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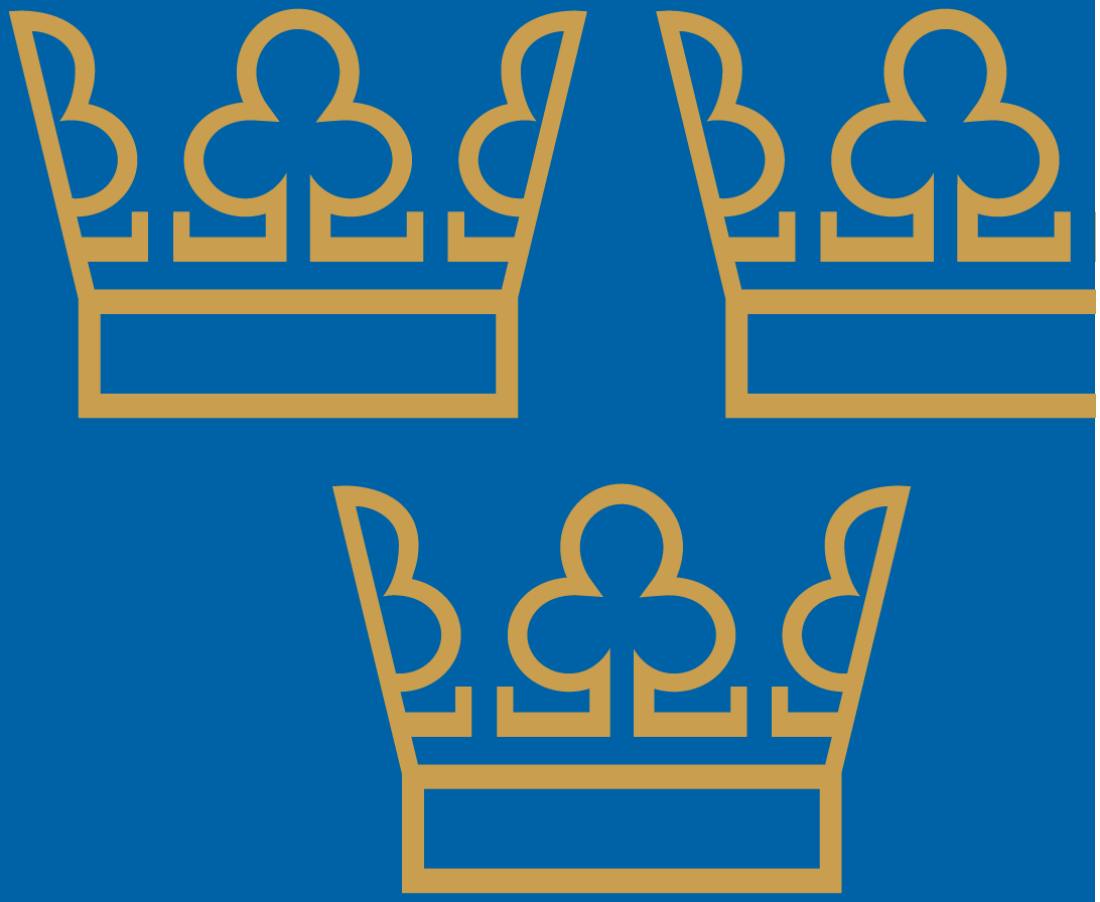
FOCUS REPORT

THE DEVELOPMENT OF SWEDISH HOUSING PRICES

Mårten Bjellerup and Lina Majtorp



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The Swedish National Debt Office's Focus Reports

The Debt Office manages the central government finances and has a primary role in the Swedish economy. The agency's responsibilities include central government cash management, borrowing and debt management and providing state guarantees and loans. Under its mandate to safeguard financial stability, the Debt Office collaborates with the Ministry of Finance, the Riksbank and the Swedish Financial Supervisory Authority. The Debt Office is also responsible for bank crisis management and ensuring that there are well-functioning deposit insurance and investor protection schemes.

The Debt Office's Focus Reports contain analysis and reviews of various issues within the agency's areas of operation. The reports serve to highlight and provide in-depth knowledge on key topics for the Debt Office's target groups as well as a wider audience. The report series also provides the agency's employees an opportunity to publish analyses externally and thus obtain valuable input.

We aspire to increase awareness and understanding of our activities and contribute to further discourse. Discussion of the Debt Office's topics is important for us as an agency and as part of the broader socioeconomic context.

Hans Lindblad
Director General of the Swedish National Debt Office

Summary

The Development of Swedish Housing Prices

Mårten Bjellerup and Lina Majtorp[1]

The development of the housing market affects not only the macro economy, but also the central government budget and financial stability. These areas are of crucial importance for the mandate and activities of the Debt Office.

The purpose of this report is to describe and understand the development of housing prices, which has been facilitated by significant improvements in the statistical picture during the past 5-10 years, especially where apartments are concerned. Furthermore, the new statistics published in this report have been expanded with additional excerpts for apartments of different sizes and price categories. These more granular statistics constitute an important complement to a traditional econometric modelling approach in the analysis of both historical and future price developments.

The econometric model offers a good explanation of the long-run, historical development of housing prices. Prices have followed the development in household incomes and lending rates and there was a structural downward shift of around 7 per cent in conjunction with the introduction of the mortgage cap in 2010. Moreover, the new statistics point to several ways in which the mortgage cap seems to have increased the price difference between small and large apartments for several years following its introduction.

However, the model has difficulty explaining the price decline in 2017. But, an analysis of price, sales and supply statistics indicates that a likely explanation for this decline may be a simultaneous change in supply and demand. Among other things, the increase in supply is due to a sharp increase in the production of new housing, while the stricter amortisation requirement most likely contributed to a decline in demand. In turn, the increase in the supply of new production probably contained elements of speculation, a conclusion substantiated by the fact that a surprisingly large proportion of newly constructed apartments had already been sold on the succession market in connection with the first occupancy. Since the summer of 2017, the number of sales of expensive apartments has decreased significantly in Stockholm, which could partly be a result of reduced speculation. However, an analysis of the distribution of total sales shows that the 50 per cent reduction in the sale of expensive apartments is a result of the development in the market as a whole and not that the expensive segment has been more affected.

According to the econometric model, housing prices in the next 10 years will bring about a clear reversal in trends. It is worth noting that the model does not envisage any conflict between the last 30 years or so of rapid price rises and a future marked deceleration in the rate of price increases. The change in the development of household income and mortgage rates is sufficient to explain the reversal in price development trends. In addition, the analysis indicates that there is reason to believe that the introduction of the stricter amortisation requirement may have a long-run dampening effect on price developments, a dampening that may be strengthened in the short term by a of newly built homes.

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Contents

Introduction – Why a report on the development of housing prices?

The development of the housing market affects not only the macro economy, but also the central government budget and financial stability. The macro economy, for example, is affected by housing investment, employment in construction-related industries and wealth effects on household consumption. The central government budget is partly indirectly affected by the macro economy and partly by such things as construction VAT and construction industry payroll taxes. Financial stability is affected by both banks and households through the importance of prices for mortgages.

These three areas all play a vital role for the mission and activities of the Debt Office and consequently an analysis of the housing market is part of the ongoing work with debt management and macroeconomic forecasting. In addition, the changes that the housing market has undergone in recent years – such as the introduction of macroprudential policy measures, falling prices on the succession market and a steep increase in the number of newly constructed homes for sale – underscores the need for an in-depth analysis.

This Focus Report aspires to contribute to a better understanding of the development of housing prices. Although the report does not analyse related topics such as household indebtedness or risks to financial stability, the content of the report will hopefully contribute with some knowledge where these topics are concerned. The same applies to the broader issues of how the housing market functions, including the rental market, a part of the market that the report does not address.

The aim of the report is to analyse not only price development and the effects of the increase in supply and macroprudential policy measures of recent years, but also to analyse possible future price developments. A large part of this analysis has been carried out using partly new statistics that account for the heterogeneity of the housing market in various ways. In recent years, ever more extensive statistical sources have improved analytical possibilities. Tenant-owner and newly constructed housing are perhaps the two most important parts of the improved statistical base.[2] Together with existing statistics about the single-family housing market, these new statistics in the report have been supplemented with additional tailored statistical excerpts from Swedish Broker Statistics. For example, these excerpts have made it possible to break down the tenant-owner apartment market according to the number of rooms in the apartments and to trace the number of sales according to different price levels.

The report begins with a summary of the main statistical sources used, followed by a chapter containing a statistical description of the housing market focusing on illustrating its heterogeneity. The third chapter contains the results of econometric modelling of historic house price developments as well as forecasts based on long-run macroeconomic projections. The following chapter then analyses the effects of both the previous sharp increase in the number of dwellings on sale and the introduction of macroprudential policy measures aimed at households, as well as an analysis of the decline in both prices and sales that characterised the housing market during the autumn and winter of 2017-2018. The fifth and final chapter provides a summarisation and comments.

[2] Tenant-ownership means that you are a member of a tenant-owner association, which owns a property with apartments. Every member has their own apartment. For a more thorough explanation, see for example p.2 in Lidberg (2018).

Statistics for housing prices and sales are becoming more comprehensive

The statistics available on housing prices have increased not only in scope but also in quality with the addition of new sources. This applies especially with regard to sales statistics for apartments and the market for newly constructed dwellings, which now covers a significantly larger section than it did just a little more than 10 years ago. The different statistical sources cover different sections of the market and have been produced using different methods. As a result, the statistics provide somewhat different pictures of the development of the housing market and a deepened understanding of how the statistics are compiled consequently constitute a natural starting point for an analysis of the housing market.

There are approximately 3 million single-family homes and apartments that are owned by private individuals and of these, a little less than 160,000 were sold during 2018. Variations in standard, design and buyers' preferences, together with the geographical distribution in the country, suggests that the housing market is inherently heterogeneous. The statistics available cover different sections of the housing market and are compiled using different methods.

Any analysis of the development of prices in the housing market should be based on statistics that cover as large a part of the market as possible. For a long time, it has been far more difficult to follow the price trends for apartments than single-family homes, resulting in the sales volumes for more than two-thirds of the market being neglected. However, more recently, new statistics have been produced by new actors that have made it possible to also monitor price and sale trends of apartments in more detail.

Depending on what measurement is used and how the statistics are processed, the conclusions drawn can vary greatly. This chapter presents the statistical sources that have primarily been used in the work with the report and which are commonly used when analysing the housing market. The purpose of the review is to provide a clear picture of the statistics that are available about the housing market and how the statistics provided by the various actors relate to each other. Hopefully, this will make it easier to understand the statistics included in the following chapters and contribute to the general knowledge about statistical data pertaining to the housing market.

Since parts of the new statistics are still in the build-up phase, previously published results are sometimes revised, even relatively far back in time. This has happened on several occasions during work with the report, resulting primarily in a partial change in how the new production market is viewed. Most likely, even the parts of the statistics published in this report will be revised in the future and thus possibly give a partially different picture of developments.[3]

[3] The expansion of statistical data has also led to the development of new measurements during the writing of this report. One example of statistics that have been added is the number of confirmed sold apartments on the new production market from Booli.

Newly added sources complement official statistics from Statistics Sweden

For a long time, the most common measure of price development in the housing market has been the Real Estate Price Index from Statistics Sweden (SCB). The Real Estate Price Index displays the price development for single-family homes from the mid-1980s. This is a relatively long period of time spanning several business cycles and the statistics are comprehensive since they are based on the Swedish mapping, cadastral and land registration authority's (Lantmäteriet) Real Property Register of property sales. One disadvantage with the Real Estate Price Index is that sales of apartments are not included. Since the turnover of apartments is higher than that for single-family homes, apartments make up a larger part of the housing market than they represent in the housing stock. The sale of apartments accounts for two thirds of the total number of sales, despite the fact that they make up about one third of the housing stock. A further disadvantage of the Real Estate Price Index is the time lag between the sale of the dwelling and publication of the index. This is because statistics are compiled on a quarterly basis and it takes some time for sales to be registered in the Real Property Register.

There has been a great need to keep track of the price development of apartments, especially since the concentration of tenant-owner rights is higher in metropolitan areas where a large part of the country's population resides. This has probably contributed greatly to the appearance of a number of new actors producing these statistics in a relatively short time. Such examples are Swedish Broker Statistics, Valueguard and Booli. What these actors have in common is that they compile price statistics not only at a higher frequency but also with shorter lead times, since they use statistics obtained directly from broker sales records and housing advertisements published on the web, instead of awaiting registration with the Real Property Register and the Swedish Tax Agency.

The main statistical sources

Since there are now several different ways to measure the development of housing prices, and because they differ somewhat, they also partly have different uses. In order to make full use of the information contained in them, it is necessary to understand how they are developed and what they include. It is of particular importance when it comes to the new construction market where newly constructed dwellings are *not* included in many of the most common price and sales measurements. Similarly, differences in methodologies mean that the annual price development of single-family homes at periods may differ by several percentage points between different pricing measurements.

The following is a description of the different measurements of the price development in the housing market that have been used in this report; these are primarily Statistics Sweden's Real Estate Price Index and price and sale statistics from Swedish Broker Statistics and Booli. In some cases, these have been supplemented with statistics from Valueguard. In many ways, Swedish Broker Statistics and Valueguard's price development series are very similar since they largely consist of the same sales data, but there are differences that one might need to know about. In addition to the sources that have been used in the report, Statistics Sweden's Single-Family Home Barometer is also described since it constitutes a link between the Real Estate Price Index and the pricing

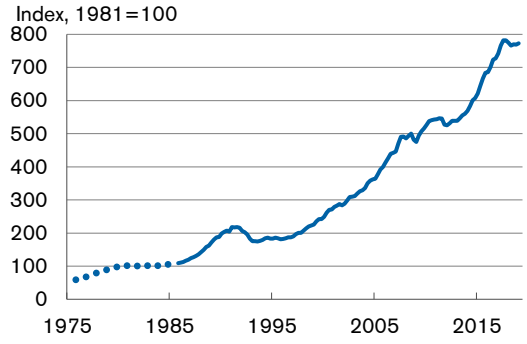
measurement produced by Swedish Broker Statistics.[4] In order to clarify the added value of the new statistical sources for apartment prices, there is also a description of the tenant-owner prices that Statistics Sweden produce in the compilation.[5]

In this report, all statistics from Statistics Sweden are public, while data from Swedish Broker Statistics, Valueguard and Booli are from payment services. The specific data excerpts for the report comes from Swedish Broker Statistics.

Real Estate Price Index, Statistics Sweden

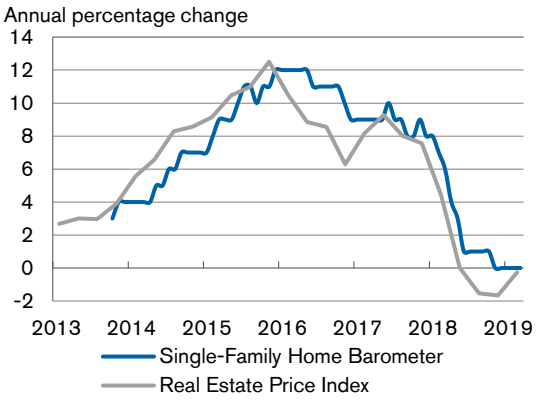
The Real Estate Price Index for permanent single-family homes is Statistics Sweden's primary measurement for price development of the existing stock of single-family homes. It is published on a quarterly basis and contains all the granted transfers of single-family houses throughout the country purchased on market terms. For example, this means that the transfers made at prices that are deemed to be outliers are excluded. At present, this limit is set for sales where the purchase price exceeds SEK 20 million. Also, sales where the assessed value of the property deviates significantly from the sales price have been removed. Therefore objects that were not sold at market prices such as properties given away rather than sold were removed from the dataset. The Real Property Register contains all national transfers that have taken place; this also means that even the sale of single-family homes brokered privately without an estate agent are included in the Real Estate Price Index.

Figure 1. Real Estate Price Index, Sweden



Note: Prior to 1986, the index consisted of annual observations.
Source: Statistics Sweden.

Figure 2. Single-Family Home Barometer and Real Estate Price Index, Sweden



Source: Statistics Sweden.

The Real Estate Price Index takes into account the different properties of different types of single-family homes in terms of geographical location, size and standard by weighting sales with their respective assessed value. This has been done using the purchase price coefficient (K/T), which is the quotient between the purchase price and the assessed value for the sold properties. After a sale has been concluded and the contract is signed, on average it will take two to three months to the

[4] The name of the statistical publication is *Småhusbarometern*, which translates into the Single-Family Home Barometer. However, the publication has no official name in English.

[5] The compilation is based on informational material published on the websites of the various producers of statistics and has been supplemented through conversations with each producer. The in-depth documents used for compiling statistics from Statistics Sweden are specified in the reference list.

date of the bill of sale, or date of access, and then another one to two months before the title-deed processing is completed and the sale has been registered in the Real Property Register. This means that it takes three to four months from the time the contract is signed until the sale is registered. After registration, the sale becomes available to Statistics Sweden and can be included in the Real Estate Price Index, which is usually published around one month after the end of the quarter in question. This means that in the statistics, there are delays of varying lengths between the sale and publication depending on when the sale takes place during the year. For example, the price trend for sales recorded in July may either appear in conjunction with the result of the third-quarter Real Estate Price Index published at the end of October or in the fourth-quarter result published at the end of January of the following year. The quarterly index will be revised as the transfers gradually are recorded in the Property Price Register until the final annual statistics are compiled, which usually takes place at the end of May or the beginning of June each year.

The Real Estate Price Index is available both as annual series and a quarterly series, distributed at a national level and by region and metropolitan areas. It has been available as an annual series since 1975 and quarterly since 1986, allowing for comparisons over a relatively long period of time. The base year of the index is 1981 when the value was 100. This base value has been calculated according to the annual series that has been available since 1975. See Figure 1 for the development of the Real Estate Price Index since 1975.

Single-Family Home Barometer, Statistics Sweden

Statistics Sweden also publishes the price development for single-family homes in the form of the Single-Family Home Barometer. The Single-Family Home Barometer has several similarities to the Real Estate Price Index. All transfers of single-family homes that can be considered marketable are included and sales are also weighted with the purchase price coefficient (K/T) to take into account the different properties of the property. The period of time between the date of the contract and the date of the bill of sale is generally two to three months, which also applies to the Real Estate Price Index. However, since the Single-Family Home Barometer is published each month, the time between purchase and publication is shorter. Usually, publication takes place between one and two weeks after the end of the current month.

According to the Single-Family Home Barometer and the Real Estate Price Index, price trends periodically deviate, see Figure 2. These discrepancies arise from the fact that the two series are developed in somewhat different ways, which may be important to keep in mind when comparing them. One difference is that sales are recorded in the Single-Family Home Barometer for two weeks less than in the Real Estate Price Index, which has a later publication date. The method used in the Single-Family Home Barometer to measure price trends is also somewhat simpler than in the Real Estate Price Index, which also takes into account how property stocks are distributed throughout the country. Unlike the Real Estate Price Index, the Single-Family Home Barometer also contains leasehold rights that account for about 4 per cent of all purchases.

The Single-Family Home Barometer is available on Statistics Sweden's website as of October 2013. However, it has been around much longer than that, but these outcomes are only available in the form of earlier press releases. In the press release, each outcome of the Single-Family Home Barometer is divided into different regions, but it is only for the nation as a whole that a time series can be obtained. Price trends are recorded as a moving average where the last three-month period is compared with the same months of the previous year and as a change compared to the previous three-month period. The monthly outcomes are rounded off to the nearest whole number, which

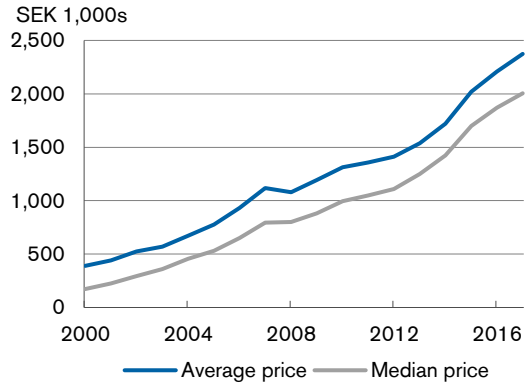
explains the somewhat staccato appearance of the Figure 2. At the time of the preparation of the outcome for a given month, approximately 60 per cent of the sales made during the month have been reported in the Real Property Register. For the previous month just over 90 per cent is reported. Due to the backlog, the Single-Family Home Barometer is revised at each publication session, which concerns the last published month in particular.

Tenant-owner rights prices, Statistics Sweden

Statistics Sweden's compilation of the price development of tenant-ownerships differs in terms of frequency and method from that of single-family homes. This is because the tenant-ownership constitutes a unit in a tenant-owner association and not an individual property registered in the Real Property Register. Instead, the statistics are based on the control data the tenant-owners associations submit to the Swedish Tax Agency.[6] This means, among other things, that the statistics are only available on an annual basis.

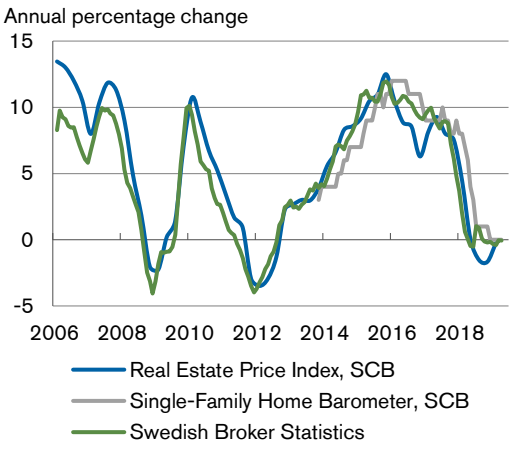
Just as for single-family homes, the price statistics for tenant-owner dwelling include all sales on the succession market amounting to a maximum of SEK 20 million.[7] Transfers made through inheritance, a gift or a division of property are not included in the statistics, but housing transferred for a symbolically low value will be included. In order to be included in the statistics, the transfer must have been made by a natural person and the entire tenant-owner right must have been sold, i.e. not simply a part of it. New apartments are not included since they are sold through building or real property companies. The statistics do not take into account the size, location or other factors that affect the market price, which makes it difficult to draw conclusions about how prices on the tenant-owner right market have evolved from year to year. The statistics are available at a national level and divided up according to counties and metropolitan areas.

Figure 3. The price of tenant-owner apartments, Sweden



Source: Statistics Sweden.

Figure 4. Comparison of single-family home prices, Sweden



Sources: Statistics Sweden and Swedish Broker Statistics.

[6] The basic data for the statistics is based on the statement of earnings and tax deductions provided by the tenant-owner associations to the Swedish Tax Authority in connection with the transfer or sale of the tenant-owners right. These must be submitted to the Swedish Tax Authority by 31 January of the year following the transfer, but they may also be submitted earlier.

[7] The succession market refers to the sale of existing homes in the housing stock, i.e. all homes except brand new homes being sold for the first time.

The preliminary outcome for each year is published approximately six months into the following year. At the very most, there may be a delay of 18 months between the signing of the contract and the preliminary outcome. The definitive outcome will be completed a year later, but any revisions to the preliminary outcome are usually small.

The statistics are presented as the average and median price as of 2000. In most regions, there are very expensive apartments that drive up the average price, which means that in some contexts the median price may be a more accurate measure because it is not influenced as much by the fact that a few sales are significantly more expensive than the average number of sales. See Figure 3 for price developments since 2000.

Swedish Broker Statistics

Swedish Broker Statistics is a result of industry actors in the housing market merging to collect sales data directly from the brokerage reporting systems.[8] This enables them to produce price and turnover statistics for both single-family homes and tenant-owner dwellings that do not have an official register.[9] The lead time between sales and publishing is shorter because the public registration does not have to be awaited. Typically, sales statistics from the previous month can be published within one week from the end of the month. The degree of coverage has gradually increased since the collection of the statistics began in 2005 and at present, slightly more than 95 per cent of the sales made are through brokers. To varying extents, newly constructed dwellings are included depending on whether they are single-family homes or apartments. This is dealt with in more detail in the section on the succession market and newly constructed apartments.

Generally, sales statistics for single-family homes can be said to correspond to what Statistics Sweden publishes in the Single-Family Home Barometer, with some differences as illustrated in Figure 4. Just as in the Single-Family Home Barometer, sales are reported per month and price developments are adjusted using the purchase price coefficient (K/T), as described in the section on the Real Estate Price Index. In order for sales to be within the representative range, adjustments are made similar to those made as in Statistics Sweden's Real Estate Price Index and the Single-Family Home Barometer. Only sales with a purchase price of up to SEK 20 million are included and the purchase price coefficient (K/T) and living space must not be less or exceed a certain interval.[10] Price developments at the national level have been calculated as a weighted average of the underlying metropolitan areas and the rest of the country, while developments in the Single-Family Home Barometer are unweighted.

The differences between price developments in the Single-Family Home Barometer and Swedish Broker Statistics' data can primarily be explained by the fact that the reporting rate has increased since the compilation of the statistics began as well as the time lag that exists between contract

[8] Swedish Broker Statistics is currently owned by the Association of Swedish Real Estate Agents, Fastighetsbyrån, Svensk Fastighetsförmedling and Fastighetsmäklarförbundet. Previously, the company was a subsidiary of Hemnet.

