusions can be drawn (Saunders *et al*, 2012; Robson, 2011). The findings from the qualitative data analysis function as an aid to explain and interpret the quantitative data (Robson, 2011) and to provide a deeper understanding of the subject. Empirical data collected from the telephone interviews has been categorized into the categories *price affecting variables* (5.3.1), *differences between initial and sale prices* (5.3.2), *underpricing* (5.3.3) and *additional topics* (5.3.4).

4.5 Trustworthiness and ethics

Generalizability, validity and reliability are important terms to consider in order to make a research paper and the presented findings trustworthy (Robson, 2011). Generalizability concerns whether the findings can be applied to other contexts than the depicted study.
Triangulation is a widely used strategy that implies the use of different sources and methods to strengthen the validity of the research (*ibid*). There are four types of triangulation. *Data triangulation* refers to the use of different data collection methods. *Observer triangulation* is the use of more than one observer. *Methodological triangulation* is the use a combination of quantitative and qualitative approaches. *Theory triangulation* is the use of multiple theories and perspectives. A multiple-strategy design includes both methodological and data triangulation which enhances the validity of the findings. Further, given the same argument multiple theories and perspectives are used in this paper. The quantitative and qualitative findings may corroborate each other which strengthens the validity and enhances the confidence level (*ibid*). If they do not corroborate the researcher must find the reasons for the discrepancy (*ibid*).

Validity concern whether the data in an analysis is valid and that the researcher measure what he/she intends (Robson, 2011; Jacobsen, 2002). One example of how validity may be uphold is by minimizing the risk of errors in calculation sheets. Hence, during the process of the paper new copies of the calculation sheets were made on a daily basis. This in order to be able to trace and correct potential errors. Further, regression analyses have tools that indicates the validity of the model and how well the model fits the variables, this is explained in section 4.4.2. An example is that Mallows C_P is a complement to the coefficient of determination (r^2) as a means of ensuring the validity.

Reliability of a study may be compared with stability and implies that if the study is performed by another researcher or if the study is repeated the results should be the same (Robson, 2011). The data used in this study are only available with an approval from Top-Skog, but if granted, another researcher would be able to reach the same results if the same time period is chosen. This as no data is modified from the original data.

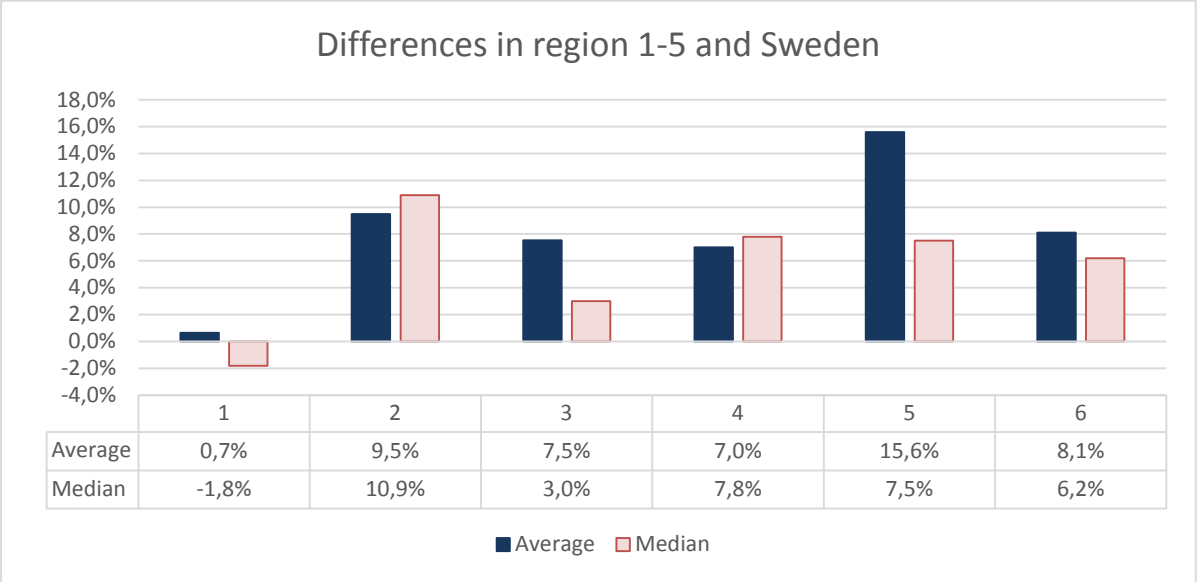
Bryman & Bell (2013) argue for ethical principles used in the approach of people involved in the study. One example is that interviewees shall be given the opportunity to be anonymous and that they are informed about the purpose of the study. These principles are considered in this study as all interviewees are anonymous and were informed about the purpose of the study. Bryman & Bell (2013) also stresses the importance of securing sensitive data from unauthorized persons. In this study the author has been careful with the access of the SLU Market Price database and strictly have not showed it to anyone. Also the files are stored in a password secured hard drive on a computer in the Swedish University of Agricultural Studies.

5 Results

In the beginning of this chapter the results from the price data synthesis is presented in form of figures and interpreting texts. Thereafter, the results from the regression analysis are presented with figures and interpreting texts. Finally, a summary of the interviews is presented.

5.1 Price data

From the analyzed data differences in initial and sale prices was found. Figure 8 presents the percentage average differences and the median in region one to five (bars 1 to 5) and in Sweden (bar 6). The dark staples are the percentage average difference in the regions and they show that the lowest difference is in region 1 (0,7 percent) whilst the highest is in region 5 (15,6 percent) and the average in Sweden is 8.1 percent. As the average differences may be affected by particular differences the median is shown as well to show the value in the exact middle of the sample (light staples). The median confirm that the lowest difference is in region 1 (-1,8 percent) but also shows that region 2 has the greatest (10,9 percent) and that the median for Sweden is 6,2 percent).



	1	2	3	4	5	6
Average	0,7%	9,5%	7,5%	7,0%	15,6%	8,1%
Median	-1,8%	10,9%	3,0%	7,8%	7,5%	6,2%

Figure 8. Percentage average difference in initial and sale prices in region 1-5 (bar 1-5) and Sweden (bar 6), (own processing).

In order to obtain an improved understanding of figure 8 additional figures is presented for each region. The data is sorted by initial price from the lowest to the highest in SEK (line and right y-axis) and difference between initial price and sale price in percentage units is displayed (staples and left y-axis). The x-axis represents the properties. Figure 9 presents the 20 properties sold in region 1.

