FACOLTÀ DI ARCHITETTURA

SAPIENZA
UNIVERSITÀ DI ROMA

PhD Course
Riqualificazione e Recupero Insediativo
XXV Cycle

Coordinator: Prof. Roberto Cassetti

Scientific Disciplinary Sector: ICAR 22

Rocco Murro

Tutor: prof. Saverio Miccoli

INNOVATIONS IN REAL ESTATE APPRAISAL FOR URBAN RENEWAL

Rome 2013

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Dubium sapientiae initium

(René Descartes, *Meditationes de prima philosophia*)

INDEX

Part I
Background and scientific issues

Part II
Hypothetical markets and stated data for the appraisal in implicit and instable markets

Part I

Background and Scientific Issues

1. THE CONTEMPORARY CITY AND ITS REGENERATION

1.1. The contemporary city: current features and ongoing dynamics

The historical city – compact and clearly distinguishable from the rural areas that stretch around it – preserved its distinct features up until the early XIX century. Until then, diffused or direct sprawl along the major infrastructural lines among different cities was quite an exceptional event. Through higher living density, historical cities used less land for an increasing number of inhabitants, thus becoming saturated, with poor collective services and few public open spaces.

As of the second half of the XX century, urban growth in Italy caused the land occupied by cities to increase, in some instances by over 300%. Public initiatives peripheries are an emblematic example of new urban sprawls. Designed as complete urban fragments theoretically capable of performing every urban function, as they stood they often were non-quarters, separated from the traditional city in terms of distance from the centre and morphological discontinuity. Most times, they stood out as rows of orthogonal settlements that did not appear as organically as cities; indeed, they lacked services to residents and urban green areas and often became segregated and autistic islands, where degradation went together with expansive land use the public transportation network could not cope with.

Another aspect of the recent urban sprawl was the rise of settlements outside the traditional city, which catered to new needs (industrial/manufacturing, tourist, residential, supermarkets and malls, etc.) or new paradigms for existing uses (residential solutions, market-roads, etc). The industrial and commercial areas were, among the new settlement types, some of the first forms of extra-urban expansion forms to take distinct and clear traits opposed to the multi-functional complexity of the traditional city. Often, they lacked any relation with the surrounding areas, except for the functional connection with mobility infrastructure, and over time they took a hybrid nature, suspended between specialised stores and supermarkets, which in turn mixed with leisure facilities and new residential areas.

Other aspects of the ongoing urbanisation trend are the widespread urbanisation of rural areas and the seasonal centres developing along the coast. These two phenomena are bound by the common pursuit of living models providing more comfort and isolation; these recent forms of urban growth have a tendency to appear at the borders of cities or along major roads.

Second house proliferation was an important element of this trend; it took place both in the countryside (where it caused progressive transformation and reduced its productive importance to a residual condition), as well as along the coast (where it fit into the intense and diffused building boom starting in the Sixties, both in the planned and unauthorised way, in the narrow strip of land between infrastructural lines and the coast).

Finally, in the central portion of metropolitan areas the market-road paradigm grew, consisting of the progressive rise of small manufacturing businesses, logistic or commercial facilities, both wholesale and retail, developing along state or provincial roads. Lacking any alternative road access, on the one side such settlement types posed specific efficiency and road safety issues, but on the other they suggest a possible alternative model to the industrial and commercial pen model, since they leverage the local rooting of existing urban areas and may stand as an antidote to land use for the same purposes in the open country.

TRENDS OCCURRING IN THE CONTEMPORARY CITY

The major new settlement trends taking place on the urban scale in a complex local network are:

1. *Linear attractors* (river parks, market-roads…) as urbanisation generators;
2. *Hybrid machines* (office and shopping centres) whose presence changes the distribution and mode of use of mobility and centres;
3. *Islands* (production and residential centres) introducing destabilising elements in areas that have not transformed yet;
4. *Repetition areas* (urbanisation of areas meant for mixed use);
5. *Plugs* (interstitial densification initiatives);
6. *Metamorphic areas* (transformation of brownfields).

At metropolitan scale, the urbanising processes may be traced back to recurrent models:

1. Capital city, the place for privileged contacts;

2. Multi-centre urban systems, creating relations among interconnected centres;
3. Post-industrial reconversion cities;
4. Southern metropolis;
5. Non-axial linear alignments along the coast.

Two main trends may be detected: 1) urban polarisation (attraction produced by minor centres near major urban areas); 2) urban dispersion (settlement dilation, simplification of urban functions, separation between production-related activities and consume-related activities) caused by the decentralisation of metropolitan areas.

Such depopulation and settlement concentration phenomena affected the dynamics and balance of the real estate market quite substantially. Residential preferences produces local divides based on real estate value in constantly growing and steadily shrinking areas. In polarising areas real estate value tends to grow, to the detriment of the areas that are being progressively abandoned: higher demand calls for higher production of goods and services. In the dispersing areas the trends consist of a sort of real estate value redistribution on the hinterland and diffused growth.

The real estate market is deeply suffering because of the changes taking place in the settlement processes. As real estate value exists as a function of demand, it tends to grow in high-development prospect areas and tends to decrease in areas affected by depopulation and demographic emptying. As such, it is a strategic priority to prevent the depopulation of city centres from happening by means of a management paradigm aimed at development and value generation.

There are cities that mainly perform one function, and there are even more small and large cities where there is no such thing as a main vocation, but rather a more or less balanced bundle of functions.

There are relatively few cities having almost or all the range of functions, and there are even less that have them all and perform them at macro-regional level. The latter are called metropolis, while the few metropolis whose influences stretches on a planetary scale are called *world or global cities*.

In 1990, King described some traits of the global cities:

- High labour specialisation and division;
- Stability and permanence over time
- High internal cultural, ethnic and social differentiation;

- Primary transportation and communication infrastructural nodes;
- Urban environment with high cultural, physical and architectural quality;
- Strong social polarisation, that is, many rich and many poor.

1.2. Marginal and distressed areas in urban contexts

Most European cities feature extensive distressed areas that suffer from severe and widespread shortage of those characteristics that qualify urban life and its development prospects: degraded lodgings, inadequate infrastructure, inefficient public transportation service, abandoned industrial areas (brownfields), environmental problems, lack of general services; from a social standpoint, such areas usually stand out for high unemployment rates and remarkable social issues, such as poverty, low education levels, population ageing, low healthcare coverage and strong dependency from welfare. Such shortcomings hinder the sustainable development of the entire city, discouraging investments and employment creation, while favouring social exclusion and environmental deterioration.

Deep local, economic, social, cultural and structural divides are forming in most European cities between on part moving towards development and quality of life improvement, and another, usually smaller but still quite sizeable, following different economic and social models, which are rather backwards, subordinate and strategically ineffective.

It would be difficult to fathom the causes of this phenomenon, which has become structural in the European urban system. Many possible reasons were offered, such as the globalising pressure, the governmental fiscal crisis, the competition between areas and cities, the collapse of *welfare state*, the emergence of information and knowledge society, etc., even though we cannot underestimate contingent and locally-defined conditions, which are often the triggering cause.

In literature, the issue of large distressed urban areas has enjoyed poor coverage mostly because of the very phenomenon and the meagre recognition it was met with. Indeed these areas are sometimes regarded as a matter of urban/building/environmental requalification issue, or else as an economic, social or cultural problem or, finally, as a simple matter of safety. Rarely was this problem dealt with a systematic approach that could account for al these aspects together, while managing them in terms of general governance of the city.

The focal point lies in recognising these large areas as a crucial urban issue. As things stand now, large distressed urban areas lack institutional, technical, cultural and political recognition. Rather, they are regarded as a mass of local, environmental, social, economic problems more ore less related one another but not connected in a system. As such, each of those problems is viewed as suitable to be dealt with and solved individually.

The quality of life in large distressed urban areas is lower than in other areas of the same city, and the coordination systems among the stakeholders are structurally weaker and less effective that in the rest of the city (Bentivegna, 2007).

More specifically, as compared to the city as a whole, in these areas:

- The decision-making processes combine risks, uncertainty and dynamic instability with an open-endedness that stems from unpredictable exogenous events, inconsistent interaction and opportunistic attitudes; decision makers must tackle high risks, strong, localised diseconomies and high costs, also in terms of price/quality ratio: the creation of an effective and rather predictable decision-making context would imply remarkable difficulties;
- Economic development and social changes are hindered by low urban governance levels; in these areas public funding is the main source of investments, but it's too low, not only because of the paucity of public resources, but also because of competition with more efficient areas in the city;
- Social, economic and environmental renewal is basically supported by public intervention, the strategies, though are insufficient and often break down into many different sector-targeted policies managed by many agencies and organisations (public, private and non governmental); in general, access to market, knowledge, information and power systems is less likely and more uncertain than elsewhere: consequently, the decision-making processes are widely fragmented;
- Development requires sizeable investments in many sectors, but local companies struggle to access credit and the risk conditions are higher: the financial and credit markets do not operate easily in such areas;
- The guarantee and protection of human rights are weaker as compared with other areas in the city and the State finds it relatively harder to guarantee the respect and protection of such rights; social security is poor, and violence against women, children and immigrants is more frequent than elsewhere: it is not pleasant to live in such areas.

Among the strategies pursued by the public administration to stimulate the requalification

of these areas the following turned out not to be enough:

- Choice of policies based on massive fixed capital initiatives in order to re-qualify the built-up environment;
- Urban environment requalification aimed at improving quality of life. Because property value game in the real estate market is such that local tenants are forced to move from the area, and the problem is merely transferred to some other urban or metropolitan area, be it far or nearby;
- Focusing on job creation. Indeed, if qualified jobs are created to recover the local competitiveness of the area – given the poor qualification of the local inhabitants – this new employment opportunity will advantage qualified workers residing elsewhere; on the contrary, boosting employment in obsolete sectors would prop up inefficient solutions, destined to fail in the short term;
- Qualifying the local labour force, to give it the tools to compete effectively in the labour market, in that the ensuing increase in individual income would cause the qualified workers to move to other areas in the city where quality of life is better, thus impoverishing the deteriorated area of its best assets;
- Turnover policies aimed at changing the economic, social, ethnic or age structure of the existing population. In fact, without generalised structural measures, the risk is to shatter mutual support – or even survival – networks that had formed over time, thus triggering negative processes within the relational systems of weaker demographics, such as to cause their expulsion.

1.3. Urban renewal and urban quality development

It is becoming common belief that the issue may no longer be tackled by focusing, from time to time, either on urban planning and the infrastructural and development projects, or on economic support initiatives and company subsidies or, finally, on social support to the underprivileged.

A new approach has come to grow lately. It stands out for a multi-dimensional perspective based on the efficacy of the collective decision-making process, which must become a long-term reference, to bear in mind of all standpoints and opinions of all stakeholders.

Consequently, the rebirth of an area cannot rest solely on the State and/or a fistful of promoters. It should start from understanding that the recovery of such areas calls for a

common effort from anyone who can be involved in the shared view of a possible future, then the development of a distressed urban areas is the product of the interconnected action of a large number of stakeholders. Thus, the focus shifts from a physical, economic or social environment, to those subjects who, directly or indirectly, actively or passively, have an interest or are involved in regenerating the area.

Recent studies offered to focus long-term development strategies for these areas on three main issues:

1. Integration of policies, stemming from the need of combining quality of life and sustainable development;
2. Efficient co-ordination of actions and behaviours within the collective decision-making process;
3. Active and qualifying participation of the local population and a key condition for the requalification of the deteriorated social capital.

In summation, we may believe that the regeneration of such areas is a matter of governance method (that is, how to deal with physical, social, economic and institutional issues); a matter of co-ordination (among different stakeholders who, in varying fashion and conditions, make decisions about or in the area); a matter of capacity (that is, the ability of individuals, groups, institutions and organisations to understand the problems that must be dealt with in order to exit the deteriorated circle and act effectively in the direction of a solution).

The recovery prospects are believed to be found especially:

- In the ability of politics to understand and govern the complexity of this urban sub-system, by exposing and focusing on its specificities: more specifically, for local governments the matter stands as a multiple and integrated approach to tackle physical and environmental, organisational, economic and social issues, matching quality of life and sustainable development;
- In the capacity of the city system to set up strategic coordination initiatives (visions, prospects, conditions, coordination procedures) in the decision-making processes targeted at the area, with specific reference to city government as the main decision-maker for the recovery policies;
- In the ability of individuals, companies, organisations and institutions in the area to develop and support the ability to detect, tackle and solve problems connected with single recovery instances as well as general recovery over a fairly long time frame.

Among the different urban regeneration measures promoted in Europe over the last twenty years, one may find some remarkable innovation. The new policies regulating the development of these projects are the product of implementation practises that had to change model in order to keep operating in a deeply changed social and economic context. Even though there is no such thing as a shared and well-established practise, it is possible to outline a new process profile based on the common elements singled out in the different interventions.

The starting condition to make for a great regeneration project is the existence of a vast, abandoned and progressively deteriorating stretch, located in the centre of well connected with it, usually public or belonging to some public administration authorities and situated in a strategic position in terms of high-intensity urban and economic development areas.

Such operations are based on the assumption that the real estate stock at hand stands out for excellent market potential. Nowadays, given the current operational approach, it would be delusional to believe that a large-scale urban project could happen in areas lacking any market appeal. This constraint is caused by the public finance crisis, which prevents competent subjects from supporting such large-scale initiatives out of their own pocket. Conversely, private entrepreneurs are motivated to operate only in view of returning and profiting from the investment made over time and with gains being compatible with the best alternative use. In this view, the idea of binding project feasibility to market context seems to be the strategy followed in most cases. Therefore, it is inevitable to provide for certain physical, economic, legal-administrative features appreciated in the real estate market as prerequisites (Miccoli, 2005).

In most cases the projects are instrumental to local development and act upon a diverse array of local potentials in order to increase its environmental, social and economic yield. This is possible by pursuing the sustainable development goals. Generally, this consists of complex integrated projects whose success depends on the ability to bring a number of diverse and conflicting variables into a single model.

Most of the times, large urban projects are promoted by public subjects who see to project start up and limit their scope of intervention to creating suitable conditions to attract new operators and investments, either public or private, through which they may develop and bring the project to its completion. In turn, the development process stands out for multiple operators being involved. During the implementation, a key role is

assigned to organisations established specifically for the purpose of managing product development.

FINANCIAL PROCEDURES

Public and private funding contributes to final project set-up. The shares vary depending on the initial conditions of the target context: is situations that are suitable to return on the invested capital, private initiative is the most common approach; in situations that are unfavourable to investment expectations, public initiative has a more prominent role. In general, the participation of public subjects is focused at the initial and completion phases.

The funding structure leverages several tools:

- Traditional public and private systems (ordinary funds and credits);
- Special and extraordinary public allocation;
- Incentives, breaks, guarantees and other public pre-funding instruments;
- Real estate sale or pre-sale operations as customary with private investments.

Even when the facilitator is a public subject, the main approach requires the development of the intervention by resorting as much as possible to market procedures. The general economic criterion the intervention is aimed at – at least as the priority option – involves the return of the invested capital through the ability of the project for self-funding as well as the opportunities and indications detected in the market. In this perspective, the accurate knowledge of market demand becomes a key factor in all components and in all design phases, since any projects formulated without any real market feedback – that is, unknowing of the preferences and needs expressed by the recipients-to-be – would make the initiative more likely to fail (Miccoli 2005).

According to one of the most widespread procedures, the facilitator of the intervention purchases the areas in order to define the building lands, perform the urban development works and resell the developed lots to the interested operators. The proceeds will feed into a fund used to finance the intervention. Another direct line for project self-funding is called *project financing,* a tool whereby the return on the capital invested to develop the project is accomplished by efficient management of the works, once completed.

2. PROPERTY INVESTMENT IN URBAN RENEWAL PROJECTS

2.1. Real properties and real estate markets

Real property features specific physical and economic characteristics:

1. *Real property may not be transported*: they are not transported where the transaction takes place; the seller may only take the deed of ownership and any other documents describing the property; the buyer cannot easily compare the characteristics of more properties found in the same place;
2. *Real property is durable*, and is a long-lasting asset: the ground is indestructible; buildings have a physical life and a functional life – depending on the systems and the state of maintenance – and an economic life – even shorter that the functional life if the property should not be in demand in the market or the costs to transform it should be higher than the revenues;
3. *Real property is not liquid*: it is expensive but may not immediately converted into cash; low liquidity, though, corresponds to higher long-term yield;
4. *Real property has long production time*: in the time required to develop the property, the market may move from a positive to a negative cycle;
5. *The surrounding environment affects the nature of the property*: the property is influenced by the surrounding context both in terms of value and use;
6. *Every property is unique*: the quality of a real property depends on the features and the location, which is unique.

The market takes different shapes and sizes depending on the profile of the purchasers and the characteristics of the transacted properties. The interaction between demand and supply changes over time, and this variability gives the real estate market a cyclic nature. Moreover:

1. *Market knowledge is not perfect*, it is impossible for the purchaser to have a thorough knowledge of the supply;

2. *The size of the market varies depending on the purchaser and the type of property* (neighbourhood, urban, national and international depending on the purchaser and the type of property to purchase; variable potential catchment area);
3. *The real estate market is cyclic* (partly due to the gap between demand and supply, hence at the beginning the supply is poor and prices go up, and when the supply increase, prices tend to stabilise);
4. *It is influenced by the credit cycle* (if the cost of money is low, there is a tendency to invest more in real property, as opposed to times when the cost of money is high; cost increases drive the demand down);
5. *The market is segmented by type* (depending on the actual or potential intended use) and *geography* (depending on the urban or neighbourhood features the local market may change);
6. *The market is strongly regulated* (through laws, codes and rules, public administration may apply constraints to the use of real property).

The real estate market is an imperfect coordination device that makes it possible to dynamically adapt the built-up space with the conflicting requests for land use from different groups, individuals and institutions.

The purchase and sale of real property requires a capital, which may be obtained through a specific financial method that developed over time.

The exchange takes place based on the market value. Over the last decades, in line with market evolution, the real property appraisal scenario has become the subject of growing attention by virtue of the important relative value taken by real estate within the overall portfolio.

The benefits provided by a real property may not be transferred to more favourable markets, as they are bound to the position where the property is located. Given the diversity of single real property units, it is difficult to make comparisons. Such differentiation gives a high degree of complexity to the market, which feed further into the level of imperfection in this market (see Figure 1).

LACK OF STANDARDISATION, HIGH PROPERTY DIFFERENTIATION

In the real estate market every transaction takes place based on a specific property featuring specific and hardly comparable characteristics; conversely, standardisation produces lower market complexity.

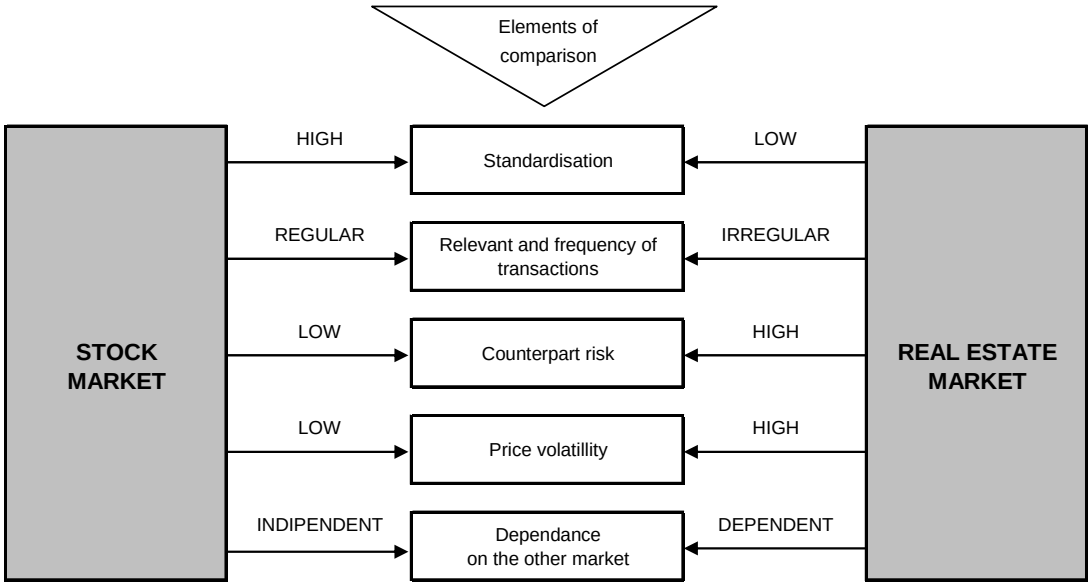

Figure 1. Differences between stock market and real estate market

RELEVANT AND FREQUENCY OF THE TRANSACTIONS

Pricing criteria are highly correlated with the quality and usability of the available information. In the real property market, relevance and continuity are variable and the negotiability is not constant. The market shows basic information asymmetry that prevents consistent and comparable investment opportunities.

COUNTERPARTY RISK

The main counterparty risk categories a real property investment generally stands out for are: commercial risk (change in demand and offer, prices and market conditions, capital loss, purchaser insolvency); liquidity risk (problem converting the investment value into liquidity, due to the transaction time).

In a market that is "thick", active and dynamic, commercial risk tends to decrease. Other risk categories are: production risk; operating risk; destination of use risk; risk of catastrophic events; financial risk; system risk.

VOLATILITY AND POOR QUALITY OF PRICING CRITERIA

The price of a property is determined by the market where the transaction takes place at the end of the negotiation process being the result of demand and supply. The real

property market balance is affected by a number of factors causing continuous changes in the spread between demand and supply, such as: social and demographic trend; polarisation and urban depopulation; changes in consumer taste and habits; per capita income; cost of money, inflation; economic trends.

Moreover, the market is certainly correlated with the stock market: if the latter goes through a negative stretch, the former should grow and vice versa, mostly because o new, alternative investment opportunities.

2.2. Characteristics of real property investments

An investment is the use of money for economic activities for the purpose of obtaining a return. In real property investments, money is invested is assets relating to the production, management, purchase and sale of real property. A real estate company makes its profits exclusively by leasing or selling real property; those who purchase shares in such companies do not purchase the real properties.

FINANCIAL INVESTMENTS

The acquisition of securities makes this investment similar to any other financial investment. It represents a different indirect financial investment from the traditional/direct one, consisting of direct managing, producing, purchasing and selling properties.

The advantages to the financial approach are essentially higher liquidity and lower investment access amount, since the purchase is targeted on shares resulting from the property values having been broken down.

For the purpose of reducing risk, diversification is sought both in terms of economic sectors and geography: investors build an investment portfolio such as to reduce the gap from the initial goals as much as possible.

More and more frequently, investment portfolios include real property investments for three reasons: real property returns do not depend of the factors that influence the other assets; higher safety from unexpected inflation changes; lease value grows with inflation and keeps the investment protected.

On the other hand, the setbacks may be: inefficiency of the real property market; low liquidity; deep knowledge of the market required; incomplete information and low

transparency in the market, which do not allow to compare the investment return accurately.

INVESTMENT FINANCING

Being expensive, many real property transactions take place through credit. Resorting to credit makes it possible for a real property financial market to exist.

Mortgage loans are the most common long maturity loan in the real property sector. The guarantees requested are mortgages on the property; in case of insolvency, the creditor may request the sale of the mortgaged property. A distinction should be made between the primary mortgage loan market (loans granted by financers to the purchasers; the creditors may keep the loans until extinction or sell it in the secondary market) and a secondary market, where mortgage-backed securities are traded; the selling bank immediately returns from the issue loan; the purchasing bank gets a discount due to the insolvency risk.

Those who invest in commercial properties, often combine their risk capital with a share of debt. Some of the different financing methods are: Commercial loans; Join ventures (two or more investors joining efforts to develop and real estate project together); Sale and leaseback (an agent sells a property to a financer, who leases is back to the agent).

For public project financing, a distinction should be made between two ordinary sources, one coming from taxation and public allocation, one from debt: such as loans; Project financing; Debenture loan.

2.3. Real property market globalisation and financialisation

Until 2007 the real property market followed a trend towards steady growth. As compared with the previous periods, this phase shows some disparity, which is made evident by the many financial operations focused on real properties.

This regards a growing financialisation process: real property tends to become the same as any other goods traded in financial markets; the two markets integrated. Real property investment today is considered as alternative or complementary to other financial products. Real property investment instruments increased (spin off, securitisation, funds) and became accessible also to small investors; new, deep

innovations took place in terms of urban project financing. The properties are acquired because of their economic returns instead of their potential use; real properties are valued in the light of their profitability.

Investors may choose to allocate their capital on securities, assets, commodities or real property through more or less standardised contracts.

The financialisation process allows to overcome some real property constraints and eliminate the barriers to entry. As such, real property market operators may be divided into two categories:

- Real property purchasers for use purposes (families, traditional companies);
- Investors who access the market exclusively for speculative purposes.

Securities financialisation happens when securities investors allocate their savings to the real property market by purchasing savings collection securities instruments; *Credit financialisation,* happens when subjects access the market and lack the necessary resources and therefore resort to a credit broker.

Financialisation was fostered by a number of factors, including: 1) the return is not correlated with other types of investment, therefore adds no risk to the portfolio; 2) it provides good hedging in case of inflation; 3) it has an intermediate risk/return ratio between equity and bond.

Through financialisation, the real property market may: 1) move towards higher standardisation; 2) become more relevant and consistent 3) reduce counterparty risk; 4) reduce volatility; 5) reduce its subordination to the financial market.

THE MAIN REAL PROPERTY FINANCIAL OPERATIONS

More and more commonly, the portfolio breakdown of an institutional investor, whose management approach aims at risk diversification, includes real estate finance operations. The most recurrent being:

- Real estate mutual funds (officially established in 1998, they have taken growing importance in terms of number and managed asset);
- Securitisation (sale of real estate assets to a company established for the purpose and that, in order to pay for the purchase, issues securities in the financial market);
- *Spin-off* operations (companies breaking down all or part of their real estate assets that are not deemed strategic for the benefit of a third party defined *Property Company).*

Real estate mutual funds

Mutual funds are divided into shares, each having the same unit value, subscribed by investors and managed by an asset manager (*società di gestione* - SGR). Savings are allocated in the real estate market by investing in properties; thus, the construction, purchase and sale processes are indirectly favoured.

At least two thirds of the total fund value must be invested in real properties, rights in rem and real property company shareholdings.

The proceeds from real estate management and the purchase and sale are reinvested of distributed periodically, if so provided in the articles of association. At the end of the fund's life, which legally cannot last longer than 30 years, the properties must be disposed of and the proceeds distributed.

The maximum property value is accomplished through the separation between the owner, the manager and the user; risk reduction is accomplished by diversifying the properties and the tenants by geography and property type.

Before the 2003 reform, the funds were mostly targeted at small investors, with prudential income investments in tertiary properties in Rome and Milan. After 2003, there was a strong diversification in terms of locations, as well as an opening to commercial and production properties (residential, tourist, healthcare) and the possibility to invest also in real property promotion and development operations.

Securitisation

Securitisation is a financial technique through which subject, defined as the *originator*, transfers assets generating cash flow to a *Special Purpose Vehicle* that, in order to repay the purchase, issues debt in the financial market by issuing securities, usually defined as *Asset Backed Securities* (ABS).

As guarantee of a successful financial operation, a specific organisation (vehicle) is established to issue the securities. It purchases the assets by agreeing to a specific purchase price, set in such a way that the flows generated by the interests and the sales plan is enough to repay the interest and the capital subscribed by the securities subscribers.

The success depends on good financial flow planning, seen to by the *investment bank*, a subject appointed for contract and structural planning; in turn, the *credit enhancer* provides services supporting the operation, while the rating agency values the quality of the financial structure as well as the legal operation framework.

The rationale of securitisation lies in the fact that by transferring assets to a special purpose vehicle, the risk of the same assets is isolated as compared to the overall company risk. The specific subject of a securitisation operation is the real estate value as such.

Real estate spin-off operations

Many companies have revised their allocation policies in favour of real property investments in the asset breakdown. They transferred their properties to special purpose vehicles and, in some cases, chose to retain the use of the same properties through lease contracts.

The *property company* is an external legal entity specialised in the real estate business, namely the management and, sometimes, the expansion of the property assets. The new company allows to safeguard the real properties from company risk. The mother company may choose whether to buy shares of the new company, turning the real properties into securities.

The reasons for this type of operation should be sought in the need to value the assets through active management; or, if it should be deemed not strategic to keep the properties among the assets, for the purpose of raising resources to invest in the company's core business.

2.4 The current real property market between instability, risk and uncertainty

According to the Real Estate International Exchange Group, the worldwide real estate business accounts for over 54% of global financial wealth. Real estate investments, though, are not liquid of compared with other forms of investments, say, equity and bonds. The steady tendency towards securitisation of real estate assets over the past decades contributed to improving the liquidity picture. This is why securitisation has become and increasingly popular strategy, so much that is became the backbone of the mortgage loan market until the global real estate bubble caused the entire system to collapse in July 2007.

According to Arestis and Karakitsos (2009), while the origin of the financial crises should be sought in the creation and following market development of *subprime* loans,

three main forces contributed to the collapse of the worldwide financial sector: financial liberalisation, financial innovation an the easy monetary policy. The combination of financial liberalisation, unregulated financial engineering and poor real estate asset management, together with a lack of transparency, predatory lending and low interest rates, was the prevailing policy between 2000 and 2006. This fed into the real estate market boom. Finally, another factor that led to the crisis was the use of ineffective risk evaluation methods and theories.

The real estate market speculative bubble bust initially in the United States in 2006 and generated the crisis of the past years; it also hit Europe, though not with the same force. The European real estate market had different features and the absence of subprime loans prevented the real estate market crisis from spreading as much as it did in the United States. Many economists identified the main cause of the recent real estate market crisis in the poor use of systems capable of monitoring the value history of properties and the lack of public awareness of the risks entailed in real estate investments.

UNCERTAINTY AND RISK

According to the market efficiency hypothesis, financial markets are "informatively efficient" in that, once the risk has been taken into account, extra returns may not be systematically realised given the information available when the investment was made (Fama, 1970). Such hypothesis, though, is not applicable especially in the case of real estate, which is traded in imperfect and often asymmetrical markets with uncertain information (Byrne et al, 2010.). Moreover, real estate asses are also affected by many different risks. In economics, the distinction between risk and uncertainty is defined in a paper by Knight (1921): *Uncertainty must be taken in a sense radically distinct from the familiar notion of Risk, from which it has never been properly separated [...]. The essential fact is that "risk" means in some cases a quantity susceptible of measurement, while at other times it is something distinctly not of this character; and there are far-reaching and crucial differences in the bearings of the phenomenon depending on which of the two is really present and operating [...]. It will appear that a measurable uncertainty, or "risk" proper, as we shall use the term, is so far different from an unmeasurable one that it is not in effect an uncertainty at all.*

Doug Hubbard defined uncertainty as a state of limited knowledge whereby it is impossible to accurately describe the current state, the future outcomes or even more than a possible result, and its measurement is the product of many possible states whose results

or probabilities are assigned to each state or possible outcome. Risk, though, is defined as a state of uncertainty in which some possible results produce an undesired effect or a significant loss. Risk measure is construed to mean a series of measured uncertainties where some of the results are possible losses, as well as the extent of such losses.

Given the current economic crisis, it is very likely that uncertainty and risk will dominate the economic scenario for a long time. Risk management has obviously become a relevant matter lately, also in the real estate sector. Resorting to inadequate or inappropriate market evaluation may turn out to be detrimental for financial stability during stressful times, in that it amplifies the credit price and asset *boom-bust* cycle. In the real estate sector, institutional investors are seeking efficient tools and procedures suitable to manage and contain financial risk. To this regard, statistical modelling is gaining consensus in the real estate valuation sector, in that it is viewed as an effective tool to improve information transparency and as a useful tool to tackle the risk management issue.

Nevertheless, risk has not been adequately incorporated in real estate valuation process yet. After all, the advancement in actual real estate risk theory was not capable of preventing the crisis from happening. We must recognise that real estate risk today implies such complex issues that it is not possible to leave its management solely in the hands of modelling. Indeed, subjective elements, such as experience and decision-analysis capabilities should be included.

Risk is usually defined as uncertainty regarding future events, provided the probability may be estimated. The term "megatrend" was coined by John Naisbitt in connection with those social, economic, political and technology changes in society that have a strong impact on our lives and usually last a long time (Naisbitt 1982). Therefore, we may define “real estate megatrends” those phenomena involving people, the economy, the environment, public finance, society, urbanisation and technology, which:

- Are producing measurable influence on real estate markets as we speak;
- Feature high future risk and an impact based on well-established forecasting methods;
- Involve other market sectors in the same way.

According to Larsen (2006) "megatrends say something about the probable future, but there are other possible futures". First, no one can foresee to the last detail the changes trends will produce. Second, it is particularly difficult to estimate the interplay between trends and the human ability to adapt to novel situations. Third, we cannot predict "black

swans", that is, highly improbable events whose extreme consequences can stop or change megatrends. Hence, megatrends are certainties, though they invariably contain elements of uncertainty.

The same may be said about valuations. The Mallinson report, for instance, argues "there will always be a degree of uncertainty in any valuation". As a consequence, valuers must approach uncertainty with professionalism, say, to express the level of uncertainty in their report. The simplest way is to include verbal description of uncertain aspects, or other possibilities are such tools as tables. Another way is to estimate the likelihood of achieving different results affecting property value. As opposed to literature on real estate valuation, this probabilistic approach is the dominant one on today’s real estate risk literature.

3. REAL ESTATE VALUATION THEORIES AND METHODS IN THE CONSOLIDATED PRACTISE

3.1. Real estate valuation principles

3.1.1. ITALIAN VALUATION THEORY

The principles of the appraisal process in the Italian academic tradition (from Serpieri to Forte, Realfonzo and Orefice), may be summarised in the following assumptions:

1. Value depends on the purpose of the appraisal. Consequently, there is no such thing as a unique estimate of the concept of value; rather, there are many different values depending on as many purposes to which there may correspond, for the same property, as many valuations. Hence, appraisal must be construed as the attribution of different values from as many purposes, not as the determination of the mere market value;
2. The forecast is an immanent feature of a valuation;
3. The price is the fundamental element to a valuation;
4. The valuation method is unique, as it rests exclusively upon comparison;
5. The valuation must be objective and generally valid; as such it must be based upon the ordinariness theory.

Purpose of the valuation

As for any object, the perspectives under which the same may be regarded are many and all depends on the chosen angle. For property or goods, there are different economic aspects depending on the purpose of the estimate.

The different economic aspects depend on the intrinsic features of the assets, the same characteristics that should be held into account in view of the practical purpose for which the estimate is required. Selecting the purpose depends of the economic relations being at play between the object of the valuation and the involved persons.

To each different economic element corresponds, for the same assets and in the same

market, a different and specific estimated value. The purpose of valuation is to define which of those economic elements should be held into account in the specific estimation process, by setting a specific criterion through which the corresponding value may be determined.

The feature of deploying direct assets and being the object of trade determines the appreciation of an assets in view of the transfer, hence, a market value meant as the equivalence between an amount of money and an asset, depending on the demand or supply for the same assets.

Another example regards the ability to foresee the production of economic assets, therefore, to come up with a production cost value estimation, meant as the sum of the market values of single production factors.

Finally, to every different purpose there corresponds a specific value, which in turn quantitatively depends on external circumstances that vary together with the market.

Indirect use is directly linked with the ability to foresee the price of one among the production factors depending on the market value of the product. As regards the valuation of the most probable price of one production factor, it is necessary to look again at the economic factor corresponding to the most likely value of development, meaning the difference between the market value of the product after the development and the cost required for the development.

From the complementary value of assets there ensues a possibility to foresee the price of a property based on the complementary production relation between the asset at hand and other assets. Finally, the substitution between the assets allows to foresee the price, be it market or cost, of an asset being substituted with the subject of the valuation.

Even though each of the values is expressed in monetary terms, the obvious difference between an amount of money corresponding to the market value and another amount of money representing one of the other values for the same asset should be always considered. Only under conditions of perfect competition and long-term balance do the values have a tendency at coinciding quantitatively with the market value; only in this case, then, would it be possible to use any of the valuation criteria to determine one of the values. This not being the case on the market, it does not make any sense to determine on the values, say, as the average of the others.

Forecast

The “forecast” is a crucial attribute in the valuation process. To estimate means to express

an equivalence between to assets. The equivalence may be of two kinds: historical opinion; hypothetic opinion. Historical opinions (also known as verification) refer to circumstances and instances that took place in the past. Prices, that is, accomplished facts, historical data, allow to verify that in a given period of time, place and circumstances, a given amount of money and a given asset were deemed to be equivalent. Hypothetic opinions of equivalence (also known as forecasts) refer to circumstances and purposes, which have not happened yet, but should be deemed becoming or likely to happen in the future. Forecasts are hypothetic opinions of equivalence between an asset and a given amount of money in given circumstances of time and place. While price is certain, value is probable.

Valuation forecast is based on verifiable revealed data. It follows that the only economic method applied to valuation is the observation of tangible market experiences, searching for analogies between assets having a known price and others to valuate, comparing past and present circumstances, for the purpose of forecasting the hypothetic value. The forecast may also yield the expected value, admitting the possibility of the valuation influencing the market and not the other way round (when the value is accepted by the market economic operators).

The probabilistic nature of valuations is to do with the intrinsically uncertain nature of the valuation opinion as well as the likelihood of the value to turn into the price.

The valuation forecast, indeed, is based on the condition of “stability of conditions”, whereby the process takes place based on the conditions known at a given time and based on the hypothetic development, in foreseeable forms, of those parameters and situations the asset subject to valuation is subject to. The forecast hypothesis is a real probabilistic hypothesis regarding market development. Even though the principle requires to resort to trend development, non-tend market development hypotheses are also perfectly compatible with the valuation approach, in that they detect the obtainable consequences as the effect of subversions induced by economic, urban, construction policies, etc.

As Forte reported, the principle of stability of conditions, which is akin with the so-called postulate of “invariance of reality”, has theoretical and practical implications: in theory, it would require the hypothesis of static economy in which such outstanding elements as market and production would be constant. It is not the valuation theory that imposes the permanence of conditions, as much as economic reality, in that in practise, the operators base their transactions on the verification of the past and on the knowledge of the present.

In the light of the current market dynamics, this principle is also certainly flawed, given the difficulties and uncertainties connected with the formulation of foreseeable development hypotheses.

Price

Attributing a value to an asset is nothing but foreseeing its price, expressed with a monetary parameter. Any valuation, be it quantitative, that is not expressed in monetary terms is not part of the valuation theory. Such assumption is currently the object of careful analysis in the light of a change in the valuation needs and the existence of assets that may not always be valuable in monetary terms.

Comparison

The valuation "method" is unique and based exclusively on comparison. From a purely logical standpoint, the valuation is performed by comparing the asset to valuate to other assets through technical and economic analogies. This method does not depend on the number of parameters and assets to be compared with those to valuate. Indeed, these cause higher or lower degree of analysis and complexity to come to the final value, though the conceptual process remains the same. Polelli (2008) highlights that the multi-criteria approach adopted for environmental valuations calls for a new reflection on the need to use, for such valuations, criteria based on dominance and priority vectors rather than on comparison alone.

Ordinariness

The valuation opinion must be objective and generally valid; it must be formulated according to the "principle of ordinariness".

The value to attribute to the asset at hand must be the most probable among those which, in those specific time and place, may be expected for the same asset. The valuer must value the technical and economic elements that influence the value of the asset, getting as close as possible to the general view of the prospect purchasers. Nevertheless the valuation opinions is always subjective and may not be unbiased from the personal judgement of those who formulate it. As Realfonzo (1994) maintains, intuition, experience, technical ability and cultural background are essential and irreplaceable resources to form a valuation opinion.

By applying the "principle of ordinariness", the asset to be valued is always considered

in the conditions it would feature if it were performed by an “ordinary entrepreneur”. An “ordinary entrepreneur” is defined as someone who has normal technical, economic and organisational skills, that is, common to the majority of entrepreneurs in the area. Within the valuation discipline, the term “ordinary” refers to such circumstances most frequently found in the market and production sector. The theory of ordinariness is based on the assumption that original attitudes of a homogeneous mass of individuals will arrange with a binomial trend; for such distribution the typical value should coincide with the arithmetic average.

As stated by Polelli, this principle is the most exposed to criticism due to its reliability and reproducibility to the large valuation case-set and the current validity. Though considering the operating goal of getting rid on single cases and particular conditions from the valuation process, this principle loses validity in case of assets that may not be inscribed into homogeneous groups or not having valuation references in conditions of ordinariness.

3.1.2. INTERNATIONAL VALUATION THEORY

At an international level, and more specifically in the Anglo-Saxon valuation culture, real estate valuation is essentially based on estimating the market value and other values (fair value, investment value, etc.) that may be traceable back to the market. The valuation discipline refers to principles taken from economic theory, and aims at finding the real estate market features and mechanisms that are involved in the formation of the asset value. Some principles are common to those of the Italian valuation theory.

Anticipation and change

In order to analyse the main dynamics and factors that influence the formulation of value, the fundamental principles of anticipation and change must be introduced.

Value is based on the anticipation of future benefits. In the real estate market, current asset value is not based on historical prices, but rather on the opinions market operators have of the future benefits of acquisition. Therefore it is necessary to know local, regional and national real estate dynamics that influence operators' opinions and their forecasts for the future; historic data are important only if they can read current market dynamics.

The dynamic nature of social, political, economic and environmental conditions affecting the real estate valuation process must always be held into account. Any changes in these conditions affect the demand and supply as well as the value of a property. The valuer must bear in mind of the foreseeable variations in the reference context, looking for signs and elements in the market that would allow the forecast.

Demand and supply

The principle of demand and supply states that the market price of an asset varies directly, though not necessarily proportionately, with the variation of the demand and inversely, though not necessarily proportionately, with the variation of the supply. Increases in the supply or decreases in the demand for an item tend to reduce the value of the equilibrium price, and vice versa. As regards real property, low supply corresponds to very high values, which tend to reduce in case of building and construction increase.

Competition between buyers and sellers is a key aspect in the real estate market. Every property competes against other similar assets available for the same use and in the same market segment. Over time, the forces at play in the competition market tend to reduce the extra profit of the producer, to the advantage of a larger consumer pool.

Substitution and comparison

The principle of substitution states that when there are many similar assets, the one with the lowest price attracts most of the demand. This is based on the assumption of a rational behaviour on the part of the consumer. According to this principle, a purchaser is not willing to pay a higher price for an asset than that of another asset that is equally desirable and available in the market. This is a fundamental principle upon which cost approach and sales comparison approach are based.

Even though this principle is applicable to many instances, there may be goods that, given their characteristics, are considered unique in the market and whose demand sets a unique price that is not comparable with any other assets.

Balance

According to the principle of balance, the value of real property is the expression of the balance of contrasting, opposed or interacting elements. For instance, economic balance is accomplished in case of an optimal combination between the value of the land and the value of the building, that is, when there is no marginal benefit is obtained from the individual increase in the asset's characteristics.

