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Tesi di Laurea

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The Collateral Value in LGD Computation

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Anno Accademico
2012 / 2013

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List of abbreviations

ABI	Italian Bank Association
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
CCCB	Counter Cyclical Capital Buffer
CLTV	Current Loan-To-Value
CRC	Credit Risk Capital
DCF	Discounted Cash Flow
EAD	Exposure At Default
HQLA	High Quality Liquid Assets
ICAAP	International Capital Adequacy Assessment Process
IRB	Internal Rating Based
IVS	International Valuation Standards
LCR	Liquidity Coverage Ratio
LGD	Loss Given Default
LTV	Loan-To-Value
M	Maturity
MCA	Market Comparison Approach
NSFR	Net Stable Funding Ratio
PD	Probability of Default
RDS	Reference Dataset
RMBS	Residential Mortgage Backed Securities
RWA	Risk Weighted Assets
SREP	Supervisory Review and Evaluation Process
TEGoVA	The European Group of Valuers' Associations
VaR	Value at Risk

Introduction

A recent judgement of the Court of Venice underlines the importance of the valuation method used when estimating the value of a real estate collateral. According to the judgement pronounced by the Court, the relevant value to assign to the real estate collateral has to be the so-called mortgage lending value (MLV) and not the simple market value. The MLV was defined and adopted first by German mortgage banks during the 90's; the application of such value comes from the awareness of the limits of assigning the (historic) market value to the real estate collateral.

Market value and mortgage lending value are in fact two different ways to valuate the real estate collateral: on the one hand, the first approach assigns to the collateral the market value detected at loan origination and it therefore doesn't consider possible future changes of the real estate market to which the property belongs; on the other hand, the MLV is a more prudential measure and it is based on the future marketability of the real estate being valued. The MLV therefore aims to be a valid indicator of the value of the property throughout the entire life of the loan.

From the awareness that the financial market is, by its nature, global and, by looking at the link between one of the main causes of the current financial crisis and the real estate market, the assessment of the "real estate risk" should be harmonized as much as possible in order to facilitate the comparison of the risk of financial products secured by real estates located in different states.

Therefore subsequently to the adoption of the concept of MLV, later taken up by the Basel Accords, the banking system and the real estate field are now moving to the more precise concept of "Property and Market rating". A property and market rating system consists of "objective assessments of the relevant factors underlying the sustainable quality, volatility, liquidity and marketability of the subject property on a risk-rated scale".

This change is due to the fact that the current financial crisis is also linked to the incorrect representation of the value (and therefore of the risk) of the real estate collaterals of credit facilities that are secured and then sold, through structured finance instruments, to third parties.

The present work focuses its analysis on the importance the banking system has to give in producing accurate and sustainable valuations of real estate collaterals when computing LGD estimates of each facility.

The first part of the work aims at presenting the Basel regulation: first from its general structure to a more specific focus into credit risk approaches (chapter one), then focusing the analysis into the LGD estimation methods set by Basel II (chapter two).

The second part considers the different real estate valuation approaches developed by the industry: from the "traditional" approaches based on market value and recognised by the regulation (the sales comparison, the income capitalization and the cost approaches explained in chapter three), to the definition of a more stable and prudential real estate valuation (MLV), and to the outlining of a standardised and harmonised real estate rating system.

As a connection between the regulation aspects and the real estate valuation approaches, the third part aims at looking for links between such new concepts of collateral value and the Basel regulation itself.

Chapter 1

The Basel Accords and the approaches on credit risk measurement

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The Basel Accords on banking regulation are the outcome of the *Basel Committee on Banking Supervision* (BCBS) work on banking supervisory matters. The central bank governors of the G-10 countries established the Committee in 1974 and it now counts, among its members, 27 countries. This entity represents a consulting organism within the *Bank for International Settlements* (BIS), whose aim is to strengthen the cooperation among vigilance authorities in order to achieve a better stability in the international banking system.

The Committee does not issue binding regulations: its guidelines, standards and recommendations are issued in expectation that every national authority can promptly implement those policies.

Basel I was the first of the Basel Accords: published in 1988 and implemented by the G-10 countries in 1992, it arranged a set of prudential minimum capital requirements for banks.

However the inadequacy showed by Basel I in adjusting capital requirements with the risks that banks have to face in their activity led to a redraw of the regulation and the consequent drafting of *The New Basel Accord*.

This second set of guidelines, known as Basel II, was published by the Committee at first as a draft document (*The New Basel Capital Accord*) in January 2001 and then as a final document on 26th June 2004 named *International Convergence of Capital Measurement and Capital Standards*.

Through the implementation of the 2006/48/EC and the 2006/49/EC directives, the Bank of Italy introduced those rules in the Italian legal system through the emission of the Circular No. 263 (*New Regulations For the Prudential Supervision of Banks*).

As a result of Basel II improvements on the previous Basel I prudential requirements, this new regulatory framework is structured in three pillars concerning the minimum capital requirements, the supervisory review process and the market discipline.

This set of instructions intended to ensure a more accurate measurement of a wide set of risks and to establish prudential capital requirements that could be better proportioned with the effective level of risk exposure of any financial institution. The "new" regulatory framework also fostered banks to improve their management procedures and risk measurement techniques in order to be able to obtain possible capital savings; finally, while introducing specific duties on information transparency, it also endorsed the importance of the market disciplinary role in the financial system.

1.1 The first pillar of Basel II

The first pillar of Basel II deals with the assignment of an appropriate amount of capital every bank has to maintain in order to face the three major components of risk of a banking activity: credit risk, market risk and operational risk.

The "new" framework maintains both the Basel I definition of total capital and the minimum required percentage (8%) of the bank's capital to the *Risk Weighted Assets* (RWA), however Basel II "*provides a [continuum] of approaches from [basic] to advanced methodologies for the measurement of both credit risk and operational risk in determining capital levels. It provides a flexible structure in which banks, subject to supervisory review, will adopt approaches [that] best fit their level of sophistication and their risk profile*".[1]

Dealing with risk differentiation, term structure effects and risk mitigating techniques, Pillar 1 therefore addressed the main weaknesses of the previous framework; consequently, this leads up to the obsolescence of arbitrage phenomena caused by not elastic capital requirements across different risky portfolios.

1.1.1 Credit risk capital

Related with the typical bank activity, the credit risk component represents an essential part of the minimum capital requirements and for this reason Basel II paid special attention to its regulation.

[1] Bank for International Settlements, Secretariat of Basel Committee on Banking Supervision, *The New Basel Accord: an explanatory note*, January 2001. p.2

Credit risk can be defined as "*the risk of loss of principal or loss of a financial reward stemming from a borrower's failure to repay a loan or otherwise meet a contractual obligation*"[2].

Basel II, as it will be shown more in details below, determines two different methods to calculate capital requirements for credit risk and, in particular, to estimate risk weighted assets (RWA):

- The Standardised approach;
- The Internal Rating Based approach (IRB).

Briefly, with the standardised approach, RWA are obtained by adopting different risk weights strictly set by the vigilance authorities; credit risk capital (CRC) is thus equal to:

$$CRC = 8\% \sum_{s} RWA_s$$

With the IRB approach, RWA are expressed as a function of variables describing the exposure (and thus the debtor) riskiness: the probability of default (PD), the loss given default (LGD), the exposure at default (EAD) and the exposure's maturity (M). This approach is divided in:

- Foundation IRB: in which the bank provides own estimates of PD for the assets in its credit risk portfolio leaving other variables (LGD, EAD and M) being set by Basel II as follows:
  - LGD= 0.45 for senior exposures and 0.75 for subordinated exposures;
  - M= 2.5 years;

[2] http://www.investopedia.com/terms/c/creditrisk.asp Accessed on 26th July 2013

- EAD= current exposure + 75% of agreed (but undrawn) facilities.

- Advanced IRB: with this approach, banks that not only meet the minimum requirements to use an IRB approach, but also that "meet the incremental minimum requirements for these risk factors [LGD and EAD]"[3], can provide own estimates of all the above parameters PD, LGD, EAD (including off-balance sheet positions) and M.

CRC under the IRB approach is given by:

$$CRC = 8\%\ CF \sum_{s} RWA_s$$

Where:
CF is a calibration factor (equal to 1.06).

1.1.2 Market risk capital

Regulators distinguish between two types of bank assets:

- Trading book assets: including all assets held for trading purposes and thus marked-to-market daily;
- Banking book assets: including all assets held to maturity at the historic cost.

"*Market and credit risk capital requirements are meant to cover for risks in the trading and banking book respectively*".[4]

[3] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.94
[4] S. Varotto, *Risk Management: An Overview*, 2012, p.11

Among different risk typologies that banks, by constantly maintaining a certain amount of capital, have to protect themselves from, market risk is defined as the risk of losses stemming from negative market price movements:

- Of stocks or stock indexes (Equity Risk);
- Of interest rates (Interest Rate Risk);
- Of foreign exchange rates (Currency Risk);
- Of commodities (Commodity Risk).

Minimum capital requirements for market risk can be computed using:

1. A "building block" method in which Market Risk Capital (MRC) is given by the sum (thus not taking into account diversification effects) of the capitals computed for each risk category:

$$MRC = IRR\ Capital + ER\ Capital + CR\ Capital + COR\ Capital;$$

2. An internal model approach based on VaR (thus considering diversification effects):

$$MRC_t = max\left[VaR_{t-1}, F\frac{\sum_{i=1}^{60} VaR_{t-i}}{60}\right] + SRC_t + IRC_t + STC_t$$

1.1.3 Operational risk capital

Operational risk refers to losses stemming from "*inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk*".[5]

[5] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.149

To calculate minimum capital requirements for this risk typology, regulators consider three different methods:

1. BIA (Basic Indicator Approach): it estimates capital requirement by applying a single regulatory coefficient to the positive annual gross income:

$$K_{BIA} = [\sum(GI_{1\ldots n} * \alpha)]/n;$$[6]

2. TSA (Traditional Standardised Approach): it considers several coefficients differentiated in the strength of bank's business lines;

3. AMA (Advanced Measurement Approach): the amount of capital requirement is calculated by the bank through models based on past operational losses data.

1.2 The second pillar of Basel II

The second pillar of Basel II introduced new guiding principles for the national vigilance authorities, whose powers are not only delimited in verifying that the capital requirements are respected, but they also concern in verifying the implementation, by the banks, of policies and organizational procedures for the measurement of the main risks they have to face.

The Basel Committee introduced, with this second pillar, the supervisory review process, which is the process through which:

[6] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.149

1. Banks determine their own capital requirements and plan eventual future capital adjustments to maintain an adequate level of capitalization;
2. Vigilance authorities verify the adequacy of the very process and effect prudential and prompt adjustments when needed.

This dualism is then divided into two complementary processes named ICAAP (Internal Capital Adequacy Assessment Process) and SREP (Supervisory Review and Evaluation Process). These processes represent the first two principles (of four) of the second pillar of Basel II. The third principle establishes that banks have to operate with a capital cushion (in excess to the minimum regulatory one) in order to face sudden periods of stress. The fourth principle disposes that vigilance authorities must pre-emptively act to avoid banks' capital to fall below the minimum regulatory.

"*The [new framework] stresses the importance of bank management developing an internal capital assessment process and setting targets for capital that are commensurate with the bank's particular risk profile and control environment. Supervisors would be responsible for evaluating how well banks are assessing their capital adequacy needs relative to their risks*".[7]

This pillar is therefore intended to set, along with quantitative rules (pillar 1), an interactive process between banks and supervisors, so that, on the one hand, the specific characteristics and risk profiles of an individual banking group are taken into account, and, on the other hand, it is possible to assess the likely adverse impact of markets and products evolution.

[7] Bank for International Settlements, Basel Committee on Banking Supervision, *The New Basel Capital Accord: An Explanatory Note*, January 2001, p.5

1.3 The third pillar of Basel II

The third pillar moves in the direction of strengthening the market discipline towards banks. The logic pursued in this pillar is to remove those factors that prevent the market disciplinary role by requiring banks to fulfil particularly stringent disclosure criteria. It "*sets out disclosure requirements and recommendations in several areas, including the way a bank calculates its capital adequacy and its risk assessment methods*".[8]

This pillar therefore considers a group of disclosure requirements that can inform all the operators in the market about the risks a bank is exposed on and about its capital adequacy level. This requirement (to be applied to banking groups) sets a mandatory publication of several disclosure tables, containing information about the economic results, the financial structure, the strategy of the risk management, the corporate governance and the accounting policies used by the bank.

The public information thus produced would significantly be increased and improved, and it would therefore be possible to more accurately assess the actual health condition of a bank.

In Italy this pillar is regulated at the "Titolo IV" of the Circular No. 263 of the Bank of Italy; this circular basically implements what disposed by Basel II and establishes the annual publication (along with the financial statements) of a "third pillar document" containing all the 15 disclosure tables required.

[8] Bank for International Settlements, Basel Committee on Banking Supervision, *The New Basel Capital Accord: An Explanatory Note*, January 2001, p.5

1.4 From Basel II to Basel III

With the new Basel III regulation, that has to be implemented within 2015, the Basel Committee stated, once and again, that the three main aims of this further regulatory framework are:

1. To prevent an excessive risk-taking activity by the operators;
2. To make a more solid financial system;
3. To truly establish a uniform financial framework.

The recent financial crisis has represented a hard test bench for Basel regulations: many aspects of the regulatory framework have been called into question.

The renown main weakness of Basel II lies on the fact that those rules proved to be affected by procyclicality effects. Along with accounting standards based on mark-to-market (and fair value)[9], the United States housing bubble effect virulently spread on the real economy without being hindered (and in facts being amplified) by Basel II regulations.

An initial fall in value of an asset class (subprime mortgages and MBS) affected the asset side of banks' balance sheet causing them to devalue their assets following mark-to-market accounting rules. This gradually caused capital erosions resulting in too low capital ratios (well below those ratios set by Basel II). Consequently, banks performed several operations in order to reduce RWA and, at the same time, to raise additional capital; unfortunately, both the expedients provoked a further assets value depression and a drop in the banks stock value, thus launching a negative spiral whose effects are still living matter.

[9] B. Bernanke in a Senate testimony on September 23rd 2008 stated: "[Fair value] accounting rules require banks to value many assets at something close to a very low fire-sale price rather than the hold-to-maturity price. [...] However, this leads to big write-downs and reductions in capital, which in turn forces additional assets sales that send the fire sale price down further, adding to pressure".

Basel III, while addressing procyclicality problems of Basel II through the introduction of a Counter Cyclical Capital Buffer (CCCB)[10] above the minimum requirement, it sets a strengthened capital base by imposing an increased size and quality of both the common equity and the Tier 1 capital.

Table 1.1 Strengthened capital framework: from Basel II to Basel III. Source: Bank for International Settlements, Basel Committee on Banking Supervision, Basel III: towards a safer financial system: Speech by Mr Jaime Caruana, Madrid, 15th September 2010, Annex p.7.

