

## How bloated is the Dutch housing market?

Is the Dutch housing market overvalued and, if so, to what degree? Are the home prices too steep in comparison to other economic data, such as interest rates and income? Can we expect a bubble to burst, causing a collapse of the market similar to what has happened in the United States of America? After all, the Netherlands also experienced a long uninterrupted period of rising home prices, from 1985 until 2008. Between 1996 and 2001 prices even increased between 10 and 18% on an annual basis. This growth period came to an end in August of 2008. The annual difference between 2008 and 2009 is according Statistics Netherlands (CBS) approximately minus 3%. Whether further price drops can be expected in the near future depends especially on the question whether the current home prices are too high in relation to the relevant economic factors. To answer this question, I will present an error correction model. This model can measure a potential overvaluation, as well as make predictions concerning future home prices.

by prof. dr. Marc K. Francke

**T**his article is a summary of the second part of my inaugural lecture titled “Casametrics. The art of modelling and forecasting the market value of houses”, delivered on the appointment to the Chair of Real Estate Valuation at the Faculty of Economics and Business, University of Amsterdam on Thursday 4 February 2010.

Will the Dutch housing market decline any further, or has the trough already been

reached? Put differently: are homes in the Netherlands overvalued? In the last couple of years several reports have appeared on this issue, with widely diverging conclusions. The Organization for Economic Cooperation and Development reported an overvaluation in 2004 of 20% (Girouard et al., 2005, p. 136). The International Monetary Fund (IMF, 2008, p. 113) announced that the Dutch housing market in 2007 was overpriced by 30%. Kranendonk and Ver-

bruggen (2008) of the Netherlands Bureau of Economic Policy Analysis (CPB) stated in their reaction to the IMF report that the overvaluation of approximately 10% in 2003 has dwindled down to about 0% in 2007. The IMF (2009a, p. 24) pointed out that prices at the beginning of 2009 were approximately 7% too high. The preliminary countries report of the IMF (2009b) demonstrated that global housing prices are in agreement with fundamental economic factors, a conclusion that was confirmed by De Vries (2009) of the research institute OTB. All these studies are rooted in error correction models that lead, depending on the variables used and model specification, to different results.

### The error correction model

The housing market is a typical example of a so-called stock market. Each year no more than 1½% is added to the stock. In the short term, therefore, supply does not adjust to demand, yet in the long run it does. For the Netherlands there are some indications that, partly because of government interference in the real estate and housing market, the supply in the medium-long term is also fairly inelastic. This implies that the sup-

ply is more or less fixed, regardless of the height and development of the price, see for this the CPB reports of Verbruggen et al. (1995) and Vermeulen and Rouwendal (2007). The real housing prices are therefore largely determined by demand factors: how affordable are homes given the status of wage earnings, the interest rates and the mortgage tax relief?

In the error correction model (ECM) a distinction is made between two equations, describing respectively the long and the short-term price developments. The long-term price development depends on the levels of the variables, such as the height of the income and the interest rate. This long-term equation defines for each period an equilibrium price, depending on the height of the explanatory variables. If the actual price ( $P_t$ ) is above the equilibrium price ( $P_t^*$ ), there is talk of overvaluation.  $(P - P^*)_t$  is called the error correction term. In the short-term equation price changes are explained from previous price changes, changes in the fundamental economic variables and the deviation between the actual price and the equilibrium price in the previous period. In its basic form, the ECM looks as follows:

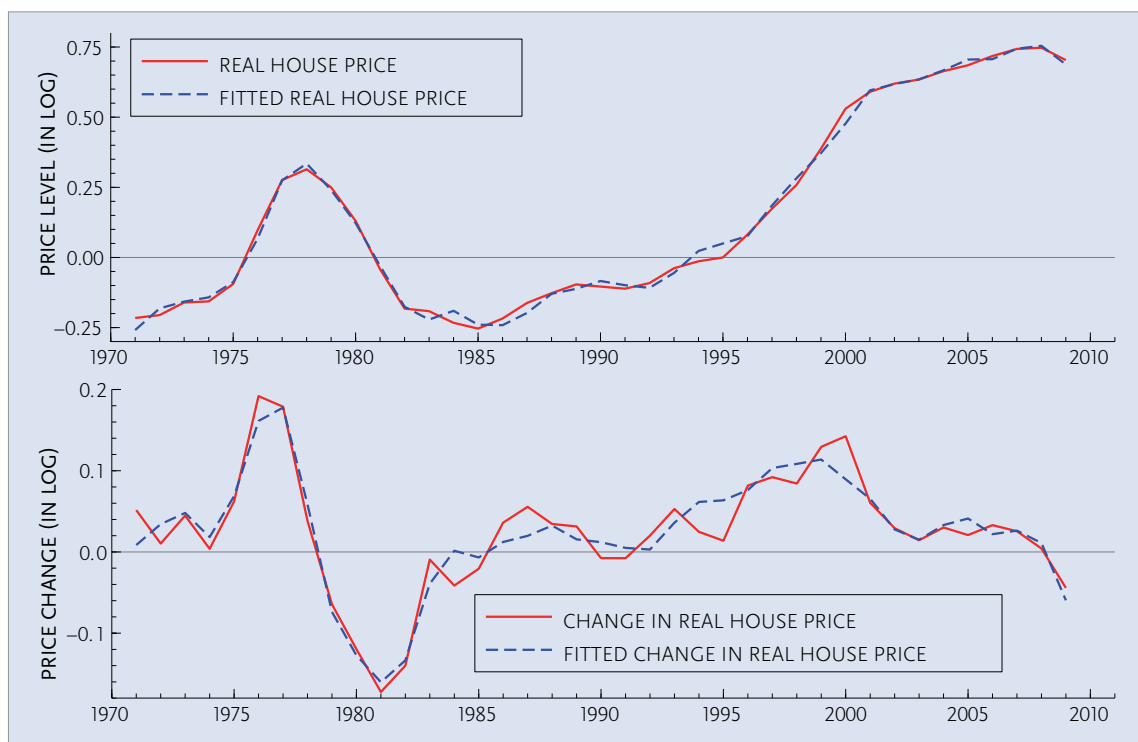
$$\begin{aligned} P_t^* &= \beta_1 x_{1,t} + \dots + \beta_k x_{k,t} \\ P_t - P_{t-1} &= \alpha (P_{t-1} - P_{t-2}) + \delta (P - P^*)_{t-1} + \gamma (x_t - x_{t-1}) + \varepsilon_t, \end{aligned}$$

in which  $x_{i,t}$  stands for the fundamental economic factors, and  $\varepsilon_t$  the error term. The coefficient  $\alpha$  of the term  $(P_{t-1} - P_{t-2})$  indicates how the current price changes relate to previous price changes. The existence of this effect can be explained as speculation effect and/or market inefficiency (Hort, 1998). The coefficient  $\delta$  indicates how quickly prices revert to the long-term equilibrium. If  $\delta$  is equal to -1, then prices adjust immediately to changes in the fundamental variables. The coefficient  $\gamma$  measures the contemporaneous price adjustments as a result of changes in the current fundamental economic factors.

Francke et al. (2010) estimate an ECM based on data from 1970 on. This is opposed to some studies in which the large price increases of the 1970s, followed by the crisis in the housing market around 1980, are not included. Another difference is that instead of average or median annual sales prices a constant quality price index is used. For the period to 1995 the repeat sales price index of Mahieu and Van Bussel (1996) is drawn upon. From 1995 onwards the SPAR index, as published by the CBS, is utilized. Ultimately, as explanatory variables for the long-term relation of the real home prices, only demand factors are used. Supply data, such as the number of new construction units, whether or not in the private sector, the housing stock and the construction costs fail to explain the price changes in this period. The model contains the following demand-related factors: the user costs as a

percentage of the home price, the aggregated disposable wage income per household and the aggregated financial capital per household. The user costs consist of the mortgage rate, corrected for the mortgage tax relief and increased with maintenance and insurance costs and depreciation minus the expected inflation (Poterba, 1992). Changes in the aggregated disposable wage income per household can be the result of changes in the average wage, the size of the working population and the unemployment rate. The financial wealth per household contains savings and other liquid capital reduced by debts. Mortgage debts and home and stock ownership have been kept out of consideration. The short-term explanatory variables are the annual changes of the user costs and the aggregated wealth per household and the growth of the gross domestic product.