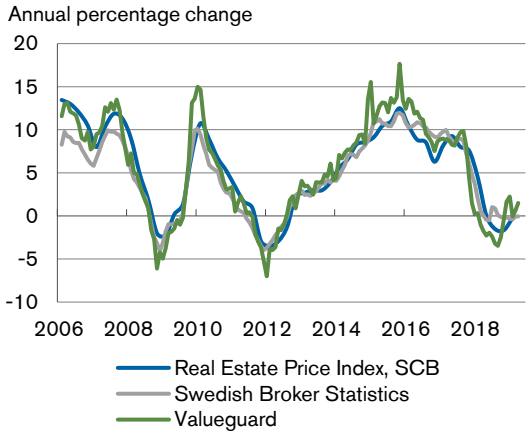
[9] In addition to price data, the sales data from Swedish Broker Statistics also includes other parameters, such as number of square meters, number of rooms, the advertising price and the date the ad was published. The latter two of these make it possible to compile statistics about bid premiums and on how long the dwelling has been up for sale.

[10] Statistics Sweden's selection includes all sales with purchase amounts less than SEK 20 million, while Swedish Broker Statistics have removed sales of less than SEK 10,000. Statistics Sweden uses properties with a purchase price coefficient (K/T) in the range of 0.8 to 6.0, while Swedish Broker Statistics uses the range of 0.8 to 5.0.

writing and deed processing.[11] The reporting rate, i.e. the proportion of properties sold included in Swedish Broker Statistics' data, was just over 50 per cent in 2005, while it is 100 per cent in Statistics Swedens' data. After this, the reporting rate has increased to over 95 per cent in 2018. The sales of single-family homes that do not go through brokers are not included in the statistics.

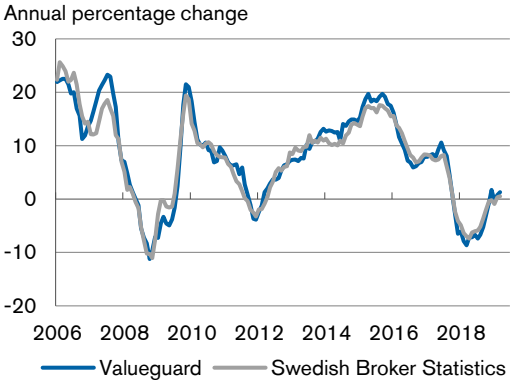
The time lag between the writing of the contract, on which Swedish Broker Statistics bases its data, and title deed processing that Statistics Sweden waits for, is two to three months. This means that there will always be a corresponding time lag between the two series, and when comparing these two, one of them must be moved 2-3 months in time depending on whether it is the price development at the date of the contract or the date of the title deed that is of interest. Via the brokerage systems, Swedish Broker Statistics has access to sales statistics earlier than Statistics Sweden. In practice, this allows sales for a specific month to be available three to four months earlier than via the Single-Family Home Barometer. The results for the past months may differ slightly because all sales have not yet been recorded in the Real Property Register while they are available in the brokerage systems. As all purchases for the month are registered, the Single-Family Home Barometer is revised and any differences are reduced.

Figure 5. Comparison of price development for single-family homes, Sweden



Sources: Statistics Sweden, Valueguard and Swedish Broker Statistics.

Figure 6. Apartment prices, Valueguard and Swedish Broker Statistics, Sweden



Sources: Valueguard and Swedish Broker Statistics.

[11] Another difference between the Single-Family Home Barometer and Swedish Broker Statistics is how single-family homes for permanent residence are separated from holiday homes. In the property tax proposal for 2015, the Swedish Tax Agency changed the type codes for both types of dwellings so that the same code now applies to both single-family homes for permanent residence and holiday homes. The reason for this change was that over time many holiday homes were converted into permanent residences but still retained the original classification resulting in the fact that the type code did not always reflect the actual use of the property. Statistics Sweden separates holiday homes from single-family homes by examining the population register to see if someone has been registered in the property during the past year. Swedish Broker Statistics focus instead on how the broker has categorises the item on sale, i.e., if it is sold for the purpose of being a permanent residence, it will be categorised as a single-family home. When the change was implemented and the different methods were introduced, it generated a one-time effect on price developments, partly explaining the difference between the two series in 2016.

The statistics for apartments from Swedish Broker Statistics' have no direct equivalent from Statistics Sweden since Statistics Sweden only publishes annual statistics for tenant owner apartments. As with single-family homes, the sale of apartments is cleared so that base data will consist of representative sales. Sales below SEK 5,000 and above SEK 20 million will not be included and even tenant-owner dwellings whose square metre price and living space can be considered to be outside a normal range will be removed.[12] Price developments are measured by monitoring the change in the average square metre price, i.e. the ratio between price and living space. In other respects, price developments have not been adjusted for other characteristics in terms of location, year of construction and standard. The valuation that is made in the tax assessment is missing tenant-owner apartments and a methodology for corrections like the one with the purchase price coefficient (K/T) is therefore not possible. As with price developments for single-family homes, developments at the national level have been calculated as a weighted average of the underlying metropolitan areas and the rest of the country.

Statistics are available as of January 2005 for both single-family homes and tenant-owner dwellings. Price developments are reported as a three-month moving average where the current month is in the middle of the three-month period. This evens out price movements from temporary impacts between months and is the same method that Statistics Sweden uses in the Single-Family Home Barometer.

Nasdaq OMX Valueguard-KTH Housing Index (HOX), Valueguard
The HOX Index is a quality adjusted price index for housing prices developed by Valueguard in collaboration with the Royal Institute of Technology (KTH) and with distribution via Nasdaq OMX. The index is primarily intended to show price change instead of the current price level. It has been designed using a so-called hedonic method that compensates for the sale of different types of dwellings during different periods, thus providing a better picture of the underlying price developments on the housing market. For example, the index takes into account several different parameters for tenant-owner dwellings in terms of geographic area, monthly fee, square metres, number of rooms, year of construction and floor plan. This means that the rise and fall in prices driven by the fact that, for example, relatively speaking more dwellings have been sold in attractive areas a month are not included. The measurement methodology is the same for tenant-owner dwellings and single-family homes thereby facilitating comparisons between the different segments of the housing market. Valueguard publishes several different indices showing price trends for detached houses and tenant-owner dwellings in Sweden as a whole and in the three largest cities. There is also a summary index showing the development of both detached houses and tenant-owner dwellings in Sweden.

Valueguard's index is primarily based on data from the Real Property Register and from Swedish Broker Statistics. Unlike Swedish Broker Statistics' data, newly constructed homes are not included in the statistics because the actual purpose is to capture price movements and newly constructed homes have usually been sold at a fixed price a relatively long time before they are ready for occupancy. In general, price statistics in the HOX index are more volatile than the corresponding prices from Swedish Broker Statistics and Statistics Sweden, especially when it comes to single-

[12] In the statistics included in this report, tenant-owner dwellings with more than 10 rooms have also been omitted. Apartments with this number of rooms are unusual but may affect the statistics in some segments the few times they are traded.

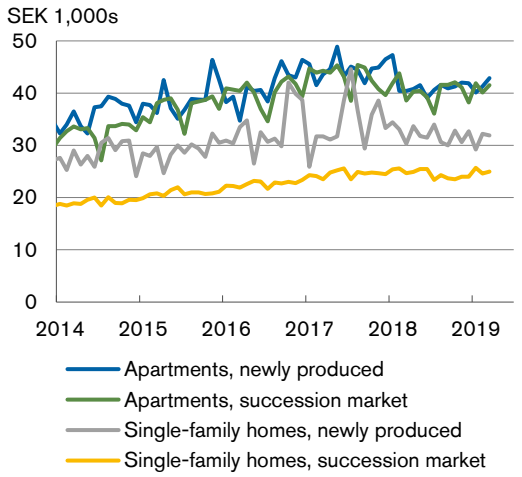
family homes; see Figure 5 and Figure 6. One important explanation is that HOX is based on pure monthly values, while Swedish Broker Statistics use a moving average and the Property Price Index is made on a quarterly basis. Valueguard publishes its price index just over two weeks after the end of the current month.

Booli

Booli.se is a housing site that compiles current homes for sale and final prices for previously sold properties.[13] Data is collected from the advertisements published on the websites of brokers and construction companies. Via Booli.se, Booli caters to private individuals for the purpose of compiling information and targets professional users on the housing market via its statistics portal Booli Pro. Booli Pro collects data from a little more than 90 of the largest construction companies that are active in Sweden making it possible to follow the new production market at a detailed level. Figure 7 shows the square metre price trend for single-family homes and tenant-owner dwellings in Sweden divided into the succession market and newly constructed dwellings.

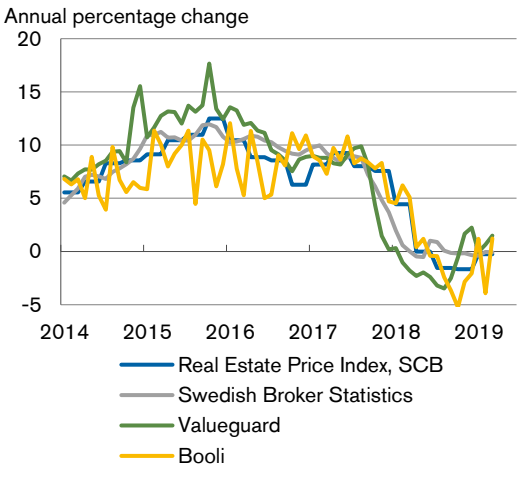
Booli has statistics for, among other things, ad prices and final prices ranging back to 2013.[14] Geographically, the statistics are aggregated at national, county, municipal, district and area level. For newly built dwellings, the sales history of each item can be followed from the first sale through a construction company or broker and subsequent future sales if they are resold on the succession market.[15]

Figure 7. Square meter price for apartments and single-family homes to Booli, Sweden



Source: Booli.

Figure 8. Square metre price for single-family homes since 2014, Sweden



Sources: Statistics Sweden, Swedish Broker Statistics, Valueguard and Booli.

Final prices for sold items are assembled by reading the last bid published on the brokers' websites. For single-family homes, these tasks are then supplemented with title deed data from Real Property Register. When a tenant-owner dwelling is removed from a broker's website, the broker will receive

[13] Booli.se was founded in 2007 and is owned by SBAB Bank (National Housing Finance Corporation) since 2016.
[14] Information concerning a number of other parameters is also collected, e.g. number of bidders, number of price reductions, advertising time, bid premium etc.
[15] This presupposes that Booli has matched the new production project with the tenant-owner' association.

a notification of the collected price and is thus given the opportunity to correct the final price if the most recently published bid deviates from the contractual bid. Sales of tenant-owner dwellings that take place without an advertisement being published on a broker's website are not included in Booli's statistics. Booli's data is presented in its basic form without weighting based on the different standard and geographic location of the item. This means that price developments of single-family homes, for example, periodically deviate from the other sources, see Figure 8.

Hemnet

Hemnet is a housing site where real estate agents can advertise the homes they have for sale.[16] It is estimated that approximately 90 per cent of the brokered housing ads in 2018 were published on the site. From 2014, Hemnet has been compiling aggregated statistics of the current supply of dwellings for sale, the number of newly added dwellings and their starting prices. The statistics are broken-down by different types of dwellings, i.e. detached homes, tenant-owner dwellings or holiday homes and how many rooms they have, as well as county and municipality level. The final prices of the brokered items are also collected and available as of 2013. Consequently, in several respects, the statistics available on Hemnet are similar to what is publicly available via Booli.

Newly constructed dwellings and the succession market

Statistics Sweden has statistics about the housing stock and how many homes have been completed. The statistics are divided according to type of accommodation, such as single-family homes or blocks of apartments, and the form of tenure they have, i.e. tenancy, tenant-owner or ownership. The dwellings that have ownership tenure or tenant-owner tenure are assumed to have come onto the housing market by being sold to a private individual. This sale may be made directly via construction companies or via brokers. Depending on what sales channel is selected, statistical reporting will be different. In the statistics from Swedish Broker Statistics, only those dwellings sold through a broker can be found. This can be done both by a construction company hiring a broker to sell the dwelling during the sales and construction process and by having a private individual who has signed up for a newly constructed apartment subsequently having the assistance of a broker to sell the dwelling before moving in. If the dwelling is sold directly through the construction company, it will not be recorded in the brokers' reporting system and will subsequently not be included in Swedish Broker Statistics. However, these sales will be in Booli's statistics, which also include the direct sales by the construction companies.

In the statistics from Swedish Broker Statistics included in this report, new production has been defined as all tenant-owner dwellings that have been built in the current or previous year. Since it is not mandatory for brokers to indicate in their systems whether or not it is question of a newly constructed apartment, it is not possible to easily separate these out, so the chosen definition will have to represent the newer segment. This can mean the apartment has not always been unoccupied but may have been up for sale not only once but several times during this period of time. All sales with a year of construction older than the current or previous year have been categorised as belonging to the succession market.

[16] Hemnet was founded in 1998 by Fastighetsmäklarförbundet, the Swedbank Real Estate Agency, the Association of Swedish Real Estate Agents and the Svensk Fastighetsförmedling. Since 2016, majority ownership of Hemnet lies with the US investment company, General Atlantic.

The housing market is far from uniform

The housing market can be said to consist of several submarkets and knowledge of these is important for understanding the overall development. Two prominent examples are that apartments account for a majority of all sales, although the stock of detached homes is twice as large, and that Stockholm's large share of the total market has a major impact on statistics of the country as a whole. Furthermore, development with regard to price and sales are different for apartments with a different number of rooms and for dwellings belonging to existing respectively newly constructed stock. In addition, the market exhibits obvious seasonal fluctuations linked to the summer and Christmas months.

The housing market in Sweden is not uniform but exhibits tangible differences depending on the part of the country where the dwelling is sold and the type of housing. A prerequisite for the analysis in subsequent chapters concerning, among other things, how the housing market has been affected partly by the increased supply of dwellings and partly by the macroprudential policy measures that have been introduced, is knowledge of the characteristics of the housing market.

In the next chapter, the econometric analysis is based on how prices of single-family homes have developed, since this is the part of the housing market where the statistics go furthest back in time. In the following chapter, a large part of the analysis is based on the market for apartments. An important piece of knowledge to bear in mind when analysing the housing market is that developments at a national level are largely driven by developments in the Stockholm area.

Throughout the report, developments in Sweden as a whole will be set in relation to developments in metropolitan areas, and occasionally also in relation to the Inner City of Stockholm.[17] A very large part of all sales takes place in Stockholm where the price level is higher and the higher price level can, for example, affect the impact of the macroprudential measures imposed by the Swedish Financial Supervisory Authority (Finansinspektionen). It is for this reason that the Inner City of Stockholm has been included. The clearly defined geographic area and the consistently high price level means that any effects there will be able to stand out even more.

Construction and housing stock – large differences between detached homes and apartments

In Sweden, approximately two thirds of the privately-owned housing stock consists of detached homes and one third of apartments in blocks of apartments.[18] The detached homes usually have ownership tenure, but there is also a smaller segment of about 4 per cent that consists of tenant-

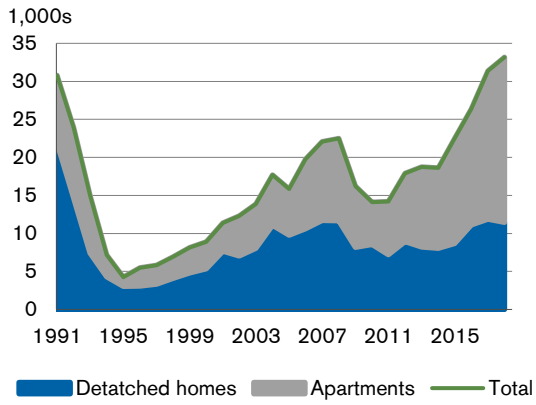
[17] The municipalities included in the various metropolitan regions are set according to Statistics Sweden's definition and have been specified in Appendix, page 63. In the current text only the name of the city is printed, but unless otherwise indicated, it is the metropolitan region that is referred to.

[18] In the rest of the report, detached homes is a collective term for various kinds of single-family homes. All free-standing one and two dwelling buildings as well as semi-detached houses, town houses and terrace houses are included. However, dwellings classed as holiday homes are not included.

owner dwellings. Among the apartments, the form of tenure is primarily exclusively tenant-ownership, even if there is a very small share, 0.03 per cent consisting of ownership tenure.

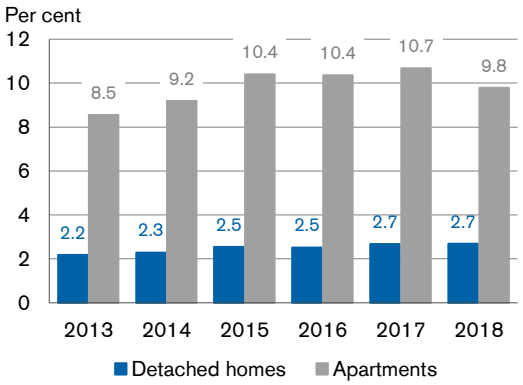
In 2018, a little more than 33,000 homes intended to be sold on the market were built in Sweden. This is the largest addition since the beginning of the 1990s, see Figure 9. Of the newly built dwellings, 65 per cent were apartments in blocks of apartments and the remainder consisted of detached homes. As far as detached homes are concerned, this is a decrease since the beginning of the 1990s when they accounted for 70 per cent. In relation to the existing housing stock, the newly built dwellings constituted just under 3 per cent.

Figure 9. Annual increase of dwellings for ownership, Sweden



Note: Refers to dwellings with ownership tenure and tenant-ownership tenure added via reconstruction or new construction. Conversion from tenancy right to tenant-ownership is not included.
Sources: Statistics Sweden and own calculations.

Figure 10. Turnover of dwellings, Sweden



Note: Turnover refers to the number of sales in relation to the housing stock for a given year.
Sources: Statistics Sweden, Swedish Broker Statistics and own calculations.

The variation between where properties are being built in the country is great. During 2018, the construction of apartments was mainly concentrated to the metropolitan areas, while the detached homes were primarily built in the regions outside these. Most apartments were built in Stockholm, which accounted for almost 50 per cent of the addition that year. Around 10 per cent were built in both Gothenburg and Malmö.[19] Basically, the reverse applied to detached homes where almost two-thirds were built outside metropolitan areas.

Distinct regional variation in sales and price levels

The number of real estate sales as well as the price level has generally increased over the last 15 years. However, occasionally there are considerable differences between different parts of the market. There can be major differences depending on different factors, such as referring to different

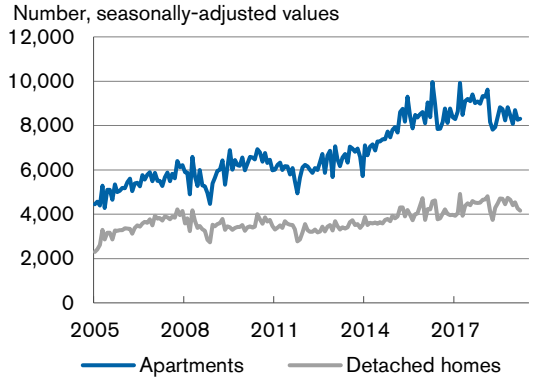
[19] The construction of dwellings with tenancy rights, which is not dealt with in this section, is in addition to the construction descripted in this report. A little more than half of the apartments built in 2018 were dwelling with tenancy rights and even the construction of these exhibit regional differences. In Stockholm, 3 out of 10 newly built apartments in blocks of apartments has tenancy-ownership tenure and in Gothenburg this figure was 4 out of 10. In Malmö and outside the metropolitan areas, the proportion was greater, where 6 of 10 new apartments were built with tenancy right.

regions, referring to detached homes or apartments, or if it is a question of the succession or new production market.

Turnover and sales are dominated by major cities and apartments

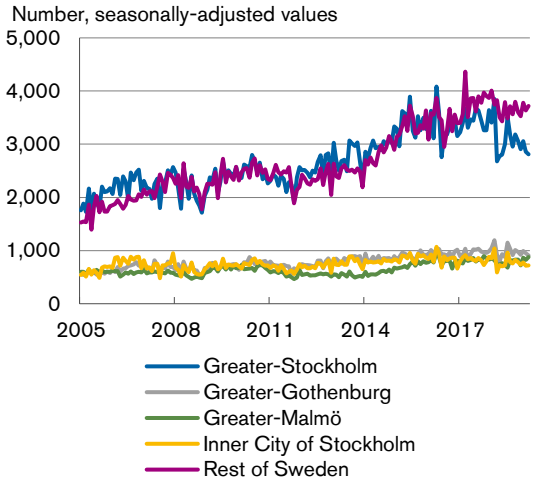
The number of sales of dwellings has risen, which is a natural consequence of a growing population and that the housing stock has increased both through newly constructed dwellings and conversion of tenancy rights to tenant-ownership. Even the turnover, i.e. sales measured as a proportion of the existing stock, has increased, see Figure 10. The turnover in apartments is at a much higher rate than for detached homes, around 10 per cent per year compared to just under 3 per cent. This means that the average length of occupancy in an apartment will be shorter; about 10 years compared to 30 years in a detached home.

Figure 11. Number of real estate sales per month, Sweden



Sources: Swedish Broker Statistics and own calculations.

Figure 12. Number of apartment sales per month in different regions

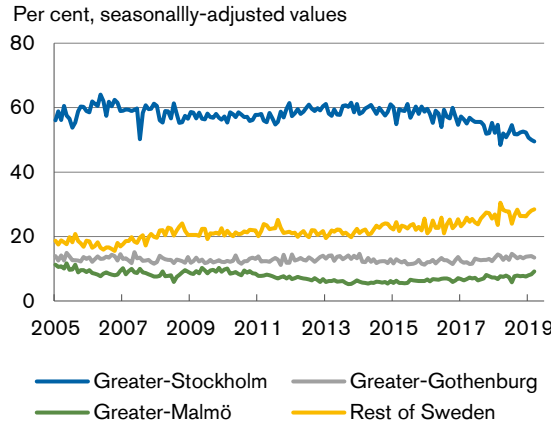


Note: The Inner City of Stockholm is a part of Greater Stockholm.
Source: Swedish Broker Statistics.

Due to the higher turnover of apartments, more apartments than detached homes are sold each year in Sweden, despite the fact that the stock of detached homes is larger. Of the total of slightly less than 160,000 dwellings sold in 2018, two-thirds were apartments and one-third detached homes. Just over 8,000 apartments and 4,000 detached homes are sold each month, see Figure 11. Stockholm makes up a major part of the market, especially for apartments. In 2018, Stockholm accounted for 36 per cent of all sales of apartments in Sweden. This means that each month, almost as many apartments are sold in Stockholm as in the whole of Sweden outside the metropolitan areas, see Figure 12. Sales in the Inner City of Stockholm accounted for just over 9 per cent of the total number of sales, which is about the same proportion as in Gothenburg and Malmö.

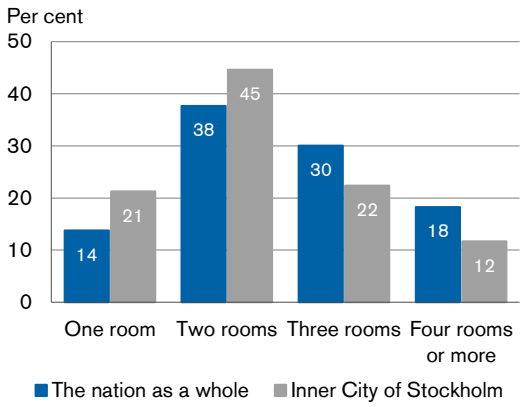
In terms of the total value of apartments sold, Stockholm's significance is greater, as the price level is higher in Stockholm. On average, the total sales amount for apartments in 2018 was SEK 20 billion a month, half of which came from sales in the Stockholm area, see Figure 13. About a quarter of the sales took place outside the metropolitan areas and around a tenth in Gothenburg and Malmö.

Figure 13. The different regions' share of the total sales value of apartments



Source: Swedish Broker Statistics.

Figure 14. Sales according to number of rooms in 2018



Source: Swedish Broker Statistics.

The most common type of apartment consists of two rooms has become smaller

The most common type of apartment sale relates to a medium-sized apartment with two or three rooms, see Figure 14. The share of sales for small and large apartments, i.e. apartments with one or four or more rooms, is about the same size. In recent years, this distribution has been relatively constant, but it does contain regional variations. For example, in the Inner City of Stockholm, sales shift towards smaller apartments, see Figure 14. There, one or two-room apartments make up 65 per cent of sales, compared to just over 50 per cent in the nation as a whole. In Malmö, however, the sale of medium-sized apartments is slightly higher than in Sweden as a whole.

In 2018, the average size of a sold apartment in Sweden was 65 square metres. On average, the area of a one-room apartment was 33 square metres, and apartments with two, three and four rooms or more had areas of 53, 77 respectively 105 square metres. The size varies depending on where in Sweden the apartment is located. Generally speaking, apartments are smaller in Stockholm than in Gothenburg and Malmö.

Since 2006, the size of apartments sold has become smaller. As can be seen from Figure 15, the area of an apartment with two rooms has decreased by a little less than 3 square metres up to 2018. This decrease has been greater in the Stockholm region and less in Gothenburg and Malmö. Even the area of apartments with one and three rooms has decreased, but to a lesser extent. However, the area of larger apartments with four rooms or more, has decreased even more. On average, the area of these is currently almost 9 square metres smaller. It is primarily in the Inner City of Stockholm that larger apartments have become smaller; in this area the apartments sold are on average 23 square metres smaller compared to 2006.

