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The Mortgage Lending Value (MLV): proposal for a new calculation procedure

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Abstract. The mortgage lending value (MLV) is a type of value different from the market value (MV). The MLV appraisal is normally required in loans secured by real estate (collateral) context. In Italy, this appraisal is often made in percentage terms or with subjective criteria that do not consider the reference principles also defined by the valuation standards. This paper, starting from the analysis of the German procedure to appraise the MLV, which is the first country to introduce the concept of a security value in the context of property valuations, aims to propose a more precise procedure than the German one by adopting calculation methodologies typical of the income approach which are based on the principles derived from the definition of mortgage lending value and from market trends. The case is made that the proposed methodology and calculation procedure provide a more objective method to appraise the MLV compared to the current ones, in accordance with both national and international valuation standards, and that it represents a useful tool in the professional field.

Keywords: market value, mortgage lending value, market income, income approach, international valuation standards.
JEL codes: G21, D46, R31.

1. INTRODUCTION

Banks and financial institutions are faced with the possibility that adverse events could lead to significant losses every day. This situation is known as "prudential risk". Financial regulation and supervision are important tools for ensuring that financial institutions manage prudential risk in a way that keeps the overall financial system stable. In this regard, central banks, and supervisory agencies, conduct a meticulous surveillance of financial institutions to ensure that they effectively manage prudential risk. This supervision includes keeping rules and regulations, such as Basel standards, which set minimum capital requirements that banks must meet to manage

risk. In this regard, the European Court of Auditors (ECA, 2023) recently wrote a document known as: *Special report 12/2023: EU supervision of banks' credit risk – The ECB stepped up its efforts, but more is needed to increase assurance that credit risk is properly managed and covered*, in which stated that the credit risk assessments conducted by the European Central Bank are of high quality; however, it is observed that banking supervision fails effectively to utilize the available tools to ensure sound management and coverage of such risk.

The assessment of the collateral value is one of the tools for prudential risk management by financial institutions. Financial regulators closely monitor this issue to ensure that financial institutions are properly managing the prudential risk associated with collateral assets. Following the Basel agreements on the regulation of the banking system, European legislation has addressed the problem of mortgage guarantees and the associated risks of Non-Performing Loans (NPLs) in the event of debtor insolvency, starting from the indications contained in European Parliament Directive n. 2006/48/EC of 14 June 2006 subsequently replaced by 2013/36/EU.

In this context, it is imperative to address the issue of accurate appraisal of real estate for loan provision and the corresponding quantification of risks, with the objective of overseeing the soundness of credit institutions. The main European bodies responsible for the standards reworking in the field of property assessments to meet the stated needs, have had to consider the dictates expressed by European legislation on real estate valuations aimed at granting credit by integrating them into their doctrinal corpus and framing them in accordance with the principles of valuation and standard valuation methodologies already consolidated. The integration process seeks to advance the concept of mortgage lending value (MLV), which is a distinct value from the market value but closely tied to it. This value is determined specifically when appraising a property for the purpose of using it as collateral for a mortgage loan. The Italian Banking Association (IBA) has studied the subject thoroughly by publishing in 2011 appropriate guidelines with the objective of appraising real estate for the purposes of providing security for credit exposures. In addition, the Italian Unification Authority (UNI) has taken steps to address this matter by establishing a working group. The purpose of this group was to develop a standard and methodology for quantifying the mortgage lending value. However, the group has not yet fully completed this task.

The mortgage lending value (MLV) is not a term universally understood or accepted and a codified and shared methodology to calculate it is still not available, thereby leaving a delicate issue to the competence and individual responsibility of the professional called to perform the calculation. The primary aim of MLV is to determine a value that is sustainable and suitable for evaluating whether a property can serve as secure collateral for a mortgage in the long term.

This paper, starting from the analysis of the MLV calculation method adopted in Germany, which was one of the first country to introduce the concept of a security value in the context of property valuations, tries to provide a solution to this problem proposing a more precise method than the German one by adopting calculation methodologies typical of the income approach.

