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# **Managing Banking Risk with the Risk Appetite Framework: a Quantitative Model for the Italian Banking System**

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## **ABSTRACT**

We analyse the structural aspects of the banking Risk Appetite Framework (RAF), suggesting an operational application in the light of the detailed recommendations of the banking supervisors. We develop a quantitative approach that could be used to adapt to the requirements of these regulations and that might be useful for management purposes. This approach is empirically applied to the balance sheets of the Italian banking system. Our findings show that the Italian banks are generally underexposed in terms of credit risk and market risk, so there is room for shifting the risk profiles towards higher thresholds with a view to improving the credit institutions' profitability while keeping their RAF consistent with the regulatory bodies' requirements. The quantitative model can be applied effectively to different types of risk, making the necessary adjustments according to the particular features of the profile being examined.

**KEYWORDS:** Banks; Risk Appetite Framework; Risk Management

**JEL CODE:** G20; G21; C43

## **1. INTRODUCTION**

In 2013 the Financial Stability Board (FSB) published three reports on the topic of risk governance, the first of a general nature<sup>1</sup>, the other two on the founding principles of the so-called “Risk Appetite Framework” (RAF)<sup>2</sup>. The last of the three documents should serve on the one hand as a tool for an exchange of ideas and debate amongst financial institutions (and particularly SIFIs – Systemically Important Financial Institutions) and supervisors; on the other it should provide the former with an easy-to-use tool to support their activities for monitoring and controlling the various classes of risk to which they are exposed. In this setting, the FSB developed a sort of guideline - in cooperation with other standard setters - concerning the key elements that a RAF should contain in order to be effective.

Given the novel content of the above-mentioned requirements and the considerable impact they should have on how banks are managed, this paper further analyses the structural aspects of the RAF, suggesting a possible practical application in the light of the detailed recommendations of the supervisors. After some introductory comments to examine the dictates of the currently applicable regulations and identify some of the associated problems (section 2), we propose an approach that could be used to adapt to the requirements of these regulations, that might be useful for management purposes too (section 3). This approach is then empirically applied to the balance sheets of a number of Italian banking groups (section 4). The last part of the paper (section 5) adds a few considerations prompted by the results obtained.

## **2. THE FINANCIAL STABILITY BOARD’S RULES**

The outbreak of the financial crisis has obliged operators, researchers and regulators to see the need for banks to formalize an organic reference framework for their global risk management and its timely monitoring and control, in order to avoid them taking risks incompatible with their capacity to absorb and manage them<sup>3</sup>. The FSB has responded to this need by drawing up a set of principles that banks should follow in developing their RAF and national supervisors have been asked to urge financial intermediaries to adopt the proposed guidelines according to criteria of proportionality. The FSB’s document was published in November 2013 and is organized basically in two parts, the first containing key definitions and the second describing the roles and responsibilities of

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<sup>1</sup> See FSB (2013a).

<sup>2</sup> See FSB (2011; 2013b, c).

<sup>3</sup> The chronological order of the main documents providing recommendations on the advisability of banks developing a RAF was as follows: Counterparty Risk Management Policy Group (2008); BCBS (2009); Senior Supervisors Group (2010); BCBS (2011); FSB (2013a); FSB (2013c); FSB (2014); EBA (2014).

businesses' various management functions. The first section thus defines the following expressions (FSB, 2013b, pp. 2-3):

- “*risk appetite framework*: the overall approach, including policies, processes, controls and systems through which risk appetite is established, communicated and monitored. It includes a risk appetite statement, risk limits and an outline of the roles and responsibilities of those overseeing the implementation and monitoring of the RAF. The RAF should consider material risks to the financial institution, as well as to the institution’s reputation vis-à-vis policyholders, depositors, investors and customers. The RAF aligns with the institution’s strategy;
- *risk appetite statement* (from now on “RAS”): the articulation in written form of the aggregate level and types of risk that a financial institution is willing to accept, or to avoid, in order to achieve its business objectives. It includes a qualitative statement as well as quantitative measures expressed relative to earnings, capital, risk measures, liquidity and other relevant measures, as appropriate. It should also address more difficult to quantify risks such as reputation and conduct risk, as well as money laundering and unethical practices;
- *risk capacity*: the maximum level of risk the financial institution can assume given its current level of resources before breaching constraints determined by regulatory capital and liquidity needs, the operational environment (eg technical infrastructure, risk management capabilities, expertise) and obligations, also from a conduct perspective, to depositors, policyholders, shareholders, fixed income investors, as well as other customers and stakeholders;
- *risk appetite*: the aggregate level and types of risk a financial institution is willing to assume within its risk capacity to achieve its strategic objectives and business plan;
- *risk limits*: quantitative measures based on forward looking assumptions that allocate the financial institution’s aggregate risk appetite statement (eg measure of loss or negative events) to business lines, legal entities as relevant, specific risk categories, concentrations and, as appropriate, other levels;
- *risk profile*: point in time assessment of the financial institution’s gross and, as appropriate, net risk exposures (after taking into account mitigants) aggregated within and across each relevant risk category based on forward-looking assumptions”.

Although these definitions are in line with the sector’s standards<sup>4</sup>, they prompt a few considerations concerning their content. Generally speaking, there is no clearly stated relationship between the parameters that the RAF should consider as listed below, in the sense of a hierarchy or their dependence on one another. The document only mentions the comparison that should be drawn on a

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<sup>4</sup> See ECRS – EMEA Centre for Regulatory Strategy (2013), p. 6-7; Bank Governance Leadership Network (2013), p. 5-6.

continuous and iterative basis between risk profile and risk appetite<sup>5</sup>. The most important issue, however, concerns the document's failure to explicitly define the concept of *risk tolerance*, a term used in the footnotes as if it were synonymous with *risk appetite* and *risk limits*. It is worth emphasizing that this notion has not been used systematically (and therefore properly defined) by authorities or researchers<sup>6</sup>. Risk tolerance is nonetheless a necessary and useful parameter in defining risk monitoring and control methods and should therefore be included in the RAF. Risk tolerance can be identified as the difference existing between maximum assumable risk and risk appetite<sup>7</sup>, so it could be expressed in terms of the maximum allowable deviation from an organization's risk appetite<sup>8</sup>.

It has already been underscored that the RAS represents a way of making known in written form, to the whole business organization and to all stakeholders in general, what risks the intermediary intends to assume or avoid under normal or stressful market conditions, the corresponding limits it has adopted and some quantitative and qualitative measures of said risks<sup>9</sup>. The content of the RAS should be adapted appropriately as a function of the class of operators to which it refers. Separate documents need to be drafted, depending on whether the RAS is intended for the business organization<sup>10</sup>, or for its various categories of stakeholders (clients, depositors, etc.), because they need different types and amounts of information and they have different levels of technical expertise.

The proposed definition of *risk capacity* does contain a sort of hierarchy, requiring compliance first with regulatory constraints, then with limits relating to the operational environment and finally with obligations to depositors, regulators, shareholders, bondholders and so on.<sup>11</sup> While the first condition is an easily-identifiable perimeter and various statistical measures can be used to quantify it in relation to subsequent "boundaries" within which to contain an organization's risk capacity, there are some doubts as to their measurability and suitability for representing a consistent parameter to take into account when establishing the maximum level of risk assumable. As for the

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<sup>5</sup> See FSB (2013c), p. 4.

<sup>6</sup> This is true, for instance, of the FSB and the Senior Supervisors Group. The concept of *risk tolerance* was defined explicitly, however, in the following works: KPMG (2008), p. 8; The Institute of Risk Management (2011), p. 14; COSO (2012), p. 4; Protiviti (2012b), p. 8-10. It is worth adding that risk tolerance was included among the principles of *risk management* by the CEBS (2010).

<sup>7</sup> Analytically:  $RT = RC - RA$  (where RT identifies the *risk tolerance*; RC identifies the *risk capacity* and RA identifies the *risk appetite*).

<sup>8</sup> According to the supervisory rules established by the Bank of Italy. See Bank of Italy, *Circular no. 263 of 27 December 2006, 15° Update*, 2<sup>nd</sup> July 2013.

<sup>9</sup> On the recommended structure and content of the RAS, see: FSB (2013c), p. 5-6; Bank Governance Leadership Network (2013), p. 6-7; Institute of International Finance (2011), p. 24-25; GARP – Global Association of Risk Professionals (2013), p. 14-15.

<sup>10</sup> This aspect is considered significant for the success of the introduction of the RAF in business organizations (called *cascading down*). On this topic, see: COSO (2012), p. 19; Price Waterhouse Coopers (2009), p. 6; Institute of International Finance (2011), p. 24-26.

<sup>11</sup> On the role of stakeholders in the processes for defining the RAF, see: Cremonino (2011), p. 3-5.

most appropriate risk appetite, this must be stated for single types of risk as well as in overall terms. There are no specifications regarding how to measure the correlations between the risks, ie methods for their calibration or recomposition in relation to the continuous variations that might occur in their volume, which could temporarily implicate violations of certain limits<sup>12</sup>. Partly in the light of these considerations, we feel that this parameter should be expressed in terms of a range of values rather than a single figure.