The sale of newly constructed apartments is increasing

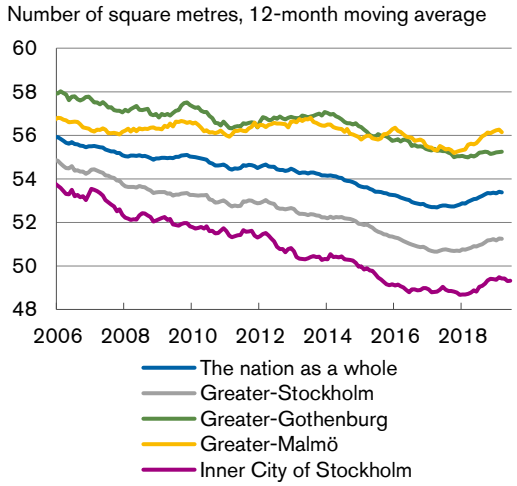
Since most construction has taken place in metropolitan regions, this is where most of the newly constructed dwellings have been sold. Due to different definitions the statistics for what constitutes a newly constructed dwelling, following a sale is not that simple. Figure 16 shows the sale of apartments in Sweden with statistics from Swedish Broker Statistics and Booli. The differences in definition have been described in more detail in the first chapter of the report, and as illustrated in

the diagram, they present different depictions of sales. According to the definition used by Swedish Broker Statistics, sales of newer dwellings have declined since the beginning of 2018, while data from Booli show that sales peaked in 2015 and that since then sales have remained roughly at the same level.

According to Swedish Broker Statistics, up to the middle of 2016, there were about as many newly constructed apartments in Stockholm as in the rest of the country. Since then, sales in Stockholm have been lower, implying a reversal in trends. The same development can also be found in Booli's statistics, even though the number of sales is higher.

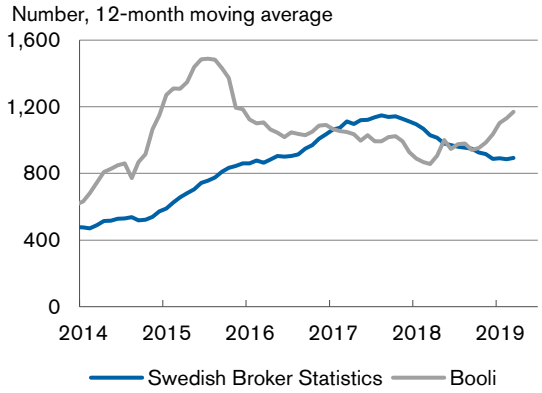
The sale of newly constructed apartments as a percentage of the succession market has continuously increased over the last ten years, from having accounted for around 3 per cent from between 2005 and 2008 up to being around 15 per cent when the proportion was at its highest at the beginning of 2017. After this, the proportion of new production has fallen by a few percentage points and in 2018 accounted for approximately 12 per cent according to statistics from Swedish Broker Statistics.

Figure 15. Average size of a sold two-room apartment



Source: Swedish Broker Statistics.

Figure 16. Sale of newly constructed apartments, Sweden



Note: For Swedish Broker Statistics, the term newly constructed refers to tenant-owner homes built during the current year or previous year and for Booli, tenant-owner homes sold directly by the construction company, or sold through brokers.
Sources: Swedish Broker Statistics and Booli.

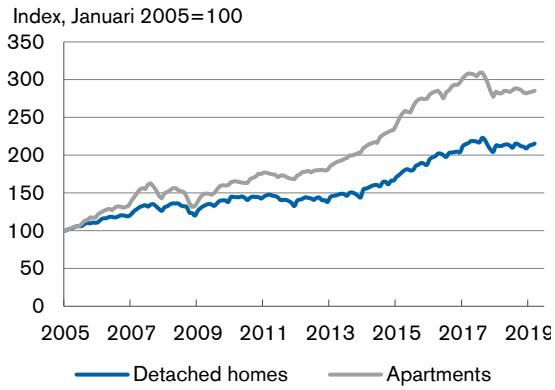
Small apartments in big cities have the highest square metre prices

Price developments on the housing market have differed between detached homes and apartments. Since 2005, prices of apartments have increased substantially more than prices of detached homes. Up to 2018, an average apartment had increased a little less than 70 per cent more in price than an average detached home, see Figure 17. The difference in price increase has varied around the country. In Stockholm and Malmö, apartments have increased by just over 50 per cent more than detached homes; in medium-sized cities by about 80 per cent and most in Gothenburg where the difference was almost 100 per cent.

The average price of an apartment varies depending on where in the country it is located. Generally, the price level increases with the size of the city, see Figure 18. The price per square metre in the

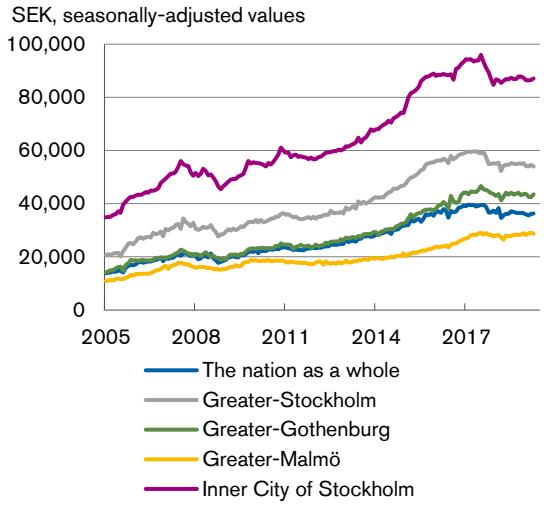
beginning 2019 rises from approximately SEK 30,000 in Malmö to SEK 45,000 in Gothenburg and SEK 55,000 in Stockholm, while it is over SEK 85,000 in the Inner City of Stockholm. The average for the country as a whole is around SEK 35,000 per square metre.

Figure 17. Housing prices, Sweden



Source: Valueguard.

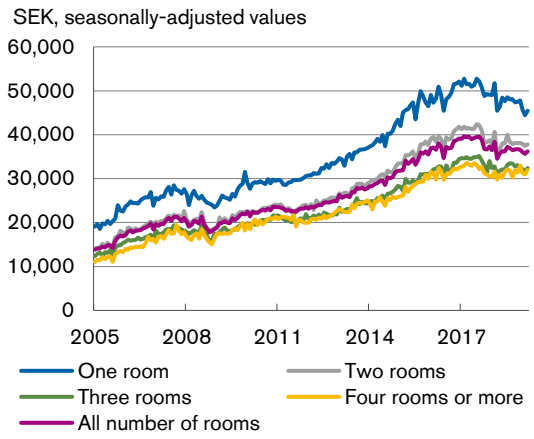
Figure 18. Square meter price for apartments in different regions



Source: Swedish Broker Statistics.

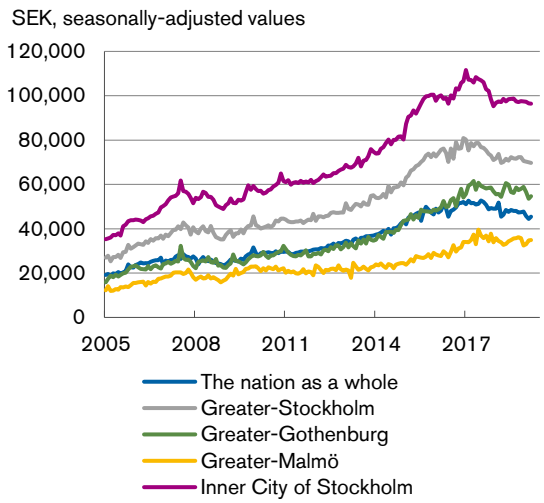
The prices of apartments also vary depending on how many rooms the apartments have, even if the price is quoted per square metre. Figure 19 shows that the average square-metre price is higher for apartments with fewer rooms. Consequently, the highest square-metre price is for small apartments in large cities, see Figure 20. Even the price difference between small and large apartments within a city is higher the larger the city is. At the beginning of 2019, an average one-room apartment in Sweden cost around SEK 14,000 more per square metre than an apartment with four or more rooms. In Stockholm, the same difference was almost SEK 25,000.

Figure 19. The square-metre price for apartments broken down according to number of rooms, Sweden



Source: Swedish Broker Statistics.

Figure 20. Square-metre price for one-room apartments in different regions



Source: Swedish Broker Statistics.

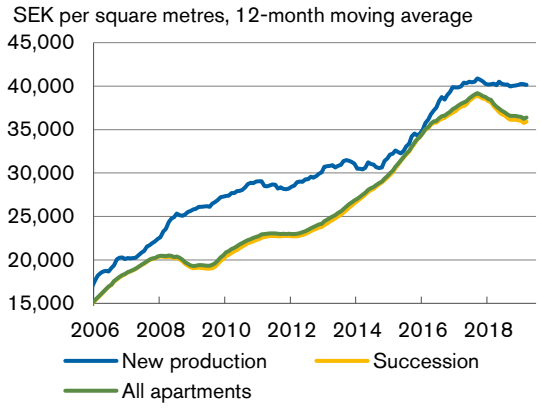
Higher square-metre price for newly constructed apartments but statistics are difficult to compare

There are also price differences between newly constructed dwellings and dwellings sold on the succession market. As a rule, according to Swedish Broker Statistics, a newly constructed apartment has been more expensive than an existing apartment, see Figure 21. There are regional differences and in Stockholm the price of newly constructed apartments has periodically been lower than for existing apartments. For the most part, it can be linked to the fact that the availability of buildable land is lower in the central parts, and instead much of new production has taken place further out where prices are also lower.

There are differences in the square-metre price for newly constructed apartments depending on the method and definition used to produce the statistics. Booli's statistics show that the average price per square metre for a newly constructed apartment at the beginning of 2019 was around SEK 40,000, which is consistent with what statistics from Swedish Broker Statistics show. On the other hand, the price of a newly constructed apartment has often been lower than that for an existing one, see Figure 22.

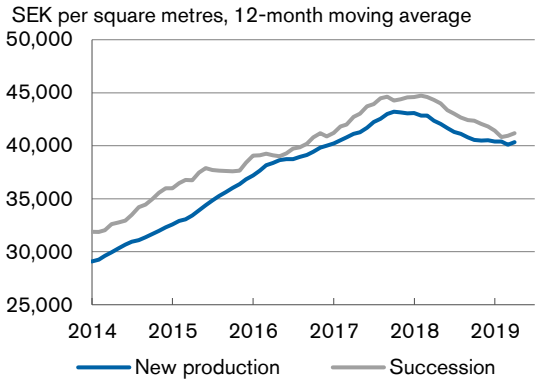
For newly constructed dwellings, the type of aggregated and weighted measure for the average price increase that exist for the succession market is missing. This makes it more difficult to fairly compare the two parts of the market with each other and to make comparisons within the new production market. It is also worth noting in Figure 21 how close to the square-metre price for apartments in the existing stock is the square-metre price of all sales. This is a consequence of the succession market being so much larger than the market for newly constructed apartments. Although sales of newly constructed dwellings have increased, their impact on the average price of all housing is small. The chart also shows that the price drop that started in the middle of 2017 has primarily affected apartments on the succession market, while prices have largely remained unchanged for newer apartments. In Booli's statistics, however, even the newly constructed apartments have demonstrated a price decrease in recent years.

Figure 21. The prices of apartments according to Swedish Broker Statistics, Sweden



Note: New production is defined as apartments constructed within the last two years and sold through brokers.
Source: Swedish Broker Statistics.

Figure 22. Prices of apartments according to Booli, Sweden



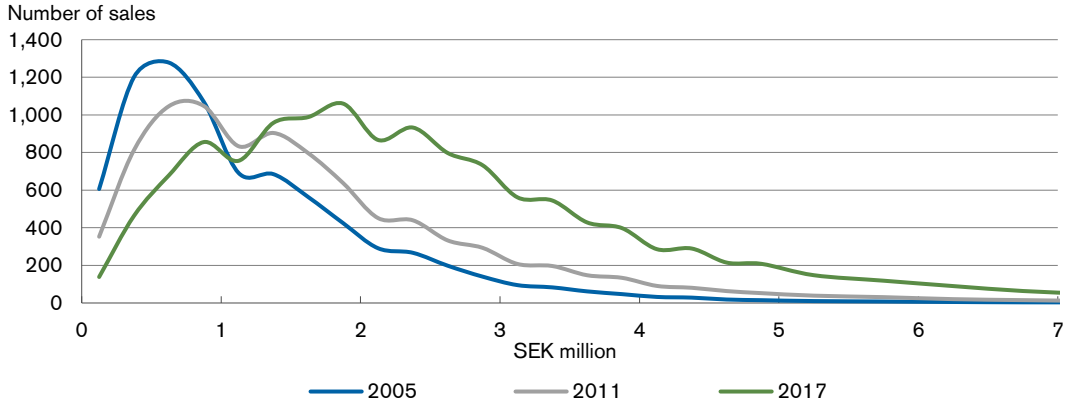
Note: New production is defined as sold by construction companies, directly or via brokers.
Sources: Booli and own calculations.

Distribution of sales – yet another illustration of heterogeneity

One way of illustrating price developments over time is to study what the distribution of sales looks like, i.e. how many dwellings have been sold and at what prices. By dividing the information about the home sales into the number of sales in different price ranges, it is possible to illustrate the distribution of home sales with regard to price.

Time series describing average price trends provide a type of information, but by studying how the distribution of home sales with respect to price has changed over time, it is possible to partly obtain other information about the development of the housing market. In Figure 23, this distribution of home sales in Sweden is illustrated for 2005, 2011 and 2017.[20]

Figure 23. The breakdown of home sales with respect to price, Sweden



Note: Sales refer to monthly averages.
Sources: Swedish Broker Statistics and own calculations.

[20] See the Appendix on page 64 for a more detailed description of how these distributions have been created.

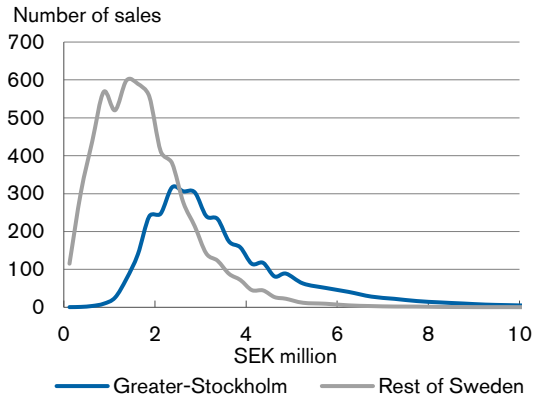
An initial impression is that the distribution over time has shifted to the right in the diagram. Also, the average price for the three selected years rose from around SEK 1.25 million in 2005 to SEK 1.75 million in 2011 and to about SEK 2.7 million in 2017. The area under each distribution has also become larger over time, which is a consequence of the number of sales having increased. In 2005, a little less than 90,000 homes were sold and in 2011 these had increase to about 110,000, and to about 160,000 in 2017. Another way of describing the change is by establishing that in 2005, the most common sale was a transaction within the range of SEK 500,000 - 750,000, and in 2017 this was within the range of 1,750,000 - 2,000,000.

Large differences in price distributions - not only between different parts of the country but also over time

As described in previous sections, there are large regional variations in housing prices, which can also be illustrated using distributions, see Figure 24. This shows that most of the apartments sold in Stockholm during 2017 had a price *above* SEK 3 million, while most of the dwellings in the rest of the country had a price *below* SEK 3 million. The total sales are illustrated according to area under each line and show the average number of dwellings sold per month. In Stockholm, an average of a little more than 3,400 apartments were sold per month and around 5,600 in the rest of the country. In spite of this, a large majority, almost 90 per cent of all apartments worth more than SEK 5 million were sold in Stockholm.

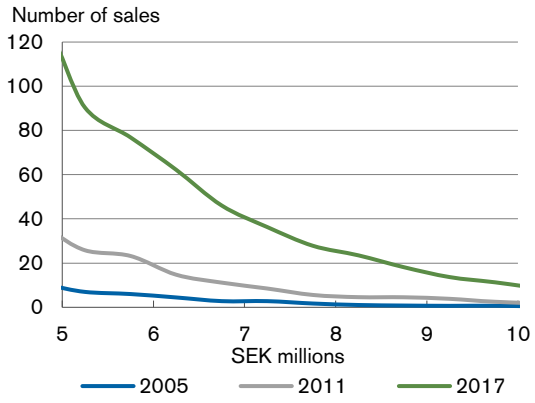
As prices have increased, the number of dwellings sold above a certain price level has also increased. Figure 25 shows the distribution in the SEK 5 to 10 million price range for Stockholm for three different years. The average price in Stockholm increased by roughly the same amount between 2005 and 2011 as it did between 2011 and 2017 and the overall price increase was around 130 per cent during the entire period. In combination with an overall increase in sales, this meant that the sale of homes in the SEK 5 - 10 million price range increased by more than 1,300 per cent. Thus, an important aspect of development over time is that a sustained rise in prices means that sales in a higher price range increase much faster than the actual price rise.

Figure 24. Breakdown of apartment sales in 2017 with respect to price



Note: Sales refer to monthly averages.
Sources: Swedish Broker Statistics and own calculations.

Figure 25. Housing sales in the SEK 5-10 million range, Stockholm



Note: Sales refer to monthly averages.
Sources: Swedish Broker Statistics and own calculations.

The lack of uniformity poses a statistical challenge

In many cases, housing market statistics need to be processed in order to facilitate the interpretation of the development. Two examples are an adjustment for seasonal variation and summary index of general price developments.

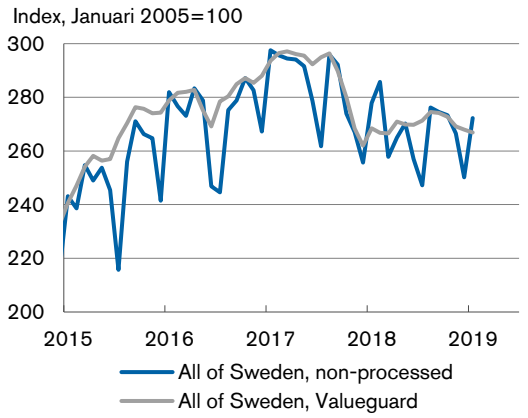
Distinct seasonal patterns in sales and prices

The housing market has a clear seasonal variation. For example, there is a recurring decline in the number of sales of both single-family homes and tenant-owner dwellings during both the summer months and Christmas. This seasonal pattern, however, is not the same in all parts of Sweden and the pattern also varies depending on the type of dwelling sold. This means that the seasonal pattern may look different for apartments with different numbers of rooms. One reason for this decline is that buyer preferences are not constant over the course of a year. For example, in cities with universities, the demand for small apartments is higher in connection with the start of terms. Figure 26 shows the price development of tenant-owner dwelling in Sweden since 2015. The non-processed series comes from Swedish Broker Statistics and shows recurring drops in square-metre prices primarily in July and December.

Figure 27 shows the square-metre price for 2018 and is broken down into how many rooms each apartment has. Prices generally exhibit the same seasonal pattern, but the pattern varies depending on the number of rooms. For example, the pattern is not as distinct for the smallest apartments. The fact that the square-metre price varies in this way may depend on several different things. Both supply and demand decrease during the summer and around Christmas and this affects prices. Another explanation may be that the items that are up for sale during these months do not correspond to the average annual supply.

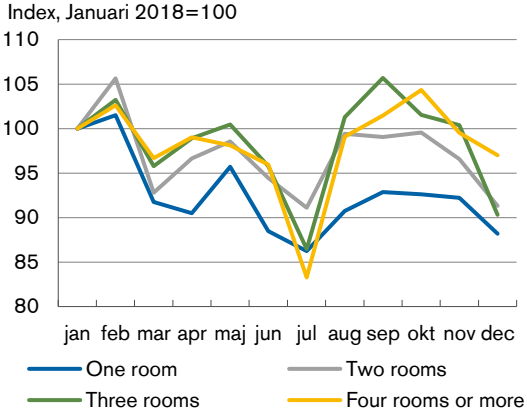
The variation in both price and number of sales means that there may be different interpretations of the market depending on whether or not the statistics are seasonally adjusted. Moreover, the fact that seasonal variation differs not only between cities but also between how many rooms an apartment has makes it even more important not to jump to conclusions about developments between certain individual months.

Figure 26. Square-metre price for tenant-owner dwellings, Sweden



Sources: Swedish Broker Statistics, Valueguard and own calculations.

Figure 27. Square-meter price for tenant-owner dwellings 2018, Sweden



Sources: Swedish Broker Statistics and own calculations.

A summary measure of price development consists of many considerations

As shown so far in this chapter, developments in the housing market are more heterogeneous than what a summary measure of price development implies. The large differences that exist between different regions, between houses and apartments, between newly constructed and existing dwellings and between the times of year when the sale takes place mean that there may be significant discrepancies between different parts of the market. This also means that a summary measure of price development needs to be able to cope with this heterogeneity.

The summary measures of the average, aggregated price developments on the housing market that Statistics Sweden, Swedish Broker Statistics and Valueguard etc. produce in different ways, takes into account a wide range of variations. Figure 26 shows both a non-processed series of square-metre prices of tenant-owner dwellings in Sweden and Valueguard's weighted series. The difference in price development in individual months is tangible and shows the importance of processed measurements for housing prices. If unprocessed original data is used, all market variations must be taken into account to ensure that the information is accurate.

Finally, it should also be stressed that there is currently no weighted price measurement for new production, even though the statistical coverage of this part of the market is continually being expanded and contributes to an increasingly clear overall picture.

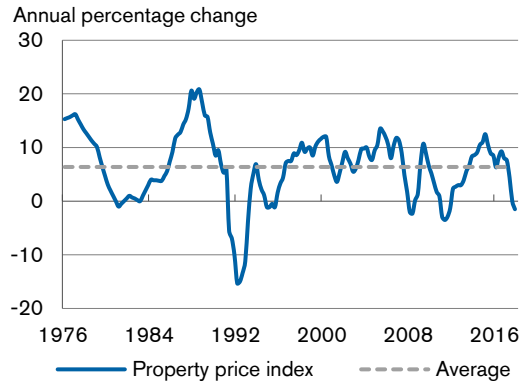
House price developments are well explained by an econometric model

Income and interest rates provide a good explanation of the development in house prices, including the sustained increase of the past 20 years. During that period, increases in income stood for two thirds of the price increase while a fall in interest rates stood for one third. The results from the econometric model also show that the introduction of a mortgage cap coincides with the fact that the estimated equilibrium price fell by about 7 per cent. For the coming 10-year period, the models' forecast point towards a clear trend reversal as price increases are expected to be noticeably lower compared to the two previous decades. That picture will persist even if the economic development is more favourable than assumed in the main scenario.

Prolonged and fast growth rate in house prices

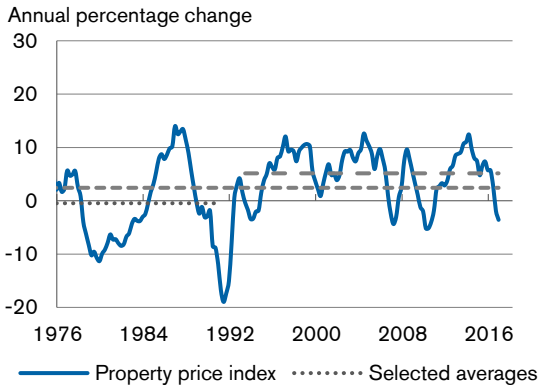
Swedish house prices have been increasing for a long time at a high pace. Over the past 40 years or so, the price trend for houses defined as single-family homes, measured using the Real Estate Price Index, has, on average increased by more than 6 per cent per year. This figure includes the large decline in house prices that took place at the beginning of the 1990s and the falls associated with the financial and Euro crisis in 2008 and 2012 respectively, see Figure 28.

Figure 28. Development of house price during the past 40 years



Note: Before 1985, annual observations are interpolated to quarterly observations.
Sources: Statistics Sweden and own calculations.

Figure 29. Real house price trends in the past 40 years



Note: Before 1985, annual observations are interpolated to quarterly observations. The Real Estate Price Index is deflated with the Consumer Price Index.
Sources: Statistics Sweden and own calculations.

Real house prices show how the price of housing have developed in relation to general price developments in the economy. Figure 29 shows house prices deflated with the Consumer Price Index. Compared to the nominal house prices, there are primarily two circumstances worth noting.

Firstly, as expected, the average annual rate of increase is now lower amounting to just below 2.5 per cent. Secondly, the average differs depending on the time period selected. The average of -0.5 per cent up to and including 1992 is significantly lower than the average of 5.1 per cent after 1995. This difference is mostly a reflection of the difference in the inflation rate between the periods where the corresponding averages for the nominal prices are 7.6 and 6.3 per cent respectively.

In addition to the introduction of an inflation target for monetary policy, several major reforms were carried out from the mid-1980s to the end of the 1990s, including, among other things, a liberalisation of the credit market. The increased possibilities for private individuals to take out a mortgage in order to buy a home was a contributing factor to house prices increasing at the rate they did and has also contributed to the increase in the total debt of households.

An error correction model can be used to explain both equilibrium and temporary deviations

Usually, econometric models are used to explain what drives the development of house prices in a longer perspective.[21] By using such a statistical tool, it is possible to not only explain the historical development but also obtain an image of future development, given forecasts for economic development in general.

