Price movements on the housing market in Stockholm

A study on apartments when stratified by size

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Abstract: This paper analyzes the differences in price performance of apartments when stratified by size, in inner city Stockholm for the period 2006 to 2008. The empirical findings are that smaller apartments have had a stronger development both for the part of the period classified as a bust and the part of the period classified as a boom. The implication of this is that prices are fluctuating within a "span" of the assumed equilibrium. Furthermore, we have provided five possible explanations for these temporary differences in price development. These are; *behavioral economics and irrational decisions, credit constraints, income deterioration, substitution effects, income elasticity* and *price inequalities on square meters.*

Keywords: Housing price, apartment, Stockholm, size.

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“No. No way. There are no relative differences in price development between objects”

-Anonymous real estate agent

Contents

1 Introduction

1.1 Prologue

The development of prices on the Stockholm housing market is of great interest for a number of people. Especially those considering exiting or entering the market supervise it closely but it is also closely followed by building contractors, carpenters, real estate agents and journalists through to the general public. Not surprisingly, this development is therefore also closely followed in the media. Newspapers, radio, television and different websites on the internet present information, if not on daily bases, at least once a week.

The housing market is also often the target of different studies where especially price development over time is studied. The phenomenon of different development of relative price is though seldom considered. Prices are often reported on an aggregated basis for different metropolitan areas compounded on a yearly basis.[1] However, these studies do not let prices vary between different apartments with different sizes.

The aim of this study is to find if there in Stockholm have existed any such differences between apartments when stratified by size. If such differences are present and at the same time not considered, it can have affects both on personal economy and public finances. The general conception is that all apartments appreciate at the same rate. Potential buyers believe in this and take it into consideration when buying an apartment, with the result that they might suffer unnecessary losses and lose out on potential gain situations. Not taking these movements into account when setting the framework for fiscal policy might also create unwanted gainers and losers on the housing market.

[1] See for example Mayer (1993)

1.2 Previous Studies

What we find to be the first study to address a this issue is made by Poterba (1991). He studies this phenomenon by looking at how tax- and demographic changes have affected housing prices in the United States during the late 1970's. The findings in this study are that both these factors affect prices differently across apartments by price. Mayer (1993) shows that differences exist in the relative appreciation rates of high-priced and low-priced homes, and that these differences can persist over long periods of time. Clapp and Giacotto (1992) study the different appreciation rates between high-turnover properties and properties that are less frequently sold in five metropolitan areas. Their conclusions are that these properties in the short run exhibit different appreciation rates. Smith and Tesarek (1991) used data from Houston and found that high-quality properties appreciated at a faster rate during the boom of 1970 but less during the bust of 1980. Pollakowski, Stegman and Rohe used data from 1974 through 1983 for five cities and their result was that low- and high quality properties appreciated at the same rate. Delaney, Seward, and Smith (1992) used data from St. Petersburg, Florida and found that high-price houses had more rapid appreciation rates than low-price houses during expansionary periods but that there are no statistical difference during more contractionary periods. When houses are stratified by size they find no consistent difference between different houses.

An apparent difference between previous studies and ours is that none of the above mentioned focus on relative prices on apartments but rather on houses spread over several areas. In most cases the data stretches over a number of decades with yearly observations while our study focus on a three year period with monthly observations.

1.3 Formulation of the Issue

Given the earlier mentioned aim of our essay, we set out to answer the following question:

”Have apartments in the inner city of Stockholm when stratified by size had different relative performances in price during the latest general price downturn on the housing market?”

1.4 Hypothesis

We believe that when there is a general downward trend in the economy, a lot of people have to trade down apartment size; those living in three room apartments are forced into two room apartments, and those with two rooms might be forced to live in one room.

The same will of course be true for those living in one room apartments, but here the consequences of moving are greater. Moving from a one room apartment in the inner city of Stockholm, to a one room apartment outside the inner city is a much larger step compared to switching from two rooms to one room inside Stockholm. Those living in one room apartments will therefore be much more reluctant to move, meaning that they are prepared only to move if they receive a substantial amount of money for their current apartment. You could say that one room apartments serve as a kind of base, from which it is quite a large step to move from.

Smaller apartments should therefore have had better performance in price compared to larger apartments during price downturns.

1.5 Demarcations

We have chosen to specify our research on the inner city of Stockholm apartment market only. This is done mainly because we want to have a well defined market, where effects that may distress only parts of our market are minimized as far possible. For example, one room apartments in the inner city of Stockholm and one room apartments in the suburban areas are assumed not to be on the same market. By limiting our research to just the inner city, we get rid of the problem of having different geographical parts of our market developing in separate ways.

Moreover, given that the main aim of this thesis is to study relative prices during downturns, we have chosen the most recent period in time where we experienced large price falls on the housing market; a period that we have isolated to between the middle of 2007 and the end of 2008. We also use data from the preceding upturn in prices (starting in the beginning of 2006 and ending in the middle of 2007) to be sure to no miss any underlying factors that affects the downturn in the market and to be able to test the validity of some of our possible conclusions in reverse cases.

Finally, we limit our study only to include tenant-owned apartments. The other prominent form of housing in the inner city of Stockholm, tenancy-rights, we do not consider to be on the same market. The reason for this is that the rental restrictions prevailing in Stockholm put the normal relation between rental prices and housing prices out of play. Prices of tenancy rights therefore only have highly limited effects on prices of tenant-owned apartments, which would be the case in the absence of these restrictions.

1.6 Methodology

To deal with the issue of this study, we will begin by presenting the dataset we have made use of. Thereafter we will analyze the data and present our findings. When the data and the empirical findings have been presented we will create a theoretical framework (a basic model) which we will use to analyze this. This framework will be made up of a number of assumptions which will allow us to look at different explanations for our empirical findings separately in a ceteris paribus fashion. In the subsequent section we challenge these assumptions one by one to provide explanations for our empirical findings.

2 Presentation of the data

2.1 Presentation of Variables

The data presented below, we owe the gratitude of Mäklarstatistik to.[2] Robin Jakobsson, an analyst for the company, has compiled and delivered the dataset which we use in our analysis. Large parts of the data are confidential why do not have the possibility to present it as a whole.

[2] Mäklarstatistik AB (www.mäklarstatistik.se) is a company that gathers information and covers roughly 70% of all sales on the housing market for Sweden.

Our dataset consists of 17 996 observations of apartments sold in the inner city of Stockholm, during the period 2006 to 2008. The variables which we will use in our analysis are *township*, *square meters*, *price*, *room*, *day of contract* and *price per square meter*.

Initially, the dataset consisted of all townships of Stockholm. However, since we have decided only to focus on the inner city, we only included those inside the city tolls.[3]

The variable *price per square meter* we created ourselves by dividing the price of an object with that apartment's amount of square meters. The variable *room* we have used to define the size of the apartment, instead of using the more exact measure of size which is square meters. This was done mainly to avoid the problem of having to create arbitrary categories. We also believe that potential buyers consider the number of rooms prior to the number of square meters, either consciously or subconsciously. In the dataset the variable *room* stretches from one to ten but we decided to group all apartments from five and upwards into one stratum. The idea is that there are too few of these objects to let them constitute an own category, plus the belief we have that these objects do not to the same extent represent the market square meter price. We rather think of four room apartments to be the most interesting category when comparing relative prices between small and large apartments.

We also decided upon the *day of contract* as the most accurate variable to match the price to the right date. The *day of contract* is the date when both seller and buyer agree upon the price and settle the deal. This price then reflects the market value of that apartment at that particular date.[4]

2.2 Processing of the Data

For starters, to make the dataset more reliable, we removed all observations where the square meter price was below 12 000 Swedish crowns (hereon after referred to just as crowns). This was done for two reasons. Firstly, we believe that apartments sold in the inner city of

[3] See appendix (a) for a list of townships included.

[4] In our original dataset we had the time variables *day of handover* and *day of moving in* as well.