The guidelines establish that risk appetite be articulated by adopting operational limits (*risk limits*) for each type of risk and business unit and for different legal entities, counterparty client categories, product lines, or other types of cluster of relevance for a given intermediary. There is no mention of the adoption of any so-called *early warning system*, ie indicators to use when nearing any risk limits to enable the timely planning and proper implementation of the most suitable management initiatives to return to the desired risk-taking levels<sup>13</sup>. Finally, there is the concept of *risk profile*, or the intermediary's exposure to risk, which is measured in instantaneous terms, using gross and net figures as appropriate. When it comes to recording this parameter, it is emphasized that currently-used information technology (IT) systems are sometimes still partially inadequate for the purpose of promptly and accurately quantifying an organization's risk profile, especially at banking group level, for different business lines and for different legal entities<sup>14</sup>.

The second part of the principles developed by the FSB concerns the roles and responsibilities for ensuring the adoption of the RAF, not only by top management, but also by managers of the various business lines and different legal entities. It also establishes what the Internal Audit function has to do. Generally speaking, the Board of Directors is responsible for approving the RAF - developed in cooperation with the CEO, CRO and CFO. Consistency must be assured between its content and the predictions of the short- and medium- to long-term business strategy, the business & capital plans, the organization's risk capacity and the compensation programs. The chief officers are primarily responsible for transposing the content of the RAF to the company structures; for instance, they jointly approve the risk limits for the business lines; they ensure that the business lines have appropriate processes in place for continually monitoring the corresponding risk profile; they establish processes for facilitating the metabolization of the concepts of risk appetite and risk profile in the organization's risk culture; and so on. It is essential for the managers of the business lines and legal entities to incorporate the content of the RAS and the risk limits in their daily risk management activities. To do so, they need to cooperate with the CRO and with the risk management function. Finally, the main duties of the Internal Audit function are established, which

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<sup>12</sup> This aspect was emphasized by the Institute of International Finance in their comments on the FSB's document (2013b). See Institute of International Finance (2013).

<sup>13</sup> The importance of including an early warning system (EWS) in the structural layout of the RAF also emerges from the following works (among others): ABI-Bain & Company (2011). p. 47-49; McNish *et al.* (2013), p. 2.

<sup>14</sup> The Basel Committee has recently discussed this topic. See BCBS (2013).

include a number of controls of various kinds, eg identifying whether violations of the risk limits have been effectively identified, authorized and reported to the specified levels of competence; reporting to the top management on any weaknesses in the RAF; and so on.

### **3. A PRACTICAL APPLICATION OF THE RAF**

The effects of introducing a quantitative methodology for defining and articulating a RAF that complies with the regulations depend largely on whether a given financial institution has certain prerequisites, ie a reference infrastructure that can favor the onset and positive deployment of the effects deriving from the adoption of this new regulatory approach. The framework should be founded on the following elements:

- the presence of an adequate risk culture;
- the existence of a significant interdependence between a business's risk management and other processes (strategic planning, ICAAP [Internal Capital Adequacy Assessment Process], organization, control systems, etc.);
- the use of effective methods for internal communication and cooperation;
- the use of sufficiently advanced IT systems.

Concerning the first element, it is important to bear in mind that the term *risk culture* generally refers to the behavior of people operating within the organization in the light of how they identify, understand and manage current and prospective risks<sup>15</sup>. A consolidated risk-oriented culture should facilitate a rapid and effective implementation of the RAF, but this is probably not very common among intermediaries, especially when they are not very large. It is consequently hardly surprising that numerous researchers and institutional bodies have been emphasizing the importance of promoting, developing and circulating a risk culture to all levels for some time now<sup>16</sup>. In particular, the FSB document assigns the task of integrating the new parameters in the business's risk culture to the CEO and CRO.

From the practical standpoint, the successful integration of the content of the RAF in the bank's day-to-day management presumably depends largely on whether there are already well-established interrelations between governance and risk management activities, ie between the risk management function and other company processes such as strategic-operational planning, ICAAP implementation, the conduction of single business lines and so on. What we wish to emphasize here is that any barriers (be they functions, divisions, or of any other nature) to an enterprise's risk

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<sup>15</sup> See Ashby *et al.* (2012), p. 19-21.

<sup>16</sup> The importance of a risk culture in facilitating the introduction of the RAF in banks has been mentioned in numerous works, both of an institutional nature and in the academic setting. Among others, see: Committee of European Banking Supervision (2010), pp. 2-3; Cortez (2011), pp. 48-51.

management activities, or the latter's limited influence on its overall governance, may represent significant obstacles to the practical usage of the output deriving from the adoption of the RAF<sup>17</sup>.

After outlining the framework of an organization's risk objectives, it is important for them to be reviewed periodically to adapt them to any changes to their strategy and/or market variations. This activity must presumably be conducted with a shared effort of collaboration and communication involving the Board of Directors, the general management, or so-called *C-Suite* (the Chief Executive Officer, Chief Financial Officer and Chief Risk Officer) and their respective functions, the managers of the different business lines and the whole operational structure. These parties need to develop an iterative process of communication, feedback collection and reporting and a shared commitment to preventing any excessive risk-taking and to rapidly and effectively managing contingencies, improving their ability to identify, analyze and solve operational problems relating to risk monitoring and control. A consolidated aptitude for developing synergies between the various company organs and functions would contribute to the proper definition and gradual fine-tuning of the content of the RAF<sup>18</sup>.

The feasibility of precisely identifying the risks assumed by an organization with a level of detail sufficient to ensure their effective monitoring demands an IT infrastructure - or *Management Information System* (MIS) – adequately focused in order to capture these profiles (intrinsic in the various activities undertaken), not only to satisfy the regulators, but also for the management's purposes. The major international banks' experiences in this area still seem to be partial and rather limited<sup>19</sup>. The choices that managements must make in this setting are likely to represent a far from negligible challenge, in terms of both economic outlay and regulatory commitment<sup>20</sup>, the outcome of which will be fundamentally important to their effective use of the principles of risk appetite schematics and frameworks.

The different constructs for which we can schematically illustrate the more specifically quantitative section of the RAF - ie the RAS - with reference to a particular type of risk, are shown in the following figure (Figure 1):

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<sup>17</sup> The term *enterprise-wide risk management* was coined specifically to emphasize the importance of integrating risk management with the other business activities. For a seminal work on the topic, see: Deloach (2000). The matter was subsequently developed in operational terms by the COSO (2004).

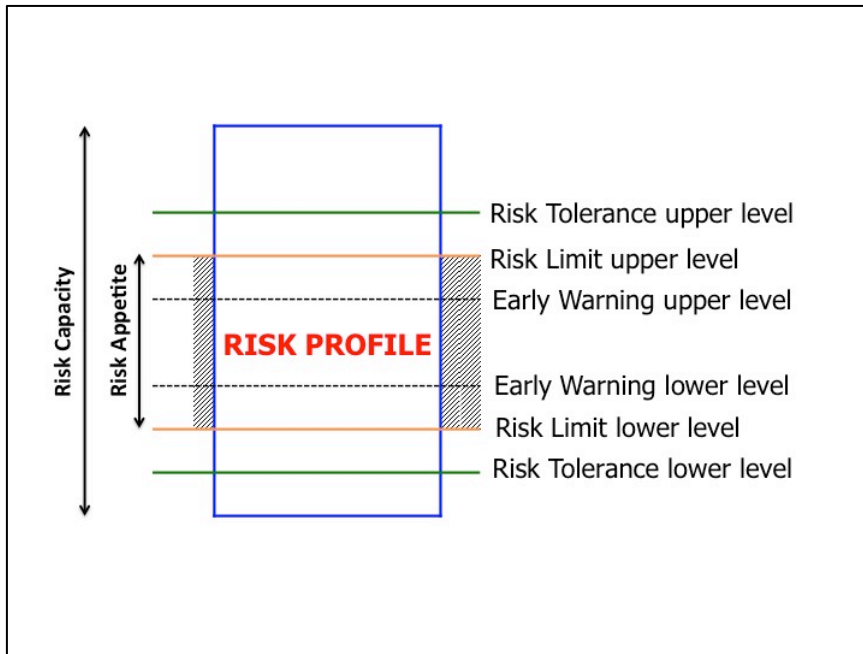
<sup>18</sup> See Protiviti (2012a), pp. 2–3; KPMG (2011), p. 7; Guorguiev and Gualerzi (2013), pp. 38–41.

<sup>19</sup> Bank Governance Leadership Network (2013), pp. 8–9.

<sup>20</sup> Global systemically important banks (G-SIBs) have been set a deadline, in 2016, by which time they must comply with the standards according to the so-called *risk data aggregation* and *risk reporting* principles. See BCBS (2013), p. 16.



**Figure 1: RAS implementation scheme**



Source: authors' adaptation from ECRS-EMEA (2013), p. 8.