This paper consists of four sections. In Section 2, a literature review on the subject and the legislative and institutional state of the art is provided. In Section 3, the differences between market value (MV) and mortgage lending value (MLV), together with their notable definitions, are illustrated. Section 4 describes the materials and methods employed in this study. In particular, in Section 4.1, we deliver the procedure structure used in Germany to appraise the MLV in the banking sector, highlighting the principles on which it is based. In Section 4.2, a proposal for a new calculation procedure, based on the German one, is presented and a small practical example is considered. Finally, in Section 5, we present the conclusions drawn from the study.

2. LITERATURE REVIEW

Mortgage valuation is a topic widely discussed in German literature mostly. In particular, Rossler and Langner (2004), Ross and Brachmann (2005), and Sommer and Kroll (2005) have dealt with this topic extensively. Contents and approaches to MV methods are very similar in these publications with national applicability. The study of Adolf (2005) and Metzner (2005) only marginally covers this research area. More specific studies aiming to analyse the MLV were conducted by Werth (1998), Ruchardt (2001), Stocker (2004), and Kierig (2006).

In the Anglo-American journals about property valuation and lending there are several studies regarding MLV (Adair and Hutchison, 2005; Crosby and French, 1999; Joslin; 2005; Serret and Trello, 2004; White and Turner, 1999).

Among other issues, matters related to the valuation quality, the macroeconomic impact, or the exertion of influence of banks on the valuation results are also dealt with, as in Bretten and Wyatt (2001), Crosby et al. (2004), Pitschke (2004), Bienert (2005), and Ciuna et al. (2016). Often, these studies are particularly interesting and relevant within the boundaries of the countries considered.

On a macroeconomic level, in 1994, Renaud worked on questions concerning real estate cycles, property risk, credit crunch, and cause and effect chains within the real estate industry (1995). The findings of Ropeter (1998), Maier (1999), Wüstefeld (2000), and Pfnür and Armonat (2001) related to property risk identification and assessment are of great interest, particularly for German real estate markets. The results of studies made by PriceWaterhouse-Coopers (PWC, 2004), as well as Tsatsaronis & Zhu (2004) or Milleker (2005), concerning the determinants of real estate prices are also significant. Otherwise, the works of Poppensieker (1997) and Jorion (2000) are focussed on risk assessment in general. French and Gabrielli (2006) define risk as the measure of the difference between actual and expected outcomes of the analysis, whereas uncertainty concerns the lack of knowledge and poor or imperfect information about the inputs required in the model. Ferreira et al. (2014) employ an AHP-based methodology in the credit-scoring system employed by one of the major banks in Portugal. Their objective is to propose a methodological framework to adjust trade-offs among the criteria considered and provide decision makers with a more transparent mortgage risk evaluation system. A few years later, the same authors analyse the results from the application of the AHP, Delphi Method, and Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH) during the trade-off readjustments operations during the credit risk were obtained (Ferreira et al., 2016). As for the risk, Locurcio et al. (2021) identify a synthetic risk index through the participatory process, in order to support the restructuring debt operations to benefit smaller banks and small and medium-sized enterprises (SME), by analysing the real estate credit risk.

With reference to aspects of mortgage lending from a bank's point of view and the interaction of European mortgage markets especially, mention must be made of the works of Rode (1993), Rüchard et al. (1993), Steffan and Scholz (1993), Süchting (1995), Rüchard (2001), Paschedag (2002), Low et al. (2003). Gondring and Lorenz (2001) affirm that the MLV must be conceived as an independent value which is not identical to the market value. In this regard, Benvenuti (2013) proposes a calculation criterion for the MLV determination that originates from the financial method application (direct capitalization) by adopting a capitalization rate calculated by means of the debt coverage ratio (DCR). A more recent study by Tajani and Morano (2018) proposes and tests an innovative methodology for assessing MLV, trying to improve and rationalize the appraisal of the percentage reduction to be applied to the market value. Salvo et al. (2022) propose an appraisal model to determine the mortgage lending value in particular cases, such as when the existing buildings provide income during their useful life. In this study some of the indexes introduced are completely original with respect to the current referenced literature.