In percentage of risk-weighted assets	Capital requirements							Additional macroprudential overlay	
	Common equity			Tier 1 capital		Total capital		Counter-cyclical buffer	Additional loss-absorbing capacity for SIFIs*
	Minimum	Conservation buffer	Required	Minimum	Required	Minimum	Required	Range	
Basel II	2			4		8			
Memo:	*Equivalent to around 1% for an average international bank under the new definition*			*Equivalent to around 2% for an average international bank under the new definition*					
Basel III New definition and calibration	**4.5**	2.5	**7.0**	6	8.5	**8**	**10.5**	0–2.5	Capital surcharge for SIFIs?

* Modalities to be defined.

With Basel III the minimum total capital requirement remains at the 8% of the RWA, however more than a half of it (4.5%) has to be fulfilled entirely by the Common Equity (composed, basically, by ordinary shares and retained earnings). Similarly, the minimum requirement relative to the Tier 1 capital has been increased from 4% to 6%.

Moreover, banks will also have to maintain a capital conservation buffer at 2.5% consisting in primary quality capital to withstand to future stress periods. The consequences of a failure in complaining this requirement are clear: the more the level of the bank's capital is close to the minimum requirement, the more the bank will be constrained in its dividend pay-out policy until the reconstitution of the capital reserve is reached. This will of course help to

[10] This capital-cushion is set in order to ensure that banks can accumulate capital during a period in which the credit growth compared to the GDP level is particularly high.

ensure that capital remains available to support the activity of the bank during stress periods. Therefore, in normal times, banks will have to maintain a total common equity ratio at 7% (4.5% + 2.5%).

Another criticism moved to Basel II concerned the lack of attention paid to banks' liquidity problems: Basel II rules are in fact focused in building a sort of a capital-cushion in order to face insolvency risk in banks although ignoring liquidity problems and, more generally, the absolute (not risk-weighted) gearing level.
While introducing minimum global standards for funding liquidity, Basel III pays now more attention to liquidity risk. In particular, two new ratios are set:

1. A Stressed Liquidity Coverage Ratio (LCR) is set in order to ensure that banks can have sufficient amount of liquid assets to face a stress period of 30 days. This ratio can therefore be defined as follows:

$$\frac{Liquidity\ Buffer\ (Stock\ of\ HQLA)}{Total\ net\ cash\ outflows\ over\ the\ next\ 30\ calendar\ days} > 100\%$$

   Basel III defines the High Quality Liquid Assets (HQLA) as those assets that are "*liquid in markets during a time of stress and, ideally, [...] central bank eligible*"[11].
   "*The term total net cash outflows is defined as the total expected cash outflows minus total expected cash inflows in the specified stress scenario for the subsequent 30 calendar days*"[12]

2. A Net Stable Funding Ratio (NSFR) is set in order to limit liquidity risk stemming from a maturity mismatch problem. This indicator is based on

[11] Bank for International Settlements, Basel Committee on Banking Supervision, *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools*, January 2013, p.7
[12] Ibidem, p.20

the comparison between the total amount of stable funding (including customer deposits, long-term wholesale funding and equity) and the "less-liquid" components of the asset side. This ratio is therefore defined as follows:

$$\frac{Available\ amount\ of\ stable\ funding}{Illiquid\ components\ of\ the\ asset\ side} > 100\%$$

Where the available amount of stable funding are:

- Tier 1 and Tier 2 capital;
- Over 1 year maturity deposits;
- Stable component of funding.

Moreover, a leverage ratio, defined as the Tier 1 to total exposure ratio and set at a minimum of 3%, will be tested between 2013 and 2017 and will help to avoid excessive accumulation of leverage in the banking system. Total exposure will include on-balance sheet as well as several off-balance sheet positions.

Basel III therefore provides a set of capital requirements and liquidity ratios that will help to increase the resilience of the financial sector during stress periods. Moreover, Basel III provides a greater clarity to the financial sector in terms of regulations: in the current hostile economic and financial environment, uncertainty can in fact be considered the main enemy: removing uncertainty may significantly contribute to the ongoing recovery.

1.5 Credit risk approaches in Basel II

As previously stated, the Basel Accords set 2 approaches to calculate the minimum required capital banks have to maintain against credit risk: the

standardised approach and the internal rating based approach (which is divided in foundation IRB and advanced IRB).

1.5.1 The standardised approach

The standardised approach is the simplest method considered in Basel II; while providing a greater sensitivity to credit risk, it represents an evolution of the previous Basel I procedure. In Basel II's standardised approach, the exposures are partitioned into several exposure classes (or portfolios):

- Sovereigns;
- Non-central government public sector entities (PSEs);
- Multilateral development banks (MDBs);
- Banks;
- Securities firms;
- Corporates;
- Retail claims.

So under the standardised approach, regulatory capital will be 8% of the RWA, and the weights are the following:

Table 1.2 Risk weights in the standardised approach. Source: A. Resti, A. Sironi, *Risk Management and Shareholders' Value in Banking: From Risk Measurement Models to Capital Allocation Policies*, Wiley Finance, 2007, p.594.

	AAA	AAA-	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	Below B-	Unrated	Past-due
Corporates	20%					50%			100%						150%				100 %	150 %
Sovereign entities	0%					20%			50%			100%						150%	100 %	
Banks	20%					50%						100%						150%	50%	
Banks, depending on the country of incorporation	20%					50%			100%									150%	100 %	
Retail	75%																			
Residential real estate mortgages	35%																			100 %
Non-residential real estate mortgages	From 100% to 50%, upon discretion of the national supervisory authorities																			150 %

For those claims on which a rating agency has already assigned a credit rating, the weighting depends on the entity's creditworthiness; whereas for unrated entities, a risk weight of 100% (or 75% for retail claims) is applied.

Moreover, Basel II, while broadening either the number of eligible collaterals and the number of eligible guarantees, also extends the possibility to use risk-mitigating techniques.

Now, focusing on the main topic of this work, when dealing with exposures secured by a (real estate) collateral, banks that choose the standardised approach have to identify two different portfolios named "*claims secured by residential property*" and "*claims secured by commercial real estate*", in which they can include all the exposures secured by real estate collateral as long as the following conditions are fulfilled:

1) "*Minimum requirements for the recognition of real estate collateral:*
   a) *The mortgage or charge shall be enforceable in all jurisdictions which are relevant at the time of the conclusion of the credit agreement, and the mortgage or charge shall be properly filed on a timely basis.*
   b) *The value of the property shall be monitored on a frequent basis and at a minimum once every year for commercial real estate and once every three years for residential real estate. More frequent monitoring shall be carried out where the market is subject to significant changes in conditions. […] The property valuation shall be reviewed by an independent valuer when information indicates that the value of the property may have declined materially relative to general market prices.*
   c) *The types of residential and commercial real estate accepted by the credit institution and its lending policies in this regard shall be clearly documented.*
   d) *The credit institution shall have procedures to monitor that the property taken as protection is adequately insured against damage*".[13]

These requirements, which are reproduced from the 2006/48/EC directive that transposes the new capital requirements into European law in the *Official Journal of the European Union*, are applied to both the portfolios mentioned above, whether or not the collateral is a residential property or a commercial real estate.

The Directive, after requiring independence between the value of the property and the credit quality of the obligor, sets also rules for the valuation of a real estate collateral as follows:

- "*The property shall be valued by an independent valuer at or less than the market value. In those Member States that have laid down rigorous*

[13] European Parliament, Council, *Directive 2006/48/EC of the European Parliament and of the Council of 14 June 2006 relating to the taking up and pursuit of the business of credit institutions,* June 2006, p.133.

criteria for the assessment of the mortgage lending value in statutory or regulatory provisions the property may instead be valued by an independent valuer at or less than the mortgage lending value".[14]

The importance, the definition and the difference between market value and mortgage lending value will be explained in details later, when the real estate valuation methods (and the main issues around them) will be exposed.

Given these requirements, Basel II allows bank to weigh exposures (or part of), fully and completely secured by residential properties, at 35% on the condition that (LTV requirement) the exposure itself does not exceed the 80% of the value of the property.

The directive allows applying these weightings to such exposures as long the property is occupied, intended to be occupied or let by the owner, or the beneficial owner in the case of personal investment companies, without specifying whether the debtor must be an individual or may also be a corporate, thus arising the issue whether or not the 35% risk weight can be applied to exposures secured by mortgages on residential property incurred by corporates.

Anyway, following this requirement, the 35% weighting can be assigned only to the part of the exposure within the 80% of the real estate value, thus assigning the residual value of the exposure to another portfolio depending on the nature of the creditor.

An example can clarify how a retail exposure secured by a residential property can be weighted: let's consider a bank that distributes a loan of €1,100,000 secured by a mortgage on residential property valued €1,250,000. Considering the criteria stated by Basel II the calculations are the following:

$$0{,}8 * €1{,}250{,}000 * 0.35 + 0.2 * €100{,}000 * 0.75 = €425{,}000$$

[14] Ibidem, p.150.

The 0.75 (75%) risk weight is the weighting that has to be applied to a retail exposure (see Table 1.1).
Therefore the capital that the bank has to maintain for this particular exposure is:

$$0.08 * €537,500 = €34,000$$

Moving to commercial real estate collaterals, Basel II states that a risk weight of 50% may be assigned to exposures secured by mortgages on commercial real estate, here again following the LTV condition; the directive indeed states that:

- "*The 50 % risk weight shall be assigned to the part of the loan that does not exceed a limit calculated according to either of the following conditions:*
  a) 50 % of the market value of the property in question;
  b) 50 % of the market value of the property or 60 % of the mortgage lending value, whichever is lower, in those Member States that have laid down rigorous criteria for the assessment of the mortgage lending value in statutory or regulatory provisions."

A 100 % risk weigh shall be assigned to the Part of the loan that exceeds the previous limits."[15]

Using the same numbers of the previous example, let's now consider a loan of €1,100,000 secured by a mortgage on an office valued (market value) €1,250,000. As previously stated, the bank will weigh at 50% the part of the exposure that falls within the 50% of the value of the real estate, i.e. €625,000; the remaining €475,000 will be weighted at 100%. Thus, the weighted exposure will be:

[15] European Parliament, Council, *Directive 2006/48/EC of the European Parliament and of the Council of 14 June 2006 relating to the taking up and pursuit of the business of credit institutions,* June 2006, p.87.

$$€625{,}000 * 0.5 + €475{,}000 = €787{,}500$$

Finally, the capital requirement for this particular exposure will be:

$$€787{,}500 * 0.08 = €63{,}000$$

Given these two numerical examples, it is possible to recognize how differently the same exposure (in terms of amount distributed) can affect more or less, depending on the nature of the collateral, the bank's capital requirement.

1.5.2 The Internal Rating Based approach

With the IRB approach, as previously stated, risk weightings depend on the internal valuations that banks can perform on each debtor. Using this approach, banks have the possibility to assign to the same credit a lower weight than the one given by the standardized approach. This leads to a benefit both for banks that can get savings in terms of regulatory capital, and for the firms themselves that can have an easier access to credit thanks to a likely credit expansion policy of the bank.
With the IRB approach, three main aspects note:

I. The definition of the credit risk components: the risk associated with an exposure is expressed through 4 components:
    a. Probability of Default (PD);
    b. Exposure At Default (EAD);
    c. Loss Given Default (LGD);
    d. Maturity (M).
II. Minimum organizational and quantitative conditions and disclosure

requirements;

III. Risk weights functions, set by the regulators, according to which, risk components are transformed into capital requirements and thus into RWA.

The credit risk components are defined as follows:

- PD, is the probability that a creditor will be unable to meet his/her obligations over a 1 year horizon;
- EAD, is the expected value of the exposure in the event of a default;
- LGD, is "*the percentage of exposure that the bank forecasts that it will be unable to recover*"[16];
- M, is, for each exposure, the average of the payments' maturities weighted for the amount due.

From the credit risk capital formula[17] (as already shown in paragraph 1.1.1) it is possible to notice that RWA are still added, as in Basel I, but here risk weights are function not only of the 4 credit risk components, but also of the assets' correlation (expressed as a function of PD).
Correlation is now taken into account reflecting two simple empirical observations:

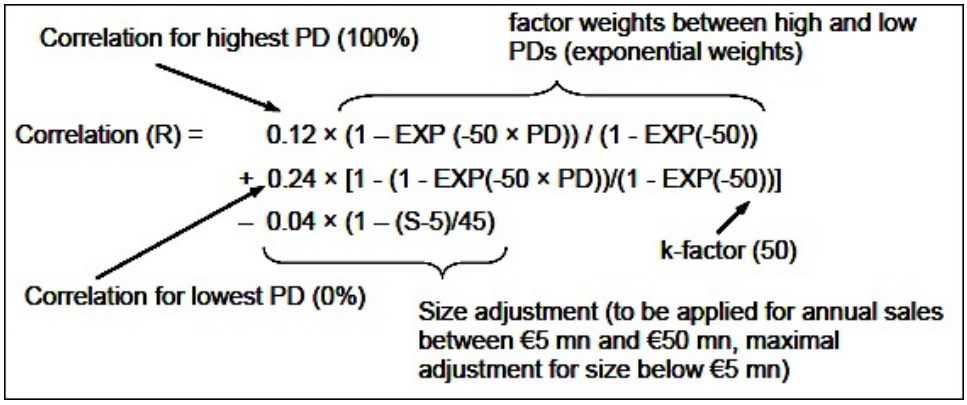
1. Asset correlation decreases as PD_s goes up[18];
2. Asset correlation increases with the firm size.

The asset correlation formula, reproduced from BCBS (2005), exhibits both

[16] A. Resti, A. Sironi, *Risk Management and Shareholders' Value in Banking: From Risk Measurement Models to Capital Allocation Policies*, Wiley Finance, 2007, p.345.
[17] CRC= $0.08 * CF * \sum_s RWA_s$

[18] As proof of that, consider asset correlation formula under the CAPM: $\frac{\beta_u \beta_v \sigma_m^2}{\sigma_u \sigma_v}$, as the PD of u increases, then its volatility increases as well, thus the value of the denominator rises and the correlation of u and v falls.

dependencies.



A shown, asset correlation is set between two bounds: the upper one (24%) is the asset correlation limit for the lowest level of PD (0%), the lower bound (12%) is vice versa the asset correlation limit for the highest level of PD (100%).

The dependence on different PD's levels is then weighted using exponential weights. The "speed" of the exponential function has to reflect the different nature of the counterparty, that's why the so-called "k-factor" is used in order to consider different "paces" of the function for the three different counterparties this equation is built for: sovereign entities, banks and corporates. In the above formula, built for corporate exposures, the k-factor for this counterparty is set at 50.

Asset correlation is then adjusted to firm size using the following linear formula:

$$0.04 * (1 - (S - 5)/45)$$

This adjustment affects borrowers (corporates)[19] with annual sales (S) between €5mn and €50mn.

[19] The size adjustment factor is not applied to banks and sovereign exposures.

Chapter 2

Methods to obtain LGD under advanced IRB

Index

As previously stated, banks eligible to use the advanced IRB approach have to calculate credit risk capital requirement by performing own estimates of the four main variables affecting this risk typology. Banks using this approach thus have to develop methods to estimate these key components.

