

Contingent Valuation Method and Market Value: Applying Stated preference methods in Real Estate Market

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Abstract

One of the most criticism in Real Estate appraisal processes based on sales comparison approach is the reliability of data about market prices of comparable properties. The lack of information on house prices is particularly relevant in Italy, where households' preference for housing wealth is very high, due also to the market orientation of Italian households for owner-occupation (Di Addario 2002; Faiella *et al.* 2008). In this context, the use of evaluation methods based on hypothetical markets, most widely used in the field of the evaluation of environmental goods or cultural heritage, could solve that problem. It has been found (Mattia *et al.* 2003) that estimating the willing to pay (WTP) for a sample of goods with different features brings to reliable outcomes with negligible gaps by comparison with the values obtained by the more traditional real estate appraisal methods.

According to these general assumptions, the paper suggests the use of stated preference methods with the aim of replace in the appraisal models the market prices (historical data) of a sample of properties with the willing to pay for the same goods. More in deep, of the various valuation stated preference (SP) techniques available, Contingent Valuation Method (Dichotomous Choice Model) has been used in order to estimate the market value of a sample of residential properties in the city of Milano. Even if the two main features of this method – the hypothetical character of the questions and the fact that actual behaviour is not observed but only predicted – has been broadly criticized (Adamowicz *et al.* 1994), in this study the WTP can be considered the behaviour of potential buyers selected by a real estate agency and advertisements on real estate reviews in the face of real choices. Strategic bias has been reduced by pre-testing the valuation questionnaire and using different bidding mechanism according to two different groups of buyers selected, the one who answer that the property meets its needs and the second who is not really interested in it.

To this end, it's meaningful to specify that the possible strategic character of the answers to the questionnaires given by individual interview is consistent with the real estate prices' formation process.

Starting from the critical analysis of the outcomes of this first case study, the paper suggests an evaluation procedure for the systematic production of economics data – median WTP – to use in statistical pluriparametric appraisal models in order to build up a databank of normal willing to pay for properties according to the principle of transparency.

1. Introduction

In the field of real estate appraisal, the goal of the valuation process is to forecast the most probable value for specified properties. There are three commonly used approaches for determining value: the sales comparison approach, the cost approach and the income capitalization approach¹. Costs, income and sales vary widely from one situation to the next, and particular importance is given to the specific characteristics of the subject (Barbu & Gramescu 2009).

Generally the appraiser decides to apply one or more of these methodologies according to the scope of the appraisal².

One of the most criticism in Real Estate appraisal processes based on sales comparison approach is the reliability of data about market prices of comparable properties. The lack of information on house prices is particularly relevant in Italy, where households' preference for housing wealth is very high, due also to the market orientation of Italian households for owner-occupation (Di Addario 2002; Faiella *et al.* 2008). Furthermore, markets solve only a tiny corner of the overall problem of valuation, even for goods that are regularly and efficiently brought and sold (Epstein 2003). The price is the result of actions by different market participants who may be affected significantly by a wide range of intrinsic and external factors³, that have become so difficult to predict that they cannot be considered reliable over time (De Lisle 1985). In order to increase the reliability of market-value, it's crucial to understand what kind of factors affect specific real estate markets and how much they influence prices. Since for a specific property at a particular moment, different prices are possible because of different circumstances of sale, different buyers' preferences, different buyers' information, historical data about prices used by appraisers to predict property's value by sales comparison include random variation. As Random variable, the price explains the heterogeneity, uncertainty and limited information of buyers and sellers (Kummerow 2003). Ratcliff (1972) called for valuers to reduce the uncertainty around the most probable price⁴, pointing out that valuation lies on the prediction of human behaviour⁵.

¹ According to the cost approach, the value of a property can be estimated by summing the land value and the depreciated replacement cost of the building, where depreciation is the loss of value of the property being valued compared to a new one. It is used to estimate buildings in their current use, when are not available meaningful market data. Cost does not equal market price very often. Sales transactions are necessary to reveal the current relationship of costs to prices. The tendency will be for markets to adjust towards equilibrium, but because adjustments are slow, at any given time, the market is likely to be out of equilibrium. The sales comparison approach estimates value by comparing the subject property to similar ones being sold recently. Given the heterogeneity of properties, adjustments concerning physical characters, location, lease contracts, quality of tenants and market conditions are introduced in order to consider the differences between the subject property and the comparables. More adequate are prices of comparable properties, more reliable can be considered the outcome of the valuation process. Sales comparison approach can lead to mis-pricing as price of a specific property at a point in time is a random variable reflecting the heterogeneity, uncertainty and limited information of buyers and sellers. The income approach is used to value properties on the basis of the stream of income that is expected from them. Thus, it's traditionally applied to income-producing properties. Despite the approach requires to estimate the cash flows for the economic life a property and an appropriate rate to discount them, simplified methods, based on net operating income (NOI) of the first year and capitalization rate, are generally used. See Hoesli 1999, Kummerow 2003, EVS 2009, Barbu & Gramescu 2009. With aim of testing if different approaches work as well or better for some types of property valuation, over the years new methodologies or variants on existing ones have been developed (Roddewig & Frey 2006).

