

# Chapter 2

## Traditional Housing Demand Research

Harry J.F.M. Boumeester

### 2.1 Introduction

Moving house is never a goal in itself, rather a means to achieving a goal (Goetgeluk 1997). In modern society there are general life goals towards which everyone strives, such as physical well-being and social acceptance (Lindenberg 1990). People tend to focus on various specific, more concrete goals, with the ultimate aim of achieving these general life goals (Coleman 1990; Oskamp 1997). Mulder (1993) refers in this context to preferences, which differ from person to person and can also change over the period of an individual's life (Willekens 1989; Oskamp 1997).

Moving house can be regarded as an adjustment in response to the altered housing needs of a household. Information about the current and future composition of the population in terms of households and the desired housing situations (housing preferences) provides a good foundation for mapping out current and future housing needs. Such knowledge can also be used by policy-makers and builders as a starting point in their acting.

Since the Second World War, the production of housing in the Netherlands has been heavily guided by central government. It is therefore important that the government has a clear picture of the current and future demand for housing. The Netherlands has a long tradition in researching housing needs – since 1977 the national Housing Demand Survey (*Woning Behoeft Onderzoek: WBO*) has taken place every 4 years. In 2006, this was changed to every 3 years and related subjects were included in the research (Housing Research Netherlands survey, *Woon Onderzoek Nederland: WoON*). The findings from this housing demand research is representative for the whole of the Netherlands and for all segments of the housing market. Since 1995, there has also been, initially annually and since 2000 bi-annually, national research

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H.J.F.M. Boumeester (✉)

OTB Research Institute for the Built Environment, Delft University of Technology,  
Delft, The Netherlands

e-mail: h.j.f.m.boumeester@tudelft.nl

carried out into the housing preferences of households with an above-average income. This research is commissioned by the *Nederlandse Vereniging van voor ontwikkelaars en bouwondernemers* (NVB) – the association for developers and builders.

Surveys into housing also take place in England – the national Survey of English Housing (SEH) (renamed the English Housing Survey in 2008) has been carried out annually since 1993. In the USA, the American Housing Survey (AHS) began in 1973, initially annually, and since 1983 has been carried out bi-annually.

The housing demand survey gives a picture – or “photo” – of the current housing distribution and expected housing demand in the short term at a given time. There is no indication, however, of how specific the picture is. By carrying out the research in individual regions, a “photo-mosaic” can be created by putting the individual pictures together. The geographical reference gives the findings more value. However, such a mosaic still only represents the housing market at a given moment and cannot be used to determine whether possible developments in the housing demand have taken place. For that, a succession of mosaics is necessary – transforming a “photo-mosaic” into a “film” and thereby giving the findings a reference point in time. There are two methods available that provide successive measurements of housing demand. On the one hand, there is the longitudinal approach, where a specific group (panel) of households is followed over time. The film is actually a serial, like a TV series with the same cast. De Groot discusses this approach in more detail in the chapter on longitudinal analysis. On the other hand, the same research is carried out at different moments in time with different, but representative, groups. An example of this approach is provided later on in this chapter.

In Sect. 2.2, research into housing preferences is briefly looked at, as this provides the foundation for accurately determining the demand for housing by housing consumers. In Sect. 2.3, the procedure for the move from measuring housing preferences to housing demand research is briefly explained, and the WBO research is used to illustrate and clarify this process. Section 2.4 provides a state of the art of studies that have applied the transverse, or cross-sectional, approach in the analysis of housing demand. This includes both national and international studies creating a “photo” or “photo-mosaic.” Following on from that the transition is made in Sect. 2.5 to a “film” by providing an example using data from repeated cross-sectional studies into housing demand in the Netherlands. Data are used from the demand for owner-occupied houses at the top end of the housing market in the period 1975–1997.

## 2.2 Housing Preferences Research

People’s acting and thinking are often based on a long-term vision in order to provide continuity and security in life. Current behavior is adapted according to a person’s long-term preferences. “Living is the continuous attempt to find concord between the current housing situation and one’s aspirations, determined by considering the available practical possibilities, and the continuous attempt to find concord between one’s aspirations and one’s subjective ideal, determined by the

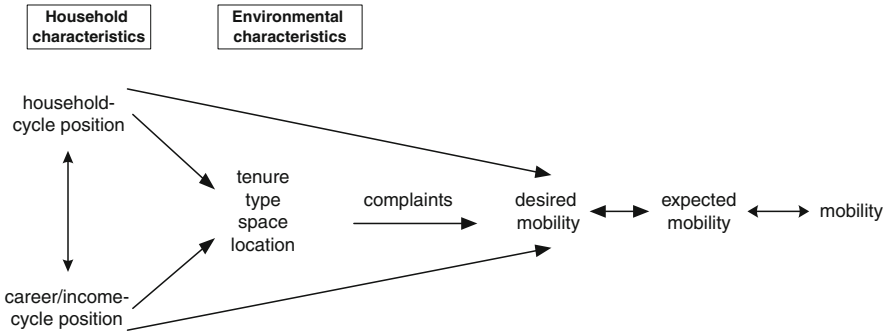


Fig. 2.1 The modified career/life cycle model (Source: Priemus 1984, p. 113)

available theoretical possibilities” (Priemus 1969, p.14, translation author). The individual endeavors to give his/her life shape according to fairly consistent paths, denoted as careers. People can furthermore follow parallel, strongly connected careers for different areas of their lives, such as education, work, sport, and creating a household and living (Mulder 1993; Mulder and Hooimeijer 1995; Clark and Dieleman 1996).

Every household has a specific housing need, which is partly determined by the status of the other careers. Changes in the household cycle or work cycle lead to changes in the housing needs. If the current housing situation deviates too much from the altered needs then this can lead to dissatisfaction. Once a certain threshold value has been crossed, people begin to think about moving to a dwelling that better suits their needs (Priemus 1984). Once the right kind of dwelling has been found and is available, a move to the more fitting dwelling will take place. The conceptual framework of housing preference research is based on these suppositions and is illustrated in Fig. 2.1.

2.2.1 Preferences and Value: Compositional Modeling

If people strive towards a particular goal they will want a dwelling and living environment that suits that goal. It is assumed that the dwelling and the living environment are made up of a collection of features (attributes). Different people with diverse goals will therefore ascribe different values to these attributes. People have a preference for those attributes to which they ascribe greater value; in other words, people have preferences. Working out the preference structure is central to the research.

According to some, the preference structure can be researched by studying the choices that people make. This assumes that the choice is a good reflection of a person’s preferences. This type of research is known as “revealed preference” research. A number of important assumptions have to be made in order for the choice to be a valid source for measuring preferences. In a market where the consumer is boss and

the suppliers react to the demand, the choice that is made is the perfect basis upon which to determine the preference structure. However, in a tight market where people probably have to make do with something that does not fit their criteria so well, the actual choice is not a good reflection of the preference. In that case, studying the preferences using a “stated preferences” approach is probably better. The problem here is then that the predictive ability of the preferences may be less realistic. The chapters by Koopman, De Groot and Goetgeluk, as well as the concluding chapter, provide greater insight into the question of stated and revealed preferences.

2.2.2 Variables

The stated housing preference is the combination of all the desired features of the dwelling as well as the location (the living environment). These various features are each given a separate value by the household when they are looking for somewhere to live. All these values together form a “total value” for the situation. The number of features is in theory endless; in practice (both in the actual search and in housing preference research), however, the number of features that individuals take into consideration is restricted. Housing preference research focuses on the “part-value” of each individual feature, whereby the total value of a dwelling with certain features can be determined. In such research the features mentioned in Table 2.1 are often utilized (the list is not exhaustive).

The total value can be determined by summing all the part-values and is an indicator of the desirability of the dwelling by the participant consumer. An idea of

**Table 2.1** The most often utilized dwelling and environment features in housing preference research

Dwelling features	Environment features
Type of dwelling	Type and size of local council
Number of rooms	Type of neighborhood
Size of living room	Type of housing
Total usable surface area of dwelling	Period built
Backyard present?	Amenities in the neighborhood
Size of backyard	Public transport
Presence of balcony	Green and water
Size of balcony	Semipublic area (parking, etc.)
Storage space	Parking places
Tenure	Safety, including traffic
Price	Space, building density
Architecture	Urban development design for the neighborhood
Quality/level of maintenance	
Year built/period built	
Private parking place	

Source: Goetgeluk (1997); Heins (2002); Boumeester et al. (2005)

**Table 2.2** Frequently used features for households in housing preference research

Demographic features	Social-economic features
Type of household (single, couple, family, single-parent family)	Position in the job market (self-employed, employed, unemployed, unable to work, retired early, retired)
Number of people	Number of hours work per week
Ages of household members	One or two incomes
	Level of income head of the household/partner
	Components of income for head of the household/partner
	Receipt of benefits/allowance
	Level of education
	Political stance

Source: Clark et al. (1990); Mulder (1993); Boumeester (2004); De Groot et al. (2008)

the “popularity” of a particular dwelling can be obtained by considering all the total values together. However, the popularity of a dwelling appears to vary between households with different dwelling needs and positions in the job market. The same dwelling can have a completely different value for one household than for another. A dwelling can also have different total values for the same household over time, if the household itself enters a different phase or the job market position changes. Housing preference research also needs to gather information about the demographic and social-economic features of households. Table 2.2 gives an overview of features frequently used (the list is not exhaustive).

