FORECAST OF MARKET DEMAND FOR HOUSING IN HCMC BY 2015

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1. Problem

Market for urban housing is considered as a segment of the realty market. During the fast urbanization following the industrialization, this segment develops quickly. In HCMC in the past 20 years (from 1986), the market for urban housing has gained remarkable developments. This is a market for a special commodity that has high values and long history. To develop this market, it's necessary to grasp the market demand in each stage of the socioeconomic development with a view to establishing some balance between the supply and demand.

2. Studying the demand for urban housing

a. Selecting the model: urban housing is a durable commodity on the realty market that is consumed by acquiring its ownership. The demand for urban housing is affected by various factors, such as household income, price, size of the household, and sources of credit, etc. Studying dependence of the demand on these factors with a view to finding out a mean value of the demand for urban housing means conducting a multi-variable regression analysis. When studying effects of so many factors, the multivariate linear regression analysis is useful.

b. Bases for the model: field surveys in HCMC provide us with firsthand data needed for the model of the demand for urban housing. The regression analysis helps estimate effects of each factor on the market for urban housing in HCMC, which allows us to work out feasible measures to stimulate the market demand. Bases for the model are as follows:

- The demand for urban housing depends on price, income, credit, and household size. These are quantitative factors that affect decisions to buy or build houses. Because everybody always wants to maximize utility within limited disposable income, these factors become main contents of surveys of the market for urban housing carried out in HCMC.

- Surveyed sample includes various classes of residents in HCMC: interviews were conducted with some 200 visitors to the Vietbuilt Exhibition Fair held in Phủ Thọ Stadium (HCMC) in September 2006; and 180 correct samples were selected and used for building the model.

- House is a shelter for a family including many members called a household. It is used for building home for family members, and all of them have their own contribution to the building a house, therefore the household is an important subject matter to the research.

The analysis model in a multivariate linear regression, and at the time of survey the model has the following general form:

$$Q_D = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i \quad (1)$$

Where :

Q_D: demand for urban housing

β_0: constant

β_I: coefficient of independent variables x_i ($i = \{1,2,3,4\}$)

X_1: loan (VND million)

X_2: personal income (VND million/member/month)

X_3: Price of house, land, flat (VND million)

X_4: number of family members (person)

U_i: variable that has a random quality because of effects from changes in macroeconomic policies or socioeconomic conditions.

According to theory of the demand, area of a house is directly proportional to income, credit and size of household. When the income and possible loan increase, people are readier to pay for house of bigger area to ensure better housing for all members, therefore we expect $\beta_1, \beta_2, \beta_4 > 0$.

On the other hand, the housing area is inversely proportional to prices: the higher the price, the lower the ability to acquire a house, and we expect $\beta_3 < 0$.

With data from 180 samples and help from Eview software, the model can be presented in the following table:

Table 1: Estimated parameters of the model

β_i	Coefficient of variables	Prob
β_0 (constant)	77	0.0000
β_1(loan capital)	0.09	0.0000*
β_2(personal income)	7.3	0.0000*
β_3(accepted price)	-6.6	0.0000*
β_4(number of family members)	8.9	0.0000*
R^2	0.99	
R^2	0.99	

Source: Author's calculations based on the survey in September 2006

Note: * statistical significance of 99%

The White heterocedascity test shows that Prob (nR^2) = 0.546 (bigger than 0.05), therefore the model, with a reliability of 95% can't be changed by variance of error. Thus, after estimating the model using the White method of weighted least squares, the model overcame changes in the variance of error.

The Ramsey test shows that Prob (F) = 0.293 (bigger than 0.05), therefore the model may be uncharacteristic and the form of function is appropriate.

Thus, we choose the model after dealing with heterocedascity and passing tests. Because signs of coefficients are not contrary to expectations, so multi-collinearity has no effect on results of the model. The model of demand for housing influenced by price, income, loan and household size estimated according to the OLS method is as follows:

$$Q_D = 77.1 + 0.092x_1 + 7.34x_2 - 6.68x_3 + 8.9\,x_4 \;;\; R^2 = 0.99 \quad (2)$$

t = (13.02) (18.97) (7.91) (- 10.16) (7.5)

P = (0.0000) (0.0000) (0.0000) (0.0000) (0.0000)

c. Some remarks on the model:

With the coefficient $R^2 = 0.99$, the model shows that independent variables can explain 99% of changes in the demand for housing, and they are directly proportional to the demand for housing, except for the variable of price. This is appropriate to expectation in terms of signs of coefficients according to the independent variables.