² Depending on the availability of data and the type of property being valued, the three approaches don't estimate the same value and they are not reliable in the same way. The appraiser has the task of reconciling the values according to his experience, to the accuracy of data and procedures and to the market conditions. The reconciliation methods vary from country to country. In the United States all three methods are used in most cases. In France only the sales comparison and the income approach are used. In Switzerland the final value is given by the weighted average of the value estimated by cost approach (1/3) and income approach (2/3). In UK appraisers apply a hybrid method. For a deeper treatment of these issues see Hoesli 1999.

³ In a review of a sample of hedonic regression papers, Kummerow & Watkins discovered that literally hundreds of variables have been found to be statistically significant price predictors (Kummerow & Watkins work in progress). See also the concept of utility given by Lancaster: the price people pay for complex goods is a sum of the utility of various characteristics (Lancaster, 1966, Rosen, 1974).

⁴ The objectivity principle support appraisers in the estimation process of the most probable price.

⁵ Market-based assumptions for each of the stages of the appraisal process may improve individual appraisals by reducing the uncertainty around the most probable selling price. Some behavioral inputs are essentials: 1. only if the underlying appraisal database is expanded to include the variables used by the market in arriving at subjective values will an appraiser be able to analyze the same features as the market; 2. unless the rules of measurement for quantifying variables reflect the market's perception, valid adjustment cannot be assured; 3. unless the search for comparable produces a subset of the data that matches the pricing evidence used by the relevant market, an appraiser will have to rely on different evidence of value from that used by

Nevertheless contingent valuation is traditionally used in opposition to market valuation, as a technique for estimating value when no markets data are available like in the case of public goods (Epstein 2003), in this paper it is proposed as a valuation technique for predicting the normal market-value according to the preferences stated by market participants.

The paper is structured into seven sections. The introduction points out the key concepts about real estate appraisal. Follows a literature review on the use of Stated Preference valuation methods (Contingent Valuation Method) for the appraisal of real estate market value (section 2). Section 3 focuses on the theoretical assumptions. Section four describes the use of contingent valuation method (CVM) for estimating the market value of a sample of residential properties in the city of Milano (section 4.1) and suggests a careful consideration of its outcomes (section 4.2). Section five concludes the paper and puts forward further research issues.

2. Theoretical elements

As *Stated preference* (SP) techniques rely on asking people hypothetical questions, looking how they respond to a range of choices – while the *revealed preference* (RP) analysis are based on people's behavior in the face of real choices – they could potentially be applied in almost any valuation context (Pearce *et al.*, 2002)⁶.

Furthermore, since both SP and RP models are based on the same theory of choice, the random utility model, combining stated and revealed preference information could yield several benefits to appraisal processes (Adamowicz, Louviere & Williams 1994).

Apart from the different fields of application, all SP techniques create a hypothetical market for the good being valued by a survey that describes the good, the reasons of payment and the payment vehicle⁷. Contingent valuation method (CVM) ask respondents the amount they are willing to pay for the good being valued. Other types of stated preference analysis, like Choice Modeling approach (choice experiments, contingent ranking, paired comparisons and contingent rating), also use a hypothetical market, but they ask respondents for rankings, ratings or choosing among alternative scenarios defined by a set of several attributes including price, rather than for values (Louviere, Henscher & Swait 2000).

The most important difference between CVM and Choice Modelling approach is that the former is more suitable to evaluate a good as whole, while the latter is more likely to be required when the interest is on preferences for the individual characters of good being valued⁸.

CVM is based on the direct elicitation of individuals preferences about hypothetical choices through the use of carefully designed and administered sample surveys (Arrow *et al.* 1993).

After its theoretical settlement by Ciriacy-Wantrup in 1947⁹, CVM has obtained several attentions because of the increasing importance of non-use values estimate. Thus, it has been applied to a wide range of problems including water quality, wilderness and wildlife protection, air quality, health care, food safety, cultural heritage preservation by federal and state agencies, governments and international organizations like the World Bank.