The housing preferences are therefore closely linked to the features of the household. A family with children, for example, is more likely to prefer a single-family dwelling with a backyard than a single person is. Alternatively, a household with a high income is more likely to buy a dwelling than a household with a low income is. However, knowledge about the popularity of a dwelling does not tell us everything about possible plans to move. A household that tries to achieve maximum value will only make plans to move when it is clear that the current housing situation is valued less than other possibilities. In order to be able to utilize the findings about housing preferences in, for example, the calculation of the housing demand, insight into possible discrepancies between the current and the desired housing situation are therefore also important. The dwelling and environment features of the current housing situation therefore also need to be determined.

### 2.2.3 Data Collection

A household’s “stated” housing preferences only become meaningful when they can be compared with the current housing situation (dwelling and environment). This is also true for the “revealed” housing preferences in relation to the previous housing situation. In addition, the preferences need to be studied in relation to the demographic features (type of household, number and age of people) and the social-economic features (income, education, type of income, position in the job market, number of earners) of the household.

In the WBO/WoON research, therefore, a questionnaire is used that comprises the following sections:

1. Extent of likelihood to move house/recently moved.
2. Features of the present dwelling.
3. Features of the present living environment.
4. Desired features of the dwelling.
5. Desired features of the living environment.
6. Features of the previous dwelling (for those who have recently moved).
7. Features of the previous living environment (for those who have recently moved).
8. (Current and expected) demographic features of the household.
9. (Current and expected) social-economic features of the household.

The form and structure of the utilized questionnaire in much housing preference research will be very similar to this structure used in the WBO. The WBO questionnaire comprises a number of closed questions, many with predetermined answer categories.

The WBO questionnaire is carried out using face-to-face and telephone interviews with 60,000 individuals who are representative of the Dutch population aged 18 years and over who are not living in institutions. The criteria for the participant group was altered and improved during the transition to the WoON in 2006 and the number of respondents was restricted. The two methods of interviewing give the interviewer the possibility to provide clarifying information in the course of the interview if necessary. Furthermore, due to the personal approach, the level of response and the distribution of the net response over the *a priori* formulated strata can be better monitored and more quickly adjusted. The methods used clearly differ in this respect to using written questionnaires, which can be offered either by post (hard copy) or via the Internet (digital copy). The main advantage of using written questionnaires is the financial saving in comparison with personal or telephone interviews (Hilkhuisen 1999).

It is clear that standard housing preference research is characterized by quantitative data collection. The features to be studied and possible answer categories (attributes and attribute categories) contained in the questionnaires are selected on the basis of the available knowledge. The influence of the researcher is restricted to the creation of the structured questionnaire. A large number of respondents are approached to take part, in order to obtain enough data to test the expected links between the features of the household, the dwelling, and the environment, frequently with a statistical analysis.

## 2.3 From Housing Preferences to Housing Need Research

Measuring housing preferences provides insight into how diverse households would like to live. Such insight provides, in combination with knowledge about expected changes in demographic and social-economic factors, information about

the existing housing demand. Knowledge about the size and composition of this housing demand provides a good foundation for different decision-making processes. For example, insight into the quantitative (size) and qualitative (composition) housing need is necessary in order to be able to make well-founded decisions when drafts are made for the interpretation of the urban development plans of a location for new houses, or redevelopment areas, or for realizing the vision for a particular area at a particular time.

Housing demand research is therefore carried out in order to obtain information about the housing market in the short term (for example, mobility effects resulting from new-build) and in the long term (for example, whether there are structural changes in the houses that are sought after) and possibly to guide the market (government or market party). Housing demand research therefore needs to measure the correct housing preferences of all potential and actual households in the particular (local, regional, national) housing market.

### ***2.3.1 Reliability and Validity***

The measured preferences need to be reliable and valid. Reliability is based on accuracy. A questionnaire must produce the same findings when it is done the second time. Errors (for example, due to respondents guessing an answer) must be random rather than systematic. Guesses as answers are not a problem, as long as the guesses are not systematically too high or too low (systematic errors).

Validity is concerned with whether we are actually measuring what we thought was being measured. Are the measurements valid for the “concept as it was intended?” Is the variable properly operationalised and the correct question utilized? In other words, are the findings valid?

### ***2.3.2 Selecting the Sample***

It is clearly not feasible to actually measure the housing preferences of all households (that is, the whole population). The housing demand is therefore based on the opinions of a representative group of households from the population. A random sample is drawn from the total group of households and their housing needs are ascertained. The sample is made up of all the individuals or households for whom the necessary information is available and the group of respondents is drawn from this sample. A random sample is when each household in the sample group has an equal chance of being chosen. The straightforward random sample and the stratified sample are the most utilized.

The larger the diversity in the features of the individuals, the larger the sample from the group needs to be to obtain reliable findings. By dividing the group into several more homogeneous groups (strata), such as age or income groups, or position

in the job market, the diversity within each stratum is reduced. A simple random sample can then be drawn from each stratum, which then has a smaller size. This is known as a stratified sample.

In the WBO a sample is created of all individuals who are 18 years or older in the Netherlands and who are registered with their local council (in the *Gemeentelijke Basis Administratie* – GBA). From this group a stratified sample can be drawn according to the design of the survey, divided according to age, marital status, country of birth, and size of council. In the WBO from 2002 there were in total 24 strata, or clusters (VROM 2003).

### ***2.3.3 Size of Sample and Nonresponse Percentages in Housing Research***

The size of the sample is partly dependent on the desired reliability of the sample findings and the expected diversity within the wider sample. The size of the sample as well as the nonresponse level determine the expected net response, in other words the number of individuals who actually complete the questionnaire in the research. Not everyone will be prepared or will want to take part in the research. The researcher needs to take, as far as possible, the nonresponse into account when determining the size of the sample. The nonresponse is often estimated based either on experience from previous research or by doing a small pilot study. The nonresponse percentage varies greatly depending on the target group (for example, young people or old, looking for new accommodation or not likely to move), the subject (very general or more specific) and the manner of the interview.

In the WBO in 2002, the regular sample comprised approximately 100,000 individuals: 61% took part in either a face-to-face or telephone interview, 24% refused, and the other 15% could not be contacted. Individual councils had the option to resample if desirable. Interviewing extra individuals made it possible to perform reliable analyses at the council level. A sample of at least 50,000 individuals was drawn for this resampling, 59% of whom were interviewed. This national study ultimately involved 92,000 respondents (VROM 2003).

### ***2.3.4 Generalizability of the Findings: Weighting***

Even if stratified samples are utilized, it is not always possible to generalize the findings of the sample to the general population. If the different strata are not proportional then, just as with straightforward sampling, the findings need to be “weighted.” This can also happen when the a priori stratification goals are not reached (for example, due to deviant response percentages that were insufficiently adjusted). This latter procedure is, however, risky as the composition of the nonresponse is often not known. Each case in a stratum is given a weight such that the proportion in numbers between the strata in the total response



group corresponds with the original proportion in the empirical population (the original sample group).

Weighting of the findings is not to be confused with adjusting the results. By adjusting is meant that the weighted number of cases in the response group is multiplied, such that this number corresponds with the total number in the population (this does not change the division into features). This is necessary in order to express, for example, the total housing demand (or the balance of housing demand and stock of dwellings) into actual number of dwellings. The 92,000 respondents in the WBO from 2002 are representative of the 16.1 million inhabitants, 6.9 million households, and 6.6 million dwellings in the Netherlands (VROM 2003).

## 2.4 Cross-sectional Analysis

The findings from housing preferences or housing demand research are frequently used to map out the current housing market, on the basis of which local, regional, or national policy can be developed for different areas (distribution of land for housing, restructuring, housing expenditure, supply of new-build). Frequently it is sufficient to do descriptive analyses such as frequency distributions, two or more dimensional contingency tables and comparisons of subsets using center, distribution, and skewness measures. The findings are presented in tables or graphically.

The descriptive analyses can be carried out for a number of subjects, based on the research criteria. As such, a more specific description can be drawn up of the composition of the population from the demographic and/or social-economic features of the households. Types of households can also be drawn up by combining a few features. Equally, the existing housing stock can be sketched in more detail by making use of the possibility of combining diverse features from the dwelling and living environment. In this way different housing products can be distinguished, often using features such as tenure, type of dwelling, size, price and/or location (Moore, and Clark 1990; Kruythoff 1993; VROM 2002; Boumeester et al. 2004).

An important added value from the housing demand research lies in the fact that the actual division of living space can be seen in these results. It is otherwise not possible to make such a direct link between household features and dwelling features from the available population registration and housing statistics.

By dividing the households and dwelling supply into types, it is possible to distinguish groups of housing consumers: groups of more or less comparable households with similar housing situations (Clark and Dieleman 1996; Oskamp 1997; Boumeester 2004; VROM 2007a).