One of these components, the Loss Given Default, can be considered as the most important one since its variations, in the credit risk capital requirement formula, considerably affect the whole capital requirement: in fact, a 1% increase in its value causes a 1% increase in the credit risk capital requirement. Moreover, its sensitivity and the "*flexibility to determine LGD values tailored to a bank's portfolio will likely be a motivation for a bank to want to move from the foundation to the advanced IRB approach*".[20]

Basel II outlines few minimum requirements banks have to follow when computing LGD; in particular, when dealing with exposure secured by a collateral: "*LGD estimates must be grounded in historical recovery rates and, when applicable, must not solely be based on the collateral's estimated market*

[20] Til Schuermann, *What Do We Know About Loss Given Default?*, January 2004, p.3.

value. […] Banks must establish internal requirements for collateral management, operational procedures, legal certainty and risk management process that are generally consistent with those required for the standardized approach".[21]
The presence of a collateral is not the only one factor affecting LGD value. All factors influencing this variable can be grouped in four main categories:

1. The technical characteristics of the exposure including:
   - The presence of a collateral and its degree of effectiveness;
   - The exposure "condition", in terms of seniority or subordination;
   - The possible presence of guarantees;
   - The recovery contentious, as defined in the contract.
2. The borrower's characteristics:
   - The industry sector in which the borrower operates;
   - The country where the business is located.
3. Bank's internal factors, such as the soundness of recovery procedures;
4. Macroeconomic factors:
   - Current and expected default frequency;
   - Cycle indicators;
   - Industry-specific conditions at the time of default.

Before going through the several approaches by which LGD (and thus recovery rates) can be computed, it is important to clarify the exact meaning of default and loss. The importance of the definition of default lies on its influence in affecting LGD value when considering different meanings of it.
The definition provided by the Basel Committee is the following:

[21] Bank for International Settlements, Basel Committee on Banking Supervision, *The New Basel Capital Accord: An Explanatory Note*, January 2001, p.108.

"*A default is considered to have occurred with regard to a particular obligor when either or both of the two following events have taken place:*

1. *The bank considers that the obligor is unlikely to pay its credit obligations to the banking group in full, without recourse by the bank to actions such as realizing security (if held).*
2. *The obligor is past due more than 90 days on any material credit obligation to the banking group. Overdrafts will be considered as being past due once the customer has breached an advised limit or been advised of a limit smaller than current outstandings*". [22]

Once the definition of default is clear, an essential point is now to define loss by considering it from three sides:

1. The loss of principal;
2. The carrying costs of non-performing loans, e.g. interest income foregone;
3. Workout expenses (collections, legal, etc.).

In the LGD computing phase, LGD can be further defined and classified in two different meanings:

- Ex-ante estimate of LGD: it gives the loss value for a non-defaulted facility expressed as a percentage of EAD. Following this meaning, LGD is thus a random variable and its expected value (ELGD) is therefore an estimate for the expectation of this random variable;
- Ex-post LGD: it gives the loss value (expressed as a percentage of the exposure at time of default) of a defaulted facility. The ELGD relies on information about past losses of similar facilities.

[22] Bank for International Settlements, Basel Committee on Banking Supervision, *The New Basel Capital Accord: An Explanatory Note*, January 2001, pp.104-105.

The objective methods, through which LGD on non-defaulted facilities can be estimated, are classified into explicit and implicit methods:

- The explicit methods work using information on defaulted facilities from a reference data set (RDS). Basically, these methods assign an LGD to non-defaulted facilities through a model using, for example, "the simple mean of the realized LGDs in the RDS"[23];
- Implicit methods compute LGD using risky bond prices and their credit spread (implied market LGD); LGD for retail exposures, computed with an implicit method, can be computed using a measure of total losses and PD estimates. The RDS they use therefore shows non-defaulted facilities and credit spreads instead of realized LGDs.

The Basel II classification of the objective methods to obtain LGD is the following:

Table 2.1 Classification of the objective methods to obtain LGDs. Source: Bank for International Settlements, Basel Committee on Banking Supervision, May 2005, p.62.

Source	Measure	Type of facilities in the RDS		Most applicable to
		Defaulted facilities	Non-defaulted facilities	
Market values	Price differences	Market LGD		Large corporate, sovereigns, banks
	Credit spreads		Implied market LGD	Large corporate, sovereigns, banks
Recovery and cost experience	Discounted cash flows	Workout LGD		Retail, SMEs, large corporate
	Historical total losses and estimated PD	Implied historical LGD		Retail

[23] Bank for International Settlements, Basel Committee on Banking Supervision, *Studies on the Validation of Internal Rating Systems*, May 2005, p.61.

The main difference between these four approaches lies on the assumptions they are built on: market LGD and implied market LGD, by assuming market efficiency of defaulted bonds and of defaultable bonds respectively, they consider the market (this two markets in particular) as a benchmark. Market LGD and workout LGD use a RDS including defaulted facilities and thus they are considered explicit methods; whereas workout LGD and implied historical LGD are implicit methods.

2.1 Market LGD

As previously stated, this approach is based on process analysis of defaulted bonds or marketable loans soon after the default. The idea on which LGD is estimated is based on the definition of recovery rate (1-LGD) on a defaulted instrument as its market value when default is occurred.

Let's consider, for example, a bond that, after a certain period of time from the date of default[24], is traded at 45 cents a euro. Following the definition of recovery, and thus the definition of LGD, in this example, the market is estimating a 45% recovery rate for that bond (hence a 55% of LGD).

Following another bank practice[25], recovery rate can be defined as the discounted prices of settlement securities at the resolution of a default. Given this definition, another approach, named ultimate LGD (similar to the workout LGD method described below) estimates LGD by discounting market values of several settlement instruments.

The following table shows how market LGD is, on average, around 5% greater than the ultimate LGD.

[24] Gupton and Stein (2002) suggest a one-month period, clarifying that the date is not always well defined and it depends on the type of instrument.

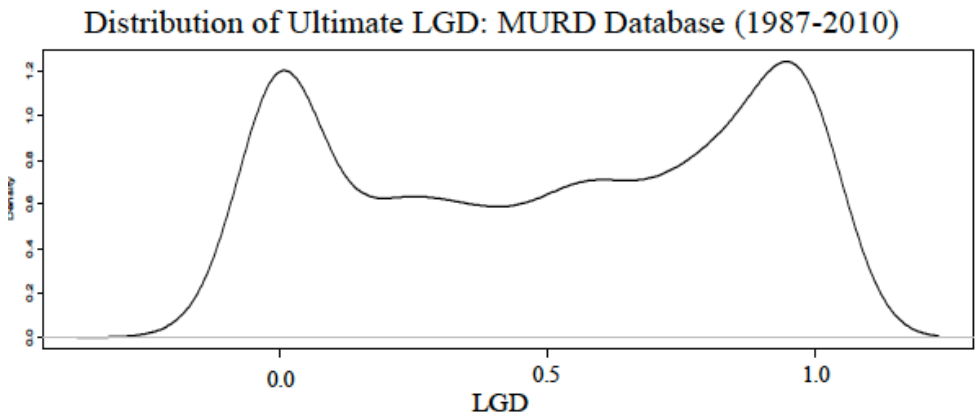
[25] Banks typically receive a cluster of different securities in exchange from a defaulted instrument.

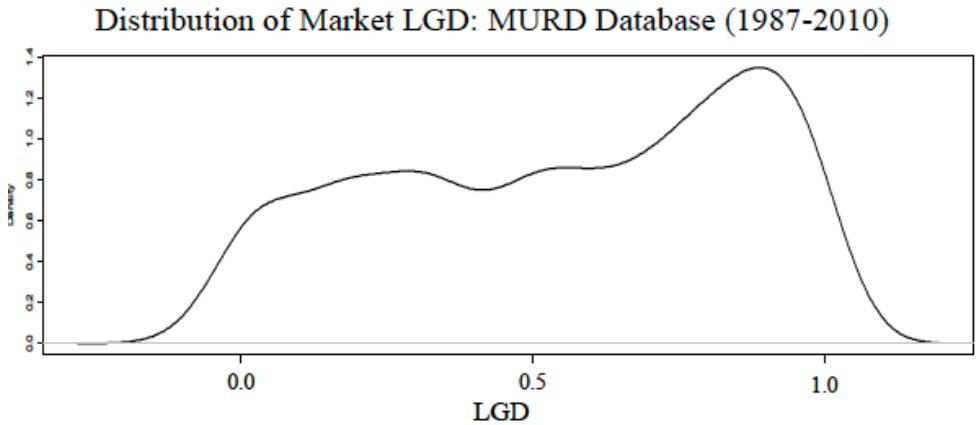
Table 2.2 Discounted Ultimate vs. 30-Day Trading Price LGD for Bonds & Loans (1987-2010). Source: Moody's Ultimate Recovery Database Release August 2010

		Ultimate LGD		**Market LGD**	
Seniority Class	*Cnt*	*Avg.*	*Std Err of the Mean*	*Avg.*	*Std Err of the Mean*
Seniority Bank Loans	458	29.54%	1.50%	35.80%	1.28%
Senior Secured Bonds	166	39.73%	2.47%	48.60%	2.49%
Senior Unsecured Bonds	538	54.08%	1.57%	59.58%	1.25%
Senior Subordinated Bonds	209	75.23%	1.95%	76.02%	1.51%
Subordinated Bonds	137	77.39%	2.32%	76.13%	1.97%
Junior Subordinated Bonds	65	93.53%	1.26%	90.61%	0.94%
Total	*1518*	***50.29%***	*0.95%*	***55.17%***	*0.80%*

The difference between these two approaches can be confirmed by looking at the two different distributions.

Charts 2.1, 2.2 Source: Michael Jacobs, *LGD Quantification*, September 2010, p.19.





As the charts show, the distribution of market LGD has more (less) 100% (0%) LGDs.

Market LGD seems therefore to be a more prudential estimate of LGD and thus might be considered more accurate, however, it is important to underline that market LGD can only be a "*suitable measure for investors who sell their debt immediately after default*"[26]. The main limitation of this approach is therefore related to the restricted number of assets on which the model can perform an accurate LGD estimate. Moreover, its assumption appears to be too weak and subject to the market sentiment.

2.2 Workout LGD

International analyses have highlighted difficulties related to the estimation of the LGD using the previous approach, especially small companies (such as the Italian ones) that can't perform bond financing. The lack of market data that can be considered comparable to loans granted by Italian lending institutions makes them to consider another approach in order to perform an accurate LGD quantification: the workout LGD.

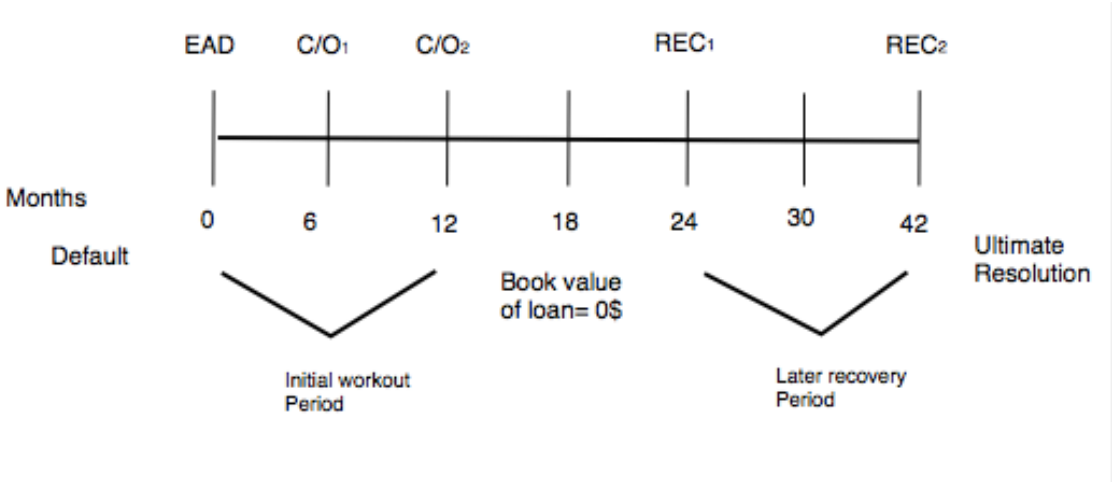
The workout LGD is the second (explicit) model using an RDS of defaulted facilities. This approach is based on the actual recovery rates realized during the months (or sometimes years) gone-by the date of default.

This backward-looking method provides an LGD estimate by discounting all cash flows (positive and negative) the bank occurred from the default date to the ultimate resolution (i.e. the final cash flow realization).

To better understand this method, let's now consider a basic timeline of a typical recovery process.

[26] A. Sironi, *LGD Estimation and Recovery risk*, p.4.

Chart 2.3 Recovery process stylised timeline (Own chart).



$$LGD = \frac{1}{EAD}\left[EAD - \frac{REC_1}{(1+r)^{24}} - \frac{REC_2}{(1+r)^{42}}\right]$$

The formula above contains three important elements the bank needs to know in order to compute the workout LGD:

1. The recoveries' amount (cash or non-cash);
2. The direct and indirect workout costs;
3. The discount rate.

Acknowledged the tricky aspect of the process when computing workout costs (especially indirect costs), the most important problem is related to the choice of the rate at which all the cash flows are discounted. This factor, as explained in Moral-Oroz (2002) is particularly relevant in the computation of LGD: the authors, by performing an empirical study on a mortgage portfolio for a Spanish bank, noticed that choosing a discount rate 1% higher than another one can lead to a 8% increase in the LGD estimate.

Basel II classifies discount rates in two broad groups: current rates and historical rates.

Current rates "*can be either average rates computed at the moment when the loss is being calculated [...] or spot rates plus a spread existing at that moment. The use of current rates allows the consideration of all available information and facilitates the comparison between LGD estimates from different portfolios*".[27]

"*Historical discount rates are fixed for each defaulted facility. All of the cash flows associated with a defaulted facility are discounted using a rate determined at a particular date in the life of the defaulted facility*".[28]
Most used historical discount rates are:

1. The contractual rate.

   With this approach, cash flows occurred during the recovery process are discounted at the contractual rate, set at the beginning of the contract or using the last agreed contractual rate.

   The accuracy of the result obtained with this approach decreases, other conditions being equal, the higher the lag between the date on which the rate has been chosen and the dates (and the payments frequency) of the cash flows occurred during the recovery process.

2. The risk-free rate.

   The problems related to identifying "*a suitable rate for an asset of similar risk at the default date*"[29], as Basel II suggests, can lead to preferring a risk-free rate. The occurrence of a default event makes impossible to predict the amount (and the dates) of the cash flows and causes, as a result, an increase in the volatility (and hence the risk) of those cash flows.

   Therefore even assuming that the risk-free rate represents a correct value when discounting the future cash flows before the default occurs, it is hardly

[27] Bank for International Settlements, Basel Committee on Banking Supervision, *Studies on the Validation of Internal Rating Systems*, May 2005, p.68.
[28] Ibidem.
[29] Ibidem.

possible to assume that the use of this rate is a good choice even when the default occurs and those cash flows lose the characteristic of being certain.