In this chapter, one of the proposed types of models presented in the report by the Riksbank on the housing market (Sveriges Riksbank, 2011), a so-called Error Correction Model (ECM), is used to explain the development of real house prices.[22] The choice was made based on the fact that this type of model has been well tested on Swedish data, is convenient and stable. In addition, the model provides an estimated equilibrium price at any given time.

The model is used to estimate the period ranging from 1985 to 2018. Primarily, the choice is based on the perspective of using the longest time series possible. In this case, the starting date also happens to coincide with the implementation of the previously mentioned liberalisation of the credit market, making it a natural starting point also in this respect.

The model consists of two parts

An ECM consists of two parts: a short-run and a long-run part respectively, which together will explain the short-run development of the dependent variable (in this case, house prices). The short-run component consists of the short-run development of the explanatory variables (e.g. income and interest). The long-run component consists of two parts; on the one hand an equilibrium relationship describing how house prices are determined by the level of the explanatory variables (e.g. income and the interest rate), on the other hand, a correction mechanism. The correction mechanism means that if actual house prices not are in line with the price given by the equilibrium relationship, there will be a correction of a specific part of the difference between the actual price and the estimated equilibrium price in each time period. It is also this corrective part of the model that has given the

[21] For other econometric studies of Swedish housing prices, see Dermani, Lindé and Walentin (2016), Geng (2018), Sveriges riksbank (2011) and Birch Sörensen (2013).
[22] See Claussen (2012) for a more detailed description of the results in Riksbanken (2011).

model its name. In this report, the purpose of this choice of model is to determine which macro-variables have driven house price developments historically and, given the current forecasts for these macro-variables, how these are expected to impact the development of house prices in the future.[23]

The model can be seen as an estimate of how factors that steer demand determine the development of prices. This approach is justified in the Riksbank report by saying that it takes time to build new houses and that the annual increase in supply is small, which means that, in the short term, supply is very inelastic with regard to price. In addition, the model is designed in such a way as to correct for temporary deviations. If, for example, a temporary supply shock occurs in the housing market and affects the actual price, this would be interpreted in the model as a temporary disturbance, after which a gradual adjustment would take place so that the long-run, demand-steered equilibrium relationship is fulfilled.

One limitation with the kind of macro-economic models used in this chapter is that they require relatively long time series. This means that in the current situation, one can only model the prices of single-family homes, while the expanding market for apartments is not picked up. Instead, to study this part of the market, we will need a different approach. Examples of this will be provided in the next chapter.

Income and interest rates are the most important factors for price developments

As in Sveriges Riksbank (2011) and in other literature, a number of different explanatory variables have been tested, not only in the long-run part but also in the short-run part of the model.[24] The choice of the final model specification presented below was a relatively simple matter. This since the many alternative specifications that were tested either did not meet requirement regarding cointegration (long-run relationship) or did not pass the diagnostic texts (estimation of entire model).[25]

The variables used in the model

- *Real house prices.* Statistics Sweden's Real Estate Price Index deflated by Statistics Sweden's Consumer Price Index with fixed interest rate (CPIF).[26]

[23] It should be underlined that the model chosen here is a 'satellite model', i.e. a model that only models house prices and does not model house prices within the framework of the development of the whole of the economy. A model for the whole of the economy would also pick up indirect effects on house prices.

[24] The variables that have been tested are the real disposable income of households, the real actual interest rate paid by households after tax, the number of people employed in different age categories (25-34 years, 35-44 years and 25-44 years), real construction cost according to different definitions and the real financial wealth of households.

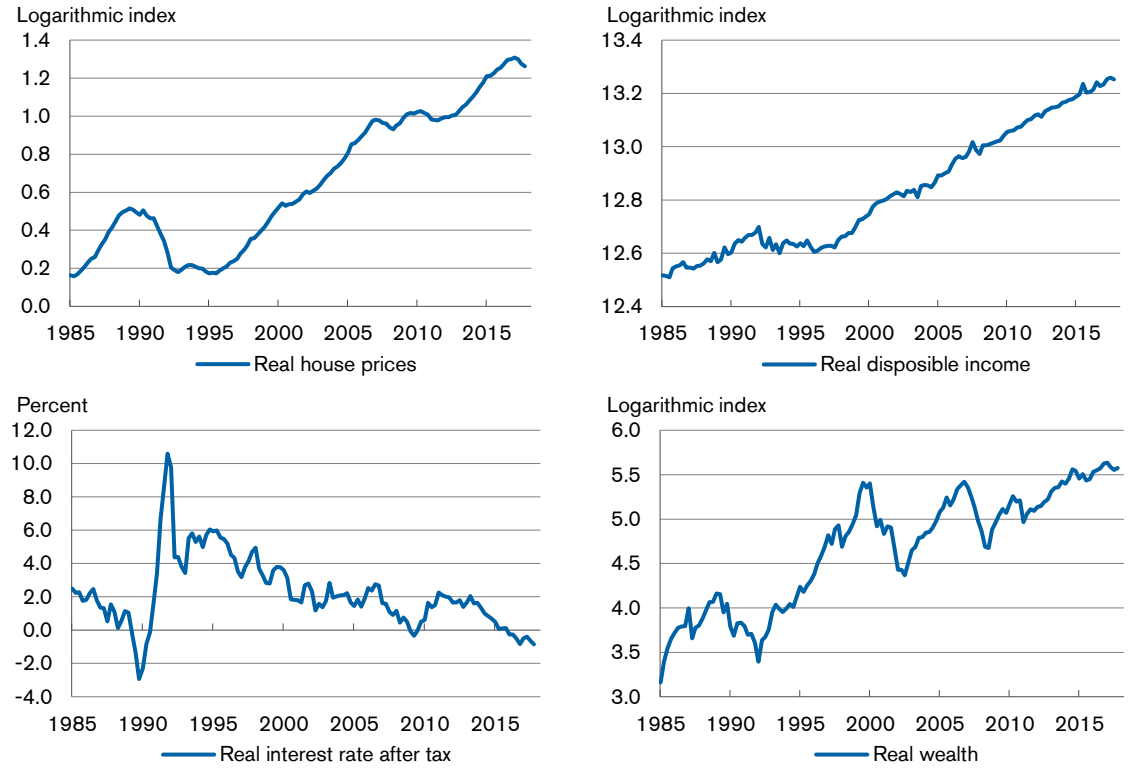
[25] The variables used in the model meet the requirement of being integrated of the first order, i.e. that they are stationary in first difference, which is one of the conditions for being cointegrated.

[26] Claussen (2012) argues that a time lag in the production of the statistics means that house prices in period t actually measure house prices in period t-1. The model used here has been estimated using prices defined in both ways. In both cases the results of both cointegration tests and long-term correlations are very similar but the final estimate of the ECM model as a whole renders a better result if house prices are defined as in the official statistics, i.e without the time lag advocated by Claussen (2012).

- *Real disposable income of households*. Statistics Sweden's standard definition in the National Accounts.
- *Real actual interest rate paid by households after tax*. Interest on households' outstanding agreements with Monetary Financial Institutions according to Statistics Sweden's Financial Markets Statistics *[Finansmarknadsstatistik]*, adjusted for tax deductions, deflated by CPIF.
- *Real financial wealth of households*. The OMXS30 index on the Stockholm Stock Exchange deflated by CPIF.[27]

All the variables in the model are logarithmic, apart from the interest rate, and seasonally adjusted. See Figure 30 for the variables in level.

Figure 30. Variables in the estimated model



Sources: Statistics Sweden, Nasdaq OMX and own calculations.

[27] It would have been preferable to use the actual wealth of household, just like in Claussen (2012), instead of this approximation, but unfortunately the time series are not long enough because the statistics have been reorganised since that study was published. However, estimates have been made using shorter samples where it has been possible to use the actual wealth of households (based on statistics from Statistics Sweden) but this variable has not been included in stable cointegration correlations there either.

Test for cointegration

As mentioned above, the only combination of variables that forms a cointegration relationship that is significant and has reasonable parameter values is a long-run correlation between house prices, income and interest rates. For this specification, all tests for cointegration provide clear, affirmative results, and the selected model also passes stability testing.[28]

Estimation and interpretation of the long-run correlation

The estimation of the long-run relationship in the model using Dynamic OLS gives the following parameter values for the period 1985Q4 to 2018Q3:

$$hp_t^* = -16.7 + 1.37di_t - 0.06ir_t - 0.07D_t^{LTV}$$

where hp_t^* is the real equilibrium price at time t, di_t is real disposable income, ir_t is the real interest rate paid by households after tax and D_t^{LTV} is a dummy variable that assume the value of 0 before the fourth quarter of 2010 and the value of 1 afterwards.[29]

The parameter estimates for income and the interest rate in this estimation are in line with estimates in previous studies, for both Sweden and other countries.[30] The interpretation of the parameter estimates is that in a long-run equilibrium, an increase of one percentage point in real disposable income will result in an increase in house prices of just above 1.4 per cent, while an increase of one percentage point in the real interest rate of households after tax will result in a decrease in house prices of 6 per cent.[31] The fact that the parameter for income is greater than 1 means that households spend a greater percentage of their income on housing. This, for example, could be explained by the on-going urbanisation and rising land prices.

The dummy variable has been added to pick up the assumed effect of the introduction of the mortgage cap.[32] During the time period in question, 1985-2018, a number of different events have taken place that could, for good reason, be assumed to have impacted the estimated long-run relationship. In addition to the included dummy for the introduction of the mortgage cap, dummies for the transition to a floating exchange rate (1992Q4), the elimination of property tax (2008Q1) and the introduction of an amortisation requirement (2015Q2) have been tested, but none of these have resulted in a significant parameter. The introduction of a stricter amortisation requirement is such a recent measure that this cannot yet be tested for.

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[28] The tests for cointegration (Johansen, Engle-Granger and Philips-Ouliaris) are concordant and the p-values vary between 0.02 and 0.09 while Hansen's instability test gives p values above 0.2. If Johansen's test based on a VAR model is performed instead, the p-value will be just less than 0.1 and with a parameter estimate similar to that from the DOLS specification.

[29] The estimate has been performed with 4 lags as this gave the highest coefficient of determination. If the estimate is performed with more or less lags, the parameter estimates are not seriously affected.

[30] See Claussen (2012), for example, for an overview of previous estimates.

[31] Please note that the variable is defined in such a way than an increase by 1 corresponds to an increase by one percentage point and thus differs from other variables that are in logarithmic form, for which an increase by 0.01 corresponds to an increase by one percentage point.

[32] It is also possible to model the introduction of the mortgage cap using a dummy that interacts with income, i.e. by allowing the parameter for income assume one value before the introduction of the mortgage cap and another lower value after the introduction. However, essentially such an estimate will provide very similar quantitative results and all conclusions in the chapter will be the same. Such a specification, however, will not provide quite as clear cointegrated correlations and will not suit the data quite as well as the selected specification.

The long-run relationship provides an easy way to break down the contributions from the model's variables

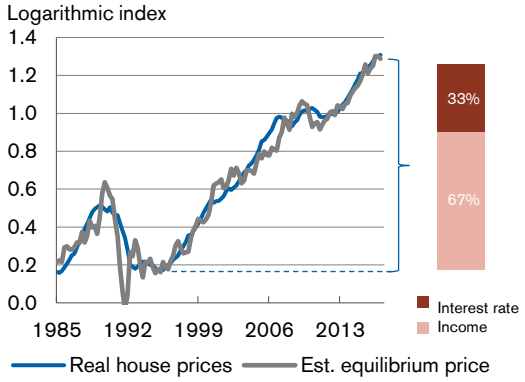
Thus, the long-run part of the model can be used to calculate an equilibrium price, hp_t, which can be interpreted as the price that should apply for the model in the long term in the absence of other disturbances, given the level of income and interest rate.

The long-run relationship can also be used to determine how the different variables have contributed to the development of the equilibrium price over time. As can be seen in Figure 31, real house prices have, apart from a brief respite, increased continuously from 1996 to 2017. During this period of a little more than 20 years, two thirds of the upturn was due to the fact that disposable income increased and one third due to the interest rate falling. It is worth pointing out that such a development in the interest rate is very unusual in the long term. It is possible to study the development of the real short-term interest rate from the late 19th century and onwards, using Edvinsson & Söderberg (2010) and Waldenström (2014). A period corresponding to the one we have experienced in the past 20 years with a sustained and large fall in real interest rates can only be found on one other occasion during this almost 140-year period and that was in the interwar-period. Thus, from this perspective, the period that is the basis of the present econometric estimate is very rare. In the longer term it is, instead, reasonable to expect that on average interest rates would have a neutral effect on the development of house prices.

Deviations from the long-run relationship also contribute with information

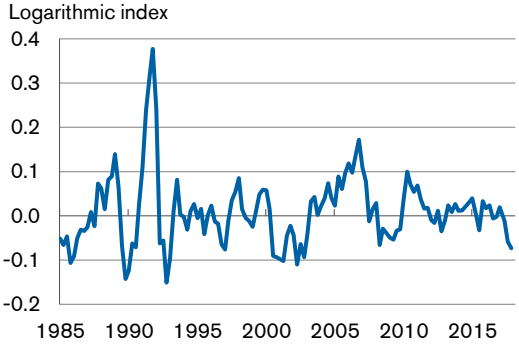
If we study the deviation of actual prices form the estimated long-run relationship, this will provide a picture as to whether the price level is above or below the equilibrium level. Figure 32 shows that the actual price at the last observation, the third quarter of 2018, is only about 7 percentage points below the equilibrium price. Viewed over the whole sample there are two occasions on which prices for a longer period of time clearly have deviated more than 10 per cent from the estimated equilibrium value, partly at the beginning of the 1990s and partly in 2007. On both occasions it was a question of over-evaluations. However, in this context it is worth underlining that there were two completely different reasons for the model pointing to an over-evaluation.

Figure 31. Driving forces behind the rise in house prices 1996-2017



Note: The calculated driving forces relate to the change in the estimated equilibrium price between 1996Q1 and 2017Q4.
Sources: Statistics Sweden and own calculations.

Figure 32. Deviation of actual prices from the estimated equilibrium price



Source: Own calculations.

In the early 1990s the main reason for the over-valuation was a substantial decline in the estimated equilibrium price. The change in the tax deduction for interest payments in the Budget Bill for 1990/91 was made shortly before the short-term market interest rate rose sharply in conjunction with the Riksbank's defence of the fixed exchange rate and, taken together, this had the effect that the contribution of interest rates to the estimated equilibrium price fell sharply within only a couple of years. In addition, the development of disposable income was relatively weak in the years immediately following, which reduced the estimated equilibrium price even more. Equilibrium was not reached until actual real house prices had fallen sufficiently, i.e. just under 30 per cent, to reach the estimated equilibrium price.

The development during the years immediately preceding the crisis in 2008 is clearly different. At this time, the estimated equilibrium price rises at a fairly good pace while actual prices rise even faster. This time equilibrium is achieved by virtue of a moderate decrease in actual prices for about a year while the estimated equilibrium price continues to rise.

Finally, it is worth noting that the estimated long-run correlation is robust not only in terms of satisfying diagnostic tests (see footnote 28), but also in terms of parameter values. If, for example, the model is estimated up to 2005Q4, virtually identical parameter values are obtained, implying, among other things, that the estimated equilibrium price and the deviations therefrom are virtually identical to those found in Figure 31 and Figure 32. An interesting finding is that a model of this type that is estimated using data before the financial crisis interprets the data from three years before the outbreak of the crises as a clear and increasing over-valuation of housing prices.

Estimate of the whole model including the short-run relationship

Using the residuals from the estimate of the long-run relationship, hp_{t-1}-hp^{*}_{t-1}, it is possible to estimate the entire model, including the short-run relationship, see table 1.[33] The parameter that steers error correction in the model is just over 0.06, which is almost identical with the results in Claussen (2012). The value of the adjustment parameter means that just under 25 per cent of the difference between the actual and the estimated equilibrium price will be corrected within one year. In addition to the two lags of the dependent variable, Δhp_{t-i}, the lagged values of change in interest rate, Δir_{t-i}, and wealth, Δfw_{t-i}, are also significant. In the light of results in earlier literature, where both variables are included, in both long-run and short-run correlations, these results are not surprising. There is a clear element of momentum as the parameters for both the lags of the dependent variable are positive, but also stable as they add up to less than 1. The model also satisfies diagnostic tests for auto-correlation.

[33] In line with Claussen (2012), four lags of all explanatory variables were included, after which the highest p-value was removed until all remaining were significant at the 5 per cent level. After that a test was performed to determine whether the variables not included in the long-term correlation (construction cost and wealth) are significant in the short-run correlation and diagnostic testing was carried out.

Table 1. Results from the estimate of short-run dynamics in the house price model

Model	Variable	Parameter	Standard error	t-stat.	p-value
	constant	0.002	0.001	1.98	0.05
	Δhp_{t-1}	0.45	0.08	5.57	0.00
	Δhp_{t-2}	0.22	0.07	2.96	0.00
	Δfw_{t-1}	0.04	0.01	3.77	0.00
	Δfw_{t-2}	0.02	0.01	2.33	0.02
	Δir_{t-1}	-0.02	0.01	-2.06	0.04
	hp_{t-1}-hp^{*}_{t-1}	-0.06	0.01	-4.41	0.00
Diagnostics					
	Adjusted R2	0.65			
	DW stat.	2.00			
	No. of obs.	129			

Note: Δ denote the first differential of the variable, hp_t is real house prices, fw_t is real financial wealth and ir_t is real interest rate after tax.
Source: Own calculations.

Long-run forecast points to a future trend reversal

What will anticipated economic developments mean for house price trends in the coming years? The question is of general interest and even more so at the present time when not only the estimated equilibrium price but also the actual price has increased at a relatively fast and essentially interrupted pace for 20 years. After such a long historic period with a robust and sustained increase, it will be interesting to see if the estimated model can generate a development that can flatten out or even drop off. If not, it would be reasonable to question the characteristics of the model. Below are three scenarios for house price trends in future years based on a long term macro-economic forecast.[34]

Long-run equilibrium prices based on three different scenarios

The main scenario of the model for the long-run equilibrium price has been based on the long-run scenario for economic development from the National Institute of Economic Research (NIER). By using the forecasts produced by the NIER for explanatory variables included in the long-run correlation, house prices can be estimated up to an including 2027.[35]

The long-run scenario by the National Institute of Economic Research and two alternative developments

The main features of the NIER's scenario for economic development up to 2027 are well covered by the GDP growth forecast. The economy will weaken in 2018—2019 when growth will fall from 2.5 to 2 per cent, followed by a growth of just under 2 per cent in 2020—2022, after which growth will increase roughly in line with potential growth in 2023—2026, i.e. about 2 per cent. It is anticipated

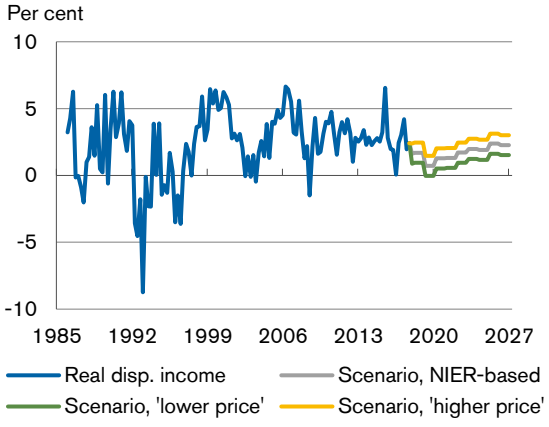
[34] Just as in Claussen (2012), the 'out-of-sample' predictive capacity has been tested resulting in similar, satisfactory results.
[35] The National Institute of Economic Research forecasts disposable income (the same variable as in the model), the repo rate and the 5-year government bond rate. Based on historical correlations between the repo rate, the 5-year government bond rate and the actual interest rate paid by households, the interest rate variable in the model has been projected using National Institute of Economic Research interest rate forecasts. The forecast has been taken from the NIER report The Swedish Economy in October 2018.

that the interest rate will rise successively during the forecast period while the development of disposable income will be weaker than the historical average.

However, basing a 10-year projection of the house price model on a single macro-economic scenario is unnecessarily restrictive, in particular since part of the objective is to illustrate the characteristics of the estimated model. Thus, a 'lower' respectively 'higher' scenario is used as a complement to the baseline macro-economic scenario. Here, lower/higher refers to the effect on house prices, where the 'lower' scenario will result in slower price increases and the 'higher' scenario will lead to faster increases, thus implying that the scenarios are not designed to be more or less credible in a broader economic perspective.

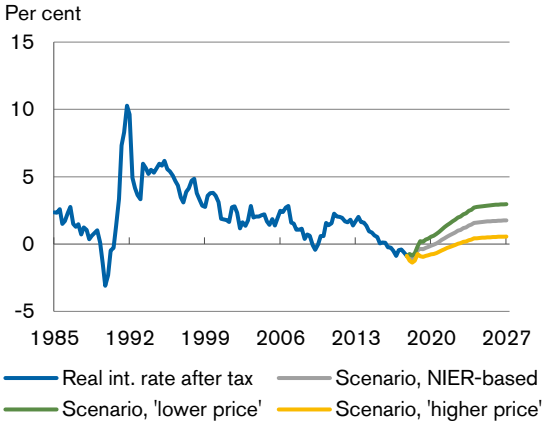
The three macro-economic scenarios expressed as the development of the variables in the model, can be found in Figure 33 and Figure 34. The main scenario is based on the National Institute of Economic Research's long-run forecast as described above. The two alternative scenarios are primarily intended to serve as alternative trends to the main scenario in order to show the extent to which house prices are affected by alternative developments of the explanatory variables. For real disposable income, development in the 'higher scenario' is equal to an average rate of increase (just under 2.5 per cent), which is roughly the same as the historical average, which is 0.75 percentage points higher than in National Institute of Economic Research's forecast (on average, about 1.7 per cent). The lower' scenario is symmetrically designed and consequently 0.75 percentage points lower than in their forecast (on average, around 1.0 per cent points). For the actual real interest rate paid after tax, the 'higher' scenario partly comprises of the fact that interest rate increases are 30 per cent lower for each period than in National Institute of Economic Research's forecast, partly that the average rate of inflation of 2.5 per cent is 0.5 percentage points higher than in the National Institute of Economic Research's forecast. Here as well, the 'lower' scenario has a symmetric design. The level of lower interest after tax at the end of the period is 1.75 per cent in the main scenario while it is less than 0.6 and almost 3.0 respectively in the 'higher' respectively 'lower' scenario.

Figure 33. Real disposable income, outcome and scenarios as basis for house price forecast



Sources: Statistics Sweden, National Institute of Economic Research and own calculations.

Figure 34. Real interest after tax, outcome and scenarios as basis for house price forecast

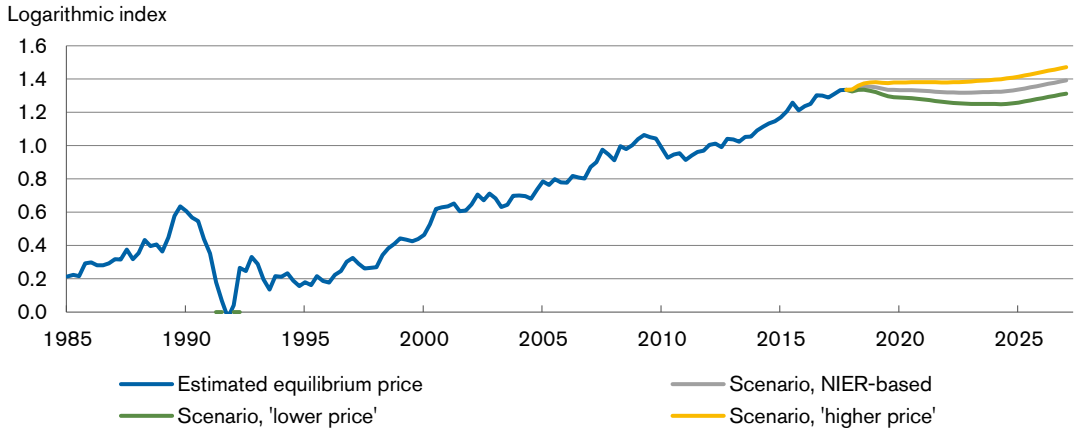


Note: The scenarios are illustrated with four quarterly moving averages.
Sources: Statistics Sweden, National Institute of Economic Research and own calculations.

Equilibrium price trend for next 10 years based on the three economic scenarios
If these three scenarios are used for the explanatory variables, three different trends will be obtained for the estimated equilibrium price, see Figure 35. The three scenarios provide almost a similar impression in that they all imply that there will be distinctly slower increase in the equilibrium price than was experienced during the previous 20 years. The increase in the estimated equilibrium price in 1998-2007 and 2008-2017 was approximately 72 and 52 per cent respectively. For the ten-year period 2018-2027, the increase based on the three scenarios will be 2, 11 and 20 per cent respectively.

For econometric models in general and for long-run forecasts in particular, there are reasons to be careful when drawing far-reaching conclusions. At the same time, the difference in development between the previous 20 years and the next 10 years, is so great that it is reasonable to assume that house prices will not increase at the same rate in the future as they have done for a long time before. This will also apply even if the macro-economic development is significantly more favourable than is reflected in the scenarios. However, if the economic development is less favourable than even in the 'lower' scenario, it is possible that real house prices might stand still or even decrease during the next ten-year period.