For households who have moved house in the last 4 years, the previous housing situation is also mapped out. Based on the information about both the previous and the current dwelling recent relocation movements can be more closely analyzed. The size of the flows can be centrally determined, and also the nature of the relocation. This involves splitting the different flows into housing market areas (regions or housing areas), housing market segments, or housing consumer

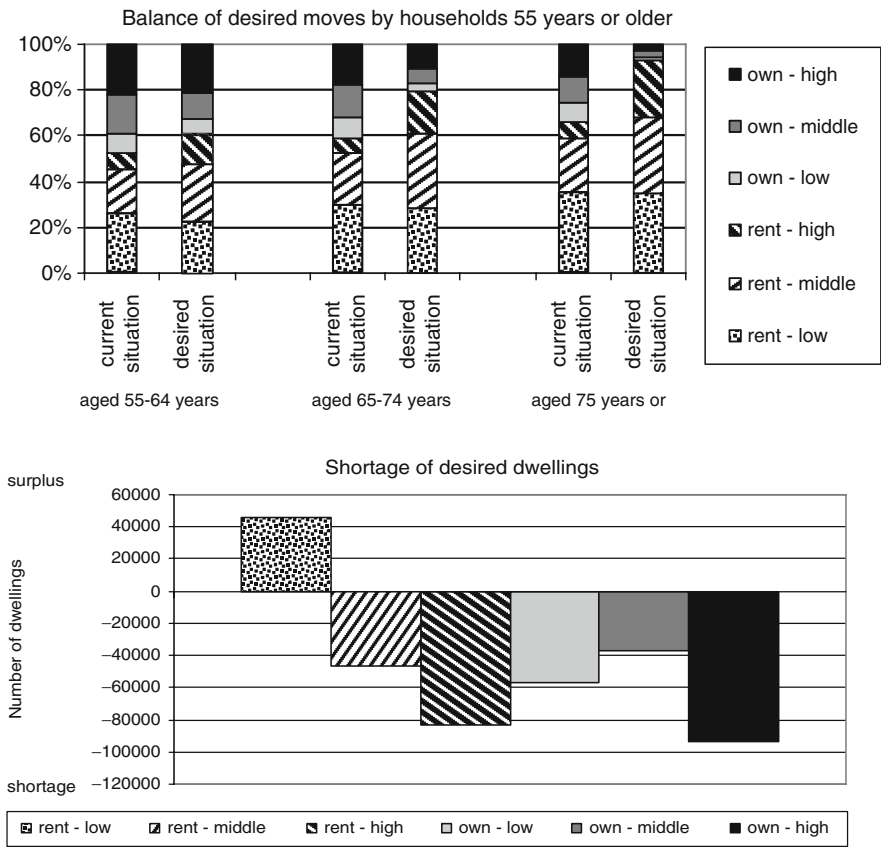
groups. By linking the information from housing consumer groups who have recently moved house with the features of the dwellings involved, housing demand profiles can be constructed (Boumeester 2004; Kulberg and Ras 2004; VROM 2007b; Boumeester et al. 2009). The flow effects can be determined by linking the information about the dwelling concerned to the features of the previous dwelling and thereby also the relocation chains. With this information, the expected dynamics of the housing market as a result of new-build can be modeled (Everaers 1990; Teule 1996; Goetgeluk 1997; Elsinga and Goetgeluk 2003; De Groot et al. 2008).

Respondents in the housing demand research are also asked if they are likely to move house: whether they have more or less concrete plans to move in the near future (1–2 years). If the likelihood that a household will move is high, further questions are posed about the features of the desired housing situation. This information can be used to map out the popularity of particular housing products and can possibly be split into diverse housing consumer groups. Potential mobility flows can be analyzed by linking the desires of a respondent with the features of their current housing situation. Furthermore, once again the desired mobility flows can be distinguished into housing market areas (regions, districts, or living environments), housing market segments (rent or owner-occupancy, type of housing, price group), and housing consumer groups (desire profile). Potential mobility balances can often be drawn up, or the theoretical balance calculated, whereby insight can be gained into the potential demand in specific housing market segments (Elsinga and Goetgeluk 2003; Boumeester and Van der Heijden 2004; VROM 2007c; Boumeester et al. 2008; De Groot et al. 2008). Figure 2.2 illustrates an example of a mobility balance and a theoretical shortage of dwellings.

An indication of the future housing demand can be determined by applying the desired (or current) distribution of housing space in a research area onto the projected number of households for the same area. This can only be indicative, as such an approach involves making a number of serious assumptions: that the households remain or come and live in the area, the preferences of diverse types of households remain unchanged over time, the relocation movements of households is carried out in agreement with each other and there is no substitution of housing preferences.

### ***2.4.1 Repeated Cross-sectional Analysis***

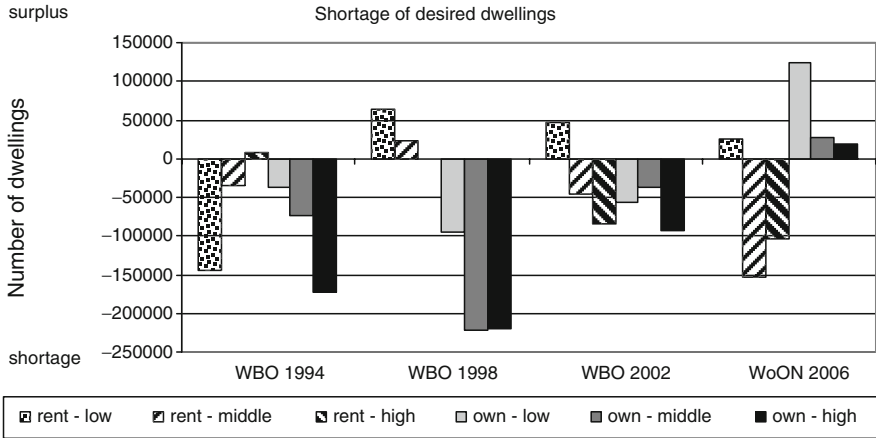
As stated earlier, a one-off survey of the housing preferences within a housing market area (national, regional, or local) only gives insight into the situation in that particular area. The data collected in a one-off study into housing demand can be used to more accurately specify the housing supply (market segments) and the housing demand (consumer groups), as well as to determine both the current and desired housing space distribution and the discrepancy between them. However, there is no reference point for the results of the analysis.



**Fig. 2.2** Examples of the balance of desired moves and the potential shortage of desired dwellings in 2002 (Source: WBO 2002 (OTB/TU Delft calculations))

For this reason, the survey used is often repeated in other housing market areas (or in a national study which is split up into different regions) or at another time in the same housing market area. Utilizing the same measurement instrument (the same questionnaire) enables a direct comparison of the findings and the relative value of the results can be determined.

Cross-sectional data become even more valuable if the survey is repeated at regular intervals in the same research area with the same measurement instrument. In this way a succession of findings regarding unequivocal, operationalised variables are created at an aggregated level. It is then possible to determine changes over time for particular variables, as well as the links between variables. Possible trends can then be identified. Such a survey in the Netherlands is the national Housing Demand Survey (1977, 1981, 1985/6, 1989/90, 1993/4, 1997/8 and 2002) and its successor the Housing Research Netherlands Survey 2006.



**Fig. 2.3** The potential shortage of desired dwellings in 1994, 1998, 2002, and 2006 (Source: WBO 1993/94, 1997/1998, 2002, and WoON 2006 (OTB/TU Delft calculations))

In addition to this, since 1995 there has been the recurring national survey Housebuyers in Profile (HiP 1995, 1996, 1997, 1998, 1999, 2000, 2002, 2004, 2006 and 2008) that specifically studies the housing situation and wishes of households in the Netherlands with an above-average income. In the publications from this latter survey, much use is made of the desire profiles (Boumeester et al. 2008).

It is possible, with the help of the repeated cross-sectional data, to determine changes or trends in housing preferences and housing demand. For clarity, Fig. 2.3 illustrates once more the potential shortage in desired dwellings in 2002, this time in combination with the same information from surveys before that time and from 2006. It is clear that the potential housing shortage in 2002 would be interpreted very differently based on Fig. 2.3 than on Fig. 2.2. Looking only at the potential housing shortage in 2002 it is possible to conclude that there is great shortage of expensive houses for sale (100,000 dwellings). Figure 2.3 indicates, however, that this shortage is considerably smaller than in the 1990s, and can even be regarded as part of a transition towards a surplus in 2006.

The WBO research asks households that have recently moved (in the 4 years before the survey) in which 6-month period they last moved. The features of both the previous dwelling and the current dwelling for this last move are determined. With the help of successive WBO data files, a variable can be constructed that contains the number of house moves for each 6-month interval over a long time period (first half of 1975 to second half of 2009). Such variables are often used for secondary data analysis, including for research into the demand for more expensive houses in the Netherlands (Boumeester 2004). This research provides a good illustration of the techniques of repeated cross-sectional analysis, which we now move on to.