Stockholm with a square meter price below this do not reflect the overall market, why these observations would give faulty information (quite likely these could be transactions between family members etc). Secondly, it is likely that observations with a square meter price below 11 000 crowns actually reflect transactions made at a different price, but where the data has been misreported; a square meter price of 11 000 crowns could easily have been a misreported transaction in fact made at a square meter price of 110 000 crowns. The reason for choosing 12 000 crowns (and not say 9 000 crowns or 14 000 crowns) is that 120 000 crowns per square meter serves the maximum price for quite a number of apartments.[5]

In order to analyze the data in a more comprehendible fashion, we subsequently compounded our daily observations on a monthly level. This makes diagrams less muddled and also gives fewer swings in prices, making them easier to draw conclusions upon. It also gives us more observation per period of time, giving each observation a higher level of reliability.

To create these monthly observations we summed up all prices for each category of apartment during a particular month and divided it by the sum of the square meters for the same objects. By doing it this way we think of the housing market as a number of square meters instead of a number of apartments i.e. allowing larger one-room apartments to represent a larger share of that market.[6]

3 Empirical Findings

3.1 Data for the Total Period

Featured below is a descriptive statistic summary of the dataset based on every individual observation. The table is meant to give the reader an initial overview of the complete dataset.

[5] There are observations with a square meter price above 120 000 crowns per square meter, but they are reasonable few and usually have some special characteristics (very prestigious address, low monthly fee, etc) implying they actually have been sold at that high price.

[6] One could also have used a mean of the square meter price per apartment category and month but then letting all objects in a category constitute the same weight.

	N	Minimum	Maximum	Mean	Std. Deviation
Square meters	17996	11	310	59,8	29,7
Price	17996	544000	18638000	2846033,15	1500573
Price/m2	17996	12000	142029	48368,14	9289
Valid N	17996				

Table 3.1. Descriptive statistic of the dataset for each single observation. Source: Data compiled by Mäklarstatistik, table by authors[7].

The diagram illustrated below shows the price development for all different objects, on a monthly basis. Trend lines have been added for one room and four room apartments (see appendix (b) for diagram with trend lines for all strata).[8]

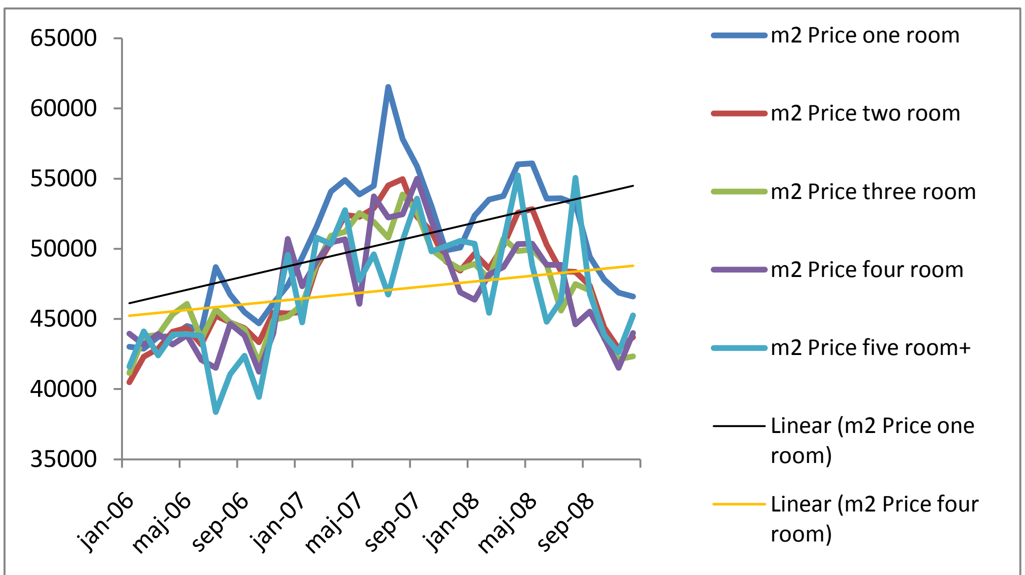

Diagram 3.1. Monthly observations on apartments stratified by size for the whole period[9].

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[7] Hereon after all tables and diagrams in section 3 are created by the authors but the data is from Mäklarstatistik.

[8] In the forthcoming presentation of the data we have chosen only to provide the diagrams with trend lines for one room and four room apartments. This is done to make the diagrams easier to read but also due to the belief that one room and four room apartments represent the most accurate proxies for "small apartments" and "large apartments", respectively.

From diagram 3.1 it is clear that during the entire period, prices on smaller apartments have had a much stronger development, in nominal terms, compared to larger apartments, even though the total price trend for all objects is positive. These findings are visualized by the trend lines, where the slope illustrates the differences in price development during the time period.

Illustrated below, are descriptives for the period shown in diagram 3.1.

	N	Minimum	Maximum	Mean	Std. Deviation
One room	36	42894	61527	50280,10	4804,877
Two room	36	40480	54975	47717,62	3939,730
Three room	36	41156	53884	47255,77	3444,903
Four room	36	41233	54996	46993,20	3818,397
Five room+	36	38376	55239	46629,47	4439,412

Table 3.2. Descriptives for apartments stratified by size for the whole period.

Worth noticing from table 3.2, is that mean price on one room apartments is the highest (50 280 crowns per square meter), followed in a consecutive manner by size to five room apartments with the lowest mean price (46 629 crowns per square meter). From the same table we also see that the larger or the smaller the apartment is, the greater its standard deviation is. One room apartments and five room apartments show largest swings in price (standard deviations), followed by two room and four room apartments while three room apartments seem quite stable relatively.

[9] Not that the names of all months are labeled in Swedish due practical issues.

Since our ambition is not to explain actual price differences over time, but to study relative prices, our data needs to be cleared of the differences in price that prevail between objects. We therefore "reset" all prices at the beginning of the period (January 2006), so that all prices are given the value 100. Featured below, is the total period with prices indexed to 100 in January 2006[10].

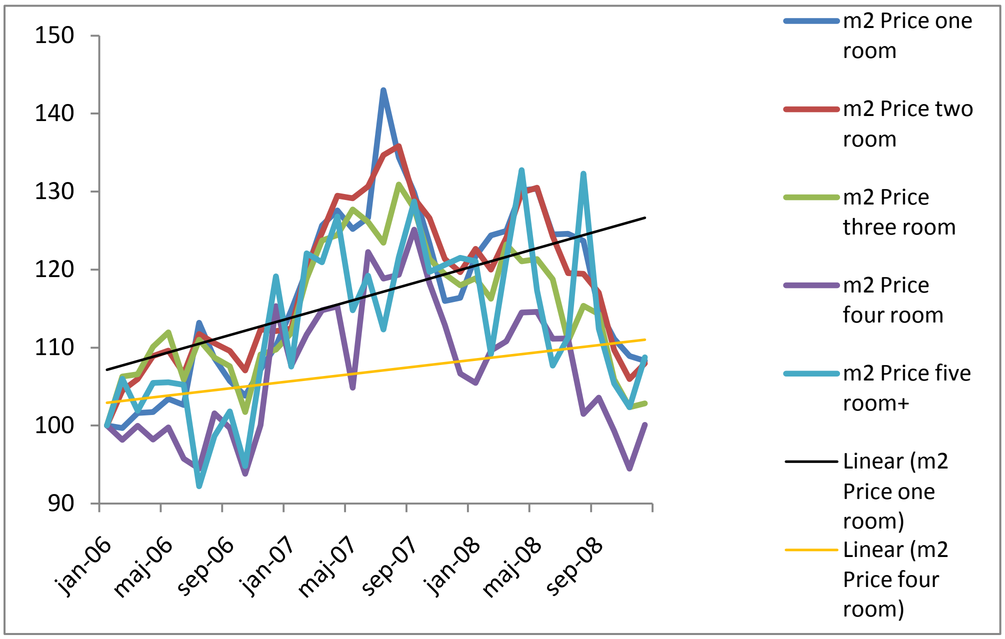

Diagram 3.2. Monthly observations on apartments stratified by size with prices indexed to 100 in January 2006[11].

From diagram 3.2, it can be seen that prices of one- and two room apartments have developed stronger than that of other objects also in relative terms. Four- and five room apartments, on the other hand, seem to underperform in price relative to smaller apartments, during the whole period while three room apartments are somewhere in between. Also worth noticing is that when four room apartments (and five room apartments) in the beginning of the period had a negative development the rest of the market was up to around 10 per cent. At the end of the

[10] See appendix (c) for diagram with trend lines on all strata.