The application of CVM involves the following six different phases: 1) Preparation; 2) Survey; 3) Calculation; 4) Estimation; 5) Aggregation; 6) Appraisal. The goals of the first stage are: defining the initial items of the research as what is the object being valued; settling the hypothetical market¹⁰;

the market; 4. unless the adjustment process reflects the underlying utility functions of those market participants who ultimately affect the price of the property, precise estimates cannot be obtained; 5. unless the consolidation of the evidence of value produces the same results as the pricing models of the market, defensible conclusions cannot be generated (De Lisle 1985).

⁶ With reference to the meaning of Total Economic Value, SP techniques can estimate both use and non-use values, while RP techniques can estimate only use values.

⁷ Since SP methods have different features, values may vary according to which technique is used both from a methodological and psychological perspective (Stevens, Bellner, Dennis, Kittredge, & Willis, 2000).

⁸ The choice about which technique is the more appropriate must be carefully carried out by experts. Nevertheless it's possible to use both of them with the aim to verify the sensitivity and consistency of results.

⁹ See Ciriacy-Wantrup, S. (1947), "Capital Returns from Soil Conservation Practices", *Journal of Farm Economics* 29; 1181-96.

¹⁰ There are two fundamental variants, depending upon which consumer surplus measure is considered: "How much are you willing-to-pay (WTP) for a welfare gain?" and "How much are you willing-to-accept (WTA) in compensation for a welfare loss?"

choosing target population and sample¹¹; choosing the elicitation method among Iterative bidding game, Open ended, Close ended-Dichotomous Choice (single/double bounded)¹² (see appendix 1); providing information about the good¹³; selecting the payment vehicle¹⁴; testing and eventually redesign the questionnaire¹⁵. During the survey phase valuers obtain responses to the questionnaire by interviews made face to face, by mail/telephone or by a mix format to users and non users¹⁶. In the third stage are calculated the mean WTP (or WTA) from responses¹⁷. In order to understand the determinants of WTP bids, in stage 4 a bid curve can be estimated. For a continuous question format linear least squares estimation techniques are typically used. With a dichotomous payment format a logit or a probit¹⁸ approach is required, which relates the probability of a yes answer to each suggested sum to the explanatory variables.

In stage 5 the total value is obtained from mean WTP according to the targeted population. In the last phase the acceptability¹⁹ of the values estimated by CVM is well considered (Hanley 1990; Bateman & Turner 1992).

CVM is the subject of great controversy from both economic and psychological point of view, causing users of this technique to pay great attention to preference elicitation and to reliability of the method. Most of the criticisms concern: i) the inconsistency of the answers given by respondents with the principle of rational choice, the so called embedding issue; ii) the difficulty of respondents of clearly understanding what they are being asked to evaluate because of the lack of adequate information about the good being valued; iii) respondents don't answer to the questions seriously because of the hypothetical character of the method; iv) responses to CV surveys sometimes seem implausibly large in view of the many programs for which individuals might be asked to contribute; v) relatively few previous applications of the CV method have reminded respondents of the budget constraints under which all must operate; (vi) it's difficult sometimes to determine the extent of the market; vii) answers

¹¹ It occurs to follow this sequence of tasks in choosing a sample from a target population (Pearce *et al.*, 2002): 1) to choose correctly the target population (general population or a defined group of people) in order to avoid bias that can negatively affect the validity of the evaluation such as sampling error and non response error; 2) to identify the sample frame population from which the sample will be obtained; 3) to select a sample from the frame using probability sampling in order to correct for bias in sample selection and to construct confidence intervals for the population parameters using the sample data. Other sampling procedures, as focus groups are used but they don't meet the requirements of applying statistic approaches. The choice of sample size concern cost and precision of estimate. It depends on: the variance in the underlying population; the precision required in the estimates; the likely response rate; the need for any disaggregated information, i.e. for sub-samples and the resources available for the research.

¹² These are considered the most widely used elicitation methods. The Iterative bidding game submit to respondents different rounds of discrete choice questions or bids, with a final open-ended WTP question. In a Open ended approach respondents are asked "how much are you willing to pay?". Thus, the result is a continuous bid variable that may therefore be analyzed using ordinary least squares approaches (OLS). It's possible to use the Open ended method through a payment card that helps respondents in stating their own WTP. The Close ended - Dichotomous Choice ask respondents "are you willing to pay £X". The amount of money is systematically stepped across the sample to test individuals' responses to different bid levels. The result is a discrete bid variable, that requires logit-type analysis.

¹³ The quantity/quality change in its provision, who will pay for it, who will use it.

¹⁴ Higher taxes, entrance fees, donation to a charitable trust.