## 2.5 An Example of Repeated Cross-sectional Analysis: The Development of Demand in the Housing Market

Moving house can be seen as a decision-making process, where the current housing situation, the possibly changing housing preferences and the knowledge about other dwelling spaces play a role. The decision to move to a particular dwelling can be explained as comprising three part-decisions: the moment of deciding to move house, the choice between renting and buying and the choice for a certain amount of dwelling features (type, size, and quality of the dwelling). These part-decisions are closely interconnected. The decisions are often made all at the same time, and the choice in one part-decision often determines the choices made for the other part-decisions (Laakso and Loikkanen 1992; Elsinga 1995). The choice for a particular sort of dwelling can lead, for example, to an individual entering the house-buying sector. If the desired dwelling is not available then substitution behavior may take place, where a move is made to a comparable rental dwelling or another dwelling is bought with features that are different to the desired ones. A decision might also be made either not to move house at all or to postpone moving.

The revealed housing choices of a household reflect the housing preferences, but also the housing market conditions within which these choices are made. It was concluded above, in Sect. 2.2, that housing preferences are closely linked to the demographic and social-economic features of a household. The actual demand for dwellings in a particular market segment is also linked to the demographic (age and type of household) and social-economic (household income, level of education) composition of the population. However, the availability, accessibility, and affordability of the desired dwelling also play a role in the eventual size of the demand for the dwelling (Hooimeijer and Linde 1988; Goetgeluk et al. 1992; Teule 1996; Boumeester 2004). Government policy and the policy of mortgage credit institutions are also structural explanatory factors. These factors have influence particularly in the long term on the development of demand, with the exception of the social-economic factors, which can also be of influence in the short and middle-long term. Far-reaching changes in policy can also play a role in the short term.

In addition, there are three factors regarding the dynamics of the housing market itself that can play a role in the development of demand for more expensive houses in the short and middle-long term. This is the supply of new-build dwellings as well as dwellings in the existing stock, the sale price of the dwellings (the actual price as well as the percentage of change) and the rental prices.

The housing policy of the Dutch government seemed to go one step further than in the twentieth century with the publication of the paper “People, Wishes, Living” (VROM 2001). Key words were “quality improvement” and “freedom of choice.” The focus is on the housing consumer’s qualitative housing demand, both in the rental sector and particularly in the owner-occupied sector. Realizing the policy goals is even more dependent on the actual housing market conditions than in the previous period. Such a policy does not only demand an accurate and current insight into the supply and demand in the housing market, but greater and more

accurate knowledge about expected developments in the supply and demand in the near future are also of great importance. It is also important to know which factors influence the demand for housing and in what way. These developments in policy provided the stimulus for a study by Boumeester (2004) into the development of the demand for houses at the top end of the market in the Netherlands. Boumeester (2004) aimed to answer the following two research questions:

- Which factors influenced changes in the level of the actual demand for expensive houses between 1975 and 1993?
- To what extent can the actual demand for this sort of house be explained by demographic, social-economic and/or cultural changes at a macro level and through changes in the state of the housing market?

### 2.5.1 *The Technique in General*

A search through both the Dutch and the international literature revealed that there appears to be no explanatory model available specifically for the demand for expensive owner-occupied housing. It is therefore not possible either to utilize or refute an existing model. A new model has therefore been constructed, making use of the data available from different sources.

Several choices need to be made before a model can be constructed. Firstly, a choice regarding the content needs to be made to incorporate a “constant factor” in the model. Omitting a constant assumes that the dependent variable will have the value “zero,” if there is one (in a multiplicative regression model) partial effect, or that all (in an additive model) partial effects equal “zero.” This assumption is not made in the model for the demand for expensive houses and therefore a constant is incorporated into the model.

Given the exploratory character of the analysis that was carried out on the changes in demand referred to, it must equally be ascertained whether the effects of the independent variables on the dependent variables need to be delayed by one or more time periods. For example, an increase in interest rates at time “ $t$ ” often leads to a change in the demand for housing at time “ $t+1$ ” or “ $t+2$ .” An increase in mortgage rates leads to a reduced loan capacity, whereby some of the potential house buyers are forced to start looking in another, cheaper, price category. These people will also choose and move to a house in that cheaper price category. This search and choice process takes time. The length of the delay can be determined by theoretical assumptions, but can also be determined by “trial and error” during the statistical estimation of the model. Just as in Boumeester (2004), a combination of both is often applied.

As stated earlier, constructing the model needs to be done as economically as possible (the greatest possible explanatory power with the smallest number of dependent variables). This requires that the model is constructed step by step, involving two possible approaches: either starting from a full (saturated) model and working backward to an optimal model, or starting with a model with only a constant and building up to the optimal model. In Boumeester’s (2004) study the second approach is utilized. The analysis begins with an estimation of the values of the dependent variables using a model with only a constant. The partial correlations

between the residuals are then determined from this estimation and all the possible explanatory variables. The first independent variable is added on the basis of the direction (meaningful) and strength (as high as possible) of the correlation coefficients. This extensive model is then used to estimate the dependent variables again. The partial correlation coefficients between the residuals and the remaining possible explanatory variables are calculated again, on the basis of which the next dependent variable can be selected and added to the model. This procedure is repeated as long as the addition of an independent variable leads to substantial improvement in the model. It is possible that the whole process of estimating the model can be repeated with alternative combinations of the explanatory variables in the model.

### 2.5.2 The Method

The aim of the analysis is to develop an explanatory model of how the demand for expensive owner-occupied housing evolves, simultaneously based on the changes in diverse social-economic, demographic, and housing market factors. This implies, therefore, a multivariate analysis that results in an analysis model very similar to a standard regression model (see, for example, Field 2004, p. 116):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon_i \quad (2.1)$$

The same criteria hold for an assessment of this model as for a standard multiple regression analysis. Firstly, the model needs to be as sparing as possible; in other words a model with the smallest number of independent variables and the greatest explanatory power possible.

Both the explanatory variables incorporated in the model and the direction of the determined links need to be theoretically possible. If the model is also going to be used to gain insight into possible changes in the short or middle-long term then the “turning points” in the development of the demand need to be explained as well as possible.

From a statistical point of view, just as with a standard regression model, this model must meet the following criteria: the links between the dependent variables and the individual explanatory variables need to be linear (no *nonlinearity*), the independent variables must not be too strongly correlated with each other (no *multicollinearity*), the residuals must be normally distributed with an average of zero and the distribution must be the same for each value of the predictor(s) (no heteroskedasticity) and must not be correlated with each other (no *autocorrelation*) (Lewis-Beck 1980; Berry and Feldman 1985).

Due to the specific role of “time” in the model, the proportion of the explained variance,  $R^2$ , is assessed differently than in a standard regression model.  $R^2$  indicates the correlation between the actually observed values and the estimated values of the dependent variable using the model. Due to the fact that the score in year ( $t$ ) may also have an influence in subsequent year(s), known as the trend correlation, a high value for  $R^2$  is generally pretty quickly obtained. In addition,  $R^2$  is often estimated slightly too high in small sample sizes, giving the impression that the model

fits better than is actually the case. It is therefore better to utilize  $R^2$  corrected for the number of degrees of freedom. Just as in standard regression analysis, the analysis aims for an  $R^2$  that is as high as possible (Draper and Smith 1981).

The standard error (standard error of the estimates, SEE) is aimed to be as low as possible. The smaller the SEE, the more accurate and reliable the model. The standard error is used to determine the 95% confidence interval of the estimated values (Draper and Smith 1981).

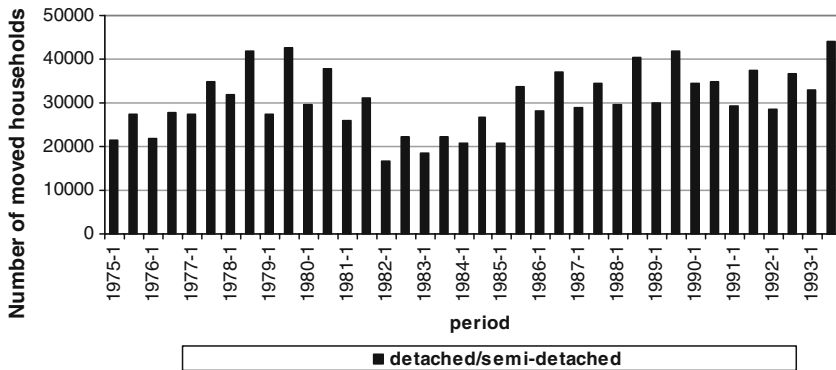
In repeated cross-sectional analysis, one has to take possible autocorrelation into account. Autocorrelation indicates a connection between observations at a particular time with observations from the same series at an earlier time. If autocorrelation is reported, then consecutive observations are not independent of each other. Autocorrelation can lead to incorrect standard errors and consequently incorrect hypothesis tests and confidence intervals (Cohen et al. 2003). To test for autocorrelation the Durbin–Watson test (DW) is often used. The value of the DW statistic  $d$  always lies between 0 and 4 (Maddala and Lahiri 2009). Values close to zero indicate a positive autocorrelation between the residuals and values near 4, a negative autocorrelation. A value of 2 indicates no autocorrelation. A more precise indication can be obtained by comparing the value  $d$  to lower and upper critical values, which are based on the number of parameters (predictors+constant) and the number of cases in the model (see, for example, Table A.5 on p. 616 of Maddala and Lahiri (2009)).