3. The risk-free rate plus a risk premium.

Several studies have been made on this subject: the most important one uses a model with a formulation very close to the CAPM formula. Following this approach, the discount rate can be calculated as follows:

$$r = r_f + \beta(r_m - r_f)$$

Where:

r: Estimated discount rate

r_f: Risk-free rate

r_m: Market index (used as a proxy of portfolio market)

β: Correlated volatility between the estimated rate and the benchmark

This approach is built on the hypothesis that it can be possible to identify an index (r_m) that is representative of the market risk of all debtors included in the LGD estimation. Altman et al. (2002) suggest using, as a proxy of this index, "*a monthly indicator of the market weighted average performance of a sample of defaulted publicly traded bonds*".[30]

Once LGDs are computed, the workout LGD of a non-defaulted exposure has to be estimated. In addition to several complex regression models, one of the simplest (and most used) methods entails the use of the "look-up tables". This method pools historic LGDs with same characteristics and then calculates, for each LGD class, the weighted average LGD and the standard deviation.

[30] Bank for International Settlements, Basel Committee on Banking Supervision, Working Paper n.113, Altman et al., *The link between default and recovery rates: effects on the procyclicality of regulatory capital ratios*, June 2002, p.11.

2.3 Implied market LGD

This method, as the market LGD one, in order to estimate LGD, uses the bonds' market as a benchmark; however this approach, unlike the first one, deals with risky but not yet defaulted bonds' prices.

Following this approach, LGD can be computed looking at the credit spreads of those instruments (e.g. corporates bonds), and it is based on the assumption that the differential (spread) between corporate bonds and risk-free (treasury) bonds can be a good indicator of how the market is pricing the risk (risk premium) of that particular bond and therefore its expected loss (EL). Given the definition of EL[31], it is clear how the credit-spread factor can *implicitly* contain information on the PD and the LGD of the related exposure.

Jarrow, Lando & Turnbull (1997) suggested, in their model, a way to expound the relationship between a risky debt and its capability to incorporate "*a firm's credit rating as an indicator of the likelihood of default*"[32]. Following the authors' thinking: the value of a (risky) loan can be expressed by the following equation:

$$L = L_{rf} * (1 - PD) + L_{rf} * PD * RR$$

Where:

L_{rf}: risk-free loan

$1 - PD$: probability of a non-default

PD: probability of default

RR: recovery rate

Implied market models differ only in the statistic modeling of the parameters of the above equation and different interpretations of the recovery rate.

Given the qualities of a market implied LGD approach, as the large amount of available data and the observable parameters involved, some issues undermine

[31] $EL = PD * LGD$.

[32] Jarrow, R. A., Lando, D. & Turnbull, S., *A Markov Model For the Term Structure of Credit Risk Spreads*, Review of Financial Studies 10 (2), 1997, p.481

its effectiveness: is the market (used as a benchmark) sufficiently liquid? Are its instruments (bonds) sufficiently representative of bank internal exposures?

2.4 Implied historical LGD

The implied historical LGD is an implicit method to derive the LGD of retail exposures. This approach is based on historical losses and PD estimates, not anymore of the single exposures, but of the entire retail portfolio.
Considering the formula to derive the expected loss El, LGD can be expressed as follows:

$$EL = EAD * PD * LGD$$

i.e.

$$LGD = \frac{EL}{EAD * PD}$$

Now, taking into account that the bank retail portfolio considered here includes both defaulted assets and non-defaulted assets, EL can be calculated as follows[33]:

$$EL = \sum_{i=1}^{D} \left[EAD_i - \left(\sum_{j=1}^{J_i} R_{i,j} - \sum_{k=1}^{K_i} P_{i,k} \right) \right]$$

Where:
i, …, D are defaulted assets included in the portfolio of N assets (in which D+1, …, N are non-defaulted assets);
j=1, …, J are the amounts of recoveries;
k=1, …, K are the amounts of direct/indirect workout costs

LGD is finally calculated as follows:

[33] See Porto R. F. (2011)

$$LGD_t = \frac{\sum_{i=1}^{D}\left[EAD_i - \left(\sum_j R_j(r) - \sum_k P_k(r)\right)\right]}{\sum_{i=1}^{N} EAD_i * PD}$$

The formula looks similar to the first one (the effective LGD), but it actually differs in the denominator, the latter is in fact considering the entire portfolio EAD and PD estimates.

2.5 Downturn LGD

"*A bank must estimate an LGD for each facility that aims to reflect economic downturn conditions where necessary to capture the relevant risks*".[34]

This requirement is based on the awareness that in a recessive phase (downturn period), during which the number of defaults is larger than in normal economic conditions, recovery rates and systematic risk are negatively correlated. The paragraph 468 of Basel II aims to underline the importance of performing models that can appropriately identify and assess the repercussions of recessive cycles and that can incorporate these negative effects into LGD estimates; the use of accurate models to estimate "downturn LGD" can thus avoid unexpected losses and hence a larger credit risk capital absorption.

The following charts (built on Moody's data) exhibit a comparison between market LGD during an economic expansion and market LGD during an economic downturn; it is clearly shown how, during a stress period, there is a larger number (more than two times larger) of high LGD (90%) than during a period in which the economy is expanding.

[34] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.108.

Chart 2.4 Distribution of Moody's Market LGD: Economic Expansion. Source: Michael Jacobs, *LGD Quantification*, September 2010, p.29.

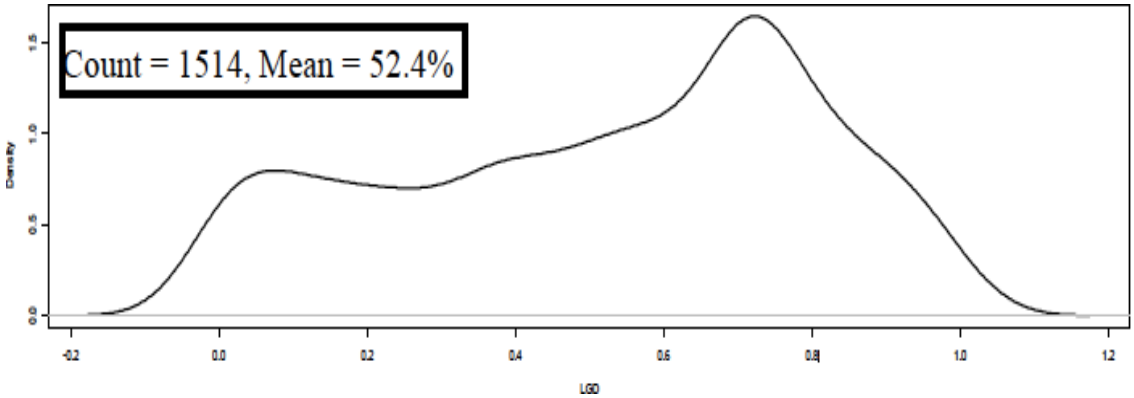
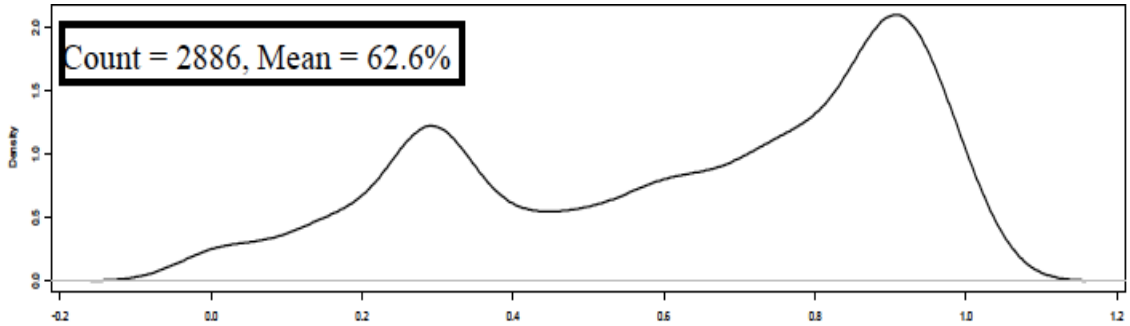


Chart 2.5 Distribution of Moody's Market LGD: Economic Downturn. Source: Michael Jacobs, *LGD Quantification*, September 2010, p.29.



Before going through the process usually followed to estimate the downturn LGD, it is important to underline that, acknowledged the evidence that LGDs are higher during economic downturns (when default rates are high), facilities may react in a different way to the business cycle effects. In particular, unsecured LGDs tend to follow the business cycle, whereas secured facilities might maintain lower LGD values. The positive effect on LGD of secured facilities will of course depend on the quality of the collateral (in terms of its "liquidability") and on the exposure's position in the capital structure (level of seniority/subordination).

In order to calculate a prudential measure of the LGD, banks have first to define[35] the business cycle (such as a macroeconomic adverse phase - decrease in GDP, increase in the unemployment rate, etc. - or a past period characterized

[35] Supervisory authorities let banks to independently find the reference business cycle used to verify its impact on the recovery rates.

by a high number of defaults) on which they have to verify the likely negative relationship between the number of defaults and the recovery rates.

The average long-run default rates are then compared with the average default rates occurred during the chosen business cycle; ultimately banks have to verify the presence of a significant relationship between LGD and PD estimates within an entire economic cycle (including the negative phase).

Now, if "adverse dependencies" have been identified, banks have to incorporate them within LGD parameters and thus calculate the downturn LGD.

"*If no material adverse dependencies between default rates and recovery rates have been identified [...], the LGD estimates may be based on long-run default-weighted averages of observed loss rates*".[36]

Paragraph 468 therefore requires that LGD estimates can't be less than the "*long-run default-weighted average loss rate given default*"[37]. Thus, considering loss as the "economic loss", the LRDWA-LGD is the simple mean (weighted by the number of defaults) of all LGDs included in a RDS.

Following this prudential meaning of LGD, the expected LGD (ELGD) can be expressed as follows:

$$ELGD = LGD^{LRDWA} = \frac{1}{N}\sum_{i=1}^{N} LGD_i$$

Where:

N is the number of defaults during the sample period.

Since this average is *default-weighted*, it will weigh more heavily downturns having more defaults.

[36] Bank for International Settlements, Basel Committee on Banking Supervision, *Guidance on Paragraph 468 of the Framework Document*, July 2005, p.4.

[37] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.108.

Therefore, the estimation of LGD can be as follows (numerical example from Moody's DRS market LGD):

Table 2.3 Average LGD numerical example on Moody's DRS Market LGD (rounded values for LGD & counts scaled by 10). Source: Michael Jacobs, *LGD Quantification*, September 2010, p.36.

Year	**Number of Defaults**	**Annual Average LGD**	**(Number of Defaults) x (Annual Average LGD)**
2001	23	60%	1380%
2002	47	59%	2773%
2003	45	66%	2970%
2004	14	52%	728%
2005	18	58%	1044%
2006	11	42%	462%
2007	7	38%	266%
2008	4	32%	128%
2009	58	76%	4408%
2010	88	52%	4576%
Total	**315**	**535%**	**168525%**

$$LGD_{LRDWA} = \frac{168{,}525}{535} = 59.5\%$$

Since vigilance authorities don't provide any restriction but only indicate principles to follow, when calculating downturn LGD banks have a relatively wide freedom. However, due to a shortage of historical data, many banks, although the *Basel Committee* fosters them to perform internal LGD estimates, apply a supervisory LGD mapping function when computing downturn LGD. The function, proposed by the Federal Reserve in the *Advanced Capital Adequacy Framework*, is the following linear equation:

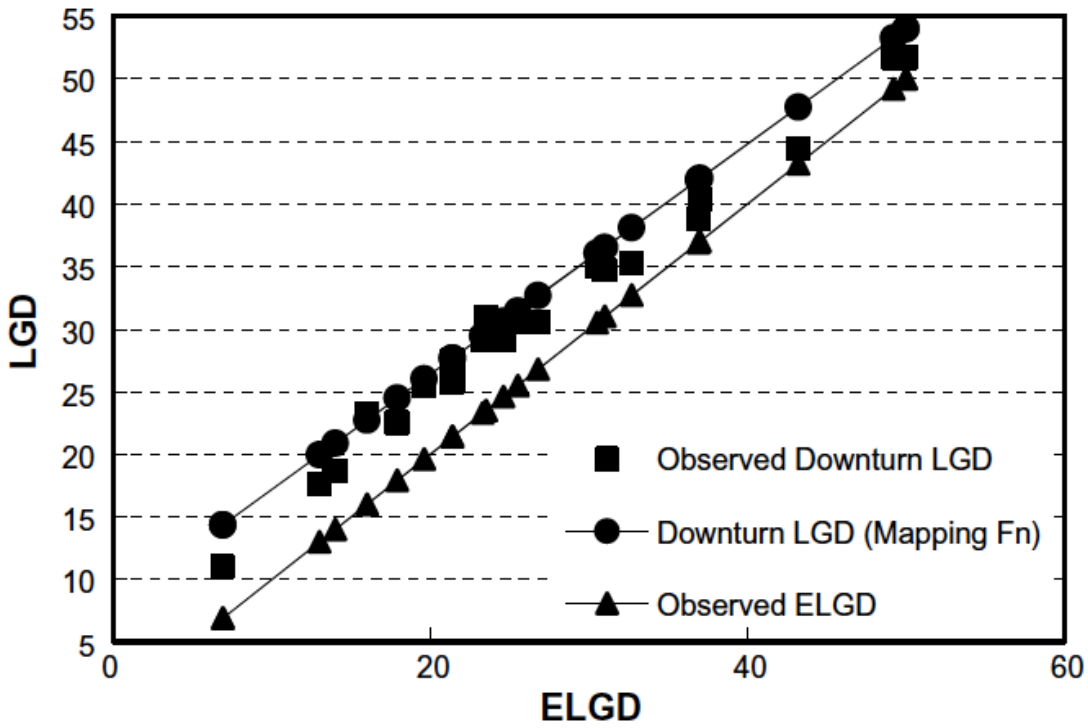
$$LGD = 0.08 + 0.92 * ELGD$$

This function can be considered as a further prudential way to estimate LGD, starting from the estimate of the long-run default-weighted average LGD (ELGD) it in fact "weighs" its value at 92%, thus adding the remaining 8% as a

further prudential and proportional coefficient. Thus for example, when ELGD is computed at 0%, this function converts it in an LGD of 8%.

Qi and Yang (2008) considered, in their work, the mean loss severity of a data set of 241.293 mortgage insurance claims settled between 1990-2003. The authors first identified the downturn period (1990-1994) by considering the "*HPR, defined as the current HPI [House Price Index] as a percent of HPI 1 months previous*"[38]: the economic downturn is occurred when this ratio is less than 100. After identifying the downturn period, the authors, in order to examine the accuracy of the supervisory mapping function described above, plotted the observed downturn LGDs against the observed ELGDs and the estimated downturns LGDs (the supervisory mapping function) as shown in the following figure.