Figure 1 contains the definitions proposed by the FSB, integrated with appropriate additional parameters. Both tolerance thresholds and the early warning values are used and paired upper and lower values are provided in both cases, in the same way as for the risk limits. This is necessary because the intermediary must monitor instances not only of excessive risk-taking (upper level), but also - given its established risk-return objectives – of violations of the opposite thresholds (lower limits) that could prevent it from achieving its expected income results. The ideal position of the risk profile would come in between the two early warning thresholds<sup>21</sup>. It is advisable to distinguish here between the actual risk profile and the *target* risk profile<sup>22</sup>. While the former may come anywhere within the band defining the risk capacity (or even outside it in extreme cases), the latter, to be consistent with strategic needs, should come somewhere within the established risk appetite band. Whenever the actual risk profile nears or exceeds the limits or tolerance thresholds, various kinds of action must be taken to adjust it.

The layout shown in the diagram in Figure 1 relies on quantities that should be processed consistently with the metrics used in the internal capital adequacy assessment (ICAAP) process. This means that, in defining risk capacity in relation to a given type of risk, we can use the concept of “capital”, a portion of which (ie its intermediate levels) can be used to express the risk tolerance and risk limits. To measure risk appetite, we should consider the objective “internal capital” (in

<sup>21</sup> For these thresholds to be useful, the range of the risk appetite (defined by upper and lower limits) must be sufficiently broad.

<sup>22</sup> Note that the concept of risk profile in this second sense can be made to coincide with the desired level of risk appetite, while the actual risk profile may not necessarily coincide with the bank's real propensity to take risks.

absolute terms or as a percentage of the “capital” available), while the risk profile could be expressed by the “internal capital” actually allocated<sup>23</sup>. This leaves us with the problem of which mechanism to use in deciding reference values for the measurements indicated in the figure and especially for the tolerance threshold and risk limit (and for both aggregates we need to set upper and lower levels). For the first indicator, assuming that it can be reconstructed in terms of a maximum allowable “deviation” from the risk objectives, in its definition we can consider said statistical measure in combination with a dispersion index such as the coefficient of variation, the variance and the standard deviation. Given their relative characteristics, we opted for the last of these<sup>24</sup>. Based on the mean value of the risk in question and its volatility, we identified upper and lower tolerance levels by adding/subtracting the desired multiple of the latter to/from the former. To delineate the range of variation for the risk appetite, ie to establish its operational limits<sup>25</sup>, the two previously-defined tolerance thresholds were correlated with the aggregate figure expressing the given actual risk profile in question (which was also distributed between an upper and a lower value).

The RAF subsequently developed from the RAS (prepared using the proposed parameters) would not only be an effective tool for risk control purposes; with a few simple manipulations, it could also become a useful working reference for the company’s global risk governance. This is confirmed by the fact that one interesting approach involves assessing the positioning of certain key performance indicators (KPIs) aligned with the objectives expressed by the stakeholders in relation to the risk appetite and tolerance thresholds (Hyde *et al.*, 2009)<sup>26</sup>.

#### **4. IMPLEMENTATION OF A QUANTITATIVE MODEL FOR THE RAS**

##### *Method*

The regulations establish that the RAF should indicate all the types of risk the bank intends to assume, identified from among those of the first and second pillars and use them for the purposes of

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<sup>23</sup> The meanings of the definitions between inverted commas are drawn from the provisions of the regulations for preparing the ICAAP. With a few adjustments, the proposed reconciliation can be found in: A.B.I.–Bain & Company (2011), p. 8. In some risk categories (eg liquidity), reference to “capital” or “overall capital” becomes insignificant in the definition of the related risk capacity and consequently of the tolerance threshold and risk limits: this is confirmed by further problems subsequently encountered when aggregating between risks expressed using different methods.

<sup>24</sup> An alternative solution might be subjectively to define a maximum percentage deviation from the risk appetite limit established in the light of the Board’s expectations. Choosing a dual tolerance threshold entails using measures of variability capable of providing indications of the downside risk and upside potential type.

<sup>25</sup> For the two early warning levels, we might hypothetically consider an arbitrary definition, related to subjective assessments.

<sup>26</sup> On the feasibility of using the approach adopted with the introduction of the RAF for management purposes, see also Corbellini (2013), pp. 70–76.

preparing the ICAAP<sup>27</sup>. The RAF also demands the drafting of a RAS<sup>28</sup>: among other things, this document provides a summary of the quantitative measures of the risk that a financial institution is willing to accept, or that it intends to limit, for the purposes of achieving its business objectives.

In this setting, the present work proposes a quantitative model for drafting a RAS that was applied to the financial statements of 15 Italian banking groups for the period from 2008 to 2013 ( $n = 6$ ). The resulting RAS were subsequently analyzed to obtain a rough outline of a RAF suitable for use by an internal analyst, but also (and more importantly) by an external analyst interested in knowing the position of financial institutions in terms of their propensity to accept or avoid the main types of risk to which they are exposed. We thus propose to overcome several already-identified shortcomings that are: normative (failure to provide in Pillar III of Basel II for the information deriving from the ICAAP to be communicated to the market); methodological (the lack of a quantitative model for reference in constructing a RAF); and academic (researchers' inadequate attention to the topic of banks' risk appetite).

The model used to draft the RAS considers three risks regulated as part of Pillar I of Basel II, ie the counterparty and credit risk ( $j = 1$ ); the operational risk ( $j = 2$ ); and the market risk ( $j = 3$ ). For these three types of risk, we consider the specific minimum capital requirements (*MCR*) that each bank must meet according to the dictates of Pillar I and we examine how they correlate with their Tier 1 and regulatory capital. For each bank, we also consider the minimum total capital requirements (*TCR*), calculated as the sum of the capital requirements for each type of risk considered. The *TCR* are likewise placed in relation to Tier 1 and regulatory capital, identifying the overall "weight" of the risks vis-à-vis the bank's capital. We thus aim to underscore the influence of the minimum capital requirements on the regulatory capital by specifying tolerance thresholds within which the credit institutions examined should keep these weights. Risk appetite statements drafted in this way would serve the purpose of identifying the banks' current situation in relation to the "consumption" of their capital by the three types of risk considered.

In detail, the variables comprising the RAS (see Figure 1) are constructed as follows:

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<sup>27</sup> For some risk categories (eg reputation), but also for all the so-called "pure" risks in general, it is hard to imagine a bank having a particular "appetite", since no economic returns can derive from accepting such risks. In such cases, unless the risks are "quantifiable", it would be better to define a generic "tolerance", expressed in mainly qualitative terms.

<sup>28</sup> See FSB (2013c). p. 2.

$$\begin{aligned}
RTu_{i,j} &= \mu \left[ \frac{MCR_{i,j}}{Tier1_i} \right] + \sigma \left[ \frac{MCR_{i,j}}{Tier1_i} \right] \\
RTL_{i,j} &= \mu \left[ \frac{MCR_{i,j}}{Tier1_i} \right] - \sigma \left[ \frac{MCR_{i,j}}{Tier1_i} \right]
\end{aligned} \tag{1}^{29}$$

where

$RTu_{i,j};(RTL_{i,j})$  = Risk Tolerance upper level (lower level) of the  $i$ -th bank with respect to the  $j$ -th risk, with  $i = 1-15$  and  $j = 1-3$ ;

$\mu \left[ \frac{MCR_{i,j}}{Tier1_i} \right]$  = mean of the ratio between the Minimum Capital Requirements of the  $i$ -th bank with respect to the  $j$ -th risk ( $MCR_{i,j}$ ) and the Tier 1 (going-concern capital) of the  $i$ -th bank ( $Tier1_i$ ), covering the period 2008-2013 ( $n = 6$ );

$\sigma \left[ \frac{MCR_{i,j}}{Tier1_i} \right]$  = standard deviation of the ratio between the Minimum Capital Requirements of the  $i$ -th bank with respect to the  $j$ -th risk ( $MCR_{i,j}$ ) and the Tier 1 (going-concern capital) of the  $i$ -th bank ( $Tier1_i$ ), covering the period 2008-2013 ( $n = 6$ ).

$$\begin{aligned}
RLu_{i,j} &= \frac{RTu_{i,j} \left[ \frac{MCR_{i,j}}{Tier1_i} \right]}{RTu_i \left[ \frac{MCR_{i,j}}{Tier1_i} \right]} \\
RLl_{i,j} &= \frac{RTL_{i,j} \left[ \frac{MCR_{i,j}}{Tier1_i} \right]}{RTL_i \left[ \frac{MCR_{i,j}}{Tier1_i} \right]}
\end{aligned} \tag{2}^{30}$$

where

$RLu_{i,j};(RLl_{i,j})$  = Risk Limit upper level (lower level) of the  $i$ -th bank with respect to the  $j$ -th risk, with  $i = 1-15$  and  $j = 1-3$ ;

$RTu_{i,j};(RTL_{i,j}) \left[ \frac{MCR_{i,j}}{Tier1_i} \right]$  = Risk Tolerance upper level (lower level) of the Minimum Capital Requirements of the  $i$ -th bank with respect to the  $j$ -th risk, calculated as sum (difference) between the mean of the  $MCR_{i,j}$ , covering the period 2008-2013 ( $n = 6$ ) and the corresponding standard deviation ( $i = 1-15, j = 1-3$ );

<sup>29</sup> Only the tolerance thresholds are estimated by referring to conditions of normal operativity: the corresponding values applicable to situations of stress could be fixed by considering simple percentage increments (eg  $\pm 10\%$  for the upper and lower levels). The formula is applied in the same way to the regulatory capital (RC), substituting Tier1 in the denominator of the ratios.