A last comment concerns the number of observations required for a reliable analysis. Although there is no standard rule, the number of observations in the example given – 38 observations ( $19 \times 2$  half-years) – seems to be somewhat limited. This is a limitation of the current example.

### 2.5.3 *The Variables*

The dependent variable “realized demand for more expensive owner-occupied houses” can be transformed into the number of households that choose a dwelling in the more expensive segment of the market, and therefore choose not to rent or to buy a cheaper house. In the literature, it is clear that changes in the sale price of dwellings can influence the buying behavior of housing consumers, in terms of both affordability and the so-called speculative effect. The variable “sale price” definitely plays a role in the explanation of the progression of the level of demand for more expensive houses to buy. If the average sale price is utilized to distinguish the more expensive segment, then part of the explanatory power will not be seen. For this reason, the term “more expensive houses to buy” is defined as “all detached and semidetached dwellings in the owner-occupied sector” (Boumeester 2004). Closer examination shows that the average sale price for these types of dwellings is higher than for other types of dwellings. Detached and semidetached dwellings can therefore be considered as a proxy for the top end of the owner-occupied sector. The housing market sector “detached and semidetached dwellings” includes at least 45% of the housing market (which is about 20% of the total housing stock).





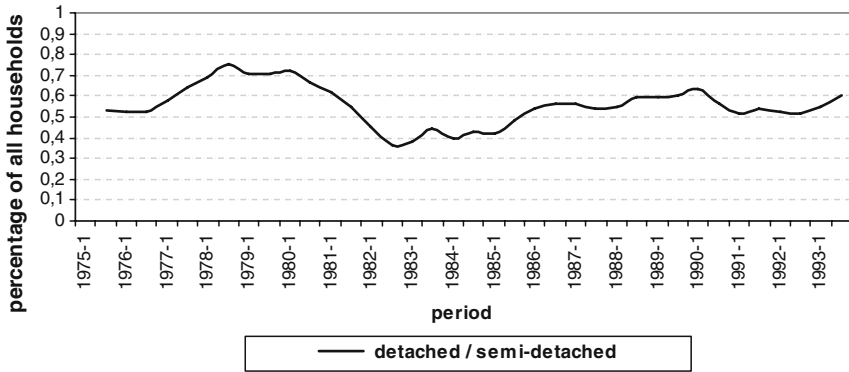
**Fig. 2.4** The number of households that moved to a detached or semidetached dwelling in the Netherlands, on a half-year basis, during the period 1975–1993 (Adapted from Boumeester 2004, Fig. 8.1, p. 217)

Changes in the realized demand can be determined with the help of the consecutive WBO databases. Using these data, a series of the number of house moves on a 6-monthly basis can be constructed over a longer period of time (1975–1997). Figure 2.4 illustrates the changes in the demand for more expensive houses and this demand for detached or semidetached houses to buy.

When there is no insight into the changes in the total number of households, the developments within this series do not say much about the changes in the development of demand in the highest segment of the house-buying market. The number of moves into detached or semidetached owner-occupied houses is therefore related to the total number of households in the Netherlands. The variable to be explained therefore becomes “the percentage of all households that move to a detached or semidetached house per half year.” As a consequence, the percentages are advanced by 2 months. Figure 2.5 illustrates the course of the dependent variable. The share varies from 0.75% in the second half of the 1970s, to 0.35% at the beginning of the 1980s to approximately 0.60% in the first half of the 1990s.

As was indicated in the introduction to Sect. 2.5, the literature shows that the actual relocation behavior is dependent on the housing preferences of households and on the availability, accessibility, and affordability of dwellings. The number of relocations to dwellings at the top end of the market in a particular period is therefore partly dependent on the demographic and social-economic composition of the population, the supply of such dwellings (both in new-build and the existing housing stock) changes in prices in the housing market and within the rental sector, and the possibilities within the mortgage market (level of mortgage interest rates, types of mortgage).

The potential predictors are therefore, in the first instance, constructed from the possible explanatory variables listed below. Series of data on a half-yearly basis are gathered for these factors and then the most appropriate way to represent the data is



**Fig. 2.5** The number of households that moved to a (semi)detached owner-occupied dwelling, as a percentage of the total number of households in the Netherlands, in the period 1975–1997 (two periods average) (Adapted from Boumeester 2004, Fig. 8.3, p. 224)

sought by applying transformations (absolute figures, percentage of change, advanced averages over two or more periods). The following datasets are involved:

- Population growth by age categories (absolute numbers).
- Average income of households (absolute value and percentage of change).
- Inflation.
- Average house price (nominal, real, absolute value, and percentage of change).
- Average rent for housing (nominal, real, absolute value, and percentage of change).
- Average mortgage interest rate (nominal, real, absolute value, and percentage of change).
- Newly built dwellings in the owner-occupied sector or in the rental sector (absolute numbers).
- Proportion of the owner-occupied sector in the existing housing stock (percentage).

By studying the correlations between the dependent variable and these factors, as well as by graphic comparisons, the usability of these factors in the time-series analysis can be determined. It is also taken into account that changes in these factors may have a delaying effect on how the demand changes. For example, from the literature it is already known that a fall of the mortgage interest rate or a bigger housing supply (newly build and in the housing stock) only affects the consumers' choices on the housing market after some time.

## 2.5.4 Results

After examining a number of alternative explanatory models, it seems that model A (see Table 2.3) can most accurately estimate the dependent variable “number of households that have moved into a detached or semidetached house, as a percentage

**Table 2.3** Model of explanation for the volume of the demand for (semi)detached owner-occupied dwellings in the Netherlands in the period 1975–1993

Model profile <sup>a</sup>	b	t	B
Model A			
Constant	0.211	(3.60)	
Real price{1}	0.002	(10.92)	0.762
Interest rate{2}	−0.021	(−4.92)	−0.303
Supply (1)	0.00000489	(5.04)	0.260
Aged 65+	0.000011	(5.26)	0.310
Nominal price{3}	−0.004	(−3.30)	−0.232
N	37	Sign on 5%	
R <sup>2</sup>	0.932		
SEE	0.025		
Durbin–Watson	1.850		

Source: WBO 1977/1978, 1981, 1985/1986, 1989/1990 and 1993/94 (OTB/TU Delft calculations)  
*b* *b*-coefficient, *t* value of the *T*-test, *B* standardized *b*-coefficient, *real price* average real house prices (corrected for inflation, in terms of 1994 prices), *interest rate* average nominal mortgage interest rate, *supply* number of newly built dwellings in the middle and upper price classes, on a half-year basis (a two periods average), *Aged 65+* increase (absolute) of the number of persons in the age category 65 years or older, on a yearly basis (a two periods average), *nominal price* changes (%) in the average nominal house prices, on a half-year basis (a two periods average), *N* number of observations, *R*<sup>2</sup> percentage explained variance, corrected for the number of degrees of freedom and based on the number of observations and the number of independent variables in the model, *SEE* standard error of the estimated value

<sup>a</sup>The addition {1} means that the independent variable affects the dependent variable with a lag of one period (half year)

of all households.” This involves a model that comprises five explanatory variables as well as the constant. Three variables are related to the housing market conditions, one variable is a social-economic indicator and the fifth variable is a demographic indicator. The negative coefficients indicate that the level of the mortgage interest rate and the variation from the average nominal sale price are negatively related to the size of the realized demand for more expensive housing. The datasets used can be found in Table A.1 of the [Appendix](#).

The *t*-test makes clear that in this model all relations between the predictors and the dependent variable are statistically significant, meaning that the predictors have an influence on the dependent variable. The level of the average relative sale price has by far the strongest relation (standardized *B*-coefficient = 0.76) with the dependent variable to be explained. Increases in real house prices lead, other things being equal, to more moves to detached or semidetached houses, with a delay of one period (a half-year). Housing consumers also want to profit from the relatively large increases in the value of houses. However, there also appears to be a brake on these changes, given the negative correlation coefficient for the factor “change of nominal selling price” (*B*-coefficient = −0.232). If the actual price, corrected for short-term price fluctuations, continues to rise too quickly, then after a delay of three half-years there will be a small drop in

demand. If the other explanatory factors stay the same, the affordability of the houses comes under pressure.

The level of the mortgage interest rate is included as the second variable in the explanatory model and in the final model as the third strongest relation ( $B$ -coefficient =  $-0.30$ ) with the realized demand. The interest rate changes have a negative effect, with a delay of two half-years.

The relation between the changes in the supply of new-build houses and the actual demand appears to be less strong ( $B$ -coefficient =  $0.26$ ) than the mortgage interest rates, while at the same time the contribution to the total explained variance is slightly higher. The effect on the demand is seen with a delay of a half-year.

