

An Evaluation Model for the Optimization of Property Sales in Auction Markets

Francesco Tajani[1](✉), Pierluigi Morano[2], Marco Locurcio[2], Paola Amoruso[3], and Carmelo Maria Torre[2]

[1] Department of Architecture and Design, "Sapienza" University of Rome, 00196 Rome, Italy
francesco.tajani@uniroma1.it
[2] Department of Civil, Environmental, Land, Building Engineering and Chemistry, Polytechnic University of Bari, 70125 Bari, Italy
[3] Department of Economics and Management, LUM University, Casamassima, 70010 Bari, Italy

Abstract. This paper proposes a logical-deductive model for the estimate of forced sale value, in support of individuals involved in real estate auctions. This value is estimated by starting from market value, considering an appropriate discount/premium coefficient which, due to obtainable yields and associated risk, guarantees transaction admissibility for the investor in terms of convenience. The model borrows from Ellwood logic as applied to the real estate sector, integrated through the evaluation approach of investment risk inherent in Real Options Analysis. Applying this model to one hundred and forty cities in which the Italian courts are based allowed for comparison of the discount/premium coefficients determined by the model with those determined by sector operators. The results of this application underlined the speculative behavior of market operators, who mainly focus on obtaining better discounts than those admissible, while at the same time supplying useful indications on the territorial contexts where the difference between hammer price and admissible value can be maximized.

Keywords: Forced sale value · Auction market · Real options analysis · Ellwood · Market value

1 Introduction

The real estate market has undergone widespread global transformations as a result of the Covid 19 pandemic. At the same time, however, the real estate market in the first half of 2020 recorded transactions totalling € 8bn, € 2bn more than the same period in 2019. There has been a net growth in the NPLs market over the past five years, with non performing exposure stock in the H1 – 2020 amounting to € 130bn [25]. The extraordinary conditions [1, 2] that characterize the market for judicial auctions contribute to the formation of a sale price that is generally (and not infrequently it is worth noting) lower than the market value estimated by the technical consultant. In this context, the Consolidated Banking Act [5] and the Circular 285 of the Bank of Italy [3] have specified that the appropriate value basis for the estimate of real estate guarantees

© Springer Nature Switzerland AG 2021
O. Gervasi et al. (Eds.): ICCSA 2021, LNCS 12954, pp. 241–252, 2021.
https://doi.org/10.1007/978-3-030-86979-3_18

is the market value, i.e. "*the estimated amount at which the property would be sold at the valuation date in a transaction carried out between a seller and a buyer who are aware of normal market conditions after adequate commercial promotion, in the context of which both parties have acted in full knowledge of the facts, prudently and without being subject to constraints*".

In principle, the aim of ownership transfer in judicial proceedings is to bring the transfer price as near as possible to market value. Since the elements that characterize the definition of market value in these situations are unlikely to be fully satisfied, the appropriateness of referring to the conditions that influence the methods of transferring the property is evident: the result is accordingly a market value based on assumptions, since ownership transfer of property occurs in conditions which are not fully compliant with the set definition.

Indeed, in the event of a judicial sale, one or more of these conditions provided for by the definition of market value cannot be met, specifically:

- the estimated amount must be determined in accordance with normal market conditions while the case in question necessarily takes into account the fact that it is at times impossible to view the property with due attention by the potential buyer, thereby making it impossible to ascertain the state of the property;
- real estate advertising effectiveness is notably reduced as the auction market presents clear barriers to access;
- the seller/debtor does not appear in a situation in which he or she is consenting, as would be the case under normal market conditions;
- property valuation is carried out by the expert on a date that may be well in advance of that of the property sale or transfer procedure;
- there is a temporal uncertainty in regards to maintaining possession of the property by the debtor;
- the debtor, tenant of the property, for the above, is often an obstacle to the property sale.

It comes as no surprise that in this particular market segment RICS [16, 27] defines a specific value – the forced sale value – specifying that it does not constitute an independent basis of value, but rather a market value in specific situations, determined within the premise of the evaluation report through appropriate special assumptions.