**FIGURE 1** ► REALIZED AND FITTED REAL PRICE INDEX (CHANGE) IN LOG.



Between 1970 and 2009, the real home prices have risen by an annual average of 2.6%. Figure 1 shows that within this period there are huge differences. For example, prices increased 80% between 1970 and 1978, followed by a decline of 43%, with 1985 as a low point. At the end of the millennium prices increased yearly with more than 10%. The last few years the growth was more moderate, around 2%. In 2009 prices declined approximately 4%, all percentages in real terms. The user costs are to a significant degree determined by the mortgage rate and the inflation. The seventies are characterized by a high inflation percentage, more than 7%, and a growing mortgage rate. The average mortgage rate increased from 8% in 1970 to almost 13% in 1981. On the other

hand, from 2003 onwards the interest rate and inflation are relatively low. The aggregated disposable wage income has annually increased over the period 1970-2009 in real terms with an average of 2.1%. In the early eighties the wage income declined, whereas in the late nineties there was substantial growth, partly because of the increased participation of women in the labour force. See also the CPB publication by Ewijk and Teulings (2009, p. 96).

A good model gives a valid description of the data on plausible grounds. 'Our' ECM satisfies both requirements. All explanatory variables possess the right sign and the expected size. The model can be summarized as follows, where  $p_t$  is the real house price index in year  $t$ :

$$\Delta p_t = 0.31\Delta p_{t-1} - 0.23(p - p^*)_{t-1} - 0.08\Delta ruc_t + 1.22\Delta gdp_t + 0.16\Delta wealth_t,$$

$$p_t^* = -0.87 - 0.34ruc_t + 0.69wealth_t + 1.43wage_t.$$

Table 1 provides detailed information of the estimation results.

**TABLE 1** ► ESTIMATION RESULTS FROM THE ERROR CORRECTION MODEL

DEPENDENT VAR: $\Delta p_t$	COEFFICIENT	STD.ERROR	T-VALUE	T-PROB
$\Delta p_{t-1}$	0.307	0.089	3.48	0.002
$p_{t-1}$	-0.233	0.045	-5.21	0.000
$\Delta ruc_t$	-0.081	0.013	-6.02	0.000
$\Delta gdp_t$	1.218	0.290	4.26	0.002
$\Delta wealth_t$	0.161	0.067	2.41	0.022
<b>Long-run relation</b>				
Constant	-0.867	0.180	-4.82	0.000
$ruc_{t-1}$	-0.338	0.055	-6.17	0.000
$wealth_{t-1}$	0.690	0.313	2.21	0.034
$wage_{t-1}$	1.430	0.130	11.0	0.000
sigma	0.025	RSS		0.019
$R^2$	0.907	F(7,31) =		43.2 [0.000]**
log-likelihood	93.37	DW		1.92
no. of observations	39	no. of parameters		8
mean ( $\Delta p_t$ )	0.025	Var ( $\Delta p_t$ )		0.0052
Long-run sigma	0.106			