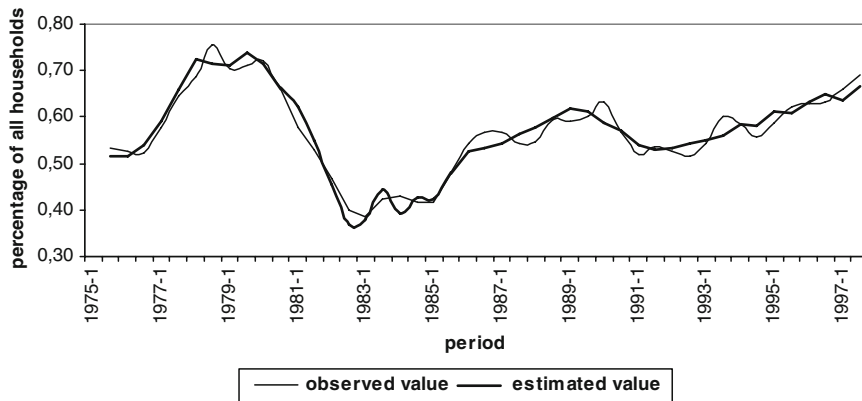
Finally, the demographic variable “increase in the number of individuals 65 years or older” appears to have a strong relation with the dependent variable ( $B$ -coefficient =  $0.31$ ). However, the relation does not correspond with the expected relation, given the positive correlation coefficient. There is apparently no demand effect, but rather a supply effect: more older people leads to more vacated detached and semidetached houses that other households can move into. In order to explain this we need to look at the great “shortage in the housing market” during the research period. The big potential demand from housing consumers for this type of housing can only be transformed into actual relocation when such houses become available, for example, due to older people moving house.

The model statistics indicate that the model is, on the whole, good. Approximately 93% of the variation in the dependent variable can be explained by this comparison. The standard error for the estimated comparison is low, indicating a good fit between the observed and estimated sets. In addition, the DW value (1.85) is sufficiently close to 2 to indicate that there is no autocorrelation. When comparing this value to the upper and lower critical levels, which are calculated on the basis of the number of parameters and the number of cases in the model, there is a statistical indication that the error terms are not positively autocorrelated. Note, however, that this statistic can be biased by the relatively small number of observations.

### ***2.5.5 The Predictive Potential of the Explanatory Model***

Based on the explanatory model presented for the actual demand for detached and semidetached housing it is possible to predict future changes in demand. An important condition is that the relations found in the period studied do not change in successive years. In addition it has to be assumed that the conditions for other factors, which are possibly of influence but not present in the model, remain unchanged.

In the study of Boumeester (2004) this was not the case, due to the introduction of the double-earners' mortgage in the Netherlands in 1992 that suddenly increased the number of financing possibilities for households. Therefore an adjustment of the model was necessary by adding a dummy variable to distinguish the periods up to 1993 and after 1993. The predictive ability of that adjusted time-series model B, with only slightly changed  $b$ -coefficients for all other predictors, is determined for



**Fig. 2.6** Observed and estimated number of households that moved to a (semi)detached owner-occupied dwelling, as a percentage of the total number of households in the Netherlands in the period 1975–1997 (Source: WBO 1977/1978, 1981, 1985/1986, 1989/1990, 1993/94, 1997/1998 (OTB/TU Delft calculations))

the period 1975–1998. The result for the actual demand for detached and semidetached housing is represented graphically in Fig. 2.6 and the model data for the new model (model B) can be found in Table A.2 in the [Appendix](#).

The explanatory model for the period 1975–1998, model B, can be written as:

$$D = 0.227 + 0.002 \times RP_{t-1} - 0.023 \times MI_{t-2} + 0.00000469 \times S_{t-1} + 0.00001 \times A \\ - 0.004 \times NP_{t-3} - 0.047 \times DUM_{t-3}$$

where

$D$  = number of movers to (semi)detached owner-occupied dwellings, as a percentage of the total number of households

$RP$  = average real house prices (corrected for inflation, in terms of 1994 prices)

$MI$  = average nominal mortgage interest rate

$S$  = number of newly built dwellings in the middle and upper price classes, on a half-year basis (a two periods average)

$A$  = increase (absolute) of the number of persons in the age category 65 years or older, on a yearly basis (a two periods average)

$NP$  = changes (%) of the average nominal house prices, on a half-year basis (a two periods average)

$DUM$  = period effect, with 1975–1992=0; and 1993–1997=1

The actual data for changes in the demand for detached and semidetached owner-occupied dwellings in the period 1994–1997 is available from the Housing Demand Surveys 1997/1998. Besides the changes in demand in the period up to 1998, the actual changes in the explanatory variables are also available. By adding these actual values to the regression equation in the explanatory model, the “predicted” change in

demand for detached and semidetached owner-occupied dwellings can be determined for the named period. This prediction can then be compared with the actual change in demand, available from the consecutive Housing Demand Surveys.

As seen in Fig. 2.6, the actual and estimated courses of the demand are now more similar. The dummy variable is included in model B with a delay of three half-years and has a negative relation with the dependent variable. This dummy therefore corrects for the delayed reaction in the actual demand to the cited changes in the granting of mortgages. Comparing the *B*-coefficients in the original (see Table 2.3) and the new model (see Table A.2) shows that these are very similar, both in direction and in strength. This confirms the assumption that the partial relations between the independent variables and the actual demand are the same both before and after 1993.

### 2.5.6 Demand Projections Using Scenarios

Changes in the demand for detached and semidetached houses can be predicted for several years using the model, even when the actual values of the independent variables in the comparison are not available. An important assumption in this case is that the statistical relations are the same for these years as for the period 1975–1997. An estimation of the future values of the explanatory variables also needs to be made. In this situation scenarios are often utilized, within which the expected changes in the variables should show a logical, realistic relationship.

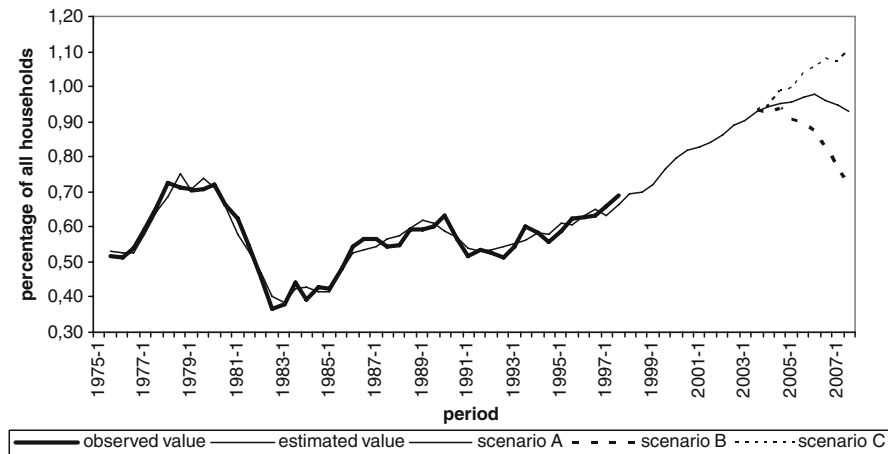
Working with scenarios usually aims to provide a broad range of the possible future changes in the dependent variable rather than providing as accurate a prediction as possible. The detailed scenarios need to be clearly distinguished from each other: a minimum and a maximum variant (and possibly a variant in between), a favorable and an unfavorable variant, or a most probable variant and a more desirable variant.

The expected demand for detached and semidetached dwellings in a scenario can be calculated by adding the values, per period, for the six independent variables from that scenario into the regression equation for model B. This calculation is repeated for each scenario and the findings can then be compared. A graphic representation is also often useful.

The quality of such predictions of housing demand therefore depends on the demonstrated validity/stability of the model, the degree to which the context stays the same and the credibility of the scenarios utilized.

Boumeester's (2004) study calculated a model-based prediction for the changes in the demand for detached and semidetached owner-occupied dwellings. Three scenarios were used: a very favorable future scenario (scenario C), an unfavorable future scenario (scenario B) and moderate development (scenario A). For the period 1998–2002, the actual values for the independent variables are utilized and from the first half of 2003 the model input is scenario-specific. An overview of the utilized data can be found in Table A.3 in the [Appendix](#).

The results are illustrated in Fig. 2.7. The predictions according to the three scenarios clearly vary in the last years. The value of the dependent variable could



**Fig. 2.7** Observed and estimated number of households that moved to a (semi)detached owner-occupied dwelling, as a percentage of the total number of households in the Netherlands in the period 1975–1997, and the forecast using three scenarios for the period 1998–2007 (Source: WBO 1977/1978, 1981, 1985/1986, 1989/1990, 1993/94, 1997/1998 (OTB/TU Delft calculations))

increase to 1.1% of all households in 2007 under the most favorable conditions, while in the most unfavorable scenario this value decreases to 0.72%. Converted into the number of households that would move into a detached or semidetached owner-occupied dwelling in the second half of 2007, the range lies between 81,000 and 52,000 households. On a yearly basis, this implies an actual demand for houses in this market segment in the region of 100,000–160,000 dwellings.