[11] See appendix (d) for list of input data and (e) for diagram with trend lines for all strata.

period, four room apartments summarize negative growth in price while other objects have had a positive development.

During this period of three years we have identified four periods of either upturn or downturn in overall prices. The first upturn began in January 2006 and ended in September 2007. Thereafter there was a shorter period of falling prices until December 2007, followed by an upturn again ending in May 2008. The period then ends with falling prices until the beginning of December 2008.

3.2 The Upturn

The first upturn with indexed prices is shown in the following diagram.

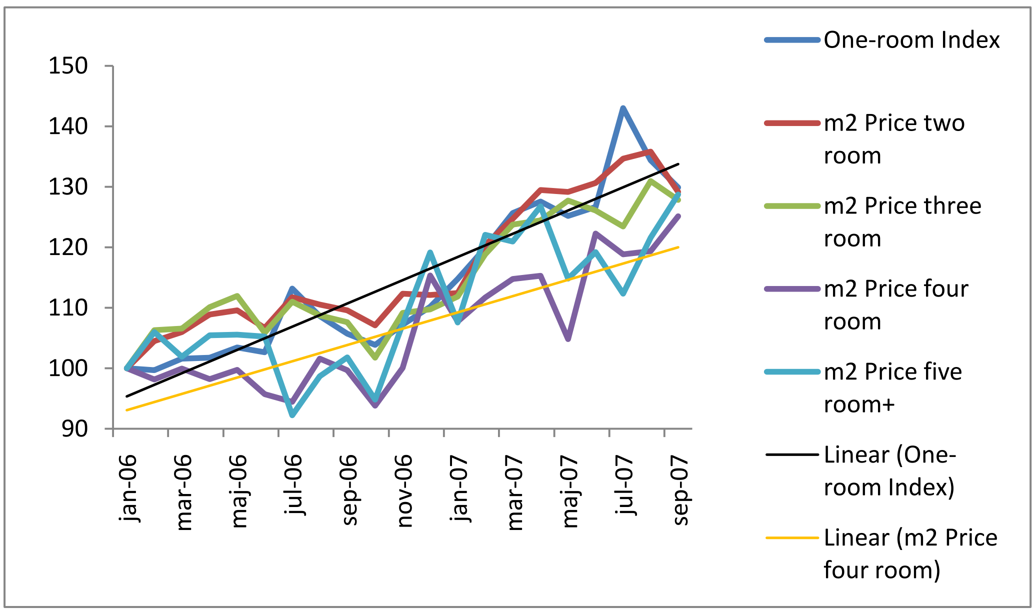

Diagram 3.3. Monthly observations on apartments when stratified by size with prices indexed at January 2006 and ending on September 2007.[12]

When isolating the first upturn, it can from diagram 3.3 be seen that smaller apartments have had the highest pace of growth in prices, while four room apartments clearly have underperformed. During this upturn period, there is only one observation (December 2006)

[12] See appendix (f) for list of input data and (g) for diagram with trend lines for all strata.

when prices on four room apartments have risen more in percental terms than smaller apartments (even three room apartments for this particular observation).

3.3 The Downturn

The three following shorter periods with two periods of falling prices and one with rising prices, we decided to merge into one period where the overall attribute is falling prices. We decided to have only one period of falling prices because drawing conclusions with respect to such short periods would be hard and probably inaccurate. We believe it is more interesting to look for overall market tendencies, why we chose to see the whole remaining period as a period of falling prices even though it also includes a shorter period with rising prices.

With prices indexed at the same date as the previous upturn ended on (September 2007), we get a diagram that look as the one below. We decided to skip the last observation in December 2008 because that month showed a positive price development for all objects except for one room apartments that were nearly unchanged. Since the diagram is to show the attributes of a downturn it makes sense to remove that observation from the data.[13]

[13] December 2008 could be the start of a new upturn and to minimize attributes assigned to upturns this month was excluded.

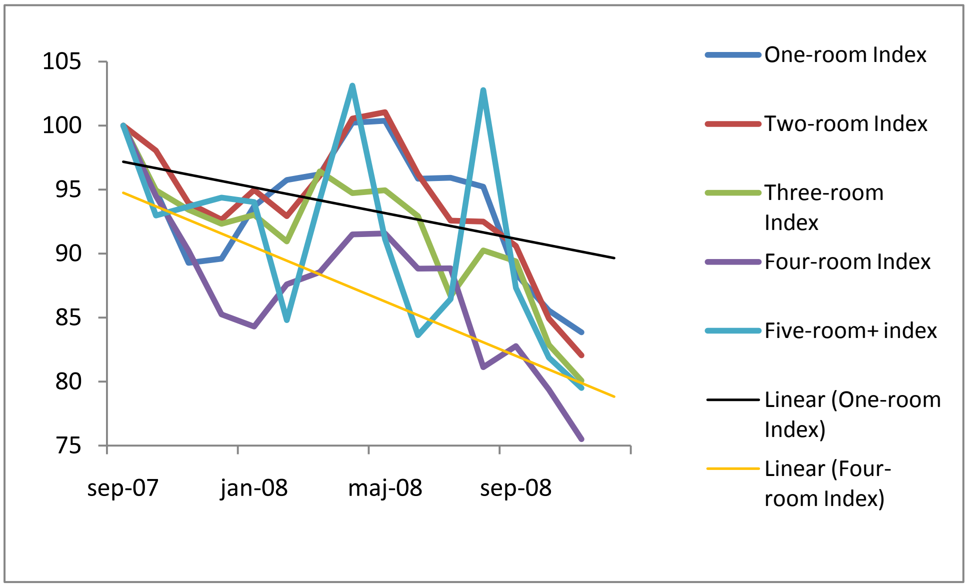

Diagram 3.4. Monthly observations on apartments stratified by size with prices indexed at September 2007 and ending on November2008.

During this downturn, smaller apartments seem to withstand the fall in prices the best. While prices on four room apartments are down nearly 25 per cent, one room apartments are down around 15 per cent.

3.4 Apartment Turnover

From our dataset we have also compiled statistics for the number of sold objects during both the upturn and the downturn. During the 21 month long upturn, a total of 11 159 objects were sold, and during the 15 month long downturn, 7 191 objects changed owners. Two things should however be observed; statistics for objects sold during September 2007 are included in both the up- and downturn period and objects sold during December 2008 are not at all included.[14]

[14] The sum of 11 159 and 7 191 is 18 350 but excluding the September 2007 observations (628) and including December 2008 (274) gives us our initial number of observations (17 996).

Illustrated below are the average number of sales per month during the up- and downperiod, respectively for each category of apartment.[15]

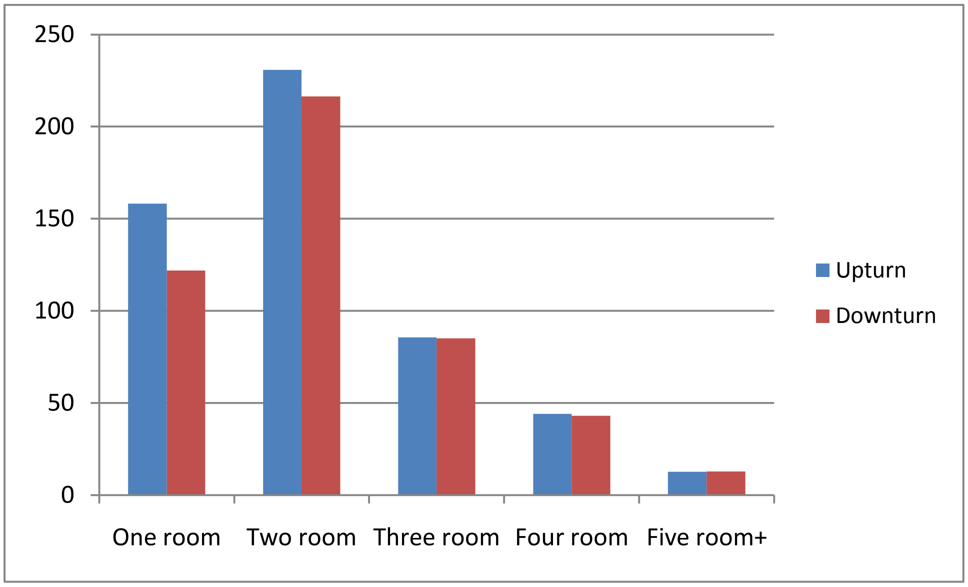

Diagram 3.5. Apartment turnover on a monthly average basis for both periods for all strata.