<sup>30</sup> The risk limits are placed symmetrically in relation to the tolerance thresholds (a different risk propensity could be apparent from differently spaced limits for the tolerance thresholds).

$RTu_i;(RTl_i)[Tier1_i]$  = Risk Tolerance upper level (lower level) of the Tier1 of the  $i$ -th bank calculated as sum (difference) between the mean of the Tier1 covering the period 2008-2013 ( $n = 6$ ) and the corresponding standard deviation ( $i = 1-15$ ).

$$\begin{aligned} EWu_{i,j} &= RLu_{i,j} - 2b.p. \\ EWL_{i,j} &= RLL_{i,j} + 2b.p. \end{aligned} \quad (3)$$

where

$EWu_{i,j}; (EWL_{i,j})$  = Early Warning upper level (lower level) of the  $i$ -th bank with respect to the  $j$ -th risk, with  $i = 1-15$  and  $j = 1-3$ ;

$RLu_{i,j}; (RLL_{i,j})$  = Risk Limit upper level (lower level) of the  $i$ -th bank with respect to the  $j$ -th risk, with  $i = 1-15$  and  $j = 1-3$

2b.p. = two basis points (0.02%)<sup>31</sup>.

By way of example, we provide data for drafting the RAS of one of the banking groups analyzed (Table A.1) in Annex 1.

### Dataset

The model for drafting an ICAAP-compliant RAS was applied to 15 Italian banking groups, comprising the first five groups and all the so-called “large” institutions<sup>32</sup>. This sample has a market share of 69.80% (calculated on the basis of loans to customers). We disregarded credit institutions involved in activities other than those of the “commercial banks” (eg corporate banking, investment banking, etc.) and groups that were in receivership at the time of our analysis.

We considered the consolidated financial statements as at 31 December for the years 2008-2013. For each group, we drafted a RAS with reference to 8 indicators<sup>33</sup>:

- total capital requirements / core capital ( $TCR_i/Tier1_i$ );
- total capital requirements / regulatory capital ( $TCR_i/RC_i$ );
- minimum capital requirements for counterparty and credit risk / core capital ( $MCR_{i,1}/Tier1_i$ );

<sup>31</sup> The early warning values were arbitrarily set at 2 base points below and above the upper and lower risk limits. Different values can be used, based on internal estimates and different types of risk. In fact, there could be a wider margin between the early warning threshold and the risk limits for risk categories coming to bear less on the first pillar. To use the same range for all risks, we could set the early warning threshold at a distance from the risk limit corresponding to a given percentage (eg 30%).

<sup>32</sup> The dimensional groupings classify banking groups and banks belonging to groups or operating independently as “large” if they have total intermediated funds in excess of €21.5 billion. See Bank of Italy (2014), p. 249.

<sup>33</sup> Before drafting the RAS the data obtained for each indicator were normalized to rule out any presence of outliers.

- minimum capital requirements for counterparty and credit risk / regulatory capital ( $MCR_{i,1}/RC_i$ );
- minimum capital requirements for operational risk / core capital ( $MCR_{i,2}/Tier1_i$ );
- minimum capital requirements for operational risk / regulatory capital ( $MCR_{i,2}/RC_i$ );
- minimum capital requirements for market risk / core capital ( $MCR_{i,3}/Tier1_i$ );
- minimum capital requirements for market risk / regulatory capital ( $MCR_{i,3}/RC_i$ ).

The resulting statements were analyzed using a between-groups comparison to establish the RAF<sup>34</sup> for the Italian banking system as a whole. Then a RAF was prepared for the groups revealing critical situations. Below we discuss the main evidence emerging from our analysis of the banking system and of the groups considered most significant. The RAS for each group are attached in Annex 1.

### *Main findings*

#### *Analysis of the banking system*

**Table 1: Descriptive statistics - RAS for the Italian banking system (2008-2013)**

$TCR_{Italy}/Tier1_{Italy}$	Mean	Median	$\sigma$	$\sigma^2$	Max	Min	$\sigma/\sigma_{MAX}$
RTu	108.40%	105.84%	14.486%	2.098%	128.235%	78.536%	0.595
RLu	100.61%	101.04%	13.205%	1.744%	125.992%	75.267%	0.521
EWu	100.59%	101.02%	13.205%	1.744%	125.972%	75.247%	0.521
Ewl	92.87%	93.30%	13.784%	1.900%	123.947%	68.719%	0.503
RLI	92.85%	93.28%	13.784%	1.900%	123.927%	68.699%	0.503
RTI	86.41%	89.08%	14.841%	2.202%	121.750%	64.870%	0.538
Values as at 31.12.2013	89.39%	86.83%	20.698%	4.284%	137.109%	60.477%	0.557
RiskTarget	96.73%	96.93%	13.334%	1.778%	124.960%	72.448%	0.509
RiskGap	7.34%	9.16%	12.728%	1.620%	26.943%	-25.097%	0.505
$TCR_{Italy}/RC_{Italy}$	Mean	Median	$\sigma$	$\sigma^2$	Max	Min	$\sigma/\sigma_{MAX}$
RTu	76.82%	74.49%	7.982%	0.637%	92.164%	60.980%	0.512
RLu	72.85%	70.89%	8.410%	0.707%	89.109%	58.836%	0.557
EWu	72.83%	70.87%	8.410%	0.707%	89.089%	58.816%	0.557
EWI	67.99%	68.48%	8.489%	0.721%	86.446%	55.891%	0.568
RLI	67.97%	68.46%	8.489%	0.721%	86.426%	55.871%	0.568
RTI	64.51%	64.66%	9.213%	0.849%	83.558%	49.255%	0.540
Values as at 31.12.2013	66.38%	65.69%	12.649%	1.600%	87.207%	42.297%	0.565
RiskTarget	70.41%	68.72%	8.295%	0.688%	87.767%	57.354%	0.551
RiskGap	4.03%	4.86%	7.157%	0.512%	17.161%	-11.928%	0.494
$MCR_{Italy,1}/Tier1_{Italy}$	Mean	Median	$\sigma$	$\sigma^2$	Max	Min	$\sigma/\sigma_{MAX}$
Rtu	99.14%	97.00%	15.398%	2.371%	121.662%	70.303%	0.604

<sup>34</sup> See FSB (2013c), p. 2.