Generally, international studies show that the relationship between the MV and how the MLV should be calculated is still unclear (Bienert and Brunauer, 2007). European legislation, following the Basel agreements on the regulation of the banking system, on several occasions has addressed the problem of mortgage guarantees and the associated risks of non-performing banks in the event of debtor insolvency, starting from the indications contained in the EU Directive 2006/48/EC (2006) of the European Parliament and Council of 14 June 2006. As a result, the main European organizations responsible for drawing up standards for property valuation had to take account the principles and concepts set forth in European legislation on property valuation, integrating them into their doctrinal corpus and framing them in accordance with the principles of the estimative doctrine and the standard methodologies of evaluation already consolidated.

The European Parliament defines the guidelines to which the international standards adhere: the "White Book" of the IVSC (International Valuation Standard Council), the "Blue Book" of the EVS (European Valuation Standards) of TEGoVA (The European Group of Valuers' Associations) and the Appraisal and Valuation Manual known as "Red Book" of the RICS (Royal Institution of Chartered Surveyors).

The European Mortgage Federation (EMF) states that the MLV cannot be grouped with other valuation approaches based on MV that are taken on a given date; the MLV is estimated to verify if a mortgaged property provides sufficient guarantee to secure a loan over a long period and thus reflects the long-term value of a property.

TEGoVA is the first institution to adopt this definition and integrate it with the EVS. In its European Valuation Standards, TEGoVA defines the MLV as a valuation basis other than MV. This concept is reproduced even in the most recent edition of the 2020 European Valuation Standards (TEGOVA, 2020). The European Banking Authority (EBA) has identified the need to apply the MLV and reach a harmonization of rigorous criteria for the respective valuation (EBA, 2015).

3. MORTGAGE LENDING VALUE (MLV) VS MARKET VALUE (MV)

There are significant differences between the market value (MV) and the mortgage lending value (MLV).

The MLV is defined by the European Valuation Standard (TEGOVA, 2020) as follows: *"The value of immovable property as determined by a prudent assessment of the future marketability of the property taking into account long-term sustainable aspects of the property, the normal and local market conditions, the current use and alternative appropriate uses of the property"*. The above definition is incorporated into Capital Requirements Regulation (EU) No. 575/2013, art. 4 (74).

The International Valuation Standard Council (IVSC) defines the MLV as a non-market value basis in the International Valuation Standards (IVS), highlighting that the MLV *"is a value concept used for property lending purposes, based on the sustainable aspects of the property and restricting the assessment of property value to the permanent economic characteristics of the property and the revenue that any tenant could produce by proper management"* [2]. With this value, they refer to market risks (present market conditions, market cycles, market volatility, stability, liquidity, demographic trend, attractiveness of regional markets, etc.), location risks (suitability of the location for investment, revenues and increases in values, infrastructure, micro-trend of the local economy, etc.), construction-related property risks (physical quality of the property, maintenance requirements, reconstruction costs, etc.), risks related to the tenants and leases, fiscal risks (current tax situation, potential positive or negative changes, etc.), and legal risks (ownership, planning permission, subside, etc.).

The MV definition, also incorporated into Capital Requirements Regulation (EU) No. 575/2013, art. 4 (76), is defined as follows: *"The estimated amount for which the property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion"*. This definition is quite similar to that one given by EVS and IVS.

The most substantial and principal difference between MLV and MV is that the first is intended to be a property value assessment for a long period of time and theoretically obtainable in a sale at any moment during the loan period; instead, the MV is an assessment at a given moment in time (specific valuation date). The MLV is lower than the market value because it does not consider the market fluctuations and settles down to the minimum value that the property may take throughout the terms of a mortgage (Figure 1).

The appraisal of the MLV is crucial for banks to be able to take decisions on the granting of loans and allows to establish if a mortgaged property is able to offer sufficient collateral to cover a long-term loan. On

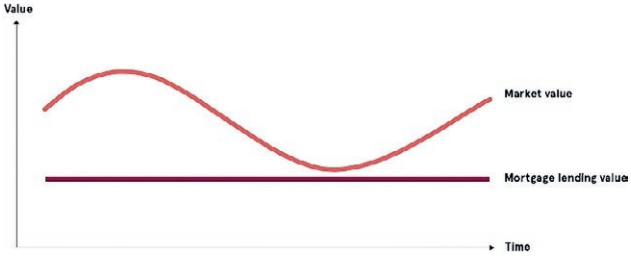

Figure 1. MLV and MV graphs through time.

the basis of this, the appraiser has to seek a value that is safe for the bank over an appropriate period of time. To pursue this goal, it is necessary to consider some fundamental elements such as the future marketability of the property in the long term. It should focus on the property characteristics that have a high degree of sustainability through time, such as the location, the quality of the construction and the context in which it is inserted. The appraiser will have to calculate rental income based on past and present long-term market trends.