The uncertainty related to the economic discrepancy between market value estimated in the appraisal and final hammer price is a binding issue, affecting as it does the overall timing and efficiency of auction procedures.

In order to reduce procedural time and encourage an increase in adjudication prices, Italian legislation has promoted several relevant initiatives between 2005 and 2018 [22]. The Public Sales Portal (pvp.giustizia.it/pvp) was launched by the Ministry of Justice to favour advertising of sales of the assets and of executive and competitive procedures in general, while similar initiatives have been promoted by private facilitators (www.astegiudiziarie.it, www.asteannunci.it, www.astetelematiche.it, www.astagiudiziaria.com).

Despite these various interventions, statistical surveys show that auctions in Italy continue to lack dynamism and tend to be repeated several times, resulting in a significant reduction in the auction price. Lots up for auction totalled 95,329 during 2020, generating

a total of 117,376 auctions, which means that each lot went to auction on average 1.23 times. In the same year, real estate auctions suffered significantly as a result of the Covid-19 pandemic: the lockdown made property viewing impossible, while blocks on court activity and suspension through to 31/10/2020 of executive procedures relating to the "first house" led to a 40.6% drop in the number of lots on auction and a 53.9% drop in the number of auctions held [26]. This block had highly significant economic repercussions: we need only consider that 30,815 auctions were postponed during the first lockdown for a value of €3 billion 669 million [10].

Geographically speaking, 16.5% of the lots are concentrated in Lombardy, followed by Sicily (9.7%), while the regions of Veneto, Emilia Romagna, Piedmont, Tuscany, Marche and Lazio have percentages varying between 6.5% and 7.7%, and Puglia and Campania account for 5.5% and 5.3% respectively. The other regions account for less than 5%, with Basilicata, Molise and Valle d'Aosta closing off the ranking with percentages of less than 1%.

2 Aim

The years of economic crisis that hit Italian businesses and families have seen an increase in the number and amount of bad loans [2]. Furthermore, the lengthiness of judicial debt recovery procedures can have significant repercussions on the economic and financial system.

The lengthy duration of the judicial credit recovery procedures is one of the factors responsible for the accumulation of impaired loans, which in recent years have affected bank balance sheets. Indeed, the poor performance of the judicial recovery mechanisms, both in terms of timing and values, has had a negative impact on their management. Shortening recovery procedure times is thus essential in order to favour the disposal of stock of non-performing loans, and – in the same context – avoid the possible negative repercussions of introducing in prudential regulation the concept of calendar provisioning (i.e. the practice of progressively writing off impaired loans over time, regardless of recovery expectations) [4].

This study fits into the framework outlined, aimed as it is at the definition and experimentation of a logical-deductive model for the estimate of forced sale value, determined by starting from market value and, based on the risks of the context under analysis, applying an appropriate reduction (or incremental) coefficient. When implemented in the one hundred and forty cities where the Italian courts are based, this model made comparison possible between the discount/premium coefficient determined by the model and that detected by operators in the sector. With regards to auction procedures, the model allows us to determine the price of the property to be sold which, due to obtainable yields and transaction risks, is admissible for the investor in terms of convenience. The basic assumption here is that the price at which the property will be sold depends *i)* on sales times characterizing the procedure, and *ii)* on the risk inherent in an auction market.

This study is structured as follows. Section 3 describes the proposed model. Section 4 develops an application to the Italian context, comparing the discount/premium coefficients obtained with those found both on a regional basis and in nine Italian cities. Finally, conclusions of the study are drawn, envisaging possible future developments of the research.

3 The Model

Starting from the premise that defining forced sale value starts from market value, by borrowing concepts of financial mathematics, we are able to determine the former (V_{fs}) by means of an appropriate "discount" of the latter (V_m), taking into consideration that the value of the forced sale will take place after a time n (>0), which is the time span between completion of the appraisal and sale of the property. In specific terms, the estimated discount coefficient (i) will constitute a proxy of the risk inherent in the forced sale mechanism.