It is in both periods the case that two room apartments constitute the largest part of the market, followed by one-, three- four- and ultimately five room apartments.

Shown below is the percentage share of total turnover the different objects make up during the two periods.

[15] Noteworthy is that the two periods do not constitute of the same corresponding months in different years which could lead to seasonal differences which is however not further considered.

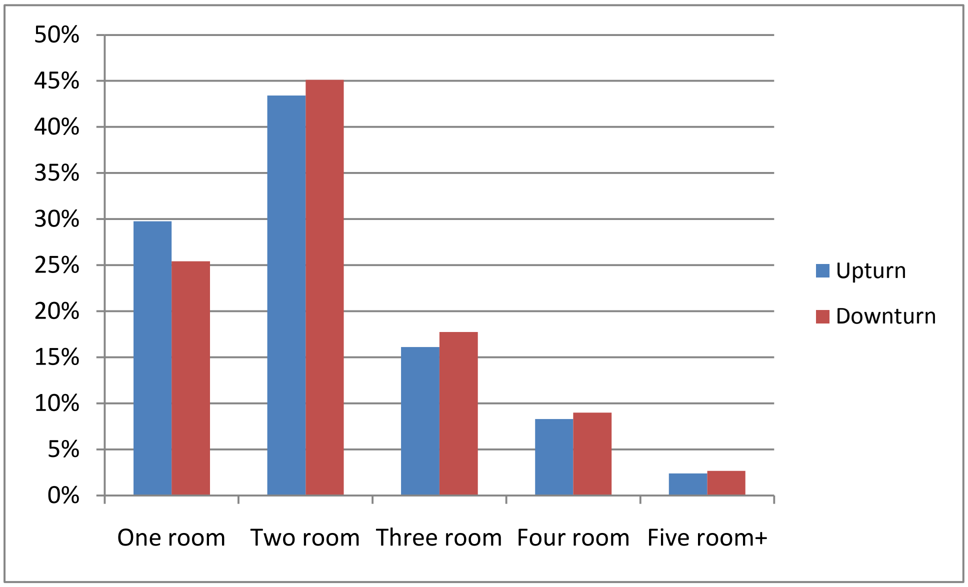

Diagram 3.6. Relative apartment turnover with respect to total sales for both periods separately for all strata.[16]

These figures, simply calculated as the number of objects sold in each stratum during a period divided by the total of objects sold that same period, casts light on a couple of things. Firstly, one room apartments was the only stratum that had a lower relative turnover during the downturn compared to the upturn. Secondly, it was also in this stratum were the difference between the two periods was the greatest, approximately 5 percentage points.

3.5 Quality of Sold Objects

In order to control for what type of apartments that have been sold during the two periods we have calculated the average number of square meters for each stratum for both periods. The assumption made is that apartments in one stratum with equal square meters have the same quality on average. The diagram below shows the mean amount of square meters for both periods for all strata.

[16] See appendix (h) for input data.

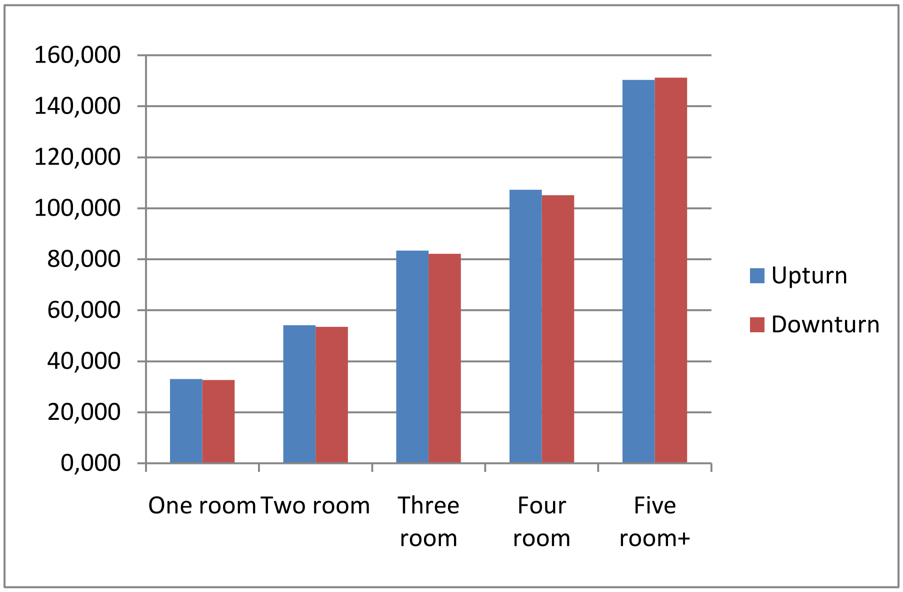

Diagram 3.7. Square meter average for both periods for all strata.

Looking at diagram 3.7, there appears to be small differences between objects sold in the upturn versus the ones sold in the downturn for either stratum. The percentage differences between the two periods, from upturn to downturn, are shown in the following table.

	One room	Two room	Three room	Four room	Five room+
% change	-1,14%	-1,04%	-1,47%	-2,01%	0,57%

Table 3.3. Percental change in square meter average between the upturn and the downturn stratified by size.

4 The Basic Model

Now that the data has been thoroughly presented, and the reader should be familiar with our empirical findings, we will continue with trying to analyze these findings.

To be able to do so in meaningful way, we need a common thinking ground to stand on. It is essential that readers and we have the same perception about the characteristics of the different apartments, the behavior of households living in them, and the general function of the market. Hereby we aim to create a scenario where all things that can affect prices can initially be kept constant, allowing them later to be challenged one by one.

We therefore create a basic frame, or model, which should be seen as a default position for this further analysis. (Already now, it should though be noted that all forthcoming assumptions are not necessarily thought of as probable, or even plausible, but rather as the necessary basis for further analysis).

Suppose a situation where the inner city of Stockholm housing market is assumed to consist of 100 apartments with 100 households occupying these. In this context, and given the limited period of time that over which our data stretches, we continue building a model with the following assumptions:

- The number of apartments is constant during the time period (which we have sorted into different strata). This means that no new apartments are built and nor are any old ones demolished. Furthermore, no apartments are combined nor any current ones split.
- Each apartment is at all times occupied.
- The number of people in each stratum is constant over the period.
- The number of people in each household is on average the same in each stratum over the period.
- Households with highest income live in the largest apartments, through to the households with the lowest earnings who live in the smallest apartments. Literally this means that the richest household lives in the largest apartment, the poorest household in the smallest apartment, and the fiftieth richest household lives in the fiftieth largest apartment.

Given this, the number of households on the inner city of Stockholm housing market is constant over the period (although the constitution of these people can of course change during the period).

Moreover we make the following assumptions about these households, their living conditions and the behavior of them:

- Tough economic climates with decreasing in incomes will (in relative terms) hit the different income groups to exactly the same extent.
- Downturns in prices on apartments depend exclusively on a downturn in household's income (including expectations on future incomes). We thereby exclude factors like changing demographics, changes in preferences etc. This is motivated by the limited period of time of which over our data stretches.
- Income elasticity on housing is 1 and independent of income (and thereby also on apartment size). This means that every household is assumed to dedicate the same percentage of extra income towards their apartment regardless of where in the income span they are.
- All consumers behave in a rational fashion and have the same understanding of how the market works.