Essentially, the MLV appraisal implies the methodological problem of its quantitative measure since it is a risk analysis even before an appraisal judgment; for this reason, it can be classified as a Non-Market-Value.

The methodological procedures used to appraisal the MLV, whether the calculation is performed independently or is derived from the market value, must always consider the following considerations:

- The MLV is a type of value that needs to be determined considering long-term sustainable characteristics of the property and the normal and local market conditions;
- The definition of the mortgage lending value also introduces a notion that can be described as a mitigation of market trends, rents, and capitalisation rates. The sustainability of the mortgage lending value may require adjustments to the actual income of the property, to the discount or capitalisation rate and to the costs of managing the property;
- The MLV cannot be determined through a straightforward percentage reduction of the market value;
- The assumptions used for the appraisal of the MLV must derive from a thorough knowledge of the historical development of the property market and from a critical examination of current conditions and trends, especially in terms of risk;
- The MLV appraisal cannot be based on tabular real estate prices and list prices of companies and brokers;
- In the MLV appraisal, the evaluator must make explicit reference in the valuation report to any guidelines issued by the Bank.

4. MATERIALS AND METHODS

4.1 German method to appraise the MLV

In this paragraph, the MLV calculation methodology used by the German Pfandbrief Banks is presented: this represents the starting point for the definition of the procedure proposed in this paper.

The German procedure is based on the following general principles:

- To determine the mortgage lending value, the future marketability of the property is to be taken as a basis within the scope of a prudent valuation, by considering long-term sustainable characteristics of the property, the normal and local market conditions, the current use, and alternative appropriate uses of the property.
- The determination of sustainable characteristics of the property and their influence on the valuation requires a long-term view of market conditions.
- The period under consideration shall be specified and its appropriateness comprehensibly explained.

Below, we state the key steps of the German procedure:

Step 1: *Determination of the annual gross income of the property*
The determination of the annual gross income of the property takes into account only the income that the property is capable of yielding to any owner on a sustained basis assuming proper management and permissible use. Following this statement, the monthly unit income considered to appraise the MLV is lower than that one used to appraise the market value of a property. The gross income of the property is derived by multiplying the surface area of the property with the monthly unit income, and then multiplying that result by twelve months.

Step 2: *Determination of the net income of the property*
The net income of the property is determined by subtracting the usual operating expenses, which are typically the responsibility of the landlord, from the annual gross income. To accomplish this, factors such as management costs, maintenance expenses, rental income risk, any additional expenses not covered by shared costs, and property-specific modernization risks need to be considered.
Management costs encompass several expenses, including:

- The costs associated with personnel and equipment required for property management.
- Expenses related to accounting, payment transactions, and year-end financial statements.
- Costs incurred for lease agreement administration and handling of damage cases or insurance claims.

Maintenance costs are costs that have to be incurred as a result of wear and tear, age, and weather to preserve the use of the building for its intended use during its useful life. These costs comprise ongoing maintenance and regular repairs of the building, but not its renovation.
Rental income risk is the risk of a reduction of income due to irrecoverable rent arrears or vacant rental space. This risk also encompasses expenses related to legal action for rent collection, lease agreement termination, or eviction.
Running costs are the costs that are incurred on an ongoing basis as a result of ownership of the property or of the designated use of the property as well as of the building and other installations for the purpose specified.
Modernization risks are the costs for the necessary adjustments needed in addition to the maintenance costs to preserve the marketability and to safeguard the basic rent level on a permanent basis. They are to be shown as a percentage of the reconstruction costs.

Step 3: *Calculation of the income of the built area*
The income of the built area is calculated starting from the knowledge of the market value of the land. This value, appraised by multiplying the land surface with its unit price, is then multiplied with the capitalization rate to obtain the income of the built area. The capitalization rate is derived considering a *"sustainable valuation"* in accordance with the general principles stated at the beginning of this paragraph that have to be followed to appraise the MLV. For this reason, the capitalization rate normally used to appraise the market value, in a specific market and for a specific property, is *"softened"*.