Translated into formulas, since the market value estimate is carried out at a time "t" while the sale will take place at a time "$t + n$", we can state that:

$$V_{fs} = \frac{V_m}{(1+i)^n} \tag{1}$$

In order to determine the discount rate i, the model we propose uses Ellwood financial balance [6, 9, 12, 14], simplifying its implementation by introducing suitable hypotheses. Specifically, the proposed model incorporates a number of logical principles underlying the methodology developed by Manganelli et al. [20] to estimate the capitalization rate in the income approach, reworking the algorithm in the present case, as related to determination of the discount coefficient for the estimate of forced sale value.

On the basis of these assumptions, Ellwood's financial statements for real estate investment following an auction sale can be written up as in Eq. (2) below, which, at the first term, indicates revenues deriving from the investment, consisting *i)* of the financial sum of constant and deferred annual market rents (R), accrued between the year of the sale (n) and the 'exit time, i.e., the moment in which "it is convenient" to dispose of the investment (m), and discounted at the time of the valuation (year zero), and *ii)* by the allotment price (V_{fs}) revalued/devalued with the coefficient i' for the $m - n$ years of possession. The discounting of items at the first term is carried out using an appropriate rate (i''). The second term is determined by initial investment costs (C), which include the award price of the property, costs associated with the transfer of ownership and due diligence.

$$\frac{R}{(1+i'')^n} \cdot \left[\frac{(1+i'')^{m-n} - 1}{i'' \cdot (1+i'')^{m-n}} \right] + V_{fs} \cdot \frac{(1+i')^{m-n}}{(1+i'')^{m-n}} = C \tag{2}$$

Recalling Eq. (1), if we assume that costs for property purchase amount to 10% of the sale price and transferring the costs to the first term, we obtain Eq. (3):

$$\frac{R}{(1+i'')^n} \cdot \left[\frac{(1+i'')^{m-n} - 1}{i'' \cdot (1+i'')^{m-n}} \right] + \frac{V_m}{(1+i)^n} \cdot \frac{(1+i')^{m-n}}{(1+i'')^{m-n}} - 1.10 \cdot \frac{V_m}{(1+i)^n} = 0 \tag{3}$$

Note that, although they could coincide in value, the discount rate i'' and the discount rate i (the unknown of the model), are conceptually different parameters in terms of risk. The former is in fact related to factors [8] that refer to the yield of a real estate investment in the period of "full and free" availability – context risk (city rank, suitability of the

location for the intended use, real estate market trends, etc.), property risk (size, building and maintenance type/quality of the property, fungibility, etc.) and tenant risk (number of current/potential tenants, vacancy, solvency, etc.). The discount rate i, on the other hand, is closely connected to risk factors pertaining to a specific condition, such as that of the auction, in which the probable temporal distance (n) between the moment of property evaluation and that of sale requires analysis of the benefits generated by the possible evolution of the reference market and thus of the tolerable discount for the purposes of financial sustainability of the transaction.

For the estimate of exit time (m), needed for implementation of Eq. (3), investment risk analysis is borrowed as the first step in the Real Options Analysis (ROA). ROA is an investment evaluation technique used to manage the uncertainty related to possible scenario evolutions [23] and to assign a value to the various project solutions, referred to as options [7, 24].

Volatility (σ) – a fundamental parameter for ROA risk analysis – is determined by considering the change in revaluation/devaluation rates of the half-yearly quotations published by the Real Estate Market Observatory (OMI) of the Revenue Agency for the macrozone, the city and the intended use analyzed [29], and by using the exponentially-weighted moving average (EWMA) method [18, 19, 28, 30]. Once volatility has been obtained, the tree of scenarios can be constructed based on the binomial approach, considering as the evolutionary variable the change in the present value of cash flows of the investment (Y), equal to the total of discounted rents received in the period of possession of the property ($m - n$) and any real estate revaluation/devaluation expected from the investment. Since i constitutes the unknown of the problem, it is hypothesized, for the sole purpose of constructing the evolutionary trend of the value Y, that the discount rate i coincides with the discount rate i''. This condition leads us to Eq. (4).