Furthermore we also make the following assumptions about the Stockholm property market, and the apartments themselves:

- Cost of living is directly proportional to size of dwelling. This is undisputable the case with the monthly fee (as it is based on the apartment size in square meters). When it comes to consumption of water, electricity and insurances one could argue that small apartments (in relative terms) consume more of these goods (you typically only have one kitchen however big your apartment is, and you do not have an extra bathroom just because you have one extra room). These differences are however neglected, partly because you could balance up these assumptions with some counterarguments. Households in a larger apartment typically tend to be made up of a larger number of people, meaning higher energy and water consumption, higher insurance fees etc. People in these households will also (according to previous assumptions) be wealthier, which makes it reasonable to assume that they also consume more of these goods on a per person basis.

- All households have the possibility to borrow to the same interest rate and to the same extent i.e. everyone can borrow proportionally to their income.
- Perfect competition prevails on the market.
- Every square meter of an apartment has the same value.
- The quality of all sold objects in each stratum is the same for both periods. This assumption is supported by the results from table 3.3 which shows that there are only marginal differences in size hence quality.

Summarizing the basic model yields a situation where the prices of all apartments, in relative terms, move in the same fashion**.**

5 Analysis

5.1 Behavioral Economics and Irrational Decisions

In our model we have made the assumption that all households are behaving in a rational manner and that they all have the same perception of future housing prices, inflation and interest rates. However, assuming that all people have the same level of understanding of how the market works is debatable. By loosening that assumption we get a model where we have different beliefs across different households. One way to think about this is by assuming that smaller households, with less income, have less education and hence less understanding of how the market works. A less controversial way of viewing it would be by saying that newer households, typically living in smaller apartments, have spent less time on the market relative to those who live in larger apartments and therefore have had less practical experience of how the market functions. Less practical experience could be thought of as poorer ability to predict future price movements, housing loan interest rate development or other factors that may affect prices.

In a paper by Brunnermeier and Julliard (2007) it is stated that people, when comparing monthly payments on tenancy owned apartments and rents on tenancy rights, do not take into account that inflation lowers future real mortgage payments hence not behaving rationally. In an article in The Nation (2008-11-25) one can read the following citation, which supports the assumption that specifically small households lack understanding of how the housing market works.

"Because a market slowdown seemed unlikely and a crash unthinkable, risky loans proliferated, particularly loans made to low-income or credit-poor "subprime" borrowers. Many were first-time homebuyers who flocked to low down payments with only a vague understanding of ballooning interest rates to come; at the same time, mortgage lenders like Countrywide ignored obvious long-term repayment risks to collect outlandish lending fees in the very short term."

More money was used in the market for small apartments which drove prices to a peak during the summer of 2007. This partially explains why apartment prices rose relatively more during the upturn. One should though have in mind that these are American conditions and are not directly applicable on the Swedish housing market. However, there are great similarities between the two markets why the reasoning should be valid for Sweden as well. As it was in the US with easy access to credits with low securities, it was according to Dagens Nyheter (2008-07-22) during the same period easier to get loans with less security on the Swedish credit market as well. The same reasoning about lacking understanding in the US market could easily be transferred to Swedish low-income and first time borrowers.

It would be natural to think that the opposite would occur during downturns, that prices of small apartments should fall the hardest, but that is not the case in our data. This does however not make the explanation invalid but rather that there could be other effects outweighing this particular explanation.

One reasonable explanation is that those people who bought small expensive apartments during the upturn do not want to sell their apartments with a capital loss a year later when prices are falling. This reflection could be backed up by the number of small apartments that changed owners during the downturn in relation to the upturn; during the upturn 30 per cent of the total market sales constituted of one room apartments while during the downturn it was only 25 per cent. It is plausible that those buying small expensive apartments during the upturn are not the same people selling their apartments during the downturn.

Even if a person would be better off in real terms selling his apartments, there are psychological barriers to make that kind of a loss in nominal terms why that person rather holds his apartment for multiple periods. This argumentation is consistent with the research done by Genesove and Mayer (2001) whose conclusion are that sellers facing a nominal loss set prices above the present market value hence not letting the market adjust. This implies that the housing market in the inner city of Stockholm is far from perfect competitive, which would be another deviation from one of the assumptions of the basic model that could affect the appreciation rates to different extents for different apartment sizes.

5.2 Credit Constraints

An explanation why prices of small apartments have had a better price development relative to larger ones during the total period can be backed up by an article in Dagens Nyheter (2008-07-22). There it is stated, by Tor Borg, an interest rate analyst of SBAB, that Swedish banks today cannot let borrowers loan 100 per cent on their apartments which was the case during the upturn period. A down payment of 10-25 per cent is today more or less a demand from the banks. In the same article, Tor Borg says that first time buyers today (which we have assumed to be households living in small apartments) have difficulties in receiving reasonable housing loan interest rates due to the fact that they more often need to have a higher debt-to-equity ratio. The higher this ratio is the worse condition on your housing loan you get. This would imply that fewer people had access to the market for small apartments during the downturn compared to during upturn which should serve as a driver for prices downwards. This offsets the assumption in the basic model that all households face the same possibilities on the credit market.

We however believe that when credits were easy accessible, a new group of participants entered the market for small apartments and competed with the already established potential buyers. In terms of our model one could think of this as an increase in the number of households on the demand side of the market but with supply still consisting of 100 apartments. All these new participants wanted to enter the market via small apartments, driving up prices for these. When the financial crisis struck and banks got more reluctant of giving credits, some of these new participants (those did not buy an apartment during the upturn) disappeared. Left were these new participants who bought apartments during the upturn and all of those initially on the market, still with more people than what there was initially.

The demand during the downturn has therefore shrunk in relation to the upturn (but still risen on a total for the whole period). However, we also believe the supply has shrunk during the period. Those households that during the upturn received advantageous conditions for their loans (which they would not be able to get today) have gained entrance to a market on which they wouldn't be able to enter today. Since these people have borrowed 100 per cent on their apartments and had depreciation in value their debts are greater than their assets, they have lost the equity of their "apartment balance sheets". If these people where to sell their apartments and realize their capital loss they would be in debt why they choose not to sell. In terms of the model, the supply is no longer 100 apartments but less. With both shrunken demand and supply it could be the case that smaller apartments do not exhibit the falls in price they should have had if these people were not "locked in". Depending on the magnitude of the fall in supply, there is then a possibility that the price of small apartments should not fall to the same extent as larger ones, in relative terms. This could explain why smaller apartments have withstood this particular downturn the best.

5.3 Income Deterioration

In our basic model, we assume that the general income deterioration that has caused apartment prices to fall, has struck all income groups in inner city Stockholm to the same extent. For example that between 2007 and 2008 every household has received 10 per cent less income. This however, is most likely unreasonable.

Figures for Stockholm for 2008 were not available at the time of writing but looking at data for the years 2006 and 2007 and then using countrywide data compiled by SCB for 2006-2008 as a proxy for the same period in Stockholm, some conclusions are possible to draw.

Below is a diagram showing how the number of people in different income classes (relative to the total population in the inner city of Stockholm), have changed between the period 2006 and 2007. Since the total number of people in the population has increased by a meager 1,3 per cent between the two years, we can conclude that the changes are mainly due to people switching categories, rather than migration effects.[17]

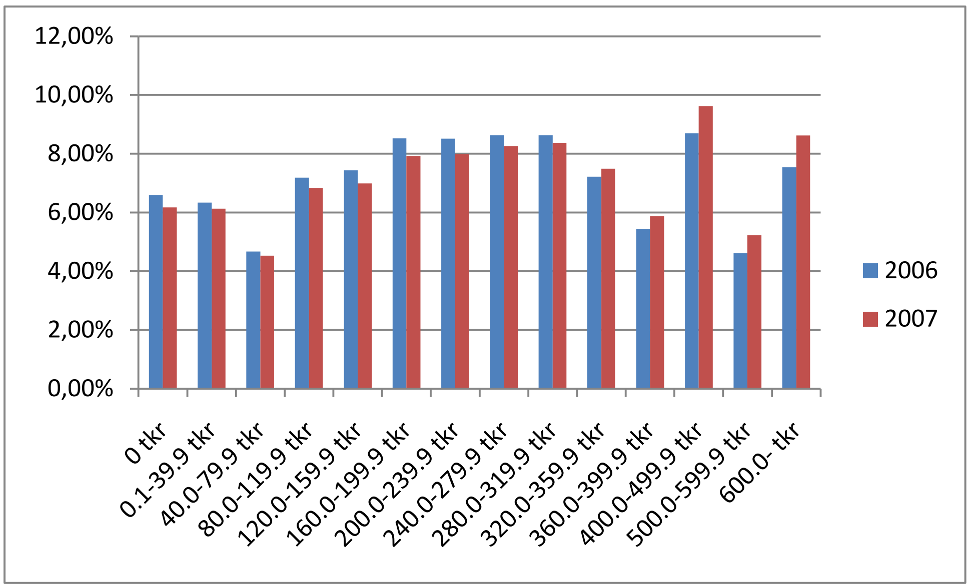

Diagram 5.1. Percentage of people in inner city Stockholm sorted by different income groups for 2006 and 2007. Source: USK(a), USK(b).