RLu	91.67%	92.08%	14.095%	1.987%	118.292%	65.909%	0.538
EWu	91.65%	92.06%	14.095%	1.987%	118.272%	65.889%	0.538
EWI	83.40%	83.55%	14.252%	2.031%	115.273%	59.543%	0.517
RLI	83.38%	83.53%	14.252%	2.031%	115.253%	59.523%	0.517
RTI	77.44%	82.78%	15.671%	2.456%	113.453%	55.547%	0.558
Values as at 31.12.2013	79.30%	79.82%	21.144%	4.470%	125.633%	53.670%	0.614
RiskTarget	87.52%	88.81%	13.901%	1.932%	116.772%	62.716%	0.516
RiskGap	8.22%	9.05%	13.140%	1.727%	28.037%	-24.768%	0.514
<b>MCR<sub>Italy,1</sub>/RC<sub>Italy</sub></b>	<b>Mean</b>	<b>Median</b>	<b><math>\sigma</math></b>	<b><math>\sigma^2</math></b>	<b>Max</b>	<b>Min</b>	<b><math>\sigma/\sigma</math>MAX</b>
RTu	70.26%	70.68%	8.363%	0.699%	86.220%	53.177%	0.506
RLu	66.69%	65.05%	8.330%	0.694%	82.872%	51.521%	0.532
EWu	66.67%	65.03%	8.330%	0.694%	82.852%	51.501%	0.532
EWI	60.75%	61.95%	9.809%	0.962%	81.164%	46.606%	0.577
RLI	60.73%	61.93%	9.809%	0.962%	81.144%	46.586%	0.577
RTI	57.68%	58.60%	9.986%	0.997%	77.988%	41.628%	0.553
Values as at 31.12.2013	58.87%	60.31%	13.399%	1.795%	79.908%	38.424%	0.646
RiskTarget	63.71%	62.75%	8.840%	0.781%	82.008%	49.641%	0.551
RiskGap	4.84%	5.36%	7.451%	0.555%	15.839%	-10.846%	0.567
<b>MCR<sub>Italy,2</sub>/Tier1<sub>Italy</sub></b>	<b>Mean</b>	<b>Median</b>	<b><math>\sigma</math></b>	<b><math>\sigma^2</math></b>	<b>Max</b>	<b>Min</b>	<b><math>\sigma/\sigma</math>MAX</b>
RTu	8.41%	8.46%	1.047%	0.011%	10.048%	6.437%	0.582
RLu	8.00%	7.99%	1.093%	0.012%	9.925%	5.858%	0.538
EWu	7.98%	7.97%	1.093%	0.012%	9.905%	5.838%	0.538
EWI	7.13%	7.08%	1.085%	0.012%	9.134%	5.577%	0.615
RLI	7.11%	7.06%	1.085%	0.012%	9.114%	5.557%	0.615
RTI	6.77%	6.74%	1.135%	0.013%	8.649%	5.032%	0.628
Values as at 31.12.2013	7.51%	7.35%	1.580%	0.025%	10.394%	4.447%	0.532
RiskTarget	7.56%	7.68%	1.056%	0.011%	9.340%	5.843%	0.604
RiskGap	0.05%	0.42%	0.971%	0.009%	1.688%	-1.614%	0.588
<b>MCR<sub>Italy,2</sub>/RC<sub>Italy</sub></b>	<b>Mean</b>	<b>Median</b>	<b><math>\sigma</math></b>	<b><math>\sigma^2</math></b>	<b>Max</b>	<b>Min</b>	<b><math>\sigma/\sigma</math>MAX</b>
RTu	6.09%	6.21%	0.685%	0.005%	7.267%	4.945%	0.591
RLu	5.78%	5.72%	0.792%	0.006%	7.101%	4.334%	0.573
EWu	5.76%	5.70%	0.792%	0.006%	7.081%	4.314%	0.573
EWI	5.25%	5.05%	0.702%	0.005%	6.396%	4.031%	0.594
RLI	5.23%	5.03%	0.702%	0.005%	6.376%	4.011%	0.594
RTI	4.96%	4.78%	0.788%	0.006%	6.227%	3.429%	0.566
Values as at 31.12.2013	5.60%	5.45%	1.085%	0.012%	7.218%	3.110%	0.541
RiskTarget	5.51%	5.40%	0.734%	0.005%	6.738%	4.173%	0.573
RiskGap	-0.10%	0.11%	0.682%	0.005%	1.062%	-1.431%	0.548
<b>MCR<sub>Italy,3</sub>/Tier1<sub>Italy</sub></b>	<b>Mean</b>	<b>Median</b>	<b><math>\sigma</math></b>	<b><math>\sigma^2</math></b>	<b>Max</b>	<b>Min</b>	<b><math>\sigma/\sigma</math>MAX</b>
RTu	3.15%	2.09%	2.400%	0.058%	9.260%	0.829%	0.637
RLu	2.78%	1.90%	2.141%	0.046%	8.024%	0.733%	0.653
EWu	2.76%	1.88%	2.141%	0.046%	8.004%	0.713%	0.653
EWI	1.65%	1.24%	1.417%	0.020%	5.499%	0.020%	0.566
RLI	1.63%	1.22%	1.417%	0.020%	5.479%	0.000%	0.566
RTI	1.44%	1.04%	1.345%	0.018%	5.211%	0.000%	0.578
Values as at 31.12.2013	1.73%	1.16%	1.547%	0.024%	5.783%	0.048%	0.593

RiskTarget	2.20%	1.49%	1.605%	0.026%	5.856%	0.465%	0.637
RiskGap	0.48%	0.31%	0.918%	0.008%	3.395%	-0.385%	0.579
<b>MCR<sub>Italy,3</sub>/RC<sub>Italy</sub></b>	<b>Mean</b>	<b>Median</b>	<b><math>\sigma</math></b>	<b><math>\sigma^2</math></b>	<b>Max</b>	<b>Min</b>	<b><math>\sigma/\sigma_{MAX}</math></b>
RTu	2.26%	1.60%	1.690%	0.029%	6.887%	0.675%	0.623
RLu	2.02%	1.34%	1.498%	0.022%	5.806%	0.634%	0.654
EWu	2.00%	1.32%	1.498%	0.022%	5.786%	0.614%	0.654
EWI	1.19%	0.89%	1.010%	0.010%	3.752%	0.020%	0.583
RLI	1.17%	0.87%	1.010%	0.010%	3.732%	0.000%	0.583
RTI	1.05%	0.74%	0.963%	0.009%	3.593%	0.000%	0.589
Values as at 31.12.2013	1.30%	0.86%	1.153%	0.013%	4.042%	0.033%	0.619
RiskTarget	1.60%	1.10%	1.120%	0.013%	3.802%	0.319%	0.667
RiskGap	0.30%	0.19%	0.670%	0.004%	2.447%	-0.448%	0.528

Source: financial statement data processed by the authors.

Table 1 shows the results of drafting the RAS for the Italian banking system, with the mean values (“Mean”) of the indicators calculated for each group.

Concerning the ratio of total capital requirements to core capital ( $TCR_{Italy}/Tier1_{Italy}$ ), the Italian banks have tolerance thresholds in the range of 108.40%<sup>35</sup> to 86.41%, while the risk profile is identified by upper and lower risk limit values ( $RLu$ - $RLI$ ) of 100.61% and 92.85%. As at 31 December 2013 the national banking system had a  $TCR_{Italy}/Tier1_{Italy}$  ratio of 89.39%. Assuming that the “target” risk profile (“RiskTarget”) coincides with the mean value of the risk profile (96.73%), we have a positive *risk gap* of 7.34%. This difference can be interpreted as an additional margin of overall risk that the banks could assume - without departing from the regulators’ requirements for a prudent risk profile - with a view to achieving a greater profitability and a consequent growth.

The same considerations apply to the ratio of total capital requirements to total regulatory capital ( $TCR_{Italy}/RC_{Italy}$ ). In this case, the tolerance thresholds range between a maximum of 76.82% and a minimum of 64.51%, while the risk profile comes between risk limits of 72.85% and 67.97%. If we look at the risk target (70.41%) and the values as at 31 December 2013 (66.38%), the risk gap remains positive (albeit by only 4.03%), confirming that there is room for Italian banks to assume greater risks.

To see what types of risk the Italian banking system might increase its exposure to without negatively influencing its overall solidity, we can analyze the RAS for the “First Pillar” risks (counterparty and credit risk, operational risk, market risk). The ratio between the minimum capital requirements for counterparty and credit risk and the core capital ( $MCR_{Italy,1}/Tier1_{Italy}$ ) lies within a range of tolerance thresholds between 99.14% and 77.44%, while the risk profile comes between

<sup>35</sup> It is allowable for the upper tolerance threshold of the MCR to be higher than Tier1 (values of the indicators with Tier1 as the denominator greater than 100%), providing this threshold is lower than the total regulatory capital.



91.67% and 83.38%. Comparing the risk target (87.52%) with the value of this ratio as at 31 December 2013 (79.30%), we find a positive risk gap of 8.22%. So, Italian banks could increase the “weight” of their minimum core capital requirements for counterparty and credit risk by taking on additional counterparty and credit risk - by distributing loans, for instance. As for their total regulatory capital, the positive margin available to the banking system amounts to 4.84%.

Turning to the operational risk, we see a marked reduction in the positive gap and even some evidence of a negative gap, pointing to the need to reduce the weight of this type of risk on the total regulatory capital. In fact, if we compare the risk target relating to the  $MCR_{Italy,2}/TierI_{Italy}$  ratio (7.56%) with the value of this ratio as at 31 December 2013 (7.51%), the margin available for a further increase in the weight of the operational risk on the bank’s core capital amounts to just 0.04%. Comparing the risk target relating to the  $MCR_{Italy,2}/RC_{Italy}$  ratio (5.51%) with the corresponding value as at the end of December 2013 (5.60%) gives us a negative risk gap (-0.10%), meaning that the weight of the operational risk on the banks’ capital needs to be reduced.

As for the market risk, the Italian banks’ risk gap calculated as at 31 December 2013 reveals a positive margin for both the  $MCR_{Italy,3}/TierI_{Italy}$  ratio (0.48%) and the  $MCR_{Italy,3}/RC_{Italy}$  ratio (0.30%).

Analyzing the RAS as a whole, we can say that the Italian banking system is generally underexposed in terms of credit risk and market risk and the positive margins identified mean that it could raise its risk thresholds - thereby contributing to the institutions’ profitability - while keeping their RAF consistent with the regulations.

These considerations are applicable to the system’s “mean” level, but our analysis would be more meaningful at single group level because drafting the RAS brought to light situations that sometimes differed considerably from one another and from the system as a whole. This was confirmed by the fact that the standard deviation ( $\sigma$ ) and relative variability index “ $\sigma/\sigma_{MAX}$ ”<sup>36</sup> for the indicators as at 31 December 2013 (“values as at 31.12.2013”) have higher values than the other elements in each RAS, revealing significant differences between the single banking groups.