$$Y = R \cdot \left[\frac{\left(1 + i''\right)^{m-n} - 1}{i'' \cdot (1 + i'')^{m}} \right] + V_m \cdot \frac{\left(1 + i'\right)^{m-n} - 1}{(1 + i'')^{m}} \tag{4}$$

With the exception of exit time (m), all the parameters in Eq. (4) are assumed to be known. On this condition it is demonstrable that, since the sale will be carried out in the year in which this option is economically at its most convenient, there is a unique relationship between investment value volatility (σ) and exit time (m) [21].

In particular, the model we have developed sees the ideal exit time for the investor (m) as estimated by means of a function of maximization of the evolution of the present value of investment cash flows, taking into account the most pessimistic situation (i.e. $d = e^{-\sigma}$, according to the binomial formulation of the ROA). Accordingly, by using h to indicate the h-th year of evolution of cash flows values ($h > n$), Eq. (5) may be stated as:

$$m = \max\left(d^h \cdot Y\right) \tag{5}$$

Furthermore, as volatility increases, the ideal exit time for the investor decreases: as risk increases, it is worth holding onto the investment for fewer years.

Table 1 shows the equations of the proposed model for estimating the discount/premium coefficient (Δ).

Table 1. Model.

$i = \sqrt[n]{V_m \cdot \left[1.10 - \frac{(1+i')^{m-n}}{(1+i'')^{m-n}}\right] \cdot \frac{i''\cdot(1+i'')^m}{R\cdot\left[(1+i'')^{m-n}-1\right]}} - 1$	Discount rate (variable model)
$Y = R \cdot \left[\frac{(1+i'')^{m-n}-1}{i''\cdot(1+i'')^m}\right] + V_m \cdot \frac{(1+i')^{m-n}-1}{(1+i'')^m}$	Present value of investment cash flows (rents + capital gains)
$d = e^{-\sigma}$	Pessimistic evolution coefficient of investment value
$m = max\left(d^h \cdot Y\right) \quad h > n$	Ideal investor exit time
$\Delta = \frac{1}{(1+i)^n}$	Discount/premium coefficient for determining forced sales value

4 Application of the Model

The validity of the proposed model was tested by applying it to the Italian context, allowing us to determine the regional average discount coefficients along with those related to nine large Italian cities.

In particular, implementation takes into account sales times (n) – from delivery of the appraisal by the technical consultant to awarding of the asset in the auction phase – as recorded for the one hundred and forty Italian courts in 2019.

With n obtained for each court, the data necessary for implementation of the model was acquired by starting from the OMI quotations published by the Revenue Agency, with reference to residential destination and "central" (OMI band "B"), "semi-central" (OMI band "C") and "peripheral" (OMI band "D") macro-areas. The analysis was carried out on the one hundred and forty cities in which the courts are based.

Annual market rent (R) and market value (V_m) are relative to average OMI prices at the second half of 2019 for city, band and destination under consideration.

The discount rate (i'') is set as equal to the average OMI capitalization rate at the second half of 2019, or the ratio between annual market rent (R) and market value (V_m).

The revaluation rate i' is set as equal to the average of the historical series of revaluation/devaluation rates of purchase and sale prices processed by the OMI during the final three years under analysis (period I semester 2017 – II semester 2019).

Our reference period (T) for estimating volatility (σ) of the historical series of changes in revaluation/devaluation rates of real estate prices runs from the first half of 2005 to the second half of 2019, i.e., the period in which the Revenue Agency made economic data needed for application of the proposed model available.

Results obtained from the application of the developed model were compared to those found by the Immobiliare.it Research Department [15].