¹⁵ Generally good CV surveys contain the following issues: (a) an introductory section that helps set the general context for the decision to be made; (b) a detailed description of the good to be valued; (c) the institutional setting in which the good will be provided; (d) the manner in which the good will be paid for; (e) the preferences elicitation format; (f) debriefing questions about why respondents answered certain questions the way that they did; and (g) a set of questions regarding respondents' socio-economic characteristics (Carson, 2000).

¹⁶ All these data collection method has advantages and drawbacks. Face to face interviews are highly flexible, allow the greatest control on answers and clarification if complex questions are included, but they are very expensive. Mail survey is relatively inexpensive, but has low response rate (25-50%) and little control of answers, because no clarification is possible. Telephone interviews are cheaper than face to face interviews, the response rate is satisfactory (60-75%), but it's possible that respondents don't answer to sensitive questions. See Pearce *et al.*, 2002.

¹⁷ Generally protest votes and trimmed means are omitted. In a Dichotomous Choice format the mean is obtained by calculating the expected value of the dependent variable (WTP or WTA).

¹⁸ The Probit and Logit models are techniques for analyzing the relationship between fixed-level independent variables and a dependent variable constrained to vary between 0 and 1. They are used to model a relationship between a dependent variable Y and one or more independent variables X.

¹⁹ It's possible to identify four features of acceptability: technical (theoretical and methodological correctness); institutional (decisionmakers use the method into their framework of analysis); Users (comprehension of the technique by evaluators); and financial (is the cost of application reasonable).

are affected by the “warm glow” effect (Arrow *et al.* 1993). Nevertheless these criticisms are widely acknowledged also by the proponents of CVM, they believe that future CV studies will solve all the objections. At this purpose, each of them has been widely discussed by the Contingent Valuation Panel, suggesting recommendations for CV studies in order to minimize the controversies emerged (*ibidem*).

3. Applying Stated preference methods in Real Estate Appraisal: a targeted literature review

Despite CVM is a method traditionally applied in order to estimate the value of non-market goods in several planning and policy contexts²⁰, in the late 1990s its use in the valuation of real estate has been suggested. At this purpose, it's crucial to highlight that one of most controversial issue about CVM is the scarcity of criterion validity tests (Loomis *et al.* 1996)²¹. Thus, the disparity between stated and actual WTP remains a problem still open. Cummings *et al.* (1995) have verified the assumption that Dichotomous Choice (DC) method leads to accurate estimates of true WTP, because it yields incentive-compatible results. The authors tested this hypothesis pointing out that the hypothetical DC method doesn't generate the same answers as the real DC method²². Unlike the past experiments in this field, the results of the experiments carried out by Loomis and other researchers of the USDA Forest Service show a reduction of this divergence of WTP²³, due to some important reminders to respondents: not to state what they thought to be the fair price; to act as they were in a real market and to consider their household budget.

In more recent years few published studies concern the use of CVM for predicting specific real estate impacts in the context of litigation to determine the impact of contamination on property values²⁴. Despite the effort expended to make the hypothetical choice as real as possible in order to get the maximum reliability of responses²⁵, relevant researches have been carried out concerning that criticism. Thus, CV approach is not fully accepted, as some studies show that it doesn't produce acceptable estimates.

Starting from a market-based reliability test of the results of the application of CV technique for damaged properties, Roddewig & Frey (2006) argue that CVM cannot be considered an appropriate approach to value of real estate unless in situations involving special-purpose or limited-market properties for which there are few real sales transactions that can be analyzed. From their point of view, the inaccuracy of the real estate values' prediction based on hypothetical surveys depends on several reasons: the CVM questionnaire provides less information about the good than the ones generally available in an real market; the opinions of sellers and buyers are affected by the intermediaries; the survey format doesn't include those factors generally affecting real estate purchase and sale decisions as urban context's characters; survey consider only one side of transaction, either buyer or seller; CVM disregards that the price is the result of a negotiation process between two subjects, buyers and sellers, who often agree on a level of price that is a compromise as to their initial positions.

In a similar way Wilson (2006) analysing the recommendations published by the blue-ribbon panel of National Oceanic and Atmospheric Administration (NOAA) in the context of real estate valuation,

²⁰ The CVM was firstly used in the early 1960's by Davis (1963) who estimated by questionnaires the benefits of outdoor recreation in a Maine backwoods area. Starting from this research experience, Ridker (1967) used the CVM many times in order to estimate air pollution effects. In the next years other economists used the CVM to value several recreational amenities (Randall *et al.* 1974). Since the early 1970's the CV technique has been used by economists to measure the benefits of a wide variety of goods, including recreation, hunting, water quality, decreased mortality risk from a nuclear power plant accident and toxic waste dumps. Funding from the US Environmental Protection Agency (EPA) was crucial for CVM's development.