The other principles below refer to the above principle:

- The principle of *diminishing marginal productivity*, whereby an increase in the productive factors leads to an increase of value up to a certain point, coinciding with the maximum value; having exceeded such point, every additional charge will produce a lower increase in use that the incurred cost;
- The principle of *contribution,* whereby the value of a characteristic of the asset results from the higher value that same feature brings to the asset as a whole or, conversely, the lower value the asset would take in case that characteristic should be missing;
- The *surplus productivity* stands as the producer's net income, after costs and other production factors have been paid; traditionally, such surplus would coincide with the land rent and this principle lies at the base of building areas valuation; for some XX century economists though, it represents the remuneration for the entrepreneurial activity;
- According to the principle of *conformity*, an asset has a value in the market if its characteristics conform to the requests from the demand. Moreover, according to the principle of increase, a lower level asset shall benefit if surrounded by other assets in

better conditions; vice versa, according to the principle of decrease, a high quality asset surrounded by lower quality assets, will lose value.

Such principles are interconnected and crucial for market valuation. Indeed, they represent the theoretical foundation for the estimation of depreciation, adjustments and income.

Externality

According to the principle of externality, external factors to the real property may affect its market value either positively or negatively. Being physically immobile by definition, real estate is affected by external factors, relating to the physical context as well as the economic conditions in the reference market of the asset.

Generally speaking, value may be influenced by international economy, fiscal policy or national economic dynamics; at local level, laws, regulations and administrative policies may be of influence, together with the socio-economic conditions.

3.2. Real estate valuation methods

3.2.1. ITALIAN VALUATION METHODS

"The valuation method, meant as the combination of norms, methods and processes through which the valuation opinion should be based, represents at once the necessary motivation to every valued asset" (Forte, 1979). The valuation method is the suitable tool to express and motivate an opinion of value by examining the data resulting in the outcome and researching the correlation between economic cause and effect.

Since the analysis and search of correlations are carried out with reference to the market as a logical consequence of the price principle, at the base of the valuation method there cannot be anything but a comparison among known circumstances already occurred and known current circumstances.

Though the valuation method is unique and based on market data comparison, the valuation methods that derive from the only method may be distinguished as "direct" (or synthetic) and "indirect" (or analytic).

Direct valuation methods

Direct or synthetic valuation methods are those that rest on direct comparison between the characteristics of the valued asset and those of the know price element(s) taken as reference; the unknown market value will result from a comparison between the characteristics of the assets whose price is known and those of the asset to be valued.

Single parameter method

The method is based on collecting basic historical data regarding the market price of similar assets in a time close to the valuation reference time. The prices will refer to a single parameter (say, €/sqm, €/room for residential lodgings, €/bed for hotels, €/parking space for vehicle repair shops, etc.).

Once the known price scale for similar assets has been prepared, the valuation of the most likely market value is done by adding the asset to be valued, a step which features remarkable analogies with the former.

The introduction to the process is quite evidently based of the assumption that the market will set the price of the asset to be valued the same way it expressed the prices of the assets taken as reference.

Of the two operations described above, the first is surely objective, in that it rests upon detecting tangible market data; the second, is a synthesis operation, which is highly influenced by the subjective skills of the valuer, who takes a key role in coming to an opinion of value in this specific phase.

In case a series of elementary and consistent market data should arrange according to a Gaussian law, the average arithmetic value of the rate shall coincide with the datum having highest statistical frequency. In this regard and for recent data, the most likely value of the asset to be valued coincides with the arithmetic value of the known prices.

In the practice of valuation methods, it is not very likely to observe normal distribution of basic historical data. Nevertheless, such circumstance does not rule out the possibility of a Gaussian distribution of prices (which is also provided for in the principle of ordinariness). When it so happens that, though single price do not distribute normally, the higher number of normal single prices should be detected within a specific interval, the most likely market value may be derived not from the arithmetic average of prices, but by what literature defines as the "average price":

$$Vm = (P1 * A + P2 * B + P3 * C + P4 * D) / (A + B + C + D)$$

Where:

A, B, C, D are the quantity of single assets (expressed through a single parameter, say, square metres);

P1, P2, P3, P4 are the respective single prices (in €/ m^2);

Vm is the most likely single value of the asset to be valued.

Valuation by "*punti di merito*" (quality points)

The valuation by "*punti di merito*" (quality points) is a direct approach to valuation that is based on the accurate analysis of the characteristics determining the market price of real properties.

From an operational standpoint, starting from the higher price observed in the same market, at the same time, the assumption is that such real property may be graded as optimum in terms of all elements and characteristics that are usually appreciated in the market and determine the price of the asset. By attributing to each characteristic a minimum and maximum incidence of the market price, it is possible to proceed with analysing the incidence levels based on the market indications and, subsequently,

comparing the specific characteristics of the asset to be valued and the optimum-grade characteristics of the asset having the highest price.

By attributing the relevance of K=1 for the highest price asset to the sum of coefficients K_i, through which the degrees attributed to the different characteristics are expressed, the unit market value *Vmj* of the asset *j* to be valued, whose overall relevance based on its characteristics is K*j*<1, will result from:

$$Vmj = (V\max * Kj).$$

Since the process adopts a practical approach in defining the influence of single characteristics on price, some authors believe it merely allows to "verify the market value of residential buildings obtained with another process, since this is not sufficient, given its approximation, to accurately determine the value"(Forte, 1979).

Nevertheless, the conceptual rigour of this method is quite evident (price as a function of "n" characteristics), as well as its potential application in case it should be supported by accurate market survey. The more the coefficients referring to the characteristics influencing the value were determined with utmost reliability and accuracy, the higher would be the objectiveness of the process.

Indirect valuation method

If it should not be possible to adopt direct valuation methods because of the inexistence of a market, or the inability to know the operation of for lacking or insufficient basic historical data, assuming comparison as the only valuation method, other economic values must be chosen (through a pre-emptive and quite necessary market survey) having different nature than those being the subject of valuation. Once suitable processed, such new values shall allow to valuate the asset indirectly.

The indirect approach to valuation develops through:

- Income capitalisation for the asset, that is as a function of its ordinary propensity to produce an income;
- The development value in case, for instance, of development areas or more generally, of real properties suitable to be developed, whose market value may be expressed as a function of its development potential;
- The substitution value criterion, adopted as a valuation method, for special properties that often lack a reference market; such criterion allows to valuate the market value as

the depreciated replacement cost of another asset that could substitute that being the subject of valuation.

Income capitalisation

Valuating the market value by means of income capitalisation for an asset is based on the assumption that, in a competition-based market, the assets that generate an income are worth as much as they generate. This introduces the equivalence between the sum of future ordinary income, discounted at the present, and the market value of the asset that will produce it.

The valuation is performed by discounting - at an appropriated rate - future, ordinary, constant and unlimited *Rn* income levels deployed by the real property, through the expression:

$$V = Rn / r$$

Where *r* is the net capitalisation rate, which stands as the economic rate in terms of investment yield or real estate capital.

In order to state that the expression of the capitalisation value coincides with the most likely market value of an asset, one must admit to the equivalence between the latter and the sum of its discounted future net income, and the following conditions must be met:

- Net income and rate are those ordinarily expressed in the market;
- Income must be immediate, constant, yearly, postponed and unlimited;
- The rate must be constant.

By detecting current gross profitability in the lease market, consistently with the principle of stability of condition, the future ordinary profitability may be derived. Net income is derived from gross income less the operating expenses incurred by the owner, usually expressed as a percentage of gross income, namely:

- Maintenance;
- Services;
- Vacancy and collection loss;
- Insurance;
- Replacement allowance;
- Administration;
- Tax.

The capitalisation rate may be given directly by the market by comparing the income and price of similar assets; if, then, it is possible to scale the known rates and include the asset to be valued in the higher analogy step, the rate is determined more consistently with the indications provided through the valuation method.

In practical terms, though, since the rate may not be frequently calculated directly, an indirect valuation is in order, by surveying the market and analysing the different circumstances that have a quantitative influence on it. It is assumed that real estate investment rate in urban settings may vary within a maximum and minimum limit and that such variation be determined by a number of "ascending and descending influences" acting on the average rate. By attributing a given cents of a point to each influence, based on market indication, first of all the existence of such influences should be verified for the asset subject to valuation; by adding or subtracting them from the average rate, we may determine the specific capitalisation rate for the asset subject to valuation.

Development value as a method

Estimating the market value of a real property as development value, means to set the theoretical price an ordinary entrepreneur would be willing to pay to purchase it, with the purpose of completing an ordinary development and sell the developed product. The price is measured as the actualised difference between expected revenues and development costs through an analysis to be performed in line with the principle of permanence of conditions.

Such process is applied mostly to land and site valuation, considering the urban area as a production asset from which, by investing a sum equal to the development cost, the real estate product may be obtained. The development cost also includes the existence of profit for the entrepreneur, described both as the consideration for the economic risk as well as an incentive; for the valuation, one may refer to the profit of an "ordinary" construction entrepreneur.

The most likely market value of a development land, then, stems from the market value of the completed development, less the development cost including interest and "normal" profit, discounted at the present according to the development term, as expressed in the following formula:

$$Va = [Vm–(Ku+ Kc+ P)]/q^n$$

Where:

Va is the market value of the development land;

Vm, is the market value of the completed development;

Ku, are permit fees;

Kc, is the general development cost including the profit of the contractor;

P, Profit of the producer/entrepreneur;

$q = (1 + r)$;

r, Industrial capital yield rate;

n, number of years between the valuation and the real property becoming profitable.

This value represents the upper economic convenience limit beyond which the entrepreneur will not profit from purchasing the land.

Depreciated replacement cost method

The cost of replacement of a real property is defined as the current cost hypothetically necessary to produce a property having the same use. This cost has no relation whatsoever with the historic asset cost of the asset to be valued, given that construction technology and product quality are different for existing and theoretically reproduced real properties.

"The replacement cost of a property must be defined as the cost that should be currently paid to produce a similar property in terms of location and useful inner space, though with contemporary building techniques, technology and finishing solutions and reference to current prices. Such cost must factor in the current value of the land, assuming the built area as development land within the limits of the historically built volumes"(Forte, 1979).

Then, the depreciated cost of a property is its replacement cost decreased by the cost required to make a technically and economically old and obsolete property, similar to that whose reconstruction is under review.

As an alternative to the replacement cost, it is also possible to define also the "physical reconstruction cost" as "the cost that should be paid if, once the property has been built, current costs should still apply"(Forte, 1979). In such case, the depreciation should bear in mind of age only.

As concerns the determination of the depreciation, it equals the sums of the amortisation levels, suitable cumulated, which, at the end of the asset life, shall equal the cost of property reconstruction; all in all, this represents the cost required to bring the property back to its static, building standard and functional efficiency conditions of the property reproduced under the current techniques.

Regarding the portion attributable to age and physical deterioration, it should be stated that in general the decrease in value is not a constant percentage being the function of the property age, but it's lower in the early years and higher towards the end of the physical life.

Depreciation due to technology and functional obsolescence factors in the cost of the works required to guarantee the adaptation of the building to higher building standards.

In traditional literature, the depreciation valuation is based on depreciation coefficients derived from market analyses, often summarised in curves and mathematical formulas.[1]

[1] *For the determination of physical depreciation, the formula offered by the European Accounting Association may apply:*

$$D = [(A+20)^2 /140] - 2,86$$

Where A stands as the age of the building in percentage over the number of total building life years (Forte, 1979).

3.2.2. INTERNATIONAL VALUATION METHODS

At international level, several different approaches may be singled out in terms of real estate market valuation, which may be traced back to two main contexts:

- A European context, displaying several common traits with the Italian methods and seeing the British valuation approach as the most advanced in the continent; these methods are also used for the valuation process in Africa and Oceania;
- A North American approach referring to the method used in the United States; though it emanates from the British tradition, from the second half of the last century the US culture started developing its own traits in terms of method.

In the United Kingdom, there exist five traditional valuation methods:

1. *Comparative method*, based on a comparison between the asset to be valued and similar assets having known price;
2. *Investment/income method*, used for real properties that produce income. This method determines the value of the property by applying a market-derived capitalisation rate to the passing income;
3. *Accounts/profits method*, based on capitalisation of the amount that may be paid as lease of the asset, determined as the portion of the net profit of the business performed in the asset to be valued;
4. *Development/residual method*, used for goods to be developed or redeveloped as well as development lands;
5. *Contractor's/cost method*, allowing to determine the market value based on the cost of production of assets producing the same utility.

Though with small applicative differences, the processes used in France may also be traced back to the British methods:

- *méthodes par comparaison directe (*or *méthodes par le marché) ;*
- *méthodes par le revenu ;*
- *méthodes "professionnelles" ;*
- *méthodes par le coût de remplacement ;*
- *methodes de "bilan-promoteur"* or *de récupération foncière.*

The major United States manuals refer to three “approaches to value”:

1. *Sales Comparison Approach*, comparing the subject and other similar properties of known price;
2. *Income capitalization approach*, that is, a number of methods, techniques and mathematical processes used to analyse the ability of a real property to generate benefits, from which the current market value may be derived. The ICA provides for two basic methods: direct capitalisation, referring to yearly income to value an asset, and yield capitalization, considering a number of cash flows, spread over time, including the final reversion of the asset;
3. *Cost Approach*, considering the real property value as the sum of land value and the cost replacement of the building, net of physical deterioration, functional obsolescence and external obsolescence, if any.

As opposed to the European tradition, in the United States, the *Profits method* and the *Residual method* are not considered independent methods. This does not mean that the issues such methods refer to are not considered in the US methods: indeed, they are considered as special instances in the *Income capitalisation approach* family.

One further difference is the distinction, in the *Income capitalization approach*, between *direct capitalization* (similar to European income-based criteria) and *yield capitalization*. The latter stems from a financial analysis of the investments and is missing in the traditional European valuation school, which only recently has began to include it among the real estate valuation methods.

Table 1 shows the comparative and synthetic table of the considered international methods.

USA	UNITED KINDOM	FRANCE	ITALY
Sales Comparison Approach	Comparative Method	Méthodes par comparaison directe	Direct methods
Income Capitalization Approach	Investment/Income Method	? Méthodes par le revenu	Income Capitalization
	Profits Method	? Méthodes "professionnelles"	
Cost Approach	Cost Method	? Méthodes par le coût de remplacement	Depreciated replacement cost
	Residual Method	?Methodes de "bilan-promoteur"	Development value

Table 1. Comparative and synthetic table of international valuation methods

In the following description of the valuation processes, reference is made to the US methods of *Sales Comparison Approach*, *Income capitalization approach* and *Cost approach*, as well as the British method regarding the *Profits Approach* and the *Residual Approach.*

A. Sales Comparison Approach

In the Sales Comparison Approach (SCA), the valuer expresses an opinion of value by analysing concluded sale transactions, listings or pending sales regarding assets being similar to the asset to be valued (*subject*).

The market value estimate is supported by the analysis of the market behaviour for comparable and competing assets. The comparative analysis basically detects analogies and differences that may affect the value of the asset, which may include, among others, differences in the ownership structure, financial issues, market conditions and physical properties. The true incidence on the market of the elements of comparison is tested through such techniques that allow to identify which characteristics produce a variation in the value.

Condition of applicability

The SCA is applicable to any type of real property when there is a sufficient number of recent and reliable transactions to indicate the behaviour or the value trend in the market. For real properties regularly bought and sold, such approach provides a reliable indication as to market value. When the data are available, it stands as the simplest and clearest valuation method. Even though the valuer cannot always detect and quantify the differences among the factors influencing the value, it is possible to analyse the comparables in order to substantiate the conclusions reached by applying the other approaches.

Procedure

In order to apply the SCA, the valuer follows a process that breaks down as follows:

1. Research a competitive market from which information can be derived regarding assets similar to the subject, either sold recently or in the process of being sold. The goal is to find a set of comparables as similar as possible to the subject, in order to ensure they reflect the actions of similar purchasers.
2. Verify the information to confirm the accuracy of the sources and their suitability to represent the ordinary market conditions.
3. Selection of the most relevant comparison units in the market (price per m^3, per m^2, per linear metre) and comparative analysis for each unit.

4. Look for the differences between comparable and subject using all suitable elements of comparison; then adjustment of the prices for each comparable, based on the difference from the subject, or elimination of the asset from the comparable list.
5. Reconciliation of different values produced by the comparable analysis in a value interval and, finally, indication of a single value indication.

After collecting and verifying the data, the systematic analysis begins. The choice of the comparison unit depends on the type of property and the valuation issue at hand.

The use of comparison units is instrumental to facilitating the comparison between the comparables and the subject. The choice of the most appropriate unit should derive from the analysis of the selected assets in order to single out the most significant one.

In theory, if all comparables were identical to the subject, there would be no need for adjustments. This being almost impossible, it is required to adjust every single comparable. After having selected and confirmed the data, it is useful to organise them into a market data grid. Any difference between the comparables and the subject influencing the value of the asset is considered an element of comparison. Every element is assigned a line on the matrix and the prices of every comparable are adjusted to reflect the value of such differences. The matrix sums up the logical process of the buyer in the market, quantifies the impact of some characteristics on the value and is instrumental to communicate clearly and efficiently the process used by the valuer.

The elements of comparison are the characteristics of the real properties that help to explain the variations in the price of an asset. They are determined through a market research and are supported by the market evidence.

The basic elements of comparison that may be used in the SCA are:

– Transactional adjustments: real property rights conveyed, financial terms, condition of sale, expenditure incurred after the transaction, market conditions;
– Property adjustments: location; physical characteristics; economic characteristics; use; non realty components of value.

Other possible elements may regard administrative standards and constraints; often the key elements are divided into subsets that analyse single characteristics more in detail. There is no limit to the number of elements that may be used, though care must always be used not to resort to multiple adjustments for the same factor, which is quite a common mistake.

The sale price reflects different elements that affect the value of a real property with varying intensity. In order to estimate the relative incidence of such factors, the techniques used are quantitative and qualitative. In order to derive quantitative adjustments, the processes used are mathematical; when no sufficient amount of data is available to support quantitative adjustments, the valuer analyses qualitative relations using mathematical models to detect the market trend. Only when market data are not sufficient is it possible to resort to direct or relative comparison.

Quantitative adjustments are expressed in terms of monetary amount or percentage. Non-quantifiable factors are deal with through a qualitative analysis (see table 2).

Quantitative analysis	**Qualitative analysis**
Paired data analysis	Trend analysis
Grouped data analysis	Relative comparison analysis
Secondary data analysis	Ranking analysis
Statistical analysis	
Cost analysis	
Capitalization of income differences	

Table 2. Techniques used for adjustments

The qualitative analysis allows to agree which comparable is higher, equal or lower than the subject for a specific element of comparison. The adjusted prices in the lower and higher groups are the boundaries of the theoretical range of values of the subject, whence the valuer may come to a single final valuation value.

The techniques used to quantify comparable price adjustments are:

a. Data analysis techniques

Paired data analysis is based on the assumption that when two properties are similar in all aspects but one, the value of that difference may be measured through the price difference of the two assets.

A similar technique, called *grouped data analysis*, considers a group of data joined by an independent variable and computes its equivalent typical value. The grouped data are analysed in couples in order to identify the effect on the dependent variable (sale price).

Even though *Paired data analysis* is theoretically sound method, it may be impracticable when there is a narrow sample of sufficiently similar assets. The adjustment deriving from a single couple of data is not necessarily indicative, in that a single transaction does not necessarily represent market value.

A third form of analysis, called *secondary data analysis*, is used for adjustments derived from other methods.

b. Statistical analysis

In order to calculate the adjustments, sometimes, it is possible to resort to statistical processes. In applying the statistical analysis, the valuer must take care not to valuate a result that is correct from a mathematical standpoint but meaningless from a logical perspective or inappropriate for the valuation at hand. As for the other adjustment techniques, the statistical analysis must reflect the mental process and the conclusions of market operators if it wants to stand as a useful and persuasive valuation tool.

As an example of common application, the valuer may value a number of adjustments factors of varying magnitude and create a linear regression model; using the results, the extent of the adjustment may be derived for the real properties that fall in the interval.

Scenario analysis is a model where the result of a future event is foreseen by testing the probability or the correlation of alternative results. Within the adjustment process, alternative scenarios may be created in order to value the influence of variation in various elements of comparison on the price of the asset.

c. Cost-related adjustments

Adjustments are based on cost indicators, such as depreciated building cost, maintenance cost, permit fees. The valuer must also be able to give market support to such adjustments, in that not always are cost and market value correlated. The cost for an improvement does not always correspond to an identical value increase.

d. Capitalisation of income variation

Net income difference capitalisation may be used when there is a variation in the income between two comparables in the light of the lack (or the presence) of a specific characteristic.

The qualitative analysis acknowledges the efficiency of the real estate market and the difficulty in expressing adjustments with mathematical precision. Nevertheless, it is necessary to explain the analytic and logical process applied to estimate the correct values using the qualitative analysis techniques, such as:

- *Trend analysis*. Applicable when a large number of data regarding assets not entirely similar to the subject are available while little data exist on perfectly comparable assets.
- *Relative comparison analysis*. Considers the relations among market data without recourse to quantification. Many valuers use this technique in that it reflects the imperfect nature of the real estate market. The comparables are analysed to determine whether their characteristics are lower, equal or higher that those of the subject.
- *Ranking analysis*. Used to arrange the comparables based on the differences in some characteristics. The comparables are arranged (in ascending or descending order) based on the general comparison or other characteristics according to their desirability in the market; each is analysed to verify its relative position in relation with the subject.

RECONCILIATION

Reconciliation is necessary because different transactions will be analysed that may lead to different conclusions. The adjusted comparable price shall be reconciled in a range of values or in a single value indication. From time to time one may assess which comparable has higher or lower weight. For instance, for some real properties location is the most important element of comparison of all, hence the comparables requiring the least adjustment for location must have more weight in reconciliation. If there are comparables that require minor gross adjustments, these will surely be attributed higher reliability in valuing the subject.

Even when enough data are available, the adjustment process and the ensuing final valuation opinion reflect the valuer’s decision. For this reason adjusted data should support, rather than control, the valuer’s final valuation opinion.

B. Income Capitalization Approach

The properties that produce income are generally purchased as investments and, for the investor earning power represents the key element influencing the value of an asset. A basic investment principle is that, at the same level of risk, the higher the return, the higher the value of an asset. Those who purchase real properties generating income, advances an amount of money with the perspective of having a return in time. The income capitalization approach consists of several methods, techniques and mathematical processes used to analyse the ability of real property to generate benefits from which current market value may be derived.

Any property generating income may be valued using the Income approach. It may be used to simulate the investor's behaviour. Those who invest in big office buildings with several tenants, may project future cash flows based on each single lease contract, consider the impact of lease renewals and the sale value of the asset at the end of the expected investment period; in this case the value of the asset may be valued by using the *discounted cash flow analysis.*

Procedure

The ICA provides for two basic methods: *direct capitalisation*, having reference to a single year's income to estimate the value of an asset, and *yield capitalization,* considering a series of cash flows, distributed over time, including the final sale value of the asset.

At the beginning both methods call for an accurate analysis of income and expenses involving the subject. This analysis is matched with another on costs and revenues usually observed in similar assets. A comprehensive report is produced regarding the operational characteristics of the asset.

Yield capitalization will require the projection of likely revenues and likely expenses throughout the projection period; moreover, it will be necessary to value the final sale value of the asset (reversion). *Direct capitalization,* in turn, requires an estimate of the cash flow for a single year (the valuation date and 12 months thereafter) and the application of an overall capitalisation rate. This method refers to the transaction of assets having the same "productive" features as the subject.

Even though there are different income capitalisation techniques, some key passages are common to all of them. Before applying the different techniques, it is necessary to use

potential gross income to derive the net operating income (NOI). To do so, it is necessary to:

1. Search the income and expense data for the subject and its comparables;
2. Estimate the potential gross income of the subject by adding the rental income with any other potential income;
3. Estimate the value of vacancies and collection loss;
4. Estimate the effective gross income by taking vacancies and collection loss from the potential gross income;
5. Estimate the overall operating expenses of the asset by adding fixed costs, variable costs and, if any, replacement allowance;
6. Derive the net operating income (NOI) by taking operating costs from the effective gross income (in the case of discounted cash flow analysis, it may be necessary to estimate financial charges, too);
7. Apply a capitalisation technique to estimate the market value of the asset.

A rational investor would seek overall return being higher or at least equal to the invested capital. The return expected by the investor consists of two components: full coverage of the invested capital (return of capital); a premium for risk taking (return on the invested capital).

Since in the real estate industry return may take different forms, different rates are used in the capitalisation process. One may distinguish between *income rates* (yearly income to value ratio) or *discounted rates*.

The *discount rate* is used to convert the cash flow over time into current value. Current value will always be lower than future value (hence, “discounted”). The *income rate* results from the ratio between the value of an asset and the yearly income. The *discount rate*, in turn, applies to a number of yearly incomes in order to produce a current value, and is computed with the same method as the internal return rate.

When applying a capitalisation rate or discount rate, income conversion into market value should reflect a yearly return rate that the market recognises as necessary to attract investment capital.

Since the return rates used in the ICA represent provisional, not historic, rates, risk perception and purchase power variation are particularly important. Usually higher capitalisation rates are correlated with less attractive assets (and vice versa).

DIRECT CAPITALIZATION

Direct capitalisation is the method used in the ICA to convert the expected income for a single year within a market value indication. Such conversion is instrumental to the estimated income for an adequate capitalisation rate (*income rate*), which may also be multiplied by a factor (*income factor*).

This method is widely used with full capacity real properties, operating steadily, or when there is extensive offer or similar assets in terms of risk level, income, expenses, intrinsic and extrinsic characteristics and future expectations. This is less used when it comes to properties leased for the first time or when one expects that there will be significant variations in revenues and expenses. The advantages of direct capitalisation consist of its ease of use and the simple way in which it can be explained. It expresses market behaviours and, when it is suitable supported by data, it is highly efficient.

As opposed to yield capitalization, it does not consider any variations that may arise in time.

a. Estimating the Overall Capitalization Rate

The rate may be estimated using different techniques, depending on the quality and quantity of available data. The generally accepted techniques are:

1. Derivation from comparable sales;
2. Derivation from the effective gross income multiplier and the net income ratio;
3. Band of investment – mortgage and equity components;
4. Band of investment – land and building components;
5. Debt coverage formula;
6. Yield capitalisation techniques such as *general yield and change* (R = yield – change in income and value) and the Ellwood method.

b. Gross Income Multiplier (GIM) and Gross Rent Multiplier

These methods are used to analyse the income capacity of the real property. The effective or potential gross income may be converted into value by using the multiplier. This method is closely related to direct capitalisation, since the multiplier is the opposite of capitalisation rate.

In order to estimate the GIM through transaction data, leased properties or properties expected to be leased must be available at the moment of the sale. The sale price to gross yearly income ratio is the GIM.

YIELD CAPITALIZATION

Yield capitalization is the most complex method of the two used in the ICA. There are different techniques to convert a number of future cash flows into market value indication.

The conversion takes place by using a discount rate (*yield rate*). In order to select an appropriate discount rate, the returns expected by institutional investors are analysed, reference is made to transaction data, or both. When the investment value is required, the discount rate should reflect the requests from single investors, which may be different from those of ordinary investors in the market.

In order to perform yield capitalization, the valuer:

- Assumes an appropriate projection period;
- Forecast the future cash flows, including the reversion;
- Selects an appropriate yield rate;
- Converts future benefits into present value by discounting the yearly cash flows or determining an overall rate reflecting the income pattern, the possible variation in value and the yield rate by using one of various yield capitalization formulas.

The yield capitalization procedures are: application of a capitalisation rate reflecting the yield rate, the use of present value factors and the *discounted cash flow analysis.* In order to compute the overall capitalisation rate it is possible to use mortgage-equity, yield rate or value change formulas.

DCF specifies quantity, variability, time and duration of the cash flows. Each and every cash flow is discounted to present values and the total addition allows to estimate the market value of the subject. Reversion, too, is expected at the end of the investment and discounted to present values.

There are a large number of formulas to evaluate constant annuities and increasing or decreasing annuities. The benefits of such formulas are two:

1. They may be used as shortcuts in the process, even though they may be more difficult to justify;
2. They provide a systematic method to value the interaction between current value, future value and cash flows in a single method.

In spite of the use of financial tables or IT tools, the opinion on value must always reflect the opinion expressed by the valuer based on the appropriate analysis of the asset and the data derived from the market.

a. Estimating the yield rate

In order to select an appropriate yield rate, it is necessary to verify and interpret the behaviours and expectations of market operators (purchasers, sellers, consultants, intermediaries). Even though the actual rate, or IRR, may not be computed before the investment is finalised, the investor may indicate a target yield. Historical yield rates derived from similar sales may be important, but they represent the past and not the thought of current investors. Therefore it is necessary to make reference to expected return rates for similar investments, by means of surveys or based on offer data.

The valuer narrows down the rate range and selects one that keeps into account the physical, economic, financial and risk characteristics of the subject as well as the alternative use of the capital. In some cases the estimated rate may be higher or lower than the selected range. The final estimate requires the opinion of the valuer.

Generally, the investor expects a return that represents the time value of money with an appropriate adjustment based on perceived risk. The minimum rate of return of an investment is often referred to as no risk rate (*safe, riskless o relatively riskless rate)*, relating to no risk investments (banking or government bond returns). In theory, the difference between the return of an investment and the no risk rate should be the premium for risk, for illiquidity or other assumptions made by the investor. It is possible to single out four key components in a discount rate: 1) no risk rate; 2) illiquidity risk; 3) management risk; 4) various risks.

b. Estimating the reversion

There are different ways to estimate the sale price of an asset at the end of an investment. It is possible to apply an income capitalisation rate on the year following the end of the investment. In this case the rate is defined as *terminal, going-out* or *residual cap rate* (R_N), and it is different from the *going-in cap rate,* which is the rate derived by dividing the NOI for the first year following the sale by the present property value. The *going out* rate is usually higher than the *going-in rate*.

The rate must express any depreciation based on the residual useful life of the asset, as well as the higher risk correlated with the estimate of the NOI at the end of the investment.

Based on market trends, it is possible to value the future trends of real estate values and estimate the variation of the reversion, also with the support of computers and statistical simulation software programmes.

c. Discounted Cash Flow (DCF) analysis

DCF may be used to estimate the current value and to derive the yield rate from the comparables. The use of detailed IT spreadsheets is required. The spreadsheets report the cost, revenue and cash flow items divided by year, or month, throughout the projection period of the investment. The cash flows, including the reversion, are later discounted at a rate to obtain the estimate of the current value of the asset. Thus the valuer may keep account of all cash flows, either internal or external to the asset, and assesses the distribution in time, bearing in mind of the monetary value of the moment.

Detractors stress on the fact that projections unsupported by market feedbacks may produce an unreal market value and that the results are extremely sensitive to tiny variations in the expected data. Others point at the fact that financial projections made for 5 or 10 years are subject to a high degree of uncertainty. In any case, all investors make projections and use DCF models, mostly when it comes to large-sized properties with different tenants, such as malls and office buildings, or assets with unsteady incomes.

In any case, it is necessary to distinguish between mathematical and valuation processes. Any form of capitalisation is useless without a correct and reliable estimate of net income. Moreover, the yield rate must be a market discount rate correlating net income over time with market value. Even if the application is made easier by computers, the valuer is not exempt from understanding the meaning of what the computer is processing.

In making projections, the valuer uses the same processes used by the investor in its decisions. Usually it is necessary to include income, possible vacancies, investment costs and management costs, spreading them by the risk capital for the period of ownership of the asset (from 5 to 15 years) and the residual asset value. Market-based projections are the founding element of valuation and must be carried out upon diligent research and accurate review.

C. Cost Approach

The cost approach is theoretically based on breaking down the property into two components: land and building. Such separation is important, because it poses a number of questions that are not found in the other approaches, where land is not separated from the building.

As in the other processes, cost approach, too, is based on market comparisons. The valuer analyses the cost of subject improvements by comparing the cost to produce the same improvements through the cost of construction of substitute assets having the same use as the subject. The estimate of development costs is adjusted by depreciation caused by the age, state of conservation, use and location issues. The land value is therefore added based on the transaction data for similar assets. The sum of the two values is further adjusted based on the real rights of the asset. The cost approach reflects the market attitude, in that its operators recognise a relation between cost and market value. Purchasers tend to value an existing building not only based on prices and leases of similar properties, but also by comparing the cost required to build a new, similar building in perfect state of conservation and functional use. Moreover, they adjust the price they are willing to pay by estimating the costs required to bring an existing property at the level of physical conditions and use they desire.

In order to apply the cost approach, it is necessary to sense how the market perceives the difference between an existing building and another with optimal use (ideal building).

Applicability

In any market the value of a property may be correlated with its cost. Such approach is particularly important when the SCA cannot apply in condition of the lack of an active market or when the subject may not be easily valued through the ICA. Since the cost to market value ratio is smaller when the building is new, the cost approach should be used mostly for new or fairly recent properties. The approach yields good results when the value of the land is well documented, the buildings are new or little depreciated and approximate the ideal state, which represents the *highest and best use* in the area. It may also be used for heritage buildings if suitable depreciation data are available.

The cost approach allows to estimate the market value and is frequently used for buildings for special use or other goods that are not frequently traded in the market, such as public assets. Since this approach requires the separate valuation of the land and the

building, it is also useful in the valuation process for insurance purposes, where it is necessary to separate insurable from non-insurable parts.

Procedure

Upon collecting the main information and analysing data for the market area, site and improvements, the valuer goes through a number of steps to derive a value indication:

1. Estimate the value of the site as though vacant and available to be developed according to its *highest and best use*;
2. Select the suitable type of cost basis: reproduction cost or replacement cost;
3. Estimate direct costs (hard) and indirect costs (soft) of the improvements at the date of the valuation;
4. Estimate an appropriate entrepreneurial profit or incentive through market analysis;
5. Sum of the three items above to estimate total cost of improvements;
6. Depreciation estimate and, if necessary, breakdown into the three major categories:
    a. Physical deterioration;
    b. Functional obsolescence;
    c. External obsolescence;
7. Estimate the depreciated cost, by subtracting depreciation from the cost of improvements;
8. Estimate of the *contributory value* of any site improvement that have not yet been considered;
9. Sum the site value to the total depreciated cost in order to come to a value;
10. Conclusive adjustment, if any, in case of movable goods (furnishing, finishing and equipment) or intangible assets that should be included in the valuation or, finally, if the asset is not a simple fee property.

COST ESTIMATE

As regards cost estimate, it is necessary to make a distinction between:

– *Reproduction cost*, corresponding to the estimated cost required to build, at prices applicable at the time of the valuation, the exact duplicate of the subject, insofar as possible, using the same materials, construction standards, finishing and workmanship quality, including all the deficiencies, the super-adequacies and the obsolescence of the subject;

– *Replacement cost*, that is, the cost needed to build, still at prices applicable at the time of the valuation, a substitute building of the subject using contemporary materials, techniques and finishing.

The decision regarding which of the two costs to use depends on the age of the building, its rarity and any difference existing between the use of the asset at the time it was built and its current highest and best use.

In order to estimate the costs of an entire building, direct costs (hard) and indirect costs (soft) must be considered.

Direct restructuring costs include material and labor and, obviously, the contractor's profit. Overhead costs and the profit of general contractor are agreed upon in the contract agreement and, as such, are direct costs. In particularly complex projects, involving many different subjects, a management fee may be required. Indirect costs are expenses and costs necessary for the construction but excluded in the contract agreement.

The estimate of the construction cost may be performed by using one of three traditional techniques:

1. Comparative-unit method

   Method used to estimate costs in terms of money per unit of area or volume, based on known costs of similar buildings, adjusted according to time and physical differences.

2. Unit-in-place method

   Detects the unit costs of different building components and applies them to different sub-components of the building and their quantity (in the appropriate measurement scale). It is used for standard technology components (foundations, excavations, flooring, internal partitions, roofing).

3. Quantity survey method

   The most accurate method indicates the quantity and quality of all material used in the construction of a building and all the necessary works categories. By applying unit costs to such items, one may get to estimate the overall cost. To these the developer adds a margin for unexpected events, overhead costs and profit.

ENTREPRENEURIAL PROFIT

The entrepreneurs (developers, contractors, investors and others) compete against one another in the real estate market, and every building project generates an economic

premium (other than direct and indirect costs) that is sufficient for an entrepreneur to take the risk associated with a specific project in a specific market.

As it derives from the market, its estimate is more correct, the more accurate the data available in the market. Profit estimate is a key component in the total cost and many markets have an average profit range that may be determined with market researches, through surveys with entrepreneurs or other market operators. The profit range varies based on the type of real property and the nature or scale of the project. It may be higher where there is need for more creativity, there is higher risk or unique conditions. Ordinary and less risky projects may be attributed a lower profit.

DEPRECIATION ESTIMATE

Depreciation is the difference between the contributory value (incidence on market value) of an improvement and the cost at the time of the appraisal.

By estimating the depreciation and subtracting it from the cost of replacement or reproduction, it is possible to obtain the depreciated cost of the improvement.

Depreciation results from three main causes that may act either separately or jointly:

1. Physical deterioration – due to use, damage or the impact of the elements;
2. Functional obsolescence – flaw in the structure, material or distribution, decreasing function, use and value of the building;
3. External obsolescence – a temporary or permanent reduction in the profitability or salability due to external negative influences on the property (possibly due to adverse market conditions; given its immovable nature, the property is subject to environmental effects that may not be controlled by the owner).

The addition of these components represents total depreciation. Depreciation is always the product of the market and in taken from the current cost in order to come to the depreciated cost. The sum of the depreciated cost and the value of the land gives the market value of the asset.

Different methods may be used to estimate depreciation. The method should reflect the behaviour a purchaser would have in purchasing an asset in that specific state of conservation. The main goal of depreciation analysis is to identify all forms of depreciation the market recognises and value each of them individually.

The three main methods used in depreciation estimate are:

– The *market extraction* method;
– The *asset economic age-life* method;

– The *breakdown* method.

a. Market Extraction method

The application of such method depends on the possibility to source similar assets from whom to derive depreciation. It uses direct comparison with sale transactions. Even though it is conceptually simple, it is applicable only in the presence of a sufficiently high amount of data. The fact of considering all factors from which depreciation depends (physical, functional and economic) into one calculation may lead to think of excessive simplification. It is necessary, though, for the comparables to have similar features to the subject also in relation with the depreciation.

b. Economic Age-Life method

The estimate refers to the principle of so-called “effective age” and “expected economic life”. Total depreciation is estimated by computing the ratio of the effective age of the building to its expected economic life and applying this ratio to the total cost of the building. Even though the method is not accurate, it is one of the simplest. Even though this is the simplest to apply, it features a number of limitations. First of all, it assumes that depreciation is linear, while a linear trend is nothing but an approximation of true depreciation trends. Second of all, it does not break down the depreciation into different categories. In markets where the types of depreciation of similar assets are different from those of the subject, the method is not justifiable.

c. Breakdown Method

This is the most comprehensive and analytical method to measure depreciation, in that it breaks down total depreciation in its main components:

– Physical deterioration;
– Functional obsolescence;
– Economic obsolescence.

The process is cumulative; hence in every phase of the depreciation it starts from the depreciation estimated in the previous phase.

D. Profits Approach

Some types of investments (such as hippodromes, theme parks, ski slopes and casinos) are so unique that the comparative process cannot apply. In such cases, what is on sale is the main activity taking place on site. Visitors pay to take part in events or leisurely activities and their value is strictly dependent from the takings. Moreover, even though they do not stand out as monopolies, public residences, gas stations, restaurants, leisure facilities and similar activities are difficult to value by comparison, therefore the preferred method is called *profits approach*.

The method used is essentially suited to those types of properties being quite unique or monopolies that may be valued by reference to profits. It is used when it is no longer possible to find similar properties and transactions to use as comparison.

It is considered as more reliable than the *cost approach*, at least for these sorts of properties, especially when the profit may be identified quite easily.

Procedure

The approach consists of considering final accounting or other accounting information in order to estimate gross and net profits. Then, some reductions are applied in order to account for the interest of the capital employed by the tenant in terms of asset and entrepreneurial capacity (risk premium). The remaining amount (called *divisible balance*) is later considered as available for fair distribution between the business trader and the owner of the property. The balance is often divided into equal shares. It is necessary to keep track of a fair premium for the tenant of the activity and the owner's contribution in providing the real property. The valuation should rest upon reliable data regarding the business' financial statement, in order to allow the easy split of the amount between the two parties.

Where possible, the valuer uses recent accounting data regarding proceeds and expenses in order to derive the gross and net profit. A good current practice consists of making reference to the accounts for the last three years of business. Analysing a number of accounting years may increase the reliability of the estimate on investment solidity as compared with a single financial year, which may not be representative. There may also be cases, though, where it is not possible to refer to data from previous years. In order to come to a reliable value cannot do without verified and certified accounting data.

The divisible balance results from the difference between net profit, financial charges and suitable remuneration for capital allocation by the tenant (based on the interest rate).

It represents the amount available to compensate the tenant company and the owner of the property. Often the two shares are split equally; other times, when the value depends mostly from the activity, it may be assigned by 60 to the tenant.

Once the divisible balance that may be used as yearly rent has been computed, a suitable capitalisation rate is singled out based on market assets being similar in terms of production characteristics and business volume, to apply to the income when valuing the market value of the property.

Applicability

The method is used in cases where the use of other approaches would not lead to any satisfactory results. There may be five situations in which it could be necessary to apply such method to estimate the rental value or market value:

1. Property valuation (to include in the financial account for properties used for business activities);
2. Estimates for non-domestic rates;
3. Hotels and gas stations: hotels operate mostly by seeking uniqueness, which may derive from the location, quality of the provided services or environmental quality of the site; a good valuer must know how to classify a hotel and apply adjustments based on such characteristics;
4. Valuation of compensation on compulsory purchase, when this should also cause a damage to the business activity carried out in that property, bearing in mind of any cost of transfer and loss of business;
5. On sale as a going concern.

In such cases the valuer must be able to access financial accounting for the business subject to valuation. A potential purchaser may highlight that current profit could be improved thanks to better business management. Such issues may be considered during the bargaining phase. There may also be some good reasons why the current owner did not implement better business management systems. The potential purchaser will also take the risk of the failure, if any, correlated to new ideas or new management strategies.

E. Residual Approach

Comparative and income capitalization methods are appropriate when recent sale and transaction data are available. There are cases, though, when it is necessary to value plots undeveloped land or still house obsolete buildings or buildings unfit for use, and that do not have the ability to produce economic use in the current conditions, or sites suitable for transformation or requalification. Passing rent considers the current state of the property or, at most, its state of conservation. It cannot be used to estimate the value of a land for redevelopment.

The market relates the value of a land with the level of profitability that may be derived from its redevelopment. When it is possible to find data on recent transactions regarding redevelopment lands having the same features, it is advisable to use ordinary processes. The chance of finding similar development lands, though, is very low.

Among the factors that affect the value of a development land there are: the geometrical shape of the land, the size, the access to nearby roads; the net development area as compared to the total site area, which may be subject to constraints, right of passage, planning conditions, location, which will be the key factor; urban indications and constraints; nature, features and size of the agreed development project, which may differ even though the intended use is the same, depending on the construction techniques and the architectural and technology choices made.

When sufficient information is available, the valuation is based on the estimation of the development on completion less the estimated development costs, including fees and finance costs.