The model supplies an average discount coefficient of 36% on the regional level (see Fig. 1), with maximum and minimum values set respectively at 46% (Sicily) and 23% (Trentino Alto Adige and Valle d'Aosta). The area of Italy in which the highest percentage of discounts are expected is Central Italy (41%) followed by the Islands

(37%) and Southern Italy (35%); minor, although significant, discounts are expected to appear in Northern Italy (30%).

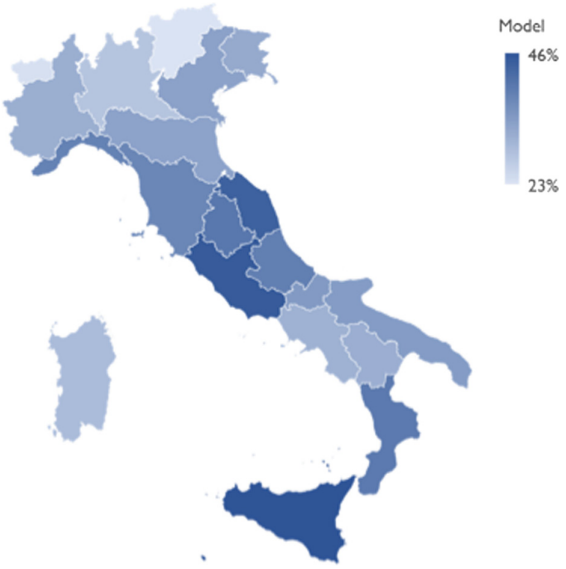

Fig. 1. Regional average of discount coefficient obtained from implementation of the model

Examining the data found (see Fig. 2), we see that Veneto and Trentino-Alto Adige compete for the podium with a detected discount of 61%, while Marche's 33% detected discount closes the ranking. North-East Italy offered the largest discounts (57%) followed by the North-West (50%), South Italy (49%) and Central Italy (57%), closing off with the Islands (44%).

By simultaneously analyzing the discount/premium coefficients of the model and those found (see Fig. 3), we observed that the discount detected is nearly always larger when compared to the model, thus indicating that buyers of residential property through the auction mechanism expect an "extra discount" compared to that deriving from analysis of the financial statement described above. The Marche and Sicily are the only regions in which the discount of the model is higher than the one recorded. In the case of the Marche, this unique position is most likely linked to the expectation of a real estate market revival supported by a widespread productive fabric and high savings for families, while in Sicily, on the other hand, the difference between model and recorded discounts is negligible at 5%. The regions where the model performs best, with resulting differences in discounts of less than 10%, are Lazio, Umbria, Puglia, Abruzzo, Calabria and Molise; in contrast, regions showing a difference between discounts of more than 25% are Veneto, Trentino Alto Adige, Lombardy, Campania and Basilicata.

Similar considerations emerge if nine Italian cities are compared (see Fig. 4) in terms of the discount coefficient elaborated by the model and that detected: in all cases except Palermo the model elaborates a higher discount coefficient than that found, with variations ranging from 8% in Rome to 42% in Torino.