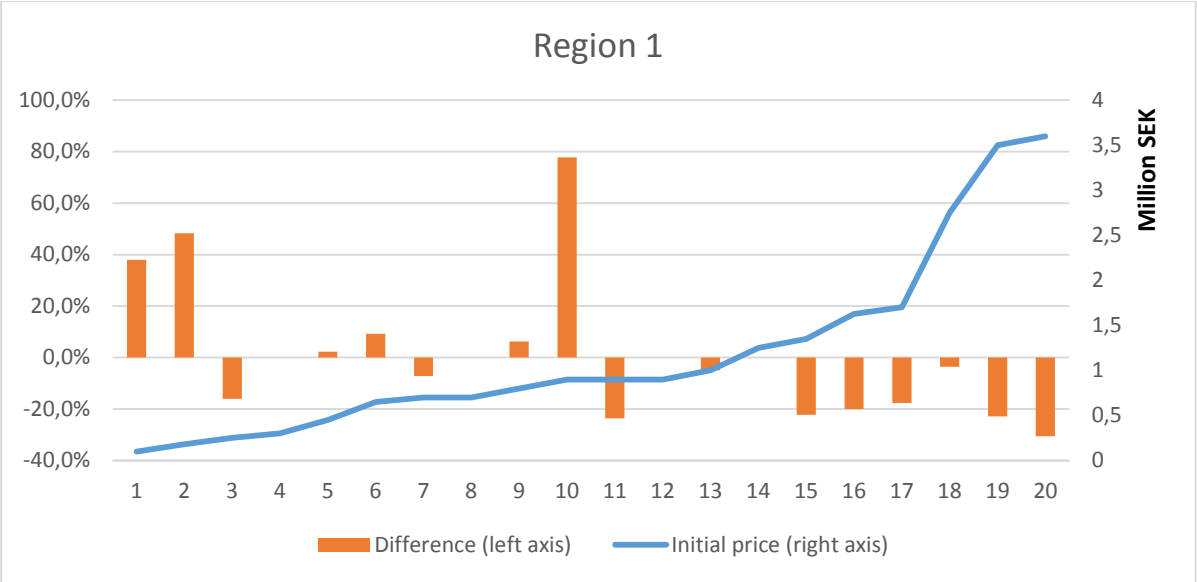


Figure 9. Initial prices and percentage differences in region 1 (own processing).

The percentage average difference in region 1 is 0,7 percent. Figure 9 presents a varied difference between initial price and sale price. In total six properties are sold above the initial price, four properties are sold at the initial price and nine are sold below the initial price. The properties with major positive differences have a relatively low price. Although, the properties with higher price tend to have a negative difference. Implying that, they are sold at a sale price lower than the initial price.

Figure 10 below displays the percentage difference between the initial and sale prices for the 84 properties sold in region 2.

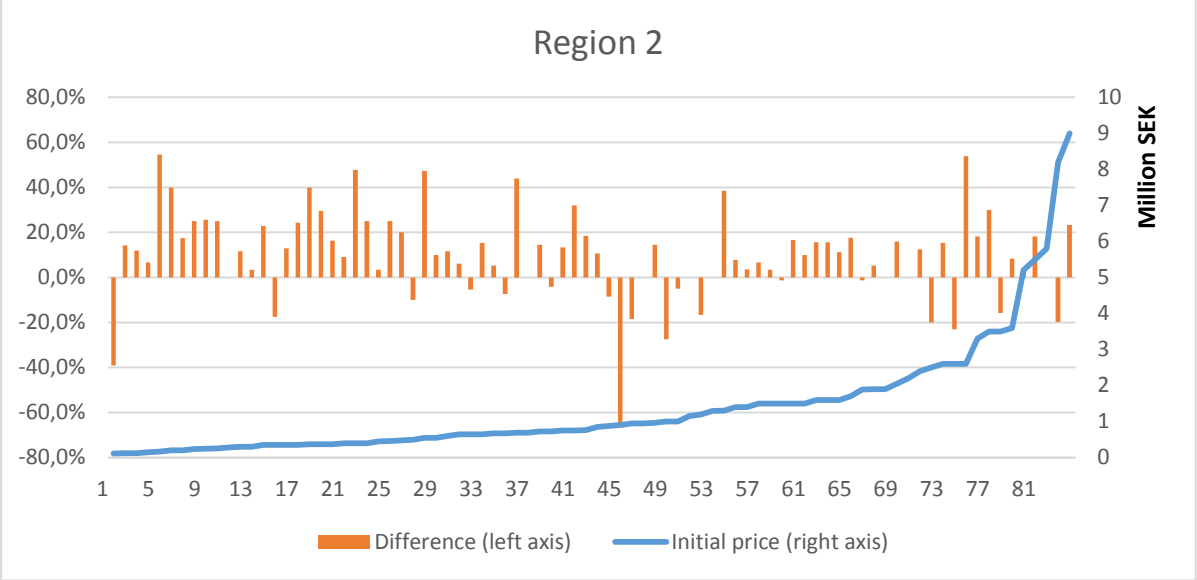


Figure 10. Initial prices and percentage differences in region 2 (own processing).

The percentage average difference in region 2 is 9,5 percent. As shown figure 2 the region represents the biggest sample with 84 sold properties. The majority of the properties (58) are sold above the initial price. Eight properties are sold at the initial price and 18 properties are sold below the initial price. No obvious pattern is noted in the figure as sale prices both above

and below the initial price occurs of all price ranges. Similar to region 1 the largest differences emerge from properties with low prices.

Figure 11 below displays the percentage differences between the initial and sale prices for the 45 properties sold in region 3.

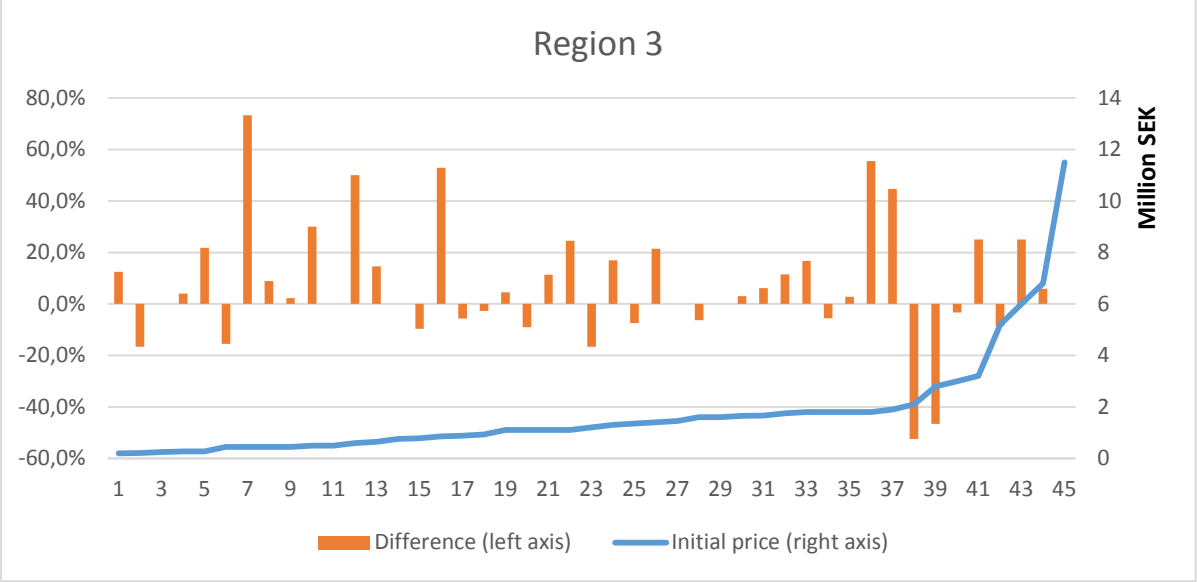


Figure 11. Initial prices and percentage differences in region 3 (own processing).

The percentage average difference in region 3 is 7,5 percent. This is the region with the second lowest average difference and most properties sold at a low difference. 25 properties are sold above the initial price, six properties are sold at the initial price and 14 properties are sold below the initial price. No obvious pattern can be observed
, except the similarity with region 1 and 2 that the biggest differences emerge from properties with low prices.

Figure 12 below displays the percentage differences between the initial and sale prices for the 49 properties sold in region 4.