Applicability and criticality

The limitations of this method have to do with the fact that the developed asset does not exist yet and everything is projected in the future: the building will be completed in two or three years; in the meantime the market may change, substantially influencing the market value. The same goes for the costs, which may vary in the following years. Therefore it is of utmost importance that the estimate be performed on absolutely reliable data.

The method is extensively used not only by valuers, but also by entrepreneurs and developers; in the simplest form, it is little more than a mental calculation, which is acceptable when the area is small and not too complex, when the valuer has experience in development cost estimation and can see a change for sale of the asset in the market, also

with reference to similar areas with known price. In the case of complex areas, the use is not indicated because of the poor level of sophistication in this method; this problem, though, may be corrected by resorting to statistical data and probabilistic cost, market value and finance costs estimate models.

Other critical issues have to do with the value of time, which may be resolved by using cash flow analysis models.

The result is very sensitive to small variations in computing the cost and market value on completion; as such, it requires detailed and thorough knowledge of the market.

It should be noted that the value of the land also represents the maximum bid the entrepreneur may make based on the derived input; other entrepreneurs may come to higher or lower values based on higher production efficiency. Thus one may say that the residual method provides the way to compute the investment worth rather than the market value, regarding an individual entrepreneur. The worth is the sum that the entrepreneur may afford to pay; market value, in turn, is the amount that should be paid normally.

Procedure

Once the highest possible amount of information has been collected, the valuer shall use them to estimate residual life. The estimate is based on the determination of the following items.

A. VALUE ON COMPLETION

The first step is the valuation of the gross development value, that is, the market value of the completed development. As it is assumed that the development will be sold on completion, the transaction costs must be deducted.

B. DEVELOPMENT COSTS

At the beginning, the investor shall considered whether it is viable or not to make a bid for the site. In this phase, it may not have the chance to indicate a detailed expense plan and have only provisional and summary data. The result of this estimate will allow to understand if there is an interest to purchase the land. The main cost items are listed below.

a. Construction costs

In this phase the valuer must be capable to provide a suitable estimate of the construction costs as well as the available funds, also because this item produces a chain effect on the other cost items (fees and finance costs). This phase requires experience, competence and a high amount of available information. The costs should also include such items and demolishing, requalification and site preparation, where they should be relevant.

b. Professional fees and charges and contingecies

Professional fees may account for up to 12-15% of the construction cost, depending on the complexity of the building. They must also be complemented with taxes, if any, and urban planning charges.

An allowance (usually estimated as percentage of the sum of construction costs and fees) must be considered as the sum available for any unexpected items. The percentage may be higher when the estimated costs are not certain.

c. Short-term finance

Short term finance is often necessary to purchase the land, develop it (construction costs, fees and incidental expenses) and exceed the vacancy (a period following the construction until the development is sold or refinanced).

If the amount is loaned, the interests for the period shall also be paid. Real estate investments are usually considered risky and the interest rate shall reflect the risk, the requested financing percentage on total costs, the quality of the initiative and the solidity of the applicant, as well as the chance of another sale to have already been finalised.

Even if the entrepreneur should invest exclusively own capital, interest should be considered, in this case as opportunity cost of the capital.

d. Advertising, marketing, agency fees and other costs

Promotion costs are not easy to foresee; another promotional campaign may be necessary, with an increase in costs, if the first session has not sold all the property.

The fees to be paid to the intermediaries dealing with the sale of completed assets increase the costs. Usually they represent a percentage of the sale value of the valued asset.

C. ENTREPRENEUR'S PROFIT

Entrepreneur's risk and profit may be registered as a cost item. It may be estimated as a percentage of the construction cost and market value of completed development. It is judged on the complexity of the operation, the volatility of the product and the risks correlated with the investments.

3.2.3. COMPARATIVE ANALYSIS OF VALUATION METHODS

Based on the definition of the internationally accepted valuation methods, one may notice that the Italian valuation school does not differ significantly from the international practise. More generally, most valuation approaches are also represented in the Italian methodology, as proven in the following table.

International appraisal methods	**Italian appraisal methods**
Sales Comparison Approach	Synthetic/single parameter method "*Punti di merito*" (quality points method)
Income Capitalization Approach *Direct Capitalization* *Yield capitalization*	Income capitalization
Profits Approach	
Cost Approach	Depreciated replacement cost method
Residual Approach	Development value

Table 3. Comparative table between Italian and international valuation methods

In line with the European valuation tradition, with which the Italian one displays the most analogies, the only process that has not correspondence is *yield capitalization*, in that is derives from financial valuation and not from appraisal tradition.

On the operating level, obviously, international methods display specific elements that are influenced by local conditions and hence are different from the Italian methods.

For each of the methods shown in the previous point, the analogies and main differences are analysed in the light of nationally accepted and consolidated methods.

Direct valuation methods and the Sales Comparison Approach

The Sales Comparison Approach (SCA*)*, in its basic version, may be traced back to our synthetic valuation method: both are based on the comparison between a subject asset and similar asset having known price. Real property data (or comparables), in both cases, are

represented by the prices of real estate transaction occurred recently in the reference market of the subject.

The SCA, as a general, though not necessary rule, considers a fairly broad number of comparables; the Italian single-parameter valuation, because of the problems of finding reliable and updated real estate data, must rest upon a limited amount of data; finally, in the "*punti di merito*" (quality points) method, reference is made to a single comparable, usually the asset having the highest price detected recently in the same market as the subject.

As for Italian methods, the SCA also accounts of the fact that real properties, given their nature, only rarely feature traits of perfect analogy; in order to get to estimate the most likely market value of the asset the comparables are adjusted, making them virtually equivalent to the subject.

Such adjustments are basically found also in the single parameter and "*punti di merito*" (quality points) methods. The definition of the value scale and the detection of the step featuring the most analogies with the subject are perfectly compatible with the qualitative adjustment operations that apply to the SCA (*ranking analysis* and *relative comparison analysis*); it should be said, though, that in the single-parameter valuation the element of comparison are not made explicit.

The "*punti di merito*" (quality points) method, in turn, is a multi-parameter method where the elements of comparison are represented by the characteristics that affect the price, similarly to the SCA. In the consolidated Italian practice, as opposed to the American one, the characteristics do not include those aspect regarding the ways in which the transaction has taken place (*transactional adjustments*), though this does not exclude that they could be considered. The assignment of points to the different characteristics is nothing but an adjustment of the price of comparables, based on percentage values.

As summed up in table 4, the main differences between the SCA and direct Italian methods are mostly based on the systematic use, in the former, of the adjustments (also quantitative) expressed in monetary terms. Thanks to the higher availability of real estate data, the British-American practice has a well-established recourse to adjustment techniques based on market analysis. Given the remarkable flexibility of the SCA, though, the recourse to qualitative techniques, in addition to the others, is not excluded for those characteristics for which it is not possible to turn to the market, or when data are not available.

	Sales Comparison Approach	Single parameter method	*Punti di merito* (quality points)
Comparables			
Single			**X**
Various	**X**	**X**	
Units and elements of comparison			
Single		**X**	
Multiple	**X**		**X**
Adjustments			
Yes	**X**	**X**	**X**
No	**X**	**X**	
Transactional	**X**		
Property	**X**		**X**
Quantitative	**X**		**X**
Qualitative	**X**	**X**	
Monetary	**X**		
Percent	**X**		**X**

Table 4. Comparison between synthetic methods and Sales Comparison Approach

Income capitalisation, Income Capitalization Approach and Profits Approach

The Income capitalization approach combines the set of valuation methodologies that are based on the equivalence between the economic benefits generated by an asset during its economic life and its market value.

The Italian income capitalisation method represents, at international level, the traditional capitalisation techniques and basically coincides with *direct capitalization*: that is, the assumption of constant, ordinary real property market income projected for a number of years tending to infinite. The market value may be valued as the ratio between a yearly income (net or gross) and a capitalisation rate or, through the product, between an income and a multiplier. Even though the recourse to a multiplier is less widespread in Italy, at least in the current professional practise, it is used in special contexts, as in the valuation for tax purposes or to calculate real estate taxes.

The difference with *direct capitalization* are limited to the capitalisation rate valuation method:

- In the Italian tradition, reference is made to rates derived directly from the market, by means of the ration between income and prices of similar assets, or at average rates from which to derive, by attributing percentage adjustments, the specific capitalisation rate of the real property;
- In the British-American practice, the capitalisation rate valuation techniques include, besides the direct reference to the market, also the recourse to additive models derived from finance.

Yield capitalization, in turn, is based on different assumption from those of income capitalisation:

- Annuities are limited;
- The incomes are not considered necessarily constant, but they may vary either regularly or irregularly (in the latter case, the method is referred to as Discounted Cash Flow analysis);
- While direct capitalisation is based on current income and market data, yield capitalization must consider future income and values based on a forecast;
- At the end of the investment the reversion must be considered, which represents the re-sale value of the asset in the market;
- The rate yield rate accounts for the risks correlated with real estate investment and is valued by making reference to future markets and incomes expected by the investors.

	Direct Capitalization	Yield Capitalization/DCFA	Income Capitalization
Income			
Net	**X**	**X**	**X**
Gross	**X**		**X**
Regular	**X**	**X**	**X**
Irregular		**X**	
Rate/Multiplier			
Capitalization rate	**X**		**X**
Yield rate		**X**	
Gross Rent Multiplier	**X**		**X**
Annuality			
Limited		**X**	
Unlimited	**X**		**X**
Reversion		**X**	

Table 5 . Comparison between Income capitalization and Income capitalization approach

Yield capitalization is a technique that has been used for long time in investment valuation and only recently was it adopted also for real estate valuation, following the growing familiarity in the market that led real estate investments to take similar traits to other types of investment. To this purpose, the method required some adjustments since the real estate sector implies mid or long-term investments, while in the other sectors the investments were mostly short-term (5-10) and the final value was generally low or null.

Some scholars criticise the possibility of correctly projecting future income; according to others (Guatri, 1987), since it cannot be possible to refer to current conditions, and a number of choices must be hypothesised, valuation is neither objective nor general, and it may bring to identifying a subjective value.

As it essentially bases on income capitalisation, the *Profits approach* may be traced back within the income capitalization. The Italian and American approaches, indeed, do not identify it as an independent valuation process, but rather as a specific case within the set on income-based processes. The income than needs capitalising is not valued in reference with ordinary incomes detected in the current real estate market, but is a share of the dividends of the business generated by the property, taken as a base of its yearly accounting. From a technical standpoint, the *profits approach* falls within the scope of capitalisation, though as it refers to specific and not ordinary data, its consistency with classic valuation principles may be questioned; hence, it may be considered a method eventually applied for special asset valuation (hotels, sports centres, museums) where it is not possible to refer to the market. On grounds of such remarks, in the British and French traditions this method is considered separately.

Development value as a valuation method and the Residual Approach

The development value used as a method to estimate the market value of productive factors (mainly used for the market value of development areas) is widely spread in Europe, where it is identified as the *Residual Approach*. The value of the land is also called *residual value* in that it represents what's left (residue) from the market value of the developed asset once stripped of the development costs and the developer's profit.

The British and Italian procedures are very similar:

– The market value of the developed asset is estimated as future value, based on market projections and according to its Highest and Best Use (HBU);

	DCF Analysis	Residual Method	Development value
Income			
Value on completion	**X**	**X**	**X**
Rents	**X**		
Costs			
Development costs	**X**	**X**	**X**
Operating costs	**X**		
Entrepreneurial's profit		**X**	**X**
Discounting	**X**	**X**	**X**
Applicability			
Property market value	**X**		
Site/land market value	**X**	**X**	**X**
Investment value	**X**		

Table 6. Comparison between Development value, Residual Method and DCF Analysis

- The development costs keep into account a set of expenses the developer incurs for the development process (construction costs, financial charges, professional fees, etc.);
- The expected developer's profit is considered as an amount to be added to the development cost, and should be valued as a percentage of the future market value;
- The cost and market values are finally discounted at the current value in order to be aligned according to the time value.

In the American tradition, the *Residual approach* does not appear as a valuation method, since it may be traced back to the *Discounted Cash Flow analysis*. The DCF allows to value gains and expenses on a yearly basis and in terms of revenues and costs regarding the development of the land. Discounting the yearly cash flows to current values through a specific discount rate, considers the developer's expected profit and the investment risk.

Depreciated replacement cost and Cost Approach

The *Cost Approach* estimates the market value as the sum of the value of the area where a building is located (considered as development land considering its HBU) and the value of the building in its current conditions. In order to estimate the value of the building, reference is made to the cost, depreciated if necessary required, to redevelop it. This method corresponds to the Italian depreciated replacement cost method.
The differences between the international method and the Italian one are limited to two key aspects:

- The first is purely lexical: as in the Italian tradition, also in the international one can one refer to the redevelopment of the property in view of contemporary construction techniques, technology and composition solutions (substitute building) or to the redevelopment process according to the original techniques and solutions (copy building). In the first case, the international approach refers to a *replacement cost*, which in Italy bears the name of "*costo di riproduzione"* (reproduction cost). The *reproduction cost*, at international level, may be correlated with what Italian manuals identify as "*costo di ricostruzione fisica*" (physical reconstruction cost), regarding the building as the exact copy of the original.

	Cost Approach	Depreciated replacement cost
Land value	**X**	**X**
Replacement costs		
Building costs	**X**	**X**
Indirect costs	**X**	**X**
Entrepreneurial's profit	**X**	**X**
Depreciation		
Physical deterioration	**X**	**X**
Functional obsolescence	**X**	**X**
External obsolescence	**X**	

Table 7. Comparison between Depreciated replacement cost method and Cost Approach

– The second has to do with the depreciation estimate method: the Italian practice often resorts to curves that bear in mind of the building's age and, based on variable or constant ratios, they allow to determine depreciation due to physical deterioration; in order to estimate the specific technology obsolescence component, reference is usually made to the cost needed to replace or remedy the obsolete component; the external or economic obsolescence is not frequently dealt with. At international level, more specifically in the United States, depreciation may be valued with synthetic (*market extraction*, *economic-age life*) or analytic (*breakdown method*) methods that allow to examine in detail all depreciation items (physical, technology and economic) and to bear in mind of the differentiated deterioration of the technology components in a building. Economic depreciation valuation has also remarkable importance: indeed, it allows to determine the value the market attributes to the real property quite accurately.

4. EMERGING REAL ESTATE VALUATION ISSUES

4.1. Valuation, globalisation and markets' financialisation

Over the past few years, the real estate market has become more and more correlated with the financial market and global economy mechanisms. Over the course of the past twenty-five years, the globalisation process has gained momentum also as a consequence of a growing interconnection between financial and real estate markets.

In the valuation contest, this situation produced several and significant changes:

- International clients often replace local clients, thus valuation needs to open to the international valuation method;
- The financial sector tends to develop and favour cross-border transactions and the financial sector requires global standards (in terms of accounting, auditing, valuation, etc.);
- The markets tend to be rather transparent and efficient thanks to technology progress, though the knowledge and understanding of the local market is still quite a decisive issue.

Real property has become more and more an investment asset, hence valuation has taken fundamental value for several purposes: in the case of an exchange, to determine the sale value of the asset; in the case of real estate funds, the law states that real properties be values periodically in the management phase; finally, banks systematically resort to asset valuation in that it shall be the guarantee for the agrees loan.

The valuers must have adequate skills and provide "adequate services" by understanding the local markets, both national and international, and their interactions.

Fast real estate investment and finance internationalisation produced a large number of international investors and changes to real estate valuation, which moved from being national to having to become more and more international. The differences between the valuation methods in different nations may be a limit to comparing and tracing back to the source of real estate valuation. This implies a growing demand for harmonisation, in order

to come to a common, shared and coded language with the other countries; common norms are needed to increase the interest and confidence of investors and savers towards the real estate market.

Today, as a matter of fact, the market asks the real estate and financial world to integrate suitable and internationally-accepted valuation processes and methods that allow to level the differences among different nations and promote the full use of valuation reports in financial, accounting and real estate transactions in the framework of shared and consistent rules and standards.

After all the strong push that took place in the European market – more specifically for the circulation of goods – the growing internationalisation of society and the enforcement of common accounting and banking standards, caused the real estate valuation tool to become essential in financial investment, risk valuation and accounting processes based on international norms and standards.

Over the past few years the financialisation of the market caused the development of valuation methods based on the financial approach (*Yield capitalization* and *Discounted Cash Flow Analysis*), in that it allows a comparison with the return of alternative investments and simulate, in a rather consistent manner, the projected life of the property (purchase, economic management for a limited period of time and sale at the end of the investment). Such methods, which originate in the scientific and disciplinary scope of finance and investments, are not always consistent with the valuation principles and their application in the real estate sector implies such skills and competences that allow to read and anticipate the market, which is not always the case in every valuer. Moreover, such methods feature high sensitivity to small variations in the parameters used (in terms of discount rates, time, hypothetical cash flows, etc.).

Finally, the high demand of real estate appraisals, on the one side, and the development of IT tools and automatic models, on the other, caused the international appraisal practice to increasingly employ IT-based statistical-mathematical appraisal models. Such models, though, as highlighted by several scholars and academicians, if they are instrumental to mass appraisal, they are not reliable when it comes to punctual appraisal. Moreover, the necessary condition for them to be applicable is a large amount of market data referring to similar assets to the subjects, a condition that is not likely fulfilled today, especially in Italy.

The deep innovation and radical changes that are underway call for a radical shift in the way to perform valuations.

4.2. Appraising under conditions of market instability, uncertainty and risk

The global financial crisis is mostly due to the failure and collapse of the real estate market. The global economic environment is uncertain. The credit crunch led to market stagnation (and the real estate market was no exception) and the market operators have take a "wait and see" attitude. In such a market, the real estate appraisal process is exposed to several sources of uncertainty; there are few market operations to be used as comparables, and reading through the market sentiment is difficult. The investment market, strongly expanding towards the end of last century, had protected valuation from the need of fully considering the impact of uncertainty.

Uncertainty is a real phenomenon in the real estate appraisal process. In academic literature the terms risk and uncertainty are often used as synonyms. According to Byrne and Cadman (1984) *uncertainty* is what one does not know about a future event the moment a decision is made, while *risk* is the measure of a loss identified as the possible outcome of the decision. With the term "risk" we refer to such situations where, given an alternative, there is a probability for a negative outcome, but such probabilities are known or believed to be known. The term "uncertainty", in turn, refers to the situations where apparently no elements are there to allow an estimate of the likelihood of the event. Usually uncertainty is due to the lack of knowledge or poor or imperfect information on the inputs that may be used in an analysis. Within real property appraisal, it depends mainly on the information inherent to the comparables. In the impossibility of confirming the truthfulness of data, the appraisal will also appear uncertain. Nevertheless, if it is possible to assign a probability of the input variables, this will allow to determine a set of possible results. The outcome, then, is a measure of risk (Byrne, 1995).

Basically, two meanings of the term risk may be given; namely, the subjective/perceptive and the rational one. The distinction is based on the fact that on the one side individuals have their own ways of perceiving and processing the information regarding the degree of risk. On the other, though, there is a rational approach to the issue of risk, which is based rigorously on the concept of probability (be it objective or subjective) and, most importantly, on a rigorous way of combining the data regarding the probabilities in the process that will lead to the final decision. Some scholars highlighted that the first meaning has a purely descriptive meaning, while the second has a regulatory meaning. In other words, the two meanings would not seem incompatible and both could be equally well substantiated, be it in different contexts. After all, some also objected to

the fact that a strictly regulatory vision in the real world would eventually have limited practical use (Momigliano, Nuti, 2001).

The outcome of an appraisal is certain only if one can foresee the future with a certain degree of accuracy. Since this is practically not possible, there will always be a risk that the "real" value would differ from the estimated value. All valuations are price projections to see how a given asset should be traded at the time of the valuation. A valuation is a pricing model that, depending on the implicit or explicit nature of the model at hand, detects the market sentiment towards the prices from a number of reference parameters (French, 2005).

As in all projections and opinions, the degree of subjectivity varies significantly, as well as the decree of 'certainty' (that is, the likelihood for the valuer's opinion may coincide with the value actually registered for the sale transaction). Such differences may arise because of the characteristics of the asset, the market or the available information.

The uncertainty of the appraisal may derive from different sources (RICS, 2006):

1. Characteristics of the property or the context: special properties in terms of intrinsic or extrinsic characteristics, which are not commonly traded in the market, make it rather difficult to source historical data; counting on very few or no comparables, the appraisal will be rather uncertain;
2. Limit in the provided information: when the information available to the valuer are limited or subject to constraints, both from the client or by the appraisal context, the appraisal itself will tend towards uncertainty;
3. Choice of the valuation method: some appraisal processes (such as those referring to the development value of the DCF analysis) require the formulation of several assumptions and projections in terms of future values. The level of uncertainty in such processes is usually higher that that correlated to other methods, in that the latter imply the appraisal of different parameters, which are sensitive to basic assumptions and slight changes to their values.
4. Variations in the legal and regulatory frameworks: some markets or types of properties may benefit or suffer from sudden variations in legal norms (as in the case of dispossession, for instance); in the meanwhile there may be unusual transactions that make reference to market data unreliable;
5. Market instability: unexpected macroeconomic and political crises may produce an immediate effect on markets; instability may produce a decrease in the number of transactions, due to concern or simple reluctance; in the long term, the decrease in

transaction reflects in market prices. If the valuation is performed in unstable markets, then the reference data may be misleading, incomplete or inconsistent, with the inevitable effect on the level of correctness of the appraisal.

4.3. Valuation under conditions of lacking, unreliable or non-current market data

The Italian situation so far has suffered because of lack of transparency in the real estate market and a poor level of information. The appraisal in very much influenced by the problems in sourcing real market data.

The lack of reliable real property data generated a situation that was attempted to be offset through expertise-based appraisal. In the Italian practice there is a well-established habit to resort to appraisal based on a synthetic opinion given by an expert, often the product of a reference to real estate quotations adjusted, if need be, by some coefficient that account for the specific characteristics of the subject.

Long lasting crises that display growing inflation and the preponderance of conventional appraisal have generated a distortion from the rest of the advanced countries. The valuations are not based on detailed and punctual analysis of market real estate data; the sources to detect the data are limited and diverse; the valuations are not consistent with each one another. The coefficients' are generic and not based on compliance with the specific market conditions. The expressed value cannot be verified, nor is it traceable by other experts.

The relentless rise of real property prices, a time of growing inflation and the problem in finding reliable prices extracted from real estate transactions made the valuer's work negligible in our country, which continues to operate according to methods and criteria lacking the transparency, reliability and sharing principles required by the market; as a consequence, in practical terms it is impossible to apply international valuation processes, which in turn are based on punctual market data detection.

The scarcity of reliable real estate data, the problems in sourcing comparable information on market trends, the inconsistency of research criteria get in the way of scientific experimentation. More specifically, qualitative and quantitative information regarding sale and lease transaction prices is poor, not to mention that regarding property characteristics; quite evidently, this negatively affects the development of a real estate method.

The creation of a real property databank is a pressing need in the appraisal sector. A detection, collection, archiving and dissemination system involving comprehensive and punctual real estate data, as it happens in most advanced countries, would allow the detailed knowledge of the real estate market, to follow its trends while detecting indexes and economic statistics and applying appraisal methods based on the comparison with similar properties of known price.

At international level, the existence of information systems based on the systematic collection of real estate data brought about a positive change also in large scale valuation, thus allowing to develop automated and computer-aided valuation systems (*CAMA – Computer Aided Mass Appraisal*).

In Italy, the application of such methods is not viable in lack of a comprehensive information system, and the few cases where such approach was implemented led to nothing other than unreliable and distorted outcomes.

To date, one of the official databanks in Italy is the *"Osservatorio del Mercato Immobiliare - OMI"*. The Observatory supervises the detection and processing of technical and economic information regarding real estate values, the lease market and the yield rates, publishes studies and reports, and assesses the statistical value of the *Agenzia del Territorio* archives. The Observatory's databank provides a set of information regarding the domestic real estate market. Even though it is a useful tool for the market operators, real estate industry researchers and scholars, it only provides data regarding average, not punctual, real estate transactions, which cannot be used for the purposes of real estate appraisal.

The detection process is divided into two operating methods that depend on the level of activity in the real estate market:

- Direct detection by means of standardisation sheets in case the number of transactions detected in a six-month period should allow the acquisition of a numerical sample suitable to be processed;
- Direct detection by means of comparison and valuation techniques taken from the appraisal method and based on the expertise of the offices that operate in the technical valuation sector, in case the market is not sufficient to build a significant sample.

Data sources are: realtors, Agency's internal valuations, auctions, sale deeds (*comma 497 of Financial Law 2006*), courts of law, etc. The detected values refer to a square metre of commercial surface for the sale and lease markets.

It should be also highlighted that, given the current situation, the available data are often unreliable because of the instability, complexity and uncertainty affecting the current real estate markets. Also the data regarding recent transaction are often unsuitable for use, in that they do not represent, if not with remarkable approximation, the likely intentions that will occur in the future market, given the fast change of values and behaviours we are witnessing; when, for instance, future annuity values should be the subject of valuation, the current situation does not allow to formulate projections and account for highly dynamic markets.

5. CONTENTS AND LIMITATIONS IN CURRENT VALUATION SOLUTIONS

5.1. Initiatives promoted to draft International Valuation Standards

Today the market requires the real estate and financial sectors to adopt valuation methods and processes approved internationally, in order to allow the full utilisation of financial, accounting and real estate transaction valuation reports in a shared environment and with consistent rules and standards.

A standard is an accepted norm, a conventional reference model to comply with. Formally organised valuers have started to offer uniformly recognised principles, criteria and appraisal methods upon which to draft the international standards.

The international valuation standards have turned into a need deriving from a number of sources:

- The globalisation process, causing investors to request a common language to be used for valuations;
- The development of the main international accounting standards;
- The need to measure the market value for the guarantees in case of mortgages;
- The need to value the management performance of real estate investments;
- State company or asset privatisation or sale, and the need of appraising their value consistently;
- On the one side, the emerging markets and the developing economies, where the valuer profession is not yet fully developed, are interested in promoting a number of professional valuation standards; on the other, the developed countries that invest in such markets require a standard valuation reference.

Among the subjects interested in valuation standards, there are:

- Valuers, who are interested in ensuring and providing the clients with higher valuation reliability (in compliance with the approved standards);
- The clients, who require higher quality and clarity in terms of real estate appraisal

outcome, also expressing the risks, if any;

– Public authorities, which require reliable and traceable appraisals in order to ensure that in public investments and utility processes the collective interest is preserved at all time.

Several institutional and professional subjects offered such real estate appraisal standards using a common, shared and coded language (see Table 8).

At the beginning of the modern globalisation process, the *Asset Valuation Standard Committee* – TIAVSC (1981) was founded to initially include 20 countries. In 1984 the first standards were published. Ten years later, the TIAVSC, renamed *International Valuation Standard Committee* (IVSC), published the first official edition of the International Valuation Standards (IVS).

In Europe, the TEGOVOFA was established in 1977 and replaced in 1992 by the *Euroval* and in 1997 by the *European Group of Valuers Associations* (TEGoVA). In 1981 the first European Valuation Standards (EVS) were published, also known as the *"Blue Book"*.

Besides the international initiatives, there are other professional associations that advocated the creation of international valuation standards (RICS, AI, ASA CCIBV, etc).

In the United Kingdom, the *Royal Institute of Chartered Surveyors* (RICS) had started to draft a standard following the 1974 real estate market crisis. In 1976 the first standard edition was issued with the name "*Guidance Note on the Valuation of Assets*", later known as the "*Red Book*".

In the United States the *Appraisal Foundation*, with headquarters in Washington, was established in 1987 by the eight major valuation associations for the purposes of regulating the valuer profession in the United States. The early *Uniform Standards of Professional Appraisal Practice* (USPAP) date back to the same time.

The most recent valuation standard versions are: "IVS - 2011 Edition ", "EVS - 2009 Edition", the "RICS Red book - 2011 Edition".

Moreover, in the past few years, the *Appraisal Foundation* and the IVSC agreed on a project to harmonise the USPAP and the IVS; the RICS referred to the IVS for its Red Book; the *Australian Property Institute* (API) recognised the IVS among its fundamental reference standards, as well as some other Latin American countries; other nations, including Romania and South Africa, adopted them as their national valuation standards.

Level/Country	Subjects	Proposals
International	IVS Commitee	*WHITE BOOK - International Valuation Standards (IVS)*
USA	Appraisal Institute	*The Appraisal of Real Estate*
	Appraisal Foundation	*USPAP - Uniform Standards Of Professional Appraisal Practice*
Canada	Appraisal Institute (Canada)	*The Standards of Appraisal Institute of Canada*
Australia	The Australian Property Institute	*Professional Practice of The Australian Property Institute*
New Zeland	The New Zeland Property Institute	*Professional Practice of The New Zeland Property Institute*
Europe	TEGoVOFA,1978/ EUROVAL,1989/ TEGoVA, 1992	*BLUE BOOK - European Valuation Standards (EVS)*
United Kindom	RICS, Royal Institute of Charter of Surveyos	*RED BOOK - Asset valuation standards*
Germany	Bundestag	*Wertermittlungsverordnung - WertV*
France	Institut Français de l'Expertise Immobilière, IFEI Association Française des Sociétés d'Expertise Immobilière, AFREXIM	*Charte de l'expertise en évaluation immobilière*
Italy	Tecnoborsa	*Codice delle Valutazioni Immobiliari*
	Associazione Bancaria Italiana -ABI	*Codice per la valutazione degli Immobili*

Table 8. Real estate valuation standards: subjects and proposals

Hordjik A., Nilisse P., and Spargisale-Koerhuis L. (2011) found some conclusions regarding the valuation practice in Europe: "even if the market values may be compared among different countries, the valuation methods are country-specific and difficult to compare among them ". In a recent research by Akiyam Y., M.Suzuki M. (2011) based on 21 countries, it was discovered that most countries have local standards (67%); in the remaining ones, valuers refer to the RICS valuation (19%) or the IVS (14%) standards. Only 10% of the countries have fully adopted the international standards; in the other cases there was an attempt to convert them or assess their consistency with the local context (57%) and a convergence process in underway between the local and international standards (33%).

While the harmonisation of the definitions has proceeded quite rapidly through the ISVC initiatives, when it comes to valuation methods we have not yet come to full convergence. As you may see in Table 9, the valuation methods offered in the main valuation standards are influenced by the consolidated practice at local level. The applicability of international valuation methods imply the existence of the same conditions in which British or American valuer operate, including the provision of detailed and punctual real estate comparison data. Even though there are several common elements within the main methodology families, mostly in terms of basic theoretical references, the issues and differences in the processes require a rather complex process in order to come to a shared solution.

IVS	**EVS**	**RICS Red Book**	**USPAP**
Sales Comparison Approach	Comparative Approach	Comparative Method	Sales Comparison Approach
Income Capitalization Approach *Direct Capitalization* *Yield capitalization*	Income Approach A *Direct Capitalization* *DCFA*	Investment/Income Method	Income Capitalization Approach
	Income Approach B	Accounts/Profits Method	
Cost Approach	Cost Approach	Contractor's/Cost Method	Cost Approach
	Residual method	Development/Residual Method	

Table 9. Appraisal methods indicated by main real estate valuation standards

At international level, the international valuation principles must be the springboard and not the endpoint for the implementation of a national and local “best practice” suitable to the specific features of the Italian system. To harmonise does not mean to

impoverish and flatten the local practice, but rather to complement the same with a broader context of methodologies shared a regional, first, and then international level. The standards must be based on the local and national valuation practice.

INTERNATIONAL VALUATION STANDARDS - IVS

The IVS *Council*, a non-governmental organisation and a member of the United Nations, was founded in 1981 in London and reorganised in 2008. It became fully operational in 2009. The organisation pursues the goal of developing and adopting the valuation standards accepted by international organisations and real estate market operators at worldwide level.

The 2011 IVS are divided into five main sections. The first provides the definitions of the IVS; the second describes the IVS *Framework* and includes the generally accepted valuation concepts and the principles upon which rest the IVS; the third section has to do with the *general standards* that commonly apply to all types of assets and for any valuation purposes whatsoever; the fourth develops the topic of *Asset standard*, showing how the general principles apply to specific real property classes such as: companies, intangible assets, systems and machinery, real property interests, real property investments on course of realisation and financial instruments. The last section regards the Applications in valuing specific financial and corporate reporting sectors and mortgage appraisal.

The valuation approaches approved by the IVS mostly refer to the North-American valuation practice: Sales comparison approach; Income capitalization approach; Cost approach.

EUROPEAN VALUATION STANDARDS - EVS

The first European valuer association was established in 1977 under the name TEGOVOFA ("*The European Group of Valuers of Fixed Assets*"). In 1989 the *European Committee* of the FIABCI took office in Brussels to promote Europe-wide initiatives. The CEPI (*Conseuil Europeèn des Professions Immobiliare*) was founded soon after and gave life to the EUROVAL. In 1992 the TEGOVOFA merged with the EUROVAL and gave life to the TEGoVA. In 1995 the first edition of the EVS by the TEGoVA was published. In its current form, the TEGoVA was established in June 1997 from the former Euroval.

The non-profit organisation is located in Brussels and its goal is to create and disseminate harmonised standards for real estate valuation.

The IVS represent the minimum common denominator for all regional and national standards applicable all over the world, including the developing countries. In turn, such regional standards as such as the EVS (as well as the USPAP in the USA) correlate with a regional positive (thus enforceable) and complex (mainly comprised of EU Directives and Regulations) regulatory system.

As regards the indicated real estate valuation methods, the first edition of the EVS, until the 2002 version, referred to the five methods of the British valuation doctrine, adapting the terminology to the approaches reported in the IVS (closer to the North-American practice): Comparative approach; Income Approach A, further broken down into direct capitalization and DCF Analysis techniques; Income Approach B, based on accounting and the turnover of a business directly using the asset (corresponding to the Profits Method); Cost Approach; Residual Method.

UNIFORM STANDARDS OF PROFESSIONAL APPRAISAL PRACTICE - USPAP

The *Appraisal Foundation*, with headquarters in Washington, was established in 1987 by the eight major valuation associations for the purpose of regulating the valuation profession in the United States. The USPAP were processed for the first time in 1987 by an ad hoc committee representing various professional valuer organisations in the United States and Canada. They represent the generally accepted and recognised standards for the valuation practice. Since 2006 the USPAP are updated every two years.

The USPAP provide a basic set of norms to control the quality in the real estate appraisal process, though they do not attempt to prescribe specific methods that must be used. Rather, the USPAP simply require the valuer to know and correctly use the methods that would be acceptable in the consolidated real estate appraisal practice and that are accepted by the recipients of the valuation. While the USPAP and the IVS are targeted basically at the same goals, there are still significant differences between the two standard groups. In June 2006, the *International Valuation Standards Committee* and the *Appraisal Foundation* drafted a memorandum of understanding whereby they undertook to work together towards a reconciliation of the difference between the two standards.

RICS RED BOOK

The *Royal Institution of Chartered Surveyors* (RICS) is an independent organisation, a body of professional representation, which regulates the real estate valuer profession in the United Kingdom.

The institution was founded in London as the "*Institution of Surveyors*" on June 15, 1868; in 1921 it was granted Royal patronage by George V. The Institution became the "*Institution of Chartered Surveyors*" in 1930. In 1946 it became a royal institution, which earned it the right of adding the word "Royal" to its name. The first edition of the valuation standards, universally known as the "*Red Book*", dates back to 1976.

At the beginning the standards would apply only to those valuations included in financial reports; subsequently, their application was extended to most valuations and, as of 1991, they are compulsory for all members of the RICS. The standards define the procedures, norms and guidelines the RICS members must apply in performing a valuation.

Their goal is to ensure that clients receive objective opinions, provided in a professional manner and in compliance with the internationally accepted standards.

The standards define a reference system for the best practices in the performance and presentation of the valuations, but they do not provide how the members of the RICS must perform such valuations, nor do they analyse the valuation methods and techniques. Still, in the English version, they make reference to the traditional separation between: 1. Comparative approach; 2. Income approach; 3. Profits approach; 4. Development/residual approach; 5. Cost approach.

REAL ESTATE VALUATION STANDARDS IN ITALY

It should be stated that the Italian valuation standard (univocal, recognised and generally accepted) does not exist yet. It should also be pointed out that the Italian real estate market features a number of constraints consisting mainly of the lack of transparency in the real estate prices, the reduced competitiveness of certain areas, the tax system being less favourable than in other countries and the growing, yet still poor, integration with the securities market.

As regards the introduction of the international standards, one must be aware that such standards were designed for different real estate contexts that the Italian one, therefore it

is necessary to adopt, as much as possible, the International standards in order to envisage a version that may fully adapt to the Italian context.

Regardless of the Italian translation of the IVS and EVS by several national institutions and associations, the first offer in the direction of Italian valuation standards came from the *Codice delle Valutazioni Immobiliari* published by Tecnoborsa, a company established by the National Chamber of Commerce, Industry, Craft and Agriculture. The project, started in 1998 by Tecnoborsa, led in 2000 to the first edition of the Codice, with the purposes of allowing the national economic and professional system to resort to a valuation method that was shared, applicable and aligned with the international *best practices*, as well as to contribute to real estate economy growth and transparency and market development.

The Code stands as a "reference standards that are instrumental to value appraisal and different from real property market ones. It intends to represent the best practice in the valuer's profession" (Tecnoborsa, 2005). The standard set out by the Code considers the professional valuation practice and the appraisal literature and, based on the operators' needs, provides for some minimum requirement standards needed to value and with the purposes of defining an internationally recognised Italian standard.

The appraisal processes, formally according to the classification set out in the international standards, in truth are described as: 1) *market approach*, further divided into the *market comparison approach,* the *appraisal system* (based on a set of linear equations between the subject and similar real properties), the *breakdown system* (breakdown of the price into average unit prices of the characteristics, through a system of linear equations), the *multiple regression analysis;* 2) the *income approach*, distinguished into *direct capitalization, yield capitalization* and *discounted cash flow analysis;* 3) the *cost approach.*

In 2011 the Italian Banking Association (ABI) adopted the IVS for real estate valuation when these were given as guarantee for credit exposure, and published its own guidance document.

The guidelines were drafted based on the indications provided in the international valuation standards (*International Valuation Standards* IVS, *Royal Institution of Chartered Surveyors* RICS, *European Valuation Standards* EVS and *Uniform Standards of Professional Appraisal Practice*, USPAP) and the *Codice delle Valutazioni Immobiliari* (Tecnoborsa).

They represent the guidelines internal and external experts must comply with in preparing their appraisal reports, and represent the basic norms aimed at harmonising the appraisals prepared for banks.

They specify the valuation methods adopted at international level (the market comparison method, the financial method, the cost method) approached according to the Tecnoborsa code.

The topics and themes analysed in the Tecnoborsa code and the ABI guidelines may not be considered comprehensive if applied to the valuer's job, which is based on different valuation principles, criteria and processes as well as practical cases. The applications are connected with specific valuation problems, whose solution depends on the ability of the valuer to select the suitable criteria and processes as well as the personal judgement.

As regards the methods, in both cases reference is made, at leas as an intention, only to the international appraisal processes, almost entirely excluding all Italian valuation methods and practices. It is assumed that the Italian appraisal processes cannot be taken into consideration at international level without seeing, as already described in chapter 3, that in many cases the Italian methods display strong analogies with the consolidated British-American practice. In spite of the intentions, in describing the methods the reference to the international standards (IVS, EVS, Red book) are followed only partially: the *Sales Comparison Approach*, renamed *Market Comparison Approach*, is presented in a version that spread through a number of recent Italian valuation manuals, though it show remarkable inconsistencies (theoretical, procedural and lexical) as compared to the Anglo-Saxon method; the *Market Approach* includes also other appraisal methods that are not found at international level and that do not represent a consolidated practice, not even in the Italian context; in the *Income Approach* the distinction between *Yield capitalization* and *Discounted Cash Flow Analysis* remains unclear and causes ambiguity and misinterpretation.

If the will to align the Italian valuation practice to the international context is quite a worthy one, it should also be considered that the results accomplished so far do not allow to come to a shared choice, since we're talking about isolated operations that are not based on the involvement of all representatives of the valuation world (academia, science, profession and institutions).

Finally, it should be highlighted that if on the one side the offer of standard method caters to the need for harmonisation, it is not enough to solve the other issues correlated with real estate valuation, in that is represents consolidated, not innovative, practices founded in real estate contexts and market conditions that are different from the current ones.

5. 2. Valuation processes under conditions of uncertainty, risk or unreliability of data

SENSITIVITY ANALYSIS

The sensitivity analysis is a technical process used to select the variables that significantly influence the outcome by analysing, through iterative simulation or statistical tools, the variation in the final outcome with the variation of the key parameters; it is employed to identify the limits of the valuation and measure investment related risk.

The statistical tools that allow to attempt the risk measurement for an investment are based on the attribution of different probabilities to the different scenarios that are deemed possible.

In the future scenario analysis, every scenario is one of the possible combinations of independent variable values; in the "what if" analysis, the appraiser looks at what changes if the values assumed as decisional parameters change.

The sensitivity analysis changes the value of a variable at a time, keeping the other variables constant. First of all it is necessary to select the critical variables, those that have the most relevance on the projections (project drivers), assigning three values to each of these variables:

- One corresponding to the most likely situation (defined as "base case" or expected scenario, which represents the value that would be obtained by following a deterministic approach, that is, assuming perfect knowledge of the expected cash flows);
- One corresponding to the most favourable situation (best case scenario);
- One corresponding to the least favourable (worst case scenario).

Having assigned such values, which must mirror the real scope of variability for the elements at play, one can move on to the actual analysis, which consists of calculating the values assumed for the appraisal value, having each variable change one at a time (with other variables kept constant at the base vale) and putting at the same level as the two end values.

The analysed subjects, then, are:

- The impact that the unit variation for each variable determines on the final value, that is, the sensitivity of the PW at the change of a variable;

- The maximum and minimum value for the appraised figure within the variation interval for the subject variable;
- The extent (and direction) of the change of each variable in order to modify the sign of the outcome (e.g. from positive to negative) and determine a consequence in decisional terms ("decision reversal").

Finally, this analysis allows to compute the extent of the uncertainty surrounding each independent variable that may influence the value assumed by the valuation base.

Hence, the sensitivity analysis provides some useful information regarding the risk level of a project and the sources it originates from. With reference to the latter, it is correct to highlight that absolute sensitivity is not the true target, as much as verifying whether there is a chance for the target function to change sign.

As a consequence, determining the scope of variability for each variable is particularly important, since it would be both incorrect and risky to assume a similar interval for each variable only for the sake of simplicity (for instance, in terms of percentage shift from the base case); thus, very unlikely scenarios may be regarded as possible.

In the performance of this analysis, the ways in which the results are presented is quite fundamental. Indeed, these may be described in simple tables, through graphics (also called spider plots), or tornado diagrams.

The latter provide a suitable picture of the overall variation in the valuation index, at the change of each variable between the two end values.

Usually this graphic description is displayed in descending order of sensitivity (hence the name tornado), in order to highlight the elements that influence the final outcome the most.