The model also shows that the household size affects decision to revamp, build or rebuild the house, thereby increasing the housing area. The coefficient $\beta_4 = 8.9$ proves that when the household member increases 1 and other factors are unchanged, the demand for housing increases 8.9 m^2. The sign of the coefficient is like the original expectation, which is appropriate to the average housing area per capita at the moment.

Personal income has great effects on decision to buy or build the house ($\beta_2 = 7.3$). When other factors unchanged and monthly personal income increases VND1 million, the housing areas increases 7.3 m^2, and the sign of the coefficient is like the original expectation. Of course, houses can't be expanded or rebuilt within a short period of time, and the building relies on long-term accumulation of savings. The higher the personal income and accumulation of savings, the shorter the time required. High personal income also facilitates efforts to secure loans, and the demand with ability to repay gets bigger.

The price, with $\beta_3 = - 6.68$, affects greatly the ability to pay. When other factors are unchanged and the price increases VND1 million, the demand for housing falls 6.68 m^2 as shown by the original expectation.

The source of loan, with $\beta_1 = 0.09$, shows that when other factors are unchanged and the source of loan increases VND1 million, the demand increases 0.09 m^2. The source of loan encourages households to revamp or rebuild their houses. In HCMC, however, the housing mortgage is not popular with the result that this source produces no huge effect on the demand for housing.

The demand for urban housing depends on various factors whose interaction affects the demand.

- As for the real demand for housing, when personal income rises but the price fluctuates the consumers are reluctant to access the market. Because of rarity of stock of land, the housing price always gets higher, by 20% - 30% a year on average; and 200% or 300% when a rush on housing takes place. This explains the importance of the variable x_2 for the personal income because the price tends to increases much faster than the personal income. When securing the loans, consumers have to afford at least 30% of the real estate value, or mortgage some assets and pay some VND5 million a month for both principal and interest. When the household gets bigger, the demand for housing certainly becomes higher, but the demand is determined by such factors as personal income, market price, and availability of loans.

- As for speculators, rises in the market price are good opportunities, which make the army of realty speculators swells and the demand for housing increases. Their presence and demand usually lead to a rush on housing; and their ability to pay depends greatly on liquidity of real estate and profit from their speculation.

From the model (2), we can evaluate effects of each factor on the demand for urban housing in HCMC up to 2015, thereby adjusting the supply of urban housing with appropriate prices and areas.

3. Forecast of the demand for urban housing in HCMC up to 2015

a. Method: The model (2) allows us to predict the future demand for housing in HCMC by considering the independent variables estimated for the year 2015 as the 181st observation, putting it in the regression function, thereby finding out possible values of variables needed for the forecast of the market demand up to 2015. Estimate of the independent variables is based on the socioeconomic development plans and policies adopted by HCMC authorities up to 2015 and facts gathered.

b. Bases for the forecast: To draw the forecast from the model (2), we have to evaluate values of such independent variables as income, price, loan and household size up to 2015. The evaluation is based on the following estimates:

- Identifying x_1: Formal loan set by Decision 91/2006/ QĐ-UBND made on June 22, 2006 by the HCMC People's Committee is VND300 million at max. The maximum maturity is 15 years at an interest rate of 9.9% a year, for which the public fund pays 3% and low-income earner pays 6.9% a year. Applicants with higher income must depend on their own money and help from commercial banks.

- Value of x_2 is based on estimate of average personal income in HCMC by 2015.