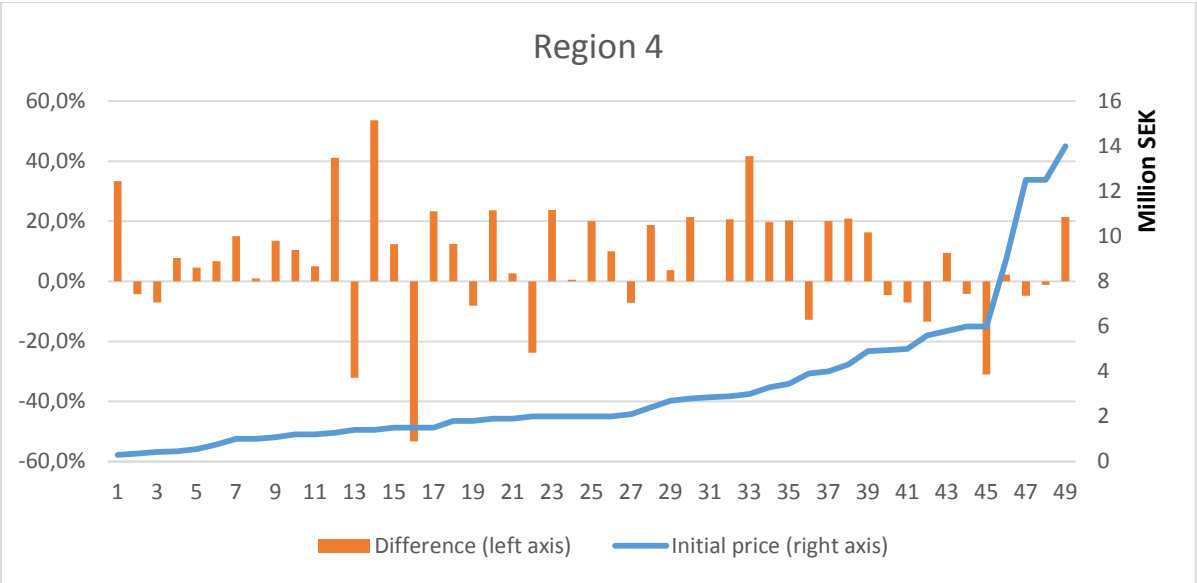


Figure 12. Initial prices and percentage differences in region 4 (own processing).

The percentage average difference in region 4 is 7,0 percent. The median is 7,8 and therefore region 4 is the region with the least difference between percentage average difference and median. 33 properties are sold above the initial price, one property was sold at the initial price and 15 properties are sold below the initial price.

Figure 13 below displays the percentage differences between the initial and sale prices for the 16 properties sold in region 5.

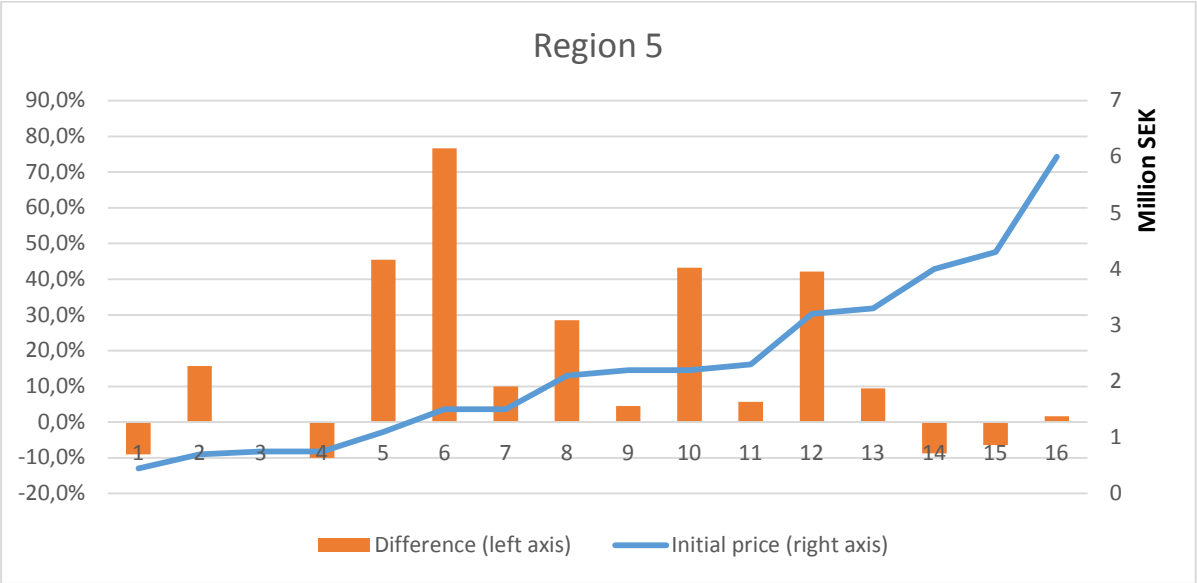


Figure 13. Initial prices and percentage differences in region 5 (own processing).

Region 5 is the region with the highest percentage average difference between initial and sale price (15,6). Figure 13 show five notable differences but the main explanation to the high average is that eleven out of 16 properties had a higher sale price than initial price, one are sold at the initial price and only four are sold below the initial price.

There is a difference in sold properties per region, which shows that property sales during the period are more common in region 2, 3 and 4 (180 properties) than in region 1 and 5 (36 properties). Further, the average differences in initial and sale price are calculated for brokers who sold more than five properties during the period, this in order to find potential patterns for their behavior. The number of properties sold and the average difference in initial and sale price are shown for each broker in table 5. The number of brokers qualified for the calculation amounted to twelve brokers and the average difference varied between 18,7 percent to -1,9 percent.

Table 5. Number of sold properties and the average difference per broker (own processing).

Broker	Region	Number of sold properties	Average difference (%)
15	2	8	18,7
6	1	7	17,7
42	3	5	15,4
28	2	8	15,2
5	1	5	-13,1
58	4	7	11,9
2	1/2	14	8,7

16	2	7	7,5
26	2	9	-5,7
31	2	8	5,5
1	1	5	-2,3
11	1	5	-1,9

Notable from table 5 is that brokers from the same region display substantial differences in the average difference. The results also indicate that the availability of brokers are higher in region 3, 4 and 5 during the period. This as brokers in those regions that sold more than five properties are rare.

Due to the relatively small number of observed samples from region 1 and 5 figure 14 displays a comparison between the average differences in Sweden and the averages of region 1 to 4, region 2 to 4 and region 2 to 5 (figure 14). These divisions exclude either region 1, region 5 or both in order to find out whether the "small samples" skew the total average difference.