From the above diagram, we can see that the number of people in the highest income groups (i.e. those assumed to live in the largest apartments) have increased while the number of people in the lower income groups decreased.

[17] Total population in inner city Stockholm 2006 and 2007 was 255942 and 259188 persons, respectively.

As mentioned earlier, data for 2008 (the largest part of the down-period) is not available for the inner Stockholm area, but the below graph shows the change in income for the whole of Sweden (with the population divided into deciles).[18]

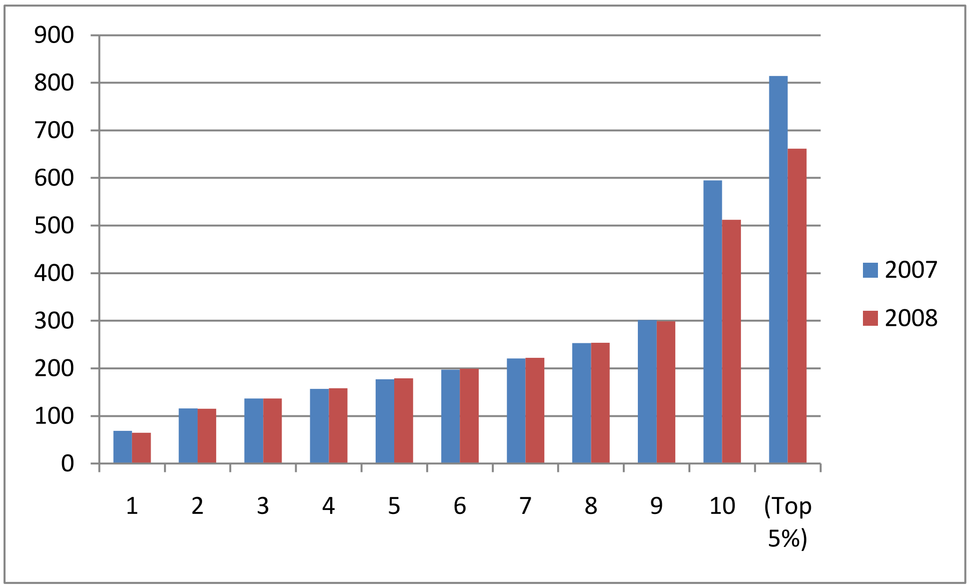

Diagram 5.2. Population of Sweden sorted in deciles with respect to their total income for 2007 and 2008. Source: SCB (2009).

From here we can see that it is in decile ten where the most apparent decrease in income has taken place.

Before any conclusions can be drawn from this material, two important things have to be clarified. Firstly, the diagram over the whole of Sweden is not directly applicable for the inner city of Stockholm but we assume the relation to be applicable on Stockholm. Secondly, data is presented for individuals, while the basic model concentrates on households. Therefore, the data should be seen as a basis for a more general discussion, rather than potential input data for a mathematical model. A discussion which we base on the view that the income of wealthiest people (i.e. those dwelling in the largest apartments) has decreased not only in

[18] See appendix (i) for the same graph including estimations for 2008 and 2009, which could have psychological effects on prices. If people expect their income to change they may already today adjust to their consumption to future wealth.

absolute terms, but also in relative terms, compared to the poorest households during the down-period.

With the assumption made in the basic model that every household has the same income elasticity for housing, the observed decrease in income will mean that richer households alter the amount of money they spend on housing to a larger extent compared to poorer households.

This does help explain the fact that larger apartments have fallen more in value during the downturn. However, the reverse argument should mean that the larger apartments should have risen more during the up-period, which is not the case. The conclusion is therefore that differences in income deterioration cannot (at least exclusively) explain the difference in price performance of different objects.

5.4 Income Elasticity

To create a frame were the prices of all objects move in the same way we, in our basic model and in the analysis so far, have assumed that the income elasticity on housing is one and also constant for all income categories. In terms of the 100 apartments, the ten richest households living in the ten largest apartments would then have an income elasticity of one, which would also be the case for the ten poorest households living in the ten smallest apartments. Regardless of where in the income ladder you are, a ten per cent decrease in household income would lead to a ten percent decrease in the part of your income you spend on housing given that income deterioration has struck equally across all households.[19]

This assumption however, seems inconsistent with research in the area. In an early study, Carliner (1973) finds that income elasticity is above zero but below one.[20] He also finds that the

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[19] Note that this part of the analysis holds income deterioration constant while loosening the assumption of a constant income elasticity of 1. The previous part on income deterioration held income elasticity constant and loosened on the assumption of equal strikes in incomes.

[20] Numerous studies have been conducted in the field, estimating different values for the income elasticity in different areas and over different time periods. For one of few studies estimating the elasticity to be above one,

income elasticity is not constant; as income rises so does the income elasticity even if the pace of the increase slows down, with the elasticity never reaching one. The implication of this is that when you get a rise in income you use a smaller part of your increase in income on housing than what you did with your original income.[21]

This means that the richer the household (i.e. the larger their apartment) the smaller the part they spend on their housing is. For a starter, this fact explains why larger objects have a lower price per square meter compared to smaller apartments.

What is more interesting is that this also means that when a household gets richer and changes housing type from say a two room apartment, to a three room apartment, they also are not prepared to spend as much in relative terms as they were before, meaning that larger apartments will develop worse than smaller ones in an upturn. If the same household were then to receive the same income as before (and switch down apartment) they would once again start spending a higher relative amount of their income on housing, meaning that smaller apartments will develop worse than larger ones in a downturn.

In summary, the fact that income elasticity most likely differs between different income groups, serves an explanation for why larger apartments have a lower price per square meter compared to smaller ones. This insight combined with letting households change income groups, could explain why larger apartments would perform worse during an upturn, but perform better during a downturn.[22]

This does serve as an explanation for why the fact that larger apartments have risen less during the up-period. However, once again the reverse argument should mean that the larger apartments should have fallen less during the down-period, which is not the case.

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see Ihlanfeldt (1984). For our purpose, most interesting is however not what the exact value is, but rather that it can be different from one and also differ between different income groups.

[21] If for example a household with an income elasticity on housing of 0,4, with an after tax income of 50 000 crowns of which they spend 12 500 (25 per cent) on housing, gets an increase in income of 5 000 crowns they would spend 500 crowns more on housing (5 000 * 0,25 * 0,4), whereas if the same household had an income elasticity on housing of 0,7, they would have spent 875 crowns (5 000 * 0,25 * 0,7) of the 5 000 crowns on housing.

[22] We here assume Carliner´s findings to be true for inner city Stockholm. With income elasticity higher than one and increasing, the reverse price movements could be explained.

Once again, the conclusion is therefore that differences in income elasticity cannot (at least exclusively) explain the difference in price performance of different objects.

5.5 Substitution Effects

In the basic model, we thought of the Stockholm apartment market as an isolated market. However, one could consider the Stockholm market as consisting of several different markets. In terms of the 100 apartments a situation where 30 one room apartments in Stockholm together with one room apartments in the town of Uppsala made up one market, but where four room apartments in inner city Stockholm and semi detached houses in a Stockholm suburb, make up a separate market, is plausible.

One could for example imagine that a typical household living in a one room apartment is a young person searching for a city job, for whom living outside the inner city is not an option; if not possible he would rather get a job somewhere else and move. The typical household living in a four room apartment on the other hand, might be a family with children for whom moving from Stockholm is not an option. They might however consider moving to a different form of housing, but in a Stockholm suburban area.