Step 4: *Determination of the net income of the building*
The net income of the building is obtained from the net income of the entire property (as calculated in **Step 2**) by subtracting the income of the built area (a**s** calculated in **Step 3**).

Step 5: *Appraisal of the building market value capitalizing the net income with the use of a multiplier* PV_{factor}
The building market value is appraised capitalizing the net income of the building (as calculated in **Step 4**) with the use of a multiplier PV_{factor} based on the remaining useful life of the building and on the capitalization rate. The multiplier PV_{factor} is calculated as:

$$PV_{factor} = \frac{1-(1+r)^{-s}}{r} \quad (1)$$

where s is the remaining useful life and r is the capitalization rate.

The *remaining useful life* represents the period in which the building can still be operated economically assuming proper maintenance and operation. The remaining useful economic life can be appraised for the specific property on the basis of the expected duration the property's assured economic usability.

The *capitalization rate* corresponds to the assumed interest rate at which the sustained net income of a property, achievable in future, is discounted over the period of its assumed payment on the basis of a prudent assessment and based on experience. It must be derived from the relevant regional long-term and use-specific market developments. Different types of use must be considered separately in each case. We specify that the capitalization rate used in **Step 5** is the same rate used in **Step 3**.

Step 6: *Appraisal of the property value*

The last step of the German procedure to appraise the MLV consists in the sum of the building market value (calculated into **Step 5**) and the built area market value. The amount calculated represents the MLV.

In Figure 2, we report a figure in that summarizes the German procedure to appraise the MLV described.

4.2 Methodological structure of the proposed model

The proposed model to appraise the mortgage lending value (MLV) retraces the steps of the German procedure seen in the previous paragraph but which presents substantial reviews concerning the capitalization rate.

The reviews are the following:

1. To appraise the income of the built area and the market value of the building two different capitalization rates are used: a land capitalization rate r_L and a building capitalization rate r_B. This modification comes from the knowledge that the investments concerning the land and the building are substantially different. The land capitalization rate r_L has to reflect a lower investment risk and an unlimited duration compared to the building capitalization rate r_B; on the other hand, the building capitalization rate r_B has to reflect an increased investment risk, a medium to long duration, a potential depreciation, and higher operating costs than the land capitalization rate r_L (Simonotti, 2019).
2. It is considered incorrect *"to soften"* the capitalization rate used in the appraisal procedure of the MLV. Because of the inverse proportionality between value and capitalization rate, by lowering the latter we would obtain a higher market value and so the

Income Value Method - Market Value

Rental Income		
1,779 sq.ft. x $18.50 per sq.ft. x 12 months = rental income per year		$394,938
Equivalent Yield	7.00%	
Multiplier	14.29 PV factor into perpetuity	
394,938 x 14.3 = Income Value		5,643,664
Less: additional purchase costs @ 5.75%		324,511
		5,319,153
Market Value (rounded)		**$5,320,000**

Income Value Method - Mortgage Lending Value

Annual Gross Income based on the incoming rent		
1,779 sq.ft. x **$17.00** per sq.ft. x 12 months = rental income per year		$362,916
Less operating costs (individual evidence)		
Administration	1.0%	
Rick of rent loss	3.0%	
Maintenance / Revitalization	5.0%	
Total	9.0%	
Minimum estimate	**15.0%**	
Less: Ttl. Exp. based on minimum estimate		**54,437**
Total annual net income		308,479
Less: income attributable to the land **950,000** x **6.50%** =		
Net income attributable to the land only		**61,750**
Building income		246,729
Present Value of Building calculation		
Remaining Economic Life	60 years	
Property capitalization rate	**6.50%**	
Multiplier (PV factor)	**15.03**	
Present Value of Building		3,709,063
Plus Land Value		**950,000**
Total Property Value		4,659,063
Less: additional purchase costs @ 5.75%		267,896
		4,391,166
Mortgage Lending Value (rounded)		**$4,390,000**

Figure 2. Summary of the German procedure to appraise the MLV (Source: Verband Deutscher Pfandbriefbanken).