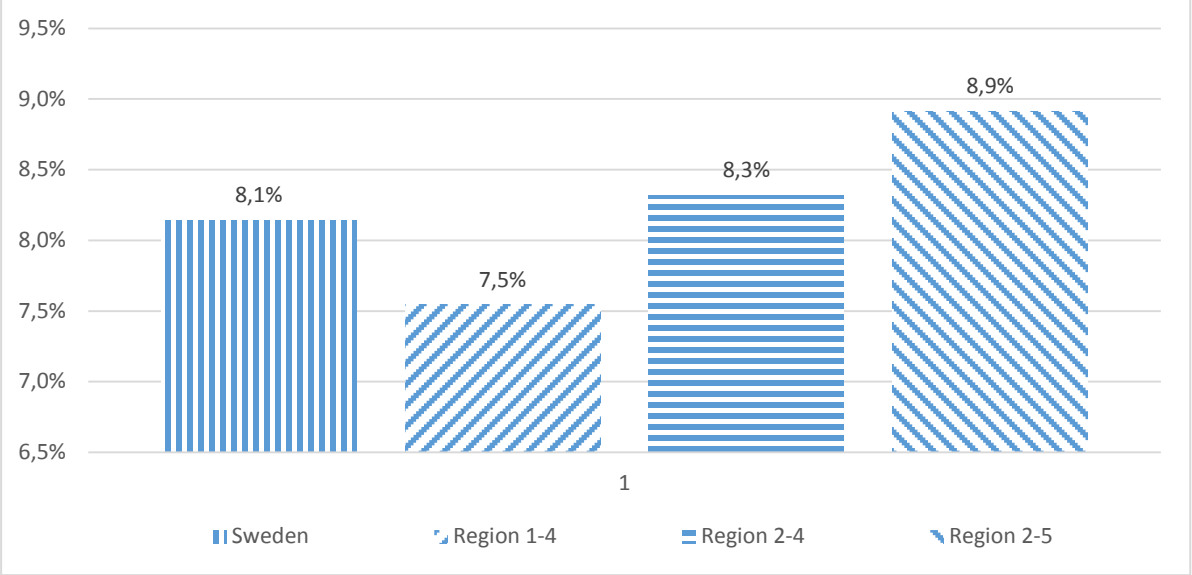


Figure 14. The average difference between Sweden, region 1-4, region 2-4 and region 2-5 (own processing).

Figure 14 shows that the average difference of region 1 to 4 is 7,5 percent, region 2 to 4 is 8,3 percent and region 2 to 5 is 8,9 percent. The interpretation of figure 14 is that, since no substantial differences is shown, the "small samples" does not skew the total average difference in a considerable manner.

5.2 Regression analysis

The analysis is a backwards-stepwise elimination regression in which the depending variable is the quota of sale price related to initial price. There are eleven independent variables: productive area, standing volume, growth, number of parcels, brokerage, broker, county, municipality, region and the dummy variable "small property". Table 6 shows the result from the analysis.

Seven steps are used to find significant variables and the R^2-adjusted that shows that the coefficient of determination is 10,84 percent. This means that the model is far from perfect (100

percent) for measuring the explanatory value of the variables on the difference in initial and sale price. However, Mallows C_P is close to the number of chosen variables which suggest that the chosen number of variables provide a decent fit to the data. The variable broker was removed from the analysis due to multicollinearity, which implies that the variable is correlated with other independent variables causing unstable coefficients. This may cause coefficients to appear statistically insignificant even though a significant relationship between the dependent and independent variables exist (www, Support Minitab, 2016). In the first step, the variable growth is removed as the p-value 0,863 is the highest among the variables. For each step in this procedure the highest p-value is continually removed until all remaining variables have a significant p-value of 0,1 or less (90 percent significance level).

Table 6. Results from the backwards elimination regression model (own processing).

Variable/Step	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Constant	0,617	0,621	0,817	0,811	0,953	1,019	1,001
Growth	0,0011						
P-value	0,962						
Municipality	0,677	0,678					
P-value	0,672	0,661					
Productive area	0,000764	0,000758	-0,000243				
P-value	0,405	0,403	0,750				
Broker	0,400	0,400	0,357	0,358			
P-value	0,587	0,579	0,558	0,531			
Region	0,1442	0,144	0,112	0,120	0,0956		
P-value	0,657	0,652	0,625	0,488	0,688		
No of parcels	-0,0222	-0,0221	-0,0110	-0,0116	-0,0124	-0,0128	
P-value	0,156	0,154	0,414	0,386	0,337	0,311	
Small property	0,00823	0,00815	0,00963	0,00976	0,01140	0,00130	0,01158
P-value	0,327	0,318	0,179	0,172	0,105	0,103	0,094
Standing volume	-0,000010	-0,000010	-0,000004	-0,000006	-0,000005	-0,000006	-0,000005
P-value	0,227	0,224	0,566	0,044	0,081	0,080	0,084
County	0,0552	0,555	0,486	0,486	-0,503	-0,479	-0,488
P-value	0,045	0,042	0,053	0,050	0,020	0,011	0,011
Capital density	0,0286	0,0284	0,0219	0,0218	0,0261	0,0302	0,0304
P-value	0,229	0,221	0,190	0,190	0,102	0,010	0,009
R^2 (adj)	5,84%	6,56%	9,08%	9,55%	10,04%	10,86%	10,84%
Mallows' Cp	85,00	83,00	36,08	34,18	17,60	11,76	10,74

The final step of the regression analysis shows that four variables out of eleven are significant, with a significance level of 90 percent. The most significant variable is capital density with a p-value of 0,009 which shows that the capital density affects the difference between initial and sale price. The coefficient reveal that each unit of the capital density index increases the difference between initial and sale price by 0,0304. The variable with the second highest statistical significance is county with a p-value of 0,011. The counties have different coefficients that either increase or decrease the difference between initial and sale price. The coding of the counties is displayed in appendix 1, the coefficients are displayed in appendix 2 and the coefficient effect is shown in appendix 3. The counties that increases the difference is Östergötland, Jönköping, Blekinge, Skåne, Värmland, Örebro, Dalarna, Gävleborg,

Västernorrland, Västerbotten and Norrbotten. The counties that decreases the difference is Södermanland, Kronoberg, Kalmar, Halland, Västergötland and Jämtland. Next significant variable is standing volume with a p-value of 0,084. The result imply that each additional m^3f lower the difference with 0,000005. The last significant variable is the dummy variable "small property" with a p-value of 0,094. The result implies that if a property is 21 hectares or smaller the difference between initial and sale price increases with 0,01158.

The four-in-one residual plot in figure 15 indicates how well the regression model fits the data (www, Support Minitab, 2012).