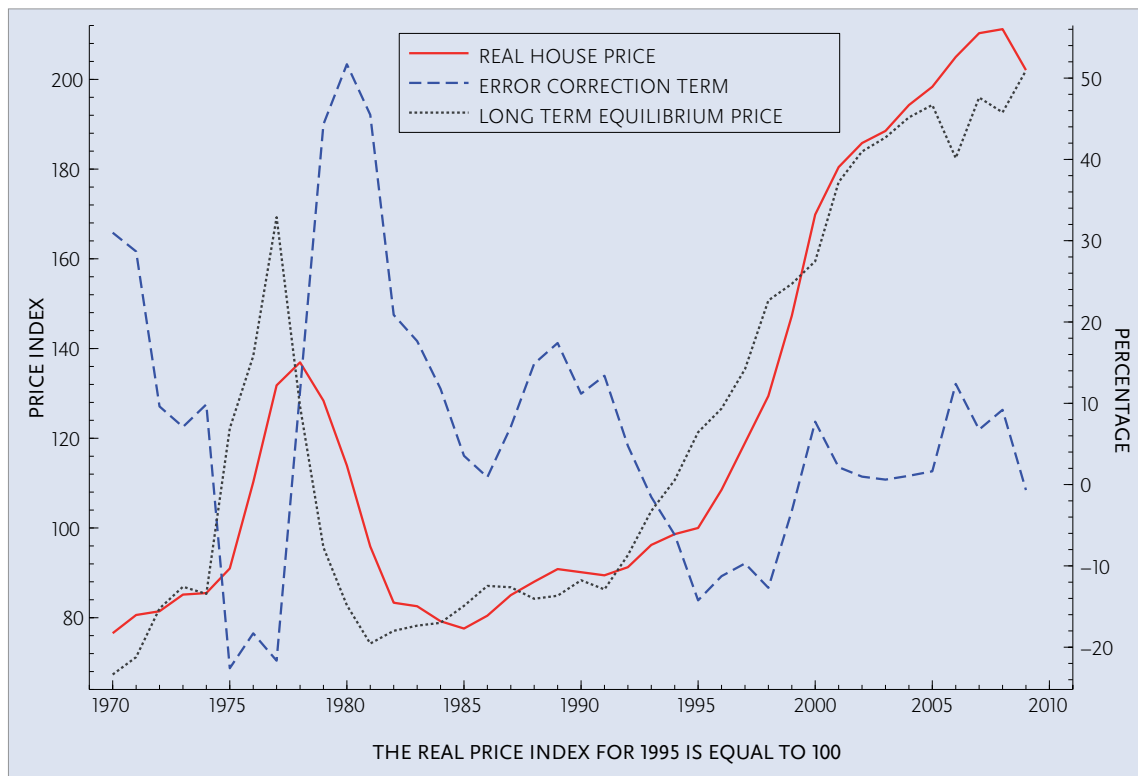
The coefficients can be interpreted as elasticities. The coefficient of the wage income amounts in the long-term relation 1.43, meaning that the prices, by approximation, increase with 14.3% if the wage income increases by 10%. The coefficients for the user costs and the financial wealth amount to respectively -0.35 and 0.69, with a comparable interpretation. In the short-term relation the coefficients for the changes in gross domestic product, financial wealth and user costs are respectively equal to 1.22, 0.16 and -0.08. Figure 1 shows that the ECM explains the home prices correctly. The upper part of the figure displays the prices in levels, the lower half displays them in annual differences. The solid line is the realized price (change), the broken line is the modelled price (change). In general the modelled price (change) appears to follow to the real price (change) quite remarkably. The model only has some

difficulties describing the extremes, as can be noted around the year 2000.

### The development of the real sales prices

The ECM provides a direct insight in the degree of overvaluation of the housing market. In Figure 2 the solid line shows the development of the real sales prices, expressed by a price index, in which the index in 1995 is equal to 100. The dotted line is the long-term equilibrium relation, also expressed by an index. Of both series the scale can be found on the left axis. The solid line is the difference between the real price and the equilibrium price, expressed in percentages, as displayed on the right axis. The figure shows that halfway the seventies there was a substantial undervaluation. At the end of the seventies and in the early eighties there was a great overvaluation; at the time the real prices are significantly higher

**FIGURE 2** ► REAL PRICE INDEX, LONG TERM EQUILIBRIUM RELATION (LEFT AXIS) AND ERROR CORRECTION TERM (RIGHT AXIS)



than the equilibrium prices. The last few years the differences between real prices and equilibrium prices are small. From the perspective of the ECM there is no reason to assume that there is an overvaluation of the housing market at the moment. This conclusion is in line with the recent reports of research institutions like the CPB, IMF and OTB.

Which factors have contributed to the change of the equilibrium price in the housing market? Figure 3 gives a graphic display of this. In the legend the contribution of the separate factors is shown, the line showing the change in the equilibrium price. In the seventies the changes in the equilibrium price were mainly the result of changes in the user costs. Around 1975 the real interest rate was more or less equal to zero, due to the rising inflation. From 1978 onwards the inflation decreased, resulting in a growth of user costs and a decrease of the equilibrium price. In the second half of the 1990s the rise of the disposable wage income is the