²¹ It's possible to single out two types of criterion validity test: field experiments (Bishop & Helberlein 1979; Welsh 1986; Seip & Strand 1992; Duffield & Patterson 1992; Champ *et al.* 1994) and laboratory experiments. Most of the latter concern common market goods, such as a chocolate bar (Kealy *et al.* 1988); a houseplant (Boyce *et al.* 1992); a painting or map (Neill *et al.* 1994); and a juicer, a calculator and box of chocolates (Cummings *et al.* 1995).

²² A subject is not led to a misrepresentation if he perceives that its expected utility could be affected by the possibility of the good actually being provided (*ibidem*).

²³ In order to minimize the likelihood that respondents would try to state the market price, the experiment use an art print since it is a good whose price people generally doesn't know because it is not frequently purchased and it is sold at different prices. It is also a good simply observable and not too expensive. The WTP has been estimated by an Open ended format.

²⁴ See Gary *et al.* 1990; Chalmer & Roher 1993; Mundy & McLean 1998; Jenkins-Smith *et al.* 2002; Simons 2002; Berrens *et al.* 2003; Simons & Kimberly Winson–Geideman 2005; Simons & Throupe 2005.

²⁵ See Cummings *et al.* 1995.

concludes that CVM is not an appropriate tool. Besides the previous flaws, he shows that applying CVM to real estate market means so many violations of the NOAA guidelines as to make it unreliable²⁶.

Mathews (2008), on the basis of a close inspection of specific CV questions and analysis techniques for better understanding why CVM fail to generate reliable estimates of property value losses associated with environmental disamenities, recognizes the practical impossibility for a property value CV survey to involve dynamic market conditions and all the information that real buyers and sellers generally consider.

The following paragraph suggests the use of CVM in order to estimate the willingness to pay for a sample of residential properties in the city of Milano, then compared to market prices²⁷, answering to the call of Contingent Valuation Panel for external validation of CVM – that is still considered the most important weakness of CVM – in context where values estimated by this technique can be compared with real values of goods that can actually be bought and sold (Arrow *et al.*, 1993).

4. Case study²⁸

As afterwards described Contingent Valuation Method has been used in order to estimate the market value of a sample of residential properties in the city of Milano. More in depth has been considered four apartments, whose size is 55 sqm (Maroncelli), 67 sqm (Gobetti), 65 sqm (Bassi), 35 sqm (Cambiasi). As the first two has been sold, their market price is well known.

4.1 The use of CVM for private goods

The sample

The sample has been chosen from potential purchasers, found both by advertisements on real estate magazines and by a real estate agency in charge of selling two of the apartments. Each individual of the sample knows the apartments by a direct visit or by a card including both a detailed description of the dwellings, of the building and of the urban context and pictures of outside and inside of the apartments. The face to face interviews has been carried out after the potential purchasers' knowledge of the good being valued in order to ensure that respondents understand the scenario and are encouraged to participate in an informed manner.

The questionnaire

As a careful questionnaire design is essential for the validity of the outcomes, its comprehensibility has been tested before administration. The questionnaire used in this case study involves four questions. The first ask respondents if the apartment meet their needs. According to these answers, the sample has been divided in two sub-samples: the sub-sample A, including those are really interested in the apartment; the sub-sample B, including instead those not considering the good suitable to their needs (see table 1). This division of the sample in two sub-sample is required by the different meaning of WTP information in each of them. Furthermore, it makes possible to verify potential strategic behaviors in WTP eliciting by those are going to start a real transaction aimed to the purchase.

	Size of the sample	
	Sub-sample A	Sub-sample B
Bassi	65	64
Cambiasi	50	79
Gobetti	65	65
Maroncelli	67	62

Table 1. Size of two sub-sample

²⁶ Wilson also stresses that the valuation community widely recognizes that there is no substitute for an in-depth analysis of real sales information, since there is a big difference between an opinion expressed under hypothetical conditions and real transactions (*ibidem*).

²⁷ See Dickie, Fisher & Gerking 1987; Cummings & Harrison 1995; Bishop & Heberlein 1979.

²⁸ For this experiments see Mattia *et al.* 2003.

For each sub-sample are collected the main information that could interest (or not) the potential purchaser: location, degree of site's quality, position, features of the building, floor, entrance, size, distribution, maintenance's conditions of dwelling, dinette kitchen, balconies, terraces, number of bathrooms, car park, attic, cellar, quality of equipments and of internal finishing (see table 2).