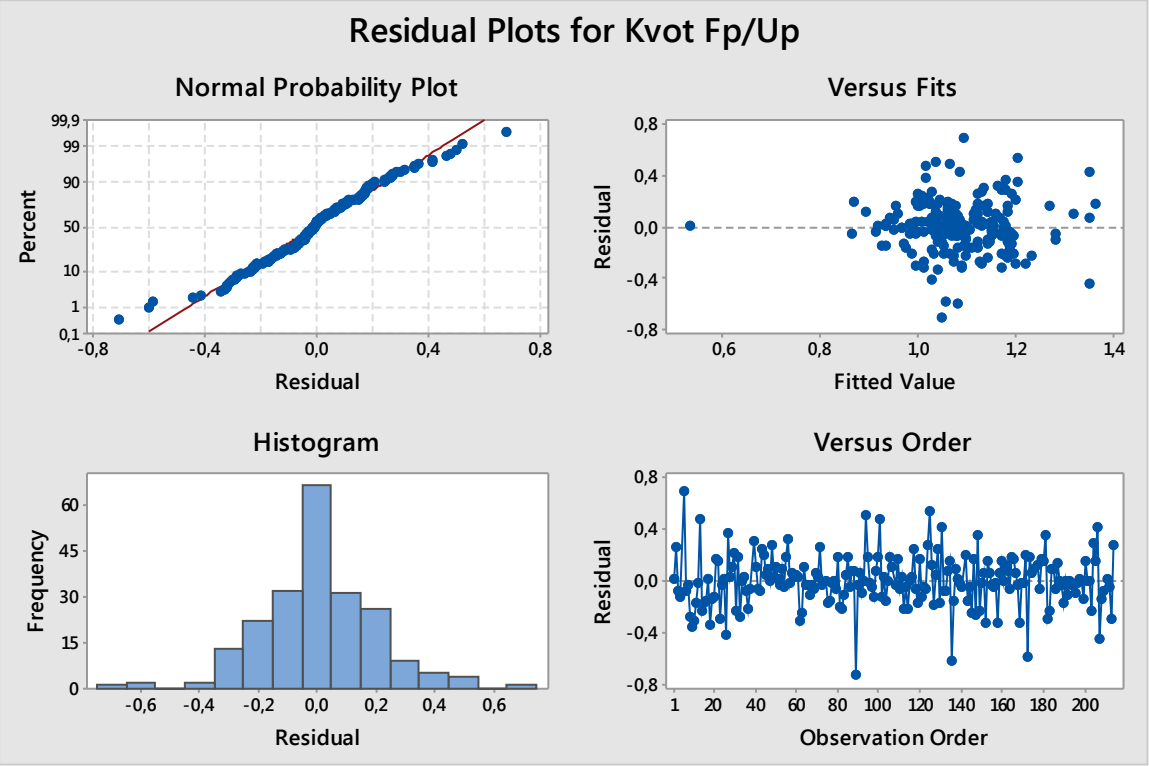


Figure 15. Four-in-one residual plot for the quota of sale price through initial price (own processing).

The histogram indicates that the residuals display a normal distribution and are not notably skewed. The normal probability plot shows no deviant patterns in the distribution of the data and confirms the interpretation of the histogram. The residuals versus fits plot shows that the variance is constant as the data is randomly spread. This also reveals that no heteroscedasticity occurs. If heteroscedasticity exists the data would be plotted like a cone with a greater vertical distance between the residuals as the fitted value increases. The residuals versus order of data plot shows that the observations are independent as no pattern occurs. These observations indicate that the results from the regression model may be accepted.

5.3 Interviews

The results from the interviews is explained briefly in table 7 and more thoroughly in the following sections. The data is categorized into three main headings based on literature and theory. One additional heading display the occurring data unrelated to the main headings. The questions are shown in appendix 4.

Table 7. Findings from the interviews (own processing).

Topic (section)	***Finding***
Price affecting variables (5.3.1)	Standing volume, geographic location, capital density, size, growth, tree age, land consolidation, distance to industry, road networks and hunting.
Difference between initial and sale price (5.3.2)	Seller should be willing to sell at initial price. Initial price used to guide potential buyers. Brokers in general satisfied with 10 percent difference from initial price. Neighbors bidding on a property increases the difference from the initial price as well as information hold by buyers. Human factor may explain differences from initial price due to mistakes in valuation.
Underpricing (5.3.3)	Underpricing not believed as an issue. Forest purchases are often pure economic investments, this makes buyers rational. Low initial prices may leads to more potential buyers but not necessarily to more actual bids. A low initial price do not lead to a high sale price. A high initial price may discourage potential buyers.
Additional topics (5.3.4)	Losers from previous auctions may be contacted regarding new objects. This may lead to sales before the property is placed in the open market.

5.3.1 Price affecting variables

All of the brokers share the view that *standing volume* is the main price-affecting factor for a forest property. The data regarding volume is usually obtained from the forest management plan and the used value is SEK per m^3f that is often guided by statistics based on the comparison method (author note; that compares sold m^3f from all around Sweden to get reginal target prices). Five out of six brokers stated that *geographic location* is one of the most important factors affecting the price on forest properties. The general belief is that the importance of standing volume decreases and price increase the closer to a big city the property is located.

One reason is *capital density* and the fact that big cities usually have more people with a higher income and hence are less price sensitive. Another view is that people from cities have less knowledge concerning local factors that affect the price and often know less about forestry. Other factors affecting price that are mentioned is size, growth, tree age, land

consolidation, distance to industry, road networks and hunting. The purpose with the acquisition is also mentioned with the example that the WTP for recreational values may be higher than production values. One broker believed that many "smaller" properties around 20 hectares may be sold to a relatively high price due to foreign buyers with a high WTP for hunting possibilities.

5.3.2 Differences between initial and sale prices

Most of the brokers viewed the initial price as an indication of the price based on their valuation and what they think that the market value is. They all mentioned that the seller should be willing to sell at the initial price. With an initial price potential buyers obtain guidance of the value and the broker saves time and energy by avoiding unnecessary phone calls. One broker stated that it is important that the potential buyers know that the property has been valued by a licensed broker to know that the initial price is reasonable. The brokers indicated an average difference of around 10 percent both over and under the initial price which they in general are satisfied with, even if the difference in some cases became bigger. The most mentioned reason for big price differences is when two or more neighbors want to buy the property. The possibility to buy a neighboring property is low and when it occurs buyers tend to be less price sensitive as they may increase their ownership or improve the land consolidation.

In addition, if there is a neighbor with the same premises they usually drive the price up and sometimes considerably higher than the initial price. It is difficult for brokers to know the interest and ability to pay by the neighbors. Although, if the property is not neighboring, but the potential local buyers have knowledge of the property their bidding is coherent with their valuation. Nevertheless, all brokers stated that it is the market that determine the price. The amount of information that the buyer has also affects the sale price. The sale price can be higher if the buyers know something that the other buyers do not. An example is when experienced buyers conduct thorough examinations of the properties and therefore are able pay more than the initial price and yet feel that they have made a bargain. Also the human factor may explain differences as mistakes in valuations by the broker do occur and that the forest management plans and price statistics may be of varying quality.

5.3.3 Underpricing

The general opinion is that underpricing is not an issue in the market for forest properties. This as investments in pure forest properties most often is equal to economic investments based on probable future revenues and without affectional values which makes the bidding more rational. The exception can be properties close to big cities with appealing recreational values. In addition, all the brokers wanted the seller to be willing to sell for the initial price. Another argument against underpricing is that the brokers believe that their relation to the customer is deeper and more long-term than for example brokers in big cities. Hence, they would not risk to affect their trustworthiness. However, one broker stated that he/she most commonly used an initial price just below the valuation as a mean not no scare potential buyers away with a too high initial price. The brokers shared the view that a lower initial price leads to a higher number of potential buyers but they also agreed that this did not necessarily lead to a higher number of actual bids. And if it did, the bids quickly ended when the price level rose above the low price level leaving a similar number of potential buyers as with a "normal" initial price. Therefore, the brokers do not perceive that a low initial price leads to a high sale price. Another presumption is that if the initial price is at a high level, potential buyers would be discouraged from participating in the bidding process.

5.3.4 Additional topics

One broker said that he often saves the number to the participants in the auctions as the losers of the auction often are interested in other similar properties. A natural way for him to find potential buyers is to contact them before advertising the property on the market. Given this approval some properties never reach the open market but are sold in an exclusive sale.

6 Analysis & discussion

This chapter aims to connect the empirical data with the theory and literature review. Also the findings will be discussed. This in order to address the research questions stated below:

Do differences occur between initial and sale prices of pure forest properties in Sweden? If differences occur, how may these differences be explained?

The chapter is designed in line with the previous chapter into sections of price data, regression analysis and interviews. Further, the interviews is related to price data and the regression analysis. The chapter ends with a discussion about criticism and further research.