The sensitivity analysis does not allow to vary all parameters at once and, even when operating systematically on every variable, the scenarios tend to be infinite.

Within real estate appraisal, the application of the sensitivity analysis combined with the DCF techniques is quite frequent.

If the variables at play are few, the sensitivity analysis may also be the last step of the process: it suffices to enter the new values in the accounting systems used and obtain new valuations for each variable. For instance: TRI or VAN sensitivity at the variation of some factors and discards the variables that do not influence the return much.

It values the flexibility of an index as a function of a variable/determining factor.

The pros of this method consists of its ability to run a deeper analysis on the elements that determine the cash flows and value the project in a dynamic fashion, thus improving the business risk awareness.

Nevertheless, right from this last issue there derive the main issues regarding this method.

Indeed, the flaws in this method lay in the need to identify *a priori* both the risk factors (cash flow or net current value drivers) and the amplitude of their variation. Even where the first requirement should be exceeded, there often remains a problem to exceed the second. Moreover, the separate analysis of the variables prevents a correlation from happening between them and stops the scenarios projected for each single variable from occurring jointly, nor does it consider the likelihood for a certain scenario to happen, so that the determination of the value assumed by the parameter in the hypothetic scenario is subjective.

MONTE CARLO SIMULATION

The *simulation* consists of studying the behaviour of a system (in the broader meaning of the term) through its reproduction in a controllable environment. In the computer-assisted simulation, a mathematical model is generated with equations describing the relations among the elements of the subject system and their connection with its operation/behaviour, for the purposes of performing "virtual" experiments on the mathematical model, assuming that the outcomes of such experiments stand as a sufficiently accurate "replica" of the behaviour the system would have.

The Monte Carlo simulation is part of the family of *non-parametric statistical methods*. The method is used to perform estimates through simulation. It is based on an algorithm that generates a series of correlated numbers, which follow the distribution of probability that is theoretically attributed to the subject at hand. The correlation among the numbers is ensured by a *chi-squared test*. The Monte Carlo simulation computes a series of possible outcomes for the phenomenon at hand, with the relevance of the probability of its occurrence, trying to explore all the spaces taken by the parameters of the phenomenon densely. Once this random sample has been calculated, the simulation runs some 'measurements' of the interesting values for that sample.

This technique is used to numerically replicate and solve a problem involving random variables and whose analytic solution is either too complex or impossible. Moreover, the use of simulation allows to easily test in higher detail the effect of changes in the input variables (e. g. in their statistical description) or in the output function. According to some the historic origins of the Monte Carlo method may be traced as far back as the XVIII century, that is, way before the advent of computers. In the XX century the method was broadly used in nuclear research, thanks to the electronic calculator technology born after the Forties.

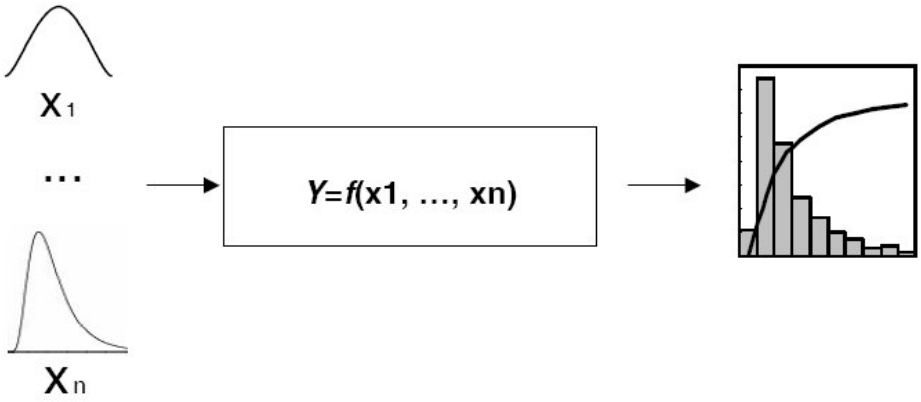

Figure 2. Monte Carlo method functioning diagram

Today the Monte Carlo method is used in several scientific settings. The first application to investment valuation is probably due to David Hertz who, in his 1964 paper "*Risk analysis in capital investment"* offered the technique to value the expansion plan for a chemical plant. The Monte Carlo simulation is now widely regarded as a risk analysis technique in investment valuation by engineering economy manuals. In describing the Monte Carlo technique, here we make explicitly refer to investment valuation under risk conditions, that is, in the situation where the forecast cash flows for the investment are tied to statistical variables or parameters.

The Monte Carlo method allows to get an estimate of the whole probability distribution of the output selected as indicator of the investment viability (current value, internal return rate, etc.) and not only the individual appraisal; this allows to somehow measure the risk of the investment project based on the indicator's statistical dispersion.

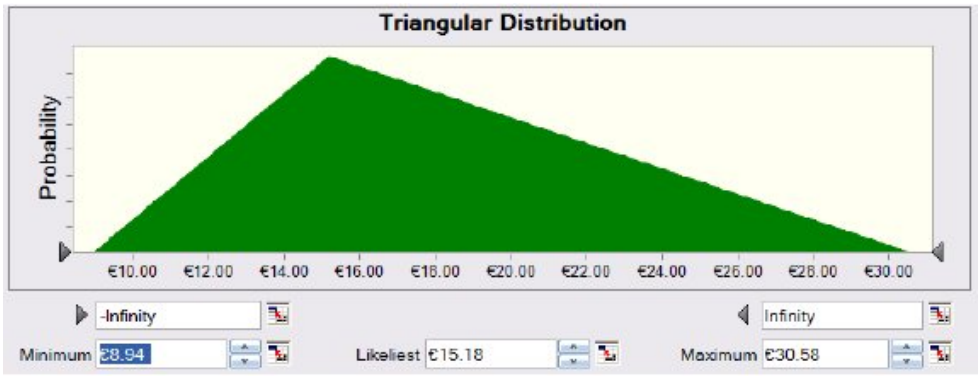

Figure 3. Example of Assumption *(probability distribution for the INPUT variable)*

The logical steps to be followed are:

1. Definition of the relevant variables;
2. Definition of the mathematical calculus model, that is, the relation among the parameters;
3. Attribution of the probability distribution function and range of relevant variables;
4. Launch of the simulation;
5. Outcome assessment.

This method helps to better understand the origin of project risk and how the variables, taken jointly, influence the final outcome.

The Monte Carlo simulation is offered as a very powerful tool to support investment decisions in conditions defined as "risky", that is, where starting data or possible relevant events may be attributed probabilistic values. The purpose of the Monte Carlo simulation is basically to extend the applicability and representative power of traditional valuation methods. To this regard, among the advantages of the Monte Carlo simulation, we may report the following:

– It allows to model large scale and/or very complicated investment problems, and represent data and scenarios at a fixed or agreed level of detail;
– It gives a comprehensive statistical representation of the output variables (e.g. PW, TIR, etc.) and not only few indicators (e.g. only the average);
– It allows to calculate several input variables at the same time (that is, indicators used to value the investment), which allows the decision-maker to resort to more valuation criteria at the same time;

– It may provide the decision-maker with estimates or indications of the risk associated with the investment, measured through statistical indicator that describe the output variables, or using suitable graphic representation methods;
– It may be tested with different hypotheses on the model and/or on input data, repeating the simulations after having introduced suitable changes and analysing the effects on the output. Therefore, it is also possible to run specific sensitivity analyses on single variables or input data.

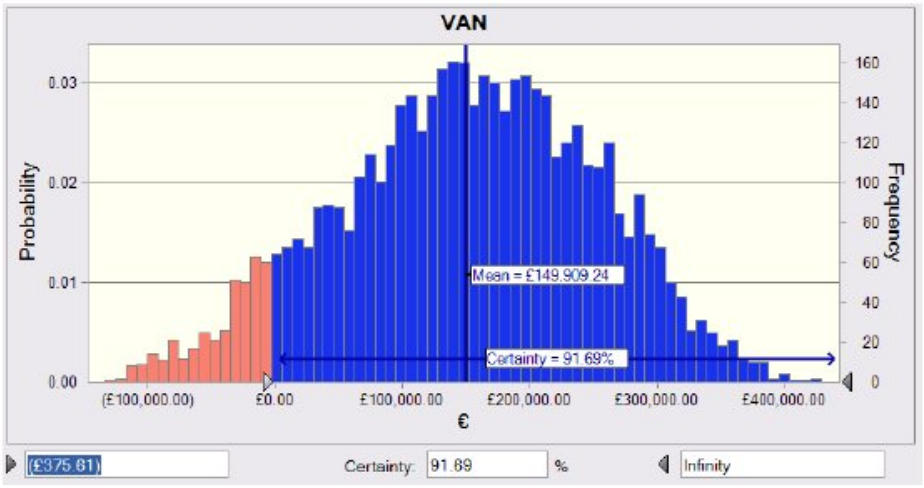

Figure 4. Example of Forecast *(probability distribution for the OUTPUT variable)*

Method limitations (see Brealey *et al.* 1999) are first and foremost correlated with the difficulties we mentioned before (model structure, the estimated probabilities to assign to random events) that must be tackled mostly by considering the costs of the analysis (also in terms of time) and the availability of resources (calculus systems, skilled staff). As we said, the architecture of the model probably represents the most critical aspect, since from it depend the obtained results. In general, the method requires specific skills (as much in the simulation technique as such, as in general in the analysis of investments under conditions of risk); moreover, the creation of the model is usually an ad hoc process to be repeated for every single investment project.

One further problem is the interpretation of the outputs, since the Monte Carlo technique is not aimed at providing the synthetic value of a single indicator, but that of articulate and even multi-dimensional outputs (e.g. complete statistical descriptions, multiple indicators regarding the same investment, other types of representations - numerical and graphic). For the purposes of a decision, the responsibility for interpreting

the results of the simulations fall in full on the analyst and/or the decision-maker; to this regard, both must be well aware of the assumptions used to build the model, as well as the issues regarding input data collection, as well as any other specific issued that were not dealt with specifically for the case at hand.

The Monte Carlo simulation applied to the Discounted Cash Flow analysis (cfr. French, Gabrielli, 2005)

The assumption for the Monte Carlo simulation is to perform the valuation process a large number of times. Instead of using a single punctual estimate, for each input variable a distribution of probability is attributed; the Monte Carlo technique selects random numbers for each variable and produces a (valuation) response on this base before selecting another random input and repeating the exercise. The model will use such process to produce multiple possible outcomes that may be statistically analysed in order to produce an average result, an interval, a standard deviation, etc. The results of the simulations are represented in a form of discreet distribution (histogram) or continuous distribution (normal distribution). Such distributions allow the valuers to know the range or results and the likelihood of the values for each point in the distribution (Evans, 1992).

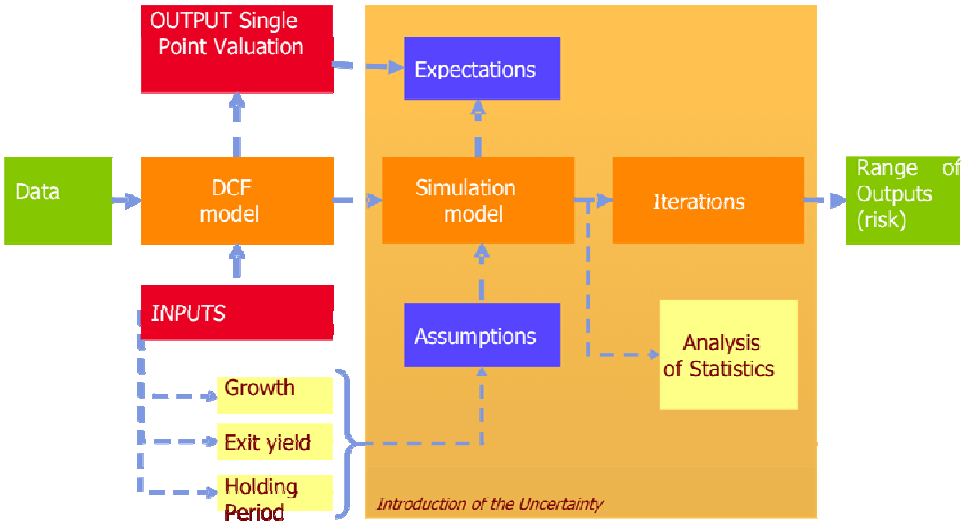

Figure 5. Simulation process chart (source: French, Gabrielli 2005)

Applied to the DCF analysis, it allows to incorporate the uncertainty of the analysis in a relatively simple form. Since every input variable (cash flow variation, actualisation rates term of the investment, etc.) is defined randomly within the distribution function of probability, it is possible to come to an interval of possible results. No result is certain,

but detecting the scope of variable variability and their distribution of probability, there will be some results having higher likelihood level.

Once the characteristics of the inputs is detected, the situation starts and reiterates the calculus 10,000 times and detects the distribution of probability for the result, which is statistically described through the average, the minimum and maximum value, the median and the standard deviation; moreover, it is possible to determine an interval of certainty where 50% of the results fall (Figure 6).

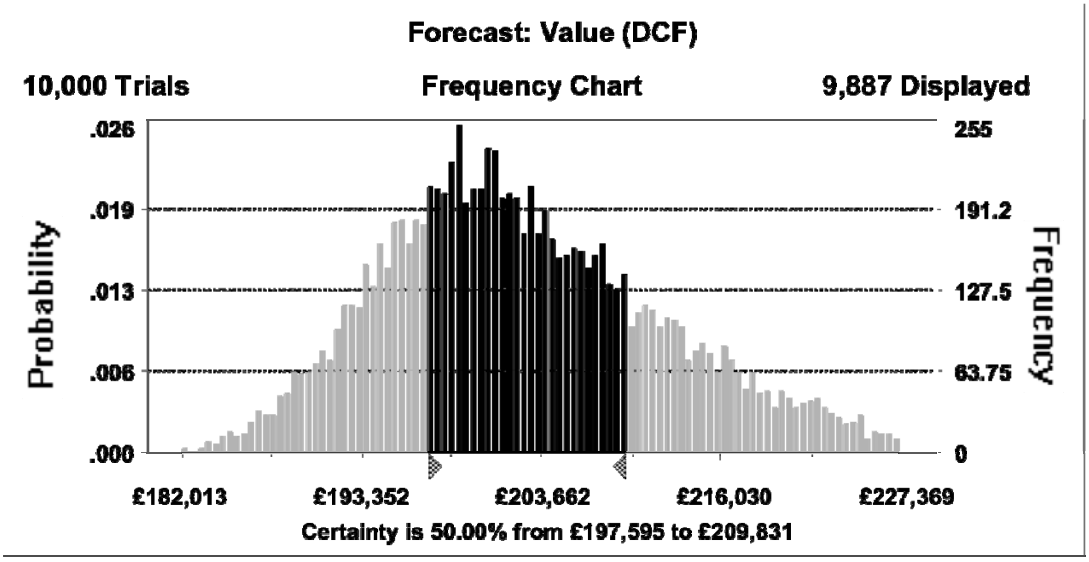

Figure 6. Outcome distribution (source: French, Gabrielli 2005)

In order to detect the scope of variation for the variables, the valuer must indicate at least three values (possible mean, maximum and minimum values). Thus the valuation accounts of how the valuator has interpreted the market and whether he factored in uncertainty.

The fact that the value of a real property is not univocal is not an entirely new concept, as shown by its use in art valuation. Since valuation is a price forecast, it only provides the most likely, not certain, value.

In order to communicate the uncertainty of the valuation, six pieces of information should be reported:

- The most likely market value;
- The confidence interval at 5%, 10%, 50% and 100%;
- The minimum and maximum distribution values.

The three data allow to give a simple and clear reading of the valuation to the user.

APPLICATION OF FUZZY LOGIC PRINCIPLES TO REAL ESTATE APPRAISAL

The principles of the fuzzy theory

In the early sixties, A. Zadeh, Professor at Berkeley University (California), started to see that traditional system analysis techniques were excessively and pointlessly accurate for many of the typical issues in the real world. The degree of membership principle was introduced in 1965.

Fuzzy logic is such that each position may be attributed a degree of truthfulness comprised between 0 and 1.

In 1994 Zadeh wrote: "the term *fuzzy logic* has two different meanings: wide and narrow. In a narrow sense it is a logical system which aims a formalisation of approximate reasoning. In this sense it is an expansion of multi-valued logic. In its wide sense, fuzzy logic is fuzzily synonymous with the fuzzy set theory of classes of unsharp boundaries".

In the fuzzy set theory the Aristotelian principles of *non contradiction* (each element belonging to A cannot belong to non-A) and *excluded middle* (the combination of A and its complement non-A constitutes the universe of discourse) do not exist. Such principles give a bivalent character to classic logic (it admits only two values of truth: true or false, white or black, all or nothing), which often bring to paradoxes it cannot shed light on.

With a *degree of truthfulness or degree of membership* (m) we mean how true a property is: it may be, beside true (value =1) or false (value = 0), as in classic logic, also equal to intermediate values.

A statement may be proven if and only if it may be demonstrated also in its formal negation, hence it is possible to cross the mirror of classic logic and be in a world where truth, demonstrability, consistency and absolute certainty do not exist. A world where the degree of truthfulness of falseness is important together with the degree of demonstrability and non demonstrability and the degree of certainty (Givigliano 1999).

An element may be within or without a set in a way that is neither absolute nor certain; not all the elements that belong in a set are identical, though they possess a given characteristics at different degrees.

The boundaries of fuzzy sets are not certain, they are blurred and vague. The limit cases represent a particular trait of fuzzy sets.

"Given a non empty set U and taken x as its generic element, the unsharp subset of U is defined as the combination of the couples (x, c(x)) being c(x) the function of membership of that element to the set U"(Fadini, 1994).

In classic logic the characteristic function assigns values 1 or 0 in order to determine the membership of an element in a set; in fuzzy logic, the function of membership is a set completely and univocally defined by a vector that matches each of the N units considered with a number expressing the degree of membership of the unit to the set.

In the function of membership, the values, which vary between one and zero, may be construed as degrees of membership and may be recombined in order to derive the functions of membership of composite entities. The boundaries of fuzzy sets do not depend on a single function of membership but by as many functions as the elements in the set.

There are many forms that the function of membership may take: triangular, trapezoid, sigmoid, bell-shaped, etc. with the indication that the form to be assumes is, for the most cases, completely subjective. Determining this function is one of the critical points in fuzzy logic. In reality there are other determination methods that use statistical methods or more sophisticated tools such as neural networks. The use of the above methods allows to increase the degree of objectivity in determining the function, though they require some data to interpolate.

The fuzzy set theory includes and contains that of probability as a particular case; the reality, then, would be deterministic but blurred: the theory of chaos highlighted this deterministic components; the fuzzy theory shoed the importance of the principle of *homo mensura*. In such models, indeed, the subject is the focus of the entire system. The subject, based on its categorisation, detects the key points of interest and builds the functions of membership in order to analyse the situation it is faced with. The subject is put back in its place as knower, discoverer and creator of portions of reality and social relations (Givigliano, 1999).

It is not possible to research all and making choices becomes necessary. Such choices will depend on the personality, beliefs, cultural level, in a word, the philosophy that determines the mental categories and the judgement criteria of the subject.

Applications to real estate appraisal

The early applications of fuzzy logic involved the industrial sector. Over the past decades, fuzzy logic found its application also in the financial sector, mostly in Asia, while recently the first experiments have been promoted also in the field of investment valuation.

Traditional investment valuation models use deterministic measures called crisps: these do not consider uncertainty if not to a limited extent. The application of fuzzy logic in valuation methods allows to run different analyses from those made with other tools, considering another type of uncertainty from the one considered through the probability theory.

We may say that the main purpose of using this tool is that we intend to preserve uncertainty as long as possible in order to leave it last, since it is always possible to reduce uncertainty through an information loss process (Del Viva, 2005).

Distribution of probability allows uncertainty to be resolved as soon as we determine the average value, while we will see that by using this logic, uncertainty shall remain until the end and may be eliminated thorough a process called defuzzification.

Following is a description of some experiments underway at international level, having to do with the application of fuzzy logic to real estate appraisal methods for the purpose of governing the uncertainty of information sources.

a. Application of Fuzzy Logic to the Sales Comparison Approach (cfr. Bagnoli, Smith 1998)

The goals of this method are:

- Reproduce the reasoning pattern of the potential purchaser based on a set of characteristics that in turn determine the value of the asset, which is a reasoning subject to inaccuracy;
- Keep account of the conditions of uncertainty of the information sources.

The method implies the application of fuzzy logic to Ratcliff's *"Statistical Inference" model*, a multi-criteria version of the Sales Comparison Approach. The offered procedure breaks down into the following phases:

1. Detection of the characteristics, the subject and the comparables (of known price);
2. Detection of the weight for each characteristic;

3. Detection of the scores for each characteristic relative to the comparables and the subject: scores and weights are expressed as triangular fuzzy numbers; for the scores the measurement scale is homogeneous for all characteristics (cardinal scale from 1 to 10); the ration between the measure of the characteristic in the suitable scale and the score is defined, in turn, through fuzzy numbers;
4. Valuation of the overall desirability level of the comparables and the subject through the weighted sum of the scores of each characterises for the weights they are associated with; the level of desirability is expressed, in turn, in the form of a fuzzy number;
5. Graphic comparison between the fuzzy number regarding the level of desirability of the subject and that of every comparable (figure 7): based on the comparison, it is possible to associate the known price of the comparable to the d*egree of membership/level of truthfulness* regarding the price of the Subject, for instance:

   for comparable price 1 = 100, μ (o α)= 0.9

   for comparable price 2 = 300, μ (o α)= 1 etc.

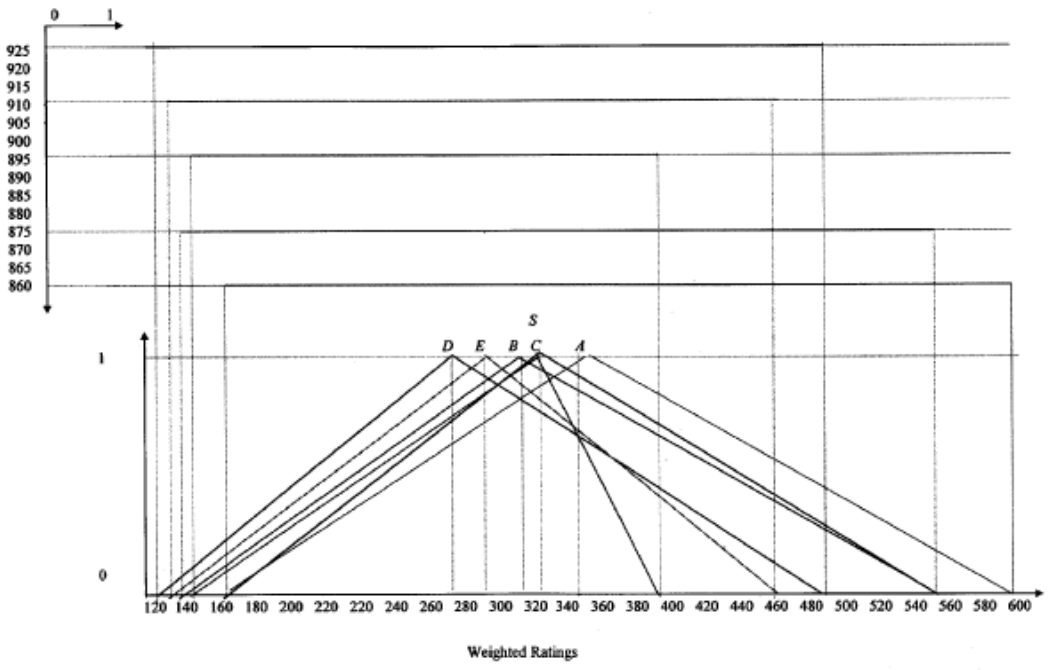

Figure 7. Graphic description of the comparison among comparables (source: Bagnoli, Smith, 1998)

6. Valuation of the most likely market value of the subject in the form of a fuzzy number.

This process allows to obtain a finite number of results with a different degree of membership to the hypothetical set "Probable market value" (Fig. 8). The fuzzy set may be expressed in any case in terms of unique value by applying a mathematical approximation process, such as linear regression.

The result, described in the form of a fuzzy set, better approximates the decision-making process of a potential buyer rather than the confidence interval produced by linear regression.

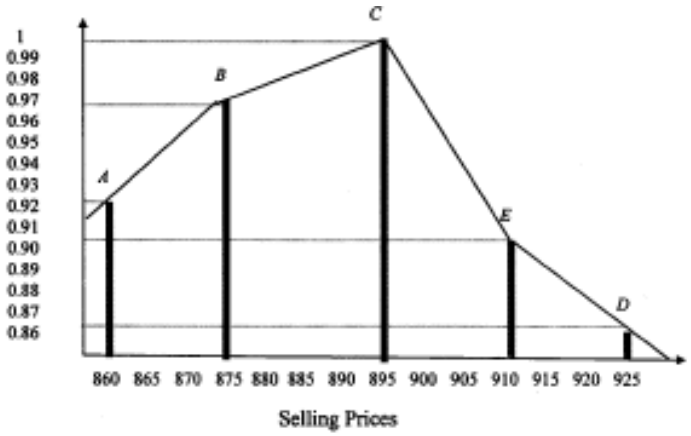

Figure 8. Graphic description of the market value in a fuzzy form (source: Bagnoli, Smith, 1998)

b. Application to multiple linear regressions (cfr. Coppi, D'Urso 2001)

The goals may be summed up in the following points:

- Exceed the constraints of probabilistic regression models, given the different sources of uncertainty both in measuring the phenomena and in the relations among the variables;
- Detect a theoretical-methodology framework where the different fuzzy regression models are justified;
- Detect a new fuzzy regression model (fuzzy adaptive regression), to study the relation between a dependent fuzzy variable and a set of independent deterministic variables (crisp).

The traditional regression analysis is reformulated in the *Informational Paradigm.* Such paradigm may be generalised in order to allow the processing of fuzzy information, both empirical (data) and theoretical (models). In general, the *fuzzy regression analysis* models used are two: possibilistic models or models based on least squares.

The presented model features a new approach, called *fuzzy adaptive regression*. It consists of a deterministic model (crisp model) suitable to analyse the relation between a dependent fuzzy variable and one or more independent crisp variables. The model refers to the principle of least squares applied to a new distance, between observed and theoretical fuzzy values.

Thus it is possible to define a linear valuation function that bears in mind of different information data uncertainty factors, which is easily applied to real cases and allows to have better results as compared with traditional *fuzzy regression* models.

The joint use of theoretical and empirical fuzzy information allows to manage the different multiple regression uncertainty factors with more efficiency; moreover, through the adaptive model the main uncertainty factors are incorporated in the dependent fuzzy variable.

c. Application to the Discounted Cash Flow Analysis (cfr. Del Viva 2005)

The model sets out to use fuzzy logic as a tool to consider the uncertainty in valuing the viability of an investment in the Discounted Cash Flow analysis, as well as to keep account of all pieces of information at hand without claiming to set a punctual value.

Assuming to have a single yearly net cash flow value, though there is uncertainty on its value and, more specifically, the return for the first period is assumed to be represented by a fuzzy set or, more simply, by a fuzzy number.

For each period there is a triplet of values representing the flow that may be derived for a given investment. Hence, for instance, for the period 1 there is $C_{f1} = (C_{f1l}, C f_{1m}, C_{f1u})$ where footer "l" stands for lower, "m" for middle and "u" for upper end. Moreover, it is assumed that the function of membership is triangular and that the interest rate is provided as a triplet of numbers i_1 (i_{1l}, i_{1m}, i_{1u}).

Once the measures have been expressed in terms of fuzzy numbers, then the discounted cash flows may be determined as expressed by a fuzzy number, which will take the following expression:

$$DCF(\alpha) = \sum_{t=0}^{n} [\underline{Cf_t(\alpha)},\ \overline{Cf_t(\alpha)}] \cdot [\underline{v_t(\alpha)},\ \overline{v_t(\alpha)}]$$

$$DCF(\alpha) = \sum_{t=0}^{n} [\underline{Cf_t(\alpha)} \cdot \underline{v_t(\alpha)},\ \overline{Cf_t(\alpha)} \cdot \overline{v_t(\alpha)}]$$

Having detected the $\alpha - cut$ (representation of the triangular numbers according to the variable), a table is produced to indicate the behaviour of the yearly cash flow and the discount rate at the variation of α (degree of membership) between 0 and 1, by replacing the values comprised between 0 and 1 in the α.

In order to determine the current value, each cash flow shall be multiplied by its own discount factor for each level of α. Thus, not a single current value, but a triangular fuzzy number, is obtained (Figure 9).

Figure 9. Actual value expressed in the form of a triangular fuzzy number (source: Del Viva 2005)

Once the result has been obtained in terms of fuzzy number, it is necessary to analyse the same in order to verify the economic viability of the investment and, if need be, proceed to selecting the best investment in case several choices should be available.

The selection outside of the cases in which the choice seems obvious from a simple visual analysis, implies the use of one or more comparison indexes whose determination rests on the use of a process known with the name "defuzzification".

There are many defuzzification methods: they range from some very simple methodologies, which do not always lead to a solution in terms of choice between one investment or another, to quite complex methods. The defuzzification process must also be intelligible in economic terms, that is, the process adopted to narrow down to a single value must follow an explainable and acceptable line from an economic standpoint.

Part II

Hypothetical Markets and Stated Data for the Appraisal in Implicit and Instable Markets

1. STATED PREFERENCE METHODS IN REAL ESTATE APPRAISAL

Urban renewal measures taken in western cities serve the purpose of improving overall quality and develop new, post-industrial economic foundations; indeed they involve degraded urban areas and brownfields. In order to be economically and financially sustainable, such investments are mainly in real estate and market operations, also at long term.

The intervention often takes place in areas where there is no active and evident market, where it is not possible to derive data regarding the willingness to invest by real estate operators or users' preferences. Nevertheless, it is necessary to assess the financial viability of such operations.

The common valuation practice, both Italian and international, would require to resort to a method accounting for real, historical market data, also known as *Revealed Preference Methods (RPM),* which allow, through true real estate transactions, to derive the preferences expressed by the actions of market subjects. Such methods, in order to provide reliable estimates, assume the availability of a large number of data, whose quality and correctness is proven. Moreover, in order to be applicable, the RPM must rest on the existence of an active market for the subject of valuation as well as demand and supply curves to make reference to. In the current economic context, though, as we also saw in the first part (see Chapter 4), and mostly when operating in urban contexts being subject to transformation, the conditions are not such to use data effectively expressed by real estate market operators.

It is often impossible to collect historical data because, for instance, of the lack of a reliable and updated real estate data collection and processing system; in Italy, real estate data banks, when available at all, merely report average valuations and not data regarding individual transactions. In other cases, historical data simply do not exist or are very poor, because of the features of the subject or the reference market:

- There are no similar assets, in terms of physical and economic features, which were traded recently (a fairly widespread situation, given the variety and uniqueness of the Italian real estate market);
- There is no such thing as an active market (a few real estate transactions are recorded);
- The areas of operation are degraded suburbs or brownfields, where the market is not explicit and does not regard the types of real properties included in the residential development projects.

In other situations the data provided are unreliable because of the instability, complexity and uncertainty of real estate markets as they are today. Also the data regarding recent transactions are often impossible to use, in that they do not represent, if not by large approximation, the possible intentions that will occur in the future market, given the abrupt change in value and behaviours we have happened to observe lately; when it comes to estimate values regarding long-term projects involving several articulate sales spanning over more years, then, the reference to the current situation does not allow to come up with forecasts and to account for highly-dynamic markets.

In such situations, using historical data would produce forced valuations based on false objectivity, which would produce worse effects that valuations based on hypothetical conditions.

As already explained previously (see Chapter 5) the most advanced and current solutions to the above problems mainly focus on probabilistic or possibilistic (based on fuzzy logic) models.

In both cases, such models can account for the uncertainty in the input data and single out some estimate values that are associated with a certain likelihood of occurring or, alternatively, detecting a range of possible values.

Such models represent a support to operate, in any case, always within the range of the RPM based on real market data. They are instrumental to improving the quality of the input data and to describe the level of uncertainty. For the to be applicable, though, historical data, though uncertain, must be assumed to be detectable and the valuation methods to apply are the traditional ones. Moreover, they refer to data detected in the past, which do not allow to make any forecasts in terms of real estate market dynamics and future scenarios.

Areas affected by big changes within urban renovation processes do not express, in past transactions, any information regarding functions, demand and preferences that do not exist even today.

The general opinion whereby the accuracy of the forecasts depends on the abundance of historical information often causes to regard valuation methods suitable to process large quantities of basic data as reliable. The idea is that a current result is directly connected to the previous results; this makes the social and economic factor dynamic extremely mechanical. To admit that the future may be reproduced according to models that belong to the past is adverse to all realistic theories. The so-called "extrapolative forecast" is delusional and dangerous.

In such cases, one happens to be in the same conditions of valuers who have to appraise assets that have no market, such as public assets; or in such conditions common to industrial products, say, technology products, where it is necessary to know the market sale price of goods that do not exist, have never been traded previously or have little historical data regarding potential consumers' expectations. Usually, the technique to use here is based on surveys and hypothetical markets, with reference to data that express the preference of market subjects.

Given the current situation, where the market cannot provide reliable historical data for real estate valuation and, more specifically, in situations involving requalification measures in areas where the market is not explicit, it becomes crucial to refer to hypothetical markets, based on a range of possible scenarios, to estimate the value of goods through the preferences stated by the operators (potential and future producers and consumers).

Not always is it possible to resort to market revealed data and behaviours. In some cases, the information needed by the analyst are not available or may not be observed in the real market; it is necessary to understand what may be the potential behaviours displayed by the subjects. Hence, it is necessary to refer to forecasting techniques based on the different interconnections among future events and build a network of global and synthetic hypotheses to design several alternative futures, which are only partially regulated by quantitative laws. It is necessary to indicate "perspectives" or "scenarios", to allow to valuate the future based on remarks that go beyond a simple "extrapolative" statistical projection and prioritise intuition and experience.

This is why an extensive literature developed on the survey methods aimed at valuating the individual willingness to pay in lack of observations in the real market. Such methods are widely used both to develop optimal pricing strategies, and to project the elasticity of demand and supply at the variation of price and, finally, to determine the demand (and supply) function.

The approaches to the valuation of an asset based on individual behaviours in hypothetical situations are called *Stated Preference Methods*. Such methods include a formal survey made on a representative statistical sample. As opposed to statistical-mathematical models, the *Stated Preference Methods (SPM)* provide answers from the operators who are really interested in a given operation; moreover, the estimates based on stated data have a dynamic character to them, in that they bear in mind of the way in which human actions and choices evolve.

RPMs are based on operators' preferences observed through their actions in the real market; in SPMs, operators are asked to state their preferences for hypothetical scenarios that include different characteristics and different levels of such characteristics. Within the two categories, direct and indirect methods may be described (see following Table).

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	Direct methods	**Indirect methods**
Revealed Preference Methods (RPM)	Competitive market price (observation of market prices)	Travel cost, Hedonic price, discrete choice
Stated Preference Methods (SPM)	Contigent valuation method (directly asking individuals their WTP)	Choice modelling tecniques (estimation of the WTP by use of price variable)

Table 10. Revealed Preference methods and Stated Preference Methods

A problem that is generally associated with RPM data is the high degree of co-linearity among the attributes detected in market data, which does not allow to foresee the effect of the variation in a single characteristic. By using SPMs, though, it is possible to overcome this problem, in that the analyst designs the interview and builds hypothetical situations for the purpose of selecting the desired information.

Conversely, SPMs are subject to distortions due to the hypothetical nature of such methods. The interviewed sample doesn't usually have the same motivation to choose as in real situations, and some issues influencing choices made in the market, such as costs, are not considered.

The first use of SPMs was made with public or non-market goods valuation. CVM was employed for the first time by Davis (1963), who used questionnaires in order to value the benefits of open-air leisurely activities in a forested area in Maine. Starting from this experiment, Ridker (1967) used CVMs several times to estimate the effect of air pollution. In the following years, other economists used CVM to value several recreational services (Randall et al. 1974). Since the beginning of the 1970s, the CVM technique has been used by economists to measure the benefits of a broad range of assets, including *amenities*, hunting, water quality, reduction in the risk of mortality due to a nuclear accident and toxic waste landfills.

Subsequently, the use of SPMs gained ground in the industrial pricing sector. In order to estimate the optimal price, is it necessary to detect the so-called *range of inelasticity*, which represents the price interval where demand may also decrease but revenues will invariably increase. This interval begins at the point where the highest number of people is willing to purchase the good and ends when the total revenues start decreasing. Even though doth direct and indirect SPM are generally used, it was CMT applications that remarkably developed in this sector, given their ability to indentify the ration between the characteristic levels of the good and the price, as well as the possibility to determine the implicit price of attributes.

Finally, at the end of the last century, some scholars proposed to apply SPM for real estate appraisal: some studies published by Mundy, McLean and Kilpatrick (1998 and 1999) analyse the use of CVM to foresee the impact of environmental contamination on real property values or in situations where the RPM (based on real transactions) are ineffective because of a lack of balance in the market. Based on such studies, in Italy, too, (Mattia, Oppio, Pandolfi 2010) scholars have begun to go deeper into issues regarding the application of SPMs to the real estate appraisal.

In spite of the efforts made to make the answers as reliable as possible, some researches highlighted some critical issues in the application of such procedures to the real estate context.

Roddewig & Frey (2006) maintain that, even though CVM may not be considered an adequate approach to real estate appraisal, its use in special situations may be considered, as in the case of special properties or market featuring few real transactions to analyse. The inaccuracy of real estate appraisal based on hypothetical markets, according to Roddewig & Frey, may depend on several issues:

- The CVM questionnaire provides less information about the asset that those usually available for a real market;
- The opinions of sellers and purchasers are often influenced by the intermediaries;
- The survey format does not include those factors that generally influence the purchase of a real property;
- Generally, the survey considers only one of the transaction subjects, either the buyer or the seller;
- CVM does not keep into account that the price results from a negotiation process between two subjects, who often agree on a price level, which is a compromise between the two respective initial positions.

Even though we do not ignore the critical issues and difficulties connected with the application of the *Stated preference methods* to real estate appraisal, it may be assumed that resorting to such methods in special contexts, where the real market does not allow to resort to consolidated appraisal techniques, may allow for valuation that is more consistent with market dynamics, uncertainty conditions and the possibility of foreseeing future market conditions. In conditions where the market is not explicit and cannot provide reliable historical data for real estate appraisal, it is usually allowed to refer to substitute methods that allow to come to reliable valuations and opinions.

The limits have often to do with the research method, the level of information of the interviewed pool and the standpoint analysis from the consumer only.

In our idea, the appraisal must be based on the preferences stated by the two samples, representing not only consumers, but also potential producers in the subject area, in order to detect the hypothetical demand and supply curves first and, subsequently, intersecting them to valuate the most likely price and the equilibrium quantity in the market. In order to improve the level of reliability of the data detected through the survey, it is also possible to apply processes that allow to increase the level of information in the interviewed sample.

2. THEORETICAL AND METHODOLOGICAL ELEMENTS OF THE STATED PREFERENCE METHODS

2.1. Theoretical foundation and differences with the Revealed Preference Methods principles

If a goods or a service contribute positively to human wellbeing, they have an economic value. What contributes to individual wellbeing is determined by its ability to meet individual preferences. The wellbeing of an individual is regarded as higher in instance B than it is in instance A if the individual prefers B over A. The basic assumption in economic valuation is that "preferences matter".

Preferences are revealed in many ways, though the reference context is usually the market. The market shows its preferences through the willingness to pay (WTP) of individuals for a specific good and the willingness to accept (WTA), which do not necessarily coincide. And the non-convergence of WTP and WTA is also due to the fact that, while the former is limited by the maximum amount of resources available to the individual, the latter, is, at least theoretically, limitless.

Monetising on the value of a good by resorting to the maximum amount available to the beneficiaries for the purchase, be it real or theoretical, of such benefits implies the persuasion that value is a subjective attribute connected to the individual unit and that there is no better judge to "quantify" such utility than the individual itself.

In the subjective value theory, the main focus is the individual: a reasoning subject, endowed with a conscience, who acts in view of an end. Human action is a behaviour that has a sense, understandable in the light of the purpose it serves. Human action is always an economic action, stated Von Mises: "every time individuals make a choice, they face some constraints, hence they must made the most of their resources: be it political influence, money, military power, or time to study, scarcity is everywhere".

Individuals are essentially "*homo agens*": an individual who acts for the purpose of given ends, deploy certain means and decides based on the knowledge it has, or believes to have, regarding the context in which it operates. Individuals act because they intend to

improve their situation: they believe that by acting they will accomplish certain ends they deem important.

Value results from a subjective valuation of the adequacy of the means, in the light of the pursued end. The fact that it is subjective, does not mean that it is arbitrary: the natural environment, of course, restricts the scope of action of an individual. Value derives from individual valuation and depends on the context where one operates.

When measuring WTP, reference is made to the Walrasian demand curve and the Marshallian surplus, with the inevitable and ensuing approximations introduced n the analysis.

Where classical perfect competition hypotheses should apply to the market of a certain good and the aggregate demand could be considered infinitely elastic in its relevant traits, the willingness to pay for a variation in the supply quantity of the good would coincide with its market price.

Resorting to the WTP principle and the reference to market prices is, as a matter of fact, independent from income distribution only to the extent in which the aggregation of individual preferences in generating market demand, being the base to pricing and surplus measurement, will not vary as the change of such distribution.

In the hypothesis markets were:

– *Competitive*: non of those who participate in the trading should manage to individually influence the price;
– *Non-distorted*: e.g., by taxes, subsidies or public regulations;
– *Complete*: anything contributing to economic wellbeing were the subject of market transactions;

based on the standard economic theory, market prices would accurately measure social benefits and costs and, since economic agents have a tendency to maximise profit and utility, any resource in poor quantity would be used in such way to maximise the generated value (Campbell and Brown, 2003).

The demand curve tells us, with regard to any amount, what is the willingness to pay at the margin for the good. Similarly, the supply curve informs on the marginal cost of production corresponding to each output level.

WILLINGNESS TO PAY AND UTILITY FUNCTION

The goal of the Stated Preference Methods (SPM) is to measure the monetary value an individual attributes to a given good. By indicating the subject good with *q* and assuming that the individual is a consumer, it is also assumed that the individual has a utility function *u* being defined by the amount of different market goods, indicated by vector *x*, and by good *q*, whereby *u (x, q)*. In correspondence with the direct utility function, it is possible to add the indirect utility function *v (p, q, y*), where *p* is the market goods price vector and *y* is the individual's income. It is conventionally assumed that *u (x, q)* is growing and almost concave in *x*, which implies that *v (p, q, y)* meets the standard properties with respect to *p* and *y*. If the individual considers *q* as a "good", *u (x, q)* and *v (p, q, y)* will be both growing in *q*. The valuation act implies a choice between two situations - one with the good and one without. When theoretically assessing a variation of *q*, from q_0 to q_1, utility will vary from $u_0 \equiv v\ (p, q_0, y)$ to $u_1 \equiv v\ (p, q_1, y)$. The value of the utility variation in monetary terms is represented by two Hicksian measures, namely, compensative variation C and equivalent variation E.