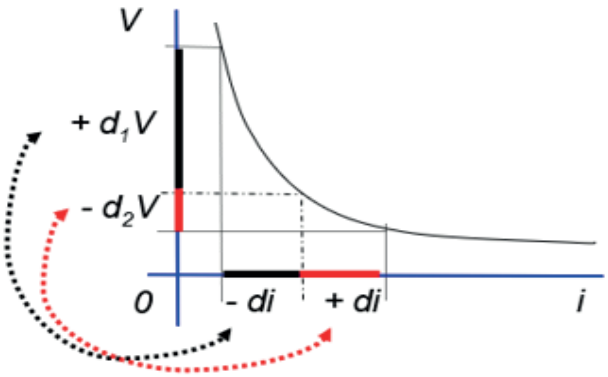

Figure 3. The relation between the market value and the capitalization rate.

rate reduction does not lead to a sustainable value. This represents a contradiction because we know that normally the MLV has to be lower than the MV. The relation between the market value and the capitalization rate is represented in Figure 3.

In order to appraise the MLV, the proposed procedure, is based, on the one hand, on the principles of the income approach appraisal methods and, on the other hand, on the same principles on which the German procedure is based. The latter derive from the definition of mortgage lending value and the market trends. The application of these principles leads to the *"mitigation"* of the input market data involved in the procedure such as the annual net income of the property, the land capitalization rate i_L and the building capitalization rate i_B; the mitigation of the two capitalization rates consists, in the light of what was explained at the beginning of the paragraph, in an increase of the same rates in order to smooth the market value. These operations of mitigation come from the recognition that the mortgage lending value has to focus on the long-term value sustainability in order to provide adequate collaterals for the credit granting. For these reasons, it is necessary to consider the smoothing of the market trends, namely, of the incomes and the rates.

The MLV appraisal method requires in-depth knowledge of the real estate market historical development, especially in terms of risk.

The first step of the MLV procedure consists in the appraisal of the market value MV and the annual net market income MI_N of the property. According to traditional real estate appraisal methods, the market value of a built property can ideally be decomposed into the sum of the land market value (without buildings) and the building market value (Simonotti, 2019; Salvo et al., 2021). Thus, in analytical terms, MV can be expressed as:

$$MV = MV_L + MV_B \tag{2}$$

where MV is the property market value, calculated by adding the land value MV_L to the building value MV_B. This relationship sets a clear separation between the land property and the building property that ideally are supposed to provide separate incomes.

The incidence of the built area c_L is the ratio of the land market value to the property market value:

$$c_L = \frac{MV_L}{MV} \tag{3}$$

According to Equation (3), we can rewrite (2) as follows:

$$MV = c_L \cdot MV + (1 - c_L) \cdot MV \tag{4}$$

Given the annual unit share of the building depreciation q and the building value MV_B, we can calculate the annual share of the building depreciation D_B in this way:

$$D_B = MV_B \cdot q = (1 - c_L) \cdot MV \cdot q \tag{5}$$

The annual unit share of depreciation q is considered constant during the economic life of the residential building and can be obtained as follows:

$$q = \frac{1}{n} \tag{6}$$

where n represents the economic duration of the building. This amount depends on the specific building type of the considered property.

According to the definition of mortgage lending value, the quantity MI_N has to be *mitigated* to consider the smoothing of the market trends. This correction is obtained using a specific coefficient α, determined after having analysed the specific market and the associated risks. The aforementioned coefficient is determined based on reasonable assumption that derives from practitioner's expertise. Once the mitigation coefficient α has been applied to the annual net market income MI_N, we define the annual net market income prudentially adjusted as $MI^{\star}_N = \alpha MI_N$.