6.1 Price data

As presented in chapter 5.1 differences between initial and sale prices do occur. The percentage average difference in Sweden is 8,1 percent. Also regional percentage average differences occur, the lowest difference is found in region 1 (0,7 percent) and the largest in region 5 (15,6 percent). Figures 9 to 13 show that 19 out of 214 properties are sold without difference. This implies that 8,8 percent are sold without difference and 91,2 percent are sold with a difference.

Krishna (2010) argues that the reason for the use of auctions is that the seller is uncertain of the buyer's maximum WTP. One part of the broker's duties is to estimate the buyers WTP for the object, but they use the auction mechanism to let the buyers finally determine the value of the property by their WTP. Provided that estimating a probable WTP is their aim, figure 8 indicates that the brokers in region 1 succeeds best as they have an average percentage difference close to zero. The second best brokers are found in region 4 and the least successful in region 5 with an average percentage difference of 15,6 percent.

Although, the percentage average difference is low as long as the number of properties sold both above and below the initial price are similarly distributed. For example the relatively even share of positive and negative differences in region 1 may explain the low average difference. Hence, it is important to examine the number of sold properties with low differences. Table 8 illustrates the distribution of the properties sold, sorted into categories of percentage differences inspired by the literature review and the interviews.

Table 8. Distribution of sold properties in categories of percentage difference (own processing).

Region/Difference	<10%	10< 25%	>25%
1	50%	25%	25%
2	33,3%	45,1%	22,6%
3	51,4%	22,2%	22,2%
4	42,9%	44,9%	12,2%
5	50%	18,8%	31,2%
Sweden	42%	37%	21%

In contrast to figure 8, table 8 indicates that region 3 have the highest number of properties sold below a difference of 10 percent and that region 3 is followed closely by region 5 and region1. However, region 3 stands out as it include 45 properties compared to region 1 (20 properties) and region 5 (16 properties).

If properties are sold with a difference of less than 10 percent they are in the "satisfactory range" perceived by the brokers. If properties are sold with a difference between 10 and 25 percent they are outside the "satisfactory range" but do not have substantial differences. Hence, they are not in the risk zone of underpricing. If properties are sold for more than 25 percent of the initial price the differences are substantial and the use of underpricing may be suspected (Hungria-Gunnelin & Lind, 2008).

The theories about underpricing (Hungria-Gunnelin, 2015; Hungria-Gunnelin, 2013; Stevenson *et al*, 2010; Hungria-Gunnelin & Lind, 2008) build on the presumption that brokers use a low initial price in order to attract many potential bidders, which can lead to a higher sale price. If this phenomenon occurred in this empirical study notable positive differences in initial and sale prices would have been found. An examination of the percentage average differences reveals that this is not the case for Sweden as a whole and neither for most of the regions. As noted in the results the percentage average differences between initial and sale prices are not near 25 percent as region 5 has the highest difference of 15,6 percent and the average for Sweden is 8,1 percent. Although, table 8 show that 21 percent of the properties are sold with a difference exceeding 25 percent. The region with the highest number of properties sold above 25 percent is region 5 (31,2 percent) and the region with the lowest number is region 4 (12,2 percent). The differences between initial and sale price for these properties are substantial which may indicate that they are underpriced. Even though this may indicate underpricing no certain proof for this phenomenon is found as there are other variables that may cause the differences.

Roos (1997) argues that the effect of non-timber values on the price of forest properties cannot be rejected. In additional, the value of an object depends on the information available for the bidders and the bidding competition (Hungria-Gunnelin, 2015). The result show that 21 percent of the properties sold have differences in price that exceeds the accepted 25 percent. The explanation for this may be that these properties are characterized by relatively high non-timber values that the buyers had a high WTP for. Another explanation could be that the buyer and maybe even the competitive bidders in the auction had information concerning the property that the broker did not when deciding the initial price.

It is important to take the initial price into consideration when looking at the percentage differences in the result. Depending on the initial price the monetary effects of the percentage differences vary. For example a small property sold for 200 000 SEK instead of 100 000 SEK have a 100 percent difference and a monetary difference of 100 000 SEK. This could be compared with a big property sold for 15 000 000 SEK instead of 13 000 000 SEK with 15 percent difference but a monetary effect of 2 000 000 SEK. The percentage difference is substantially lower on the big property but the monetary difference is substantially bigger.
In general, the initial price in region 4 and 5 is higher than in region 1, 2 and 3.

6.2 Regression analysis

Aronsson & Carlén (1999) argue that the seller characteristics income and wealth affect the price of forest properties. As the results from the regression analysis show, the capital density has a statistical significant impact on the differences between initial and sale price, the higher capital density is the bigger becomes the difference. The result matches Aronsson & Carlén (1999) as the capital density is a variable building partly on the general income in the parish where the property is located. This result is also in line with Högberg (2012) whose findings indicate that capital density in the area the property is located in affect the price positively.

County is the variable with the second highest statistical significance. Section 5.2 as well as appendix 1, 2 and 3 indicate that the difference between initial and sale price differs depending on which county the property is located in. This is a reasonable result as the capital density is different in the different counties. However, no theoretical explanation is found explaining the difference between the counties. It is probable that the distribution of properties in the sample affects the regression analysis as only one property are sold in some counties. An analysis based on a larger sample with more properties in each county would probably have a different and more logic result. Hence, the interpretation of the county effect on the differences is to be dealt with carefully.

Carlsson's (2012) results show that standing volume is the most price affecting variable and that growth do not have a significant impact on the price. Although this study investigates variables affecting the difference between initial price and sale price the regression analysis show similar results as Carlsson (2012). Standing volume has a statistical significant relation to the difference and for each additional m^3f the quota of sale price through initial price decreases with 0,000006. The explanation may be that properties with a high standing volume have higher prices and are more likely to attract buyers with production as main reason for the acquisition. An assumption is that these buyers have a good knowledge about forestry and may avoid overspending. Further, properties with a low standing volume have lower prices and may be acquired in order to obtain recreational values. Another assumption is that buyers in search for recreational values are less price sensitive.

The dummy variable "small property" is designed to find whether acquisitions made by neighbors tend to increase the price between the initial and sale price. This is based on the assumption that small properties are more likely bought by neighbors aiming to improve their land consolidation or increasing their local forest ownership. The results in section 5.2 implies that properties with a productive area of 21 hectares or less increases the difference between initial and sale prices.

According to the regression analysis, the differences in price are not affected by region. Although, the price data shows that the percentage average differences in region 5 differ by being notably higher than the other regions. It is surprising that the variable region does not affect the differences when the regression analysis shows that county does. Both region and county are geographic variables and considering the difference in population and capital density it could be hypothesized that region should affect the differences at least in region 5 in line with the price data. An explanation could be that the regions consists of many counties. If some counties do have an effect on the difference and others do not they might cancel each other out and make the regional effect on the difference non-existent.

6.3 Interviews

As illustrated by the strategic pricing pyramid (figure 4), the price level of a good depend on several layers of parameters together (Nagle *et al*, 2011). These parameters include economic value, sub-pricing, sale technique and pricing policies. The level price and value communication includes how the company communicate the value and price to customers. It is probable that the brokerages have different views on what the initial price implies. The interviews indicate that the brokers had different policies, that they use different valuation methods and that the sale techniques differs. This may be a reason for the variation in average difference between the twelve brokers with more than five sales during the period.