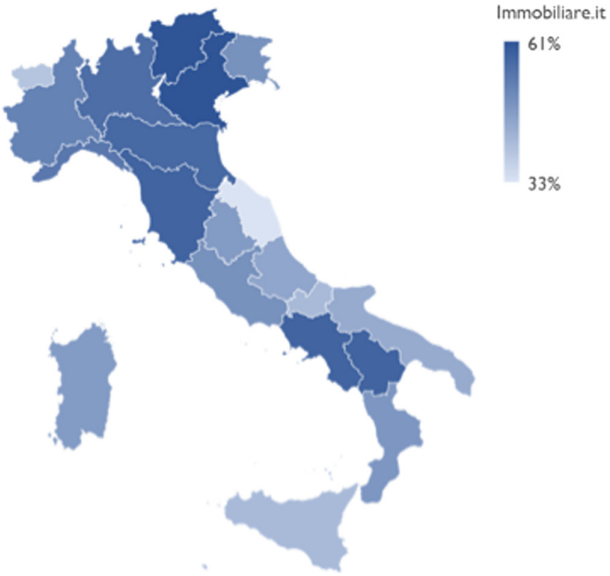

Fig. 2. Regional average of discount coefficient recorded by Immobiliare.it

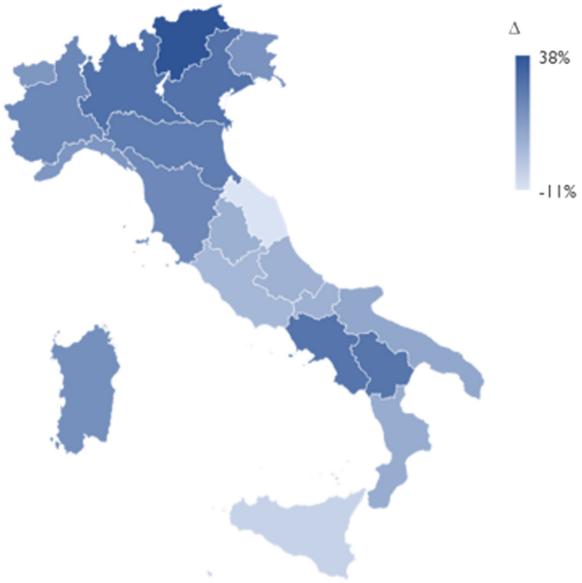

Fig. 3. Regional difference between discount coefficient detected and that elaborated by the model

These differences are most likely due to a different mindset of buyers in relation to specific contexts: a buyer could thus also "settle" for lower discounts in the regions of Northern Italy or in the main Italian cities, where the real estate market is more dynamic

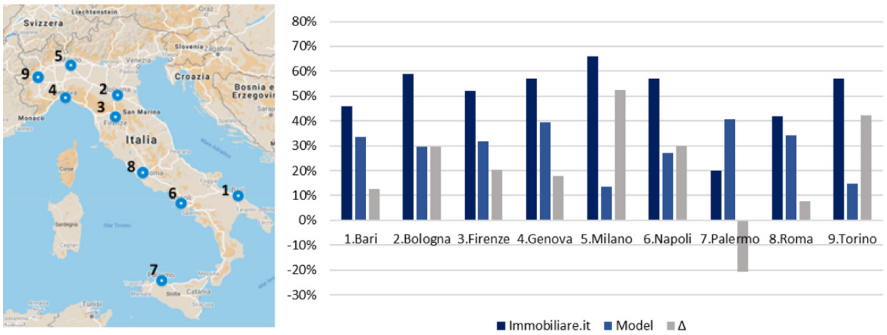

Fig. 4. Comparison for nine Italian cities between discount coefficient detected and that elaborated by the model

and operators do not perceive a decrease in risk, aiming in any case for more sizeable discounts for high discounts due to the uncertainties associated with auction procedures.

This comparison is especially useful in attempting to identify territorial contexts in which the difference between the discount coefficient detected and the admissible discount can be maximized, i.e. Italian regions and cities where it is more convenient to purchase property through auction procedures. Specifically, there are recognized and admissible discounts of 61% and 23% respectively in Trentino Alto Adige, assuring a difference between the detected and admissible discount of 38%. However, this figure is in direct contrast to a relatively small number of lots at auction (1.20% of the national total). Matching the number of lots at auction with the difference between detected and admissible discounts indicates that the most attractive region for a hypothetical investor is Lombardy, followed by Veneto and Campania. Moving on to analysis of the main Italian cities, Milan, the capital of Lombardy, is the city that displays the greatest difference between detected and the admissible discounts, confirming what has already been found on the regional level.