If the change is considered an improvement, C> 0 and E> 0; in this case, C measures the maximum WTP in individuals to guarantee change, while E measures the minimum WTA to ignore it.

The dependency of compensation C and the equivalent variation E from the initial *q* value are sometimes described as functions*: C = C (*q_0*,* q_1*, p, y*) and *E = E (*q_0*,* q_1*, p, y)*. To make thing simple, the WTP function is defined as:

$$\mathrm{WTP}(q^0, q^1, p, y) = \begin{cases} C(q^0, q^1, p, y) & \text{if } C \geqslant 0, \\ -E(q^0, q^1, p, y) & \text{if } C \leqslant 0. \end{cases}$$

The WTA function *f(q 0, q 1, p, y*) is defined similarly. The goal of SPMs is to measure one or the other of those valuation functions - both the entire function and a particular point on the function.

The interview methods are different, hence there are different elements that connect the answers provided by the interviewees with the measure of WTP or WTA. Often the answer to the questionnaire is not a direct measure of WTP, though it may be derived from the detected answers.

Conventionally, the answers to questionnaires are considered as the realisation of a random variable. Hence it is necessary to turn the deterministic model of WTP described above into a stochastic model able to generate a probability distribution of the questionnaire answers. For this purpose, it is necessary:

1) To introduce a stochastic component in the deterministic utility valuation model to define the distribution of WTP;
2) To indicate the relation created between WTP distribution and the probability distribution of the questionnaire answers, based on the assumption that the answers always indicate the solution to which maximum utility is associated.

The *Contingent Valuation Method* - CVM, in its open-ended version, allows to detect the WTP value of the interviewees directly; the closed-ended version, in turn, only provides an interval in which it may vary.

The *Choice Modelling Techniques* - CMT family is based on the same fundamental idea of Contingent Valuation, whereby it is possible and economically relevant to try and measure economic value through the willingness to pay (or accept) of individuals to enjoy an asset. The "choice" must happen among "alternatives" that are characterised by a set of different components. Each alternative is therefore defined based on the relevant attributes that define an asset. As highlighted by Blamey et al. (1998), the attributes must be "*Demand relevant, policy relevant and measurable*". While CVM attempts to valuate the good, or better said, the variation in some of its characteristics, in a holistic way, CMTs are targeted to disaggregate the asset in order to individually valuate such components from which the individuals derive a benefit. As opposed to CVM, the disaggregation offered by CMTs allows to examine the trade-off existing among different attributes. This characteristic is the main motivation underlying the application of CMTs: WTP would not be detected directly with an open question but indirectly and implicitly, including the price element as "one" of the characteristics of the subject to valuate.

In order find WTP distribution, literature suggests two approaches.

The first approach, adopted for CVM in the open-ended version, detects WTP distribution in a direct way by describing it a linear regression with an additive-type error component. As an alternative, WTP variation may be logarithmic, with a multiplicative-type error component. If the error varies according to a normal trend (Gaussian), also the willingness to pay follows the same type of trend.

The second approach introduces a random component in the utility function, with reference to the *Random Utility Model* (RUM) notion.

The Random Utility Model - RUM

Random Utility Theory is based on the idea of utility as a latent concept (it exists in the mind of the individual, but it cannot be observed directly by the analyst). As a support to researchers, a theory was introduced with regard to the probabilistic choice, which bears in mind of the existence of several sources of uncertainty. The analyst cannot accurately decide the utility a certain alternative can provide to the interviewed individual, but it can only observe the arrangement of alternatives from which he/she may derive the influence the different attributes have on utility. As a consequence, utility is made up of two parts:

- The representative utility, defined through a function (usually linear and additive) putting together the data observed by the analyst and the individual's utility;
- The stochastic component, that is, a variable that captures all those factors that influence utility but may not be observed by the analyst.

It is possible to define the likelihood of choosing an alternative as the likelihood that the utility of such alternative, for a given individual, may be higher or equal to the utility of the other alternatives found in the choice set (in Choice Set C_n).

Hence, RUM represents the theoretical basis to which to apply discrete choice models such as Multinomial Logit and Mixed Logit, used to analyse the collected data.

$$P(i|C_n) = P(U_{in} \geq U_{jn}, \forall j \in C_n) \qquad (1)$$

Formula 1 identifies the *Random Utility Theory* and the developed model is called *Random Utility Model*. In a binary choice model, the choice set (Choice Set C_n) contains only two alternatives (i and j) and, consequently, an individual (n) has the following likelihood of choosing alternative i:

$$P_n(i) = P(U_{in} \geq U_{jn}) \qquad (2)$$

where U_{in} is the utility perceived by individual n by choosing the alternative i, that is

the one that generates the most utility between the two.

The following issues must be highlighted:

1. Utility is broken down into two parts, one deterministic (V) and one random (ε);

$$U_{in} = V_{in} + \epsilon_{in} \qquad (3)$$

The deterministic part is also called systematic, representative or utility mean.

2. The analyst tries to relate the deterministic part of utility, which is formed by the attributes that describe the range of alternative choices (z_{in}) and by the individual characteristics (S_n) that may, for instance, be the socio-economic features of the individual:

$$V = V(z_{in}, s_n) \qquad (4)$$

By combining the two types of information, the resulting vector is usually defined as x_{in}. Thus the resulting equation is:

$$U_{in} = V(Z_{in}, S_n) + \epsilon(Z, S) \qquad (5)$$

which is basically the re-wording of the two components (deterministic and stochastic) forming the utility function. In the case of two choice alternatives, the likelihood of an individual (n) to choose alternative 1 may be defined as:

$$P_{1n} = Prob(U_{1n} > U_{2n}) \qquad (6)$$
$$P_{1n} = Prob(V_{1n} + \epsilon_{1n} > V_{2n} + \epsilon_{2n}) \qquad (7)$$
$$P_{1n} = Prob(\epsilon_{2n} - \epsilon_{1n} < V_{1n} - V_{2n}) \qquad (8)$$

The likelihood that the difference of the two mistakes ($\varepsilon_{2n} - \varepsilon_{1n}$) takes a value that is lower than the difference for the observed part ($V_{1n} - V_{2n}$) may be calculated as a

cumulative distribution function after having reported what assumptions are in store for the errors (for instance, assumption IID in case of Logit, which brings to a Gumbel-like distribution).

3. The most widespread functional form in the deterministic part of utility is the linear one in the parameters:

$$V_{in} = \sum_i \beta_i x_{jni} \qquad (9)$$

4. The assumption on the distribution of the stochastic part of utility (ε_{in}, also called error distribution) is not "automatically defined", but it depends on the type of analysis to be developed and, as a consequence, it is chosen by the analyst. This is why different assumptions about error distribution imply the use of different choice models. It should be said that the choice in the distribution of the error term is not independent from specifying V, but it has to do with the specification of the systematic part of utility.

DIFFERENCES WITH THE REVEALED PREFERENCE METHODS PRINCIPLES

If exception is made for the price principle (SPMs are methods that determine the monetary value of the asset), the logical and theoretical foundations for SPMs are in many ways different from those of appraisal, both with reference to the Italian theory and the international one (see Par. 3.1. in the first part).

Revealed Preference Methods (RPM)	Stated Preference Methods (SPM)
Real markets	Hypothetical markets
Revealed data	Stated data
Stability of the conditions	Change of the conditions
Generality and ordinariness	Contingency and exceptionality
Objectivity	Subjectivity

Table 11. Comparison between the theoretical references of RPMs and SPMs

Real markets and hypothetical markets, revealed data and stated data

One of the main principles of valuation is that, in order to be objective and reliable, the estimate should rest upon real market data regarding assets that are similar to the subject of valuation, recorded in the reference real estate market of the subject asset. The application of RPMs, then, implies the presence of an active market and its ability to collect a large number of historical data regarding transactions that observed in the market.

SMPs, in turn, are based on data stated by interviewees. Stated data account for the subjective preferences expressed by the interviewee and how he perceives the variation in the utility level connected with the use or the production of a given good. Subjectivity does not mean arbitrariness in the choice: SPMs always imply that the choice be rational, that the subject can match higher willingness to pay to higher utility and that the same utility be a function of the amount of consumed asset. SMPs do not contradict the principle of rationality in the choice of market operators.

Still, being the conditions upon which the choice is based hypothetical and the market simulated, WTP valuation must necessarily imply a probabilistic trend, considering that

stochastic components (as referred to by the *Random Utility Model*) that accounts for the difference between real and stated data.

Forecast, stability and dynamism of the conditions

The stability of conditions implies that every economic operation should take place according to conditions that are known at the time of reference, based on what is foreseeable as a function of the possible change produced by the action of permanent forces (structural and non-transient or contingent changes). The reality invariance postulate, which in fact theorises a static economy, stems from the stability of conditions principle.

The valuations based on revealed data, as they occur in a given moment, "look to the past" and their context is necessarily based on static concepts (what exists, what is being recorded over a given period).

Valuation based on stated values, in turn, necessarily imply a dynamic character, in that they bear in mind of the way human actions and choices evolve, building the future starting from the past.

The forecast principle necessarily implies the hypothetical and probabilistic nature of the valued data. In a general reference context where operators change along with their ends, one cannot think that current conditions can remain invariable. Through the data stated by potential consumers and producers, based on alternative scenarios submitted to a sample, it is possible to detect the future trends and the intentions of market subjects.

The hypothetical nature of SPMs does not contradict the forecast principle but, on the contrary, allows to overcome the limits determined by the approach based on revealed data. Indeed, also at the international level, valuation approaches based on forecasting (as in the case of DCF analysis) it is acceptable to have recourse to surveys and interviews to value the data to be used in the valuation.

Generality and contingency, ordinariness and exceptionality

According to the ordinariness principle, the opinion of value must be formulated as a reference to those circumstances that are most frequently detected in a given market; from such principle there ensues the objectivity of the valuation opinion.

This assumption requires to consider only the historical behaviour in the majority of considered data.

SPMs, in turn, allow to determine the entire variation curve of subjective preferences as compared with the variation in the asset quantity. The data account the preferences of all sample subjects, including any eccentricities and special instances, not only the majority.

The “contingent” nature of the data stated through SPMs indicates that valuation is tied to a context and a specific situation (the one theorised in the survey reference scenario) and not necessarily to a common or normal condition. This issue allows to detect also the data regarding special situations that could not be valued in any way under the traditional methods.

Consistently with the demand and supply principle, instead of detecting the equilibrium prices occurred in the market (as per RPMs), the stated data are used to estimate the hypothetical demand and supply curves of the asset and the equilibrium price in the market is described by the intersection of the two curves.

2.2. Methodological elements of the Stated Preference Methods

2.2.1. GENERAL CHARACTERISTICS

Within the family of Stated Preference Methods (SPM), a distinction may be made between direct methods, or *Contingent Valuation Methods* (CVM), and indirect methods, or *Choice Modelling Techniques* (CMT) (Fig. 10).

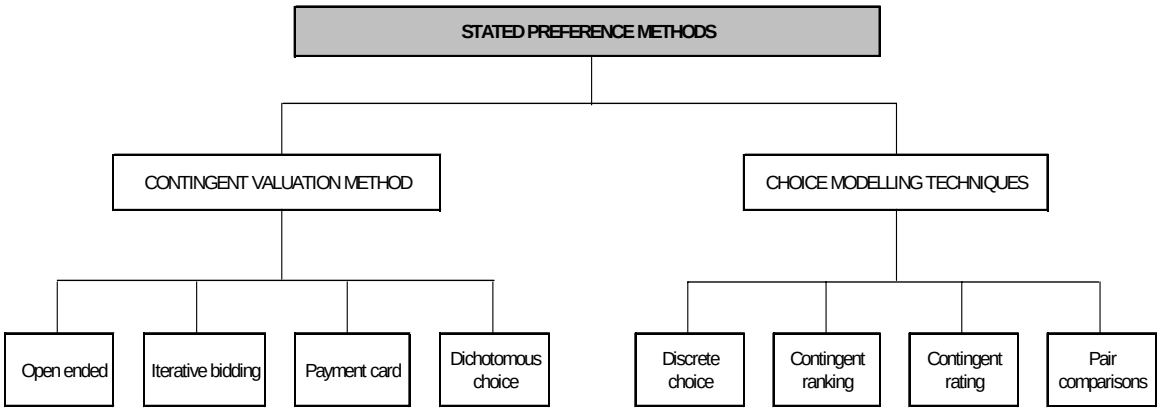

Figure 10. Classification of the Stated Preference Methods

The *Contingent Valuation Method (CVM*) requires a broad statistically significant sample of participants and allows to estimate the overall value of a good, directly asking people their willingness to pay or accept. Conversely, it does not provide any indications regarding the value of the different characteristics the good is made up of.

The *Choice Modelling Techniques (CMT)* allow to look into the attributes of the good and the effects of the variations in such attributes. This has particular importance when the decision is based on level variations in the attributes. They provide a fuller description of the implicit comparison among characteristics that individuals use in the market. The CMT family features several techniques. All are based on the assumption that an asset may be described through its characteristics and their relevant level.

In the last decades CMT applications have been more successful in that they provide a more direct route to valuate the characteristics and attributes of a good and the changes in the levels of such characteristics, rather than the value of a good as a whole. This may be of particular importance in management decisions, projects and policies appraisal where decisions are based on changes in the level of such attributes.

CMTs may be divided into four main categories, which reflect the differences in the theoretical assumptions, in the analysis methods and in the experimental design procedures. In terms of practical application, the academic literature of the recent past mostly converges on the Discrete Choice Experiments - DCE since they better describe individual behaviours in the real market (the subject makes a single choice from a set of alternatives).

As regards CVMs, in general all versions may be used, though the Payment cards and the dichotomy choice models are the most recommended CVM elicitation methods. Payment cards offer more information and less cognitive burden on the interviewees and are less costly to implement as opposed to the Dichotomy choice. Moreover, they are more efficient to both the Open-ended version and the Bidding-game version.

Valuation process structure

The basic structure of a valuation process based on the application of SPMs usually breaks down according to the phases reported in figure 11, both in the case of CVM and CMT. The main differences between the two families have to do with the questionnaire structuring and the data analysis phases.

Having detected the subject asset and the scope of the research, the survey method and the valuation technique(CVM or CMT) are selected.

Then, it is necessary to choice a statistically significant sample based on the target population, to administer the questionnaire to.

The questionnaire design takes different characters depending whether CVM or CMT apply. Before administering the questionnaire to the selected sample, it is necessary to test its validity and consistency through a pre-test carried out with a pilot sample.

Having verified the validity of the questionnaire, the actual interview phase may start. The data collected during the survey are verified and processed in order to allow the average or median sample WTP/WTA to be calculated. The processing and valuation methods depend on the adopted valuation technique (CVM or CMT).

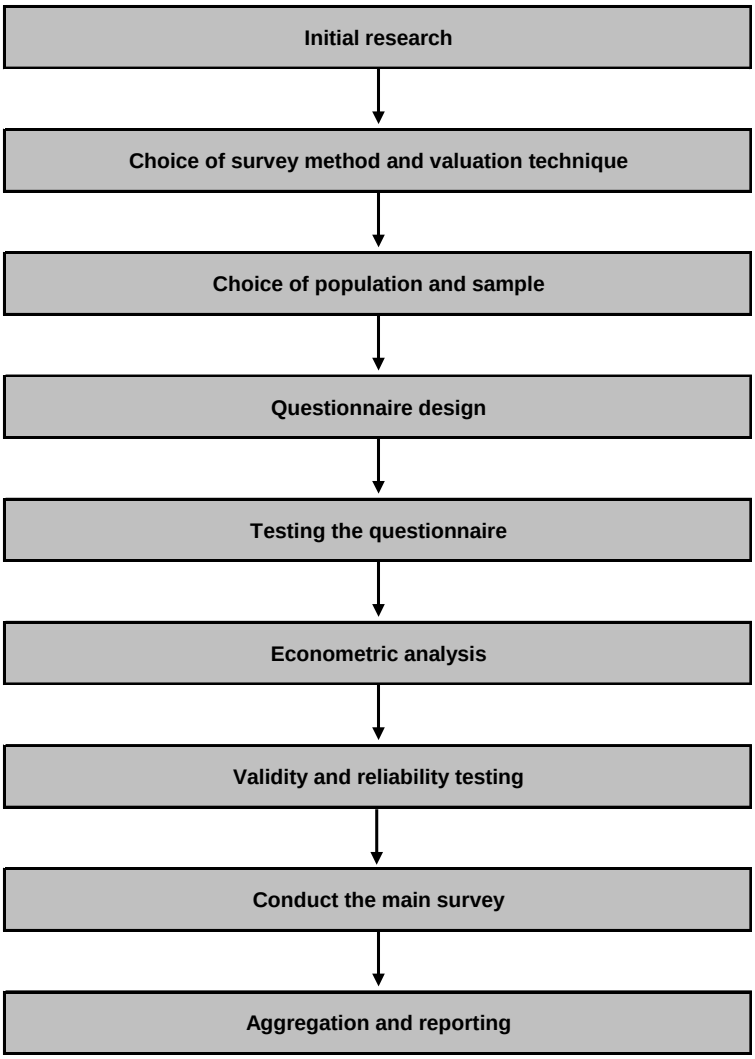

Figure 11. Structure of the Stated preference methods valuation process

Based on the WTP/WTA estimate, the data are aggregated to come to the estimate of the economic value of the good or to determine the demand (or supply) curve.

Selecting the survey method

The choice must be made among potential survey methods:

– By mail;
– By phone;
– Face to face;
– Mixed: mail + telephone; mail + face to face;

– Computer assisted.

The advantages and disadvantages of the different survey methods are reported in Table 12.

Identifying the target population and choosing the sample

The survey is carried out on a sample of respondents and the nature of the sample depends on the target population that one intends to represent. If the main interest is the general population, the survey will select a sample from that population. There may, though, occur a need to separate the behaviours and WTP/WTA in different social groups; in such case some sub-samples will be identified.

The two main forms of distortion that may derive from the sampling process are: sampling error - the selected sample is not representative of the entire population - and a high non-response rate - some people in the sample may not respond. The existence of non-responders may affect the representation level of the sample.

This moment of the research breaks down as follows:

1. Selection of the *target population.* It may represent the entire population of a country or a region or a defined group of subjects (consumers or producers of specific goods).
2. Identification of the *sample frame* population, from which the actual sample will be extracted.
3. Selection the sample from the frame by means of probabilistic sampling. The selection process implies the use of a random procedure, for instance, a computer generating a series of random numbers (see Table 13).

Experimental design

The goal of a Contingent Valuation questionnaire is to detect preferences in monetary terms, more specifically the maximum WTP or the minimum WTA in the quality or quantity changes of goods or services. Such changes may refer to hypothetical or real goods or services. First of all, CV questionnaires ask their respondents how the change in goods and services may affect them. The goods/services must be perceived as realistic, viable and described in detail before they are asked to value it. Subsequently, the interviewed pool is asked to state its WTP or WTA for the enjoyment of those goods or services.

Method	Advantages	Disadvantages
Mail surveys Printed questionnaires are posted to potential respondents	Relatively inexpensive Lack of interviewer bias Easier to answer sensitive questions Can be completed at respondent's own pace	Low response rates 25-50% Self-selection bias Time-consuming Little control over who fills the questionnaire Fixed question order No clarification or probing possible Restricts the use of visual aids Respondent can alter earlier responses
Telephone interviews Interviewers call potential respondents	Complex questionnaire structures are possible Cheaper than face to face interviews Permits probing and clarification Relatively quick to administer Easy to monitor 60-75% response rates	No use of visual aids Restricts use of lengthy scales Respondent may get tired Respondents may not answer sensitive questions Non-telephone or non-listed respondents not sampled
Face-to-face interviews Interviews take place one-to-one between the interviewer and the respondent eithe at home or another location relevant to the study (intercept survey)	Highly flexible Complex questions and questionnaire structures are possible Permits probing and clarification Larger quantity of data can be collected Potential for extensive use of visual and demonstration aids High response rates 70% + Greatest sample control	Relatively expensive Possible interviewer bias Intercept surveys: samples normally not representative and self-selection bias Intercept surveys: questionnaires have to be short
Mixed methods: drop off survey The questionnaire is mailed prior to a visit by the interviewer	Initial personal contact gives survey a 'human face' Shares the advantages of mail and face-to-face methods	Survey form may be lost in interval before calling back Expensive
Mixed methods: mail + telephone surveys The questionnaire is mailed prior to a phone call by the interviewer	Gives personal touch to the survey Can complete mailed questionnaire in own time	Shares some of the limitations of mail surveys Relatively expensive
Computer assisted interviews Interviewer records responses directly to computer and/or respondent may respond to questions on computer screen	Subsequent analysis is quicker since data inputting stage is not necessary Permits more complex interviews Permits use of e-mail and internet	Possible rejection of 'computer technology' E-mail/internet may preclude random sample unless wide coverage of PCs

Table 12. Advantages and disadvantages of different survey methods (source: Pearce and Ozdemiroglu, 2002)

Form of sampling	Method	Advantages
Simple random	Every element of the sample frame is given an equal chance of being selected.	Simple
Systematic	Select every k^{th} element from a randomly ordered population frame.	Simple
Stratified	Sample frame population is divided into distinct sub-populations, or strata. A separate and independent sample is selected for each stratum, using random sampling with either the same sampling fraction for each of the strata (proportionate stratification) or different sampling fractions (disproportionate stratification). The data are used to develop separate within-stratum estimates. Finally, the separate stratum estimates are combined (weighted) to form an overall estimate for the entire population.	Enables estimates to be derived for each separate group, even thoughselected group may be a small fraction of the population.
Clustered multi-stage	Population is divided into a set of groups or 'clusters' but only a random sample of the clusters is selected. Cluster sampling involves sampling all the elements within the selected clusters, but the term is also used to cover multi-stage sampling, in which one selects only a random sample of the elements within the selected clusters. An example of cluster sampling would be to divide a city into zones, randomly select a set of zones, and then survey every household within the selected zones. In a multi-stage sample, one would survey only a sample of households within the selected zones.	For surveys of large populations that possess some sort of hierarchical structure, multi-stage sampling is generally more convenient and more economical than one-stage simple random sampling. Multi-stage sampling is attractive when no overall sample frame is available.

Table 13. Form of sampling (source: Pearce and Ozdemiroglu, 2002)

The key passages needed to design a CV questionnaire are summed up below:

- Formulate the valuation problem;
- Consider additional questions;
- Questionnaire pre-test.

The different types of CMT display a certain amount of fundamental differences both in the theoretical hypotheses and in the structure of the survey activities.

Nevertheless, there is a certain number of common hypotheses and design phases. More specifically, all CMTs are based on data generated through a planned and

systematic survey design process, where the attributes and their levels are pre-defined and varied to create preference of choice alternatives.

The key passages are summed up below:

- Problem definition;
- Qualitative study (to identify alternatives, attributes and levels);
- Experimental design;
- Identification of alternatives;
- Generation of the survey instrument.

Data aggregation

The valuations made with CVM or CMT describe the average or median WTP of the interviewed sample included in the study. In general, though, decision-makers are usually not interested in the average or median WTP of the sample, but to the average of the entire population at hand. The final task is to aggregate the values moving from the sample to the population.

This task is usually performed at the end of a Stated Preference experiment. Nevertheless, the questionnaires must be designed carefully and the sampling processes must be carried out specifically in order to yield reliable results and for the aggregation measures to be valid. Indeed, many of the aggregation problems may be averted only by accurately selecting the sample.

Ideally, a SP study will develop following the five phases listed below:

1. Target population choice;
2. Unit of observation choice (say, family);
3. A simple random sample of units is extracted, with every population unit having the same likelihood to be included in the sample;
4. All units selected for the sample accept to be interviewed and to provide comprehensive answers to all questions. In other words, there is not a single answer missing in the survey;
5. The sample statistical measure of interest is estimated (for instance average WTP).

In this case the aggregation process is simple. If we state the statistic of interest (average or median sample WTP) as $\underline{WTP}$ and the total number of population units as N, then:

$$Aggregated\ WTP = N^{*}\underline{WTP}$$

Nevertheless, it is often difficult or even impossible to guarantee that passages 1 through 5 are applied faithfully, thus the most complex problems usually rise in the aggregation process. Consequently, the most part of the aggregation capacity has to do with the strategies to tackle non-compliance instances in the above conditions. More specifically, the deviations from the ideal study are usually to do with a non-representative sample (error in points 3 and 4) and the inability to define the relevant aggregated population (error in point 1).

Applicability and possible biases

When choosing between CVM and CMT in practical applications, the analyst must seek to match methodological rigour with the available time and budget. CMTs take longer to unfold in that they require a study on the context, focus groups and test on potential attribute levels before proceeding the main survey. The *experimental design* phase is the most important in CMT design and poses bigger hurdles than the CVM questionnaire design process. In the creation phase, then, the available time and budget are the most important elements in order to decide whether to use a CVM or a CMT.

The ability of CMT to describe the goods or services at hand within a “package” of potential trade-offs is also regarded as a way to reduce information transfer to a minimum and simulate more realistic choices. This is very important when the goods at hand are not familiar to the respondents. Hence, the CMT approach is mainly based on the accuracy and completeness of the characteristics used to describe the goods, rather than on the description itself. Moreover, the price in CMT is only one of many attributes used to describe the goods. Thus, the focus on price is lower than in CVM and the relevant distortions may be reduced.

The key issues regarding the choice between CVM and CMT are reported in Table 14. Many different circumstances may influence individual decisions and WTP as it gets revealed. The results of the interviews are particularly sensitive to the characteristics of the instruments and methods used.

SPMs are subject to a number of (biases), which mainly derive from the hypothetical nature of the answers. A bias is defined as "the difference between the distribution of hypothetical choices obtained from a survey and the distribution of choices possibly obtained from a real market environment" (Schulze et al, 1996).

Issues	Differences CVM - CMT
Cost of survey	CVM lower cost than CMT
Timescale	CVM shorter than CMT
Valuations	CMT can value individual attributes, CVM total package only
Complexity of design	CVM less complex than CMT
Software and analysts	CMT requires specialist software and analysts, CVM does not
Complexity of task for respondents	More complex in CMT than CVM
Compliance bias	High in CVM, low in CMT
Stability of preference	Better in CMT than CVM
Estimation of attribute values simultaneously	CMT but not CVM

Table 14. Comparison between CVM and CMT

Sample distortions

It is important to reduce the following forms of bias as much as possible when selecting the sample:

1. Sampling error: the sample is not representative of the population as a whole; the sampling error is reduced to a minimum by making sure that the sample is chosen randomly;
2. Non-response error: those who do not respond are different from those who do. The error may be reduced by increasing the response rates by means of the following operations:
   - Using brief, well-designed questionnaires;
   - Using well-prepared interviewers;
   - Providing guarantees of privacy and data protection;
   - Using incentives (if the questionnaire is long and/or complex).

Moreover, it is necessary that information and questions be asked in a simple and plain way, in order to make the sample aware of the bias problem before the questions are even asked. It is important to ensure that the questionnaire is not too long, since long questionnaire have a tendency of reducing the response rate, making the survey less representative and increasing the costs. Incentives may improve the response rate in the case of long interviews. The maximum suggested length of a questionnaire depends on

the research method: for instance, questionnaire the sample may fill in from home may be longer, whereas those requiring an *in situ* interview should be shorter.

As regards the identification of marginal subjects (respondents who are more inclined to change behaviour), it is necessary to perform a qualitative research in order to identify the nature of such respondents and define the appropriate questions to perform such identification.

The idea to separate the answers of marginal respondents from those of the general population is instrumental to guaranteeing that also non-marginal respondents are represented in the sample and that the proportion of marginal respondents is correctly identified in order to weigh the data correctly.

Strategic biases: free riding and overpledging

The situations one most likely encounters, especially with CVM, stand out for certainty in terms of payment and uncertainty on its extent. Moreover, the offer of an asset is perceived as dependant on the stated WTP. The hypothesis of an inaccurate detection of the responses appears to be rather unlikely. It seems impossible to convince the sample that they will have to pay the same amount as they have stated, both because of the anonymity of most surveys, and for the problem of individually collecting the payments.

Finding strong response concentrations at the ends of the WTP distribution may be considered a good indication of the presence of a strategic behaviour, since there are only two reasonable strategies to approximate the sample average to the desired value: either bid zero or the go "all-in". Finally, strategic behaviours imply high information requirements (about the opponents' behaviour), which are not met when interviews are carried out individually.

Procedural biases – interviewer and respondent bias

An interview is an interactive social relation between the interviewer and the respondent. In many instances, the latter may have a limited degree of familiarity with the subject of valuation or low awareness in terms of personal preferences: in such instances, they may try to guess the exact value, as though that value were something external. In other cases, they will grant the interview a limited interest.

Direct interviews imply the highest degree of interaction between the interviewer and the respondent, though there is no definitive proof that this is the origin of bias. Mail and telephone interviews may imply a lower risk of influence from a psychological

standpoint, but they produce others (lower response rate). More specifically, telephone interviews are extremely sensitive to the choice of words used in the questions.

An important sub-species of bias is the anchoring bias, which consists of taking one of the provided pieces of information as a point of reference to determine the willingness to pay. For instance, there can be market assets that may be assimilated to the valuation subject. Sometimes the existence of terms of comparison may be referred to by the interviewer in to make the valuation process easier.

Anchoring is not entirely acceptable: it is quite normal for the sample to do an anchoring with respect to the price of assets it will be forces to sacrifice.

Instrumental-Related Biases

1. Vehicle Biases - distortions produced by the payment instrument

The instrument offered to perform the payment may influence the stated amount. Sometimes the preference for a given instrument produces a rather higher influence on the preferences for the same asset.

The use of a tax to value public assets may have a negative effect on the willingness to pay, in others it may appear as more acceptable than an admission ticket. Even though, in the case of payment, some authors suggested to include instruments lacking any negative psychological implications for the consumers, such as voluntary donations, voluntary participation in non profit funds, etc., it is not certain whether some consumers have an aversion towards these forms of payment. A tax may appear as a more viable form of payment than others. Traditional methods (taxes, levies) may provide the right incentive, as long as the respondent understands the link between the response and the project becoming reality, and refrains from strategic behaviours.

The effects of the payment instrument may depend on the position of the respondent in the family or group.

Finally, the time distribution of payment should also be considered: usually the payment is theorised in a single solution, though it the payment should be spread over time, it can be hardly assumed that respondents can discount future payments, as they should were they applying the economic reasoning correctly.

2. Starting point bias

The lack of familiarity with the valuation object among the respondents may lead the interviewer to suggest a range of hypothetical numbers, leaving it to the respondent to

stop the process, once the goes closest to the value being considered as real. In some private negotiations sellers start at prices ten times higher than the actual ones while the consumers tends to think that the overvaluing is just twofold.

The first offered value might not be “innocent”, that is, lacking any influence on the final result.

3. Bias generated by the provided information

The information offered by the interviewer or the questionnaire play a key role in the response processing mechanism put in place by the respondent. It is difficult to define the correct amount of information to give the respondents. Some authors have come to the conclusion that the presence of variable information “doses” is a characteristic of every economic choice, starting from those having to do with real markets; hence, the only real focus should be to ensure the constant flow of the information content within the same sample and avoid biases caused by implicit opinions and the likes.

4. Bias produced by the hypothetical nature of the questions

The literature describes the risk of important biases cased by the hypothetical nature of the questions as being greater for problems formulated with WTA than for those generated in terms of WTP.

An element limiting this risk is provided a sufficient degree of familiarity of the respondent with the valuation subject. Such condition, though, is not always easy to meet, in that in many instances the valuation involves goods respondents do not have much familiarity with. To a large extent, this type of bias tends to overlap with the previous one.

5. Part-whole Bias – Embedding and Scope effects

These are the cases the attest literature put most of its focus on, in that they provide the greatest source of bias in the survey.

Some surveys seem to show that consumers are often incapable of telling apart a given valuation subject and a set of assets it belongs to: telling the part from the whole is not always easy for consumers.

An asset place at the head of a list is generally given higher valuation that the others in lower positions.

Economic theory explains this effect through the decreasing marginal utility theory: the marginal WTP of two assets considered together should be lower that that of two

assets considered separately and then added. This may be the logical consequence of the income or substitution effects.

From an empirical standpoint, it is possible to solve these biases through suitable tests (for instance, by observing the effect obtained adding a second asset).

The term "embedding" refers to the substantial coincidence sometimes recorded in asset valuation where one asset contains the others. The term scope/scale effect refers to the valuation not changing in spite of the changes in the scope or the scale of the valuation subject.

In some cases it was proven that the value attributed to an asset is higher if it is considered separately, as opposed to being presented as an addition to a series of other assets.

The explanation of the embedding effect is that individuals tend to attribute symbolic values to goods, which they usually derive from the general category the same good belong to, rather than from the analytic valuation of their characteristics.

From a psychological standpoint, some individuals may have an *implicit budget constraint* in their mental accounting for every expense item, which prevents them from exceed specific values for the same goal: once these values are expressed for a certain result, they remain fixed, even though they are offered a higher result.

Regardless of the symbolic and psychological take, it may be theorised that in some cases the respondent may correct what they consider to be meaningless or even wrong questions.

It should still be observed that individuals seem to find it hard to keep a so-called adequate mental accounting, that is, allocate personal expenses ideally for the to add up and not exceed the total available income.

It is possible to avoid or limit the embedding effect by formulating the questions in such a way to force the respondents to keep the correct accounting (e.g. asking a global estimate and then asking to divide it by component in percentage values).

Based on what was been explained, there are some practical rules to refer to when designing a survey:

- Provide the respondents suitable indications to allow the to distinctly tell the asset value apart from production costs;
- Specify whether WTP refers to the purchase of the asset or to the participation in the production costs;

- Explain the cost to result ratio and, if any, the existence of economies of scale;
- Detect the most suitable payment instrument;
- Always report the existence of substitute assets already present in the market.

2.2.2. DIRECT METHOD: CONTINGENT VALUATION METHOD

The set of techniques based on the contingency analysis includes any approach to good or service valuation that is based on individual behaviours regarding hypothetical circumstances and that is used to estimate Hicksian wellbeing measures by means of direct questions.

Its theoretical formulation, dating back to 1952, was first experimented with in the Sixties to value the benefits connected with recreational activities. Following several applications were tested to value cultural and environmental resources. More recently, a few applications were tried with urban planning, environmental damage estimate and private goods valuation.

By means of interviews made on a suitable sample, the method allows to detect the perception of personal wellbeing level variation (WTP or WTA) due to the performance of an intervention of the enjoyment of a good. Such approach helps to detect not only individual preferences, but also intensity.

The monetary expression of the value of an asset is given by the forecast amount users are willing to pay in order to enjoy the good: theoretically, reference is made to the consumer surplus concept.

Questionnaire definition

Contingent Valuation Method (CVM) implies the request to a random respondent sample their willingness to pay (WTP) for a well-defined good, or their willingness to accept (WTA) a loss.

It is essential to state the purpose of the CVM questionnaire in order to ensure that all respondents understand the context, are motivated to collaborate and are capable of participating in an informed way.

The valuation scenario defines the asset at hand and the nature of the change in its availability. These pieces of information build a scenario, which is the context where the interview is to take place. The scenario defines the asset and the subject responsible for providing the asset. It is important for the respondents to be persuaded that what they say will ultimately influence the decision and that the asset will not be provided regardless of what they say.

These conditions contribute to the credibility of the questionnaire and the scenarios. It is important, though, to avoid strategic behaviours, that is, the deliberate over or

underestimation of WTP.

The payment method describes the way the respondent is theoretically bound to pay for the good. The choice of the most suitable payment instrument depends on the nature of the good.

Elicitation methods

The value elicitation question is instrumental to detecting the monetary amount one is willing to pay (or accept) for the supply of a good. This is an essential process to detect maximum WTP or minimum WTA consistently with the economic theory underlying the valuation.

The most widely used elicitation techniques are:

a. Open ended

The respondents are left free to express their valuation. The demand curve is continuous. The interviews may also be administered indirectly, by phone or mail. Accordingly, the incomplete or non-answer rate increases; this inconvenience may be partly averted by enclosing an average value table (payment card) inherent to the distribution of per-capita expenses paid by the public administration. The response is easier and, indeed, a higher number of complete responses has been observed. This technique, though, may produce strategic behaviours: when WTP is perceived to be lower than the cost, there is a tendency to have non-responses.

OPEN ENDED

What is the maximum amount that you would be prepared to pay for the provision of X good?

FOR

- straightforward;
- does not provide respondents with cues about what the value of the change might be, i.e. no anchoring bias;
- Is very informative since maximum WTP can be identified for each respondent;
- requires relatively straightforward statistical techniques.

AGAINST

It leads to large non-response rates, protest answers, zero answers and outliers, i.e. unrealistically large bids, and generally to unreliable responses. This is because it may be very difficult for respondents to come up with their true maximum WTP 'out of the blue' for a change they are unfamiliar with and have never thought about valuing before. Moreover, in terms of 'mimicking' markets, most market transactions involve deciding whether or not to buy goods at fixed prices, rather than stating maximum WTP values.

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b. Iterative bidding game

This is the first technique developed for CVM (1964). It provides for an initial bid from the interviewer of an amount in terms of WTP/WTA, with the option of a dichotomous response. The process is iterative: the sum is gradually increased in a constant way until the end limit of acceptance is reached.

This approach provides a continuous measure of the collective demand curve. The negative influence that the first monetary indication may cause to the responses (*starting point bias*) should also be considered. Moreover, it causes high costs, since the interview must be administered in person.

BIDDING GAME

Would you pay X € for the provision of X good?

If Yes: Interviewer keeps increasing the bid until the respondent answers No. Then maximum WTP is elicited.

If No: Interviewer keeps decreasing the bid until respondent answers Yes. Then maximum WTP is elicited.

FOR

- This may facilitate respondents' thought processes and encourage them to consider their preferences carefully.

AGAINST

- Anchoring bias may exist, that is, respondents may be influenced by the starting values and succeeding bids used;
- It also leads to large number of outliers and to 'yea-saying' (giving affirmative but possibly false responses);
- Bidding games cannot be used in mail surveys and other self-completed questionnaires.

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c. Close ended – Dichotomous Choice Model

The respondent expresses the willingness to pay a given amount proposed by the interviewer. This format (called referendum) allows to understand whether the WTP is higher or lower than the offered amount.

The first goal is to determine the distribution of the WTP, to later calculate the average or median value. The statistical analysis is crucial; the use of discreet variables implies a rather complex inference process. The approach becomes probabilistic: the analyst, after having set a growing series of monetary amounts, submits to every subject a term of the series selected randomly, providing the dichotomous answer YES/NO. WTP is no longer the maximum willingness to pay, but a discreet measure of it. Determining the demand curve is done subsequently according to the inferential analysis principles. The goal is to study the event probability function, that is, the dichotomous variable YES/NO.

SINGLE-BOUNDED DICHOTOMOUS CHOICE
Would you pay X € for the provision of X good?
(the price is varied randomly across the sample)
Yes /No

FOR

- it is thought to simplify the cognitive task faced by respondents. Respondents have to make a judgement only about a given price, in the same way as they decide whether or not to buy a supermarket good at a certain price, while at the same time providing incentives for the truthful revelation of preferences under certain circumstances (incentive compatibility). That is, it is in the respondent's strategic interest to accept the bid if his WTP is greater or equal than the price asked and to reject otherwise, i.e. ensuring that the respondent tells the truth;
- this procedure minimises non-response and avoids outliers.

AGAINST

- empirical studies have revealed that values obtained from dichotomous choice elicitation are significantly larger than those resulting from comparable open-ended questions;
- some degree of yea-saying is also possible;
- dichotomous choice formats are relatively inefficient in that less information is available for each respondent (the researcher only knows whether WTP is above or below a certain amount), so that larger samples and
- stronger statistical assumptions are required. This makes surveys more expensive and their results more sensitive to the statistical assumptions made;
- there may also be starting point bias, i.e. answers are 'anchored' on the initial figure stated by the questioner.

For the purpose of increasing efficacy, it was offered to integrate this method with the iterative one, offering a second question after the first answer (*dichotomous choice - double bounded*): in case of affirmative answer to the first question, another is asked with higher value, chosen among a set of values (o vice versa, the answer being negative). The advantage of this technique is that it provides more accurate information about the WTP sample trend, without increasing sample size. The second question should improve the information. The advantage, though, should be compared against the risk of having an underestimation.

DOUBLE-BOUNDED DICHOTOMOUS CHOICE
Would you pay100 X € for the provision of X good?
If YES: Would you pay120 X € for the provision of X good?
If NO: Would you pay 80 X € for the provision of X good?

FOR

- more efficient than single-bounded dichotomous choice as more information is elicited about each respondent's WTP.

AGAINST

- all the limitations of the single-bounded procedure still apply. An added problem is the possible loss of incentive compatibility (truth telling) due to the fact that the second question may not be viewed by respondents as being exogenous to the choice situation, and the added possibility of anchoring and yea-saying biases.

d. Payment card

A list is presented to the respondents, containing a large number of monetary amounts. These are the amounts they would surely be willing to pay and rule out the amounts they are absolutely not willing to pay.

PAYMENT CARD

Which of the amounts listed below best describes your maximum willingness to pay for the provision of X good?

OR

Please place a tick next to the amounts you are certain you would be willing to pay and a cross next to those you are certain you would not be willing to pay. Leave blank those amounts that you are unsure whether you would be willing to pay or not.

FOR

- provides a context to the bids, while avoiding starting point bias at the same time (starting point bias being a form of anchoring bias whereby bids are linked to the researcher's statement of the first amount);
- the number of outliers is also reduced in comparison to the previous formats;
- some versions of the payment card show how the values in the card relate to actual household expenditures or taxes (benchmarks).

AGAINST

- vulnerable to biases relating to the range of the numbers used in the card and the location of the benchmarks;
- it cannot be used in telephone interviews.

There is a remarkable debate in literature about the best way to formulate the elicitation question. The choice of the elicitation format has remarkable importance: different formats usually yield different valuations. Payment cards and dichotomous choice are the most recommended. The first is more compatible with information technology means and more inexpensive to implement as compared to the second; moreover, it is superior to open-ended and bidding game alike. The second may be compatible with incentives (it encourages to speak the truth) and makes the valuation easier for the respondents. Both may produce uncertainty in respondents' preferences (preference inaccuracy). The first may account for uncertainty by presenting a value interval. Dichotomous choice processes may account for uncertainty by introducing the "I don't know" option next to yes and no.

In all approaches, the respondents are reminded about the substitute goods (anything that is not one of a kind will have substitutes affecting its value) and the budget constraints (income or wealth threshold).

Data analysis

The analysis phase of a CVM is the point when the data collected during the survey turn into a usable output.

Once the questionnaire has been tested and later administered to the sample, the survey data are inserted in an electronic worksheet and submitted for cross-validation to look for entry errors.

The analysis of data collected in a CVM study must serve the following purposes:

- Estimate average and median WTP/WTA for the interviewed sample;
- Test the structure of the WTP / WTA answers in the CVM survey, in order to verify whether the differences in the answers may be explained by any differences on the respondents' characteristics;
- Provide a *transfer equation* to use in following *benefit transfer*[2] exercises.