By analogy with Equation (2), the annual net market income of the property, namely $MI^{\star}_N$, can be also expressed into the sum of the market income $MI^{\star}_L$ of the built area and the market income $MI^{\star}_B$ of the building:

$$MI^{\star}_N = MI^{\star}_L + MI^{\star}_B \tag{7}$$

The annual net market income of the property is obtained by subtracting the operating expenses – nor-

mally to be covered by the landlord - from the annual gross income. The individual cost items are management costs, maintenance costs, loss of rental income risk, and any other running costs not covered by allocable shares in costs. The costs include a modernization risk specific to the property type. The operating expenses of the property would include expenses for legal and accounting services, insurance, janitorial, supplies, taxes, utilities, etc. They also include principal and interest payments on loans, capital expenditures, and depreciation. According to the Regulation on the Determination of the MLV of Properties in accordance with § 16 pars. 1 and 2 of the Pfandbrief Act, the minimum amount of a deduction of operating expenses must equal at least 15 percent of the gross income (Werth, 2001; Rüchardt, 2001; Stöcker, 2004; Kierig, 2006).

The market income $MI^{\star}$ of the property net of the annual share of the building depreciation D_B is equal to[1]:

$$MI^{\star} = MI^{\star}_N - D_B \tag{8}$$

The market income $MI^{\star}_L$ of the built area is calculated from the market income $MI^{\star}$ of the property on the basis of the incidence of the built area c_L as follows:

$$MI^{\star}_L = c_L \cdot MI^{\star} = c_L \cdot (MI^{\star}_N - D_B) \tag{9}$$

and the market income $MI^{\star}_B$ of the building is obtained by subtracting the market income $MI^{\star}_L$ of the built area from the annual net market income $MI^{\star}$ of the property this way:

$$MI^{\star}_B = MI^{\star}_N - MI^{\star}_L = MI^{\star}_N - c_L \cdot (MI^{\star}_N - D_B) \tag{10}$$

Given the quantities MV_L, $MI^{\star}_L$, MV_B and $MI^{\star}_B$, the land capitalization rate r_L and the building capitalization rate r_B are equal to:

$$r_L = \frac{MI^{*}_L}{MV_L} \tag{11}$$

$$r_B = \frac{MI^{*}_B}{MV_B} \tag{12}$$

We use an additional value β to prudentially increase the capitalization rate of the building and consequently to mitigate the market value of the property. The additional value β, as the coefficient α, is determined based on reasonable assumption that derives from practitioner's expertise. We define $r^{\star}_B = \beta + r_B$.

It is necessary to clarify that the land capitalization rate r_L, in most cases, has not to be increased because its economic value is more sustainable than the building one during the time. The land, in fact, is not subject to the process of progressive loss of economic value caused by physical deterioration and functional obsolescence. If there are some external influences that can affect the land value, we could consider a specific additional value, to be applied to the capitalization rate of the built area, that takes into account these circumstances and so the depreciation due to external obsolescence.

Considering a remaining useful life of the building equal to s years, we can transform the building capitalization rate $r^{\star}_B$ into *GRM* (Gross Rent Multiplier) form:

$$GRM = \frac{1-(1+r^{*}_B)^{-s}}{r^{*}_B} \tag{13}$$

where the remaining useful life of the building are appraised by the professional in relation to the type and to the state of maintenance of the property and considering the years of depreciation.

Finally, the calculation of *MLV* may therefore be rendered as follows:

$$MLV = \frac{MI^{*}_L}{r_L} + MI^{*}_B \cdot GRM \tag{14}$$

This expression formulates the possibility of calculating the MLV by referring to the capitalization rates and the market incomes, adequately mitigated in accordance with the national and international common definitions of MLV, and so, by adopting calculation methodologies typical of the income approach.

To clarify the proposed method to appraise the MLV, we have considered a small example starting from the data collected in Table 1 that represent the input data of the procedure. The example illustrates the MLV appraisal of a residential property.

As described hereinafter, we report the application of the procedure, step by step.

1. *Decomposition of the property market value into the sum of the land market value and the building market value. This process involves the using of the incidence of the built area (c_L).*

$$MV = 0.20 \cdot 200{,}000.00 + (1 - 0.20) \cdot 200{,}000.00 \text{ €} \tag{15}$$

$$MV_L = 0.20 \cdot 200{,}000.00 = 40{,}000.00 \text{ €} \tag{16}$$

$$MV_B = (1 - 0.20) \cdot 200{,}000.00 = 160{,}000.00 \text{ €} \tag{17}$$

[1] The annual share of the building depreciation D_B affects only the built property' part related to the building. To calculate the market income $MI^{\star}_L$ of the built area, it is necessary to separate the annual share of the building depreciation from the annual net market income $MI^{\star}_N$ of the entire property.