5 Conclusions

A recent report by the International Monetary Fund highlighted that the slowness and excessive bureaucratization of the Italian judicial system are among the main causes of investment reticence by foreign companies (www.esteri.it). This supports the findings of the World Bank Doing Business – Enforcing Contracts 2016, based on parameters of the global duration of enforcement proceedings, real costs incurred by the creditor compared to the amount of credit claimed and the quality of the judicial system in the process as a whole. The attractiveness of Italy is impacted negatively by this, since the lengthiness of the procedures results in:

– increased costs of both funding and risk for credit institutions [17] caused by the closely connected need for higher levels of capital endowment;
– competitive disadvantage of credit institutions when compared to their counterparts in other countries;

– lower levels of support for the economy from the credit system caused by lower and more expensive loans that the former is able to provide;
– a reduced inclination of companies to invest, linked to the higher investment rates which are applied to them.

As for expropriation procedures related to bankruptcies and real estate executions, although several attempts have been made in recent years to reduce timing, harmonize procedures in the various courts and ensure greater disclosure transparency, statistical data show that the persistently cumbersome phases continue to affect efficiency. In its 11 October 2017 resolution, the Superior Judiciary Council (CSM) approved "functional guidelines for spreading good practices in the area of real estate executions" [11]. As a means of monitoring the extent of application, the Permanent Observatory for the efficiency of executive procedures and the implementation of "good practices" was put in place at the Seventh Commission. The CSM then promoted drafting of guidelines established on the basis of the best practices in the field of real estate executions, within the context of complex judicial realities, in which they already tested positively. To ensure liquidation of debtor assets and obtain maximum returns, to be allocated to creditors and, residually, to the debtor in the shortest possible time, forced execution for expropriation must necessarily take place according to criteria of efficiency, effectiveness and speed. In this light, the two-year period from 2015 to 2016 witnessed the launching of two legislative measures containing a wide range of measures focused on favoring more effective management of impaired loans. These include:

– interventions to reduce the time of individual and insolvency enforcement procedures (forced expropriation and bankruptcies);
– interventions to encourage the use of management tools for companies in crisis (restructuring agreements and arrangements with creditors);
– introduction of out-of-court credit recovery mechanisms and the creation of infrastructures aimed at supporting operation of procedures and management of impaired loans (the sales portal and the register of enforcement and insolvency procedures and crisis management tools).

With a view to mapping court performance, the CSM Observatory has determined the turnover index yielded by the percentage ratio between the number of cases defined and the amount of cases that have arisen, i.e. the number of extinguished cases every 100 cases forfeited. This index showed a +38.24% efficiency increase in 2018, with a turnover index that rose from a national average of 102 in 2017 to 141 in 2018.

The logical-deductive model developed and tested in this work aims to provide scientific and practical support for the estimate of forced sale value, starting from the market value along with indication of the most appealing territorial contexts for an investor, i.e. where the difference between admissible and recognized discount coefficients is greatest.

The implementation of this model underlines the extent to which uncertainty about the timing and convenience of operations ultimately leads to speculative behavior by operators interested in buying property packages at highly affordable prices compared

to real market values [13], and thus with a discount, compared to appraisal value, which is higher than the discount coefficient returned by the model.