Average and median WTP estimate

The main goal for CVM data analysis is to obtain an estimate of two summary statistical indicators such as *average sample WTP* and *median sample WTP*:

- The average WTP may also be defined as the mean WTP of the sample;
- The median WTP is the WTP value that splits the sample exactly in half (that is, the WTP value in respect of which exactly 50% of the sample has lower WTP and 50% of the sample has higher WTP).

The two sample WTP synthetic measures are interpreted and regarded in ways that are most different. The median value is relevant within the public choice context (that is, the economic analysis of political decisions) in that it corresponds to the amount that would get the approval from the majority.

Some analysts maintained that median WTP is a stronger trend indicator in that its value is not so strongly influenced by abnormal values. Nevertheless, both average and median are WTP values that should always be reported, in that no measure is ever intrinsically better that the other. Average and median WTP may be estimated using

[2] A goal of the CVM data analysis is to provide details that may be used to transfer the benefit valuation to other similar contexts. It may seem reasonable to simply transfer the average WTP value, even though this value is strictly applicable to the population from which the sample was extracted. Hence, in order to improve the benefit transfer process, analysts often estimate a *transfer benefit* equation measuring WTP as a function of the respondents' characteristics.

either non-parametric or parametric methods.

Verifying stated WTP structure

The second goal of CVM data analysis (after estimating average and median sample WTP) is to verify the validity of WTP responses. Hence, the analysts test whether the WTP values provided by the interviewed sample follow distinguishable models and whether these models are compliant with the previous forecasts and economic theory.

In general, the analysts define a number of variables that they believe could determine the WTP of a respondent. Usually, such variables include:

- Income and other social/economic characteristics of the respondent;
- Details about their approach to the programme offered in the CVM scenario;
- Information about their actual familiarity with the good to be provided;
- for goods with a spatial dimension, their proximity to the site of provision.

Hence, the goal is to see how these variables 'explain' family WTP. The approach rests on specifying, estimating and then interpreting a bid function. A bid function is a mathematical equation that, once estimated, describes how each variable has an influence the respondent's WTP.

2.2.3. INDIRECT METHODS: CHOICE MODELLING TECHNIQUES

Choice Modelling Techniques (CMT) are based on the idea that any asset could be described in terms of the level of the attributes or characteristics they possess. Changing the attribute levels essentially determines a different 'asset' and it is on the value of such attribute changes that the choice model focuses. The CMTs differ from the Contingent Valuation in that the latter asks the respondent a choice among alternatives, a rank or a score instead of values. CMTs, then, may avert some of the problems connected with CVM, in that people may find it easier to attribute a score or a rank position without the need of thinking straight in monetary terms. Nevertheless, CMTs are used to derive economic values through a monetary indicator (a price, charge or tax) that is a characteristic of each option.

CMTs can provide information on which attributes significantly determine the value people attribute to assets, the implicit importance of such attributes among the population, the value connected to the variation of more than one attribute at a time and the total economic value of an asset.

The first CMTs with stated preferences became known in the Marketing field under the name *Conjoint Analysis*. Being *Random Utility Theory* (RUT) the theoretical basis of such models and since it becomes the element of reference for choice techniques in the economic area, this theory provided the necessary connection between observing consumer behaviours and economic theory. In order to make clear that the latest CMTs are based on economic theory, the term Conjoint Analysis is no longer used in economic literature.

The main goal of using these techniques is to determine the preferred combination of attributes regarding a product or a service to analyse, starting from the valuation of a series of options. This model is also called *multi-attribute compositional model*.

The study on the combined effect of the element the asset is made up of on consumers allows to determine the relative importance and to determine which combination of a limited number of attributes has a larger impact on consumer choices, both in terms of decision making and purchase behaviour. Usually a set of products is submitted and, based on the preferences, the implicit value of the single elements contributing to the choice is determined.

The techniques

In the CMT family there are different techniques, that may be classified in four categories having differences in terms of the theoretical assumptions, analysis method and application process.

a. Discrete Choice Experiments

In Discrete Choice Experiments (DCE) the respondents are presented a basic scenario corresponding to the status quo and different alternative options in which attributes are specified with different levels. The attributes that must be included may be determined by means of *focus groups*. The selected attributes should include a monetary value that, as for the CVM, represents the payment vehicle. The number of attributes should be limited in order to ensure its suitability to be managed by the respondents. The choice experiment is built as shown in Table 15. The respondent is asked to state their choice between A, B or none of them. To state 'none' means that the benefits with regard to the status quo are not guaranteed. Every respondent can be asked to repeat the choice experiment several times, with different characteristic levels based on an experimental design. It is always necessary to provide for the zero option.

As regards the theoretical foundation, DCE provide information regarding the chosen alternative only. Hence, the data are considered weakly ordered. The econometric technique used is consistent with the economic theory of rational probabilistic choice.

	Option A	**Option B**	**Change in attribute level from A to B (+ better, − worse): illustrative only**
Attribute	A1 A2 A3 A4 (price)	B1 B2 B3 B4 (price)	+ − + +

Table 15. Example of Discrete Choice Experiment (source: Pearce and Ozdemiroglu, 2002)

b. Contingent ranking

This method is similar to DCE, but it asks the respondents to rank the options in terms of their desirability. The respondents must rank all the presented alternatives. In this case the date are strongly ordered. Even though this technique allows to have more information, it features more criticalities from a cognitive standpoint. In some cases it may be arranged

as a multi-phase DCE: the first time respondents are asked to choose the best option among N alternatives. The second time the options are N-1 (the first choice is removed) and so on. In order to be consistent with the principles of wellbeing economy, it is always necessary to provide for zero option.

	Option A	**Option B**	**Option C**
Attribute	A1 A2 A3 A4 (price)	B1 B2 B3 B4 (price)	C1 C2 C3 C4 (price)
Ranking of options: 1.....2.....3.....			

Table 16. Example of Contingent Ranking (source: Pearce and Ozdemiroglu, 2002)

c. Contingent rating

The respondent is asked to assign a 'grade' based on a valuation scale (e.g. from 1 to 10). The respondents are presented with one alternative at a time and are asked to value them with a numeric or semantic scale. Each respondent may be presented with several alternatives with varying characteristics. The complexity of the respondent's task is higher than in the other techniques, in that it must also account for the intensity of its preferences (to what extent is one better than the others). It does not imply a direct comparison among alternatives and goes as far as to allow to come to mutually indifferent alternatives.

Attribute	Option A A1 A2 A3 A4
Tick one level showing your preference for Option A 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10 *Very low preference* *Very high preference*	

Table 17. Example of Contingent rating (source: Pearce and Ozdemiroglu, 2002)

d. Pair comparisons

The respondents are asked to choose between two alternatives, also stating the degree of preference on a semantic or numerical scale.

	Option A	Option B	Change in attribute level from A to B (+ better, − worse): illustrative only
Attribute	A1 A2 A3 A4 (price)	B1 B2 B3 B4 (price)	+ − + +
Tick one level 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10 *Strongly prefer A* *Strongly prefer B*			

Table 18. Example of Pair Comparisons (source: Pearce and Ozdemiroglu, 2002)

In terms of application, over the past few years the literature has seemed to side broadly for DCEs, in that they better mirror the behaviour of individuals in reality, that is, the choice among different alternatives. Moreover, it allows the indirect valuation of WTP.

Common CMT studies process phases

In spite of the differences among the different techniques, it is possible to single out some common process phases to build the questionnaire and carry out the survey.

1. Attribute selection

For the selection of the relevant attributes of the valuation subject, reference is usually made to a review of the specific literature, as well as focus groups, discussions or direct questions. The attributes that are most likely to influence a decision are selected.

The monetary price is usually one of the attributes to allow the valuation of WTP. The choice of the price level and payment vehicle poses the same problems as CVM. An empirical rule would be to choose no more than 4 or 5 attributes, including price.

2. Level assignment

The attribute levels must be realistic and cover the interval where the respondents are expected to have a preference. The levels may include target-values and provide for the null level.

3. Experimental design choice

The *Statistical design theory* is used to combine attribute levels in a series of alternative scenarios or in profiles to present to the respondents. The use of the Statistical design theory reduces the number of alternative options that would otherwise be impossible to manage.

4. Choice sets construction

The profiles detected through the experimental design are later grouped in alternatives to present to the respondents.

The profiles may be presented individually, in couples or in a group, depending on the technique at hand. The options, that is, the different combinations of attributes, do not usually exceed the number of 8-10.

5. Measurement of preferences

Once the survey procedure has been chosen, the interview may take place. The issues regarding this phase are common to those relating to CVM.

Data analysis

The organisation of the data is something extremely important, especially in CMT contexts were data are not in a continuous form. Every data registration must contain an indication of the attribute level for each option presented to the respondent as well as a dependant variable indicating which was selected among the options. The particular shape of the data will depend on the econometric package used to configure the valuation model.

In order to analyse DCE data and obtain the average and median WTP, it is necessary to refer to an econometric model that, in turn, may be used to describe the discreet choice behaviour. This refers to the *Random Utility Theory* deriving from the economic assumption that a rational individual, given a series of options, will chose the one providing the highest expected utility.

Moreover, it is theorised that the utility of an individual depends on the attribute level provided in every option and the price required to supply it. The level of utility associated with an option will vary among the different attributes.

The first step in determining the econometric model is to specify an *indirect utility*

function generating a relation among all attribute levels, costs and individual characteristics with the levels of enjoyed utility. The analysis of DCE data aims at determining the parameters of this function based on the analysis of how individuals have made the choice among the options.

The indirect utility function used by the analyst is merely an approximation of the actual indirect individual utility function. Hence the utility estimated through this model will not be 100% of the real utility. In order to complete the econometric model, it is necessary to add a random element to the indirect utility function of the analyst. This error component keeps into account the difference between the true utility of an option and what is estimated with the model. The inclusion of such random element explains the title *Random Utility Model* (RUM). Since there is a part of error in the utility function, the analysis becomes a probabilistic choice. The likelihood of a given respondent to prefer an option over anther may be expressed as the likelihood that the utility associated to that option, according to the model, exceeds the one associated to all the other options.

3. THE OPERATING PROCEDURE

3.1. Introduction

In conditions where the market is not explicit and cannot provide reliable historical data for real estate appraisal, the reference to substitute methods that still allow to come to reliable valuation is generally admitted. In order to ensure the operation in conditions where real market data are not available, we propose to employ, for the appraisal of exclusive real property, the *Stated Preference Methods*, that is, a set of asset valuation methods based on hypothetical markets through procedures that allow to detect the preferences stated by market subjects (consumers and producers).

The *stated preference based* appraisal procedure we propose is designed to be used in such contexts when it is not possible to resort to the real market due to a lack, inefficiency or unreliability of the data and information, such as in the case of distressed urban area; based on the preference stated by a statistically significant sample of consumers and potential producers from the intervention area, the procedure allows to detect the hypothetical demand and supply curves and, by means of the relevant equilibrium point, to value the most likely prices and quantities.

As opposed to the experiments underway in the real estate market, where reference is often made only to the potential demand estimate, the proposed procedure implies the estimate of value as the intersection between the demand and supply curves, for the purpose of accounting for the conditions generally observed in the real market. Regarding real estate specifically, the differences between demand price, supply price and actual transaction price are often significant (and may get up to a percentage difference by 13-14% between on value and the others). Indeed, for differentiated and hardly replaceable real properties, the negotiation between the consumer and the producer plays a key role in defining the transaction price. Hence the estimated potential behaviour of a single market operator (consumers and purchasers) would be ill suited to provide a reliable market value estimate.

As a priority, the process is aimed at estimating the most likely transaction value of an asset. For newly produced assets, though, it is also possible to achieve further information, including:

- The incidence of the characteristics in forming the market price (implicit prices) both for consumers and producers;
- The market share of possible alternative properties, derived from different combinations of the characteristics and the best marketability alternative;
- The optimal, or equilibrium, amount estimate, to be produced for the best marketability alternative.

As concerns the above, this procedure stands as a crucial tool in the urban regeneration processes: indeed, it allows to come up with different scenarios, to accurately compute the size of the intervention, differentiating the real property supply based on the ability of different characteristics to appreciate in the market, as well as to estimate possible revenues through reliably hypothetical market values.

3.2. Procedure description

Having defined the purpose and the scope of the appraisal, two significant samples are selected, one including potential consumers and the other potential producers who would operate in the future market area, thus defining the framework reference and the questionnaire. Having carried out the preliminary survey, the data regarding the willingness to pay and the willingness to accept are processed as stated, respectively, by the potential consumers and producers, thus deriving the hypothetical demand and supply curves. Thereafter, the equilibrium price and quantity in the hypothetical market are estimated, thus allowing to select the optimal amount of real estate units to be made within the intervention and their most likely market value.

The process breaks down into two steps: the first is aimed at selecting those alternatives that are most likely to meet the market's preference by applying the Discrete Choice (DC) Analysis; the second allows to estimate the potential demand and supply curves for those preferable alternatives singled out through the DC Analysis, using the Contingent Valuation Methods. In case the scope of application should be the estimate of the market value of an asset having defined characteristics or being already in existence, reference is made solely to the second step of the process.

Resorting to the Discrete Choice Analysis is mostly due to the purpose of valuation: the goal is to select the most preferable alternative for consumers and producers; as such, it is enough to select, among a set of given alternatives, the preferable one instead of the rank of the alternatives or the score attributed to each one of them (in the latter cases, Contingent Rating and Contingent Ranking would apply, respectively). Moreover, the Discrete Choice Analysis is simpler for the respondent and best simulates the market behaviour of the subjects (among different, replaceable alternatives, one must choose the most preferable, based on its ability to meet the minimum requirements that drive the choice).

In order to derive the demand and supply curve, we preferred to resort to the Contingent Valuation, which allows to look directly into the WTP to pay and the WTA. The elicitation methods used for the consumers and producers, though, are different. In order to derive the demand curve, it is sufficient to simply detect the WTP of each respondent; indeed, as the theory goes for real estate each consumer requires only an asset unit at a given price. The quantity in demand in the market for each price level will be derived from the summation of the collected answers, as related with the potential target

population of the asset. Hence, the elicitation method that features the most advantages is selected: the Dichotomous Choice. As a matter of fact, this method allows to simplify the cognitive task the respondents are presented with, in that they have to simply express a positive or negative opinion on a given price when submitted to them, the same way they would when deciding to purchase a product at a given price at the grocery store. In the meantime, this method provides incentives for expressing a truthful preference and reduces non-response rates to a minimum.

Conversely, in the case of producers, it is necessary to detect the WTA depending on a given quantity. The process may unfold in two ways:

- Set up an open-ended interview to ask for the preferred quantity and price, thus detecting the optimum for each respondent. Such data, as reported on a Cartesian (Price x Quantity) chart, should represent WTA distribution depending on the quantity and, through a simple regression model, allow to derive the average supply curve for a given producer. This model is applicable when there is a chance to work on a sizeable sample, thus collecting a large amount of data to base the regression on.
- In the case of a smaller sample, it is preferable to apply the Iterative bidding method: quantitative levels are set and, for each level, the minimum WTP is derived from the respondents. Thus, the potential supply curve is determined for each respondent, indicating the WTA for each quantity level. By interpolating the curve for each respondent, it is possible to derive the average supply curve. This method is suitable to derive the supply curve also from a small number of interviews.

The main phases the procedure breaks down into, as shown in Figure 12, focus on:

1. Defining the appraisal question: what is the subject of valuation, what methods are to be used and how are the surveys going to be administered.

2. Sample selecting: identifying, first, the sample population and the sample frame and, subsequently, selecting the consumer and producer samples.

3. Design of the Discrete Choice Experiment through:
   - The Qualitative study, targeted at defining the list of potential alternatives, defining the list of attributes and the respective levels;

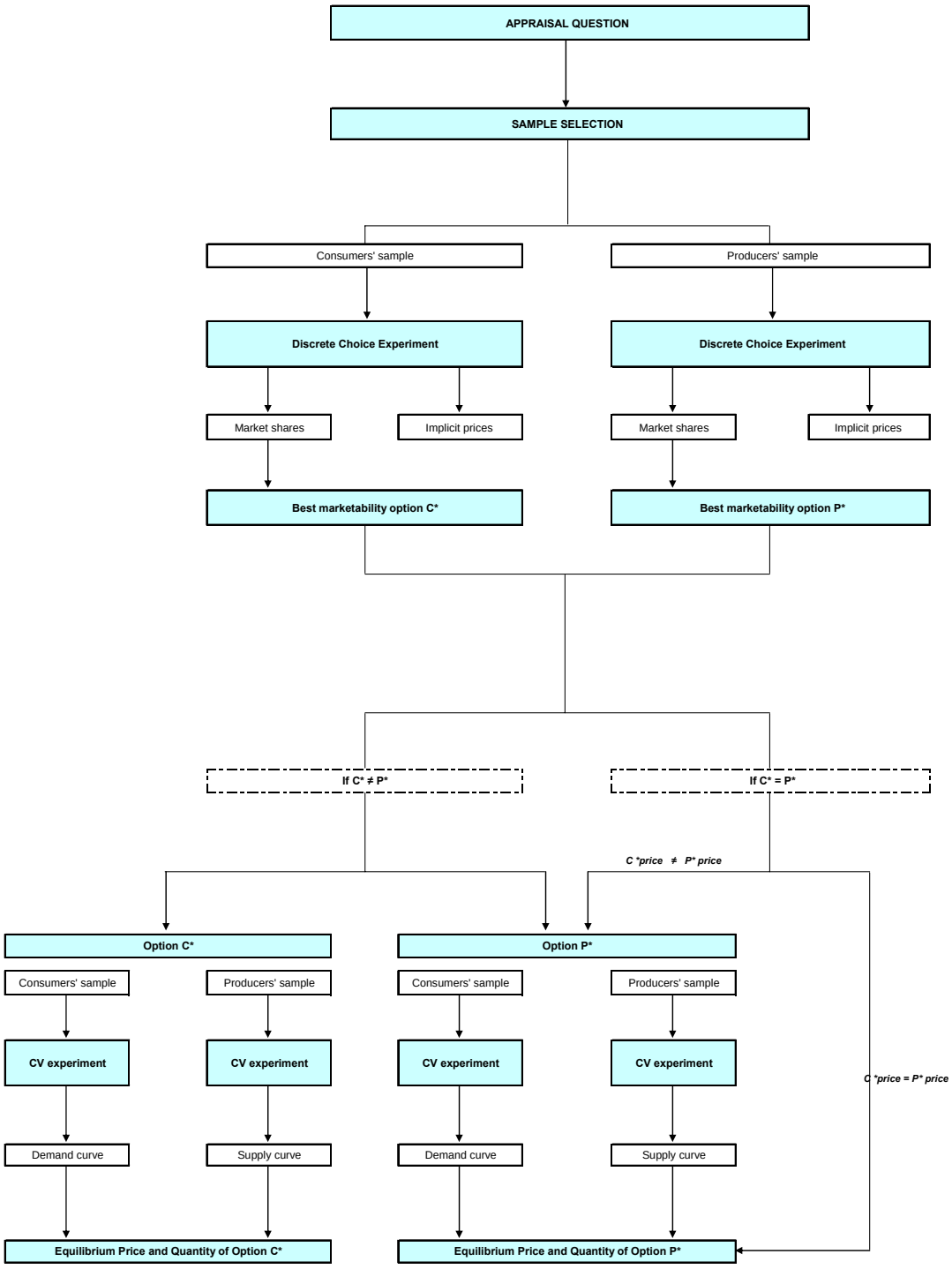

Figure 12. The proposed valuation procedure

- The Experimental design, consisting of detecting the number of scenarios being the subjects of valuation (alternatives resulting from the combination of different levels of attributes); choosing the alternatives (choice set) to be submitted in the questionnaire; questionnaire simulation and pre-test.

4. Carrying out the Discrete Choice Experiment: the respondents are informed about the purposes of the questionnaire and the structure of the task they are asked to perform; the alternatives are described, together with the attributes and the relevant attribute levels, then the questionnaire is submitted.

5. Analysis of the collected data through the Discrete Choice Experiment, structured as follows:
   - Choice of the indirect utility model to analyse the data;
   - Detection of the incidence of the characteristics on the price according to the consumer;
   - Identification of the consumer's market share;
   - Detection of the best marketability alternative according to the consumer (C*);
   - Detection of the incidence of the characteristics on the producer's price;
   - Identification of the producer's market share;
   - Identification of the best marketability alternative according to the producer (P*);
   - If the consumer preferred alternative (C*) is different from the producer preferred alternative (P*) the following step will imply two alternatives.

6. Design of the Contingent Valuation Experiment: the consumer sample will be asked the maximum WTP for the alternative C* (and for the alternative P*, should the two be different), by applying the Dichotomous Choice Model. The producers will be asked the minimum WTA for the alternative C* (and P*) for different levels of production X (through the Iterative bidding elicitation model) or the minimum WTP and the relevant minimum quantity they would be willing to produce of the alternative C* (and P*), by applying the open-ended version. The choice between two elicitation methods for the producers depends on the size of the sample: if the sample is very small, the bidding game would be the method of

choice, in that is detects the complete supply curve for each respondent; if the sample is large, then the open-ended version is preferable.

7. Carrying out the Contingent Valuation Experiment: the experiment is first performed with the consumers; they are informed about the purposes of the questionnaire and the structure of the task they are asked to perform; the alternatives are described and the then the questionnaire is submitted.
   The producers are then informed about the purposes of the questionnaire and the structure of the task they are asked to perform; the alternatives are described and the then the questionnaire is submitted.

8. Analysis of the data collected through the Contingent Valuation Experiment: the consumer survey produces the percentage of positive demands for each price level and the distribution of the responses; such distribution is later projected on the potential target population. As regards the producers, in case the open-ended version should apply, the response distribution is put in a chart reporting the quantity-price ratio. Then the average supply curve is identified as the curve of least squares according to a linear or exponential trend; in the Iterative bidding version, it is possible to identify the dominant or average WTA for each level or by building the supply curve for each individual respondent.

9. Deriving the hypothetical demand and offer supply and formulating the valuation, consisting of:
   - Building the hypothetical market offer curve for C* and P* from the individual supply curve as derived as per the above point;
   - Building the hypothetical market demand curve for C* and P*;
   - Intersecting the demand curve and the supply curve (for C* and P*) and identifying the equilibrium price and quantity for C* and P*.

3.2.1. DEFINITION OF THE APPRAISAL QUESTION

The first phase has to do with identifying the asset subject to valuation and the purpose of the valuation.

The designed process is targeted to assessing the most likely market value of a real estate asset, either existing or to build. Moreover, it is possible to identify:

- The most demanded alternatives in the market for a given property and the optimal characteristic mix;
- Identifying the incidence of the characteristics on the price for consumers and producers;
- For newly built assets, the optimal amount to build for each alternative and the potential market shares.

Based on the asset characteristics and the purpose of the appraisal, the most suitable methods to apply to the valuation process are thus selected. In order to detect the incidence of the characteristics, the market share and the optimal alternative for consumers and producers, the Choice Modelling Techniques may apply in the Discrete Choice version.

Finally, the survey method is selected. The choice is made among several different methods, namely:

- By mail;
- By telephone;
- Face-to-face;
- Mixed: mail + telephone; mail + face-to-face;
- Computer assisted.

Among the described approaches, the preferred one is a computer-assisted face-to-face interview, including a questionnaire administered by an operator and, if need be, the supervision of an expert. The meeting may take place in a venue selected by the operator or at the respondent's.

Even though this method is more costly as compared with other detection tools, it allows to use visual methods and rather flexible questionnaires, while providing better chances of making sure that the sample is as statistically significant as possible in terms of the target population of the survey. Finally, it produces higher response rates.

3.2.2. SAMPLE SELECTION

The survey is carried out on a sample and the type of sample depends on the target population one intends to represent. As applicable to the real estate appraisal, the sample must be representative of the potential consumers and potential producers of the valuation subject.

This part of the survey breaks down into the following:

1) Target population identification.

This population consists of a defined group of subjects (the consumers or producers of a given asset). The correct definition of the target is a key passage to avoid distorted results and to come to a reliable valuation. The choice is influenced by the type of asset at hand and the type of value one intends to valuate. Where the target population may not be readily identified, secondary sources may show who would benefit or who would be willing to pay for the asset at hand. In some cases, it is possible to refer to more target populations.

2) *Sample frame* population identification, ultimately the source from which the actual sample is extrapolated.

It should possibly be the closest and most viable approximation to the target population and, more generally, it may be comprised of all residential units of a city, or all registered voters in a city, all households having a phone or all residential and commercial clients of a power supplier, etc. In many cases, the sample frame is an explicit list (say, a directory of residential addresses, registered voters or utility users, etc.). In the real estate application, consumers may first refer to a general lists among the ones mentioned above, real property being a largely diffused asset; with more accuracy, it is possible to refer to Real Eestate agencies client databases. As regards the producers, it is possible to look into the member lists of construction trade associations (such as the ANCI and other local associations). Some common problems are that sometimes the sample frame may omit some members of the target population, or include others more than once or include subjects that are not relevant for the purposes of the survey.

3) Selection of a sample from the frame by means of probabilistic sampling.

The selection process implies the use of a random procedure, say, a computer generating a set of random numbers.

Within the survey, it is important to consider those who need to be selected within a family. If the goal is to obtain a valuation regarding the viewpoint of a family, then the selected person must be in a position to speak for the entire family. The answers often vary depending on the selected person. For instance, the elderly and women are more likely to respond to telephone surveys or to be at home for a face-to-face interview, as opposed to younger or male members of the family. Mail surveys register a preponderance of male and elderly respondents. In a face-to-face or telephone interview, the respondent may be pre-emptively asked to make a list of all family members who are of age. The person who will be administered the interview, then, will be selected randomly from that list.

Choosing the size of a sample implies looking into the ratio between the costs to be paid for the questionnaire and the valuation accuracy. The level of accuracy is determined by a number of factors, including:

- Population variance (the higher the variance, the larger the sample should be);
- Accuracy required in the valuation (a 95% confidence interval is widely used as a landmark);
- Likely response rate;
- Need for disaggregated information (the larger the subsamples, the larger the overall sample);
- Resources available for the study.

Where needed, it is possible to resort to the professional advice of a statistician or a special survey expert. The ratio of sample size, confidence level of the valuation and costs is shown in Table 19.

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Target population	1.000.000				25.000			
Proportion in true sample	0,5		0,2		0,5		0,2	
Accuracy: standard error	+/−3%	+/−5%	+/−3%	+/−5%	+/−3%	+/−5%	+/−3%	+/−5%
Sample size required	1111	400	711	256	1066	394	692	248
Cost if £25 per interview (£000)	28	10	18	6	27	10	17	6

Table 19. Example of sample size with a 95% confidence interval and survey costs (Source: Pearce and Ozdemiroglu, 2002)

Smaller sample sizes may be used when a larger set of information is collected from each respondent, such as in CMT, where several choices or impressions are derived from a single subject. Not always, though, is it possible to reduce the size of the sample by increasing the amount of data collected from each participant.

The statistical concern comes from the possibility of positively correlating subsequent responses from the same subject, which may derive from an array of sources, including tiredness and lack of focus. To the extent in which such correlation occurs, the amount of statistical information in the data sources from a single subject is reduced. To elicit multiple valuations from the same subjects undermines the viability of each individual choice scenario and makes it seem more hypothetical that it would be if the respondents were to deal with a single scenario.

Even if a larger sample makes data more reliable, there is always a trade-off in the market survey between cost and accuracy. In this regard, statistical reliability is a relative term. The common market research practise suggests to use a minimum sample size of 400 subjects for simple surveys, which is a reasonable balance between reliable outcomes and survey costs.

Nevertheless, it should be noted that the size of the sample for each specific interest group must be sizeable enough to provide reliable data, keeping statistical significance into account, when comparing intra-group data.

Generally, a pilot sample is used as part of the research process to verify both the survey methodology and the questionnaire. The size of the pilot sample is usually comprised of at least 50 respondents.

Moreover, it is important that the number of selected people that turned out to be out of the scope of application and the number of those who refuse to take part in the image be registered. Thus, the overall population size estimate can be representative of the sample population.

Given the problems for the real estate application to gather large samples (especially in terms of producers), the method of choice to guarantee the significance of the sample, is to generate a stratified sample. The sample frame population is divided into distinct sub-groups or layers. From each layer a sample is extracted by means of random sampling or keeping into account the proportions of each single layer vs. the overall set (proportional stratification) o by means of different ratios (non-proportional stratification). The data are used to perform separate estimates for each layer; the different values are finally aggregated once again in order to estimate the value of the overall population.

In case the procedure should apply in the two moments (Discrete choice experiment and Contingent valuation experiment), two different samples are selected in terms of consumers and producers for each of the two moments.

3.2.3. DISCRETE CHOICE EXPERIMENT

Qualitative study and Experimental design

The Qualitative study includes:

1. Definition of a list of potential alternatives: how to identify them and through what symbol or name based on the past experiments or examples.
2. Definition of an attribute list: the attributes must be consistent with the purpose of the survey, meaningful and actually significant as to the asset value. In order to favour the cognitive effort on the part of the respondent, the survey should not exceed eight characteristics, in that the sample grows exponentially vs. the number of characteristics if their incidence on price should be also included in the valuation. In order to select the attributes, a literature review, focus group discussions or direct questions are the general methods of choice. There are general attributes and specific attributes; price is one of the characteristic. Price must be viable and realistic, in a way to reduce strategic behaviour by the respondent to a minimum. It is necessary to avoid an interrelation among attributes, a cognitive distortion often tied to price-quality ratio.
3. Definition of attribute levels: definition, for each characteristic, of the number of levels to vary. They may be either quantitative or qualitative (price levels, no. of rooms or colours/material quality, etc.). The quantitative ones may be expressed in either absolute or percentage terms. The number of levels must be plausible, provide significant information that may be processed by the respondent and must be such to allow true differentiation among the alternatives. Not necessarily must the number be the same for each characteristic (it may even be 2 if the utility-characteristic relation is linear in nature). With the increase in the number of levels, the combinations and sizes of the sample require to estimate increase; thus, no more than 3-4 levels per characteristic are generally recommended.
4. Define the range for each level: a mistaken definition may produce distortions; if, with too small intervals, the differences may be considered insignificant (conversely, they may be overestimated if the intervals used are too large). The detection must occur through a qualitative search. The values must be such to generate a positive response in the whole sample, avoiding values that are either too high or too low (especially as price is concerned) that may cause to underestimate or have no positive responses. As for the attributes having nominal or ordinal levels, these must be tested

through focus groups or cognitive tests in order to understand how the scales are structured.

Experimental design

First, the number of scenarios to be evaluated must be selected (alternatives resulting from the combination of different attribute levels). The approach is based on the design of experiment: "a designed experiment is a way to manipulate attributes and their levels to permit rigorous testing of certain hypotheses of interest" (Louviere et al 2000).

The number of possible scenarios increases exponentially as a function of the number of alternatives, the number of attributes and the number of attribute levels.

The *complete factorial design* detects all possible combinations among the characteristics depending on their level. The number of generated choice sets is:

$$L^{M*A}$$

where L is the number of levels, M the number of attributes and A the number of alternatives.

Generally, a *complete factorial* design is never used unless there are a few levels and a few attributes. A *fractional factorial design* is usually applied to select an underlying portion or subset of the full factorial, as long as it is representative of the statistical characteristics. It may be orthogonal (if there is no correlation with the other characteristics) or balanced (if the levels of all characteristics occur with the same frequency).

The *optimal* or *statically efficient design* tries to extract as much useful information as possible from each set. Among the software programmes used for experimental design, the SAS and SPSS models are often used. The model most frequently used to optimise a design matrix is called D-efficiency and seeks to meet four properties at once: balance among the levels, orthogonality, minimum overlapping and utility balance.

The factorial design may have generated a high number of alternatives to present (full factorial: 14,000 scenarios, orthogonal 64...etc.), hence it is necessary to choose between the efficiency of the interview and the level of difficulty for the respondent. The ideal number, which should not be exceeded, would be 8 scenarios, though the generally accepted approach varies between 1 and 32 alternatives.

In order to obtain a small number of alternatives, it is possible to:

- Reduce the number of attributes;
- Group the attributes in a subset and develop smaller designs specifically for the subsets;
- Structure the initial design in blocks and offer each respondent only one block. 64 may be divided into 8 blocks and each respondent is offered only the eight alternatives included in that block.

Among the alternatives, it is necessary to reach alternative zero or status quo, in case none of the offered alternatives should be the preferred one. Its absence may lead to choosing alternatives deemed unimportant or choosing not to answer.

Once the number of alternatives to present has been established, the questionnaire draft may begin. Though there is no such thing as an abstract questionnaire model, in that each questionnaire should adapt to the specific scope or the research, some general rules may still be defined.

Some key aspects have to do with the number of questions (such that the questionnaire is not excessively long, it should never last for more than 45-60 minutes), the order they are in and the way the questions are worded. According to some generally accepted rules:

- The interview should be well structured;
- The initial part should include a brief presentation of the research, in order to clarify its scientific purposes;
- The questionnaire should open with simple questions, if possible of general interest;
- Start with general questions and work your way towards more specific ones gradually;
- Save the most relevant questions (regarding the preference) in the central part of the questionnaire, when the respondent has been gradually made familiar with the topic at hand;
- Save personal data questions for last.

Once the backbone of the questionnaire has been agreed upon, the next step focuses primarily of how single questions are worded. For the purpose of making them intelligible and generally fit to be analysed, it is important to:

- Focus directly on the topic at hand;
- Clearly define the subject and its context;

- Use a simple yet formal language; use concrete and specific words, avoiding specialised and technical terminology;
- Avoid to make excessively complex sentences;
- Express intelligible contents;
- Make sure the question is relevant for the respondent;
- Make sure the set of response options in the close-ended question is comprehensive and well balanced.

Before moving on to the actual interview, it is necessary to run a simulation and a questionnaire pre-test in order to:

- Select some plausible values in terms of utility parameters;
- Calculate the utility for each alternative and each respondent in the simulated sample;
- Add a standard error;
- Calculate the implicit choice or the score or the rank for each respondent;
- Save the attribute levels and the implicit choices;
- Estimate a choice model and test that the initial parameters are complied with.

Carrying out the Discrete Choice Experiment

Consumer survey

The subjects selected to participate in the sample are contacted to arrange for a place and a date to carry out the interview. In the meantime, the comprehensive documentation explaining the theme of the interview and a providing a detailed description of the valuation subject is sent to the respondent. The face-to-face interview takes place at the respondent's or at a venue selected by the interviewer.

The presence of an expert to answer and shed light on specific or obscure passages of the questionnaire should also be recommended. In order to minimise the costs, the interviewer and the expert could be the same person. Moreover, the use of a computer allows to record the answer while showing comprehensive simulations and pictures of the valuation subject.

The consumers are informed about the purpose of the questionnaire and the structure of the task they are asked to complete.

The first part of the questionnaire measures the involvement of the respondent in problems inherent to the theme at hand, his/her spending sentiment in said areas and the familiarity and use of the asset being the subject of the study.

The central part includes a description of the scenario and the measurement of personal preferences. The alternatives, attributes and attribute levels are described. The choice matrix is presented, followed by a question aimed at detecting the preference according to the following model:

Question:

If you hypothetically were in the position of purchasing real property X, which alternative would you prefer among the ones offered here?

Alternative	**Attribute X_1**	**Attribute X_2**	**…**	**Price**
A.				
B.				
C.				
…				
N.				

The last part of the questionnaire focuses on the social and economic characteristics of the respondent in order to verify the suitability of the sample to be representative and to look into any possible correlations between the choices and the social and economic variables (income, education, etc.).

Producer survey

Similarly to what has been reported for the survey to administer to the consumer sample, producers, to, are informed about the purpose of the questionnaire they are asked to participate in and the structure of the task they are about to carry out.

The structure of the questionnaire is similar to that of the consumer survey; in the central portion of the interview, the preference question will be generally worded as follows:

Question:

If you hypothetically were in the position of realising/selling real property X, which alternative would you prefer among the ones offered here?

Alternative	**Attribute X_1**	**Attribute X_2**	**…**	**Price**
A.				
B.				
C.				
…				
N.				

Analysis of data collected by the Discrete Choice Experiment

Data arrangement is extremely important, especially in a CMT context, where the data are not in a continuous form. Each data registration must report the indication of the attribute levels for each of the options presented to the respondent, as well as a dependent variable indicating which of the options was selected. The particular form of the data will determine the econometric package used to value the model.

In order to analyse DCE data, it is necessary to resort to an econometric model suitable to describe the behaviour of the discrete choice. This refers to the *Random Utility Theory* deriving from the economic assumption that a rational individual, given a number of options, will chose the one providing the most expected utility.

Moreover, the theory has it that the utility for an individual depends on the attribute level provided by each option and the price required to provide it. The level of utility associated with an option will vary among different individuals.

The first step in determining the econometric model is to specify an *indirect utility function* correlating the attribute levels, prices and individual characteristics with the enjoyed utility. The purpose of the DCE data analysis is to determine the parameters of this function based on the analysis of how individuals have made a choice among several functions.

The indirect utility function used by the analyst is just an approximation of the actual individual indirect utility function. Hence, the utility estimated through this model will

not be 100% of the real one. In order to complete the econometric model, a random element should be added to the analyst's indirect utility function. This error component keeps the difference between the true utility of an option and what is being estimated through the model into account. The inclusion of this element explains the origin of the name *Random Utility Model* (RUM). Since there is a part of error in the utility function, the analysis becomes a probabilistic choice. The probability for a given respondent to prefer an option instead of another may be expressed as the probability that utility associated to such option, according to the model, exceeds the probability associated with all other options.

In formulating a random utility model, two important issued must be agreed upon:

1. The functional form of the indirect utility function: the option is usually extremely simple indirect utility function specifications; for most applications the utility of an option is modelled as a simple linear combination of prices and attributes;
2. Random element probability distribution: in this case, a likely distribution is Gumbel distribution or extreme value distribution, which is similar to normal distribution with the exception of having mathematical elements that are easier to process; the probability of a given choice to be made may also be expressed in terms of logistical distribution.

When the choice is between two options, the model is known as *a binary logit model*. When the dependent variable takes three or more values, as customary with DCE, the model is a *multinomial logit model*. When a general extreme value distribution is chosen in stead of a Gumbel distribution, the resulting model is the *multinomial nested logit model*. If, though, normal distribution is the choice, then the resulting model is a binary probit model (two options) or a multinomial probit model (for several options).

In terms of fitness for mathematical processing, the simplest model is called *conditional logit model*, which derives from assuming the distribution of the Gumbel error terms. The model is based on the assumption of the *independence of irrelevant alternatives* (IIA). According to the IIA the likelihood ratio of choosing either of the two options will not be influenced by the attributes or the availability of other options.

The multinomial probit model is the more general model and does not involve the assumption of the IIA.

Probabilistic models, such as multinomial logit, binary logit or binary probit, may be estimated by using maximum verisimilitude procedures.

The multinomial nested logit model is estimated by using the *maximum likelihood procedure*. As for the multinomial probit model, being the most complex among the presented RUMs, it requires the use of maximum likelihood simulated procedures. Such procedures are generally available as standard components (even if, once again, ad additional package is available for LIMDEP).

1. The first data analysis phase has to do with the econometric analysis estimate of the incidence the characteristics have on price (expressed as WTP/WTA of the attributes or implicit characteristic prices) through:

– Valuing how respondents' utility would change if the attributes were changed from the current level (status quo) to another level (the levels set by the options being analysed);
– The expression of this utility variation in monetary terms.

When a simple, linear functional model for the indirect utility function, these formulas are quite simple. Moreover, is simple to calculate the WTP/WTA for each of the attributes based on:

$$M\,WTP = \frac{-b_k}{\beta}$$

where β is the price coefficient and b_k is the coefficient of attribute k.

The intuitive interpretation of this ratio should be explained further: b_k is the utility of one additional attribute k unit, β is the value in monetary terms of an additional utility unit. By dividing the two, the result is the monetary value of the utility derived from one additional attribute k unit. This is also referred to as the *implicit price* of the attribute.

For simple indirect utility function specifications, it is possible to use analytic formulas to calculate the confidence intervals.

2. The second information derived from the analysis of collected data is the asset market share (the potential market share for each possible alternative) for the consumers and producers and, from these, the selection of the best marketability alternative for the consumers and the producers (respectively referred to as C* and P*).

The partial utilities, previously estimated through indirect utility models, are used an inputs to estimate the product market share, which allows to foresee the market shares and the amount likely to be potentially sold or realised for each alternative.

One of the most extensively used models to simulate market share is called *maximum utility model*. It assumes that every subject purchases/produces the asset allowing to obtain maximum utility. The average probability that each product is chosen by a subject allows to derive the market share.

Once the partial utilities of individual attributes are detected, the alternatives (resulting from the combination of the attributes) that maximise total utility may be derived; the alternative being assigned the highest probability is referred to as the best marketability alternative.

Other simulation methods include the *Bradley-Terry-Luce* (BTL) model and the *logit model.* As opposed to the maximum utility model, BTL and logit models do not assign the entire choice probability to the preferred alternative. Probability is a continuous function of the expected utility. Conversely, in the maximum utility model choice probability is binary. In the BTL model, the choice probability is a linear function of the expected probability; in the logit model, the choice probability is an exponential function of the expected probability (see Figure 13).

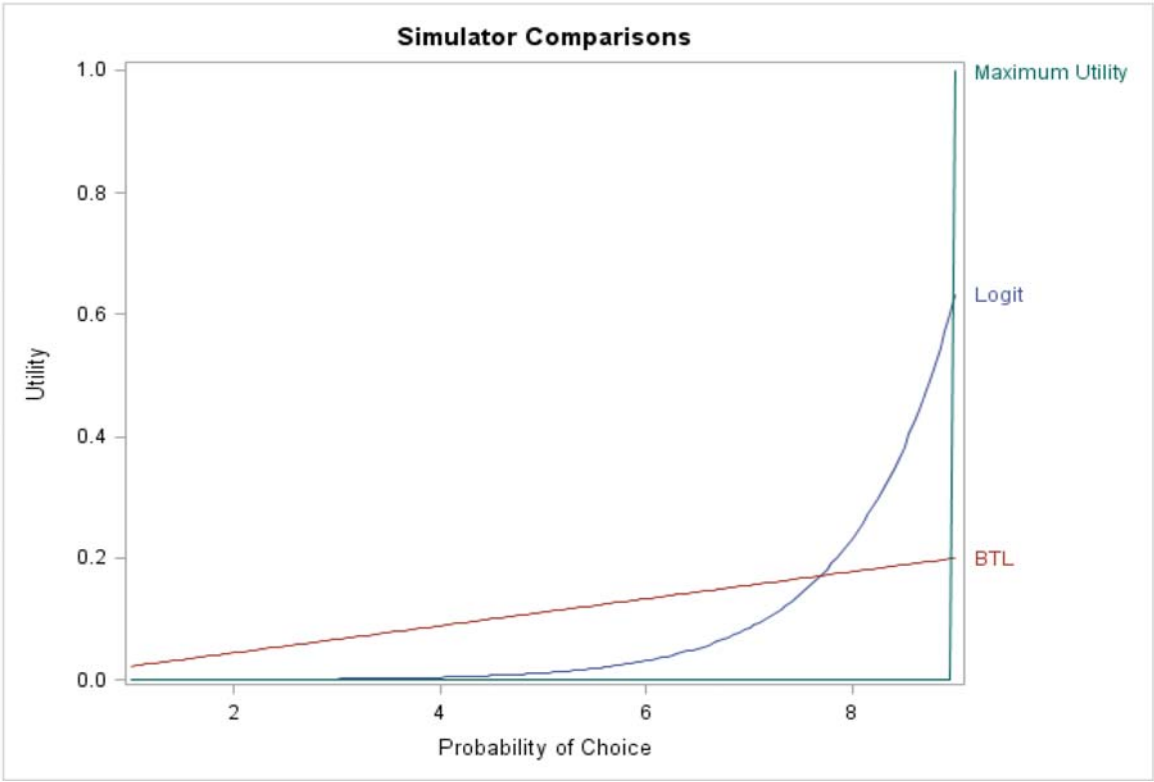

Figure 13. Simulator methods comparison

The maximum utility, BTL, and logit models are based on different assumptions and often produce different outcomes. The BTL method is quite uncommon; the logit model is used more but the most extensively used is certainly the maximum utility model.