It is far from the scope of the essay to analyze the phenomena, but the bottom line is that the inner city Stockholm housing market might not be as clearly a defined market as first thought. Rather, it can make up several different markets, either on its own (one room apartments and three room apartments respectively) or together with external objects (one room anywhere in a Swedish town versus four rooms and smaller villas in Stockholm).

The implications of this would be that prices of different objects can move independently of each other due to factors affecting only certain objects.

5.6 Price Inequalities on Square Meters

Imagine that an apartment is made up of two parts. The first part is a fixed number of square meters assumed to be the minimum space required to live in, which is the same for all apartment sizes. The second part of the apartment is made up of the rest of the square meters, which number depends on the size of the apartment.

Assuming that these minimum square meters have a fixed price (for example the cost of building) we then get a situation where actually only one part of the apartment has a market price. In terms for the basic model, this means that we challenge the assumption that each square meter in an apartment has the same price.

The implications of this are then that a fall in prices (given the assumptions, a fall solely in the price of the extra square meters) would strike differently on different apartments depending on their base-to-extra ratio. Smaller apartments would then withstand the price fall better compared to larger apartments, due to the fact that they to a greater part consist of base square meters, which price remains unchanged. During an upturn we should then observe the opposite case, i.e. that larger apartments appreciate at a higher rate compared to small apartments.

As we do not observe the expected movements during the upturn (small apartments have, appreciated at a higher rate compared to large apartments) this argument cannot serve as a sole explanation for the observed movements. Rather, it should be seen as a factor possibly reducing the magnitude of otherwise observed swings.

6 Conclusions

We set out to find if there were any differences in the appreciation rates of inner city apartments in Stockholm when stratified by size. We have presented empirical evidence showing that it is the case that smaller apartments have withstood the general downturn better relative to larger ones. However, smaller apartments had the same attribute during the preceding upturn meaning that in either period the market is moving towards, or away from, a state of equilibrium. A classic example illustrating this state of a floating equilibrium is a person walking a dog. As the dog strays away from its master, the leash will pull them back together. In this case, the leash represents the "span" of equilibrium in which the market is moving and can move.

Even though it is in the long run not a sustainable situation with different appreciation rates it is important to understand what drives fluctuations in the short run. We provided six different reasons of which we all believe can be part of such explanation. Even with these reasons set aside, the phenomena is interesting in itself for reasons concerning personal economy and public finances. Politicians should for example have this in mind when deciding upon transfer payments between different groups, not to offset the initial intentions behind them.

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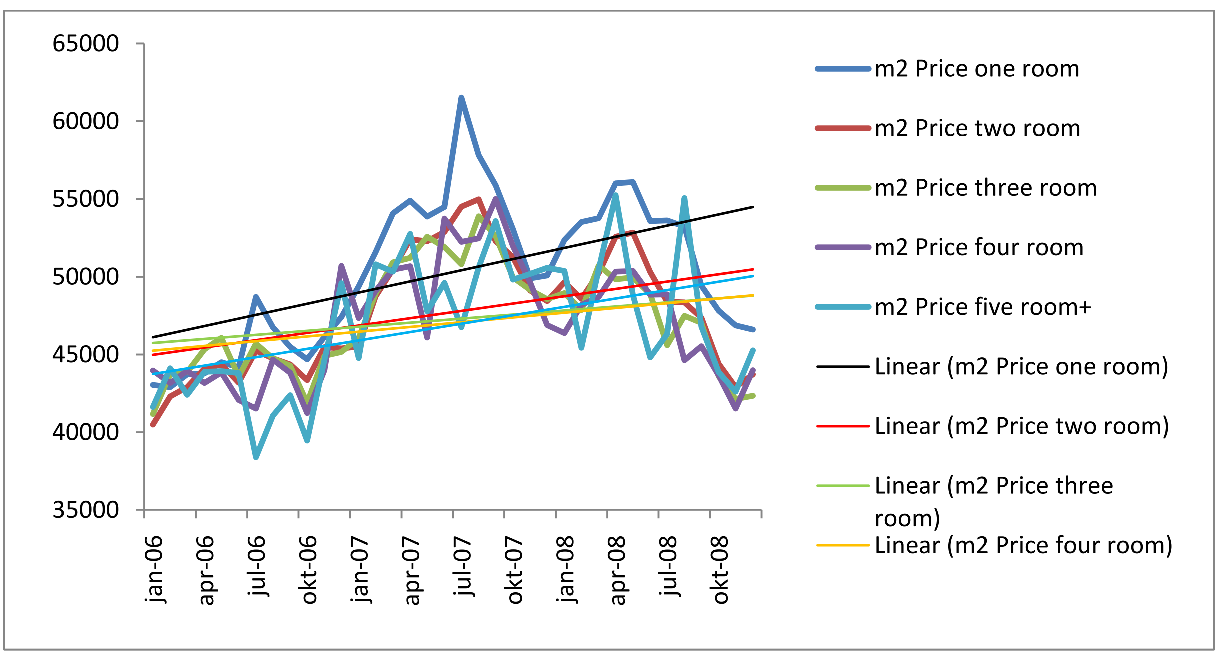
8 Appendix

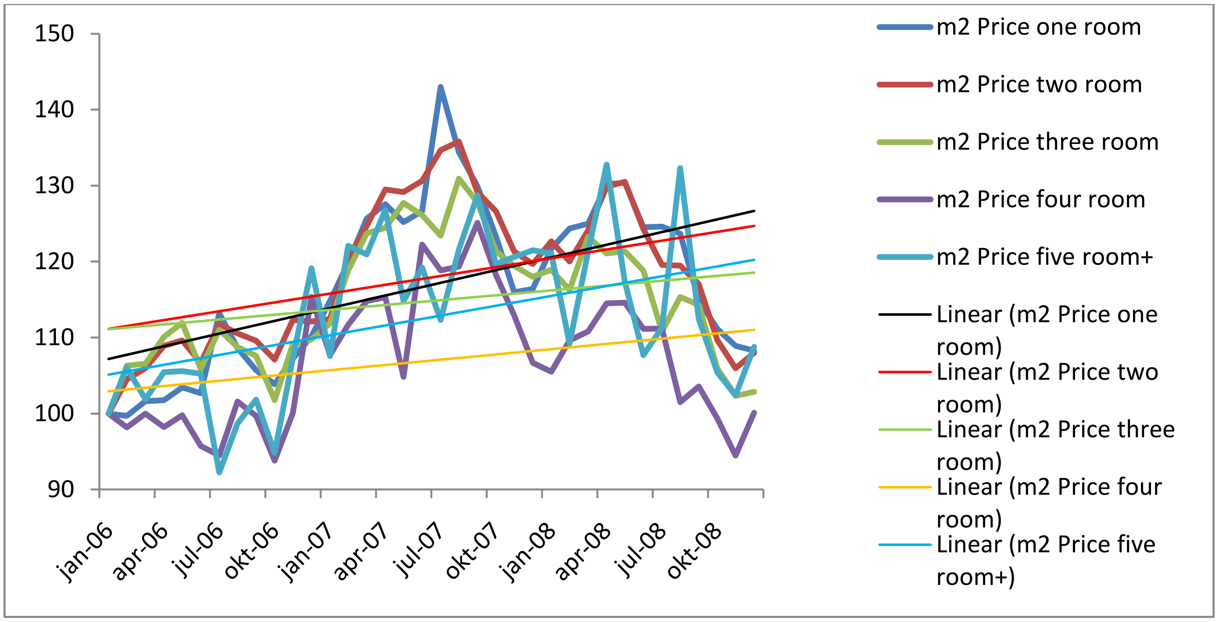
(a)

Stockholms domkyrkoförsamling
S:t Johannes församling
Adolf Fredriks församling
Gustav Vasa församling
S:t Matteus församling
Engelbrekts församling
Hedvig Eleonora församling
Oscars församling
Kungsholmens församling
S:t Görans församling
Essinge församling
Maria Magdalena församling
Högalids församling
Katarina församling
Sofia församling

(b)