## 2.6 Conclusions

In this chapter, we have shown that the value of housing demand research lies in the connection between the features of households on the one hand and the features of the current housing situation (the actual division of housing space) and the housing preferences of the household concerned on the other. On the basis of such housing demand, research and cross-sectional analysis can be carried out, local, regional, and national policy can be formulated for diverse areas (division of housing space, restructuring, housing costs, new-build supply). The data gathered in a one-off housing demand study can be used to more accurately specify the housing supply (market segments) and demand (consumer groups), and to determine the current and desired division of housing space and the discrepancy between the two. There is, however, no reference point.

For this reason, the questionnaire is often repeated in other housing market areas (or a national study split up into regions) or at another time in the same area. Using the same questionnaire means that the findings can be compared directly and the relative value of the results can be determined.

Cross-sectional data gain more value, however, when the survey is repeated in the same study area at regular intervals and with the same measurement instrument. In this way, a whole series of information is created at an aggregated level about unequivocal operationalized variables. It is then possible to determine changes over time for individual variables and also relations between the variables. Possible trends can then be identified. The Housing Demand Survey (1977–2002) and its successor Housing Research Netherlands (2006–2009) provide the opportunity to conduct a repeated cross-sectional analysis.

In the Dutch surveys referred to the actual relocation movements are determined, which means that changes in the demand for dwellings (in a particular market segment) can be mapped out. This change in demand can then be related to other macro changes, which may provide an explanation for the change.

The study by Boumeester (2004) is used in this chapter as an example of such an analysis. The change in the number of households that move to a detached or semidetached house can be mostly explained by some housing market factors and social-economic and demographic variables. The model estimated for the period 1975–1997 can then be used to make predictions for changes in the demand for detached and semidetached houses between 1998 and 2007.

## 2.7 Appendix

**Table A.1** Data used in the time-series analyses of the realized demand for (semi)detached owner-occupied dwellings

Period	Demand	Real price	Interest rate	Supply	Aged 65+	Nominal price
1973-1		162,100	8.50	13,312	13,672	6.60
1973-2		188,100	8.66	14,445	14,592	10.00
1974-1		178,600	8.59	15,719	15,511	8.90
1974-2		220,000	9.65	17,138	16,038	9.80
1975-1		192,400	9.95	15,039	16,565	6.60
1975-2	0.53	208,000	9.40	12,700	15,966	3.00
1976-1	0.53	221,700	8.87	11,501	15,368	12.30
1976-2	0.52	252,800	8.79	10,165	13,723	14.80
1977-1	0.58	297,000	8.89	11,162	12,079	19.90
1977-2	0.65	321,300	8.67	13,255	14,793	16.00
1978-1	0.69	330,700	8.41	12,630	17,506	7.50
1978-2	0.75	314,400	8.29	14,760	16,646	0.90
1979-1	0.71	300,000	8.85	16,797	15,785	-2.70
1979-2	0.71	279,700	9.55	13,985	16,500	-3.10
1980-1	0.72	259,300	10.64	13,859	17,214	-3.80
1980-2	0.66	236,700	11.36	13,870	15,278	-4.80

(continued)



**Table A.1** (continued)

Period	Demand	Real price	Interest rate	Supply	Aged 65+	Nominal price
1981-1	0.62	219,800	11.58	12,013	13,342	-4.90
1981-2	0.55	193,600	12.28	8,420	13,234	-6.30
1982-1	0.46	179,400	11.74	5,672	13,127	-6.90
1982-2	0.37	175,000	10.22	4,040	11,527	-2.90
1983-1	0.38	178,400	9.09	2,867	9,927	1.00
1983-2	0.44	174,600	8.72	2,960	10,049	1.40
1984-1	0.39	169,600	8.62	2,394	10,172	-0.80
1984-2	0.43	168,900	8.35	2,315	10,408	-0.30
1985-1	0.42	166,300	8.20	2,914	10,644	0.30
1985-2	0.48	166,400	7.84	2,910	15,183	0.10
1986-1	0.54	172,700	7.34	3,587	19,721	2.00
1986-2	0.57	176,700	6.98	4,540	18,567	2.90
1987-1	0.57	183,200	6.90	5,996	17,413	2.60
1987-2	0.54	183,500	6.98	8,040	17,720	2.10
1988-1	0.55	188,400	6.85	10,504	18,027	2.10
1988-2	0.59	191,700	6.87	12,340	18,248	2.70
1989-1	0.59	198,900	7.49	12,874	18,470	3.10
1989-2	0.60	202,700	8.18	14,415	16,389	3.40
1990-1	0.63	202,200	8.98	15,444	14,309	1.90
1990-2	0.57	195,400	9.65	15,675	14,159	-0.50
1991-1	0.52	196,700	9.58	16,182	14,009	0.40
1991-2	0.54	198,800	9.49	14,910	13,518	3.00
1992-1	0.53	205,000	9.37	14,950	13,027	4.00
1992-2	0.51	208,900	9.13	17,120	12,971	3.90
1993-1	0.54	215,800	8.54	18,539	12,916	3.80
1993-2	0.60	223,100	7.51	20,025	12,075	4.80
1994-1	0.59	232,400	7.02	19,489	11,234	5.30
1994-2	0.56	229,700	7.56	23,416	12,012	2.80
1995-1	0.59	231,700	7.98	24,124	12,791	1.00
1995-2	0.62	239,800	7.40	25,530	13,220	3.00
1996-1	0.63	250,600	6.64	23,615	13,649	5.00
1996-2	0.63	253,800	6.25	19,851	12,566	4.00
1997-1	0.66	266,200	6.02	19,649	11,483	4.50
1997-2	0.69	272,100	5.93	20,502	12,212	4.60

Source: WBO 1977/1978, 1981, 1985/1986, 1989/1990, 1993/94, 1997/1998 and Statistics Netherlands 2004 (OTB/TU/Delft calculations)

*Demand* number of movers to (semi-)detached owner-occupied dwellings, as a percentage of the total number of households, *real price* average real house prices (corrected for inflation, in terms of 1994s prices), *interest rate* average nominal mortgage interest rate, *supply* number of newly built dwellings in the middle and upper price classes, on a half year basis (a two periods average), *aged 65+* increase (absolute) of the number of persons in the age category 65 years or older, on a yearly basis (a two periods average), *nominal price* changes (%) of the average nominal house prices, on a half year basis (a two periods average)

**Table A.2** Explanatory model for the level of actual demand for detached and semi-detached owner-occupied dwellings in the period 1975–1997

Model profile <sup>a</sup>	<i>b</i>	<i>t</i>	<i>B</i>
Model B			
Constant	0.227	(4.29)	
Real price{1}	0.002	(12.27)	0.771
Interest rate{2}	−0.023	(−5.93)	−0.354
Supply {1}	0.469 E-05	(5.43)	0.332
Aged 65+	0.010 E-03	(5.59)	0.292
Nominal price2{3}	−0.004	(−3.67)	−0.230
Dummy93{3}	−0.047	(−2.8)	−0.193
N	45	Sign op 5%	
R <sup>2</sup>	0.931		
SEE	0.024		
Durbin–Watson	1.844		

Source: WBO 1977/1978, 1981, 1985/1986, 1989/1990, 1993/94, 1997/1998 (OTB/TU Delft calculations)

*Real price* average real house prices (corrected for inflation, in terms of 1994s prices), *Interest rate* average nominal mortgage interest rate, *Supply* number of newly built dwellings in the middle and upper price classes, on a half-year basis (a two periods average), *Aged 65+* increase (absolute) of the number of persons in the age category 65 years or older, on a yearly basis (a two periods average), *Nominal price* changes (%) of the average nominal house prices, on a half-year basis (a two periods average)

<sup>a</sup>The addition {1} means that the independent variable effects the dependent variable with a lag of one period (half year)

**Table A.3** Data used as input for the three scenarios in the prediction of the realized demand for (semi)detached owner-occupied dwellings, in the period 1998–2007

Period	Aged 65+	Real price			Nominal price			Interest rate			Supply		
		A	B	C	A	B	C	A	B	C	A	B	C
1998-1	12,940	281,300			3.4			5.73			21,788		
1998-2	11,774	296,100			5.3			5.40			22,980		
1999-1	10,608	318,600			7.6			5.01			22,308		
1999-2	10,681	338,900			8.2			5.28			21,335		
2000-1	10,754	362,900			7.9			5.65			20,204		
2000-2	10,892	375,500			6.8			6.11			19,682		
2001-1	11,030	385,800			5.4			5.95			20,008		
2001-2	11,568	389,600			4.1			5.64			20,899		
2002-1	12,107	394,200			2.9			5.43			20,442		
2002-2	12,886	395,200			2.4			5.24			19,188		
2003-1	13,665	395,200	394,200	396,200	1.3	1.2	1.4	5.30	5.30	5.17	20,000	21,000	21,000
2003-2	14,965	395,200	390,500	396,200	1.1	0.5	1.2	5.30	5.30	5.09	20,000	19,000	19,000
2004-1	16,266	395,200	389,500	404,900	0.8	0.2	1.9	5.30	5.80	5.02	20,000	18,500	23,500
2004-2	16,731	395,200	380,800	411,900	0.5	-0.8	2.5	5.30	6.30	4.94	20,000	16,500	21,500
2005-1	17,197	395,200	375,600	422,100	0.6	-1.2	2.7	5.30	6.80	4.87	20,000	16,000	26,000
2005-2	18,075	395,200	364,300	430,000	0.8	-1.4	3.0	5.30	7.30	4.80	20,000	14,000	24,000
2006-1	18,953	395,200	353,200	442,900	0.8	-2.3	3.2	5.30	7.80	4.72	20,000	13,500	28,500
2006-2	17,432	395,200	337,500	453,100	0.8	-3.0	3.4	5.30	8.30	4.65	20,000	11,500	26,500
2007-1	15,911	395,200	323,300	469,100	0.8	-3.6	3.7	5.30	8.80	4.57	20,000	11,000	31,000
2007-2	14,400	395,200	306,100	481,900	0.8	-4.0	3.9	5.30	9.30	4.50	20,000	9,000	29,000