Chart 2.6 Relevance of the proposed LGD mapping function based on observed LGD. Source: Qi, Yang, *Loss Given Default of High Loan-to-Value Residential* Mortgages, Journal of Banking & Finance, p.796.



[38] Qi, Yang, *Loss Given Default of High Loan-to-Value Residential* Mortgages, Journal of Banking & Finance, p.791

The figure confirms the prudential attitude of the mapping function: all the observed LGD estimates (squares) lie in fact between the downturn LGDs calculated with the mapping function and the observed ELGDs.

The fact that the function provided by the FED appears to be a too strict measure of the LGD looks like an incentive for banks to perform their downturn LGD estimates.

Chapter 3

Real estate collateral valuation approaches

Index

As already exposed in the first chapter, the *Basel Committee* aims to create a more solid banking system by setting prudential minimum requirements, standards and guidelines every bank has to comply with. Moreover, through the recognition of internal methods of assessing and managing those risks that banks have to face in their activity, the Committee also foster the adoption of advanced risk management systems.

The importance of an adequate credit risk management system lies on the very benefits that it can bring: being able to better rate a credit in all its components can in fact lead to a better assets' composition and a more effective portfolio management.

Banks performing own estimates of LGD, and thus eligible to use the advanced IRB approach, have to pay great attention to the collateral valuation approach used when assessing the credit risk of a secured exposure. The importance of this process lies on its impact on bank's capital and profits. If a collateral was not valued properly, larger unexpected losses could materialize and a substantial drain on the bank's equity capital would be met.

Recalling the definition of LGD, as the percentage of the exposure that the bank is expecting not to recover when the default occurs, it is clear the fundamental relationship between the (expected) loss rate and the recovery rate. The latter, expressed as a function of EAD and the amounts recovered (minus direct and indirect workout costs), has thus to be maximised (and hence the loss rate is minimised) by recovering greater amounts at a faster rates (i.e. at a lower cost of collection).

An inaccurate collateral valuation process can easily cause wrong recovery rate estimates, both for the amounts that can be recovered and for the duration of the very recovery process, thus causing a larger capital absorption as well as a lower level of profits. The latter consequence is proved by the effect of higher (than expected) write offs on the future estimates of LGD, which in turn will be higher, thus requiring a larger amount of capital to be held and hence causing a drop in the profit margin value.

The importance of performing an accurate valuation of a real estate led to the editing of valuation standards every valuer has to follow.

In Italy, a non-profit joint-stock consortium named *Tecnoborsa*, controlled by the Italian Chambers of Commerce, Industry, Artisans and Agriculture, has developed the *Italian Property Valuation Standard*. This work, according to the *International Valuation Standards* (IVS), states three recognized appraisal procedures: the sales comparison approach, the income approach and the cost approach.

Before going through these three approaches, it is important to briefly define and analyse the real estate valuation process. The latter can be defined as the logical and methodological estimation process through which, from the identification of the property to be valued, leads to the ultimate objective of the process, that is, the determination of the value attributable to a property.

Three main phases can be distinguished in the valuation process:

I. The preliminary phase: the valuer identifies the object, the purpose and the time of the valuation; finally, and in consequence of the elements defined above, the selection of the valuation approach can be carried out;
II. The operational phase: the valuer proceeds operationally to the collection and analysis of data, to the application of the criteria and valuation techniques, and finally to the elaboration of the final results;
III. The final phase: it is characterized by the verification of the final results and the preparation of the final report.

3.1 The sales comparison approach

The sales comparison approach is an estimation procedure based on the comparison between the asset being valued (subject) and a set of other comparable assets (i.e. those goods belonging to the same market segment) recently traded at a known price.
The main comparison method is the market comparison approach (MCA). This is a systematic comparison approach applied to the valuation of a real estate, which uses its technical and economical characteristics as a benchmark. The MCA is therefore based on the detection of real estate data such as its market price and its physical characteristics.
The MCA consists of the following documents:

- Parameters of the market segment, concerning quantitative and qualitative information on the market segment to which the property to valuate and other comparable properties belong;
- Table of data, which exhibits, in addition to the characteristics of the property to valuate, also the market prices recorded and the characteristics of other comparable properties;

- Table of marginal prices, which displays for each quantitative and qualitative feature its marginal price;
- Valuation table, which displays the market prices of the comparable properties and the examined characteristics;
- Time of evaluation;
- Concluding summary, which shows the adjusted market price that is the hypothetical price of the property derived from the comparison with the chosen "comparables".

The key aspect of this approach lies on the necessary and accurate research and analysis of the market segment to which the property belongs. The detection of the real estate market segment must fulfil the following conditions:

- Accuracy of the data of the property;
- The completeness of the data (price, date and other technical information);
- The accuracy and the rigor of the detection.

Another comparison method is the appraisal system one, which is based on the same principle of the MCA. The appraisal system is a system of equations relating to comparisons between the comparable properties and the property to be valued. The appraisal system can also be applied to calculate the marginal prices of the qualitative characteristics in combination with the market comparison approach used to estimate the marginal prices of each quantitative characteristic.

For both these methods, in order to get accurate estimations, it is necessary to know the actual market data, which is usually very tricky especially in those markets (like the Italian one) characterised by a lack of both available market data and of property databanks.

This issue raises the need to assess the quality of the collected data by checking their truthfulness and the soundness of the collection method used. The proposal for a "standard of real estate data" comes therefore from the need for transparency of a market, like the real estate one, whose evolution led it to merge with the securities' one.

3.2 The income capitalisation approach

The income approach includes the procedures for assessing the ability to generate monetary benefits of a property and the possibility of converting these benefits into capital value. This method is particularly important for those properties bought and sold on the basis of their capabilities to generate a return for the owner/investor.
This approach is divided into three procedures:

1. The direct capitalization;
2. The yield capitalization;
3. The discounted cash flow analysis (DCF).

"*The direct capitalization directly converts the yield of a property into the appraisal value, dividing the annual yield by a capitalization rate*"[39]. Since market does not naturally express the capitalization rate, the seeking for the latter deserves particular attention. This quantity is a variable derived from the ratio between the income (i.e. the rent) and the price of a real estate.
The Italian Bank Association (ABI), in its guidelines on real estate valuation, suggests a procedure for the estimation of such rate. Following this procedure, the seeking for the capitalization rate is carried out by detecting a sample of

[39] Tecnoborsa, *Italian Property Valuation Standard: Codice delle Valutazioni Immobiliari,* Third Edition (December 2005), p.102

market rents of properties R_j with a surface S_j (where j=1,2,…,m) and a sample of market prices of P_h properties with a surface S_h (where h=1,2,…,n). The average capitalization rate is thus equal to:

$$Capitalization\ rate = \frac{\sum_{j=1}^{m} R_j}{\sum_{j=1}^{m} S_j} \Bigg/ \frac{\sum_{h=1}^{n} P_h}{\sum_{h=1}^{n} S_h}$$

In the event of a lack of market data (market rents or prices), the seeking of the capitalization rate can be carried out by looking at similar market segments. The rate detected has then to be adjusted considering parameters like the location, the dimension, and the building typology.
The rate can also be calculated indirectly by considering[40]:

- The weighted average of the capitalization rate of the mortgage and the rate of return of the real estate investment of the property being valued;
- The weighted average of the capitalization rate of the area and the capitalization rate of the construction.

The yield capitalization procedure "*applies a financial calculation to the series of annuities of the property to be valued. It is the present value of the constant or variable incomes*".[41]
The seeking for the capitalization rate is carried out by detecting a sample of property sales in the same market segment of the property to be valued; the sample has to include the contracts with total prices P_h (where h=1,2,…,n) with durations t_h and the respective series of the net (or gross) incomes. The calculation of the capitalization rates i_h can be performed by using the equation

[40] Appraisal Institute: *The Appraisal of Real Estate*. 13a Edition. Appraisal Institute, Chicago, Illinois, p. 505.
[41] Tecnoborsa, *Italian Property Valuation Standard: Codice delle Valutazioni Immobiliari,* Third Edition (December 2005), p.103

of the internal rate of return referred to the incomes and the property prices of the properties comparable.
The average capitalization rate is equal to:

$$Capitalization\ rate = \frac{\sum_{h=1}^{n} i_h\, P_h}{\sum_{h=1}^{n} P_h}$$

Finally, the discounted cash flows (DCF) procedure is based on the discounted value all the cash flows generated by the real estate from the time of the purchase to the time of the resale. This procedure therefore "*aims at simulating a complete cycle of the real estate investment, from the time of purchase to that of the final sale, when a capital gain or loss can be determined*".[42] The capitalization rate at which cash inflows (i.e. the rent amounts) and cash outflows (i.e. the operating expenses and the agency costs) are computed, can be calculated using the same formula (see above) of the yield capitalization procedure.

3.3 The cost approach

The cost approach determines the market value of a property by adding the value of the land and the building costs of the property (taking into account possible accrued depreciations). This comparative approach considers the possibility that, as an alternative to the purchase of an already built property, an individual can buy a more modern property equivalent (i.e. that provides the same utility) to the "old" one. This would involve the purchase of an equivalent land and the construction of an equivalent facility. Unless there are no unforeseen difficulties (disadvantages or risks related to the investment), the price that a buyer would pay for the property being valued should not be more

[42] Ibidem.

than the cost of the modern equivalent property.[43] Moreover, the property being valued is often less attractive than a modern and equivalent one, due to age or obsolescence; thus for the replacement cost, an adjustment for the depreciation is required.

Three parts therefore compose the cost approach:

1. The land valuation: the value of the land can be estimated through either the sales comparison approach or the income capitalisation approach;
2. The reconstruction costs, calculated through the comparison of the construction costs of similar buildings of the same type and area, or through the preparation of the estimate of quantities applied to the construction to be valued;
3. The appraisal of the eventual depreciations, such as physical deterioration, functional and economic obsolescence. Such estimates are carried out through the depreciation charges, the restoration costs and through direct comparisons between properties in similar conditions that have different levels of obsolescence. The estimated economic obsolescence is performed according to the capitalized amount of the loss of income.

3.4 Market value: the cons of spot value

The three approaches exposed above aim therefore to searching for the most accurate value to be applied to the property being valued. This value proved to

[43] Tecnoborsa, *Italian Property Valuation Standard: Codice delle Valutazioni Immobiliari,* Third Edition (December 2005), Appendix F, p.108: "*The cost approach is based on the elementary assumption by which a buyer is not willing to pay for a property an amount greater than the value of the building land and of the cost of construction of another property which has the same functional utility as the existing one, considered in its state of use*"

be, regardless of the approach used, the price that the very market assigns to that property.

When assessing the borrower creditworthiness at the loan origination date, the bank is thus pushed to assess the property (the real estate collateral) with a value representing, in that particular moment, its market value.

However, considering that the majority of the mortgages have 10 years or more duration, during the recovery process, right after the creditor defaults, taking into account the (historic) market value of the collateral (estimated at loan origination) can't be significant for the overall recovery estimation.

Between the settlement date and the default event, the collateral value is in fact subject to variations that are positively correlated with the mortgage duration: the longer the duration of the loan, the more sizable variations can affect the historic market value.

From the moment of the settlement and throughout the life of the contract, the collateral value can considerably affect an important ratio: the loan-to-value ratio (LTV). The latter is defined as the ratio between the mortgage amount and the appraised value of the mortgaged property. The lower this value, the more the bank is protected from incurring in monetary losses. This ratio is set at a maximum of 80% for all mortgages secured by a real estate. This means that, if the collateral is a property valued €100,000, the maximum amount of the loan will be €80,000.

It's therefore easy to understand that, on varying the value of the collateral throughout the life of the loan, the loan-to-value ratio can have different values compared to the one initially recorded. From the settlement date, as the years go by, the very loan-to-value requirement (80%) can therefore not be respected anymore: in fact even if, on one hand, the exposure decreases (through the punctual monthly mortgage payments fulfilled by the debtor), on the other hand the collateral value can go through sizable variations even in a short time period. The direct consequence of this fact is that, in case of default, the cash

flows generated by selling the collateral could considerably be lower than what estimated, thus causing higher unexpected losses.

The main weakness of valuing the real estate collateral at the market value is that such value is a spot value, and therefore, in order to best estimate the LGD (and hence to best estimate expected losses), it requires to be updated frequently.

Basel II, as previously reproduced, therefore states that the collateral valuations have to be frequently updated (once every year for commercial real estate ad once every three years for residential real estate). However, the valuation process is very expensive both in terms of time and in terms of monetary costs, thus making such updating procedure quite rare on practice.

Nevertheless, as a proof of the importance of dealing with updated collateral values when computing LGD, Qi and Yang (2008) studied how LGD can be explained by several variables distinctive with the loan characteristics.

The authors considered a data set of 241,293 American mortgages settled between 1990 and 2003. After dividing the overall period in four significant periods, and after considering different current loan-to-value[44] (CLTV) ranges, the authors analysed different loss severity values. The following key aspects are the outcome of such analysis:

I. As expected, loss severity is positively correlated with the loan-to-value ratio;
II. Loss severity is higher during the stress period (1990-1994);
III. The CLTV is positively related (0.699) to LGD and with a higher degree compared to the initial LTV (0.065).

[44]Qi, Yang, *Loss Given Default of High Loan-to-Value Residential* Mortgages, Journal of Banking & Finance, p.798: "$CLTV_{it} = \frac{100*CUPB_{it}}{\left(HPI_t/HPI_{t_f}\right)BOVVAL_{it_f}}$, *where: CUPB: unpaid balance at default; HPI: quarterly house price index; BOVVAL: broker's opinion of value, as-is, at default, observed before foreclosure;* t_f*: foreclosure date*".

To better analyse how the chosen variables interact between each other, here is reproduced the correlation matrix:

Table 3.1 Coefficient correlation. Source Qi, Yang, *Loss Given Default of High Loan-to-Value Residential* Mortgages, Journal of Banking & Finance, p.794.

	LGD	CLTV	LTV	HPR	LNSZN	AGE	FCTIME
LGD	1.000	**0.699**	**0.065**	**−0.172**	**−0.220**	**0.178**	**0.173**
CLTV		1.000	0.002	**−0.184**	0.003	**−0.059**	**−0.013**
LTV			1.000	**0.061**	**−0.082**	**0.166**	**−0.021**
HPR				1.000	**−0.065**	**−0.118**	**−0.104**
LNSZN					1.000	**−0.099**	**0.008**
AGE						1.000	**0.240**
FCTIME							1.000

Where:

- HPR is the house price ratio, calculated by the following formula: $HPR = \frac{HPI_t}{HPI_{t-18\,months}}$;
- LNSZN is the loan size;
- AGE is the time (months) passed from the origination date to the foreclosure;
- FCTIME is the time (months) passed from the default event to the foreclosure.

The high (0.699) positive correlation between CLTV and LGD encourages the analysis to go deeper. To better understand the importance of this variable, the authors performed a model, estimated using the ordinary least squares, whose results are reproduced below.