For the sub-sample A the elicitation question has been formulated according to the Close Ended-Dichotomous Choice approach, because it avoids bias more than the other formats. The amount of money suggested randomly to respondents has been obtained by increase or decrease – according to five fixed ranges – of the most probable market value of the four dwellings, estimated by the sale comparison approach.

Once the measure of respondents' WTP has been fixed, they are asked to elicit it. The specific purpose of the valuation, the clearness and the credibility of the scenario may facilitate respondents' thought processes. Furthermore, the Close-ended Dichotomous Choice approach reduces strategic bias and encourages respondents to consider their preferences carefully. The WTP elicitation is also affected by the information about properties' market prices. Concerning this, it is crucial to point out that the meaning of no-answers is not immediately clear: it could be considered both a real unwillingness to pay the amount of money suggested and the first trial of negotiation on sale price.

On the contrary, those answering to the first question that they the dwelling being valued doesn't meet their own needs are faced to the sale price, chosen, as for the sub-sample A, among five fixed ranges. Whereas, the price is not accepted, respondents are asked to elicit the value according to an open-ended approach.

The last part of the questionnaire focuses on the socio-economic characteristics.

	BASS_A	BASS_B	CAMB_A	CAMB_B	GOB_A	GOB_B	MAR_A	MAR_B
Location	24,6	32,2	27,3	19,8	28,6	24,1	37,8	24,2
Site's quality	25,7	7	31,4	6,8	28,5	8,3	20,5	10,7
Position	33,3	8,3	12,7	23,2	22,0	26,1	52,2	13,4
Typology of building	32,3	0,67	22,3	3,6	10,3	8,3	12,7	16,6
Floor	9,2	35,9	62,0	2,5	13,8	23,1	19,4	19,3
Entrance	0,8	3,1	4,0	10,1	1,5	26,1	11,9	21
Size	75,4	64	68,0	95	69,2	69,2	61,2	61,3
State of maintenance	6,1	4,7	21,5	3,8	38,4	18,5	82,1	14,5
Internal distribution	18,44	9,1	14,4	4,4	7,7	14,3	28,3	3,75
Dinette kitchen	47,7	34,4	14,0	30,4	4,6	9,2	0	32,2
Double bathrooms	0	6,2	0	2,5	0	4,6	0	0
Balconies	60	0	0	30,4	0	27,7	0	9,7
Terraces	0	3,1	0	0	0	3,1	0	0
Finishing	27,7	15,6	6	12,6	4,6	36,9	68,6	0
Electrical equipment	1,5	3,1	0	6,3	0	6,1	29,8	0
Heating	7,7	15,7	10	18,9	15,4	12,3	44,8	0
Car park/garage	10,8	12,4	0	12,7	0	10,7	0	14,4
Attic/cellar	20	1,6	0	7,6	0	9,2	0	11,3

Table 2. Main positive (sub-sample A) and negative (sub-sample B) features

4.2 Critical analysis of the outcomes

The data collected by the survey are summarized in this step of analysis.

As each respondent has stated whether their maximum WTP is above or below a given amount, according to a single-bounded discrete choice elicitation model, the type of data is binary. In the close ended approach the statistical analysis has a crucial role: the WTP value is inferred by the trend of discrete choice variation (yes/no) with reference to the bids. The evaluator, according to an increasing sequence of bids, show to each respondent one amount of money randomly chosen. The answer (yes/no) is not the maximum WTP of respondent, but its discrete measure. The demand curve is after obtained on the basis of principles of inferential statistics. In order to estimate a binary dependent on the basis of different independent variables, the approach to be followed is probabilistic: Logit or Probit²⁹. The measure of change in utility is given by the probability function of the event (cumulate density

²⁹ The probability functions of these models are, respectively, the normal standard distribution and the logistic standard distribution, that are bounded in a 0-1 range, since they are functions of distribution. The Logit model is simpler to apply than the Probit one. It is also grounded on microeconomic behavior principles.

distribution function), that is the probability distribution of dichotomous variable yes/no (1/0), which represent the sample's answer to the bid.

In this case study the analysis of answers about WTP has been carried out by the Logistic regression model, assuming the Logit model, based on random utility theory, as function of $F_{\eta}(\Delta V)$.

$$F_{\eta}(\Delta V) = [1 + \exp(-\Delta V)]^{-1}$$

This model, which directly estimate the probability of an event, is grounded on the following hypothesis³⁰:

- the choice (yes/no) is carried out by a rational individual according to an utility function. He chooses what can maximize its utility;
- the utility function include both a deterministic and a stochastic component;
- random terms have the same probability distribution for all decision-makers and for all the options and are independent.