Table 1. Input data of the procedure to appraise the MLV.

Data type	Amount
Market value of the property (*MV*)*	200,000.00 €
Annual net market income of the property (*MI*)*	12,000.00 €/*year*
Incidence of the built area (c_L)	0.20
Economic life of the building (n)	100 *years*
Mitigation coefficient (α) *It has to be applied to the annual income of the property*	0.05
Additional value (β) *It has to be added to the building capitalization rate*	0.01

*If these data are not known, it is possible to derive them using the classical procedures in literature.

2. *Determination of the annual share of the building depreciation D_B.*

$$D_B = 160{,}000.00 \cdot 0.01 = 1{,}600.00 \text{ €/year} \quad (18)$$

In Equation (18), the amount 0.01, namely the annual unit share of depreciation q, is obtained knowing that the economic life of the residential building considered n is equal to 100 years.

3. Mitigation of the annual net market income of the property MI_N using the mitigation coefficient (α). The annual net market income prudentially adjusted MI^*_N is obtained as:

$$MI^*_N = 0.05 \cdot 12{,}000.00 = 11{,}400.00 \text{ €/year} \quad (19)$$

4. *Determination of the market income MI* of the property net of the amount D_B.*

$$MI^* = 11{,}400.00 - 1{,}600.00 = 9{,}800.00 \text{ €/year} \quad (20)$$

5. *Determination of the market income MI^*_L of the built area.*

$$MI^*_L = 0.20 \cdot 9{,}800.00 = 1{,}960.00 \text{ €/year} \quad (21)$$

6. *Determination of the market income MI^*_B of the building.*

$$MI^*_B = 11{,}400.00 - 1{,}960.00 = 9{,}440.00 \text{ €/year} \quad (22)$$

7. *Calculation of the land capitalization rate r_L and the building capitalization rate r_B.*

$$r_L = \frac{1{,}960.00}{40{,}000.00} = 0.049 \quad (23)$$

$$r_B = \frac{9{,}440.00}{160{,}000.00} = 0.059 \quad (24)$$

8. *Increase of the building capitalization rate r_B, obtaining the r^*_B, with the use of the additional value β.*

$$r^*_B = 0.01 + 0.059 = 0.069 \quad (25)$$

9. *Transformation of the building capitalization rate r^*_B into GRM (in this example it is considered that the remaining useful life of the building is equal to 60 years).*

$$GRM = \frac{1-(1+0.069)^{-60}}{0.069} = 14.23 \quad (26)$$

10. *Calculation of MLV.*

$$MLV = \frac{1{,}960.00}{0.049} + 9{,}440.00 \cdot 14.23 = 174{,}314.00 \text{ €} \quad (27)$$

5. CONCLUSIONS

The mortgage lending value is a key element of property valuation for lending purposes. It is based on the long-term, sustainable features of the property being mortgaged and excludes speculative elements and fluctuations in value tied to changes in the economy. In Italy, particularly in the professional context, the appraisal of this type of value is often made in percentage terms or with subjective criteria that do not take into consideration the referenced principles also defined by the valuation standards. In the academic field, instead, the procedures developed for the MLV appraisal are often laborious and difficult to apply in professional practice. This study aims to overcome these difficulties, proposing a procedure to appraise the MLV that is easy to apply and reflects the valuation standards. The German procedure to appraise the MLV distinguishes itself for its easy application. It takes due account of the subdivision of the property into its components, the land, and the building and, in applying the income capitalization method; it realistically considers the residual maturity of the building's structure instead of an unlimited period as is the case for the land. The procedure proposed in this paper starts from the German model but takes a step forward by considering two different capitalization rates, a land capitalization rate r_L and a building capitalization rate r_B. By doing so, the procedure recognizes that the investments concerning the land and the building are substantially different in consideration of the different risks associated with each of them, respectively.

Future insights of this work, in order to make strong the proposed procedure, could concern the development

of a methodology useful to calculate the mitigation coefficient α and the additional value β. This goal could be pursued, collecting data from different market areas, and using it in an econometric model.

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