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<sup>36</sup> The relative variability indexes are uninfluenced by the unit of measure; they enable comparisons between distributions with different means; and they are not influenced by the intensity of the trait. One such index is the ratio between an index and its maximum value. Since the maximum possible theoretical value of an absolute variability index is infinitely large, we have to refer to a maximum in which the minimum and maximum of the modalities is fixed. For the standard deviation, the minimum  $l$  and maximum  $L$  of the modalities are assumed to be known. The maximizing distribution (ie the one with the maximum variability) must have the same mean ( $M$ ) as the distribution considered. We thus obtain the following formula:  $\sigma/\sigma_{MAX} = \sigma/\sqrt{(M-l)(L-M)}$ . This index varies between 0 and 1: it is 0 in the absence of variability and 1 in the event of a maximum variability, subject to the imposed constraints.

Table 2: RAS for the Veneto Banca Group (VB)

<b>RAS Indicators</b>	<b><math>TCR_{VB}/Tier1_{VB}</math></b>	<b><math>TCR_{VB}/RC_{VB}</math></b>	<b><math>MCR_{VB,1}/Tier1_{VB}</math></b>	<b><math>MCR_{VB,1}/RC_{VB}</math></b>
RTu	104.82%	82.24%	95.38%	75.00%
RLu	99.85%	76.42%	91.27%	69.86%
EWu	99.83%	76.40%	91.25%	69.84%
EWI	99.32%	72.32%	89.97%	65.51%
RLI	99.30%	72.30%	89.95%	65.49%
RTI	94.61%	67.05%	86.07%	60.86%
Values as at 31.12.2013	103.99%	86.29%	94.62%	78.52%
RiskTarget	99.57%	74.36%	90.61%	67.67%
RiskGap	-4.41%	-11.93%	-4.02%	-10.85%
<b>RAS Indicators</b>	<b><math>MCR_{VB,2}/Tier1_{VB}</math></b>	<b><math>MCR_{VB,2}/RC_{VB}</math></b>	<b><math>MCR_{VB,3}/Tier1_{VB}</math></b>	<b><math>MCR_{VB,3}/RC_{VB}</math></b>
RTu	7.77%	6.21%	1.76%	1.24%
RLu	7.47%	5.72%	1.55%	1.13%
EWu	7.45%	5.70%	1.53%	1.11%
EWI	6.93%	5.05%	1.41%	1.08%
RLI	6.91%	5.03%	1.39%	1.06%
RTI	6.63%	4.61%	1.23%	0.97%
Values as at 31.12.2013	8.20%	6.81%	1.16%	0.96%
RiskTarget	7.19%	5.37%	1.47%	1.10%
RiskGap	-1.01%	-1.43%	0.31%	0.13%

Source: financial statement data processed by the authors.

Table 2 shows the RAS for the “Veneto Banca” Group (VB) drafted from an ICAAP-compliant standpoint on the basis of the previously-listed indicators. The VB is distinctive in that, as at 31 December 2013, it exceeded the upper tolerance threshold for six of the eight indicators, revealing severe criticalities in terms of its risk-taking activities eroding its capital. In fact, the  $TCR_{VB}/Tier1_{VB}$  and  $TCR_{VB}/RC_{VB}$  ratios show that, with risk targets of 99.57% and 74.36%, respectively, the group has negative risk gaps amounting to -4.41% and -11.93%. Not only does the group’s risk exposure exceed its risk profile range (between the upper and lower risk limits), it even exceeds the tolerance threshold, which is the maximum allowable deviation from its risk appetite. In the opinion of the present authors, these gaps indicate the urgent need to take steps designed to reduce the weight of the risks on the bank’s capital, given the erosion of the fixed margins needed to operate even in conditions of stress. In particular, a look at the  $MCR_{VB,1}/RC_{VB}$  ratio shows the need to reduce the weight of the counterparty and credit risk on the regulatory capital, where there is a risk gap of -10.85%. The same applies to the weight of the operational risk on the regulatory capital ( $MCR_{VB,2}/RC_{VB}$ ), where exceeding the upper tolerance threshold has generated a negative gap vis-à-vis the target risk of -1.43%, revealing a markedly critical situation for the group’s capital solidity.

**Table 3: RAS for the Creval Group (CR)**

<b>RAS Indicators</b>	<b>TCR<sub>CR</sub>/Tier1<sub>CR</sub></b>	<b>TCR<sub>CR</sub>/RC<sub>CR</sub></b>	<b>MCR<sub>CR,1</sub>/Tier1<sub>CR</sub></b>	<b>MCR<sub>CR,1</sub>/RC<sub>CR</sub></b>
RTu	124.83%	84.28%	114.49%	77.28%
RLu	116.07%	78.44%	106.18%	71.75%
EWu	116.05%	78.42%	106.16%	71.73%
EWI	106.55%	74.61%	98.38%	68.89%
RLI	106.53%	74.59%	98.36%	68.87%
RTI	99.16%	69.44%	91.31%	63.97%
Values as at 31.12.2013	92.70%	65.69%	85.11%	60.31%
RiskTarget	111.30%	76.51%	102.27%	70.31%
RiskGap	18.60%	10.82%	17.16%	10.00%
<b>RAS Indicators</b>	<b>MCR<sub>CR,2</sub>/Tier1<sub>CR</sub></b>	<b>MCR<sub>CR,2</sub>/RC<sub>CR</sub></b>	<b>MCR<sub>CR,3</sub>/Tier1<sub>CR</sub></b>	<b>MCR<sub>CR,3</sub>/RC<sub>CR</sub></b>
RTu	9.35%	6.34%	1.20%	0.81%
RLu	8.93%	6.03%	0.91%	0.63%
EWu	8.91%	6.01%	0.89%	0.61%
EWI	7.73%	5.42%	0.40%	0.28%
RLI	7.71%	5.40%	0.38%	0.26%
RTI	7.37%	5.14%	0.27%	0.19%
Values as at 31.12.2013	7.39%	5.23%	0.21%	0.15%
RiskTarget	8.32%	5.72%	0.64%	0.44%
RiskGap	0.93%	0.48%	0.44%	0.30%

Source: financial statement data processed by the authors.

Table 3 shows the results obtained in the RAS developed for the “Creval” Group (CR). Here we see a situation that is, in a sense, the exact opposite of the previous case of the “Veneto Banca” Group (VB). The CR has values for its indicators as at 31 December 2013 falling considerably below its established lower risk tolerance threshold. In particular, the  $TCR_{CR}/RC_{CR}$  ratio stands at 65.69%, while the risk profile ranges between 78.44% and 74.59% and the lower tolerance threshold is 69.44%. With a hypothetical risk target of 76.51% the group has a 10.82% positive margin that could be used to take on more risky activities. The  $MCR_{CR,1}/RC_{CR}$  indicator reveals a positive gap (10.00%) and so do the  $MCR_{CR,2}/RC_{CR}$  ratio (0.48%) and the  $MCR_{CR,3}/RC_{CR}$  ratio (0.30%). While for operational risk and market risk the group’s position is virtually in line with its “ideal” risk profile, for credit risk the institution should consider undertaking schemes in the medium to long term to raise this specific risk profile.

The risk containment measures that the VB should take are urgently needed to restore its capital solidity and thus ensure the group’s survival. In the case of the CR, while it is not urgent to take action in the short term, it would nonetheless be advisable to review their policy for distributing loans, given that an excessive risk containment could negatively affect the institution’s global profitability, gradually eroding its ability to remain competitive and even the margins needed to operate in situations of stress.

## 5. CONCLUDING COMMENTS

The present work discusses the RAF in terms of a possible practical application of the framework in the light of the national and international regulatory recommendations. For this purpose, we propose a quantitative model for drafting a RAS using the financial statements of 15 Italian banking groups for the years 2008-2013. The resulting RAS are then analyzed with a view to developing an RAF that can be used not only by an internal analyst but also and more importantly, by an external analyst interested in knowing a credit institution's position in terms of its propensity/aversion to the main types of risk to which such organizations are exposed.

Our findings show that the Italian banking system as a whole is generally underexposed in terms of credit risk and market risk, so there is room for shifting the risk profiles towards higher thresholds with a view to improving the credit institutions' profitability while keeping their RAF consistent with the regulatory bodies' requirements.

Our analysis on separate banking groups revealed very different pictures and some extreme situations. For instance, one group was found exposed to an excessively high total risk for its overall risk profile, that even exceeded its upper tolerance threshold (the maximum allowable deviation from its risk appetite) and consequently pointed to the urgent need for measures designed to reduce the weight of the risks vis-à-vis its capital. On the other hand, one of the RAS identified a group with indicators coming well below the lower tolerance threshold established for the risks it could assume, making it advisable to adopt schemes designed to raise this banking group's risk profile.