The binary data has been calculated by the maximum likelihood ratio estimation. Two different paradigms of change in utility (ΔV) have been followed, the first is consistent with economic theory; the second, despite it's not directly obtained by a difference between utility functions, could be considered a proxy of ΔV (Hanemann, 1984):

(1) $\Delta V = \alpha - \beta X$

(2) $\Delta V = \alpha - \beta \ln(X)$

where X is the amount of money faced to respondents.

The followings tables show the relationships between bids and WTP for each sub-sample.

BASSI				
	Sample A		Sample B	
	WTP		Do You Think "X" is the right price?	
BID	% YES	%NO	% YES	%NO
180	29,41	0,00	56,00	7,69
195	26,47	12,90	20,00	12,82
210	38,24	16,13	20,00	10,26
225	2,94	38,71	4,00	35,90
240	2,94	32,26	0,00	33,33
TOTAL	100	100	100	100

CAMBIASI				
	Sample A		Sample B	
	WTP		Do You Think "X" is the right price?	
BID	% YES	%NO	% YES	%NO
65	31,82	0,00	34,04	3,13
75	45,45	3,57	29,79	3,13
85	13,64	25,00	25,53	15,63
95	9,09	42,86	8,51	18,75
105	0,00	28,57	2,13	59,38
TOTAL	100	100	100	100

GOBETTI				
	Sample A		Sample B	
	WTP		Do You Think "X" is the right price?	
BID	% YES	%NO	% YES	%NO
160	36,84	0,00	22,45	0,00
175	23,68	3,70	32,65	0,00
190	23,68	3,70	26,53	13,33
205	5,26	37,04	18,37	26,67
220	10,53	55,56	0,00	60,00
TOTAL	100	100	100	100

MARONCELLI				
	Sample A		Sample B	
	WTP		Do You Think "X" is the right price?	
BID	% YES	%NO	% YES	%NO
180	100,00	0,00	85,70	14,30
200	50,00	50,00	92,90	7,10
220	29,00	70,60	50,00	50,00
240	0,00	100,00	0,00	100,00
260	0,00	100,00	6,70	93,30
TOTAL	32,80	67,20	50,00	50,00

³⁰ Since decisions are taken in a context of limited rationality and uncertainty, these hypothesis could be considered also the limits of the Logit model.

On the basis of logistic regressions' outcomes, the median³¹ value of WTP has been calculated³².

MODEL	$\Delta V = \alpha - \beta X$		$\Delta V = \alpha - \beta \ln X$		Open Ended	Market Value	Market Price
	MED1A	MED1B	MED2A	MED2B			
BASSI	213.635	200.829	211.853	198.989	180.000	210.000	N.C.
CAMBIASI	81.945	91.793	83.734	89.501	75.000	85.000	N.C.
GOBETTI	201.255	200.290	200.410	206.129	175.000	190.000	208.000
MARONCELLI	204.206	216.783	204.624	216.838	185.000	220.000	210.000

Table 3. Median values of WTP for each sub-sample according to two different utility models

The table 3 points out that there are negligible gaps between the WTP values and market values estimated by the more traditional real estate appraisal methods.

5. Conclusions

Even if the two main features of this method – the hypothetical character of the questions and the fact that actual behaviour is not observed but only predicted – has been broadly criticized (Adamowicz *et al.* 1994), in this study the WTP can be considered the behaviour of the potential buyers in the face of real choices. Many of the potential problems associated with CVM have been overcome, since strategic bias has been reduced by pre-testing the valuation questionnaire and using different bidding mechanism according to two different groups of buyers selected, the one who answer that the property meets its needs and the second who is not really interested in it.

To this end, it's meaningful to specify that the possible strategic character of the answers to the questionnaires given by individual interview is consistent with the real estate prices' formation process. Despite the so-called hypothetical bias has been well studied in both laboratory and field settings³³, it's widely known that a great part of the reliability of hypothetical surveys depends on how interviewed understand the scenario proposed ensuring that their answers are consistent with the objective of the survey. In this experiments the hypothetical bias is minimized since: i) respondents are selected among potential buyers; ii) they are faced to a scenario deeply drawn; iii) the sub-sample of respondents really interested in the property being valued visited the apartments; iv) the elicitation process used is familiar and puts respondent in a real market frame of mind, because it's very close to a real negotiation between parties³⁴.

Furthermore, according to the validity and reliability tests of the contingent valuation predictions suggested by Roddewig and Frey (2006)³⁵, for two of the four properties the values estimated in this research has been compared to the real market-price, showing shorter differences between the values estimated by CVM-Dichotomous Choice (average of values estimated according to different utility models for the two subsamples: 2,87% for Gobetti apartment and 2,95% for Maroncelli apartment) than

³¹ Median WTP is considered the more robust measure of central tendency since its value is not so influenced by outliers.