As regards the utility theory, the price associated with the best marketability option will indicate the minimum willingness to pay (WTP) for the consumer and the maximum willingness to accept (WTA) for the producer. If C* is different from P* the following phase will involve two alternatives.

3.2.4. CONTINGENT VALUATION EXPERIMENT

CV Experiment design

In order to structure the questionnaire, it is necessary to define:

- The consumer sample breakdown into sub-samples, in order to apply the Dichotomous Choice survey;
- How the producer survey will be administered (whether through the open ended approach or iterative bidding), based on the size of the sample at hand.

The consumer survey must necessarily take place before the producer survey; indeed, as mentioned before, in the real market producers define their supply also as a function of the consumer demand curve; hence, the producer sample is provided, among other pieces of information, also the hypothetical demand curve derived from the consumer survey.

Structuring the consumer samples into price level sub-samples

The Dichotomous Choice builds a range of values starting from the data previously detected to build price levels in the Discrete choice experiment phase and keeping as a lower value the value associated to option C*, representing the minimum willingness to pay.

In order to administer the interview according to the DC analysis model, it is necessary to sub-divide the consumer sample into sub-groups, each corresponding to different price levels. Each member of the sub-group will be asked to answer yes or no about his/her willingness to pay a given price for the purchase of an asset X.

For the optimal calculation of the amounts to be submitted and the sample distribution, several models are applicable.

Boyle et al (1988) postulate a procedure being based on the "complementary random numbers" method: the WTP distribution is derived from pre-sampling the distribution by means of the open-ended format; $n/2$ is derived, with n being the size of the sample, together with random numbers P, and the respective complementary values $Q = 1-P$ are calculated. On the curve, every Qi and Pi probability is associated with a corresponding amount, used as an offer made randomly to the respondents.

Duffield and Patterson (1991) dealt with the issue of minimising the variance of the expected WTP value; the number of intervals is defined as a function of the total sample

and the scope of variation according to regular intervals or equivalent log-linear increments.

Cooper's model (1993) starts from the sample size and preliminary information regarding the WTP in order to come to the optimal selection of amounts and subsamples through a two-stage iterative process, using mean squared error minimisation. In the first stage, once the number of offers m is set, the WTP frequency distribution is divided into *m+1* areas of equal size; in the second stage, given the offer and the total sample size, the subsample are determined in such a way to minimise the mean squared error of the willingness calculated through the model.

Questionnaire structure

Contingent Valuation consists of asking a random sample of respondents about their willingness to pay (WTP) for a given asset, or the willingness to accept (WTA) a loss. Following (Fig. 14) is the structure of a CVM questionnaire.

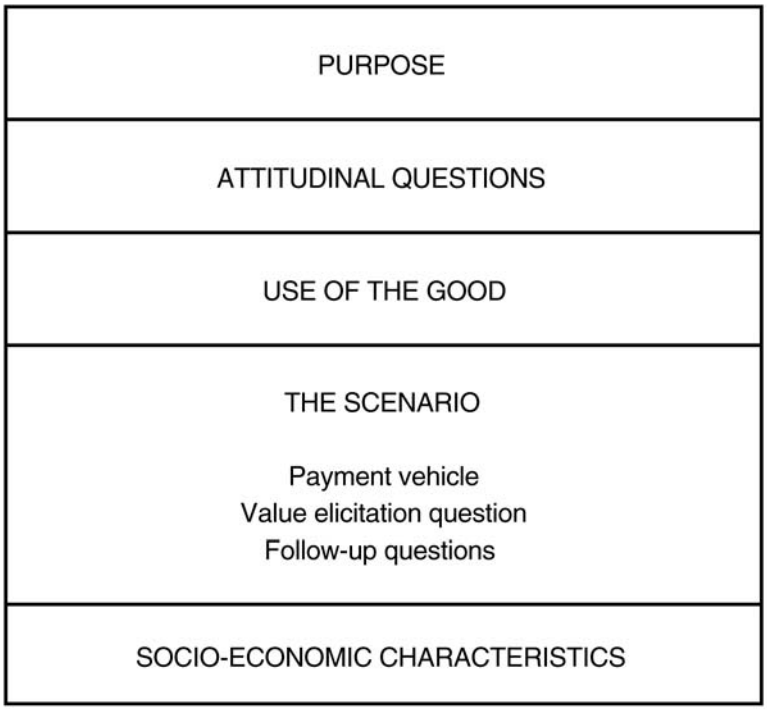

Figure 14. Structure of a CVM questionnaire

a. Purpose of the questionnaire

It is essential to state the purpose of the CVM questionnaire in order to ensure that the

respondents understand the context, are motivated to participate and capable of doing so in an informed way. The context must be as realistic as possible in order to encourage realistic and truthful answers. The interviewers should explain who they are and guarantee the respondents that their answers will be kept confidential.

b. Attitudinal question and use of the good

The following phase intends to record the point of view of the respondent about the general issues regarding the good itself. Then, the use a respondent makes of the good at hand is determined in order to understand the respondent's familiarity and tell users apart from non-users.

c. The valuation scenario

The scenario may be compared to a descriptive model focusing on external factors that influence the value, its characteristics and its relations. Once the elements and the relations explaining the actual situation are selected, it is necessary to consider the variations in said elements and relations that lead to defining a hypothetical scenario. The starting point may be "a future without surprises" that is, variable in a scheduled fashion, by extracting it from the past; then, based on a set of reliable hypotheses, an array of possible chains of element variations should be defined, in order to lead to alternative scenarios; the way to express the variations at play may happen according to quantitative laws or experience-backed hypotheses.

Several scenarios may be presented, though the respondents should not be "overloaded" or misled about what they are asked to value. Defining the scenario is a fundamental characteristic of a questionnaire: poorly defined scenarios generate meaningless responses.

c1. The payment vehicle

The payment vehicle describes the way the respondent is (hypothetically) held to pay for the asset. There are no precise rules to choose the method; it all depends on the nature of the asset.

c2. The elicitation methods

The consumers are asked the maximum WTP for alternative C* (and for alternative P*, in case the two should be different), by applying the Dichotomous Choice Model.

The producers are asked the minimum WTA for alternative C* (and P*) for different

levels of production X (by means of the iterative bidding elicitation method) or the minimum WTA and the relevant minimum quantity that they would be willing to produce of alternative C* (and P*), applying the open-ended version. In order to define price levels, the iterative bidding version implies the creation of a range of values starting from the data detected for the price level in the CME phase and setting the upper limit as the value associated to option P*, which represents the maximum willingness to accept. The amount levels may be derived by resorting to similar questionnaires, pre-tests or focus-group surveys.

c3. Follow-up questions

The elicitation question is usually followed by other questions in order to understand the reasons that produced such answers. The additional questions are particularly useful in case of some form of resistance or lack of will towards the asset at hand. The resistance may appear as the lack of will to give an answer.

Any additional questions, besides helping to shed light on the reasons and the validity of the answers, may also be used to test the credibility of the scenario. These questions may probe the interest of the respondent for the asset at hand and the perceived credibility as regards the subject theoretically in charge of delivering the asset.

d. Social and economic characteristics

The social and economic characteristics of the respondent are analysed at the end of the questionnaire in order to verity his/her suitability to represent the sample and look into any possible correlation between the choices made and the social-economic variables (income, education, etc.).

Carrying out the Contingent Valuation Experiment

Consumer survey

The subjects selected for the subsamples are contacted and a date and place for the interview are arranged. In the meantime, a comprehensive documentation is sent to describe the interview topic and provide a detailed description of the subject of valuation.

The consumers are informed about the purpose of the questionnaire and the structure of the task they are asked to perform. The first part of the questionnaire looks into the general issues and the knowledge and enjoyment dynamics for the asset at hand.

The central part includes a description of the scenario and the detection of the preferences. Maximum WTP is recorded by asking the following question:

Question:

If you were to consider the purchase of real property C*/P* would you be willing to pay a maximum of X Euros?

Yes

No

The last part of the questionnaire looks at the social and economic characteristics of the interviewed respondent.

Producer survey

The contacted producers are sent a documentation describing the interview topic and providing a detailed description of the subject of valuation, including the hypothetical demand curve.

Once the respondent have been informed about the purpose of the questionnaire and the structure of the task they will be asked to perform, the general issues relating to the topic are considered.

In the open-ended version, minimum WTA and quantity are registered by asking the following question:

Question:

1. If you were hypothetically considering to realise real property C*/P*, which would be the minimum quantity you would produce and what would be the minimum price you would sell each unit for?

Quantity: **….**

Price: **….**

In the iterative bidding version, the investigation breaks down as described below.

Question:

1.a. If you were considering to realise real property C*/P* and to produce Y_1 units from it, would you be willing to sell them at a minimum price of X Euros apiece?

Yes

No

If Yes

And at X + a Euros?

Yes

No

If No

And at X -a Euros?

Yes

No

…

1.b. If you were considering to realise real property C*/P* and to produce Y_2 units from it, would you be willing to sell them at a minimum price of X Euros apiece?

Yes

No

If Yes

And at X + a Euros?

Yes

No

If No

And at X -a Euros?

Yes

No

…

1.b. If you were considering to realise real property C*/P* and to produce Y_2 units from it, would you be willing to sell them at a minimum price of X Euros apiece?

Yes

No

Similarly to the consumer survey, the last part of the questionnaire researches the social and economic characteristics of the interviewed respondent.

Analysis of data collected by the Contingent Valuation Experiment

The analysis phase of a Contingent Valuation is the moment when the data collected throughout the survey turn into an output suitable to be used.

Before starting to analyse the data, and once the questionnaire has been administered to the sample, the resulting survey data undergo a cross examination is search of entry errors.

The collected data analysis must pursue the following goals:

- Estimate, through the respondent sample WTP/WTA, the hypothetical demand and supply curves.

  The consumer interviews generate the percentage of positive questions for each price level and the distribution of the answers; such distribution is subsequently projected over the potential target population in order to derive the hypothetical demand curve.

  As regards the producers, in case the open-ended version should apply, the distribution of the answers is calculated on a Cartesian PxQ model and, subsequently, the average offer curve is estimated as the least squares curve according to a linear or exponential trend; in the Iterative bidding version it is possible to detect the dominant or average WTA for each level or by building the offer curve for every single respondent.
- Testing the WTP/WTA response structure in the CVM survey, in order to confirm whether any differences in the responses mat be explained through any differences in the respondent characteristics.

Preliminary operations

The analysis begins by summing up the data collected during the survey. The best way to sum up the answers to any specific question depends on the nature of the question. In general, though, analysts seek to provide the details of the main characteristics of the answers to a question in a way that is easy to understand by the clients as well as those who ultimately review the results. This usually implies the use of a variety of numerical and graphic elements.

It is the responsibility of the analyst to use the available data and decide which WTP/WTA values must be considered as realistic valuations and, conversely, which

should be considered invalid answers.

The questionnaire comprises of at least five sources of information to help this decision:

- Follow-up questions asking why no answer was given to the WTP/WTA questions;
- Follow-up questions looking into the reason why a WTP/WTA offer with value equal to zero was made. "Zero" answers may be true, but they also may reflect the strategic behaviour on the part of the respondents;
- The confidence the interviewer has in terms of the answers he gets from the respondents;
- The possibility to compare very high offers with the respondent's available income (WTP cannot exceed the ability to pay);
- A report from the interviewers, who could highlight the reasons for a given behaviour.

The base for the decision concerning the identification of the invalid answers must be clearly detailed. Once all the answers have been examined in terms of validity, the analyst looks into the number of answers that qualified as invalid and the specific reason.

Invalid answers often reflect objections on the part of the respondents for several aspects of the hypothetical valuation scenario. Such objections are often identified during the pre-test phase and the scenario may be changed in a way to reduce the likelihood of no-response to a minimum.

Finally, the WTP/WTA of invalid answers is unknown. The only solution for the analyst is to rule out the respondents from the sample. Nevertheless, in ruling out such remarks, it should be guaranteed that the reduced sample does not differ significantly in its characteristics from the original sample. If the characteristics of the sample have changed, weighting procedures must be applied in order to offset the non-significance of the reduced sample.

Determining admissible WTP/WTA limits

In designing the questionnaires, it is necessary to ensure that the respondents answer the WTP/WTA questions in a way that is consistent with the theory of economic wellbeing. It is crucial that the analysis of the data coming from CV surveys retain this consistency, while ensuring that appropriate limits be set for the answers.

In order to see how the economic analysis may guide data analysis, it is necessary to answer a number of questions regarding the very nature of the valuation:

1. Does the scenario in the CV questionnaire provide the respondent with a perspective of an increase or a decrease in the supply of the asset?
2. Was a WTP or WTA value expressed?
3. Does it make sense for the respondents to have negative WTP/WTA values?

By answering the above questions, the analyst may determine the upper and lower limits that could have been assigned to the answers.

Regarding the upper limit:

- If WTA reports the willingness to waiver an increase or suffer a decrease in the asset supply, then there is no theoretical limit for the amount the respondents may desire in order to be compensated (no higher limit may be obtained);
- If WTP reports the inclination to make a profit or avoid a loss in the supply of the asset, then the respondents can pay only as much as they can afford. The analyst will try to detect the relevant income measure to use as an upper limit. If the data regard a monthly or yearly payment, the upper limit regarding WTP data will be the income available to the specific household for that period. Discretional income is that part of income left once the expenses for lodging, food, clothes, transport and other considered goods have been paid.

Regarding the lower limit:

- In many cases, it is possible to impose such a constraint whereby the WTP/WTA value may not be negative;
- In other cases, the problem could not be that clear. In general, though, the CVM survey should be designed to identify the respondents who like, dislike or are indifferent to the offer of asset variation.

The lower and upper limits must be defined for each observation in the data set, when this should be viable.

Estimated WTP and WTA trends

a. Consumers

For each of the price or subsample levels, a percentage of positive and negative responses is derived. By aggregating the data for each price level, it is possible to directly derive the

percentage of potential purchasers for each level and, as such, their distribution as the function of price (see Figure 15).

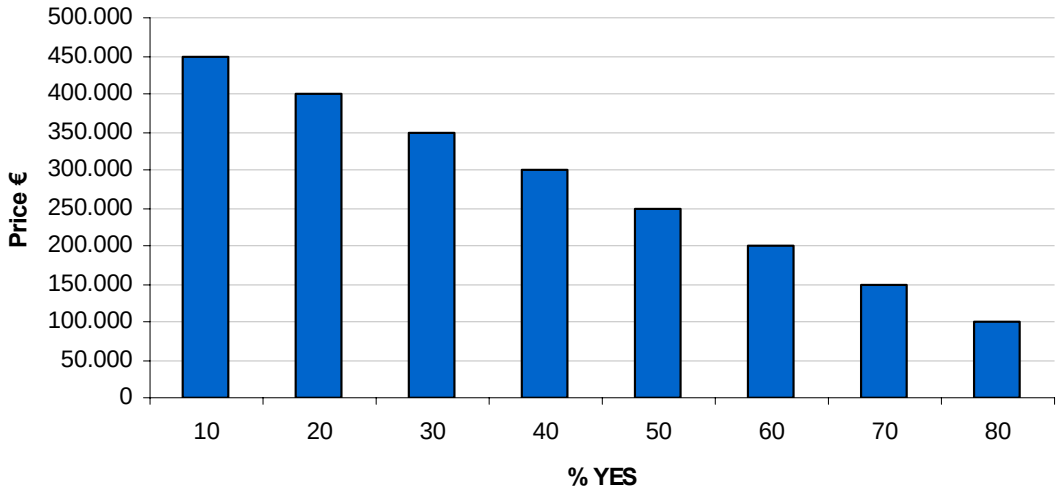

Figure 15. WTP trend

By relating such percentages to the target population size (the potential consumers for the asset being the subject of valuation) the potential demand curve for the same asset is derived. Indeed, the demand curve represents, for each price level, the quantity the market would be willing to purchase for that specific asset.

It is possible to find the maximum purchase points (the price at which most respondents are willing to buy) and the maximum return point being the boundaries of the range of inelasticity. Within this range, producers may decide to set the offer price as a function of the market strategy they intend to pursue.

This method works well when the respondents are familiar with the assets subject to valuation, since they are already in the market; for assets that are not in the market it is hard to come to a reasonably accurate price.

b. Producers

In case the open-ended version should apply, the response distribution is calculated on a Cartesian P x Q model (see Figure 16), then, the average supply curve is estimated as the least squares curve according to linear regression or exponential models.

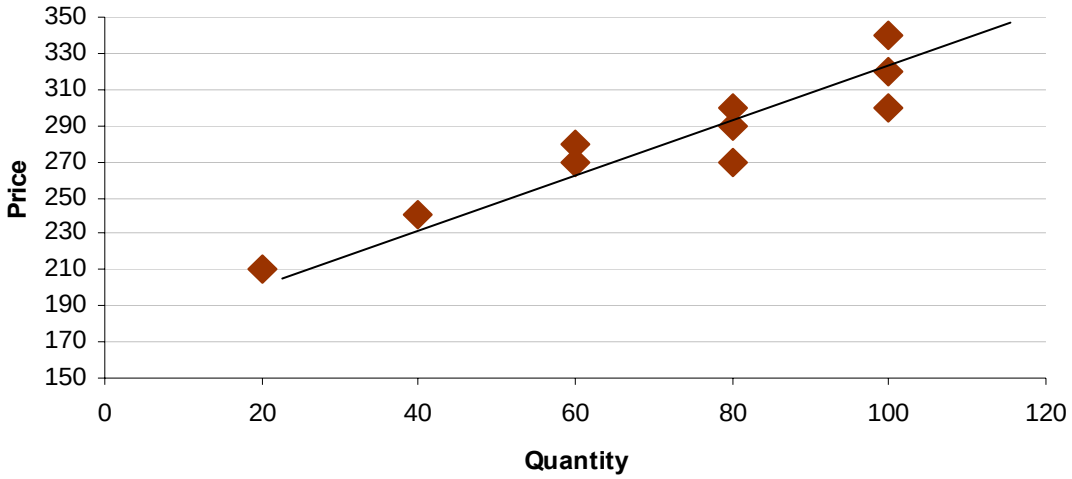

Figure 16. Open-ended survey: response distribution

Linear regression models

Linear models are cause-effect models where, given a measurable effect and having detected the variables that generated it, the parameters connecting the explanatory variables to the explained variable are sought.

In general, the models may be tracked back to the following general formula:

$$y = \sum b_i \,.\, x_i + \sum a_i \,.\, e_i$$

b_i and a_i are unknown parameters;

x_i are observable variables with information;

e_i are non-observable variable subject as hypotheses.

The simple regression model is formed by a single independent variable:

$$y = f(x) + e$$

given by a deterministic variable $f(x)$ and a stochastic variable e that keeps into account

of the external circumstances that do not allow the relation to be a perfect theoretical mathematical bond. As the relation is linear, then

$$y = b_0 + b_1 x_1 + e.$$

The dependent variable is expressed by a part being proportional to the variable and by a random amount. The relation expresses the line that best expresses the relation between the two variables as a function of the observed data (least squares line). The difference between the value estimated with the line and the observed value is equal to the stochastic component *e*.

To find it, it is possible to resort to the line criterion that reduces the sum of value shifts between observed and estimated values to a minimum *(yi - ~~yi~~),* that is, minimising the following function

$$\sum (y_i - \tilde{y}_i)^2 = min$$

of the least squares line.

Non-linear regression models

In these models, the regression coefficients are not constant, though they vary at the change of the variable. Depending on the determination index, the regression model featuring the lower index is selected.

The *Multiplication model* is of the following kind

$$y = b_0 \,.\, x_1^{b1} \,.\, x_2^{b2} \ldots . + e.$$

The method used for the calculation is based on the logarithmic transformation of the variables. The multiplication model is used to estimate the Cobb-Douglas production function. In the real estate industry, it allows to measure the complementary extent of the considered characteristics:

- If the sum of the exponents is equal to 1, there is no complementariness;
- If the sum is higher than 1, there is incremental complementariness because the combined effect on price is higher than the effect of a single characteristic;

– If the sum is lower than one, there is decreasing complementariness (the combined effect is lower than the effect of a single characteristic).

The *Exponential model* is expressed in the formula:

$$y = b_0 \,.\, exp\,(\, b_1x_1 + b_2x_2 \,...+ b_nx_n + e)$$

while the *Logarithmic model* describes the curve through the following expression

$$y = b_0 + b_1lnx_1 + b_2lnx_2 \,...+ b_nlnx_n + e.$$

When the Contingent Valuation Experiment is performed in the Iterative bidding version, the dominant or average WTA for any level of production may be identified; it ultimately yields the average supply curve derivation (see Figure 17). Similarly, the supply curve by points for each single respondent may be derived (see Figure 18).

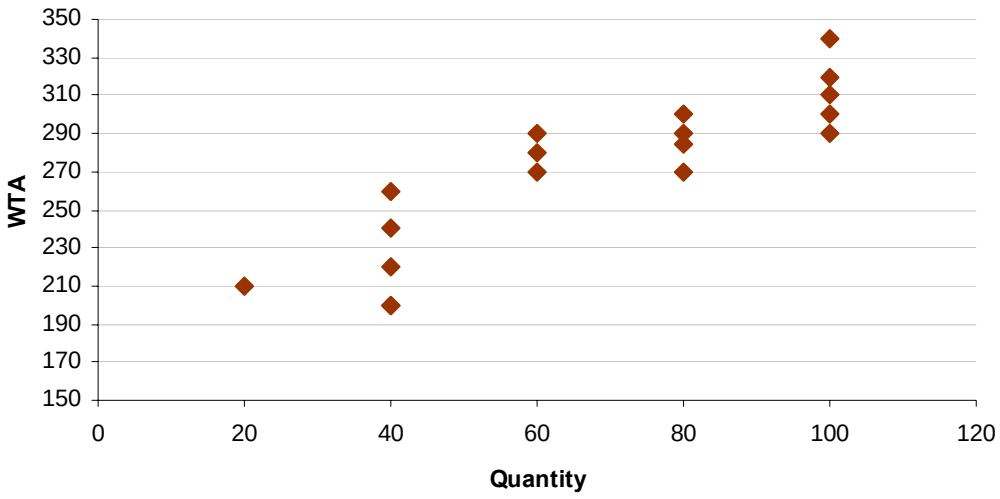

Figure 17. Iterative Bidding survey: WTA distribution

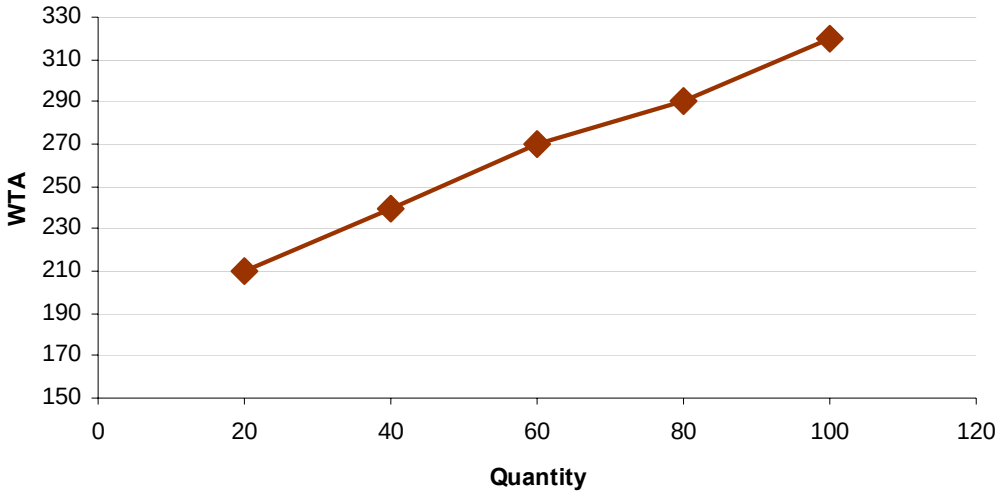

Figure 18. Iterative Bidding survey: single respondent supply curve

The average and median WTA may be estimated using either parametric or non-parametric models.

Average and median WTA through non-parametric models

The average and the median should be estimated using non-parametric techniques first. This is because non-parametric valuation is a set of techniques that may be used to estimate the average and median WTA without coming to any hypotheses regarding the nature of the WTA data. In some cases, these estimates may be obtained through the simpler of numerical calculations.

More specifically, the most appropriate techniques to be used depend on the type of data that were collected during the survey:

- Continuous data: Kaplan-Meier method;
- Binary data: Pooled Adjacent Violators algorithm;
- Data interval overlapping: Turnbull Self-Consistency algorithm.

The average and median WTA derived from a non-parametric estimate may be taken as the lower limit for these indicators. In other words, they give the minimum value for the average or the median being consistent with the sample data.

Average and median WTA through parametric models

In order to come to a more accurate estimate of average and median WTA, the parametric estimate is in order. Through the parametric estimate the analyst assumes WTA to be distributed in the population according to probability distribution. The goal of this estimate approach is to find the distribution function parameters for the assumed probability.

In the first case, the analyst must choose a probability distribution to model WTA. Once the distribution function has been selected, the analyst is capable of estimating the model parameters. Having estimated the WTA parametric model, the average and median WTA may be calculated. Many distribution assumptions may be calculated by means of simple formulas. The median WTA may be calculated in a relatively easy fashion: the analyst must simply find the median WTA whereby the cumulative distribution density function takes a value of 0.5. In order to calculate the average WTA in the hypothesis of complex distributions, there may not be a simple formula. In such circumstances it may be necessary to resort to numerical integration methods for the purpose of deriving the average WTA of the estimated distribution function.

Average and median WTA confidence interval calculation

In order to calculate the average and median WTA, the results are referred only to a family sample. They are simply the estimate of the average and median of the population based on the information provided by the sample. A different family sample could yield different WTA values. For this reason the analysis in general provide an indication as to the level of estimate accuracy. This requires a 95% confidence interval. In general there are two approaches to determine confidence intervals: an analytic approach based on the statistical theory and a numeric approach based on an extensive calculation.

In general, though, there are analytic formulas to calculate the confidence intervals only for relatively simple models. The two most widely used techniques are the *Krinsky-Robb method* and *bootstrapping*, which may be summed up as follows:

- The *Krinsky-Robb* method may be used only with parametric models and is based on some hypotheses regarding the distribution of the estimate model parameters
- *Bootstrapping* is a very strong technique that may be used to build confidence intervals for the average and median WTA using any type of data (e.g. continuous, binary or interval) or the results of any estimate method, be it parametric or non-parametric.

Of the two methods, *bootstrapping* is the preferred one. Even though it is computationally costly, the advantages have to do with the opportunity to build confidence intervals without making any hypotheses regarding the nature of the data and its applicability virtually to any situation.

Verifying the structure of stated WTP/WTA

The second goal of CVM data analysis is to assess the validity of WTP/WTA answers. The analysts test whether the WTP/WTA values provided by the respondents follow distinguishable models and whether these models are compliant with the previous forecasts and the economic theory.

In general, analysts define a number of variables they believe to determine the WTP/WTA of a respondent. In general, such variables include:

- Income and other social-economic characteristics of the respondent;
- Details about their attitude in terms of the programme offered in the scenario by CVM;
- Information on their current familiarity of the asset to supply;
- For assets having spatial dimension, their proximity to the location where the asset is found.

Hence, the goal is to see how these variables "explain" the WTP/WTA of the families. The approach is to specify, estimate and therefore interpret a bid function. The choice function is a mathematical equation that, once estimated, describes how each variable would influence the respondent's WTP/WTA.

a. Identifying the bid function

In general, the *bid functions* used in CVM analysis are relatively simple. Typically, a parameter is associated to each variable in such a way that, once estimated, the parameter sign indicates whether the growing values of such variable have a positive or negative influence on the WTP/WTA of a family, and the meaning of the estimated parameter determines whether it is possible to attribute a statistical meaning to that influence.

Two alternative paradigms may be applied in specifying the form of the choice function:

- *Utility difference model*, the function is expressed as the monetised value of the utility

variation, as perceived by a respondent after a variation in the supply of an asset; it is presumed that the income of the respondent influences the monetary value for every utility variation unit;

– *bid function model*, the function is specified directly; the hypothesis is that income and the other variables may influence the size of the respondent's WTP/WTA.

In literature there is no universal agreement about the paradigm that should be adopted to determine the *bid function*. The *Utility difference model* is consistent with the economic theory, though it produces more complex forms of function. The *bid function models* produce easier to process functions, though they are less akin with the underlying theory.

b. Bid function estimate

The *bid function* is estimated by using the parametric techniques described above.

The analyst selects a parametric distribution of WTP/WTA that is not in contrast with the economic theory.

The choice of a 'best fitting' model is not an exact science. The selection among the different choice function specifications and the distributive assumption are driven by the signs and the significance of the different parameters and the overall compliance with the model. Often, the factors that determine WTP/WTA are extremely complex and unlikely to be adequately expressed by a simple choice function.

3.2.5. DERIVING THE HYPOTHETICAL DEMAND AND SUPPLY CURVES AND OPINION OF VALUE

Based on the analysed and processed data, then:

- It is possible to build a hypothetical market demand curve for C* and P* based on answer distribution;
- It is possible to build a hypothetical market supply curve for C* and P* from the individual supply curves derived in the previous point;
- It is possible to intersect the demand and supply curve (for C* and P*) and to identify the equilibrium price and quantity for C* and P*.

Market demand curve

In economics, the aggregate demand curve expresses, for the set of consumers who represent the market of an asset, the total amount they would be willing to consume depending on the price.

From the percentage of positive questions for each level of price as registered in the survey, one can know, for each price, the quantity of assets the whole sample would be willing to consume. If the quantities referring to the survey sample would be properly related to the set of potential asset users (the target population already defined when building the sample), it is possible to determine the hypothetical tends of the quantities in demand depending on the price levels (that is, the aggregate demand curve) as shown in Figure 19.

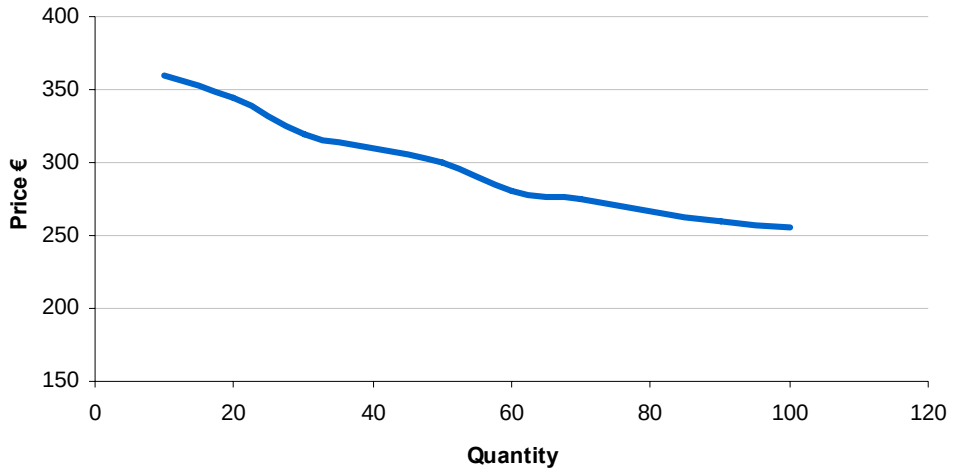

Figure 19. Hypothetical market demand curve

Market supply curve

The market supply curve is derived by aggregating the individual supply curves of each producer. It expresses, for each price level, the total amount of assets they would be willing to produce in a given market. It is also called industry supply curve (in order to tell it apart from the individual curve, representing the supply of a single enterprise).

Data analysis allows to derive the supply curve of a typical or average producer, as the least squares curve (in the open-ended version); or through the combination of the mean points of each quantity level or, finally, the interpolation of the individual supply curves (in the iterative bidding version).

In order to derive the potential aggregate supply curve, the theory is that the trend is the one detected for the average producer and the total offered quantities for each price level are obtained by multiplying the individual quantities by the number of potential bidders (producer target population). The producer target population has already been defined in the sample construction phase.

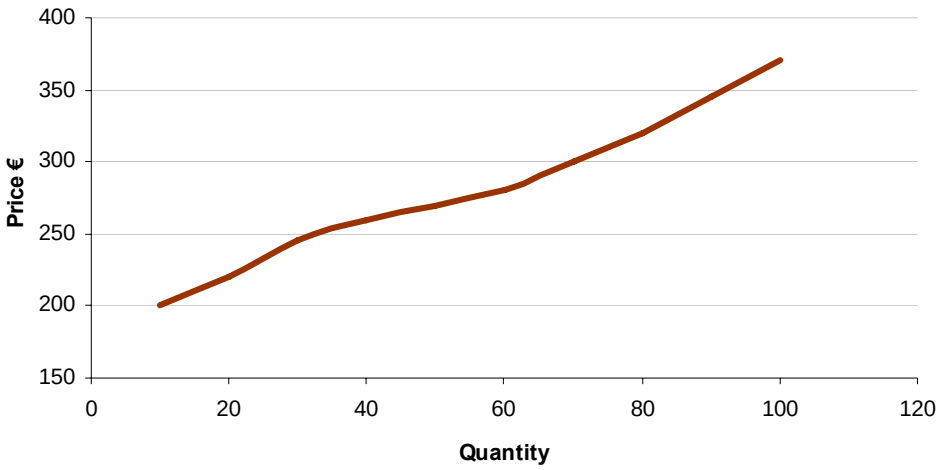

Figure 20. Hypothetical market supply curve

Identification of equilibrium price and quantity for C and P**

By applying the hypothetical market supply curve and the demand curve on the same Cartesian model, it is possible to detect the intersection of the two curves (see Figure 21).

The intersection represents the equilibrium point in the market: it identifies the price and the quantity that meet and optimise, at once, the preferences of consumers and

producers. Any intersection outlier does not represent the market point of efficiency, in that it would imply an supply surplus (for a given price the offered quantity is higher than the demanded quantity) or a demand surplus (the demanded quantity is higher than the offered quantity).

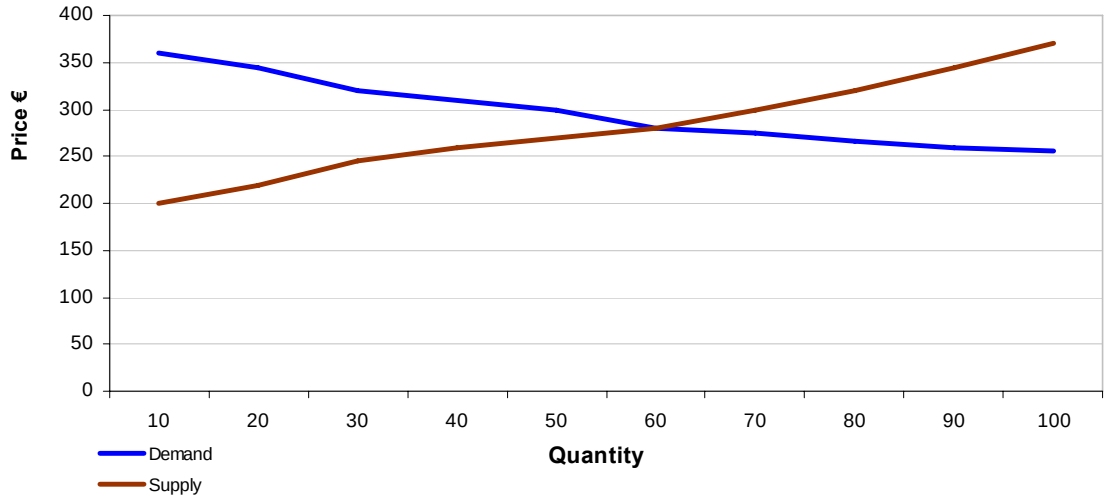

Figure 21. Hypothetical demand and supply curves

In the procedure we propose, the intersection allows to come to estimate the most probable market value for the best marketability (C* o P*) alternative. Moreover, in case of newly built properties, it allows to determine the optimal quantity to produce, which the consumer would be willing to purchase at the estimated market value.

This process allows to perform calibration and sizing according to the foreseeable market scenarios in case of requalification interventions, minimising the risks of excessive production as compared with the potential demand (supply surplus), which would remain unsold.

3.3. Testing the procedure

AIM OF THE EXPERIMENTAL PHASE

The experimentation was carried out for the purpose of testing the validity of the offered model to come to a reliable estimate of the market value of a real estate asset.

The application is targeted at verifying the second part of the offered procedure, which in turn pursues the estimate of market value by outlining the hypothetical demand and supply curves. The first part of the method is applicable to instances where the valuation subject is yet to be realised, in that is allows to value a more preferable alternative for producers and consumers; the second phase is meant to estimate the market value of such alternative.

The purpose of the experimental phase is to ensure that the difference between the values estimated by applying the offered process and the actual transaction values fall within the acceptability limits generally used in the appraisal, in order to make sure that the valuation made with this method may be reliable in cases where it should be impossible to gather historical data or in the presence of implicit markets. Moreover, it should also be verified the extent in which the valuation of the supply value only or of the demand value only differ from the actual market price.

THE VALUATION SUBJECTS

The valuation subjects are five apartments located in Rome, in the neighbourhood of Montesacro, sold in the end of 2012 (as indicated by local realtors), whose sale prices were searched in the registries of the Revenue Office (Agenzia delle Entrate) together with the relevant descriptive, qualitative and quantitative data.

The interview took place two months after the sale of the asset, for the purpose of ensuring the sample could represent a market situation being consistent with the one dating back to the real estate transactions.

The features of the valuation subjects are summed up in Table 20.

The apartments all feature similar characteristics in terms of conditions, construction quality and finishing level; they are located in buildings built between the 50s and the 70s of the XX century and all have a mid-level view.

	Apartment A1	Apartment A2	Apartment A3	Apartment A4	Apartment A5
Data source	Recorded deed	Recorded deed	Recorded deed	Recorded deed	Recorded deed
Sale price (€)	292.000,00	362.000,00	315.000,00	380.000,00	335.000,00
Transaction date	dic-12	dic-12	nov-12	nov-12	dic-12
Address	Via Conca d'Oro	Via Val di Non	Viale Val Padana	Viale Val Padana	Via Conca d'Oro
Cadastral identification					
Map sheet	268	268	269	269	269
Parcel	478	586	229	222	384
Sub-parcel	76	65	38	47	216
Gross living area (square meters)	77	85,4	86,2	91,7	81,5
Balconies (square meters)	10	8	14	14	-
Services	Single	Single	Double	Double	Single
Property type	Civil	Civil	Civil	Civil	Civil
Building conditions	Average	Average	Average	Average	Average
Apartment conditions	Average	Average	Average	Average	Average
Floor	Second	Third	Second	Third	First
Quality of views	Average	Average	Average	Average	Average
Orientation	S-E/S-W	S	S-E/S-W	N-E/N-W	E/W

Table 20.Description of valuation subjects

The property surfaces vary from a minimum of 78 to a maximum of 120 m^2 of gross living area.

The transactions were registered in the second quarter of 2012, between November and December.

Figure 22. Valuation subjects location

THE SAMPLE

The sample is made up of potential purchasers and potential sellers. The potential purchaser *target population* included families residing in the Montesacro neighbourhood and the neighbouring areas (within a radius of approximately 8 km), postulating that a portion of the demand be represented by purchasers who do not live in the neighbourhood, as resulting from interviews made to local real estate operators. As to the sellers, though, reference was made to the Montesacro neighbourhood (see Fig.23).

The *frame sample* was represented as the list of purchasers and sellers obtained from the major real estate agencies located in the areas taken as reference to single out the target population.

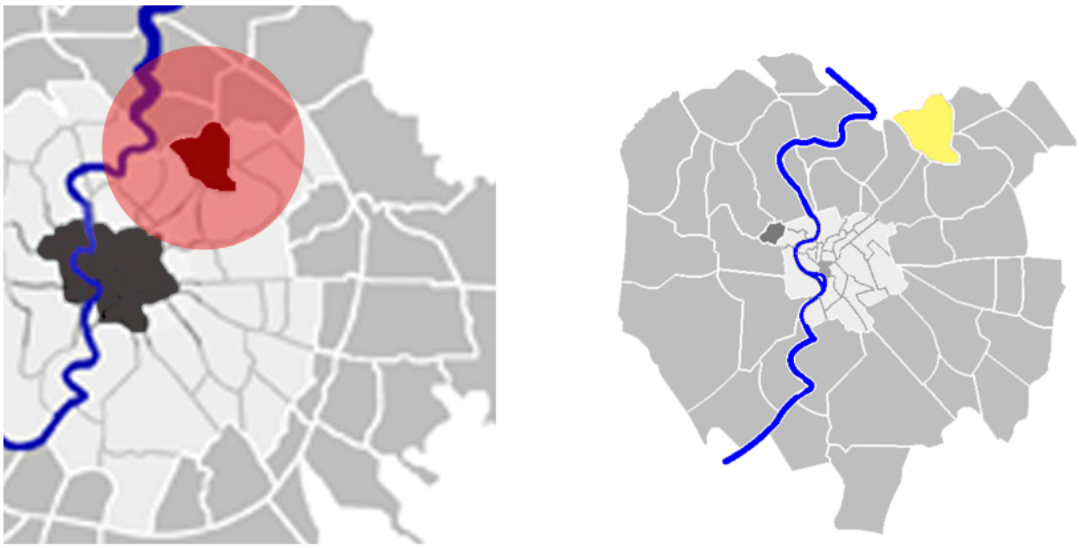

Figure 23. Identification of demand and supply target population

A number of 150 potential consumers were selected, together with 80 potential sellers (bearing in mind that in reality the sellers are always fewer than the purchasers).

The potential components of the sample were selected by telephone contact; eventually, the sample was stratified in a way to account the social and economic characteristics of the purchasers and the sellers of residential real properties, as they were recently described in a specific study published by the *Agenzia del Territorio* (Land Registry Agency) (see. Ghiraldo, Andreussi 2012).

Characteristics of the consumer sample

As reported in Figure 24, most residential real property purchasers (approximately 45%) has a yearly income ranging from 15,000 and 30,000 €; 25% has an income exceeding 30,000 € and 30% has an income lower than 15,000 €.