*Real price* average real house prices (corrected for inflation, in terms of 1994s prices), *Interest rate* average nominal mortgage interest rate, *Supply* number of newly built dwellings in the middle and upper price classes, on a half-year basis (a two periods average), *Aged 65+* increase (absolute) of the number of persons in the age category 65 years or older, on a yearly basis (a two periods average), *Nominal price* changes (%) of the average nominal house prices, on a half-year basis (a two periods average)

## References

- Berry, W. D., & Feldman, S. (1985). *Multiple regression in practice. Quantitative applications in the social sciences* (Vol. 50). Newbury Park: Sage.
- Boumeester, H. (2004). Duurdere koopwoning en wooncarrière. Een modelmatige analyse van de vraagontwikkeling aan de bovenkant van de Nederlandse koopwoningmarkt. *Volkshuisvestingsbeleid en woningmarkt*, 35. Delft: Delft University Press.
- Boumeester, H., & van der Heijden, H. (2004). *Marktimperfecties, conjunctuurgevoeligheid en segmenten op de woning(bouw)markt*. Delft: Onderzoeksinstituut OTB.
- Boumeester, H. J. F. M., Lamain, C. J. M., Marien, A. A. A., Nuss, F. A. H., & Rietdijk, N. (2004). *Huizenkopers in profiel. Onderzoek naar wensen van potentiële huizenkopers*. Voorburg: NVB.
- Boumeester, H., Hoekstra, J., Meesters, J., & Coolen, H. (2005). *Woonwensen nader in kaart: de woonbeleving van bewoners*. Voorburg: NVB.
- Boumeester, H. J. F. M., Lamain, C. J. M., Marien, A. A. A., Nuss, F. A. H., & Rietdijk, N. (2008). *Huizenkopers in profiel. Onderzoek naar wensen van potentiële huizenkopers*. Voorburg: NVB.
- Boumeester, H., Dol, K., & Meesters, J. (2009). *Stedelijk wonen; een brug tussen wens en werkelijkheid. Een onderzoek naar woonwensen en woonproducten bij binnenstedelijk bouwen*. Voorburg: NVB.
- Clark, W. A. V., & Dieleman, F. M. (1996). *Choice and outcomes in the housing market*. New Brunswick, NJ: Centre for Urban Policy Research.
- Clark, W. A. V., Deurloo, M. C., & Dieleman, F. M. (1990). Household characteristics and tenure choice in the US housing market. *Netherlands Journal of Housing and Environmental Research*, 5(3), 251–270.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). London: Lawrence Erlbaum.
- Coleman, J. S. (1990). *Foundations of social theory*. Cambridge, MA: The Bellknap Press of Harvard University Press.
- de Groot, C., Manting, D., & Boschman, S. (2008). *Verhuishwensen en verhuisgedrag in Nederland. Een landsdekkend onderzoek*. Den Haag: PBL.
- Draper, N., & Smith, H. (1981). *Applied regression analysis* (2nd ed.). Toronto: Wiley.
- Elsinga, M. (1995). Een eigen huis voor een smalle beurs: het ideaal voor bewoner en overheid? (Dissertation, *Volkshuisvestingsbeleid en bouwmarkt*, 23, Delftse Universitaire Pers, Delft).
- Elsinga, M., & Goetgeluk, R. (2003). *Onderzoek woningbouwprogramma De Volgerlanden. Visie op Vinex-locatie Hendrik-Ido Ambacht*. OTBouwstenen 83, Delft: Delft University Press.
- Everaers, P. C. (1990). *Residential mobility in the Netherlands: a descriptive analysis based on the Housing Demand Survey 1985/1986*. Supplement bij de sociaal-economische maandstatistiek, pp. 28–45.
- Field, A. (2004). *Discovering statistics using SPSS for Windows*. London: Sage.
- Goetgeluk, R. (1997). *Bomen over wonen. Woningmarktonderzoek met beslissingsbomen* (Dissertation, Faculteit Ruimtelijke Wetenschappen Universiteit Utrecht).
- Goetgeluk, R. W., Hooimeijer, P., & Dieleman, F. M. (1992). *The effectiveness of housing search: the role of motives for moving and housing market adjustment*. Paper presented on the International Research Conference: European Cities, Growth and Decline, Den Haag.
- Heins, S. (2002). *Rurale woonmilieus in stad en land, plattelandsbeelden, vraag en aanbod van rurale woonmilieus*. Delft: Eburon.
- Hilkhuisen, G. (1999). *Enquêteren op het OTB: een systeembeschrijving*. Delft: Delft University Press.
- Hooimeijer, P., & Linde, M. (1988). Vergrijzing, individualisering en de woningmarkt (Dissertation, Elinkwijk bv, Utrecht).
- Kruythoff, H. (1993). Residential environments and households in the Randstad (Thesis, Housing and Urban Policy Studies, 8, Delft University Press).
- Kulberg, J., Ras, M. (2004). *Met zorg gekozen? Woonvoorkeuren en woningmarktgedrag van ouderen en mensen met lichamelijke beperkingen*. Sociaal en Cultureel Planbureau en Ministerie van VROM, Den Haag (Ministerie van VROM).

- Laakso, S., & Loikkanen, H. A. (1992). *Finnish homes; through passages or traps? An empirical study of residential mobility and housing choice*. Paper presented on the International Research Conference: European Cities, Growth and Decline, Den Haag.
- Lewis-Beck, M. S. (1980). *Applied regression. An introduction* (Quantitative applications in the social sciences, Vol. 22). Newbury Park, CA: Sage.
- Lindenberg, S. (1990). Homo socio-oeconomicus: The emergence of a general model of man in the social sciences. *Journal of Institutional and Theoretical Economics*, 146, 727–748.
- Maddala, G. S., & Lahiri, K. (2009). *Introduction to econometrics*. Chichester: Wiley.
- Moore, E. G., & Clark, W. A. V. (1990). Housing and households in American cities: structure and change in population mobility, 1974–1982. In D. Myers (Ed.), *Housing Demography*. Madison, WI: University of Wisconsin Press.
- Mulder, C. H. (1993). *Migration dynamics: a life course approach (thesis)*. Amsterdam: Thesis Publishers.
- Mulder, C. H., & Hooimeijer, P. (1995). Moving into owner-occupation: Compositional and contextual effects on the propensity to become a home-owner. *Netherlands journal of Housing and the Built Environment*, 10(1), 5–25.
- Oskamp, A. (1997). *Local housing market simulation; a micro approach (thesis)*. Amsterdam: Thesis Publishers.
- Priemus, H. (1969). *Wonen; creativiteit en aanpassingen; onderzoek naar voorwaarden voor optimale aanpassingsmogelijkheden in de woningbouw*. Den Haag: Mouton & Co.
- Priemus, H. (1984). *Verhuistheorieën en de verdeling van de woningvoorraad*. Delft: Delftse Universitaire Pers.
- Teule, R. (1996). *Inkomen, doorstromen en uitsorteren: arm en rijk op de Nederlandse grootste-delijke woningmarkt*. Thesis, Delfse Universitaire Pers.
- VROM. (2001). *Nota mensen, wensen wonen*. Den Haag: Ministerie van VROM.
- VROM. (2002). *Beter thuis in wonen. Kernpublicatie WoningBehoeft Onderzoek 2002*. Den Haag: Ministerie van VROM.
- VROM. (2003). *Beter thuis in wonen. Kernpublicatie WoningBehoeft Onderzoek 2002*. Den Haag: Ministerie van VROM.
- VROM. (2007a). *Dynamiek in de derde leeftijd. De consequenties voor het woonbeleid*. Den Haag: Ministerie van VROM.
- VROM. (2007b). *Bouwen voor de schuifpuzzel*. Den Haag: Ministerie van VROM.
- VROM. (2007c). *Wonen op een rijtje. De resultaten van het WoonOnderzoek Nederland 2006*. Den Haag: Ministerie van VROM.
- Willekens, F. (1989). *Understanding the interdependence between parallel careers*. Paper presented at the workshop “Female labour market behaviour and fertility: preferences, restrictions, behaviour”. Den Haag: NIDI.

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