³² That is the value of X that makes $P(\text{yes})=P(\text{no})=0,5$. In the logit model, where $F\eta$ is the standard logistic cumulate frequency distribution, $F\eta(0)=0,5$. When $\Delta V(x)=0,5$, the median values of function are obtained.

³³ Different studies suggest that mean hypothetical values are about 2.5 to 3 times greater than actual cash payments. The causes underlying this bias are not still well understood. Possible reasons for hypothetical bias include: lack of consequence associated with individuals' responses; desire to increase the likelihood that the good is provided at little or no personal cost; respondents uncertainty or ambivalence. Since the hypothetical bias is associated with private as well as public goods, its underlying causes may be quite complex (Stevens 2005).

³⁴ It has been also reduced the strong influences that unfamiliar situations have on respondents. In most of the surveys these influences are not identified by researchers (Wilson 2006).

³⁵ The two authors suggest the following methods in order to test the validity and reliability of the contingent valuation predictions: i) comparison of the prices actually paid in an entire, "fully informed" marketplace to the prices predicted for that marketplace by contingent valuation surveys done before the market became fully informed; ii) comparison of the prices actually set or paid for individual properties by fully informed survey participants; iii) comparison of the prices actually set or paid by other sellers or buyers who can be determined to have possessed the same (or more) information at the date of sale or purchase as the survey participants and therefore to have been as fully informed as survey participants (Roddewig & Frey 2006).

the ones estimated by CVM- Open ended (only for sample B: 15,87% for Gobetti apartment and 11,90% for Maroncelli apartment).

On the basis of these results it's possible to consider this experiment a progress toward the challenge of reducing the match between intended and actual behavior in order to increase the acceptability of CVM studies.

Finally, the research could be developed with the aim of setting up an evaluation procedure for the systematic production of median willing to pay for properties. Providing such exhaustive information is crucial in the urban development processes, where developers are called to carry out market analysis and marketability studies³⁶ in order to understand the feasibility of their proposals.

On the other hand, it makes possible the auditing of banks or lending institutions on fairness of values and prices used by developers to have credit.

³⁶ The market analysis is the first step of a market research. It is a quantitative analysis as it requires to evaluate demand, supply, tenant mix, absorption and lease rates for a specific project. The marketability study is the second step and it's very important because it rationalizes the aspects of a specific project with the need of a targeted market (Peca 2009).

Appendix 1: Comparison among different elicitation methods (Authors' elaboration on Bianchi & Mattia, 2000; Pearce *et al.*, 2002).

Elicitation formats				
	BIDDING GAME Iterative bidding game	OPEN ENDED Payment card	CLOSE ENDED (Dichotomous Choice) Single bounded Double bounded	
First Applications	Davis, 1964	Mitchell & Carson, 1981,1984	Bishop & Heberlein, 1979, 1980; Carson, Hannemann & Mitchell, 1986	Hanemann 1985; Cameron & James 1987; Carson & Mitchell 1987; Bergland & Kriesel 1989
Measurement	Maximum WTP/WTA	Maximum WTP/WTA	Discrete indicator of WTP/WTA	Discrete indicator of WTP/WTA
Advantages	it may facilitate respondents' thought processes and encourage them to consider their preferences carefully great likelihood to fix the effective maximum WTP/WTA	straightforward may facilitate respondents' thought processes no starting point bias the number of outliers is reduced some versions of the payment card show how the values in the card relate to actual household expenditures or taxes (benchmarks)	this procedure minimises non-response it is more suitable for public goods evaluation it avoids outliers the approach received the endorsement of the NOAA panel it is thought to simplify the cognitive task faced by respondents interviews are less time-consuming respondents accept the bid if his WTP is greater or equal than the price asked and reject otherwise, ensuring that they tells the truth	more efficient than single-bounded as more information is elicited about each respondent's WTP
Disadvantages	interviews are time-consuming anchoring bias large number of outliers and to "yes-saying" (giving affirmative but possibly false responses) it cannot be used in mail surveys and other self-completed questionnaires	it cannot be used in telephone interviews large percentage of no answers large rate of no accuracy of the answers	values obtained from dichotomous choice are significantly larger than those resulting from comparable open-ended questions some "yes saying" responses less information is available for each respondent larger samples and stronger statistical assumptions are required surveys are more expensive results more sensitive to the statistical assumptions made, that are more complex than in the other approaches	all the limitations of the single-bounded dichotomous choice possible loss of incentive compatibility (truth telling)
Main Bias	starting point bias	range bias	range bias starting point bias	anchoring bias "yea-saying" bias

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