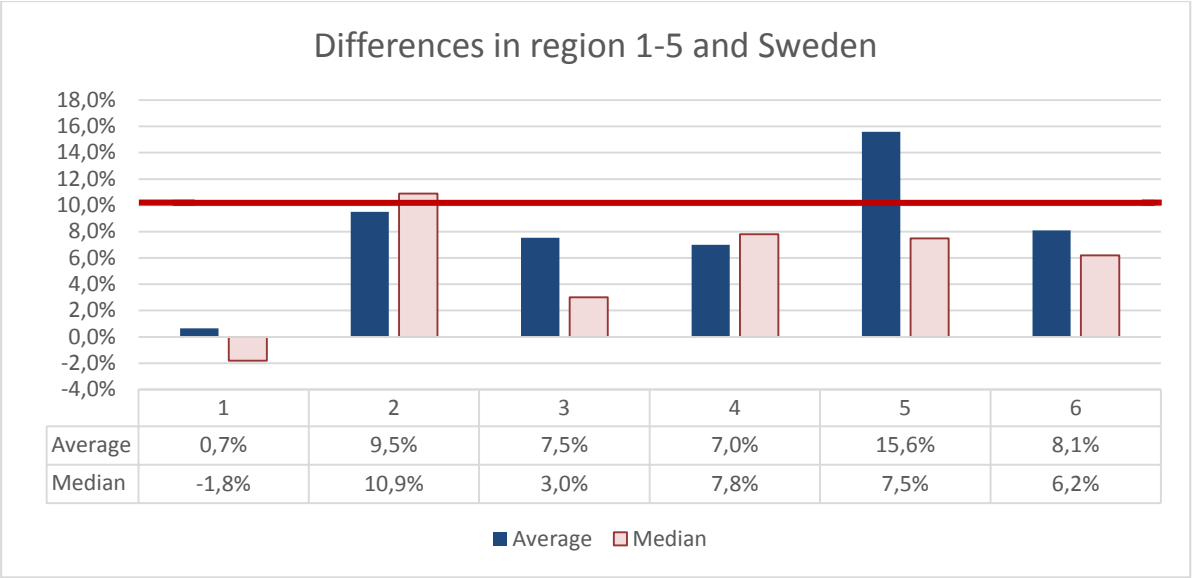
Also the interviews reflect differences in how the brokers decide the initial price. The brokers share the opinion that the initial price should be based on the broker's valuation and that the initial price should be accepted by the seller. Knight (2002) states that it is uncertain how the initial price affects the buyer perceptions and behavior. A presumption from the broker interviews is that a high initial price would discourage buyers from entering the bidding process. Hence, one broker consistently used an initial price slightly below the valuation and some other aimed for an initial price close to the sale price. Some brokers decided the initial price by themselves as one broker included the seller's opinion of the sale price.

The brokers are unanimous in the opinion that the most common reason for differences in price is the situation when two neighbors bid against each other. The explanation is probably that the possibility of an acquisition that can improve the land consolidation is rare, therefore the WTP increases. This situation has not been mentioned in the literature reviewed which probably is due to the quantitative methods that seems to be commonly used to address the matter of pricing of properties. The probability of a situation where one or more neighbors are interested in a property and have got the capital to pursue an acquisition seems difficult to foresee. Although, one broker stated that a general first step in finding potential buyers is to contact previous bidders. In the same way brokers should be able to contact the neighbors in an early stage to find out their interest and be able to make a more accurate price indication.

A factor that can affect the prices is hunting possibilities connected to the property. As mentioned during the interviews the hunting can be of great value if the property is located in an attractive location such as close to the large cities or to neighboring countries. Even though this factor is not included in the quantitative study it could possibly affect the price differences. For example the value of hunting can be hard to estimate for brokers, therefore buyer knowledge of the hunting value can lead to a higher or lower WTP depending on the value estimated by the broker.

6.4 Interviews versus price data and regression analysis

As figure 16 display, the percentage average difference in region 5 is higher than the 10 percent level of satisfaction (the red line). The region is characterized as close to big cities and by a high population density. Hence, the difference may be explained by a high WTP for forest properties in region 5 due to the number of potential buyers and the assumption that the biggest cities have a high capital density. Although, the WTP must be higher than the brokers estimation in order to result in a difference. This may imply that the market for forest properties in region 5 is attractive to such a degree that brokers cannot keep up with the development of the WTP.



	1	2	3	4	5	6
Average	0,7%	9,5%	7,5%	7,0%	15,6%	8,1%
Median	-1,8%	10,9%	3,0%	7,8%	7,5%	6,2%

Figure 16. The percentage average differences and the "satisfactory range" between -10 and 10 percent (own processing).

Even as the percentage average differences are relative low and within the +-10 percent "satisfactory range" the number of sold properties outside the range is high. As shown in table 8, 58 percent of the sold properties had differences exceeding the +-10 percent and are therefore outside the "satisfactory range".

The brokers' overall opinion is that geographic location is one of the most price affecting variables and especially if the property is located close to big cities. This finding may be compared with the regression analysis that shows that county is the second most significant variable. It can also be related to the variable capital density and the assumption that the biggest cities have a high capital density and that a location close to these cities may increase the price and/or the difference between initial and sale price.

The interviews show a perception among brokers that growth affects the price of forest properties. This can be compared with the results from the regression analysis which show that growth is the first variable to be excluded as a factor affecting the difference between initial and sale price. An explanation could be that the broker includes the growth in the valuation which affects the price of the property. The buyer has the knowledge that growth is included in the price and that it will not change. Hence, there is no reason that the growth would raise or lower the buyers WTP unless it is given an improperly value in the valuation of the property.

The argument that standing volume may affect the buyer's purpose with the acquisition is supported by the interviews. Two brokers mentioned that the purpose of the acquisition affect the WTP for the property. The brokers gave examples of experienced buyers that made thorough examinations or the properties and therefore could pay more than the initial price and yet feel that they made a bargain. This due to a standing volume higher than the figures announced in the broker or the forest management plan.

The statistical significance of the "small property" variable may be compared to the brokers' perception that interested neighbors' drive the price up. This assuming that it is not the return from the standing volume that is the main reason for the acquisition but the improvement of the land consolidation.

6.5 Criticism & further studies

The sample size in this study makes it easily affected and sensitive to extreme values. An example is the four properties that late in the process were removed from region 2 and 3. They had extreme differences of above 150 percent and together they raised the percentage average differences in Sweden considerable. Another fact that needs to be taken into consideration is that the most differing region 5 and the least differing region 1 also have the smallest samples. This may affect the results and it is possible that a bigger sample would generate a different result. Although, figure 14 (which can be seen as a sensitivity analysis regarding this matter) shows that the percentage average differences without these regions do not differ substantial. However, a bigger sample would raise the generalizability of the study and especially the assumptions made by the regions.

One important fact regarding the comparison between forest properties and condominiums is that the demand of condominiums is strongly related to the need for a housing and availability of them or other alternative housings. As there is a shortage of housings in many growing cities, and especially in Stockholm, the prices rise quickly. There is a possibility that prices rise even faster than the brokers' valuation, which could be a reason for the differences. This is not the case in the market for forest properties as they are mere economic investments or a means for recreational values.