The proposed quantitative model for first drafting a RAS and then obtaining a global RAF, can be applied effectively to different types of risk, making the necessary adjustments according to the particular features of the profile being examined<sup>37</sup>. This particular aspect is worth bearing in mind for the purpose of expressing a business's risk appetite in aggregate and unequivocal terms: having no common parameter with which to compare all the categories of risk typically encountered in banking activities makes it impossible to have a single indicator that can globally represent the risk propensity of a given intermediary. We surmise that the RAF needs to be separated into various (quantitative and/or qualitative) sections that identify, for each of the different classes of risk, the corresponding total absorption capacity, tolerance thresholds and operational limits and the measures and procedures for restoring the risk levels to within the established ranges. The framework's setup and activation relies on certain premises that are not always readily identifiable

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<sup>37</sup> Concerning the liquidity risk, for instance, we could start by considering the "Liquidity Coverage Ratio" and the "Net Stable Funding Ratio", but to apply the method described here it would be advisable to consider their respective reciprocals, ie the ratio between the volume of net outflows at 30 days and the high-quality (first and/or second tier) cash reserves available over the same period (the LCR) and the ratio between stable loans and stable funding, both measured for periods longer than one year (the NSFR). This approach would enable the *risk capacity* with which to correlate the other risk parameters to be taken into due consideration.

in the Italian credit industry. The present contribution can consequently serve as a useful methodological reference for quantifying and solving the numerous problems that will crop up in the course of action to comply with the recently-introduced requirements, as well as an attempt to overcome normative and theoretical shortcomings identified on the particularly urgent and topical issue of risk management in banks.

## Annex 1

Table A.1 Data for drafting a RAS – UBI Bank Group

<b>MCR/Tier 1 (%)</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
TCR/Tier1	103.5512%	100.5469%	107.1083%	87.9721%	74.1452%	60.4768%
MCR <sub>1</sub> /Tier1	92.9752%	90.8058%	98.6526%	81.5164%	67.9068%	54.9391%
MCR <sub>2</sub> /Tier1	7.6120%	7.6422%	6.9427%	5.5671%	5.2915%	4.4472%
MCR <sub>3</sub> /Tier1	2.9640%	2.0990%	1.5130%	0.8886%	0.9469%	1.0905%
<b>MCR/RC (%)</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
TCR/RC	72.1964%	67.1808%	71.6470%	59.2796%	49.9788%	42.2968%
TCR <sub>1</sub> /RC	64.8227%	60.6722%	65.9908%	54.9295%	45.7737%	38.4238%
TCR <sub>2</sub> /RC	5.3071%	5.1062%	4.6441%	3.7514%	3.5668%	3.1103%
TCR <sub>3</sub> /RC	2.0665%	1.4024%	1.0121%	0.5988%	0.6383%	0.7627%
<b>Risk Tolerance MCR/Tier1</b>	<b>mean</b>	<b>Σ</b>	<b>Upper limit</b>	<b>Lower limit</b>		
TCR/Tier1	88.9667%	16.8734%	105.8402%	72.0933%		
MCR <sub>1</sub> /Tier1	81.1326%	15.2858%	96.4184%	65.8468%		
MCR <sub>2</sub> /Tier1	6.2504%	1.2185%	7.4689%	5.0320%		
MCR <sub>3</sub> /Tier1	1.5837%	0.7425%	2.3262%	0.8412%		
<b>Risk Tolerance MCR/RC</b>	<b>mean</b>	<b>Σ</b>	<b>Upper limit</b>	<b>Lower limit</b>		
TCR/RC	60.4299%	11.1744%	71.6043%	49.2555%		
TCR <sub>1</sub> /RC	55.1021%	10.0772%	65.1793%	45.0250%		
TCR <sub>2</sub> /RC	4.2477%	0.8185%	5.0662%	3.4291%		
TCR <sub>3</sub> /RC	1.0801%	0.5179%	1.5980%	0.5623%		
<b>Risk Limits MCR/Tier1</b>	<b>Upper limit</b>	<b>Lower limit</b>				
TCR/Tier1	91.9945%	82.8442%				
MCR <sub>1</sub> /Tier1	84.1501%	75.3452%				
MCR <sub>2</sub> /Tier1	6.3737%	5.8966%				
MCR <sub>3</sub> /Tier1	1.9761%	1.0034%				
<b>Risk Limits MCR/RC</b>	<b>Upper limit</b>	<b>Lower limit</b>				
TCR/RC	62.5576%	56.3579%				
TCR <sub>1</sub> /RC	57.2234%	51.2564%				
TCR <sub>2</sub> /RC	4.3342%	4.0114%				
TCR <sub>3</sub> /RC	1.3438%	0.6826%				

Source: financial statement data processed by the authors.

Figure A.1: RAS for the Italian banking system (2008-2013)