Figure 35. Development of the estimated equilibrium price for real house prices, based on the three different scenarios for macroeconomic development



Note: The scenarios are illustrated with four quarterly moving averages.
Sources: National Institute of Economic Research, Statistics Sweden and own calculations.

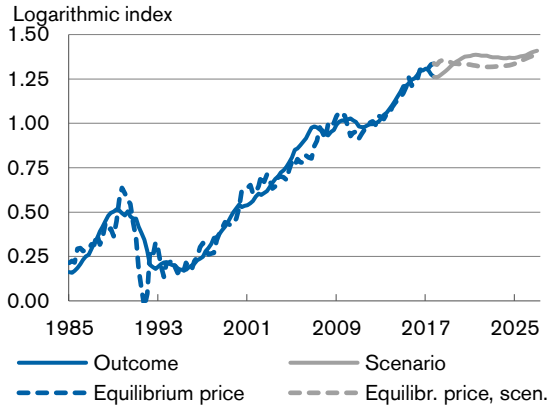
The development of actual house prices based on the main scenario
However, the most common focus of analysis tends to be actual house prices. What does the estimated model say about the development of these, given the main scenario based on the NIER's scenario? In order to be able to make a forecast for the development of actual house prices for the next 10-year period, the entire model will be used, including the short-run part. For this, a forecast of the change in real financial wealth is required; in the model this is defined as the change in the stock exchange index deflated with the CPI, which, unfortunately is not included in the NIER's set of forecasts. In the NIER forecast, the growth in GDP is largely in line with the historical average.

Therefore, in order to be consistent with the overall picture in the NIER forecast, the average historical annual increase (about 4 per cent) of real financial wealth is used an estimate.[36]

The development of the forecast for actual prices can be summarised by stating that originally they recoil upwards for a couple of years followed by a period of a relatively slow increase, see Figure 36 for on level real prices and Figure 37 for nominal prises in annual percentage change. The recoil is due to the fact that the scenario starts in a position with a negative deviation from the long-run correlation, resulting in house prices increasing more quickly due to the model's error correction mechanism. Once the actual price is the same as the equilibrium price, this will increase significantly slower.

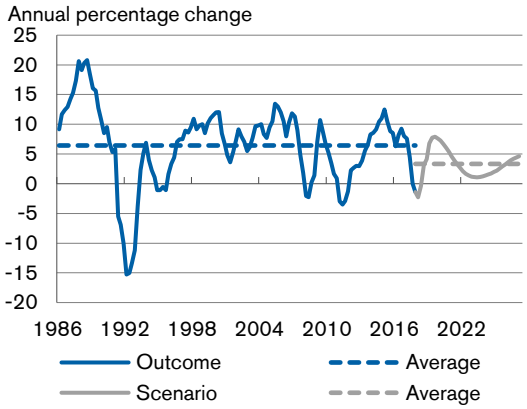
Over the entire 10-year forecast period, real house prices will increase by just below 11 per cent, compared to the increases in the two previous 10-year periods of 108 and 39 per cent respectively. Figure 36 shows that prices clearly increase more slowly in the scenario, compared to the most recent 20 year period. For nominal house prices, the average rate of increase is halved, from the historical average of about 6 per cent to approximately 3 per cent, see Figure 37.

Figure 36. Results for real house prices, actual and estimated equilibrium price, and scenario



Sources: Statistics Sweden, National Institute of Economic Research and own calculations.

Figure 37. Results for nominal house prices (FPI) and scenario



Sources: Statistics Sweden, National Institute of Economic Research and own calculations.

Flattening prices in the future – but the model has several limitations

As in the prototype in Riksbanken (2011) and Claussen (2012), the estimates here show that an error correction model (ECM) works well in describing the development of real house prices. The two variables included in the long-run relationship with real house prices, real disposable income and real interest rate after tax, explain 2/3 and 1/3 respectively of the continual price rise during 1998-2017. It should be stressed that while the sustained price rise over the past 20 years is unusual, it does coincide with a historically very unusual period characterised by an equally sustained and largely uninterrupted falling trend for the real after tax interest rate. In the final model

[36] The assumption about developments on the stock market are, however, not so important for house price trends in the model. If, for example, one instead accepts a 2 or 6 per cent increase, in this context, this will have a relatively small effect on the forecast for house prices.

specification, a dummy is included for the introduction of the mortgage cap, which, when introduced, coincided with the equilibrium rate decreasing by about 7 per cent.

When the model is used to estimate long-run scenarios, the result achieved is a clear trend reversal in price developments. Based on the National Institution of Economic Research's long-run forecasts, including two alternative developments, the model points to that the rate of increase in house prices will be significantly lower in the next ten years, compared to the sustained high rate of increase the preceding 20 years. In the scenario based on the National Institution of Economic Research's forecast, real house prices will increase by 11 per cent in the next 10 years (2018-2027), which can be compared with in an increase of almost 190 per cent in the past 20 years (1998-2017).

It is worth noting that the model does not see any contradiction between the past 30 years or so of rapid price rises and of a possible noticeable deceleration in the rate of price increases in the future. The changes in the development of households' disposable income and mortgage interest rates are enough to explain such a trend reversal in price developments. One possible reason for this trend reversal not to materialise, or at least be less noticeable, would be if current low interest rates persist during the forecast period. Such a development, however, would likely be associated with less favourable economic developments in general, so the total effect on house prices in such a situation would likely be less favourable than what simply low interest rates would imply.

It should be stressed that the model does not capture several aspects of the housing market. Firstly, only price developments for single-family homes are modelled. Thus, apartments that make up two-thirds of the housing market are neglected. The difference in price developments between houses and apartments has been evident for many years, since apartments on average have increased almost twice as fast in price as houses. Furthermore, the model is not suitable for capturing the sharp increase in housing supply that has taken place in recent years. In order to form an opinion about the impact of this on housing prices, a new type of analysis is needed, and this follows in the next chapter.

Have macroprudential policy and increased supply affected housing prices?

Over the past 5-10 years, developments in the housing market have been characterised by a sharp increase in the supply of housing and three implemented macroprudential measures directed at households. This chapter uses not only the previously presented econometric model but also new statistics to analyse these events and the impact they have had on the development of prices. The analysis indicates that not only the increase in supply and the introduction of the mortgage cap but also the introduction of the stricter amortisation requirement has had a clear impact on housing prices.

The heterogeneity of the housing market helps to explain the effects on price developments

The modelling of the development of housing prices in chapter three has several advantages, but it also suffers from a number of limitations. One such limitation concerns supply that is not included as a variable in the model; another concerns the difficulty in picking up any effects on demand from recently implemented economic policy measures. The drop of about 10 per cent in housing prices that occurred in the autumn of 2017 did not coincide with any major movement in the explanatory variables of the econometric model. On the other hand, there had been major changes in the housing market both before and after the drop, in the form of a clear increase in newly constructed dwellings at the same time as macroprudential policy measures aimed at households were implemented. It is therefore natural to study these events more closely in order to look for explanations for the price movements that the model does not manage to pick up.

In addition to also acquiring a better understanding of the short-run price developments in housing, the analysis in this chapter will also fulfil other aims. For example, an analysis of the development of the supply newly constructed dwellings can, through its impact on the construction sector, contribute with information on future macro-economic developments. In addition, an expanded analysis of the implemented macroprudential policy measures is part of the Debt Office's work to safeguard financial stability.

"Have macroprudential policy measures and the increased supply of housing affected price developments"? A majority of analysts are most likely prepared to answer this type of general question with a resounding "Yes". But the question holds several aspects and it is not certain what kind of effect the answer will refer to. This chapter analyses both the short and long-run effect on the aggregated price level as well as the effects on relative prices and the distribution of sales in terms of price, for example, by studying whether apartments of different sizes have undergone a different price development or whether price fluctuations have been linked to specific geographic areas or price ranges. In many cases, this type of disaggregated analysis will also contribute to a

better understanding of the overall development. An effort is also being made to deduce to what extent supply changes and the introduction of macroprudential measures have played in the fall in prices and sales that took place in the autumn and winter of 2017-2018.

Increased supply has probably dampened prices

The increased supply of newly-built dwellings has probably had a dampening effect on the prices on the succession market by even increasing the supply of existing dwellings. The question is whether there is a correlation that can be confirmed using available statistics.

In order to respond meaningfully to the question, it will first be necessary to define what price and what part of the supply of housing that are being referred to. The point of departure for the question at issue in this section is the steep, but unevenly distributed increase in newly-built dwellings that has occurred since 2013, i.e. in a relatively short period of time. The increase actually started in 2011, but as more detailed statistics from Booli only became available as of 2013 that will now be the starting point. Even though the new statistics are very helpful in several respects, there are some limitations that affect the chances of drawing firm conclusions about developments. These will be discussed in more detail in following sections.

The effect of the increased supply has been limited to the increase in apartments. This is due to the reason that not only the scale of construction but also the geographic variation is greater for apartments than for single-family homes, making any analysis simpler and clearer in this regard. A large proportion of the apartments are also located in areas with high prices, i.e. in metropolitan areas, where price movement has also been greater in recent years.

An unevenly distributed increase in newly constructed apartments

The large increase in newly constructed apartments in recent years has followed a longer period with a relatively low rate of construction. This meant that the number of completed apartments with tenant-ownership in 2017 and 2018 was more than twice as high as the average measured since 1991, see Figure 38.[37] A large part of this increase has been significantly unevenly distributed. This fact increases the understanding of not only why the development of newly-built homes has had a *boom/bust* character, i.e. a rapid and strong upturn followed by a similar downturn, but also of the effects it has had on the succession market both locally and nationally.

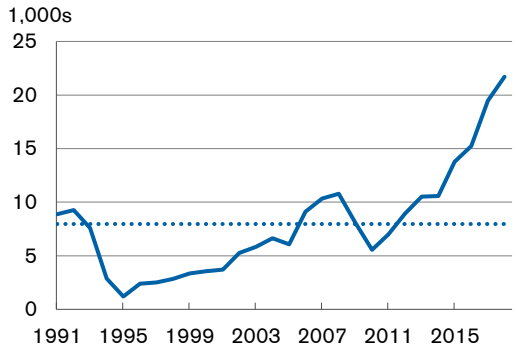
The higher the price level, the greater the increase in new production

The increased supply of newly-built apartments for sale has mainly been concentrated to the major cities, in any case since 2016. Figure 39 illustrates that the percentage increase in 2016-2018 has been greatest in Stockholm and, with a certain time-lag, in Gothenburg. If development is compared to how the number of completed apartments has developed in the previous diagram, some discrepancy is evident for the years 2013-2016. In the statistics from Statistics Sweden, construction increases during this period while Booli's data shows the opposite. Unfortunately, the difference exemplifies how different data sources can show different developments. In this case, it could be explained by the fact that Booli's statistics were under construction during this time period and that perhaps not all apartments for sale were picked up.

[37] Instead, for a number of years it was the surprisingly low rate of construction that was the focus of the analysis; e.g., see the discussion and analysis in Emanuelsson (2015).

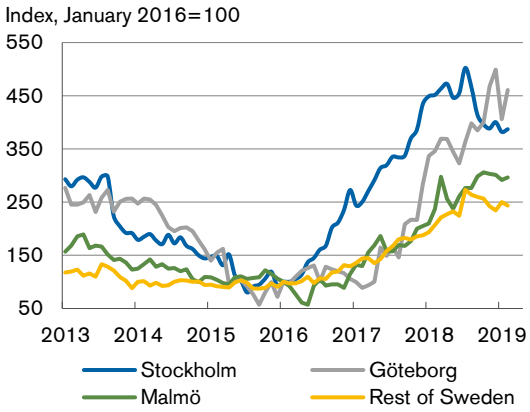
There is no obvious explanation of what significance the increase in newly-built apartments has had for the housing market as a whole because the annual addition of dwellings through new production is low in relation to the total housing stock. By contrast, the proportion of new production in relation to what is sold is larger, nearly 12-15 per cent, which was described in the second chapter of the report. Another way to give perspectives on the recent increase in newly constructed apartments is to compare it with the supply that is for sale on the succession market, see Figure 40. Although the increase in the number of completed apartments is apparent, its impact on the housing market as a whole depends on how the increase relates to the longer-run situation on the succession market.

Figure 38. Completed apartments for ownership, 1991-2018



Note: Dashed line refers to average for the entire period of time.
Source: Statistics Sweden.

Figure 39. Supply of newly constructed apartments



Note: In this respect, Stockholm refers to Greater Stockholm, while for Gothenburg and Malmö, this only refers to the municipalities.
Source: Booli.

On average, the relative supply, measured as the ratio between new production and succession was 1.1 in 2018. This means that for every existing apartment for sale in the succession market there were 1.1 newly constructed apartments to choose from. This can be compared to approximately 0.6 for the period of 2013-2016. In view of the fact that the number of completed apartments during this period was significantly above the historical average, see Figure 38 once more, there is reason to believe that even 0.6 is a comparatively high relative supply of newly constructed apartments. It is the overall development in supply that is likely to have the greatest impact on the housing market as a whole. However, if smaller geographical areas are studied, there are greater contrasts between new production and succession, which in turn can provide an explanation for reports in the media that testify to a complete halt in construction as a result of over-capacity.

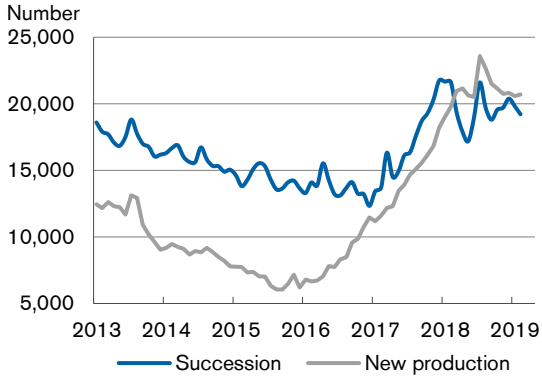
Up to ten times more newly-built apartments than existing apartments for sale in 2018

For example, in Stockholm in July 2018, the supply of newly constructed dwellings in the SEK 6-10 million price range, which is one of the more expensive price segments in the municipality of Stockholm, was more than three times the number of dwellings in the same price range on the succession market. The fact that the relationship between new production and succession at that time was as high as 3:1 should be compared with a 1:1 ratio for both Stockholm and Sweden as a whole. This 3:1 relationship is even more conspicuous when compared to what the situation was like in Sweden just a couple of years earlier. At that time, the relationship fluctuated at around 1:2.

If the geographic area is further limited, even more obvious imbalances emerge. Figure 41 illustrates the supply of larger apartments in Gärdet, a small district in central Stockholm. In almost just one year, 2017, so many newly constructed large apartments came out on the market that the relationship between new production and succession exceeded 10:1, i.e. for each apartment with 4 or more rooms in the succession market in Gärdet, there were at least 10 new apartments for sale.

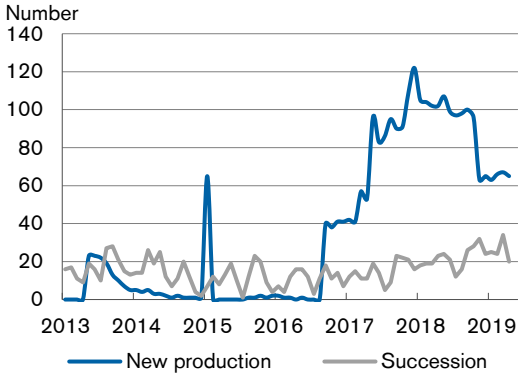
This example with Gärdet is intended to complement the development shown in the previous figures that trace the evolution of housing prices and supply in Sweden and different larger regions. It provides a certain amount of understanding of how large the local variations have been. It also shows how a *boom/bust* trend can be created in housing construction. A strong local increase of supply followed by a significantly lower rate of sales will likely result in a stalled or significantly lower rate of construction in the coming years, until there once again are signs that demand justifies increased construction.

Figure 40. Supply of apartments, Sweden



Note: Supply refers to the number of apartments that have been up for sale during a specific month.
Source: Booli.

Figure 41. The supply of larger apartments, Gärdet in central Stockholm



Note: Supply refers to the number of apartments that have been up for sale during a specific month. Large apartments refers to those with 4 or more rooms.
Source: Booli.

Thus, the sharp and unevenly distributed increase in supply in recent years will gradually become clearer when the analysis moves from a national, to a regional and, finally, a local level. Moreover, it appears that the higher the prices, the greater the increase in the new construction. With these sharp increases in supply – regardless of whether they relate to the situation in Gärdet with 10 newly-built apartments for each existing apartment or for the more expensive segments in the whole of Stockholm with 3 newly-built apartments for each existing apartment – the market will most likely need a longer period to sell enough objects to ensure that the balance between the supply in the two submarkets approaches previous average levels.

Is speculation part of the explanation for the sharp increase in construction?
In retrospect, it may appear optimistic with construction so concentrated in certain geographical areas and in certain price segments. One circumstance that may have contributed to this development is that the demand that construction companies encountered suggested that the market for several years was far from being saturated. However, this demand may have been less than the actual, underlying demand as it seems that apartments were purchased for speculative purposes; see box for in-depth info below.

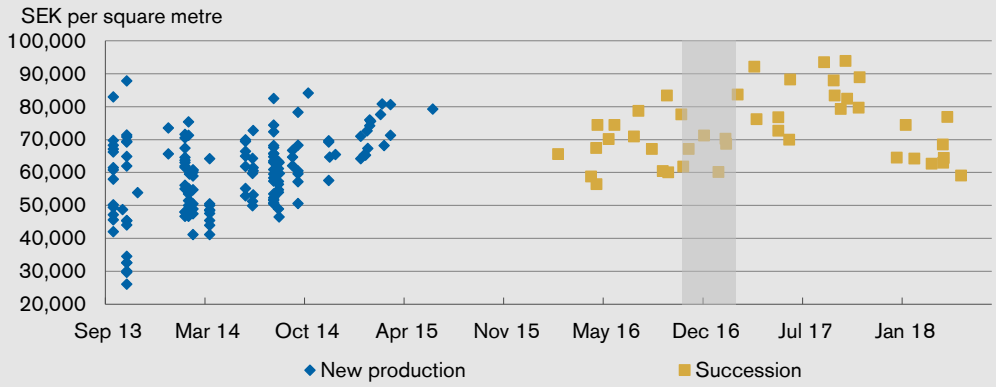
Speculation can be described in both negative and positive terms, depending on purpose. Here, however, we are trying to point to something else; namely that speculation affects construction not only in the upturn but also in the downturn phase. During an upturn, speculative purchases lead to a construction project selling out more quickly than it would otherwise, and all things being equal, will lead to new projects being started earlier than they otherwise would have been. The increase in construction is therefore faster. Instead, in a downturn, speculative purchases are likely to be the first to disappear and all things being equal, the downturn will materialise much faster. The greater the element of speculation in new production, the more pronounced the *boom/bust* trend in construction will be.

Indications of speculative buying in new production

When a newly constructed apartment is purchased, the occupancy date is usually a few years in the future. This makes it possible to buy the apartment without tying up a large amount of capital, reap the benefits of the anticipated increase in value and then sell it at a profit before occupancy, i.e. without actually having lived in the apartment. But do such speculative purchases occur?

In the Municipality of Stockholm, between 2012 and 2017 there were a large number of projects where all homes sold out and enough time had elapsed for the dwellings to begin to appear on the succession market. Of the roughly 70 per cent of projects with a satisfactory statistical basis, the 40 largest projects have been selected. In almost half of these projects there was a sales pattern where a not insignificant number of sales were made in close proximity to the date of occupation, a clear indication that speculation may have occurred.

Figure 42. Example of sales in a construction project, Stockholm



Note: Each observation is a sale. New production refers to sales during the construction process and with succession when the dwelling was resold on the housing market. The shaded portion in

An illustrative example of such a sales pattern can be found in the diagram above that shows a construction project with just under 200 apartments. Sales started in the middle of 2013 and all apartments were sold about two years later. Occupancy lasted from December 2016 to March 2017. Just over 8 per cent of the apartments were sold on the succession market prior to the start of occupancy and just over 10 per cent before occupancy had been completed. If the period is extended to include the period within one

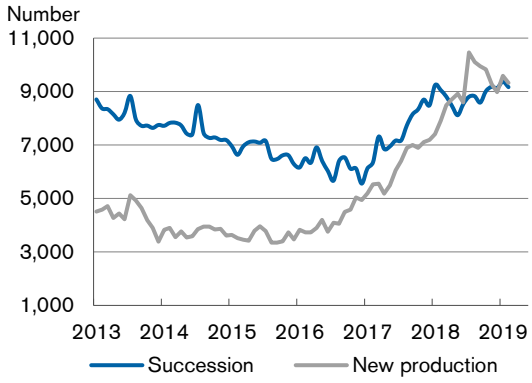
year after completed occupancy, almost 40 apartments were sold on the succession market, corresponding to about 20 per cent of the total number of apartments. This is a high figure in view of the fact that turnover in the total stock of apartments is just over 10 per cent per year.

It is difficult to determine what falls within the normal variation of moving and housing behaviour, especially when purchasing decisions are taken several years ahead of occupancy and a lot may have happened that changes housing needs of buyers. However, the fact that so many sales are made in connection with occupancy indicates that not all buyers had plans for more long-term accommodation.

An increased supply of newly-built dwellings has probably affected prices on the succession market

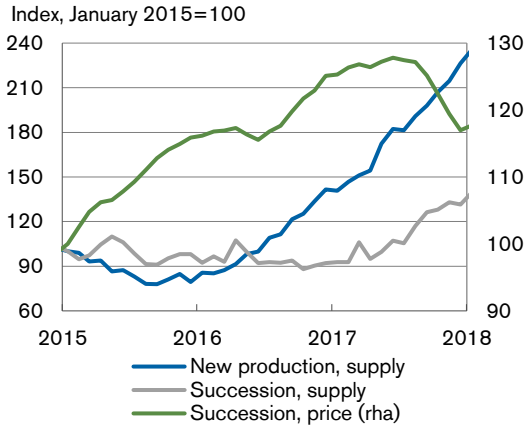
A relatively large proportion of those who buy a newly constructed dwelling are not first-time buyers but people who already own a dwelling. For this group, the purchase of a newly constructed home means that they have to sell their existing dwelling on the succession market. This means that there is a natural link between the supply of new production and succession homes and this link is probably one of the reasons why the supply on the succession market increases about a year after the supply in the newly constructed market does, see Figure 40. Even though the trend varies slightly between different parts of Sweden, a similar overall pattern can be found not only in Stockholm, Gothenburg and Malmö, but also in the rest of Sweden, as can be seen in Figure 43.

Figure 43. The supply of apartments, Sweden excluding Stockholm, Gothenburg and Malmö



Note: In this respect, Stockholm refers to Greater Stockholm, while for Gothenburg and Malmö, this only refers to the municipalities.
Sources: Booli and own calculations.

Figure 44. The connection between new production and succession for apartments 2015-2017, Sweden



Note: Refers to monthly observations. Own seasonal adjustment.
Sources: Booli, Valueguard and own calculations.

The possible link between the supply of newly constructed dwellings and the price development of the succession market can be seen in Figure 44. As is clear there, there was an increase in the supply of newly constructed apartments in Sweden starting at the turn of the year 2015/2016. With a time-lag of about one year, there was also an increase in supply of succession dwellings, after

which prices on the succession market began to drop a few more months later.[38] We should not interpret this as meaning that the drop in prices can entirely be explained by the development of supply in the two submarkets, but that it may well have been a contributory factor.[39]

Price trends for newly constructed homes are harder to measure

It may not be obvious why the previous analysis focused solely on price trends on the succession market, even though that market is the more important of the two. One important reason for this choice is the fact that there are several partially aggravating circumstances that must be taken into account when it comes to price trends for newly constructed dwellings. The statistical data are different and since the new production market differs in some ways from the succession market, in some respects they could be considered as constituting separate submarkets. Two such differences have been noted earlier in the report, on the one hand, differences in price level, on the other hand, the existence of speculation in the new production market. However, there are two more differences that are important when it comes to measuring price trends, namely the geographic distribution and price formation, i.e. what determines the price of newly constructed dwellings and existing dwellings respectively.

Geographic concentration complicates the measurement of the general price trend for newly constructed dwellings

When a summary measure is constructed for the succession market, it is largely based on the fact that there is a volume of sales large enough to enable it to construct a price index. After data on sales are collected, adjustments are made for the area and size et cetera, in order to measure the general price trend in as fair a manner as possible.[40]

Compared to the succession market, the market for newly constructed dwellings deviates in a way that has significance for being able to follow general price trends though a weighted price index. Significantly fewer newly constructed apartments than existing ones are sold, despite increased construction, and those that are sold are concentrated in the specific geographic areas where they have been built. As a result, unprocessed statistics, such as sales prices per square metre in specific geographical area, may be heavily influenced by sales in a certain smaller part of that area. These problems decrease the larger the geographical area referred to, and if unprocessed statistics for newly-built apartments are compiled throughout Sweden, the measure will be more stable than for smaller regions. However, we are still left with the fact that the statistics may be more influenced by developments in certain regions than the aggregated, processed measures on the succession market.

Price trend for newly constructed dwellings and the relation to price developments in the succession market

Even though it is difficult to create a measure of the aggregated, general price trend for newly constructed dwellings, it is possible to obtain a relatively good picture of trends through the available unprocessed price statistics, expressed in SEK per square metre. In Figure 45 it appears

[38] Even the supply of detached homes increased at the same time, but not as much as for apartments.