Table 3.2 Reggression woth CLTV. Source: Qi, Yang, *Loss Given Default of High Loan-to-Value Residential* Mortgages, Journal of Banking & Finance, p.794.

Variable	Coefficient	*p*-value	Variable	Coefficient	*p*-value
Intercept	12.744	<.0001			
CLTV090	8.925	<.0001	PROPTYPE1SFD	−0.403	0.0279
CLTV095	13.925	<.0001	PROPTYPE2CON	−2.134	<.0001
CLTV100	17.037	<.0001	LNPURP1P	0.347	<.0001
CLTV110	22.179	<.0001	OCCUP1O	−1.703	<.0001
CLTV120	28.333	<.0001	PRESALE1Y	−6.069	<.0001
CLTV120+	38.871	<.0001	PRESALE2N	−2.009	<.0001
STRESS	2.867	<.0001	AGE24	−7.561	<.0001
LTV090	0.695	<.0001	AGE48	−6.383	<.0001
LTV095	1.705	<.0001	AGE84	−5.426	<.0001
LNSZN060	10.969	<.0001	JUDICIAL	1.924	<.0001
LNSZN080	4.363	<.0001	SRR	3.029	<.0001
LNSZN110	1.958	<.0001	NODJ	−4.081	<.0001
Adj. R^2	0.610		Observation	106,857	
F	6956.75	<.0001			

As shown, the variables included in the model are able to explain 61% of the variations of the dependent variable (LGD). In order to assess the "goodness of fit", it has been used the adjusted R^2 to get a measure of fit that takes into account the number of explanatory variables included.

As a proof of the explanatoy power of the CLTV variable, another model has been run by removing from the previous regression the very CLTV variable. The output of such new regression gave the following results.

Table 3.3 LGD regression after removing the CLTV variable. Source: Qi, Yang, *Loss Given Default of High Loan-to-Value Residential* Mortgages, Journal of Banking & Finance, p.791

Variable	Coefficient	*p*-value	Variable	Coefficient	*p*-value
Intercept	35.812	<.0001			
STRESS	7.433	<.0001	OCCUP1O	−3.339	<.0001
LTV090	2.489	<.0001	PRESALE1Y	−6.898	<.0001
LTV090+	5.022	<.0001	PRESALE2N	−3.094	<.0001
LNSZN06	10.542	<.0001	AGE24	−4.511	<.0001
LNSZN08	4.287	<.0001	AGE48	−5.393	<.0001
LNSZN11	1.469	<.0001	AGE84	−4.211	<.0001
PROPTYPE1SFD	−3.206	<.0001	JUDICIAL	1.754	<.0001
PROPTYPE2CON	−1.867	<.0001	SRR	1.330	<.0001
LNPURP1P	−2.389	<.0001	NODJ	−2.172	<.0001
Adj.R^2	0.145		Observation	106,857	
F	1008.29	<.0001			

It can be clearly noticed the dramatic decrease in the adjusted R^2 value (now at 0.145); such model can thus explain only 14.5% of the variations of the dependent variable. Furthermore there is another important element to analyse while watching the above chart: comparing to the first regression's result, the STRESS factor becomes now (when the updated LTVs are not taken into account) decisively important. When CLTVs are taken into account, the loss severity appears to be 2.87% higher in downturn conditions; now, without taking into account CLTV, during the same downturn period (1990-1994), LGD is 7.43% higher than in normal economic conditions.

This study therefore shows the importance of constantly update collateral values in order to deal with values that better reflect the real price of a property. It is easy to understand that such procedure can decisively improve risk segmentation; however updated values require additional valuations made by travelling again through every step of the previously exposed valuation process.

Chapter 4

Toward a harmonised assessment of the real estate risk

Index

The previous chapter showed the main methods of properties' valuation provided by the European standards of evaluation. These methods allow obtaining the closest value to the one that the very market assigns to the property (i.e. the market value); however, as shown in the last paragraph the weakness of the market value lies in its limitations in providing a significant factor when the default occurs.

The market value is in fact a valid value only when it is detected (i.e. when granting credit) and does not take into account the possible evolution of prices in future. However, it is clear that, in theory, the collateral value that is relevant for the calculation of the economic capital is the amount that will be recovered in the event of a default of the counterparty. In a typical long-term loan (from 10 to 30 years long), this value is subject to wide variations and deviations from the value determined at the time of loan origination.

This chapter shows how the critical issues around the concept of market value led to the definition of a new concept of value to assign to the property-collateral of a loan: the mortgage lending value (MLV).

The main difference between the market value and the MLV is related to the fact that while the former, being a spot value, looks at the past, the MLV intends to assign a prudential value to the property, looking at the future and trying to obtain a value that could remain as stable as possible with respect to purely speculative variations.

Subsequently, from the concept of MLV of the mid-90s, later taken up by the *Basel Accords*, we move to the more accurate concept of "property and market rating". This transition is due to the circumstance that the financial system became conscious of the fact that current financial crisis is also linked to an incorrect representation of the value, and thus of the risk, of the real estate collateral subsequently sold to third parties trough structured financial instruments. In the context of a globalized finance, the single mortgage loan becomes in fact a "brick" of a huge building, whose collapse could lead to serious consequences for the entire economic system.

4.1 The mortgage lending value

The concept of MLV takes into account the fact that mortgage loans are usually of long duration; the MLV aims to be a valid value that can be applied to a property for the entire life of the loan. As previously seen, this quality can't be attributed to the market value, which in turns refers to a specific period of time. Using the MLV therefore allows focusing on a value characterized by long-term sustainability: by ignoring economic fluctuations, it can in fact levels out all the overstatements.

A recent judgment of the Court of Venice underlines the growing importance of an accurate valuation method needed when valuing the collateral of a

mortgage. The Court of Venice, in its judgment of 26th of July 2012, declared invalid a loan granted in violation of the LTV limit. According to the Court, the MLV must be used instead of the simple market value.

The concept of MLV was developed first by the "mortgage banks" in Germany and, in particular, by the association named *Verband Deutscher Pfandbriefbanken* already in the '90s (*Mortgage Lending Value*, Wolfgang Crimmann, Berlin, 20122, notebook n.49 of the notebooks of the Verband Deurscher Pfandbriefbanken). Later, this concept was taken up, as seen in the first chapter, by European regulations concerning the access to banking activity by financial entities (first by Directive 2000712/EC and the by 2006/48/EC).

In Italy, the Supervisory Instructions ("*Istruzioni di Vigilanza*") define the concept of mortgage lending value in the context of the rules regarding solvency ratios. The decree of the Italian committee for credit and savings (*CICR*: "*Comitato Interministeriale per il Credito ed il Risparmio*") on the secured credit is dated back to 1995 and thus it does not reflect in any way all the scientific and regulatory developments in the field. The *CICR* decree in fact generically refers to "the value of the mortgaged property".

On this point, even the previously cited "*New Regulations For the Prudential Supervision of Banks*" (circular no. 263 of 27th December 2006 of the Bank of Italy) are not entirely clear. Sometimes these rules merely quote in the footnotes the concept of mortgage lending value as an alternative to market value, but specifying that the Authority of the State where the property is located must permit such deviation. In other occasions, the same rules put the two values as different alternatives without saying more: such as the case of "exposures secured by mortgages on residential property" or the "values of eligible collateral under the IRB approach other than financial collaterals".

The impression is that the Italian supervisory authority undervalues the difference between these two concepts.

The *Verband Deutscher Pfandbriefbanken* association defies the MLV as the prudential value that can validly be assigned for the entire duration of the loan to the property being valued; such value, by eliminating temporary value fluctuations aims therefore to eliminate speculative influences.
The main characteristic of the MLV is therefore to be a long-term value: the MLV has in fact to be valid throughout the life of the lending.
According to the definition of MLV, the valuation must take into account all the circumstances that in the future could change the value of the property, and thus such estimate should not be based on market conditions at the time of its drafting and it should not express a simple readily realizable value. In other words, it is not sufficient producing a prudential deduction from the current market value, but rather it must assess the future value of the property throughout the period in which such real estate will be the collateral of such mortgage, regardless the likely forced sale in case of default.
A further definition of the concept of MLV is given by the *Italian Bank Association* (ABI) that states that:

- Mortgage lending value is a concept of value at risk that focuses on sustainable aspects and limits the property assessment to its permanent economic characteristics, and to the income that any lessee could gain through a sound management;
- The sustainability of the MLV may require to make adjustments to the actual income of the property, to the discount and the capitalization rates, and to the management and administration costs of the property;
- All the assumptions used to estimate such value must come from a deep knowledge of the historical performances of the real estate market and a critical examination of current conditions and trends, particularly in terms of risk;
- The assessment cannot rely on real estate prices and tabular lists of prices performed by companies and brokerage houses;

- In estimating the value of the property the valuer must make explicit mention of the valuation report and of the eventual directives issued by the bank.

Therefore, when calculating the MLV, the relevant features of the property are those typically of long-term; such consideration is made in order to omit those current and too sensitive market values and thus achieving a stable value.
There are no specific guidelines on how to estimate MLV; the banking law only defines the concepts and elements that must be taken into account for the calculation, but it does not explicitly say how and how much these variables must be weighted in the evaluation. This of course leaves a wide margin of discretion to the valuer, who, as exposed above, will still have to follow the directives issued by the bank and to document the underlying assumptions.

The same association of German Pfandbrief Banks issued some simple guidelines to follow during the MLV calculation; the association suggests the following three-stages-procedure:

1. Obtaining information: the valuer, by consulting all official information he/she can access to, gathers information concerning the property to be valuated and the market in which it is included;
2. Inspection: the valuer is required to personally see and analyse the physical conditions of the property;
3. Valuation and report: the report has to include the reasons that lie to such valuation and a summary of the property's characteristics (usability and marketability).

The valuer's report has thus to include those factors that determined the final valuation; these factors have to concern the long-term and sustainable features of the property, the current use of the property and the capability of the property to meet other different users' needs. As previously stated, the

valuation does not have to be affected by temporary economic and speculative effects on its value.

The 3 valuation approaches analysed in the previous chapter can also be applied to the MLV calculation. Following the instructions and the calculation set in the Pfandbrief Act[45], the following is a brief explanation of how MLV can be calculated using the income approach.
Here is the MLV of a studio flat in Berlin[46].

[45] Verband Deutscher Pfandbriefbanken, *Regulation on the Determination of the Mortgage Lending Values of Properties in accordance with § 16 pars. 1 and 2 of the Pfandbrief Act*, 12th May 2006, pp. 44-61.
[46] The example is presented as a practical tool to understand the basic calculations behind the use of the MLV, and thus it does not aim to produce a valid and true value of the (existing) property considered.

Land value	
16 square meters à €10,000	**160000**
Gross annual income (rent)	
€900*12	**10800**
Less operating expenses	
Management costs (According to Annex I to the BelWertV)	200
Maintenance costs € 7.5/sq m	120
Loss of rental income risk (2% of gross income)	216
Total operating expenses	**536**
in % of gross income	5,0%
minimum operating espenses according to BelWertV	15%
Stated operating expenses	**1620**
Net annual income	**9180**
Capitalization rate	5%
Expected return on land	8000
Net income of buiding	**1180**
Capitalization rate 5%	
Remainining useful life 80 years	
Multiplier 19.60 (according to Annex IV to the BelWertV)	
Income value of the building	**23128**
INCOME VALUE (Mortgage Lending Value)	**183128**

The calculations show only one side of the MLV, i.e. the quantitative result; for the determination of the qualitative side of the valuation (i.e. the marketability of the property) the valuer can refers to local market and property rating.

As it can be noticed, one factor that deeply affects the final value is related to the assumption that, for income properties (i.e. those properties whose aim is to be rent, and thus to generate income, rather than to be occupied by the owner) "*at least 15% must be deducted from the gross income by way of*

operating expenses"[47]. Another important factor is given by the capitalization rate; the latter is provided by the BelWertV regulation that sets different rates for different uses of the property (residential use or commercial use) and for different buildings (apartments, commercial buildings, offices, hotels, restaurants…). The European Valuation Standards (EVS) states that, in general terms "*the choice of capitalisation rates is also to be based on long-term market trends and exclude all short-term expectations regarding the return on investment. It should consider the sustainable income-producing capacity of the property, multipurpose or appropriate alternative uses as well as the future marketability of the property*".[48]

However, some criticisms can be moved to such rules:

- Input data, set by the BelWertV, do not appear to be suitable to every market, and it is not clear where the data are extracted from;
- Some interpretive doubts may exist on the definition of modernization, maintenance and their bands' width can be overlapped;
- The method appears to be quite complicated due to the duty of determining the market value as well, and due to the fact that single valuations have to be performed even for portfolio valuations.

4.1.1 The derived-MLV

The determination of the mortgage lending value can be conducted in an independent way with respect to the market value. Using the previously mentioned evaluation approaches dictated by BelWertV (i.e. following the two-pillar principle by using the income and the cost approaches, and following the

[47] Verband Deutscher Pfandbriefbanken, The *Mortgage Lending Value, Sustainability since 1900: Ten Questions and Answers*, p.6
[48] The European Group of Valuers' Association (TEGoVA), *European Vauation Standards: seventh edition*, 2012, p.83.

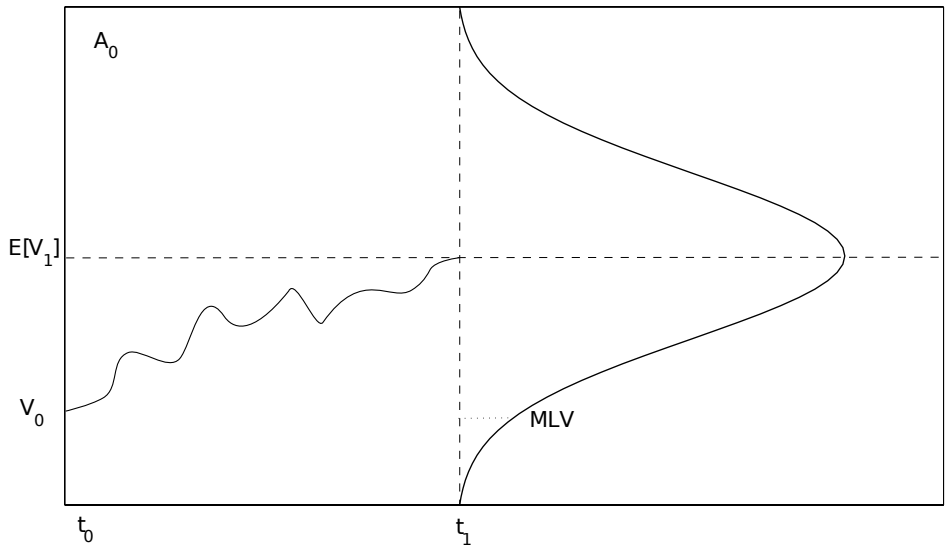
market comparison approach), the MLV can thus be calculated without estimating first the market value of the property to value.

However, as Bienert and Braunauer (2007) expose in their work, there is a further procedure to determine the MLV that is often used on practice. Despite of what the regulators intimate, the mortgage lending value is on practice derived from market values after applying a discount: a lump sum determined according to the type of the property and its intrinsic risk.