From a professional standpoint (Fig. 25), most of them are employees (63%) or pensioners (11%) and only a small portion of them is comprised of entrepreneurs and self-employed, thus confirming that in the residential business the purchase of a first house is for residential and not for investment purposes.

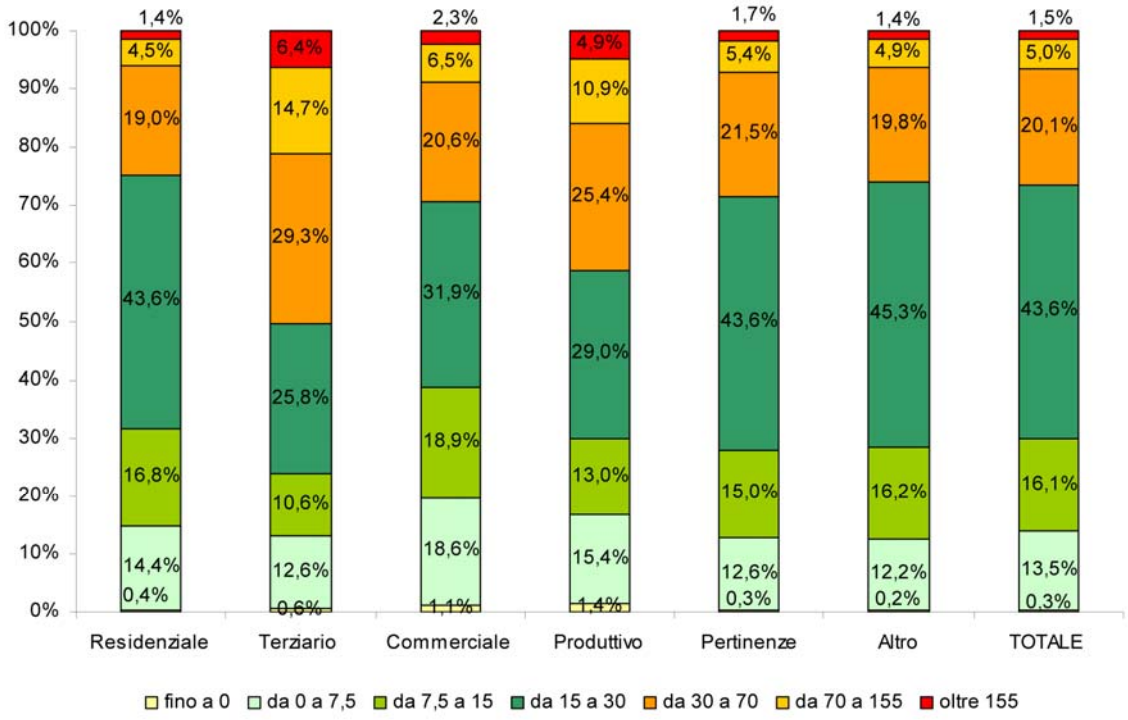

Figure 24. Distribution of consumers by income (thousands of Euros) and property type (source: Ghiraldo, Andreussi 2012)

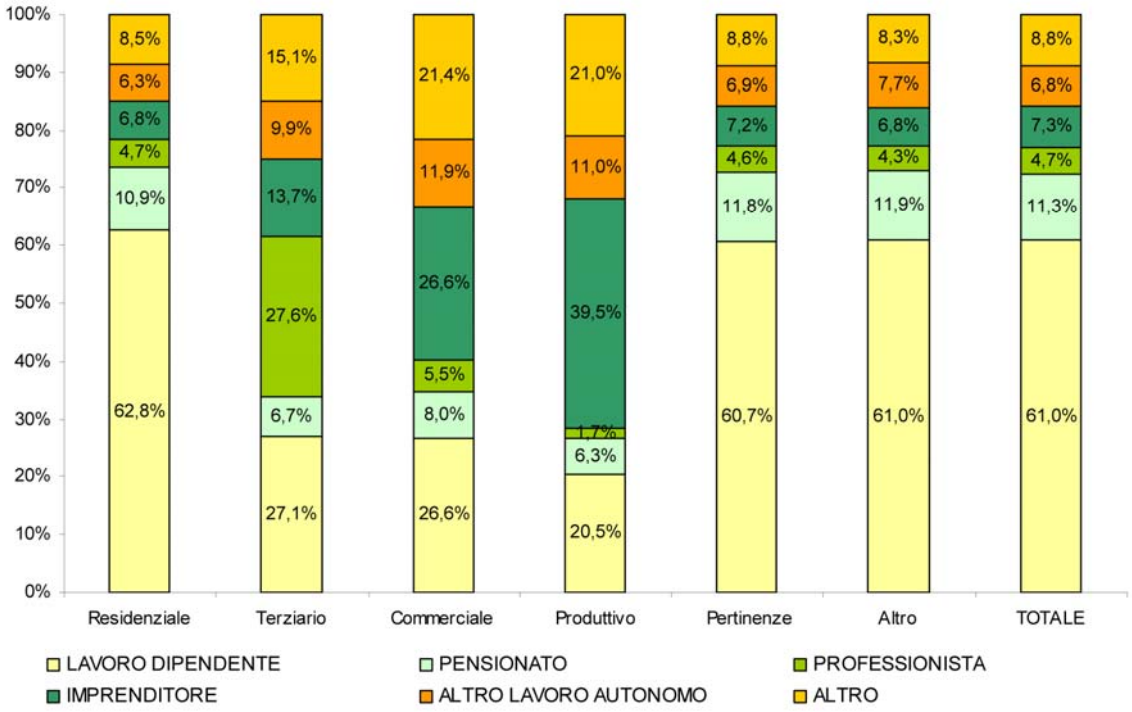

Figure 25. Distribution of consumers by profession and property type (source: Ghiraldo, Andreussi 2012)

The mean age of the purchasers was by over 60% between 30 and 50 years of age; only a small portion of the sample was younger than 20 years or older than 60 (Fig. 26).

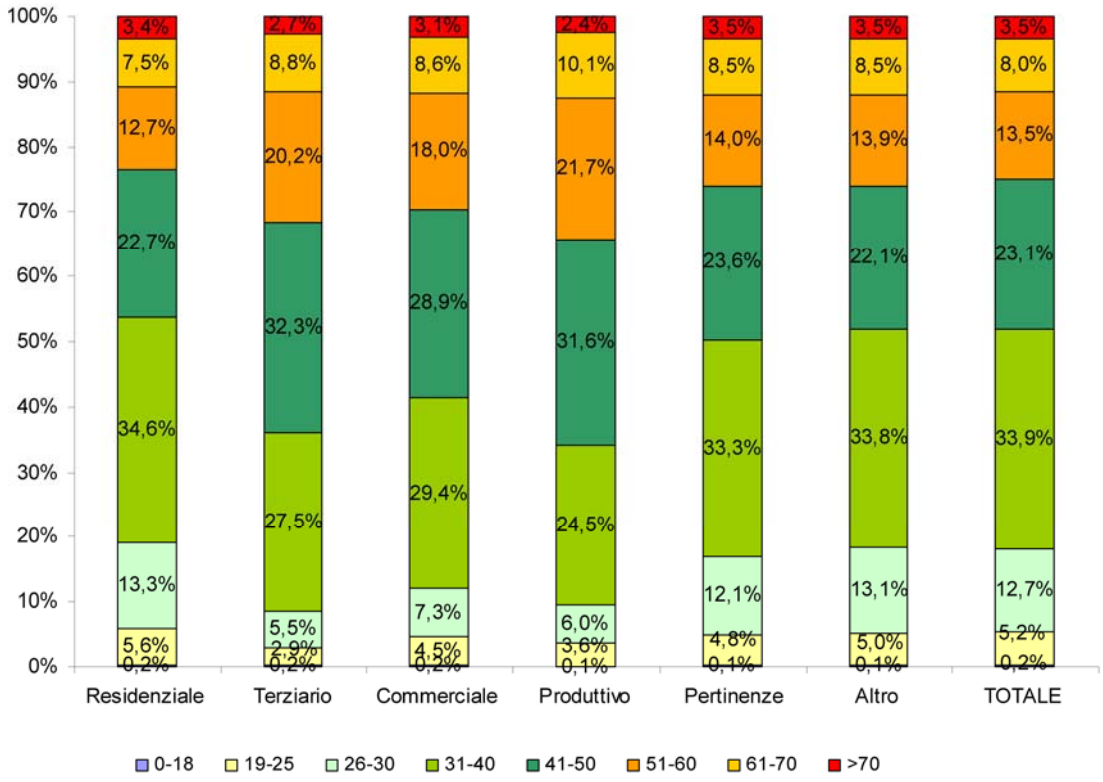

Figure 26. Distribution of consumers by age and property types (source: Ghiraldo, Andreussi 2012)

Based on said remarks, the consumers sample was selected, whose social and economic characteristics are reported below.

Age		**Profession**		**Income**	
18-30	20	Employer	100	>70.000 €	10
30-50	90	Pensioner	20	30.000-70.000 €	25
50-60	25	Self-employed	15	15.000-30.000 €	70
More than 60	15	Entrepreneur	15	< 15.000	45
Total	**150**	**Total**	**150**	**Total**	**150**

Table 21. Consumers sample: socio-economic characteristics

Characteristics of the seller sample

As reported in Figure 27, most residential real estate sellers (approximately 57%) has a yearly income ranging from 15,000 and 70,000 €; only 7% had a higher income; 36% of them had an income lower than 15,000 €.

From a professional standpoint (Fig. 28), a many of the sellers were pensioners (32.4%), 36% of them were employees and only a small portion were entrepreneurs (8%).

The age of the sellers breaks down almost evenly in the over-30 age brackets: 18% between 30 and 40, 20% between 40 and 50 years and between 50 and 60 years; 19% between 60 and 70; 17% over 70 years of age (Fig. 29).

Based on these indications, the seller sample was selected, whose social and economic characteristics are reported in Table 22.

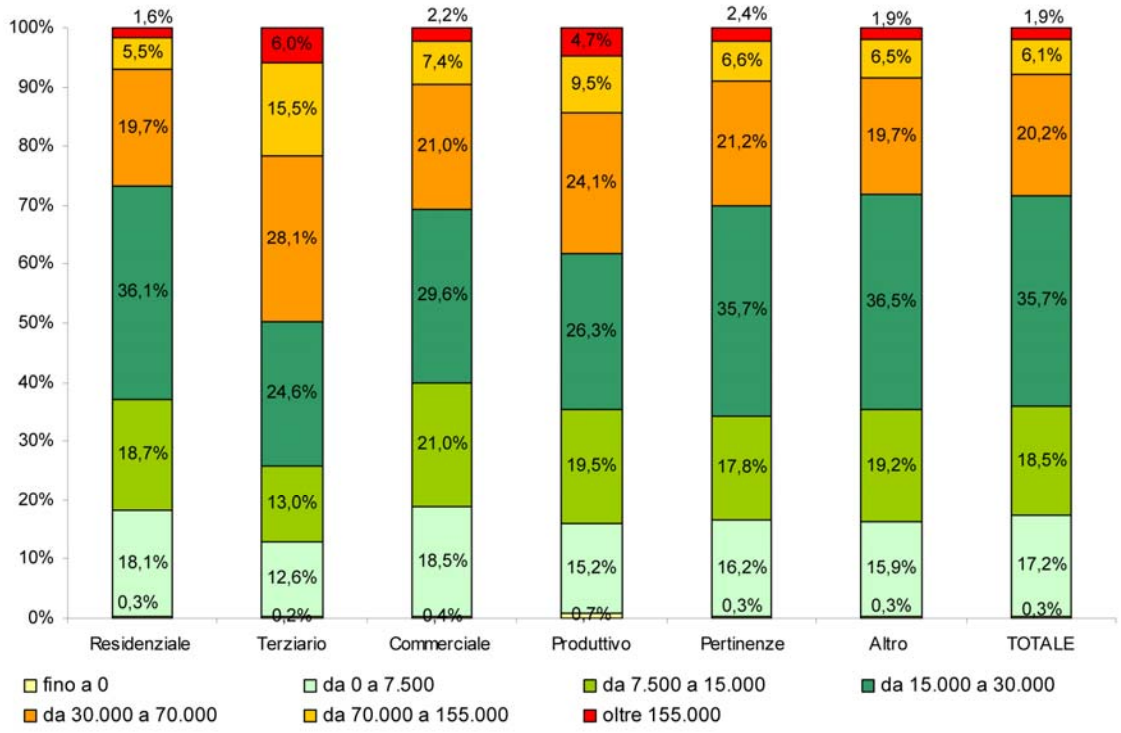

Figure 27. Distribution of sellers by income (thousands of Euros) and property type (source: Ghiraldo, Andreussi 2012)

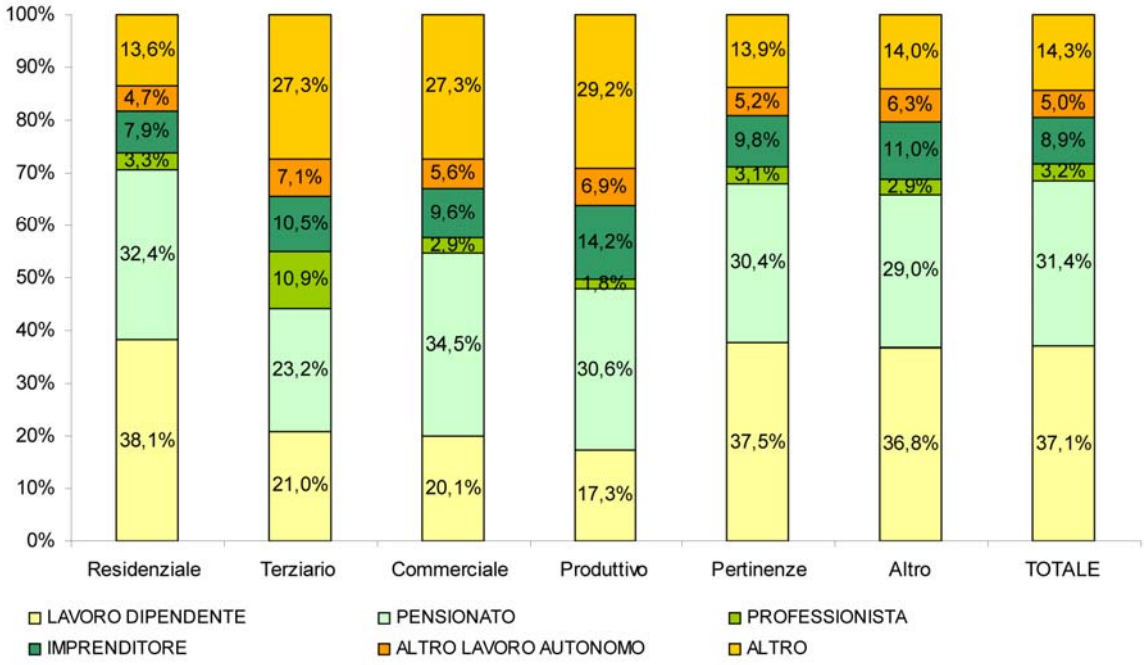

Figure 28. Distribution of sellers by profession and property type
(source: Ghiraldo, Andreussi 2012)

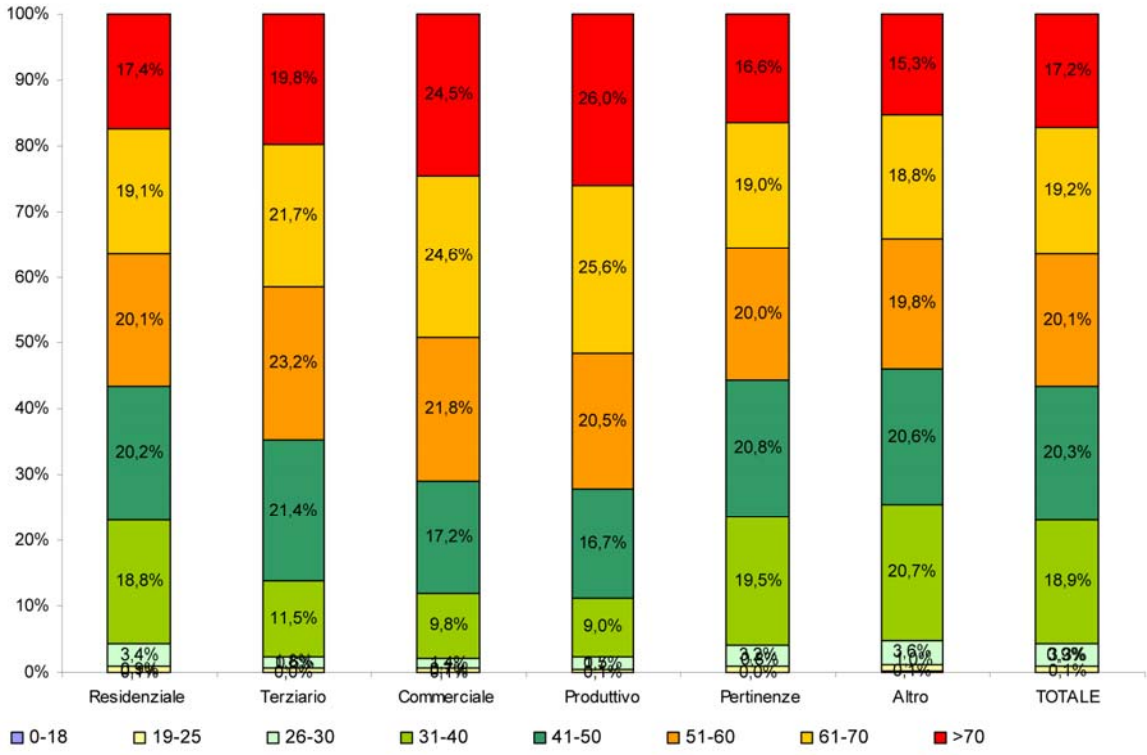

Figure 29. Distribution of sellers by age and property type
(source: Ghiraldo, Andreussi 2012)

Age		**Profession**		**Income**	
18-30	3	Employer	30	>70.000 €	5
30-50	30	Pensioner	25	30.000-70.000 €	22
50-60	32	Self-employed	10	15.000-30.000 €	28
More than 60	25	Entrepreneur	15	< 15.000	25
Total	**80**	**Total**	**80**	**Total**	**80**

Table 22. Sellers sample: socio-economic characteristics

DESIGN AND IMPLEMENTION OF THE CONTINGENT VALUATION EXPERIMENT

The CV experiment took place by applying the *Dichotomous choice* version for the survey to be administered to the consumers and the *iterative bidding* version for the questionnaire to be administered to the sellers.

The potential purchasers are asked about their willingness to pay to purchase the valuation subject. The demand curve will depend on the number of positive responses for each price level.

The potential sellers are asked about their willingness to accept for the purchase of the valuation subject. The supply curve is derived as a function of the minimum WTA detected for each respondent at the end of the bidding game.

The survey is repeated for each of the apartments. The fact of submitting the five apartments to the same sample is consistent with what happens in reality: there are different alternatives to choose from, which may be arranged in a sort of ranking.

Selecting the subsamples for the Dichotomous choice

Before determining the number of subsamples, the price variation change and the number of price levels to submit were considered.

Since the actual transaction price of the assets is known, for each apartment the selected variation range was within a 30% interval being higher or lower than the sale price.

The price variation ranges for the five assets are reported below.

Apartment	Sale price (€)	Range of variation	
		Maximum	Minimum
A1	292.000,00	380.000	210.000
A2	362.000,00	470.000	250.000
A3	315.000,00	400.000	220.000
A4	380.000,00	490.000	260.000
A5	335.000,00	430.000	230.000

Table 23. Range of variation

Given the size of the sample, for the purpose of having subsamples that are too small, we selected five price levels and five subsamples, each comprising of 30 subjects. The validity of the breakdown into subgroups was tested through *Cooper's model*.

The breakdown of the respondents into subsamples followed the structured sampling model, being significant of the consumers' characteristics.

Consumers' survey

The subjects selected into the subsamples were contacted and a data and place were arranged for a meeting and an interview. In the meantime, the comprehensive documentation regarding the real property was shared in the form of analytic info sheets including indoor and outdoor images of the properties.

During the interview, the potential purchasers were informed about the aim of the questionnaire and the structure of the task they were called upon performing; the general aspects of the issue and the familiarity with the valuation subjects were detected.

The maximum WTP for each of the apartments, was detected by means of a question of the following kind:

Question:

If you were theoretically to purchase property A1, would you be willing to pay a maximum of € 310,000?

Yes

No

Based on the subsample the respondent had been assigned to, the amount offered was one of the five levels selected previously.

In the last part of the questionnaire, the social and economic features of the respondent were recorded.

Sellers' survey

As regards the *iterative bidding game* a price variation scale was chosen consistently with the one chosen for the consumers; therefore, the selected variation range was an interval being higher or lower that the sale price by 30%, broken down into 5 levels.

The contacted sellers were sent a set of documents explaining the purpose of the interview and a detailed description of the five apartments.

Once they were informed about the purposes of the questionnaire and the structure of the task at hand, the general aspects of the issue were detected.

The detection of the minimum WTA for each of the apartments, through the *iterative bidding* method, unfolded as explained below.

Question:

1.a. If you were theoretically to sell property A1, would you be willing to sell it for a minimum of € 310,000?

Yes

No

If Yes

And for a minimum of 290.000 Euros?

Yes

No

If No

And for a minimum of 340.000 Euros?

Yes

No

…

Similarly to the consumers' survey, the last part of the questionnaire researched the social and economic characteristics of the respondents.

ANALYSIS OF STATED DATA

The first goal to the analysis of the collected data was the estimate of the hypothetical demand and supply curves for each of the apartments.

Regarding the consumer sample, for each of the subsamples the percentage of positive and negative answers was recorded. By aggregating the data for each price level, it is possible to derive the percentages of potential purchasers for each level, hence their distribution as a function of price; finally, it is possible to derive the potential demand curve for that asset.

For the sellers' survey, by aggregating the data regarding the minimum WTA, detected as a function of price, and by means of the frequency distribution as a function of price, the potential supply curve may be derived for each of the apartments.

The hypothetical demand and supply curves of the five apartments are reported in the following figures. The intersection points of the two curves identify the most likely market value for the assets.

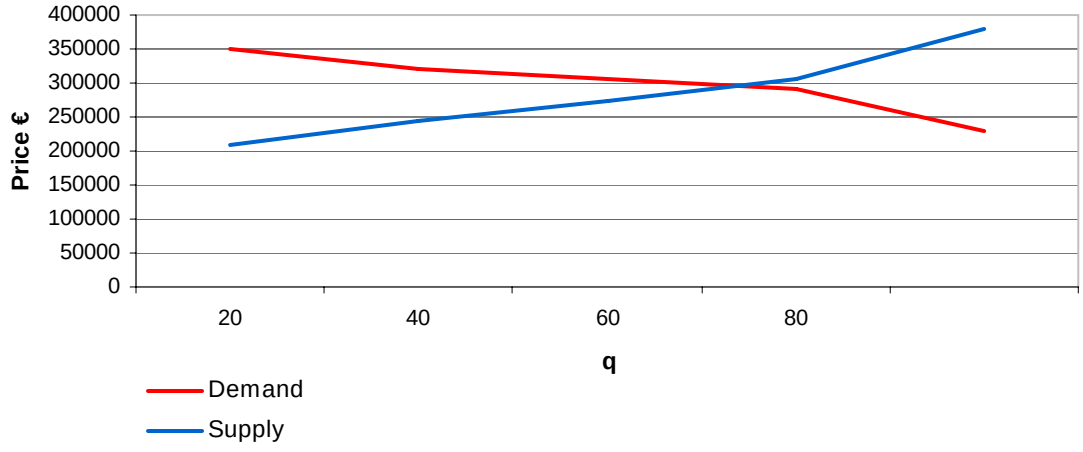

Figure 30. Hypothetical Supply and Demand curves – Apartment 1

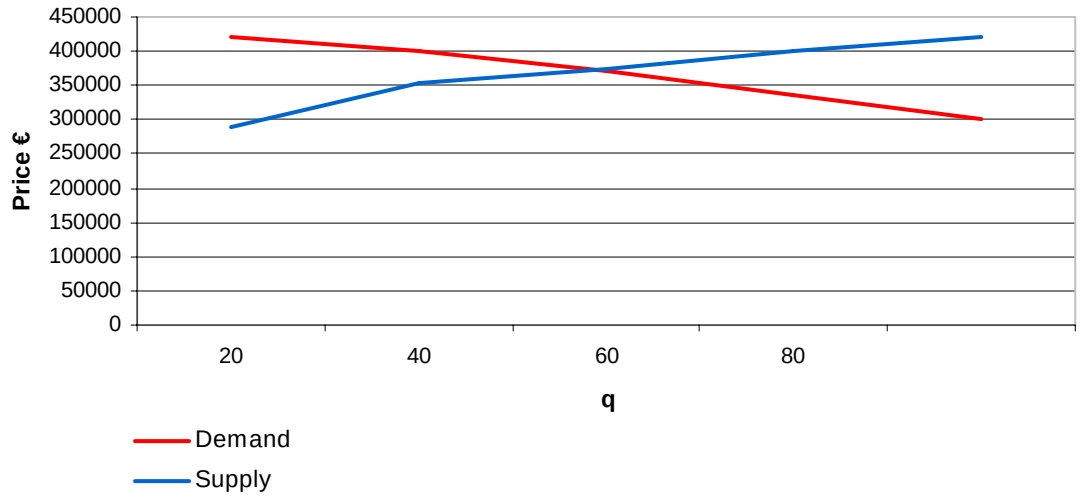

Figure 31. Hypothetical Supply and Demand curves – Apartment 2

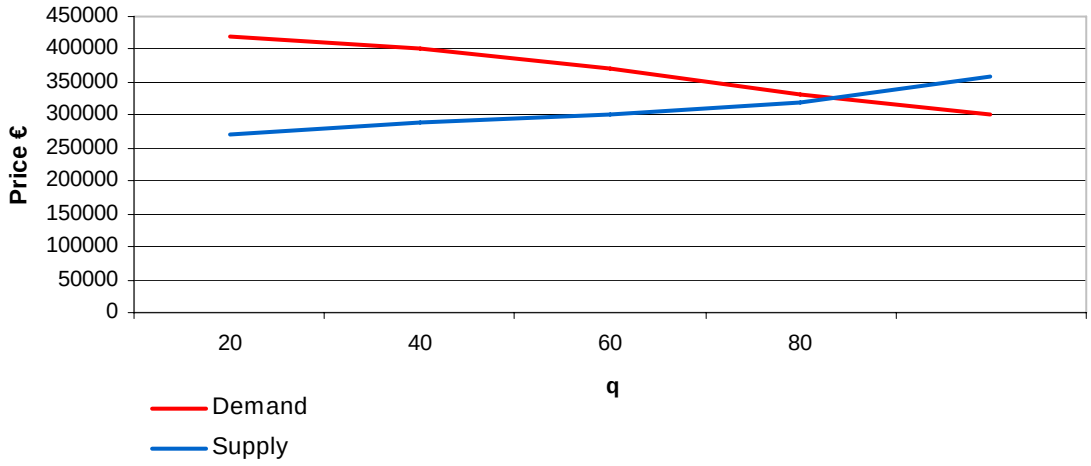

Figure 32. Hypothetical Supply and Demand curves – Apartment 3

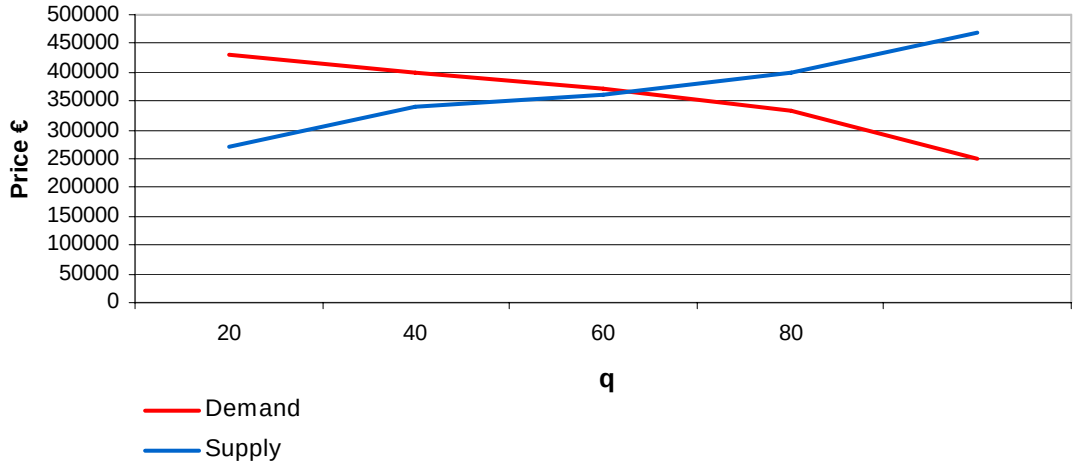

Figure 33. Hypothetical Supply and Demand curves – Apartment 4

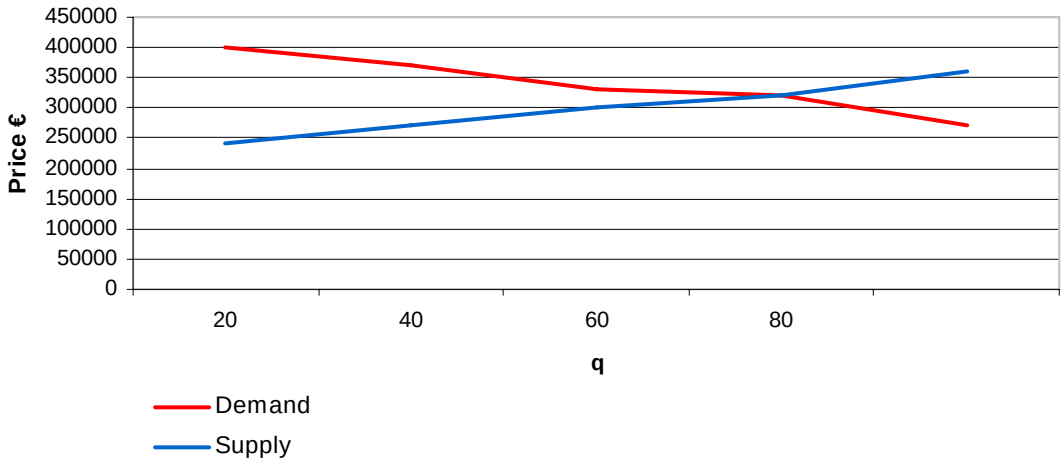

Figure 34. Hypothetical Supply and Demand curves – Apartment 5

3.4. Discussion on the obtained results

As it turns out from Table 24, the difference between the hypothetical market value and the actual sale price falls into a variation margin between -2 and + 1.5%, two values that may be deemed absolutely acceptable within the scope of an appraisal.

Apartment	Sale price (€)	Hypothetical market value (€)	Difference between hypothetical value and sale price
A1	292.000,00	286.160,00	-2%
A2	362.000,00	367.430,00	+ 1,5%
A3	315.000,00	317.205,00	+ 0,7%
A4	380.000,00	375.820,00	-1,1%
A5	335.000,00	339.690,00	+ 1,4%

Table 24. Comparison between hypothetical market value and sale price

Subsequently, for the purposes of verifying how estimating only the supply value or only the demand value differ from the actual market price, average WTP and WTA values were obtained, which corresponded, respectively, to the most likely demand price and the most likely supply price.

The recorded data were analysed with inference statistics, considering a probabilistic approach. A *Logistic regression model* was applied to estimate probability, assuming that the choice is made by a rational individual and for the purposes of increasing utility to a maximum and that the utility function includes a deterministic component and a stochastic component.

By applying the regression model, the mean willingness to pay and willingness to accept values were calculated (see Table 25).

Apartment	Median WTP (€)	Median WTA (€)
A1	262.800,00	327.040,00
A2	318.560,00	409.060,00
A3	275.625,00	351.225,00
A4	343.900,00	433.200,00
A5	291.450,00	376.875,00

Table 25. Median WTP and WTA

As it turns out from Table 26, the hypothetical demand and supply values differ by an average of 10% from the actual sale price; as regards the offer price, in some cases, the percentage can go up to 14%. This proves that estimating a single one of the two values (as it happens in some real estate applications) is not sufficient to form a reliable estimate of the market value of an asset.

Apartment	Sale price (€)	Hypothetical Demand value (€)	Hypothetical Demand value – Sale price	Hypothetical Supply value (€)	Hypothetical Supply value – Sale price
A1	292.000,00	262.800,00	-10%	327.040,00	+ 12%
A2	362.000,00	318.560,00	-12%	409.060,00	+ 13%
A3	315.000,00	275.625,00	-12,50%	351.225,00	+ 11,50%
A4	380.000,00	343.900,00	-9,50%	433.200,00	+ 14%
A5	335.000,00	291.450,00	-13%	376.875,00	+ 12,50%

Table 26. Comparison between hypothetical demand value, hypothetical supply value and sale price

Moreover, it is possible to note that, as shown in Table 27, the average of the two hypothetical values may yield a more reliable reference value, also without resorting to the hypothetical demand and supply curves.

Apartment	Sale price (€)	Mean between hypothetical demand value and hypothetical supply value	Difference between Mean and sale price
A1	292.000,00	294.920,00	+ 1,00%
A2	362.000,00	363.810,00	+ 0,50%
A3	315.000,00	313.425,00	-0,50%
A4	380.000,00	388.550,00	+ 2,25%
A5	335.000,00	334.162,50	-0,25%

Table 26. Comparison between Mean hypothetical value and sale price

This method, which may be considered a simplified version of the offered valuation procedure, confirms, in any case, how important it is to research both consumer and sellers preferences in order to come to a reliable valuation of the real property market value. Indeed, it is a known fact that in establishing a sale price for the properties, being these limited, different and hardly replaceable assets in the market, a key role is played by the negotiation between the seller and the purchaser; hence, the price of a real estate transaction rarely coincides with the sole demand or supply price.

4. CONCLUSIONS

Urban renovation measures, targeted at the qualitative improvement of settlements, mainly involve distressed urban areas. In order to be sustainable from a financial standpoint, such interventions must rest on real estate investments and market operations. This intervention, though, often happens in areas where there is no active and explicit real estate market from which to derive data regarding the willingness to invest of real estate operators, nor the potential demand and the preference of users. In other cases, when the operation implies the involvement of public subjects, it is important to understand whether the requalification, reclamation and urbanisation interventions in the area are capable of stimulating an active real estate market and generate attractiveness for private investors.

In order to assess the financial viability of such operations, the Italian and international appraisal discipline usually makes reference to appraisal methods based on real market data that allow, through actual real estate transactions, to derive the preferences expressed by the actions of market players. Such methods imply the availability of relevant data in the real estate market, whose quality and correctness have been verified. In the current economic context, and most importantly, when operating in urban contexts undergoing transformation, often such data cannot be used. It is often impossible to collect historical data, given the lack of a reliable and updated real estate data detection and processing system; in other cases, historical data do not exist or are extremely poor because of the valuation subject or target market characteristics. In still other situations, the data, albeit available, are not reliable because of the instability, complexity and uncertainty in current real estate markets. In this case, the use of “uncertain” historical data would yield unreliable or mistaken valuations.

Even the most advanced solutions applying probabilistic or possibilistic models to traditional appraisal methods allow at most to unveil the level of uncertainty of the valuation, but they invariably require the availability of historical data to be detected in actual real estate markets; if they can say something about past market trends, they do not allow to make reliable forecasts with regard to future dynamics and scenarios in uncertain

and unstable markets, such as today's. The persuasion that the accuracy of forecasts should essentially depend on the abundance of historical data is always such to rely and turn to valuation methods that are suitable to process larger and larger amounts of basic data, taking a very mechanical view of the social and economic factors whose dynamics influence the market.

Therefore, one happens to operate in similar conditions to those in which valuers estimating goods that have no market – such as public assets – happen to work, or in the conditions of some industrial productions, such as those of technology products, where the price of market launch should be estimated for a product that does not exist or has never been traded in the past. In such instances, it is a common practice to resort to techniques based on interviews and hypothetical markets, making reference to data expressing the preferences of the market subjects.

In the current situation, where the real estate market cannot provide reliable historical data for valuation and, more specifically, in a situation regarding requalification measures to be taken in areas where the market is not explicit, it becomes crucial to theorise a market that allows, based on different possible scenario hypotheses, to estimate the value of assets through the preferences stated by the potential and future producers and consumers. In these conditions, the reference to substitute methods that allow to come to reliable valuations is generally admitted. In order to operate in conditions where it is not possible to rely on real market data, the research suggests to refer, also for the valuation of exclusive real estate assets, to the *Stated Preference Methods (SPM)*, valuation approaches of an asset that are based on hypothetical markets through procedures allowing to detect the preferences stated by the market subjects.

Such methods include a formal research process carried out on a statistically representative sample. As opposed to mathematical-statistical models, *SPM* provide a response from operators who are truly interested in a given operation; moreover, the estimates based on stated data have a dynamic nature, in that they keep account of the way human actions and choices evolve; moreover, the operators are also asked to state their preference for hypothetical scenarios/alternatives that include different characteristics and different levels to the same characteristics, thus allowing to foresee the variation of a single element to the value of an asset.

The *stated preference based* real estate appraisal procedure proposed in the research was designed to be used in such contexts where it is not possible to make reference to the

real market for lack, inefficiency and unreliability of data and information, as in the case of distressed urban area projects; based on the preferences stated by a statistically significant sample of potential consumers and producers in the area subject to the intervention, the process allows to detect the hypothetical demand and supply curves and, through the relevant equilibrium points, to estimate the most likely market value and transaction quantities.

Having defined the purpose and the scope of the intervention, a statistically significant sample of potential consumers and potential entrepreneurs who would operate in the future local market is selected by defining the reference scenario and the questionnaire. Once the exploratory survey is complete, the data are complied regarding the willingness to pay and willingness to accept stated, respectively, by the potential consumers and the potential producers, thus deriving the hypothetical demand and supply curve. The equilibrium price and quantity are subsequently estimated with reference to the hypothetical market, thus allowing to select the optimal quantity of real estate units to realise within the intervention and their most likely market value. The procedure breaks down into two moments: the first is targeted at selecting the most preferable alternatives in the market by applying the *Discrete Choice (DC) Analysis*; the second, allows to estimate the potential demand and supply curves for the preferable alternatives detected with the *DC Analysis*, by leveraging the *Contingent Valuation* methods.

As opposed to the applications performed in international real estate operations (currently restricted) where reference is made solely to potential demand estimate, the described procedure prescribed to estimate the value as the intersection between the demand and the supply curves, for the purposes of keeping account of the conditions that generally occur in the real market. Especially for real estate assets, the differences between supply price, demand price and actual sale price are often significant. For different and hardly replaceable real properties, the negotiation between a consumer and a producer plays a key role in defining the transaction price; indeed, the price of a real estate transaction hardly coincides only either with the demand or the supply price. As such, the valuation of the potential behaviour of a single market operator (be it a consumer or a producer) would appear as not suitable to provide a reliable estimate of the value.

As confirmed by the results from the experimental tests made, the hypothetical demand and supply values differ by an average of 10% from the actual sale price; as

regards the supply price, in some cases, such difference goes up to approximately 14%. Conversely, the values detected as the intersection of the hypothetical demand curve and the hypothetical supplycurve or, as an alternative, as the average of the mean hypothetical demand and supply prices, fall into variation margins that range from -2 and +1.5%, that is, values that may be considered perfectly acceptable in the real estate appraisal.

Even though, as a priority, the procedure is targeted to estimating the most likely market value of an asset, for the newly produced real properties it is possible to obtain further information, such as:

- Detecting the incidence of the characteristics in coming to the market price (implicit prices) for both the consumers and the producers;
- Detecting the market share of possible alternative assets, derived from different combinations of characteristics and the detection of the best marketability alternative;
- Estimating the optimal, of balance, quantity, to be produced for the best marketability alternative.

Because of such aspects, the offered procedure represents a fundamental tool in urban renewal processes; indeed:

- it allows to theorise different scenarios and forecast the values connected with the different project hypotheses, thus allowing the estimate of possible revenues through reliable hypothetical market values for long-term operations, which in the current valuation practice, in turn, are derived exclusively by projecting the conditions detected in past markets to the future;
- By detecting consumer and producer preferences, it allows to acquire instrumental information to the design, especially in the devising and proposal phases, becoming a fundamental tool to stimulate and elicit the detection of alternative and creative solutions;
- It allows to size real estate interventions by detecting both the amount of real properties to put into the market and the characteristics of such assets as a function of the appreciation of the different attributes in the market;
- It allows to produce market estimates in contexts where the real estate typologies expected in requalification projects, for the time being, have never been exchanged (as in the case of brownfields where there are no reference data in terms of residential and commercial real properties).

The offered procedure is also applicable for the punctual appraisals of single real properties as a surrogate method, in conditions where the market data are not reliable.

It may be theorised to make the detection system of the WTP and WTA stated by market subjects as a took to build a data bank of hypothetical values, as an alternative to the data bank of real transaction data, especially in such contexts, as the Italian one, where the latter are basically missing.

Through a diffused detection system, made easier to apply by employing information technology tools, it would be possible to implement the data bank and update it periodically through the data stated by samples being statistically representative of local real estate markets.

Moreover, deriving the implicit prices of real estate characteristics may become a fundamental element of reference for the adjustment procedures that apply to transaction prices, market leases and capitalisation rates in traditional real estate appraisal methods (direct and indirect appraisal methods, Sales Comparison Approach and Income Capitalization Approach).

The valuation procedure offered and the subsequent application represent a starting point for further research developments for the purposes of expanding the experimental approach and improve those aspects that to date have limited the application of the Stated Preference Methods in the real estate industry.

The possible developments have mainly to do with those aspects connecting with the way the surveys are carried out and the level of information of the respondents. The reliability level of the results obtained through interviews depends: 1) on the ability of the interview to simulate similar conditions to shoe that occur in the market, while bearing in mind of those factors that influence the purchase of a real property in general; 2) on the ability to provide similar information to those generally available in a real market, which sometimes may derive from different sources and be influenced by the role of the intermediaries.

It would be advisable, then, to test how complete initial information, including collegial moments where the respondents may ask for explanations as to different aspects of the real estate industry and discuss with other subjects included in the consumer and producer sample, may affect the WTP and WTA values stated during the survey.

Finally, particular attention should be devoted to the negotiation between the seller and

the purchaser in defining the sale price.

The price of a real property, as repeatedly stated, is the product of a negotiation process between two subjects who often come to an agreement on a price level that is basically a compromise between two initial positions. It would be necessary to detect, though a controlled laboratory experimental test, the dynamics at play between two subjects competing with each other during a mock negotiation, in order to see how to come to the definition of a balance price.

The main contribution research attempted to make to the appraisal discipline is the detection of valuation procedures based on the subjective preferences – as an alternative to the well-established method, in the Italian and international appraisal discipline (based almost exclusively on statistical and mathematical principles) – that allow to operate in uncertain and unstable market conditions, believing that "*It is better to be vaguely right than to be exactly wrong*" (Simon, 1972).

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