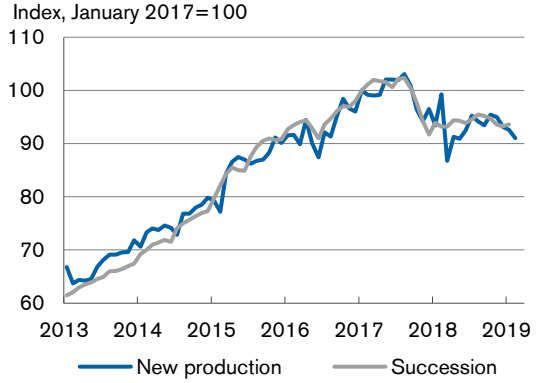
[39] Other possible explanations of what triggered and drove the price drop are, for example, announcements pertaining to the stricter amortisation requirement, which occurred just before the period when prices start to drop. In addition, the supply on the succession market was most likely influenced by factors other than just new construction, e.g. a change in purchasing and sale patterns where it has become increasingly common to sell first and then buy afterwards.

[40] See the first chapter 'Statistics for housing prices and sales are becoming more comprehensive ' page 5 for a more detailed description of how different price indices on the succession market are produced.

that the difference in price trends between new production and succession for apartments in Sweden is relatively small, provided that the comparison takes place over a longer period of time. The series for new production is, however, more volatile and on several occasions, it shows that the price changed by around 10 per cent in just one or a couple of months, which is not the case with the series for the succession market.

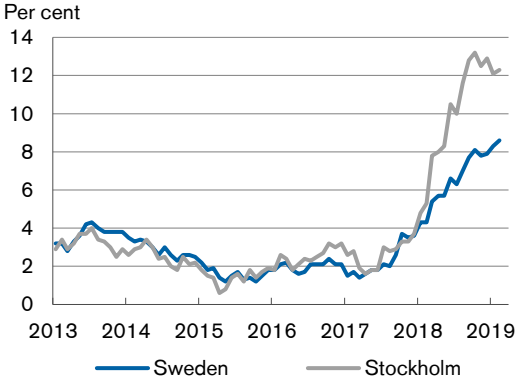
Given the measurement problems detected and the uncertainty they entail, it is common to also follow developments in the new production market using other indicators such as the percentage of deleted ads and advertising time, but also the percentage of price-reduced apartments, see Figure 46. One reason the significant increase in the percentage of price-reduced apartments has not left a bigger footprint on the overall price trend may be that the list prices of newly constructed dwellings are set well in advance. If prices have gone up for several years and the general expectation is that prices will continue to rise, the construction companies probably set a price that to some extent also incorporates future price increases. If, instead, actual market developments lead to a decline followed by a period of unchanged prices, as has been the case recently, the difference between the pre-set price and the market price will be greater than the actual fall in housing prices. The price of the newly-built apartments may then need to be reduced by a significant amount so that the apartments can be sold given the new market price. Over the past year, price reductions of at least 20 per cent on individual items have also been reported by some construction companies. Thus, the fact that these reductions of around 10 per cent are greater than the average downturn in the market as a whole, may, to some extent, be due to the price of the newly-built apartments being set well in advance, probably with the expectation of a continued price rise.

Figure 45. Price development for apartments in two submarkets, Sweden



Note: New production is measured with unprocessed statistics based on SEK per square metre. Succession is measured using a processed, weighted measure.
Sources: Valueguard, Booli and own calculations.

Figure 46. Percentage of price reduced apartments, new production



Source: Booli.

Macroprudential policy measures have most likely influenced price trends in several ways

In order to counteract excessive indebtedness among households, the Swedish Financial Supervisory Authority has carried out three measures aimed at households in the framework of macroprudential policy: a mortgage cap (Finansinspektionen, 2010), an amortisation requirement (Finansinspektionen, 2016) and the introduction of a stricter amortisation requirement (Finansinspektionen, 2017). Since the common purpose of the measures is to reduce indebtedness,

which is usually associated with housing purchases, it is reasonable to assume that they also affect housing prices. In several cases, the Swedish Financial Supervisory Authority has published studies before and after the introduction of the measures, with an analysis of the expected and resulting effects respectively.[41]

The impact on price developments can be felt through not only a general dampening of demand, but also through the fact that the measures have a greater impact on certain groups of buyers. In the former case, the general price level is affected, while in the latter case relative prices may change. In the public debate that has followed in the wake of the measures, both types of price effects have been discussed.

This chapter uses the previously presented econometric model for single-family home prices to analyse possible effects on the aggregated price level, while more finely distributed statistics on apartments and sales in different price ranges from the second chapter in the report are used to study relative prices.

The mortgage cap has probably affected both the price level and the relative price

The introduction of the mortgage cap meant that new or extended existing loans with a mortgage should no longer exceed 85 per cent of the market value of the dwelling.[42] This implied a restraint since in the years before its introduction it was possible to borrow up to 95 per cent of the value of the dwelling at many banks. The introduction of this probably meant that not only the aggregated price level would fall but also that the relative prices between smaller and larger apartments would be affected, as explained below.[43]

The mortgage cap probably affected house prices in both the short and long-run

To see if the mortgage cap affected the aggregated level of housing prices, it is possible to use the econometric model for house prices that was presented in the previous chapter. This model has several benefits. Firstly, it is possible to test for whether the measure affected the long-run relationship between house prices, disposable income and the interest rate. Secondly, it is possible to test whether it had any effect on the short-run development of home prices. This is done by using a dummy in both the long-run and short-run part of the model.

The long-run effect was already evaluated in the previous chapter of the report when the best specification of the econometric model was investigated.[44] It showed that the introduction of the mortgage cap most likely meant that the estimated equilibrium price for single-family homes fell by around 7 per cent. Given that the measure is likely to permanently affect some home buyers through an increased requirement for a down payment or a corresponding unsecured loan, a permanent price level reduction does not seem unreasonable. The part of the group of home buyers who are affected will adjust their housing purchase towards cheaper accommodation, or perhaps completely refrain from purchasing, which should lead to lower overall demand and thus a lower price level.

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[41] References to the Swedish Financial Supervisory Authority's analyses of the respective measures can be found in footnotes at the beginning of the following sub-sections.

[42] See the Swedish Financial Supervisory Authority (2010) for a more detailed description.

[43] The Swedish Financial Supervisory Authority has not only published an analysis of anticipated effects ahead of the introduction of the measure (Finansinspektionen, 2010) but also of the subsequent evaluations (The Swedish Financial Supervisory Authority 2011 and 2018).

[44] See page 29 in 'House price developments are well explained by an econometric model' for a more detailed explanation.

The short-run effect will not be quite as easy to capture because it will be necessary to make an assumption as to when the temporary effect may arise. Since there may well be a slight delay before all players adapt to the new conditions, the effect will be estimated over 4 quarters. In the short term, the dummy will assume the value 1 in the four quarters immediately after introduction and the value 0 for all other quarters.

When estimating the model, the parameter for the mortgage cap dummy in the short term is -0.01 and have a probability value (*p-value*) of 0.12.[45] Although the *p-value* is slightly above the usual thresholds this will mean, with a relatively high level of certainty, that prices fell by approximately 1 per cent per quarter in the four quarters immediately following the introduction of the mortgage cap, in addition to that explained by the other variables of the model. However, it is worth keeping in mind that in an error correction model, the long-run development of prices is determined by the co-integrating relationship, which means that these estimated short-run effects are just short-run and thus will subside as the prices in the model move towards the long-run relationship. Overall, the mortgage cap seems to have had an economically and statistically significant dampening effect on house prices, primarily in the long term but possibly also in the short term.

The mortgage cap seems to have resulted in smaller apartments becoming relatively more expensive

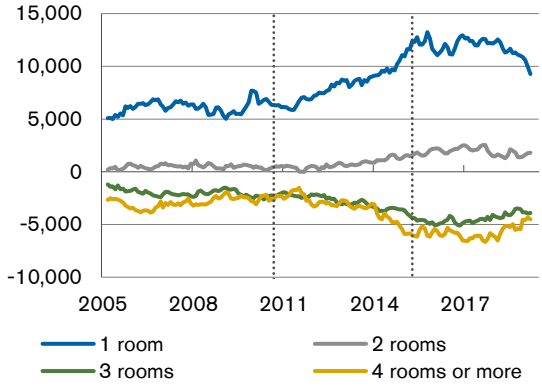
The introduction of the mortgage cap also seems to have led to an increase in the demand for smaller, cheaper apartments. One possible and likely explanation is that potential buyers affected by the requirement of a 15 per cent down payment requirement started to ask for cheaper apartments. This resulted in a relatively higher demand for cheaper apartments and a lower demand for more expensive ones compared to the time before the introduction of the mortgage cap.

In Figure 47, square metre prices for apartments with varying numbers of rooms are compared with the average square metre price for all apartments. At this point of intersection it becomes clear that apartments with fewer rooms generally have a more expensive per square metre price. It is also clear that the relative prices for different numbers of rooms had already begun to drift apart in the middle of 2011, after having been relatively stable the five years immediately preceding the introduction of the mortgage cap. Apartments with one room clearly becomes more expensive in terms of square meter price; apartments with two rooms exhibit a weak increase, while apartments with three and four rooms or more are becoming cheaper. Broadly speaking, this development in relative prices then continues uninterrupted until 2015.

[45] If 3 or 5 quarters are used instead, the parameter estimate will be lower and the p-value will be clearly higher.

Figure 47. Deviation from the average price for apartments with different numbers of rooms, Sweden

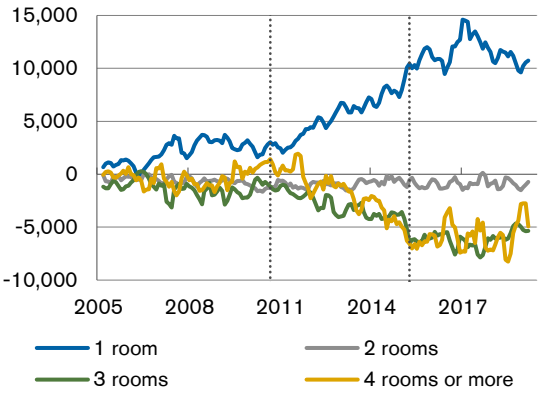
SEK per square metre, 3-month moving average, seasonally-adjusted values



Note: Vertical dashed lines refer to the date of the introduction of the mortgage cap in October 2010 respectively when the proposed amortisation requirement was withdrawn in April 2015.
Sources: Swedish Broker Statistics and own calculations.

Figure 48. Deviation from the average price for apartments with different number of rooms, the Inner City of Stockholm

SEK per square metre, 3-month moving average, seasonally-adjusted values



Note: Vertical dashed lines refer to the date of the introduction of the mortgage cap in October 2010 respectively when the proposed amortisation requirement was withdrawn in April 2015.
Sources: Swedish Broker Statistics and own calculations.

The effect is even clearer for an area with high housing prices, such as the Inner City of Stockholm, as illustrated in Figure 48. Between the introduction of the mortgage cap and the announcement of the amortisation requirement, the relative square metre price of an apartment with one room in the Inner City of Stockholm increased SEK 6,900 compared to the average price. The increase in Sweden as a whole was SEK 5,500.

Small apartments seem to have become more expensive first and foremost where the price level is higher

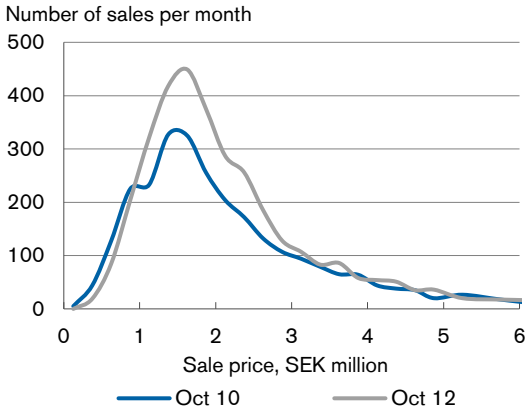
Another way of illustrating the effects on the housing market is to see how the price distribution of the number of homes sold was affected. Figure 49 shows the total number of apartments sold in Stockholm in October 2010 and October 2012 respectively, distributed according to sales price.[46] During the two years separating the dates, sales of apartments increased from 2,800 to just over 3,400. As the chart illustrates, in principle the entire increase in sales was concentrated in the segment with housing in the SEK 1 to 3 million price range. This trend contrasts with developments in the rest of the country over the same period of time where the distribution (not shown in graph form) remained basically unchanged. After two years, the effect of the mortgage cap can clearly be seen in Sweden as a whole and even more so in Stockholm, provided that the apartments sold on each occasion are comparable in terms of standard and geographical location within respective region etc. Also from this perspective, at least to some extent, the effect of the mortgage cap seems be linked to the price level.

Another way of illustrating the supposed effect is to compare relative distributions, i.e. distributions adjusted for volume and average price changes. Figure 50 illustrates housing sales in Sweden 2005

[46] If a corresponding diagram is drawn up for the number of dwellings sold, i.e. including the sale of detached homes, the result will largely be identical.

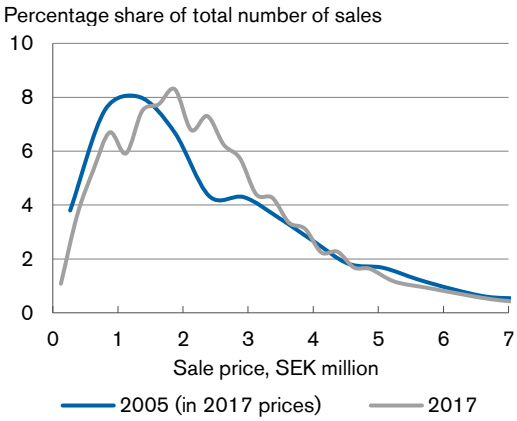
and 2017. The distributions are expressed as percentages of total sales for the respective years (volume adjustment) and the distribution for 2005 is also adjusted for the average price increase of 2005-2017 (average price adjustment). Overall, this makes it possible to compare the respective distributions with respect to relative price changes.

Figure 49. Breakdown of sold apartments in October 2010 and 2012, Greater Stockholm



Sources: Swedish Broker Statistics and own calculations.

Figure 50. Distribution of housing sales, Sweden



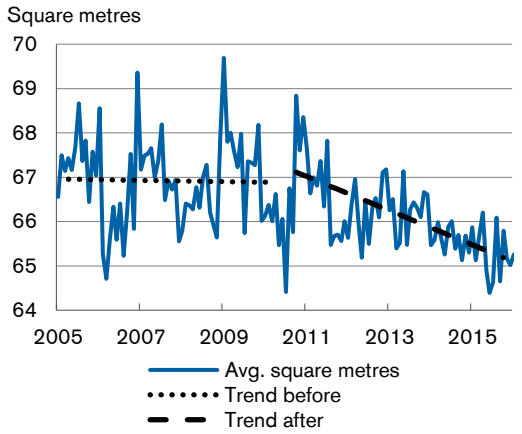
Sources: Swedish Broker Statistics and own calculations.

After the adjustments, it appears that the distributions are not the same. Assuming that sales each year consist of comparable items, this means that the rate of the price increase has *not* been the same for cheaper respectively more expensive dwellings. Distribution in 2017 has its centre of gravity farther to the right compared to the adjusted distribution for 2005. This change in distribution is consistent with a trend in which the price of cheaper dwellings increases at a relatively faster pace, in line with the analysis in the previous section.

The choice of both apartment size and the number of rooms seems to have been affected

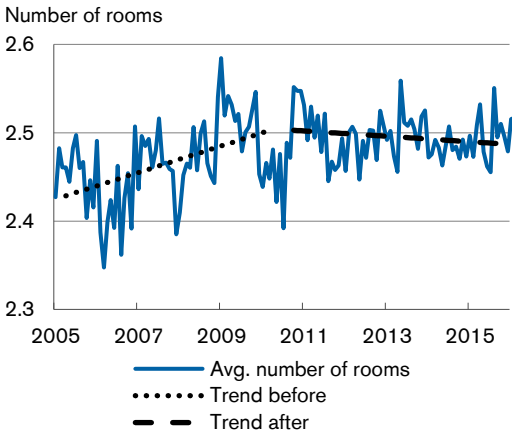
A third and final way of illustrating the consequences of the mortgage cap is studying how the size and type of housing were affected. Figure 51 shows the average size of a sold apartment and how this has evolved over time. Even though the series is relatively volatile, there is no clear trend in the development of the five years before the introduction of the mortgage cap; instead the size hovers at around 67 square metres, as illustrated by the estimated time trend. After the introduction, the average number of square metres drops for approximately five years, from about 67 square metres to slightly over 65 square metres, which time-wise is in line with the persistent divergence of relative prices seen in Figure 47.

Figure 51. Average number of square metres of apartments sold 2005-2015, Stockholm,



Note: The trend lines are estimated 5 years before the Swedish Financial Supervisory Authority sent out the referral and 5 years after the mortgage cap was introduced.
Sources: Swedish Broker Statistics and own calculations.

Figure 52. Average number of rooms for apartments sold 2005-2015, Stockholm



Note: The trend lines are estimated 5 years before the Swedish Financial Supervisory Authority sent out the referral and 5 years after the mortgage cap was introduced.
Sources: Swedish Broker Statistics and own calculations.

A trend break can also be discerned in the development of the average number of rooms for sold apartments, as seen in Figure 52. In connection with the introduction of the mortgage cap, the previous rising trend was halted and instead began to fall slightly after the introduction. However, it cannot be ruled out that these changes are also due to other factors, such as structural changes in the composition of the apartments coming up for sale on the succession market or due to changes in house-buyers' preferences.

The amortisation requirement seems to have counteracted the effect of the mortgage cap on relative prices

On 1 June 2016, the Swedish Financial Supervisory Authority introduced an amortisation requirement whereby new mortgages exceeding 50 per cent of the value of the dwelling must be amortised with at least 1 per cent of the total mortgage and new mortgages exceeding 70 per cent of the value of the dwelling must be amortised with at least 2 per cent.[47] These measure affect those households that would otherwise have opted for a lower amortisation rate. Unlike the mortgage cap that required access to capital for the purchase of a dwelling, the effect of the amortisation requirement constituted a more obvious link to income as the action resulted in an increase in current housing expenditure for the households concerned. The introduction does not appear to have affected the aggregated price level, in neither the short nor the long term, and relative prices seem to have been primarily impacted in such a way that the effects of the mortgage cap largely disappeared.[48]

[47] The requirement has since been strengthened; see the next section. For a more detailed description of the amortisation requirement, see the Swedish Financial Supervisory Authority etc. (2016).
[48] The results are in several ways similar to Swedish Financial Supervisory Authority's results. They have not only published an analysis of expected effects prior to the introduction of the action (Finansinspektionen, 2016) but also a subsequent evaluation (Finansinspektionen, 2017).

The amortisation requirement does not seem to have affected house prices
In the same way as for the mortgage cap, the econometric model can be used to see if the amortisation requirement has affected house prices. An aspect that makes things more complicated when it comes to the amortisation requirement is that it was already announced in the spring of 2015 and was subsequently withdrawn and redrafted. Even before the Swedish Financial Supervisory Authority's first announcement, the Swedish Bankers' Association issued a recommendation in line with the proposal (Swedish Bankers' Association, 2014), which resulted in a large part of those loans that were taken *before* the requirement entered into force also corresponded to the requirements that were introduced on 1 June 2016. Any effects that the amortisation requirement may have resulted in have more than likely been spread out over a longer period of time and may therefore be difficult to distinguish. Because of this uncertainty, the dates of both the announcement and the introduction been tested in the estimates, but the choice of the start date has not had an impact on the main results.

The results of the econometric estimates are not in the vicinity of any economic or statistical significance, neither in the short term nor the long term. In both estimates, the parameter is essentially zero and the *p-value* is well above reasonable acceptance levels.

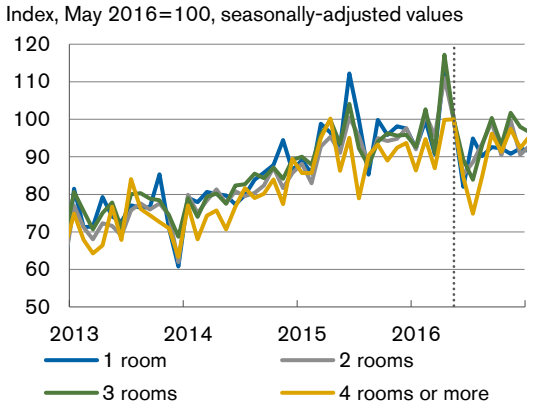
Some signs of an effect of the announcement
When the amortisation requirement was announced, a situation arose where there was reason to try to bring forward the purchase of a dwelling for some potential home buyers. Before the mortgage cap was introduced, it would have been possible to take a loan with a low or no amortisation.[49] After the introduction of the amortisation requirement, the monthly cost of the home purchase could be up to three times higher than if the loan had previously been amortisation-free.[50]

As evidenced by Figure 53, the number of apartment sales increased in the spring of 2015 when the amortisation requirement was announced. This increase was relatively evenly distributed between different sized apartments. At the same time, there was relatively faster price increase for the small apartments that started with the mortgage cap, which can be seen in Figure 47 and Figure 48. That prices increased relatively speaking faster for the small apartments suggest that demand for these increased, which strengthens the picture that those who wanted to get into the housing market and have as low housing expenses as possible brought their purchases forward. However, this effect on relative prices between different sized apartments was only noticeable for a few months at the beginning of 2015, making it difficult to draw far-reaching conclusions. The effect seems primarily to be a temporary acceleration of the housing transaction and it has been more prevalent in Stockholm, which may be a sign that the price level had significance, see Figure 54.

[49] In its reports on the Swedish mortgage market, the Swedish Financial Supervisory Authority has described how the amortisation period for new mortgage loans has increased. According to repayment terms from 2008, the banks often granted grace periods of five years for bottom loans which could then be extended following a fresh re-assessment (Finansinspektionen, 2009). From 2011, the Swedish Financial Supervisory Authority measures the proportion of households that amortise new mortgage loans and this year the proportion was 42 per cent. This proportion subsequently increased and was at 67 per cent in 2015. When the amortisation requirement was introduced, this proportion increased further and was at 79 per cent in 2016.

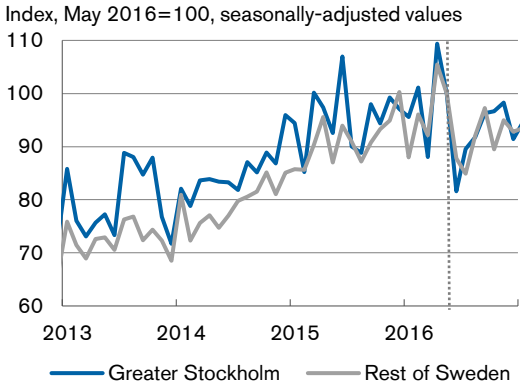
[50] With an interest expense after tax of approximately one per cent, an amortisation of two per cent means an approximate tripling of the monthly cost of financing the purchase of a home.

Figure 53. Number of apartment sales allocated according to number of rooms up to and including December 2016, Sweden



Note: The dashed vertical line marks the turn of the month May/June 2016 when the amortisation requirement began to apply.
Sources: Swedish Broker Statistics and own calculations.

Figure 54. Number of housing sales up to and including 2016



Note: The dashed vertical line marks the turn of the month May/June 2016 when the amortisation requirement began to apply.
Sources: Swedish Broker Statistics and own calculations.

Amortisation requirement seems to have slowed down the increased differences in relative prices of the mortgage cap

Figure 47 shows how small apartments have become relatively more expensive since the mortgage cap was introduced. The introduction of the amortisation requirement coincides with the decrease in this trend. This may be due to the fact that the demand for small apartments has decreased relatively speaking in that the amortisation requirement raised monthly expenditure for highly leveraged home buyers. At the same time, it is not obvious how this is consistent with the conclusions of the evaluation of the Swedish Financial Supervisory Authority, which states that young households with new mortgages purchased housing for the same prices, irrespective of whether or not they were covered by the amortisation requirement (Finansinspektionen, 2017). One possibility, however, is that there is a difference in selection, i.e. that the households that were most affected were simply prevented from buying or chose not to buy a home.

The introduction of a stricter amortisation requirement appears to have contributed to the fall in prices in 2017

At the end of May 2017, the Swedish Financial Supervisory Authority announced that it intended to introduce a stricter amortisation requirement, which was also introduced on 1 March 2018. This introduction of stricter requirement means that new mortgage loan borrowers with mortgage debts in excess of 450 per cent of gross income must amortise an additional one per cent of the home loan in addition to the current amortisation requirement.[51] The lowest permitted amortisation rate for highly leveraged households has thus been raised from 2 to 3 per cent. The stricter amortisation requirement differs from the previous two macroprudential measures as the measure creates a more direct link between the price of the dwelling and the income of the household.[52] In the past, there

[51] E.g., see the Swedish Financial Supervisory Authority (2017) for a more detailed description.
[52] The Swedish Financial Supervisory Authority's analysis of expected effects prior to the introduction of the measure can be found in the Swedish Financial Supervisory Authority (2017).

has been a link through the banks' credit assessment, but not through existing regulations. The introduction seems to have dampened the aggregated price level while it is difficult to find evidence of a clear effect on relative prices.