Table 1: Estimate of personal income in HCMC in 2002-2015

(VND1,000 per month)

Income group	2006 Statistical Yearbook			2010 - 2015	
	2002	2006	Increases in 5-year period (%)	2010	2015
Group 1	316.4	552.4	74.6	964.4	1,683.8
Group 2	525.2	826.2	57.3	1,299.7	2,044.6
Group 3	721.6	1,080.6	49.8	1,618.2	**2,423.3**
Group 4	1,008.8	1,490.0	47.7	2,200.7	3,250.5
Group 5	1,951.7	3,448.9	76.7	6,094.6	10,770.0
Difference between Groups 1 and 5 (time)	6.17	6.24		6.32	6.40

Source: Statistical Yearbook 2006 and author' calculations

Results of investigations of living standard in HCMC conducted by the HCMC Office of Statistics in 2002, 2004, and 2006 show that the estimated

increases in income of different groups in the five years 2002 – 2006 are 74.6% for the group 1; 57.3% (group 2); 49.8% (group 3); 47.7% (group 4); and 76.7% (group 5). These estimates allow us to calculate the income in the next five years (2010 – 2015) for the five groups. Up to 2015, the income for the group 1 is VND1,683,800 a month; 2,044,600 for the group 2; 2,423,300 group 3; 3,250,500 group 4; and 10,770,000 group 5. The group 3 represents the average income that is used as value for the variable of household income (x_2) in this forecast.

- The x_3 is based on the forecast of changes in the price of urban housing in HCMC by 2015. According to economists and explanations of the bubble market, the price of real estate in HCMC has much surpassed the possible income of most local residents. We hope that the price will be stabilized by effective policies. The price index in the years 1998 – 2003 increased by 0.53 time, and experts from the CBRE – a HCMC-based company specializing in the realty market)- also said that the market price of real estate in HCMC would rise by 50% at least by 2015. Thus, if based on the price level offered in September 2006, the price will increase by 50% by 2015 as shown in the following table.

Table 2: Forecast of prices of housing in HCMC by 2015 (VND million per sq. m)

	Group 1	Group 2	**Group 3**	Group 4	Group 5
1- Result of survey in September 2006					
- Average price	3.75	6.45	**10.07**	12.27	15.51
- %	7.28	24.63	**31.78**	15.23	20.08
2- Price forecast for 2015 (increasing by 50% compared with prices in September 2006)	5.62	9.67	**15.00**	18.40	23.26

Source: Author's calculations based on data collected in September 2006

According to the survey of supply of urban housing based on market price, the most common level is VND10.07 million per sq.m., so it could be seen as the most typical and used for forecasting the demand for urban housing in HCMC by 2015, which could increase to VND15 million per sq.m. by 2015 (by 50%).

- The value of x_4 (household size) is based on the standard size of a family (with two children at most). This means that the biggest size of a family comprises four members, or $x_4 = 4$.

These bases help identify the independent variables in the model (2) for the forecast. Variables x_1, x_2, x_3, and x_4 used for the forecast are as follows:

Table 3: Parameters forecasting the demand for housing in HCMC by 2015

Interpretation	Variable	Forecast value
Supporting loan (VND million/household)	x_1	300
Personal income (VND million/month)	x_2	2.4
Price (VND million/m²)	x_3	15
Household size (person/household)	x_4	4

Source: Author's calculations based on data collected in September 2006

c. Forecast results:

From the function (2), we can forecast the demand for housing by 2015 corresponding to:

- Supporting loan: VND300 million per household
- Personal income: VND2.4million per month
- Acceptable price: VND15 million/m²
- Household size: 4 persons.

To find the forecast of demand point ($\hat{Y}_0$), we use the formula:

$$\hat{Y}_0 = \hat{\beta}_1 + \hat{\beta}_2 X_2^0 + \ldots\ldots\ldots + \hat{\beta}_k X_k^0 \qquad (3)$$

Employing the Eview software, we can work out ($\hat{Y}_0$) = 57.76 m²

To find the range forecast for the average value of the demand for housing with reliability of 95%, we use the formula:

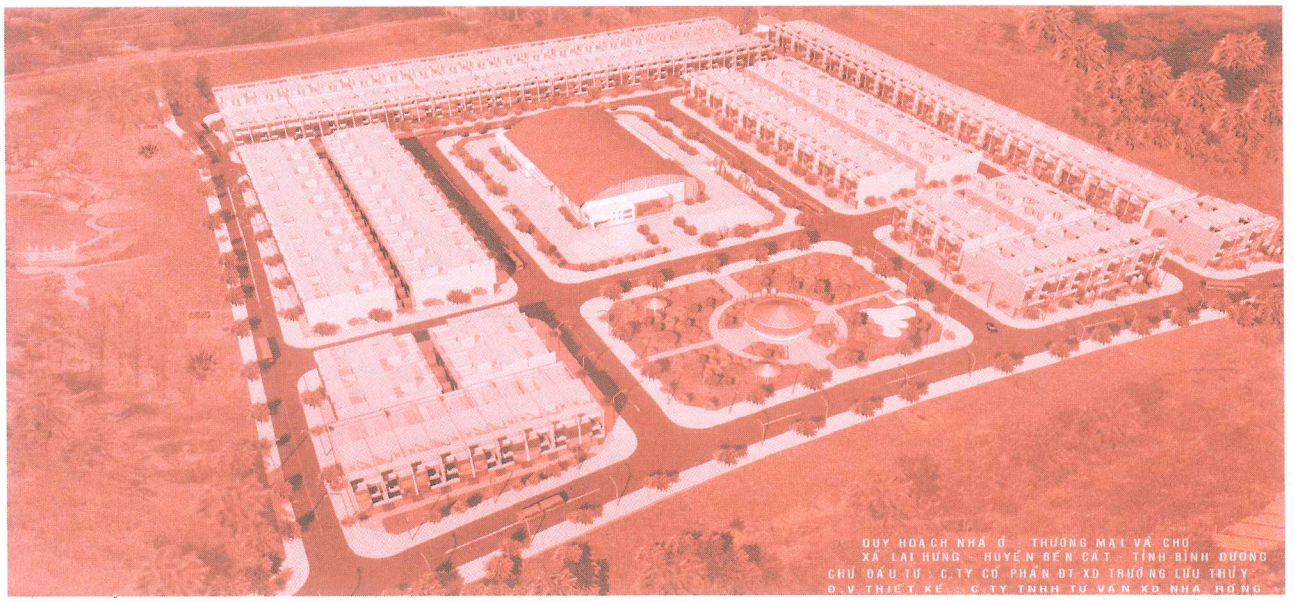
$$\left[\hat{Y}_0 - t_{\alpha/2}(n-k).se\left(\hat{Y}_0\right); \hat{Y}_0 + t_{\alpha/2}(n-k)se\left(\hat{Y}_0\right)\right] \qquad (3)$$

where: $\hat{Y}_0$ = 57.76 m²

n = 180 samples;

k = 5 parameters

(n – k) degrees of freedom = 175



$t_{\alpha/2}(n-k) = t_{0,025}(175) = TINV(0.05, 175) = 1.973612$ (employing the function TINV in Excel)

Results allow us to find out upper bound and lower bound of the demand for housing:

Upper bound: 51; Lower bound: 64.52

Thus, the demand for urban housing in HCMC by 2015 varies between 51 m^2 and 64.52 m^2.

d. Remarks on forecast results:

The results show that with an personal income of VND2.4 million per month, a family of four persons, if they can borrow VND300 million, can pay for a housing area that varies from 51 m^2 to 64.52 m^2 at á price of VND15 million/m^2. The average housing area is 57.76 m^2/ household, or 14.44 m^2/person, which is equal to the standard housing area set for the year 2015 (15 m^2/person).

4. Conclusion and suggestion

By 2015, it is estimated that the market segment of housing for low-income earners would be developed in order to supply houses and flat with area varying from 51 m^2 to 64.52 m^2 at a price of VND15 million/sq.m. or lower to persons who have an average income of VND2.4 million a month and can secure a loan of VND300 million.

From now to 2015, regulating policies must try to keep the price fluctuation index at 1.5 times at most with the 2006 price as the base one because 2006 is the third successive year in which the price of real estate was stable and free from speculation. Necessary measures should be taken to increase the supply of housing (with an average area of 60 sq.m per unit at a price of VND15 million per sq.m.) to residents of low and medium incomes.

Authority can help by allowing formal loans for persons with medium incomes (instead of the low ones only), and encouraging ownership and use of houses by offering reasonable house rent and hire-purchase contracts. These efforts can help improve the housing condition in urban areas, ensure the social equality and develop effectively and sustainably the market for urban housing up to 2015■

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