References

1. Agenzia del Territorio: Glossario delle definizioni tecniche in uso nel settore Economico. Immobiliare (2008)
2. Associazione Bancaria Italiana (ABI): Linee guida per la valutazione degli immobili in garanzia delle esposizioni creditizie, gennaio 2018 (2018)
3. Banca d'Italia: Disposizioni di vigilanza per le bance. Circolare n.285 del 17 dicembre 2013 (2013)
4. Banca d'Italia: Le procedure esecutive immobiliari: il funzionamento e gli effetti delle recenti riforme. Questioni di Economia e Finanza, paper 448, luglio 2018 (2018)
5. Banca d'Italia: Testo Unico Bancario. Decreto legislativo 1° settembre 1993, n. 385. Testo unico delle leggi in materia bancaria e creditizia. Versione aggiornata al decreto legislativo 26 ottobre 2020, n. 147 (2020)
6. Born, W., Pyhrr, S.: Real estate valuation: the effect of market and property cycles. J. Real Estate Res. **9**(4), 455–485 (1994)
7. Bulan, L., Mayer, C., Tsuriel, S.C.: Irreversible investment, real options, and competition: evidence from real estate development. J. Urban Econ. **65**, 237–251 (2009)
8. Cacciamani, C.: Il rischio immobiliare: una soluzione di rating dell'investimento immobiliare. EGEA, Milano (2003)
9. Colwell, P.F.: Tweaking the DiPasquale-wheaton model. J. Hous. Econ. **11**(1), 24–39 (2002)
10. Comitato Scientifico dell'Associazione T.S.E.I. – Tavolo di Studio sulle Esecuzioni Italiane: Quarta edizione dello "Studio dei tempi dei tribunali italiani in materia di procedure esecutive individuali", settembre 2020 (2020)
11. Consiglio Superiore della Magistratura (CSM): Buone prassi nel settore delle esecuzioni immobiliari – linee guida. Delibera 11 ottobre 2017 (2017)
12. Del Giudice, V., Passeri, A., De Paola, P., Torrieri, F.: Estimation of risk-return for real estate investments by applying Ellwood's model and real options analysis: an application to the residential real estate market of Naples. Appl. Mech. Mater. **651**, 1570–1575 (2014)
13. Donner, H.: Foreclosures, returns and buyer intention. J. Eur. Real Estate Res. **39**(2), 189–213 (2017)
14. Ellwood, L.W.: Ellwood Tables for Real Estate Appraising and Financing. Ballinger (1970)
15. Immobiliare.it: Osservatorio annuale di Immobiliare.it (2020)
16. International Valuation Standards Council: International Valuation Standards 2020 (2020)
17. Locurcio, M., Tajani, F., Morano, P., Anelli, D.: A multi-criteria decision analysis for the assessment of the real estate credit risks. In: Morano, P., Oppio, A., Rosato, P., Sdino, L., Tajani, F. (eds.) Appraisal and Valuation. GET, pp. 327–337. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-49579-4_22
18. Lowry, C.A., Woodall, W.H., Champ, C.W., Rigdon, S.E.: A multivariate exponentially weighted moving average control chart. Technometrics **34**(1), 46–53 (1992)
19. Lucas, J.M., Saccucci, M.S.: Exponentially weighted moving average control schemes: properties and enhancements. Technometrics **32**(1), 1–12 (1990)
20. Manganelli, B., Morano, P., Tajani, F.: La valutazione del rischio nell'analisi finanziaria di Ellwood per la stima indiretta di immobili urbani. Aestimum **55**, 19–41 (2009)
21. Manganelli, B., Morano, P., Tajani, F.: Risk assessment in estimating the capitalization rate. WSEAS Trans. Bus. Econ. **11**(1), 197–206 (2014)

22. Marcucci, M., Pischedda, A., Profeta, V.: Notes on Financial Stability and Supervision: The Changes of the Italian Insolvency and Foreclosure Regulation Adopted in 2015. Banca D'Italia Eurosistema (2015)
23. Miller, K.D., Waller, H.G.: Scenarios, real options and integrated risk management. Long Range Plan. **36**(1), 93–107 (2003)
24. Morano, P., Tajani, F., Manganelli, B.: An application of real option analysis for the assessment of operative flexibility in the urban redevelopment. WSEAS Trans. Bus. Econ. **11**(1), 476–487 (2014)
25. PWC: The Italian NPL market, December 2020 (2020)
26. Reviva: Scenario aste immobiliari (2020)
27. RICS: RICS Valuation – Professional Standards, London, UK (2019)
28. Tajani, F., Morano, P., Salvo, F., De Ruggiero, M.: An evaluation model for an effective risk assessment in the rent to buy property market. Prop. Manag. **38**(1), 124–141 (2019)
29. Tajani, F., Morano, P.: An empirical-deductive model for the assessment of the mortgage lending value of properties as securities for credit exposures. J. Eur. Real Estate Res. **11**(1), 44–70 (2018)
30. Winters, P.R.: Forecasting sales by exponentially weighted moving averages. Manage. Sci. **6**(3), 324–342 (1960)