The introduction of the stricter amortisation requirement probably had a dampening effect on prices
The same approach is used as in the previous two sections to see if the introduction of a stricter amortisation requirement affected the aggregated price level of house prices. The action was announced in May 2017 and was implemented in March 2018. The estimate assumes that the measures already started to have an impact on housing purchase at the time it was announced. Partly because the banks had begun to reduce lending in relation to household incomes and partly because it may have influenced households before the actual introduction, and partly because it may have already affected the decision by households to purchase or sell their dwelling in conjunction with the introduction (Veidekke, 2018).

Since not enough time has elapsed since the measure was introduced, it is premature to test for a long-run effect in the model. Because the mortgage cap seems to have had a permanent effect on price levels by limiting the size of the loan in relation to the value of the dwelling, the stricter amortisation requirement may also have had a similar permanent effect, but now by the fact that the size of the loan is limited relative to household income. But it is not yet possible to test this in the model.

However, when it comes to the possible short-run effect, the number of observations is sufficient to be able to estimate it using a dummy, in line with the previous two sections. The parameter for the dummy is both financially and statistically significant with a value of -0.015 and a *p-value* of 0.01.[53] The result is that the measure temporarily lowered the price level by around 6 per cent the year immediately after the introduction.[54]

However, it should be stressed that a dummy can only detect if something might have happened, but it cannot say anything about what that might be. In a previous section of the report, the robust increase in supply in recent years was analysed. Figure 40 shows that the supply on the succession market increased sharply in 2017 and a bit into 2018, which happens to be largely the same period of time that applies for the dummy for the stricter amortisation requirement. Thus, the parameter for the dummy shows that something has occurred that adversely affected the prices, but there is no way to determine if it is a result of the stricter amortisation requirement, the increase in supply or a combination of these. Instead, that issue is addressed in the concluding section of this chapter.

What does the relationship between income and price look like and how has it changed over time?
A recurrent feature in several analyses, both before and after the introduction, has been that the measure would have a varying effect, because those with an indebtedness above the threshold are unevenly distributed, not least geographically.[55] The higher the income and price of the dwelling, the

[53] Even here, the dummy assumes the value 1 for 4 quarters, but the results are similar if the number of quarters instead is set to 3 or 5.
[54] Just as in the case of the short-run effects that were estimated for the mortgage cap, by definition they are merely short term in an ECM. The co-integrating relationship between the variables expressed in values is what governs the model's long-term price development. Unfortunately, not enough time has elapsed to be able to test for a trend reversal in the long-term relationship, but it is quite possible that the introduction of the stricter amortisation requirement has actually resulted in a change. However, only future studies will prove if this really is the case.
[55] See, for example, the Swedish Financial Supervisory Authority (2017).

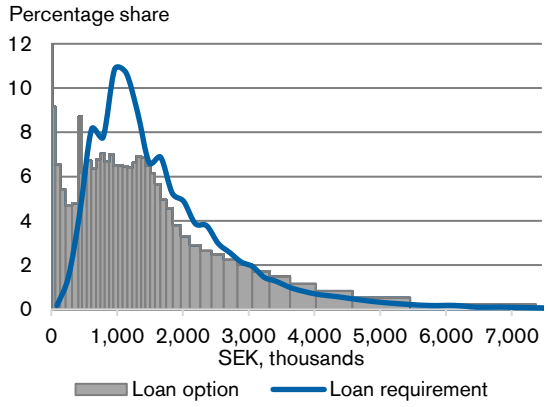
more indebted people there are above the threshold. Thus, for example, Stockholm would be more affected than Malmö and those with higher incomes would be more affected than those with lower incomes. Moreover, the proportion of home buyers with an indebtedness above the threshold has increased relatively rapidly over time, not least in Stockholm, where it increased by more than 50 per cent from 2011 to 2015 (Finansinspektionen, 2018).

One way of illustrating this change over time is to examine how income distribution relates to the breakdown of housing purchases in terms of price and how the relationship between these two breakdowns has changed over time. With the help of Statistics Sweden's micro-simulation model FASIT, it is possible to find out how the distribution of the gross income of household looks, which can be compared to sales distributions with respect to previously presented prices.

When comparing, however, it is problematic that housing prices are so much higher than incomes and therefore need to be made comparable. This is done by comparing the loan requirements of households and the loan options, which are linked to the housing price and income. However, there is no overall available information about the loan options and loan requirements of individual households. We therefore need to make a few simplifying assumptions in order to illustrate the overall change that has been made regarding the ability of households to buy a dwelling.

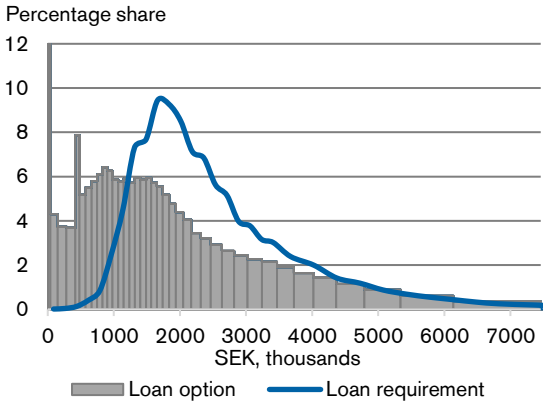
The first simplification assumes that the loan requirement is defined as 70 per cent of the price of the dwelling, as it is the average loan-to-value ratio for new mortgage loan borrowers in recent years and it also constitutes the upper threshold in the amortisation requirement (Finansinspektionen, 2018). The second simplification assumes that the loan option is defined as how much households are able to borrow without exceeding the threshold of 450 per cent of income that the stricter amortisation requirement entails.[56] By multiplying the price and income distribution by 0.7 and 4.5 respectively, we obtain the series in Figure 55 illustrating the situation in 2010.

Figure 55. Loan option and loan requirements in 2010, Greater Stockholm



Note: Loan option is defined as households' gross income multiplied by 4.5 and loan requirement as housing prices multiplied by 0.7.
Sources: Statistics Sweden (FASIT), Swedish Broker Statistics and own calculations.

Figure 56. Loan option and loan requirements in 2016, Greater Stockholm



Note: Loan option is defined as households' gross income multiplied by 4.5 and loan requirement as housing prices multiplied by 0.7.
Sources: Statistics Sweden (FASIT), Swedish Broker Statistics and own calculations.

[56] See the Appendix page 65 for a more detailed description of the calculation of the loan option and loan requirement.

In general, distributions follow each other quite well. In a broad sense, results are expected when the ability to make payments is central to the demand for housing. However, it is important to emphasise that income statistics underlying the loan option include all households, not only those who own or are contemplating acquiring a dwelling of their own.[57] Six years later, the situation is markedly different, see Figure 56. Clearly prices have increased more quickly than incomes during this period which is reflected in the fact that, relatively speaking, the need to borrow has shifted to the right, and that matching with loan options is no longer as good. This means that an increasingly smaller proportion of households have the option of acquiring housing at the prevailing price level without exceeding the thresholds for indebtedness.

Was the price drop mainly driven by falling prices among the most expensive homes?
Among new mortgage loan borrowers, a high level of indebtedness (over 450 per cent of income) is more common among those with high incomes. At the same time, it is in this group that loans have also declined most after the stricter amortisation requirement was introduced (The Swedish Financial Supervisory Authority, 2017 and 2019). Given that it is those with higher incomes that demand more expensive housing, a possible consequence of the stricter amortisation requirement could be that this action impacted the high-price segment of the market to a greater extent. This would also affect relative price developments on the market in a manner similar to what occurred in connection with the introduction of the mortgage cap.

If it is true that a part of the market has been affected to a greater extent, it should be possible to detect this through a change in the distribution of housing sales. In Figure 57, the sale of apartments in Stockholm are compared at two different periods of time, before the announcement and after the introduction of the stricter amortisation requirement. It is clear that fewer apartments were sold in Stockholm in February 2019 compared to May 2017. The largest share of the decrease has been for apartments costing more than SEK 2.5 million. One objection could be that, since the periods of time relate to different months, the decrease in sales could be linked to seasonal fluctuations, but this has been taken into account by the fact that sales distributions have been seasonally adjusted.

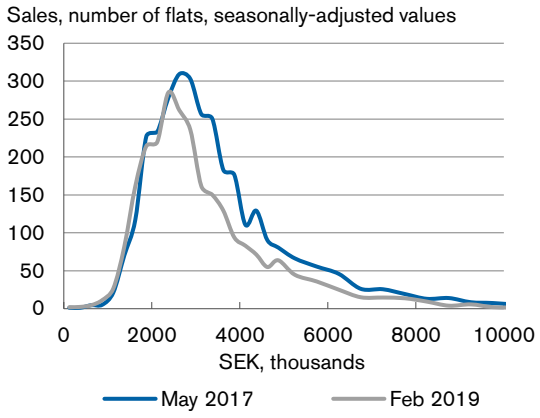
In order to see whether there has been a change in relative prices, the distributions need to be made comparable by adjusting for changes in the average price level and the number of sales at a given time. This has been done in Figure 58 where, instead, the sales in each price range are expressed as a percentage of total sales, while the prices for May 2017 have been recalculated using the average price change to the same level as in February 2019. The two series are now very close to each other and there is nothing to indicate that a particular price segment would have been more or less affected since the imposition of the stricter amortisation requirement. However, we should stress that only a relatively short period of time has elapsed; a mere a year and a half. In addition, the illustrated distributions are a somewhat blunt analytical tool, i.e. an analytical tool that requires relatively large changes for these to be clearly visible.

Thus, the analysis above points to the fact that it is difficult to see any changes in relative prices in the wake of the stricter amortisation requirement, which is in contrast to the effects of the mortgage cap discussed in a previous section. The contrast is even greater if the development of relative prices after the introduction of the stricter amortisation requirement is studied using relative prices

[57] If it had been possible to adjust the selection to only include those who own or are contemplating buying a dwelling, it is conceivable that the distributions would have resembled each other more. Such an adjustment would probably have meant that the left part of the distribution would, in relative terms, have included fewer households.

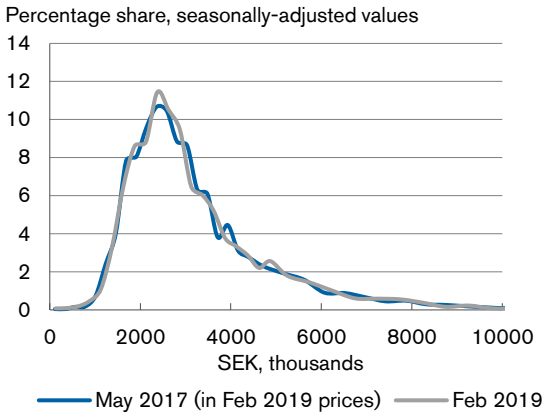
for apartments with different numbers of rooms, see Figure 47 and Figure 48. The development of these price measurements after May 2017 is indicative of a reverse relative price effect compared to the development the mortgage cap seems to have had. That is to say, instead of increasing the price difference in square metres between small and large apartments, the price difference seems to decrease.

Figure 57. Distribution of sold apartments in 2017 and 2019, Greater Stockholm



Sources: Swedish Broker Statistics and own calculations.

Figure 58. Distribution of sold apartments in 2017 and 2019, Greater Stockholm



Sources: Swedish Broker Statistics and own calculations.

What can explain the different relative effects of the mortgage cap and the stricter amortisation requirement?

It is clear that the two macroprudential policy measures have had a restrictive effect on demand as a whole, but it is not immediately obvious why the effects on demand for dwellings of varying sizes and varying price ranges seem to have differed. One possible explanation, in addition to the difference in measure design, may be that the measures were introduced at different times and thus affected different groups on the housing market in different ways. For example, first-time buyers encountered a very different and higher price environment in 2018 than in 2010, while the increase in income was clearly less, a relative change over the period illustrated in Figure 55 and Figure 56. For the group of new pensioners who were considering switching to a smaller dwelling, likely, it was easier for them to adapt their choice of a new dwelling in conjunction with the introduction of the mortgage cap, but more difficult when the stricter amortisation requirement came into force as this measure is linked to income, which, relatively speaking, is distinctly lower for pensioners. Consequently, for these two groups it is likely that the effects of the mortgage cap and the stricter amortisation requirement may have differed.

Another interesting group consists of those who want to change to a larger and thus more expensive dwelling, i.e. those households already established in the market for owned dwellings. The mortgage cap involved a restriction concerning the down payment, but in 2010, even households with a relatively short period of home ownership had experienced an increase in value of their home. This meant that it often was still possible to increase indebtedness in order to be able to switch to a larger dwelling without hitting the mortgage cap. In 2018, the situation was somewhat different. Many of those who wanted to switch to a larger dwelling had housing loans that were not covered by the previously introduced amortisation requirement. For some groups wishing to switch to a larger dwelling with a higher rate of indebtedness as a result, there was the risk of substantially

increased monthly costs after the stricter amortisation rate had been introduced. This is due to the fact that in so doing, these households would be going from not having been subject to any requirement at all to requirements that would involve an amortisation of up to 3 per cent. Overall, in 2010, the effect of the mortgage cap for this group was probably relatively limited, while in 2018, the stricter amortisation requirement of 2018 could have led to a greater demand for a smaller dwelling or simply abandoning any plans for a switch.

The way in which these varying effects have interacted to impact different groups on the housing market is far from certain. What the above reasoning would like to highlight and give credence to is that there is reason to believe that the impact of the two macroprudential measures has been different for different groups on the housing market. This could be a contributing factor to the two different trends in relative prices –existing apartments with one or four rooms and the development of the distribution of sales in terms of price – which can be observed after the introduction of the mortgage cap and the stricter amortisation requirement.

The large fall in sales of more expensive apartments depends on the development of the market as a whole

The fact that it is not possible to see any relative price effect in distribution diagrams after the introduction of stricter amortisation requirement may be perceived as unexpected since sales in the more expensive segment of the price range showed large declines. For example, the sale of apartments priced at above SEK 8 million was halved in Stockholm between May 2017 and February 2019.[58] This would indicate that the higher price has been hit harder than the lower price segment. And it has, but it is not because of any relative change in prices or demand, but on the development of the market as a whole.

Thus, when the average price fell by about 10 per cent and sales by just over 20 per cent, it was to be expected that the sale of apartments priced at above SEK 8 million would be halved. The reason for this is the appearance of the distribution of sales in terms of price. Relatively speaking, the vast majority of apartments are sold at lower prices, while a few are sold at higher prices, which can be seen, for example, in Figure 57 through the fact that the right tail of the distribution is long and thin. If there are concurrent changes in price and sales, these will have many times a greater effect on changes in the right tail. The same type of effect, but linked to an increase in the number of sales and the average price instead, was illustrated in Figure 25 on page 23.

Why did price and sales drop around the turn of the year 2017-2018?

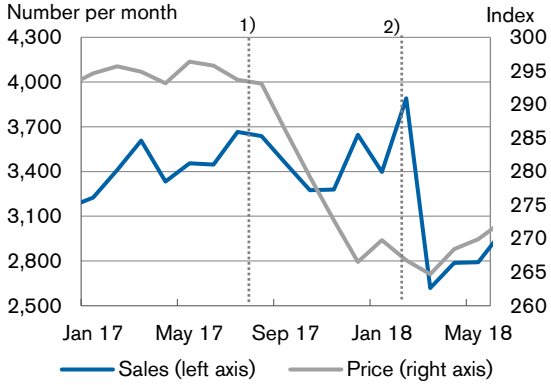
The above analysis has shown that the price-drop in 2017 may have been affected by not only the increased supply of housing but also by the introduction of the stricter amortisation requirement, but it is not certain whether one or both events had an impact. In order to try to arrive at greater clarity in this issue, it is possible to employ the help of a simpler theoretical approach in the form of the interplay between supply and demand.

[58] Here we are talking about the SEK 8 - 20 million range due to the way in which the statistics are produced. Moreover, final prices are not included in the available data base; see the first chapter page 10 for a more detailed description under the "Swedish Broker Statistics" heading.

Can a simpler analysis using supply and demand shed light on developments?

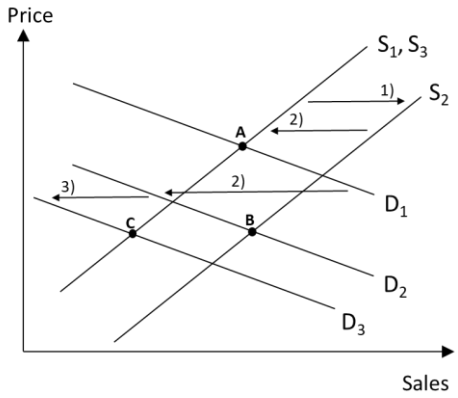
There are two events that stand out in the housing market during the autumn and winter of 2017-2018. First, in the autumn of 2017, prices fall while sales only change marginally. Then, in the first few months of 2018, sales fall instead, while prices are largely unchanged. The timing of these two events is marked with dashed lines in Figure 59. The movements in price and sales are also large: the price drop is about 10 per cent and the decrease in sales is about 20 per cent.

Figure 59. Price and sales on the succession market in 2017-2018, Stockholm



Note: Seasonally-adjusted values.
Sources: Swedish Broker Statistics and Valueguard.

Figure 60. Schematic theoretical description of developments in Figure 59



Source: Own sketch.

Both supply and demand have probably been affected

The two events can also be illustrated schematically using a supply and demand chart, see Figure 60.[59] The diagram shows the course of events during the autumn and winter as a movement between different equilibria (A, B and C). The starting position is the equilibrium point A, after which there is a movement almost straight down to point B when prices fall sharply while sales only increase marginally, followed by a movement straight to the left to point C when prices remain roughly the same while sales decrease sharply.

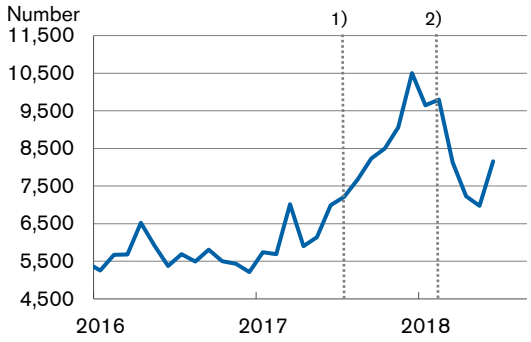
In order for movement between the three equilibria to take place, one or more shifts of not only the supply but also the demand curve (S and D respectively) will need to take place. One supporting factor in the analysis comes from the development of measured supply, see Figure 61. This clearly shows that the supply increased in the autumn of 2017 only to fall back by about the same amount a few months after the end of the year. The schematic analysis in Figure 60 succeeds in reconciling these developments, partly the observed change in supply, and partly the movements in price and sales, through shifting the supply and demand curves. In the schematic analysis, the large price drop in the autumn of 2017 is a result of not only a sharp increase in supply but also a noticeable decrease in demand ($S_1 \rightarrow S_2$ and $D_1 \rightarrow D_2$) leading to the movement from equilibrium A to equilibrium B. The decline in sales and the stagnant prices in 2018 would correspondingly be linked

[59] The supply and demand framework is a simplification for illustrating the established heterogeneous housing market in a single chart. By limiting the market to apartments in Stockholm on the succession market, and by focusing on the results from the previous section stating that no relative price changes seem to have occurred, the simplificated model is not unreasonable.

to fact that the supply is now decreasing instead, while demand is falling further ($S_2 \rightarrow S_3$ and $D_2 \rightarrow D_3$ respectively) and the movement from equilibrium B to equilibrium C.

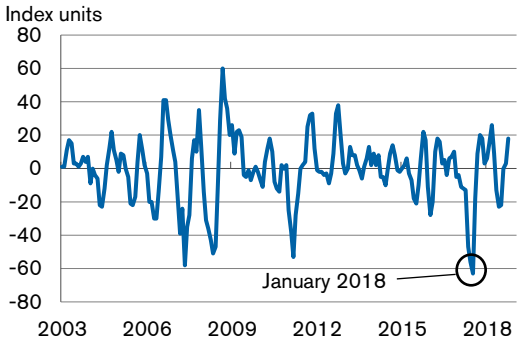
The possible antitype to that none or only one of the curves has shifted means that development during the period will become significantly more difficult to explain, at least if the slope of respective curve is to be even roughly the same over time. Difficulties in constructing an alternative explanation for development strengthens the overall image that the price drop was driven by not only an increased supply but also a decrease in demand. A reasonable objection to the schematic analysis might be that the slope of the supply and demand curve respectively is unknown. However, one strength with the reasoning above is that the movement between the different equilibrium points is not possible without there being a shift of both curves, regardless of whether either curve has a broadly vertical or horizontal slope.[60]

Figure 61. Supply, number of apartments on the succession market, January 2016 to June 2018, Stockholm



Note: Supply refers to the number of apartments that have been on sale in a given month. Dashed lines refer to the same events as described in the running text and in Figure 59.
Source: Booli.

Figure 62. Home price indicator, absolute change over three months



Note: The home price indicator shows the difference between the proportion of households that believes in rising and falling prices in the coming year.
Source: Statistics Sweden.

Is it possible to establish why the supply and demand curves have shifted?
The schematic illustration in the supply and demand chart is a way of trying to explain the actual observed movements of prices and sales on the housing market and that the shifts in the curves are, nevertheless, to some extent linked (initially) to an increase in construction and the introduction of the stricter amortisation requirement. However, the shifts in the curves may also have other causes.

The supply curve consists of what is on sale and the fact that this curve shifts can be due to several different factors. One reason for a shift towards an increased supply is that there are more newly constructed homes available at a given price.[61] But new production is not the only reason why

[60] First and foremost, it is the slope of the supply curve that is considered to vary depending on time horizon. Birch Sörensen (2013) is a good example of this. There, the short-run supply curve is vertical and the long-term is horizontal. In this context, one problem that such an approach shares with, for example DiPasquale and Wheaton (1996), is that it is based on the existing stock of housing for the current supply. However, as is evident from the statistics presented here, it is not only the stock that determines what is on sale, but rather what proportion of the available stock is currently on sale, i.e. the available supply on the succession market. And in the light of available statistics about supply, defined as homes available for sale, it is not reasonable to describe it as something that is totally inelastic with regard to price even in the short term.

[61] It has increased both direct and indirect sales because some of the people who have purchased a newly constructed home in turn sell their existing dwelling on the succession market.

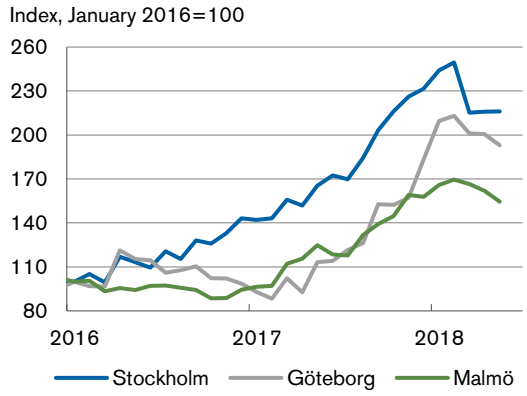
supply can increase. An increased supply may also be an 'advertising effect', linked to the announcement of the stricter amortisation requirement. It is possible that some home owners who have already thought about selling their home chose to try to do so before the stricter amortisation requirement was introduced and thus brought their sales decision forward (earlier). Conversely, their decision to sell earlier would contribute to making sure that the supply would immediately return to levels below those that existed before the announcement. As shown by Figure 61, instead, the low level of supply in the spring of 2018 remained at levels that were clearly higher than those prevailing in 2016. This means that it is difficult to explain the shift in the supply curve with only an 'advertising effect'. The supply could also have been affected by a change in sales behaviour with more people selling existing dwellings before buying new ones. Such behaviour would have led to a temporary increase in not only the supply but also the time it would take to sell the dwelling. If behaviour changes once again so that more people make new purchases first, the reverse will happen, i.e. supply and sales times decrease (Österling, 2017). Consequently, the effect is independent of other changes in the market, but a lingering 'sell-first mentality' could explain the fact that supply is still at a higher level than before, when more people bought new housing before selling their existing housing.

It is logical to explain that the shift in demand is linked to the introduction of the stricter amortisation requirement as it led to some of the households encountering greater difficulties in financing their housing purchases. Even other aspects, such as a modified expectation scenario, may have had an effect. In times of rising housing prices, it has been a good idea for many households to be a player on the housing market in the light of many years with large price increases. Instead, when prices fell significantly over a short period of time in the autumn of 2017, expectations most likely also shifted down towards lower future price increase rates and it is not unreasonable to assume that the change in pricing expectations affected how much potential home buyers were willing to pay for the dwelling. See Figure 62 for an illustration of how price expectations changed around the turn of the year 2017/2018. Such a shift in expectations in the wake of the fall in prices could therefore also contribute to a left-sided shift in the demand curve.

A comparison between Malmö, Gothenburg and Stockholm reinforces the aforementioned conclusions

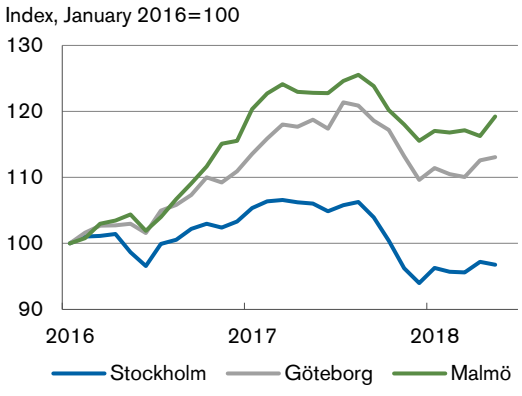
A complementary way of addressing the issue of price developments linked to an increase in supply following the introduction of the stricter amortisation requirement is to compare developments in the three largest cities.