The key aspect when calculating the derived-MLV is related to the estimation of the maximum loss in value of the property being valued. The latter consideration recalls the definition of Value-at-Risk (Var): such measure is in fact defined as the maximum loss that a financial instrument (or a portfolio of financial instruments) will occur in a set time period (day, month or year), given a certain level of confidence (i.e. the percentage by which the estimate of the loss is considered valid).

Bearing in mind the above definition of VaR, the derived-MLV is thus computable by deducting a sum (i.e. the VaR of the property) from the market value. In order to determine the per cent deduction to be applied to the market value, the density function of the systematic risk can be derived by using historical data of market trends. The following chart is provided to better understand the rationale of this approach.

Chart 4.2 MLV and VaR of the property. (Own chart).



As shown, the MLV can be thus considered as the value associated with a given quantile that lies on the tail of the distribution of the market value of the property being valued.

Another method, used by most of the valuers, can calculate the per cent deduction to be applied to market value by performing a Monte Carlo simulation. The Monte Carlo method is used to derive estimates through simulations. It is based on an algorithm that generates a series of numbers uncorrelated between each other, which follow the probability distribution that is supposed to have the phenomenon to be investigated. The Monte Caro simulation therefore calculates a set of possible realizations of the phenomenon under examination, assigning to realization a weight depending on the probability of such event. Once the representative sample has been calculated, the simulation performs the "measures" of the quantities on that sample.
Following this method, one can estimate the distribution of the market value by using the associated distributions of the subjective and objective input variables. The procedure starts with determining the probability functions for each input data; for example, for an income-property, the data to use are the

sustainable proceeds, the operating costs, the land value, the remaining useful life, the vacant periods etc.; when dealing with subjective variables distributions, the valuer, can adjust the probability distribution according to the remaining useful life.
Such method entails alternative market value scenarios; such scenarios' distribution allows conducting a risk analysis on that property whose output will be the per cent deduction that, in turn, will assign a rating to the property being valued.

Another method used by valuers is the slotting approach. With this method, the valuer includes the real estate in a given parameters' catalogue with a given risk band. The procedure to follow is quite basic:

- Market value estimation;
- Determination of different risk categories for each real estate typology;
- Assignment of the subjective weight to each risk factor associated with each real estate characteristic;
- Assignment of a supervisory recognized real estate category to the real estate, by aggregating all the risk weights;
- Attribution of a specific deduction to the market value.

The rationale behind the slotting approach is therefore completely different form the VaR and the Monte Carlo methods: while these methods' output is the per cent deduction, which, in turn determines the property rating, with the slotting approach it is the estimated rating that determines the per cent deduction to be applied to the market value.

4.2 From MLV to property and market rating systems

Recent meetings organized by UNECE (*United Nations Economic Commission for Europe*) with the support of the International Real Estate Federation, testify the importance the presidents of the European authorities assign to the real estate market; the latter has in fact been recognized of vital importance for a desirable economic recovery. In particular, restoring confidence in the primary (and secondary) market of real estate debt is the stated objective of new tools such as the Property and Market Rating system.

Generally speaking, a rating can be defined as the procedure that can give a future economic valuation on a subject (or case) in large scale. This assessment, produced by rating agencies, offers their judgment[49] on the ability and willingness of companies to issue bonds and to fully and promptly pay its debts. The internal rating procedures of banks, by contrast, are intended to provide a rapid assessment to lenders by means of standardised information flows.

As a result of Basel II requirements on rating systems on the basis of which the minimum capital requirements are calculated, rating systems have increased significantly their importance.

A similar instrument must also be provided for an accurate property valuation. The current systems of valuation of properties on market do not appear able to meet sufficiently stringent criteria for individual goods' assessment.

The need for an adequate and sufficiently harmonized property rating system also comes from those facts that have been defined by many as the roots of the financial crisis. For this reason, it is necessary to briefly analyse the main factors that led to the financial crisis of 2007-08.

Two events that occurred almost simultaneously triggered the subprime crisis: the fall of the American housing market and the rise of interest rates.

[49] Moody's definition of rating: "*An opinion on the future ability and legal obligation of an issuer to make timely payments of principal and interest on a specific fixed income security*".

At the beginning of 2007, the US housing market demand started to show an attitude in a completely opposite sense to what the market had shown till that time. In second order, and almost simultaneously to the decline of residential property prices, the effects of the interest rates rise on the mortgage payments started to be bone-crushing. With the increase in interest rates and the slowdown in the real estate market, caused a double paradox: the value of such mortgaged houses dropped, and the mortgage payments rose, thus exacerbating the already existing problems the mortgageholders were experiencing. As a consequence, mortgageholders started to default, thus forcing banks to start foreclosure processes and to finally sale the mortgaged property. The rise in the foreclosed houses supply contributed to further depress the real estate prices; moreover, the increase in interest rates also reduced the amount of residential properties purchases and therefore contributed to the depression of an already halted housing market.

The securitization process (put in place by banks before the crisis and then carried on with the sharpen of it), together with the spreading of structured financing, transferred the risk from poor underwritings to other investors around the globe. This caused uncertainty about the efficiency of the credit world and the internal assessment systems of property risk of financial institutions.

The current financial crisis was thus the result of inadequate regulation not only of the financial sector, but also of the real estate one. This dual lack of regulations led in fact to numerous events that actually triggered the financial crisis:

- The housing bubble swelled in an inappropriate way, and, at the same time, a consequent greater control over loans granting was not arranged;
- The financial markets developed complex financial instruments linked with mortgages (MBS);

- These instruments effectively converted what was credit risk into market risk;
- A market composed by such opaque and structurally complicated tools, caused rating agencies to fail in fulfilling their primary task.

The above considerations led UNECE, in April 2010, to draft a report ("*Policy Framework for Sustainable Real Estate Markets: Principles and Guidance for the Development of a Country's Real Estate Sector*") containing principles and guidelines to emphasize the need to define rules that can be sufficiently flexible to be applied to numerous and differently developed real estate markets. These rules therefore aim at creating a better regulation of the real estate risk, which, especially if connected with financial instruments, can lead to more accurate credit systems.
In particular, the development of appropriate risk rating systems for property markets can lead to a more accurate use of current credit risk management tools; moreover, as noted in Principle 8 of UNECE REM (2010), "*developing and fostering the introduction of real estate rating systems may reduce sector investment risk and encourage loans at lower interest rates*"[50].

4.2.1 Property and market rating system: the *TEGoVA*'s model

The Property and Market rating system (PaM) was developed by the European Group of Valuers' Associations (*TEGoVA*) and published in October 2003; such real estate rating system can be briefly defined as a procedure to assess the risk when buying a real estate at its current use.
The PaM model pays attention to the future rather than to the past: it focuses on the probability and thus on the investment risk of a real estate property

[50] UNECE, WPLA, REM, *Policy Framework for Sustainable Real Estate Markets: Principles and Guidance for the Development of a Country's Real Estate Sector*, Geneva 2010, p.16.

rather than on its simple value. This complex process, on the one hand, undermines the very idea of security, often rooted in the real estate sector, and, on the other hand, it applies to such sector, with the necessary adaptions, the general criteria of the asset allocation process.

In the debt sphere, this process becomes a judgement, in the medium to long term, on the property's ability to act as a stable security for a loan. It therefore requires not only an assessment of the borrower creditworthiness, but also rather an assessment on the economic quality of the property.

The use of PaM as a risk management tool began 20 years ago (used mainly by German land banks), but only the crisis of the MBS has highlighted the gap (especially in the Anglo-Saxon finance) between finance and the real estate field.

To this end, an accurate real estate valuation system thus appears to be of fundamental importance in order to achieve a sustainable financial system that is now undeniably linked to the real estate sector.

In particular, it is very important that the RMBS (Residential Mortgage Backed Securities), the CMBS (Commercial Mortgage Backed Securities) and the CDOs (Collateralized Debt Obligations) markets regain confidence through greater transparency about the risk of the underlying real estate (i.e. the real estate risk).

The PaM model adopts a real estate rating system that is conceptually similar to those rating systems provided by rating agencies. In particular, the model provided by TEGoVA is based on a 10 level rating scale, according to which a rating equal to 1 represents the best rating, whereas a rating of 10 (only given under specific circumstances) represents the worst ("*disastrous*") rating.

Table 4.1 Comparison of risk rating models. Source: UNECE-REM, *Evaluation of real estate property and market risk for real estate backed financial products*, p.17.

Aaa to AA3	A1 to A3	Baa1 to Baa2	Baa3 to Ba1	Ba2 to Ba3`	B1	B2	B3 to Caa			Moody's
AAA to AA	A+ to A-	BBB+ to BBB	BBB- to BB+	BB to BB-	B+	B	B- to C			S & P
excellent	very good	good	above average	average	below average	poor/ special mention	very poor/ substandard	doubtful	loss	Example internal bank rating system
1 (excellent)	2 (very good)	3 (good)	4 (slightly above average)	5 (average)	6 (slightly below average)	7 (mediocre)	8 (poor)	9 (very poor)	10 (disastrous)	TEGoVA PaM rating

The PaM model is divided into a property and market rating system and a project rating system. The former is, as already defined, a procedure to assess the risk grade of a current (i.e. available on market) real estate acquisition; whereas the latter procedure aims to assess the risk grade of a real estate valorisation project.

The rating system provided by TEGoVA considers several rating classes related to the nature of the property: completed properties or projects.

Focusing on the first real estate category (as the category in which real estate collaterals can be included in), the system sets four criteria classes:

1. Market;
2. Location;
3. Property;
4. Quality of cash flow.

Each of these classes is weighted depending on the type of the real estate: the TEGoVA system distinguishes between retail, residential, office and warehousing properties.

Again, each of the four classes is then subdivided into a number of subclasses; the latter are then weighted depending on their relative importance in influencing the medium-term sales prospects of the individual property (i.e. the property marketability). The table below describes the four classes and their subclasses for a residential property.

Table 4.2 The TEGoVA classes and subclasses weightings for a residential property.

Market Environment (20%)	Location (30%)	Property (20%)	Quality of cash flow (30%)
• Acts of God (5%) • Socio-demographic development (30%) • Economic situation (15%) • Political and legal aspects (10%) • Property market: retail (40%)	• Suitability for property type and target occupiers (30%) • Image (20%) • Transportation infrastructure (15%) • Quality of facilities (15%) • Acts of God (20%)	• Construction (20%) • Fitout (10%) • Structural condition (15%) • Plot situation (25%) • Ecological sustainability (10%) • Profitability (20%)	• Tenant situation (20%) • Rental and value growth potential (30%) • Letting prospects/ fungibility (20%) • Vacancy/letting situation (10%) • Expenses (10%) • Alternative use (10%)

The PaM procedure to determine the rating of a property is therefore composed by four stages:

I. Identification of the rating classes and their weightings;
II. Determination of the criteria valuation to be applied to each class, and subsequent weighting of each criterion;
III. Creation, for each rating class, of a valuation matrix by assigning a rate to each criterion;

IV. Determination of the total rating of each class, calculated by multiplying the weighted sum of the marks assigned to each criterion by the corresponding class weight.

The following is a rating example, provided by TEGoVA, of a residential property located in Munich (Germany).

Table 4.3 *"Rating example of a completed property (residential)"*. Source: TEGoVA, *European Property and Marlet Rating: A Valuers' Guide*, p.17.

Criteria Class 1

Market	1	2	3	4	5	6	7	8	9	10	weight
national					5						20%
Acts of God						6					5%
Socio-demographic development							7				30%
Overall economic development and international attractiveness					5						15%
Political, legal, taxation and monetary conditions			3								10%
Property market: residential					5						40%
regional		2									80%
Acts of God				4							5%
Socio-demographic development		2									35%
Economic situation and attractiveness	1										15%
Property market: residential		2									45%
Rating for Criteria Class 1:			3								20%

Criteria Class 2

Location	1	2	3	4	5	6	7	8	9	10	weight (appr.)
Suitability of the micro location for property type and target occupiers		2									45%
Image of the quarter and the location			3								5%
Quality of transportation infrastructure of the plot and quarter		2									23%
Quality of local supply facilities of the plot and quarter for target occupiers		2									23%
Acts of God			3								5%
Rating for Criteria Class 2:		2									30%

Criteria Class 3

Property	1	2	3	4	5	6	7	8	9	10	weight (appr.)
Architecture/type of construction					5						7%
Fitout				4							3%
Structual condition		2									30%
Plot situation		2									50%
Ecological sustainability				4							3%
Profitability of the building concept					5						7%
Rating for Criteria Class 3:			3								20%

Criteria Class 4

Quality of the Property Cash Flow	1	2	3	4	5	6	7	8	9	10	weight (appr.)
Tenant/occupier situation			3								10%
Rental growth potential/value growth potential							7				15%
Letting prospects/fungibility		2									60%
Vacancy/letting situation					5						5%
Recoverable and non-recoverable operation expenses			3								5%
Usability by third parties and/or alternative use			3								5%
Rating for Criteria Class 4:			3								30%

	Excellent	Very good	Good	Slightly above average	Average	Slightly below average	Mediocre	Poor	Very poor	Disastrous	Weighting
	1	2	3	4	5	6	7	8	9	10	
Criteria Class 1 – Market			3								20%
Criteria Class 2 – Location		2									30%
Criteria Class 3 – Property			3								30%
Criteria Class 4 – Quality of the property cash flow			3								20%
Overall rating for the completed property			3								100%

As can be seen, the strengths of the PaM model are certainly due to the fact that it's not only easy to understand and to use, but also, its high degree of standardization allows it to be used in different markets/countries, thus ensuring an harmonized real estate rating system.

In summary, the PaM is therefore an important tool that can perform many functions in the evaluation and analysis of the property. Such tools allow the valuers to avoid having to provide quantitative valuations about their national market, but these evaluations may be detected by TEGoVA based on a detailed analysis of data provided by national professional associations. The development of such a real estate rating system will ensure a harmonized evaluation for Europe in each national market.

Chapter 5

The Collateral Value in the Regulatory Framework

Index

The previous section analysed in details the main approaches, developed by the industry and implemented by the regulators, to evaluate a real estate. The analysis, after explaining the three valuation methods, moved from the awareness of the weaknesses of valuating the real estate collateral at its (historic) market value, and then focused its attention on a more prudential value of it (i.e. the mortgage lending value) and on a newly developed standardised real estate rating system.

This chapter intends to clarify the placing of such real estate evaluating methods into the Basel regulatory framework. In particular, given the efforts made up by banks in considering new and more prudential valuating schemes, the following analysis will seek for possible connections between the use of loss data and necessary forward-looking adjustments required in the current regulatory framework.

5.1 The loss data approach

Basel II requires IRB-banks to estimate the LGD using a realised losses dataset. The LGD estimation process shown in the regulatory framework is therefore the following:

I. Building the reference dataset (RDS);
II. Assigning an economic loss to each defaulted facility;
III. Analysing the realised LGDs empirical distribution;
IV. Assign an LGD to a particular facility.