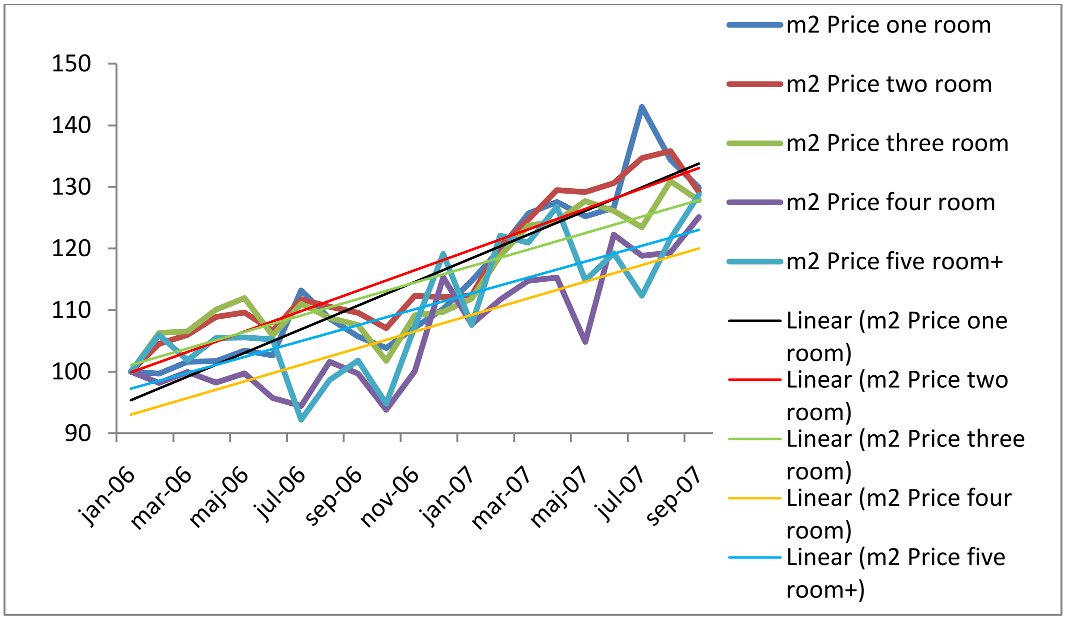
(c)


150
140
130
120
110
100
90
jan-06
apr-06
jul-06
okt-06
jan-07
apr-07
jul-07
okt-07
jan-08
apr-08
jul-08
okt-08
m2 Price one room
m2 Price two room
m2 Price three room
m2 Price four room
m2 Price five room+
Linear (m2 Price one room)
Linear (m2 Price two room)
Linear (m2 Price three room)
Linear (m2 Price four room)
Linear (m2 Price five room+)

(d)

Month	m2 Price one room	m2 Price two room	m2 Price three room	m2 Price four room	m2 Price five room+
jan-06	100	100	100	100	100
feb-06	99,68751	104,5	106,2773	98,17344	105,9907
mar-06	101,6139	105,9636	106,5647	99,96272	101,8931
apr-06	101,7286	108,9136	110,0998	98,21611	105,4657
maj-06	103,4141	109,5977	111,9394	99,7596	105,5641
jun-06	102,6616	106,6699	105,8834	95,73204	105,2429
jul-06	113,1868	111,7594	111,0037	94,46058	92,22344
aug-06	108,6257	110,5523	108,7175	101,5903	98,66062
sep-06	105,7048	109,5602	107,5967	99,68588	101,8217
okt-06	103,8459	107,0814	101,7454	93,80677	94,80295
nov-06	107,2003	112,3269	109,1316	100,0606	107,3075
dec-06	110,17	112,1181	109,7461	115,3358	119,1309
jan-07	114,7782	112,4404	111,865	107,6993	107,5687
feb-07	119,8664	120,3812	118,8446	111,6818	122,0884
mar-07	125,6737	124,6981	123,731	114,787	120,9463
apr-07	127,5682	129,4737	124,4222	115,2896	126,7908
maj-07	125,2018	129,1384	127,7041	104,8405	114,7952
jun-07	126,6414	130,6404	126,1077	122,2581	119,2126
jul-07	142,9926	134,6596	123,4401	118,8312	112,3202
aug-07	134,3941	135,8082	130,9244	119,3478	121,5916
sep-07	129,8894	129,1429	127,8116	125,1192	128,734

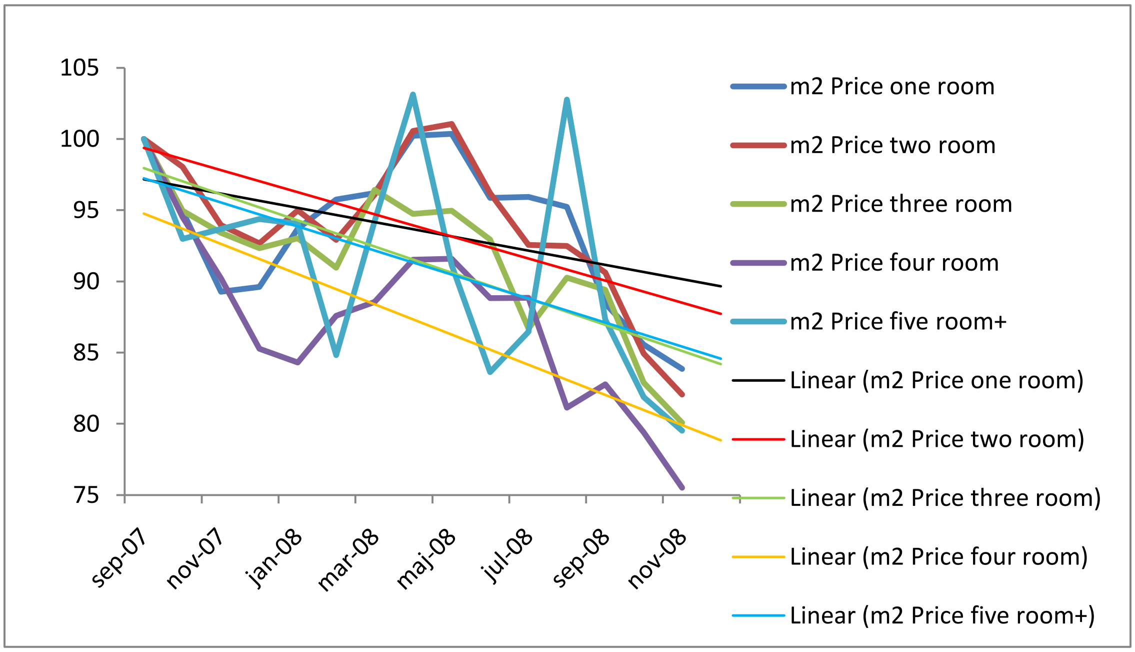
(e)



(f)

Month	m2 Price one room	m2 Price two room	m2 Price three room	m2 Price four room	m2 Price five room+
sep-07	100	100	100	100	100
okt-07	94,93405	98,04002	94,95409	94,50192	92,97294
nov-07	89,27285	93,95246	93,42164	90,22342	93,69089
dec-07	89,60909	92,6594	92,32052	85,25973	94,38667
jan-08	93,69422	94,9734	93,02964	84,30546	94,02914
feb-08	95,7484	92,92614	90,95651	87,59751	84,81075
mar-08	96,20809	96,0823	96,4307	88,55392	94,21475
apr-08	100,2222	100,5562	94,73282	91,51229	103,1169
maj-08	100,3653	101,057	94,95726	91,58294	91,13077
jun-08	95,85494	96,20965	92,93243	88,82269	83,63835
jul-08	95,92082	92,56658	86,68297	88,84714	86,4654
aug-08	95,22098	92,49255	90,25668	81,13273	102,7719
sep-08	88,44103	90,6151	89,41389	82,78278	87,32518
okt-08	85,55437	84,92869	82,88637	79,39246	81,87818
nov-08	83,84801	82,04759	80,07992	75,50357	79,51919

(g)



(h)

	One room	Two room	Three room	Four room	Five- room+
Upturn	30%	43%	16%	8%	2%
Downturn	25%	45%	18%	9%	3%

(i)