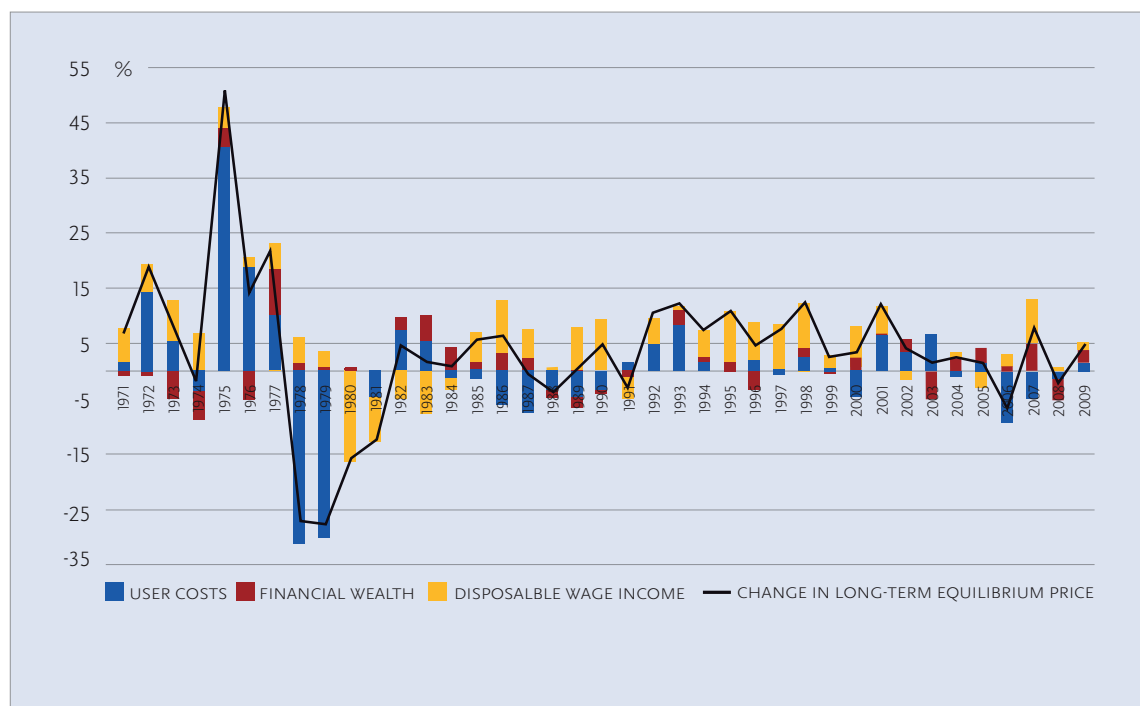
most important reason for a rising equilibrium price. The financial wealth plays only a secondary role in explaining the changes in the equilibrium price. The model further proves that the annual price change in the previous period accounts for 30% in the price change of the current period, independent of other economic factors.

### Price expectations

Based on this model, what developments in the home prices can we expect in the upcoming years? At any case the real prices in 2009 are not above the equilibrium prices. This implies that there can be no talk of a correction of the home prices as a result of overvaluation. At this moment the predictions of the future home prices from the ECM therefore depend mainly on the predictions of the explanatory variables, such as inflation (+1%), mortgage rate (almost constant), income (-1¾%) and growth of the gross domestic product (+1½%).

For this we base ourselves as much as pos-

**FIGURE 3** ► CHANGES IN THE LONG TERM EQUILIBRIUM PRICE



sible on the predictions of the CPB of December 15, 2009. This is the basic scenario. Subsequently, there is an optimistic scenario in which the economy recovers more speedily from the recession. This means higher growth rates combined with a somewhat higher inflation. Moreover, there is a pessimistic scenario in which the economy recovers only slowly with low growth rates and 0% inflation. For these three scenarios there are predictions of the sales prices of homes for the period 2010-2015. In the basic scenario the nominal price in 2010 increases with 1%, in the positive scenario with 3% and in the pessimistic scenario prices decline with 1½%. In real terms the predictions are -1½%, 0% en 1½% for respectively the negative, basic and positive scenario. In the basic scenario the nominal prices in 2011 are back to the level of 2008. In the negative scenario this price level is reached only in 2014. It is important to note that in these predictions potential changes in the fiscal treatment of home ownership is not taken

into account. Changes in the mortgage tax relief will have results for the height of the home prices, see for example the CPB report by Van Ewijk et al. (2006). Our model can also be used to estimate what possible results this may have. And in combination with the work on price developments per district and house type, many more detailed statements can be made on this politically charged issue. In other words, there is still a lot of room for further research, to which I would like to dedicate myself in the near future.

#### ABOUT THE AUTHOR

**Prof. dr. Marc K. Francke** is professor real estate valuation at the University of Amsterdam (UVA) and head of real estate research at Ortec Finance.

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