When building the RDS, banks can use both internal and external data (including those data shared with other parties not belonging to the same banking group). In any case, they must demonstrate that the estimates are representative of long-term experience and that the economic and market conditions that underlie the dataset are consistent with the current and future situation. The number of exposures in the sample and the time taken for the quantification of risk parameters must be sufficient to ensure the accuracy and robustness of the estimates.

Moreover, the RDS must be representative of the portfolio of the bank and has to be grounded on a historical depth (observation period) that provides indications on the loss rates in the different phases of the economic cycle. The Basel regulation requires banks to deal with a data basis that can ideally cover at least one economic cycle, and thus it must be no shorter than 7 years for sovereign, bank, and corporate exposures or 5 years for retail exposures, respectively.

Figure 5.1 Loss data based process.

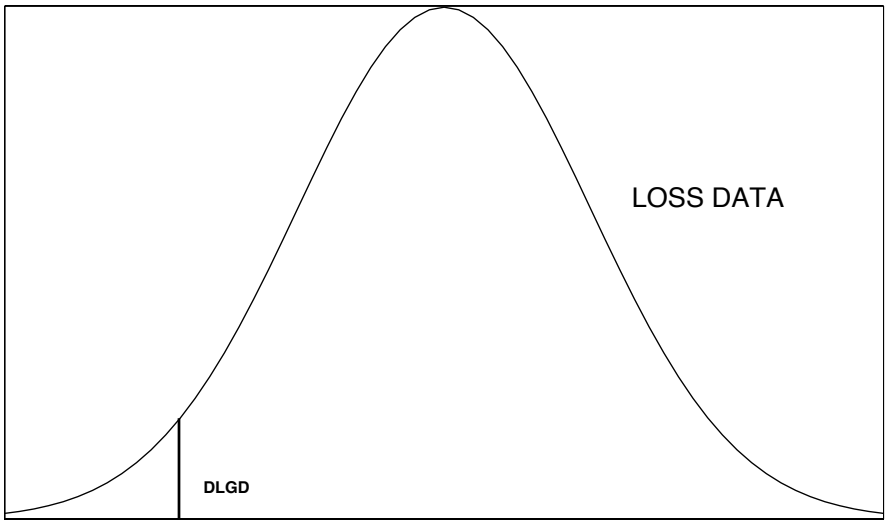
Given the loss data distribution, the next step in the process is to assign an LGD to a particular facility. During this phase, the Basel regulation appears to be quite clear:

"*A bank must estimate an LGD for each facility that aims to reflect economic downturn conditions where necessary to capture the relevant risks. This LGD cannot be less than the long-run default-weighted average loss rate given default calculated based on the average economic loss of all observed defaults within the data source for that type of facility*"[51].

Conceptually, the above requirement imposes banks to infer LGD estimates from the left tail of a loss data distribution; this estimate thus coincides with the already cited downturn LGD.

[51] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.108

Chart 5.1 Downturn LGD (DLGD). (Own chart)



From this first analysis inside the Basel regulatory framework, the concept of collateral value is presented as a variable (RR) that never enters the LGD computation directly, and never has a direct autonomy in the LGD formula since the very regulation imposes to construct the LGD starting from loss data: "*LGD estimates must be grounded in historical recovery rates and, when applicable, must not solely be based on the collateral's estimated market value*"[52].

5.2 Additional required analyses: forward-looking information and stress analysis

The analysis within the current regulatory framework can not and could not stop here. Given the fact that in any case, as a starting point to build LGD estimates, banks must refer mainly at a historic data loss, the regulation, for one of its key principles, is based on the consideration that the dataset available to banks are never exhaustive and fully informative.

[52] Ibidem.

In the advanced IRB approach, the use of the downturn LGD, as well as it has been exposed up to now, brings with it certain limitations arising from the fact that such estimates of the LGD are purely backward-looking. Such measure in fact, being estimated internally by each bank on the basis of time series, can lead to incorrect, unrealistic or not applicable results. The main difficulty when using such approach is the low availability of data about past losses and hence the lack of segmentation capabilities it comes with.

Moreover, the estimate of the downturn LGD is further complicated by the fact that, by construction, it must be estimated on the basis of realized losses in a downturn period. This, as well as causing a further lack of data in the already limited dataset information, can lead to estimates that are inconsistent with the possible future scenarios. It's in fact not possible to assume, without any doubt, that economic conditions will have future negative impacts and characteristics that will be equal to those experienced in the past. In addition, the set of available information relating to the periods of crisis in the past could be very limited and not able to cover the various situations that might arise in the future and thus it may not be sufficient to compute a reliable estimate.

In this regard, one needs only to consider the current crisis that the Italian real estate market is experiencing during these years. The current adverse situation of the prices of the property has never been experienced in the past: therefore, any estimate based on past loss data will be likely to produce biased (underestimated) estimates of LGD.

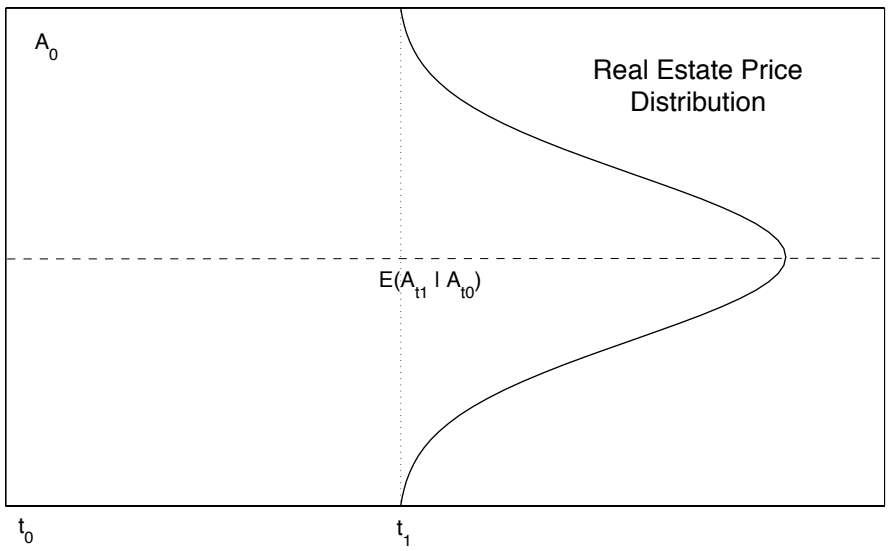
The regulation recognizes the limitations that estimates based on time series may lead, and it therefore underlines the importance of considering additional information to adjust these estimates. In particular, the Basel Committee, in a publication which provides a guide to the interpretation of one important paragraph of the regulatory framework, states that: "*The purpose of this requirement* [estimating downturn LGD] *is to ensure that LGD parameters will embed forward-looking forecasts of recovery rates on exposures that default*

during conditions where credit losses are expected to be substantially higher than average"[53].

The above requirement therefore allows the following discussion to look at LGD estimate in an opposite way with respect to what has been said until now. In particular, this requirement seems to give banks the faculty to "turn" the procedure, to not directly deal with realized losses, but to start the estimating procedure from the value of the collateral and thus obtaining the loss as the second step of the evaluating process. Within this approach, the real estate collateral valuation thus finds direct application in the LGD estimation.

In particular, an assessment of the risk profile of a property (i.e. the real estate valuation) can be considered as the stochastic version of the recovery rate.

Chart 5.2 Expected recovery rate. (Own chart).



Therefore, considering the real estate valuation phase, the estimate of LGD (within the IRB approach) can be computed startig from the collateral value:

$$Loss = EAD - Collateral\ Value$$

[53] Bank for International Settlements, Basel Committee on Banking Supervision, *Guidance on Paragraph 468 of the Framework Document*, July 2005, p.2.

Such losses estimation approach thus implies the presence of a random variable (RR) within the LGD computation formula. The latter variable will in turn be a random variable, thus requiring developing a model for its estimation. The need to incorporate forward-looking components in the LGD estimate, therefore, allows entering the previously mentioned prudential and long-term valuations of the real estate collateral (i.e. the property valuation based on the mortgage lending value). In particular, the real estate collateral value distribution, designed in terms of MLV, allows defining the stress scenario on which the required analysis is based.

In order to reduce the limits of historical data and to improve the effectiveness of models often based on simplifying assumptions, Basel regulations require banks to embed them with stress test analysis: "*An IRB bank must have in place sound stress testing processes for use in the assessment of capital adequacy. Stress testing must involve identifying possible events or future changes in economic conditions that could have unfavourable effects on a bank's credit exposures and assessment of the bank's ability to withstand such changes. Examples of scenarios that could be used are (i) economic or industry downturns; (ii) market-risk events; and (iii) liquidity conditions*"[54].

Robust stress test scenarios simulate the most likely of the unlikely bad economic outcomes over a specified future horizon. Such scenario is, in terms of the real estate collateral value, conceptually close to the definition of MLV.

As it has previously defined, one can look at the MLV considering it as a forward-looking version of the downturn LGD estimated on historical data. It is, in practical terms, a measure that is convertible (when the default occurs) into a prudential LGD calculated ex-ante. Conceptually, it is possible to derive a value of the downturn LGD from the MLV calculated in t_0. This measure is simply obtained as:

[54] Bank for International Settlements, Basel Committee on Banking Supervision, *International Convergence of Capital measurement and Capital Standards: A Revised Framework*, June 2004, p.101

$$LGD = 1 - \frac{MLV_{t_0} - Costs}{EAD_{t_1}}$$

Therefore, in any time $(t_0, \dots, t_1)$ it is possible to estimate a value of LGD that is suitable for a recession phase of the business cycle. Following this approach, using an appropriate value that is valid until t_1, that is, the instant at which the insolvency is likely to occur, the bank can compute an estimate of downturn LGD that is valid in proximity of the default date. What matters, in this approach, is in fact what one would expect to lose on average in the event of insolvency of the debtor and this, in a forward-looking viewpoint, depends exclusively on the future value of the property as collateral.

5.3 Monitoring collateral value

In this chapter, the dissertation, as it has been exposed till now, aimed at contextualizing the real estate valuation sphere within the current regulatory framework. In particular, the previous analysis focused on regulatory/managerial processes regarding exclusively IRB-banks' activity.

However, banks belonging to the standardised approach are required not only to valuate the property at the mortgage origination date, but also to monitor the value of the real estate collateral on a frequent basis and at a minimum once every year for commercial properties and once every three years for residential properties. Moreover, the regulation requires more frequent monitorings when the market is subject to significant changes in conditions.

The rationale behind this requirement is very intuitive: the fact that banks using the standardised approach, when computing the amount of regulatory capital, are not allowed to deal with own estimates of LGD based on several internal models, can't lead to the conclusion that the value of the property-collateral doesn't have to be monitored and updated on a frequent basis in order to identify possible relevant losses in value, and hence to verify the

consequent likely need for a revaluation. Therefore the above requirement, in addition to being of vital importance for the effectiveness of the entire credit process, it results likewise important in valuating a facility's sustainability in the bank balance sheet.

The collateral monitoring activity belongs to a very important part of the banking activity: the collateral management. The latter's aim is to ensure that proper records of the collateral are kept, and the collateral is regularly revalued/reappraised and monitored against the credit exposure. The collateral management activity can thus be divided in two broad streams of operations:

1. Records collection: in which all the collateral information are registered (such as the date of valuation, the valuation method used, the assumptions on which the valuation result was built, the description of the collateral, a description of the source od information, etc.);
2. Reappraisal: every collateral needs in fact to be revalued and monitored; as the regulation sets, such monitorings depend on the type of the collateral and on the market condition (market volatility, environmental contamination, overall market trends, etc.).

The regulation doesn't set any method of monitoring the value of the property, however, on practice, such monitorings are usually committed to external data providers, which frequently update market values of commercial and residential properties by comparing it with sectorial/geographic indices.

Now, once obtained an updated value of the property, it is necessary to include such information into a process framework that can produce useful information for an analysis of the property value with respect to the real estate market to which it belongs.

At this purpose, the previously exposed market and property rating system would find its best application. Using the rating result provided by the system,

it would be possible to establish, to a more differentiated degree, whether the specific property is developing in its respective market better or worse than the market average on account of its location-property-and cash flow-related attributes. Therefore, the output of a well-performed monitoring activity (i.e. the updated market value) has to be benchmarked in order to give the bank useful information to contextualize realised drops in the collateral value. In particular, with a given real estate benchmark value, the bank can set threshold-variations to mark negative variations of the real estate collateral as "normal" and negative variations as "critical".

Conclusions

This work tried to investigate a topic of great interest in the banking practice: the importance of performing an accurate real estate collateral valuation.

As the analysis showed, the use of a risk measure rather than another one can entail considerable differences in terms of capital requirements.

The above analysis has been developed by considering the topic of this work from two distinct branches: the regulatory viewpoint and the real estate valuations techniques.

The first part of the work highlighted the main requirements that the Basel regulation imposes to banks when computing the regulatory capital. In particular, in the first part the analysis focused on the different methods to compute the most important variable in the credit risk capital formula: the loss given default. The analysis within the objective methods set for IRB-banks to compute the LGD highlighted how such methods are purely backward-looking, and how such feature can lead to biased estimates.

In particular it has been highlighted the limits arising from a real estate valuation based on its market value. The latter is in fact a valid value only when it is detected (i.e. at loan origination) and does not take into account the possible evolution of prices in the future. However, it is clear in theory that the value of the collateral that is relevant for the calculation of economic capital is the amount that will be recovered in the event of the counterparty's default. In a typical mortgage agreement (from 10 to 30 years long), this value is subject to wide variations and deviations from its historical value, determined at the time of loan origination. In this regard the model performed by Qi and Yang (2008) proved the high level of significance provided by an updated version of the loan-to-value.

The need to use a prudential value that is able to be a valid parameter in the long term led to the definition of the concept of mortgage lending value. The use of the MLV, a forward-looking measure that considers only the possible

future evolution of the value of the property, leads to more consistent and realistic results than those obtained considering the market value. In fact, this measure has the advantage of being at the same time prudential and perspective. Overlooking the market value and the past experiences, the MLV allows obtaining an estimate of the economic capital that is more accurate and more reliable. In this regard, the development of more harmonized and standardised real estate rating systems represents a further headway within this issue.

The third part of the work aimed at analysing the connections between the developments made in the real estate valuation techniques and the banking regulation. In particular, it has been showed how the regulation requires banks to combine a computation approach based on loss data with an accurate collateral management. The regulation requires in fact banks not only to adjust the realised losses dataset by performing stress analysis (and hence by considering the MLV as a reference parameter to define the stress scenario), but also to embed forward-looking information in the LGD computation.

The analysis performed in this work let to understand how valuing collateral accurately ensures a more enhanced form of credit risk management. An inaccurate collateral valuation process means that the estimate for the recovery rate is out of whack from reality, as a lower amount is recovered at default as well as a longer time is taken to recover the amount. Banks should, therefore, consider using the MLV as a measure of the value of real estate collateral in order to perform an estimate of the economic capital more accurate and more realistic.

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