In the analysis and discussion an accepted percentage difference between initial and sale price is set at 25 percent before suspicions of underpricing imply. This level is used by Hungria-Gunnelin & Lind (2008) for condominiums in Stockholm. The level of 25 percent difference is considered as relevant even if the market for pure forest properties and condominiums differ. This because it measures the brokers' ability or willingness to use an initial price close to the estimated value. Also the estimation of the value is based on equal principles independent of whether m^3f is used as the main price affecting factor or square meters of living space.

A ground for criticism is the limit of five sold properties during the period to qualify into the comparison between the brokers as this limit have no theoretical support. If more properties than only pure forest properties were to be included in the sample it is probable that the number of "frequent brokers" would increase. Hence, a theoretically grounded study with focus on brokers of all type of forest properties could potentially find patterns in the broker behavior. Given knowledge of the number of bidders participating in the bidding process it would be possible to study the relation between number of bidders and sale price.

7 Conclusions

The aim of this paper is to *"examine and explain potential differences between the initial and sale prices of pure forest properties in Sweden"*. This chapter presents the conclusions made.

The percentage average difference between initial and sale price in Sweden is 8,1 percent. The percentage average difference differ between the regions, the lowest difference is 0,7 percent (region 1) and the highest difference is 15,6 percent (region 5).

The average differences indicate that the phenomenon underpricing may not be considered as an issue in the market for pure Swedish forest properties. Neither the differences for the individual brokers indicate any use of underpricing. Although, 21 percent of the properties sold in Sweden have a difference between initial and sale price large enough to suspect underpricing. However, no proof of underpricing can be given as the differences may be caused by other factors. Further, 42 percent of the properties sold in Sweden have differences below 10 percent or no differences and 37 percent have differences between 10 and 25 percent.

Capital density, county and "small property" are variables that affect the difference between initial price and sale price positively. Standing volume affects the difference negatively.

A variable affecting the difference that is not mentioned in earlier studies is bidding neighbors. The WTP for neighbors is perceived to be high due to the possibility of making improvements in the land consolidation and the fact that sales of neighboring properties are rare. The variable "small property" also indicate that the effect of bidding neighbors increases the difference between initial and sale prices.

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Appendix 1: Coding of counties

Code	Region
1	Stockholm
3	Uppsala
4	Södermanland
5	Östergötland
6	Jönköping
7	Kronoberg
8	Kalmar
9	Gotland
10	Blekinge
12	Skåne
13	Halland
14	Västergötland
17	Värmland
18	Örebro
19	Västmanland
20	Dalarna
21	Gävleborg
22	Västernorrland
23	Jämtland
24	Västerbotten
25	Norrbotten

Appendix 2: Coefficient values for counties

Translation of variables from Swedish/abbreviations to English:
Förråd = Standing volume
Kapitaltäthet = Capital density
Mäklare = Brokerage
Län = County
Dum area = Dummy variable (small property)

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	1,001	0,125	8,02	0,000	
Förråd	-0,000005	0,000003	-1,74	0,084	1,24
Kapitaltäthet	0,0304	0,0115	2,64	0,009	2,03
Dum area	0,01158	0,00689	1,68	0,094	1,05
Län					
4	-0,199	0,178	-1,12	0,265	1,49
5	0,330	0,185	1,79	0,076	1,61
6	0,022	0,145	0,15	0,877	2,43
7	-0,105	0,134	-0,78	0,434	3,28
8	-0,488	0,235	-2,08	0,039	1,31
10	0,032	0,237	0,13	0,894	1,33
12	0,053	0,121	0,44	0,660	4,24
13	-0,032	0,137	-0,24	0,813	2,62
14	-0,005	0,117	-0,05	0,964	5,62
17	0,015	0,129	0,11	0,910	6,20
18	0,096	0,135	0,71	0,478	2,94
20	0,156	0,129	1,21	0,227	5,15
21	0,040	0,122	0,33	0,741	12,76
22	0,171	0,127	1,34	0,181	7,03
23	-0,036	0,159	-0,23	0,821	2,36
24	0,112	0,125	0,90	0,369	10,07
25	0,007	0,133	0,05	0,958	5,13

Appendix 3: Regression equation for counties with separate coefficient

Translation of variables from Swedish/abbreviations to English:
Kvot Fp/Up = Quota sale price through initial price
Förråd = Standing volume
Kapitaltäthet = Capital density
Mäklare = Brokerage
Län = County
Dum are = Dummy variable (small property)

```
Regression Equation

Län
3   Kvot Fp/Up = 1,001 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

4   Kvot Fp/Up = 0,803 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

5   Kvot Fp/Up = 1,332 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

6   Kvot Fp/Up = 1,0238 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

7   Kvot Fp/Up = 0,8967 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

8   Kvot Fp/Up = 0,514 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

10  Kvot Fp/Up = 1,033 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

12  Kvot Fp/Up = 1,0546 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

13  Kvot Fp/Up = 0,9690 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

14  Kvot Fp/Up = 0,9961 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

17  Kvot Fp/Up = 1,0160 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

18  Kvot Fp/Up = 1,0975 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

20  Kvot Fp/Up = 1,1572 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

21  Kvot Fp/Up = 1,0418 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

22  Kvot Fp/Up = 1,1726 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

23  Kvot Fp/Up = 0,965 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

24  Kvot Fp/Up = 1,1137 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area

25  Kvot Fp/Up = 1,0085 - 0,000005 Förråd + 0,0304 Kapitaltäthet + 0,01158 Dum area
```

Appendix 4: Question template

Price affecting variables
What factors affect the price on a pure forest property?

Are there more factors than the obvious like standing volume, growth etc? *(Aronsson & Carlén, 1999; Roos, 1996; Högberg, 2012)*

Are different sales tactics used when selling forest properties? *(Wilhelmsson et al, 2006; Nagle et al, 2011; Klemperer, 2005)*

Difference between initial and sale prices
What tactics exists for choosing initial price? *(Wagner, 2012; Nagle et al, 2011; Hungria-Gunnelin & Lind, 2008)*

Are these tactics individual or decided by the brokerage firm? *(Jingryd & Segersten, 2012; Nagle et al, 2011)*

What is the purpose of the initial price? *(Jingryd & Segersten, 2012; Nagle et al, 2011)*
Do you always use an initial price? *(SLU Market Price database)*

How would you estimate the differences between initial prices and sales prices on properties you sold? *(Hungria-Gunnelin & Lind, 2008)*

What differences do you think is good? At which level are you satisfied? *(Hungria-Gunnelin & Lind, 2008) (Empirical results)*

How may the difference between initial price and sale price be explained? *(Empirical results)*

Do you think that an initial price is more common today compared to 5-10 years ago? *(SLU Market Price database)*

Underpricing
How would you say that the perspective on the initial price differs between a forest property and housings? *(Hungria-Gunnelin & Lind, 2008, Stevenson et al, 2006; Jud et al, 1996, Asabere & Huffman, 1993; Larsen & Park, 1989)*

A research on brokers in Stockholm show a perception that showings with many potential bidders tend to result in higher sales prices. Do you share this view? *(Hungria-Gunnelin, 2013; Hungria-Gunnelin & Lind 2008, Stevenson, 2006)*

Do you believe that a low initial price equal more potential bidders? *(Hungria-Gunnelin, 2013; Hungria-Gunnelin & Lind 2008, Stevenson, 2006)*

Do you believe that a low initial price equal a higher sales price? *(Hungria-Gunnelin, 2013; Hungria-Gunnelin & Lind 2008, Stevenson, 2006)*