Figure 63. Supply of apartments for sale, succession and new production



Note: Supply refers to items that have been up for sale in the last four weeks. Seasonally-adjusted data.
Source: Booli.

Figure 64. Price development for apartments sold on the succession market



Source: Valueguard.

As stated before, the effects of the stricter amortisation requirement will most likely vary geographically due to differences in price levels. Added to this is the fact that the increase in the supply of apartments in recent years differs significantly between the cities around the time the action was announced and implemented, see Figure 63. The larger the city, the greater the increase in supply. In the light of these two statements concerning geographical differences, it is no surprise that price developments in the three cities also differ during the same period, see Figure 64. In Malmö where the increase in supply was the smallest and where the stricter amortisation requirement was not expected to affect as many people, relatively speaking prices also increased the fastest, while in Stockholm, the opposite is true.

Conclusions and comments

The aim of this report has been to analyse developments in housing prices not only in the long-run but also in the short-run, both to explain historical developments and to make forecasts of prices in the future.

New statistics about the heterogeneous housing market contribute with interesting perspectives

The availability of the more detailed statistics that have emerged over the past 10 years has opened up new opportunities for analysing the distinctly heterogeneous housing market. A large part of the report is based on these new statistics, which also has been complemented with tailored statistical excerpts. With an increased flora of statistics also follows an increasing need to know what the different statistical sources actually show. For example, price measurements with different definitions can periodically produce significantly different images of development, something that can be worrying in periods when there are major changes. One example is that the Real Estate Price Index did not indicate falling single-family home prices in Sweden compared to the previous year until the third quarter of 2018, while, according to Valueguard, house prices already began to fall in February that same year.

Thanks to the new statistics, there are many possibilities that did not exist before. For example, for some time, this has made it possible to study price developments in greater detail in various sub-segments of the market as well as other aspects of the distribution of those sales that have taken place. It has also led to increased opportunities for analysing the effects of not only the recent increase in the supply of homes for sale but also the effects of macroprudential measures that the Swedish Financial Supervisory Authority has directed at households. Thus, the statistics for the housing market that have emerged are a welcome element as they highlight parts of the market that have previously been difficult to follow. Previously, the price trend in the detached home market often also represented the market for apartments, despite the fact that the number of sales of apartments is about twice as many as those for detached homes. The new production market was also difficult to study in more detail.

In the report, the new statistics have contributed to the analysis in various ways and have provided new insights into several different areas. The following are four of the more prominent examples.

The mortgage cap probably led to faster price increases of cheaper apartments over several years

In addition to the decline in the aggregated price level, the analysis indicates that the mortgage cap also affected the relative price between cheaper and more expensive apartments. Several different intersections in the statistics support this. Firstly, compared to the average price, it is clear that the square-metre price for apartments with one room increased over a number of years after the introduction of the measure while the price of apartments with 4 or more rooms decreased. Secondly, during the same period, the appearance of the distribution of sales in terms of price changed, a change that is consistent with a development where the price of cheaper homes increased at a faster pace. Thirdly, the entire increase in the sales of apartments in Stockholm during the years immediately after the introduction consisted of apartments in the cheaper segment, which is consistent with the fact that it was in that segment that demand increased most.

Clear indications that there were elements of speculation in the new production market
For a couple of years, there has been an opportunity to follow individual construction projects over time, meaning that it is possible to see how the individual dwellings in a specific project have been sold, firstly as newly constructed dwellings and then possibly resold on the succession market. In the past five years, many of the largest construction projects in Stockholm have seen a relatively high percentage of the newly built apartments sold on the succession market shortly after they were purchased, not infrequently even before moving in. Since, in many cases, this proportion has been around 20 per cent, it is a clear indication that there may have been speculation. The reason why this question is of analytical interest is that speculation affects construction in both the upturn and the downturn phase. During an upturn, speculative purchases lead to a construction project selling out more quickly than it would otherwise, and all things being equal, will lead to new projects being started earlier than they otherwise would have been. The increase in construction is therefore faster. In a downturn, speculative purchases are likely to be the first to disappear, which, all things being equal, will mean that the downward turn will also happen all that more quickly. The greater the element of speculation in new production, the more pronounced the *boom/bust* trend in construction will be.

Has the stricter amortisation requirement significantly influenced the sale of expensive apartments?
In autumn 2017, the number of apartment sales in Stockholm's higher price ranges fell by just over 50 per cent. Such a reduction could be perceived as a segment of the market that is more or less disappearing and time-wise it is also easy to link this to the announcement of the stricter amortisation requirement. However, this more expensive segment of the market has not disappeared but rather the sale of equivalent apartments has continued, although at a lower price. Certainly, in some respects, this development is dramatic, but, at the same time, not remarkable given how the market as a whole has evolved during this period. In essence, the 50 per cent drop in sales in this more expensive price category can be fully explained by the combination of the 20 per cent drop in total sales and the 10 per cent decline in the average price on the market. Thus, the large decline in sales was not due to the fact that expensive apartments were relatively speaking more affected than others. This conclusion becomes evident in an analysis of how the distribution of the sales of apartments has changed.

Increased supply and a stricter amortisation requirement probably contributed to the price drop in 2017
The ability to monitor how the supply of apartments develops over time has, together with more traditional price and sales statistics, made it easier to substantiate what contributed to the price decline in 2017. A supply and demand approach supports the conclusion from the rest of the analysis that both the increased supply of apartments and the introduction of the stricter amortisation requirement had an impact. Most likely, this means that the housing market would have been affected by the strong development in new construction even without the stricter amortisation requirement. Correspondingly, the new macroprudential measure would probably not have affected the price as much if there had not also been a large increase in supply.

The model predicts significantly lower growth rates for house prices in the coming decade
Price developments over the past 30 years are well explained by how household incomes and mortgage rates have evolved. However, the econometric model used in the report has limitations. The prices of apartments are not included and changes in the supply of newly constructed dwellings

are not taken directly into account. On the other hand, the model can be used to test for possible effects of major changes in the housing market, including the introduction of macroprudential policy measures. The results from the model indicate, for example, that the equilibrium price fell by around 7 per cent when the mortgage cap was introduced in 2010.

Going forward, the model points to a clear reversal in the trend in price developments. Over the next 10 years, prices will likely increase at a noticeably slower rate than they have done historically, even if the general economic trend turns out to be more favourable than in the main scenario. It is worth noting that the model does not see any contradiction between the rapid increase in prices during the past 30 years or so and a possible future significant slowdown in the rate of price increases. Changes in the development of household incomes and mortgage loan rates are sufficient to explain such a trend reversal in price developments.

Several factors will affect the housing market in the coming period

Naturally, given that price developments in the past 10-15 years have differed markedly for houses and apartments, a model based solely on single-family home prices should be used with caution when analysing the entire housing market. In addition to this more general point, there are also a few factors that the model does not capture, which may dampen price developments in the future.

If the effect of the stricter amortisation requirement is permanent, price increases will be dampened even more

Based on the way in which the stricter amortisation requirement has been designed, there is reason to believe that there could well be permanent effects that impact the ability of households to finance their homes, similar to what happened in the wake of the mortgage cap. Unfortunately, it is not possible to use the econometric model to test for any long-run effects, as insufficient time has elapsed since the measure was introduced. If there were to be a permanent effect, it would mean that the projected equilibrium price is lower than what the model indicates and that not only short-run but also long-run growth in house prices will be even slower than indicated in the model projections. More than likely, the market for apartments has also been affected by the macroprudential measures that were introduced, as also shown in the statistics, even though it cannot be confirmed by the econometric model, since it models house prices.

In the coming years, the high level of the supply of apartments may continue to dampen price trends

In addition to the macroprudential measures introduced, the high level of supply, of not only newly constructed but also existing apartments, may have a restraining effect on price developments in coming years. During the first quarter of 2019, the supply was as high as the months before the stricter amortisation requirement was introduced one year earlier. What speaks for a continued high level of supply is the relatively low rate of sales of newly constructed apartments where, above all, the more expensive segments seem to have been saturated. In addition, there may be room for additional production of new apartments, but in cheaper segments aimed at other groups of buyers. What speaks for a future reduction in supply is that the wide variety of newly constructed dwellings are gradually being sold off, even if this is taking place relatively slowly, and the incentives for construction companies to start new projects are lower than before. Even though construction will decrease in the future, more than likely there will be no major effect on the supply of newly constructed dwellings in the coming years, as there are still many ongoing projects that are not yet completed. However, in a few years, this effect may increase.

The price expectations of home buyers do affect the market
There is another factor at play: the expectations of home buyers. The price drop in the autumn of 2017 and subsequent almost unchanged prices have probably affected the view households have about future price developments. The trend reversal in the development of housing prices shown by the model is far from the historical average rate of increase of 6 per cent and presents new opportunities for players on the housing market. If there are no longer expectations for substantial price increases, this will most likely affect not only the decisions of households but also the cost-estimates of construction companies. In addition, price developments in the past two years or so – a major drop followed by only a slight increase – has also probably led to an increased awareness among households about the uncertainty associated with purchasing a newly constructed dwelling several years before occupancy. If prices are no longer expected to increase, this will probably lead to a lower willingness to pay for buyers of both existing and newly constructed homes, and thus lower price pressures.

There is much to suggest there will be a significant dampening of housing prices for a long time
Not only the econometric model in the long term but also the shorter horizon of the rest of the analysis indicate that the rate of increase in home prices will be significantly dampened in the coming years, compared to how they have evolved historically. However, forecasts can prove to be wrong. If conditions change, price trends may look different, e.g. due to current low interest rates persisting for a longer period than expected or if economic-policy decisions significantly change conditions on the housing market. In addition to expected increases in income, in spite of everything, there is another factor that points to continued rising prices in the major cities, namely that the rental market there does essentially not work for those wishing to obtain housing at short notice. Consequently, the main option for many who are looking for a home is to try to buy one. Lastly, unfortunately, it is not improbable that there will be a new financial crisis sometime in the next ten years, which, if so, would most probably have a major impact on the housing market.

Appendix

Municipalities in the metropolitan areas of Sweden

Statistics Sweden's definition of metropolitan areas has been used in the report for not only income statistics but also housing price statistics (Statistiska centralbyrån, 2015). The municipalities that are part of Greater Stockholm, Greater Gothenburg and Greater Malmö are listed in table 1.

Table 1. Municipalities included in metropolitan areas in alphabetical order

Greater Stockholm	Greater Gothenburg	Greater Malmö
Botkyrka	Lilla Edet	Lomma
Danderyd	Kungälv	Burlöv
Ekerö	Tjörn	Staffanstorp
Haninge	Mölndal	Eslöv
Huddinge	Alingsås	Svedala
Järfälla	Partille	Höör
Lidingö	Härryda	Skurup
Nacka	Lerum	Kävlinge
Norrtälje	Gothenburg	Malmö
Nykvarn	Ale	Vellinge
Nynäshamn	Öckerö	Lund
Salem	Kungsbacka	Trelleborg
Sigtuna	Stenungsund	
Sollentuna		
Solna		
Stockholm		
Sundbyberg		
Södertälje		
Tyresö		
Täby		
Upplands Väsby		
Upplands-Bro		
Vallentuna		
Vaxholm		
Värmdö		
Österåker		

Source: Statistics Sweden.

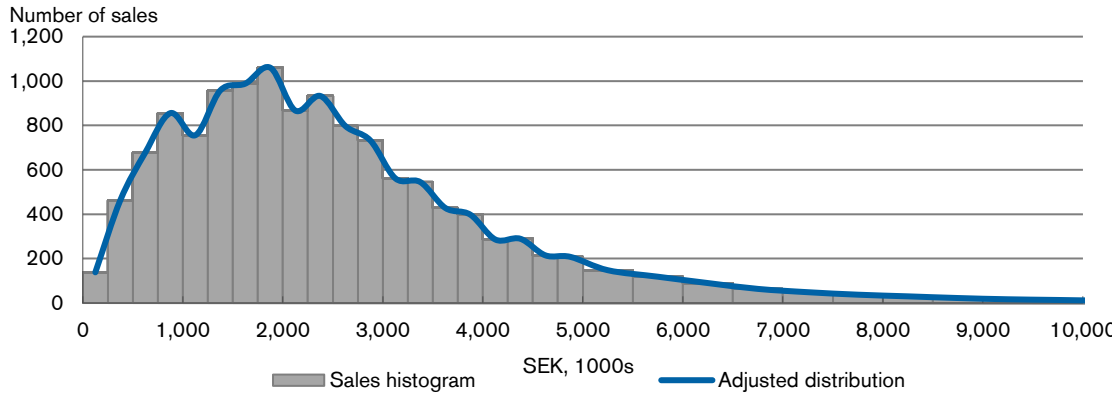
This is how price and income distributions have been created

The distribution of home sales in terms of price

The underlying statistics from Swedish Broker Statistics have been divided into the number of sales per price range. Each range has a width of SEK 250,000 up to SEK 5,000,000, then a width of SEK 500,000 up to SEK 10,000,000 and then a width of SEK 1,000,000 up to SEK 20,000,000.

A histogram is an illustration that gives an intuitive feeling for distribution, but problems arise when different distributions are compared. A simple solution is to adapt a line to the respective centre of the highest point of the bars in order to describe the distribution and thus enable graphical comparisons between different years, see Figure 65.

Figure 65. Distribution of housing sales in 2017, Sweden

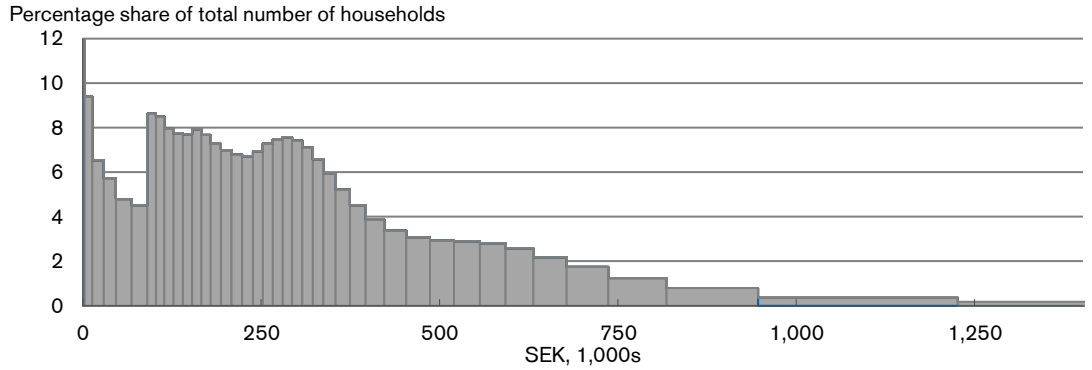


Note: The grey bars have different widths as they represent price range of varying width.
Sources: Swedish Broker Statistics and own calculations.

The distribution of households with respect to gross income

The statistics used are obtained from Statistics Sweden's database in the FASIT micro-simulation model.[62] The database has a range of almost one million households that have been ranked according to the size of their gross income. Thereafter, they have been divided into 40 equal-sized groups, corresponding to 2.5 per cent of the total number of households. Using the class boundaries for each group, it is possible to create histograms with varying class widths, see Figure 66 for an example with data for 2010.

Figure 66. Distribution of households with respect to gross income in 2010, Sweden



Note: Each bar represents 2.5 per cent of the total number of households.
Sources: Statistics Sweden (FASIT) and own calculations.

How can housing prices and household incomes be compared?

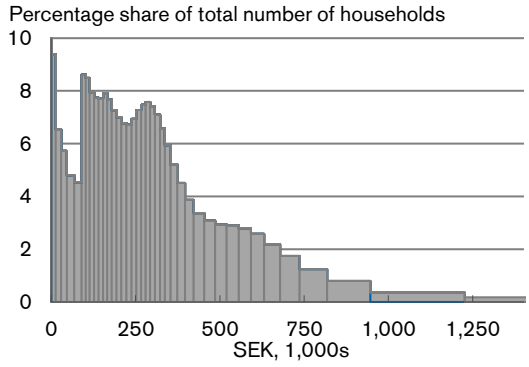
The report compares housing prices and household incomes and as a background, the following shows a more detailed description of how the comparison has been carried out.

[62] FASIT is a micro-simulation model that calculates the effects of changes in tax, fees and transfer systems for individuals and households. It is possible to calculate how changes in these systems affect different groups in society and what their impact is on public finances.

Figure 67 below illustrates the distribution of gross income in Sweden in 2010 with respect to the size of the income. At that time, the average household income was just above SEK 370,000 (average income), while the median household income was around SEK 280,000 (median income). The quarter of the households with the lowest incomes had incomes up to approximately SEK 140,000 while the quarter with the highest incomes had incomes of over SEK 520,000. The 5 per cent of households with the highest incomes had incomes of more than SEK 950,000.

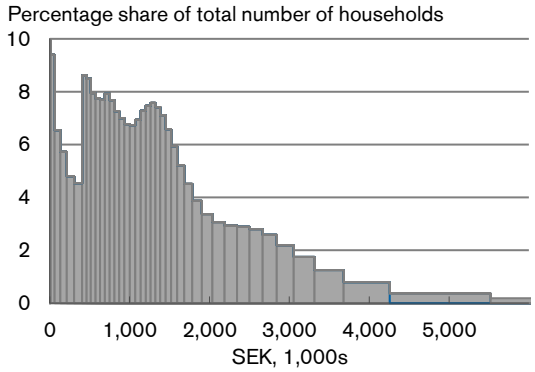
If the breakdown in Figure 67 is multiplied by 4.5, we obtain what can be called the household loan option as illustrated in Figure 68. It corresponds to how large loans households would be able to take out if they choose not to exceed the threshold of 450 per cent of the gross income that the introduction of the stricter amortisation requirement entails.[63] The difference between the two graphs is therefore only found in the values of the x-axis. The breakdown in Figure 68 shows that the median household in Sweden in 2010 could borrow slightly more than SEK 1,250,000 without exceeding 450 per cent indebtedness (i.e. gross income of SEK 280,000 multiplied by 4.5). A quarter of households were able to borrow SEK 2,300,000 or more, while 5 per cent of households were able to borrow approximately SEK 4,250,000 or more.

Figure 67. Gross income, breakdown of households in 2010, Sweden



Sources: Statistics Sweden (FASIT) and own calculations.

Figure 68. Loan option, breakdown of households in 2010, Sweden



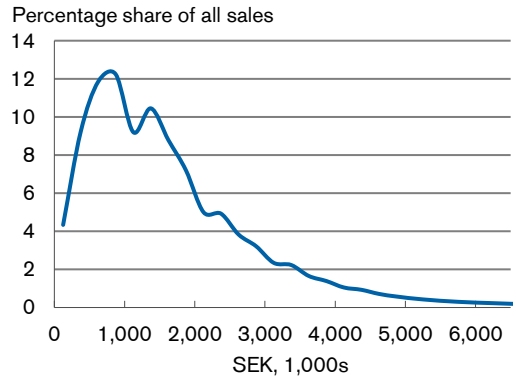
Note: The loan option is defined as gross income*4.5.
Sources: Statistics Sweden (FASIT) and own calculations.

With regard to the need to borrow money, housing prices determine the size of the need, adjusted for the proportion of equity paid. Figure 69 below illustrates the breakdown of housing purchases in Sweden in 2010. Relatively speaking, the largest proportion of dwellings was sold at lower prices. This means that the median purchase (median price) of a dwelling cost approximately SEK 1,350,000 while the average home was more expensive and cost about SEK 1,750,000 (average price). The most expensive quartile of the dwellings cost SEK 2,250,000 or more, while the most expensive 5 per cent of the dwellings cost SEK 4,000,000 or more.

[63] It is important to emphasise that the ability of households to borrow money is not only governed by this limit, but also by the bank's credit assessment. It may well be that a household is not allowed to borrow as much as 450 per cent because it is not able to manage the Left-to-Live-on estimate (KALP).

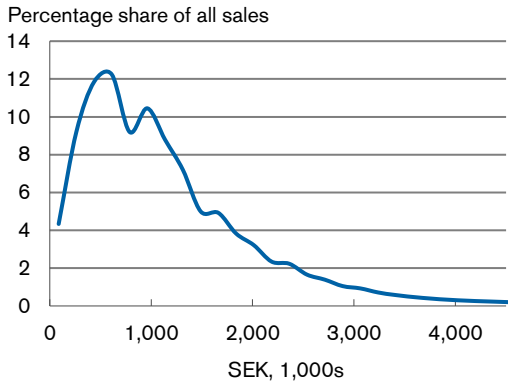
If the breakdown in Figure 69 is multiplied by 0.7, the breakdown in Figure 70 is obtained, which is termed the loan requirement of households. It shows how much home buyers would have had to borrow in 2010 if everyone took a loan equivalent to 70 per cent of the price of the dwelling. A loan share of 70 per cent has been chosen, partly because it is close to the average loan-to-value ratio of new mortgage borrowers in the last 5-10 years, partly because it is the upper threshold in the original amortisation requirement.[64,65] Measured in this way, the loan requirement for the average household in 2010 was SEK 1,200,000 (average price of SEK 1,750,000 times 0.7), while a loan of SEK 2,800,000 or more was needed to buy one of the most expensive 5 per cent of homes.

Figure 69. Housing prices, breakdown of housing purchases in 2010, Sweden



Sources: Swedish Broker Statistics and own calculations.

Figure 70. Loan requirement, breakdown of housing purchases in 2010, Sweden



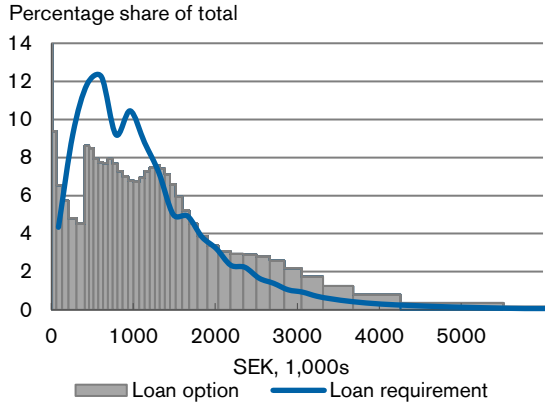
Note: Loan requirements are defined as housing prices*0.7.
Sources: Swedish Broker Statistics and own calculations.

The next step is to bring together the breakdowns of the loan option and loan requirement to see how they relate to each other. In order to show trends for a couple of years, the breakdown of 2010 respectively 2016 in Figure 71 and Figure 72 are compared with each other. Both are normalised for the number of sales and the number of households.

The overall picture is that the breakdowns are fairly well aligned, which on an overall level is an expected result. Household incomes are what govern the ability to pay, which in turn constitute the basis for the possibility to obtain a home loan. The two graphs show how the relationship between income and housing prices has changed between 2010 and 2016. In 2010, loan options as a whole were greater than loan requirements. This can be seen by the fact that the bars for a loan option are above the line for a loan requirement of more than SEK 2 million. This means that a large proportion of households could buy housing with a leverage that is less than the respective limits of indebtedness and loan-to-value ratio (4.5 and 70 per cent respectively). This difference – with altogether greater loan options than loan requirements – remains in 2016, but has been reduced somewhat. Not only incomes but also home prices have risen between 2010 and 2016, but home prices have risen faster and thus also loan requirements.

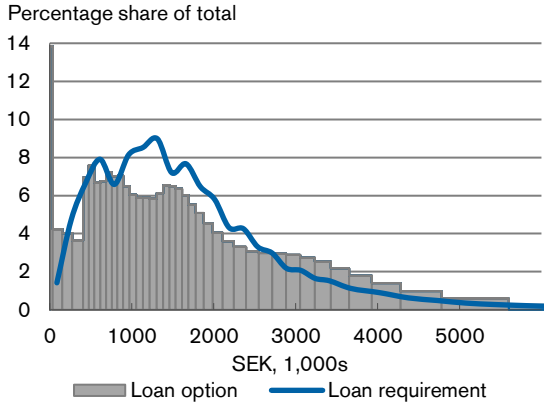
[64] For example, see Swedish Financial Supervisory Authority Report, the Swedish Mortgage Market in 2018.
[65] The leverage ratio is approximately 60 per cent if it is calculated as an arithmetic mean, while it is approximately 70 per cent if it is calculated as a volume-weighted average (Finansinspektionen, 2018). However, the conclusions are essentially the same, irrespective of the two leverage ratios used in the analysis.

Figure 71. Loan option and loan requirements in 2010, Sweden



Note: Loan option is defined as the gross income of households*4.5 and loan requirements as home prices*0.7. Both series are normalised.
Sources: Statistics Sweden (FASIT), Swedish Broker Statistics and own calculations.

Figure 72. Loan option and loan requirements in 2016, Sweden



Note: Loan option is defined as the gross income of households*4.5 and loan requirements as home prices*0.7. Both series are normalised.
Sources: Statistics Sweden (FASIT), Swedish Broker Statistics and own calculations.

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The Swedish National Debt Office is the central government financial manager and the national resolution and deposit insurance authority. The Debt Office thus plays an important role in the Swedish economy as well as in the financial market.

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