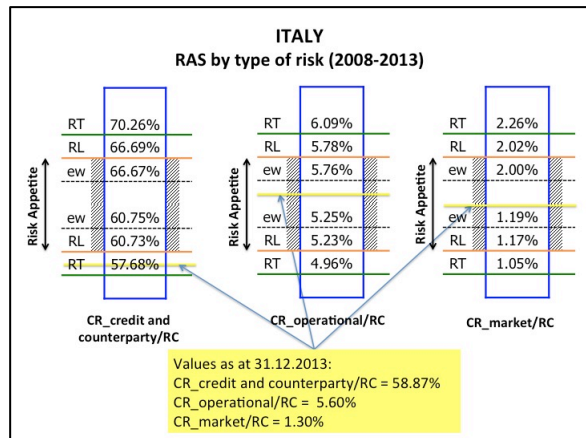
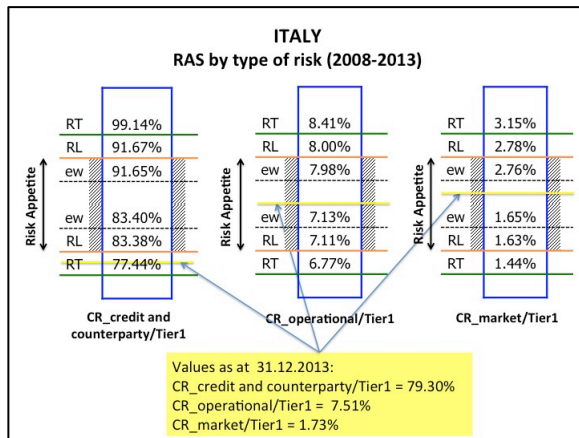
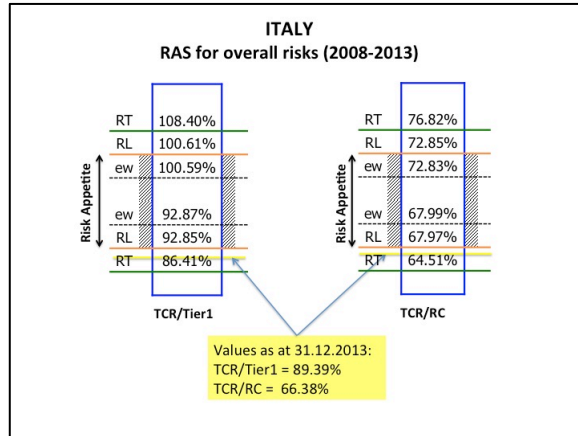
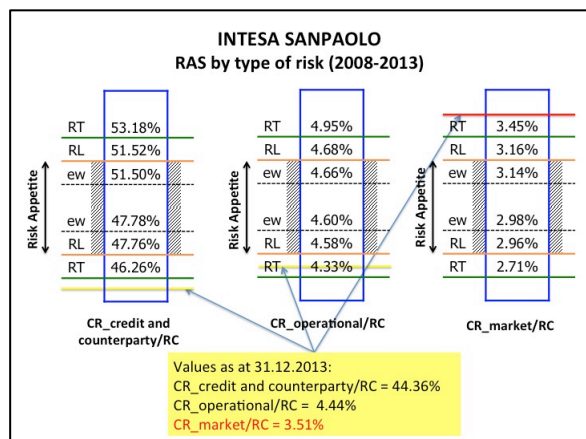
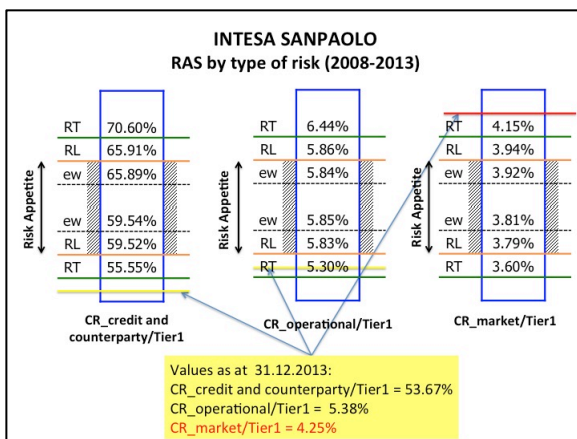
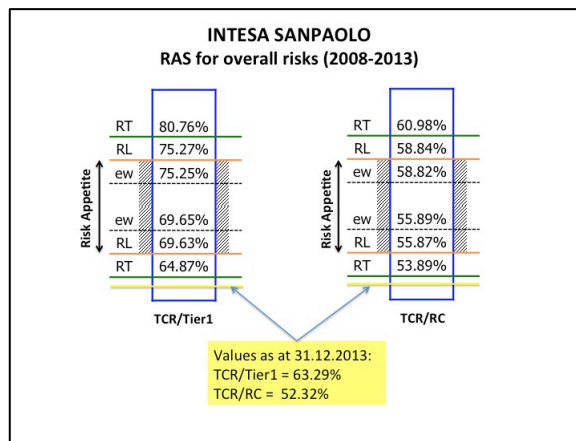
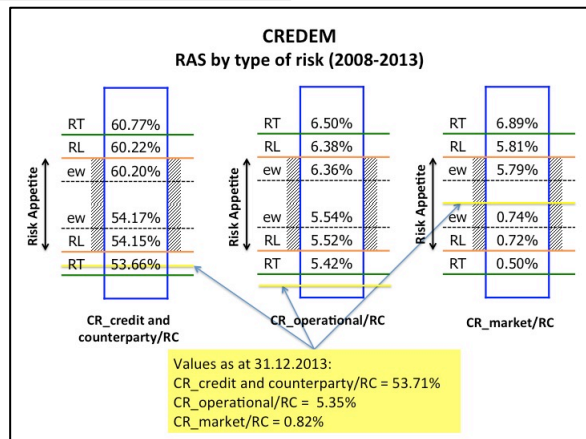
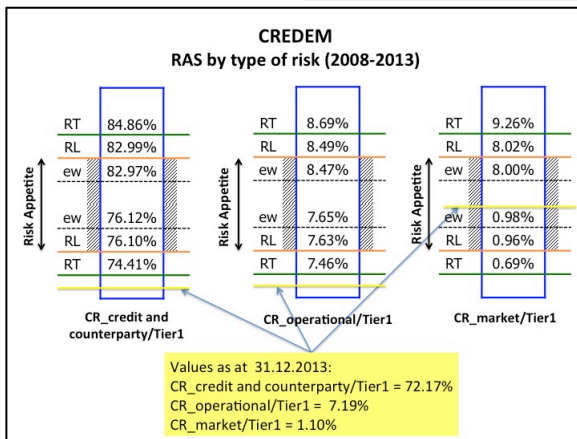
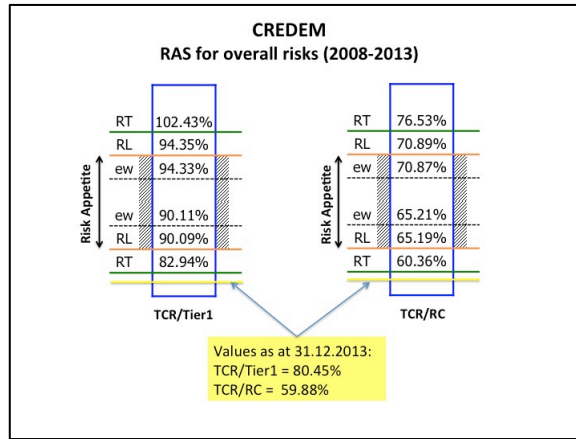
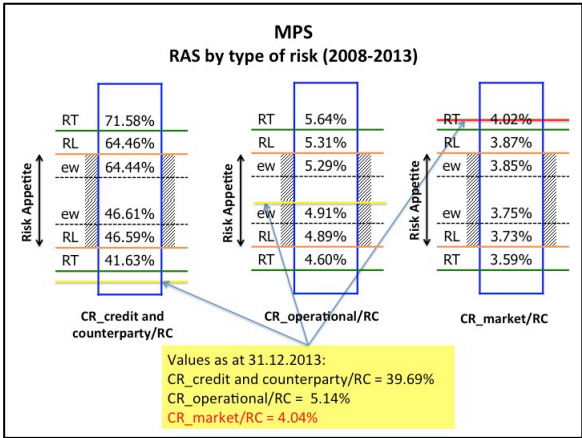
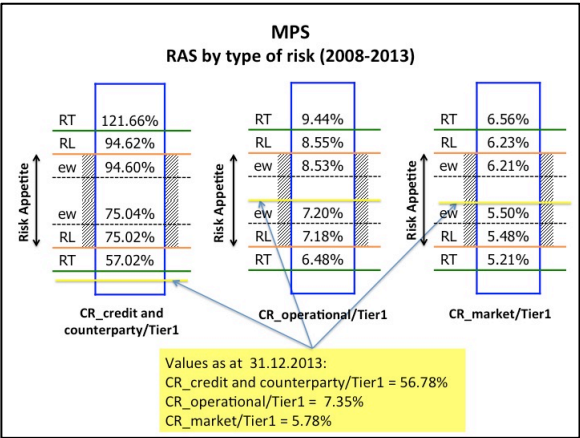
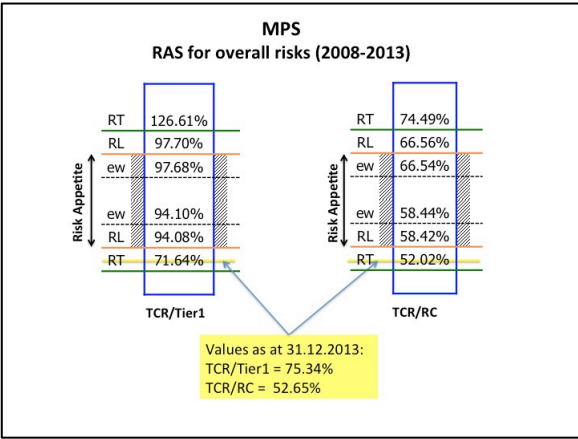
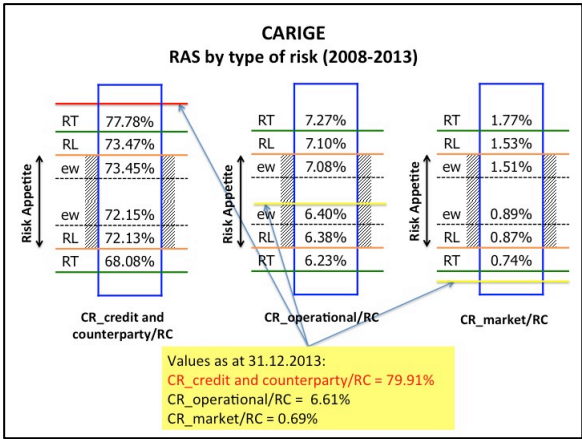
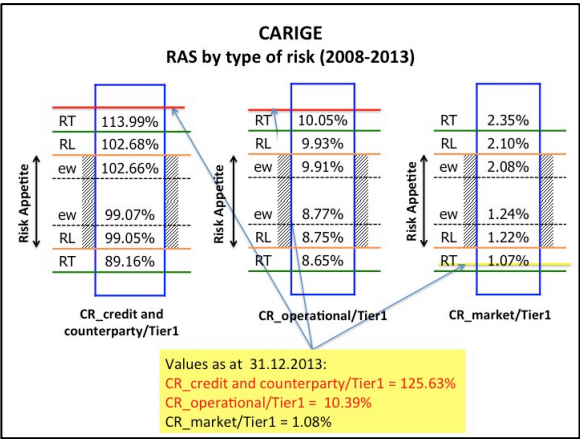
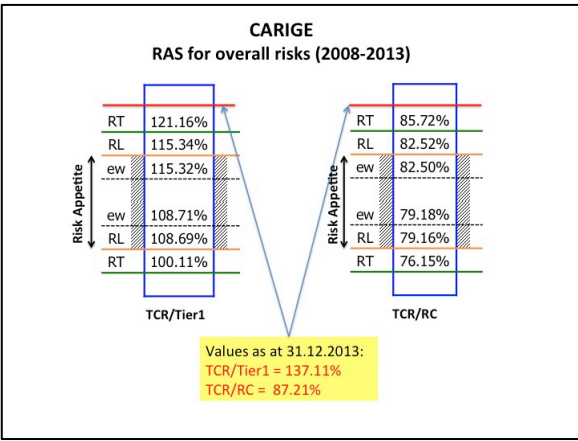
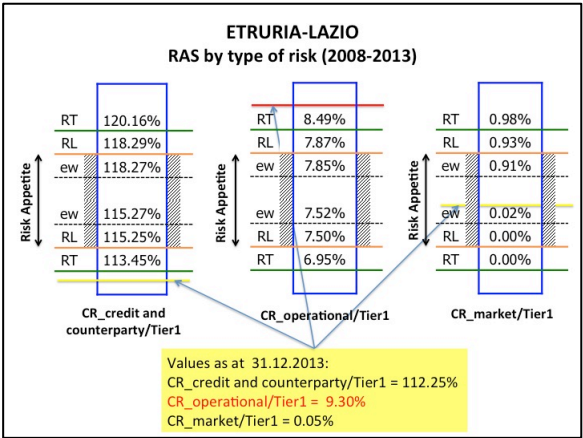
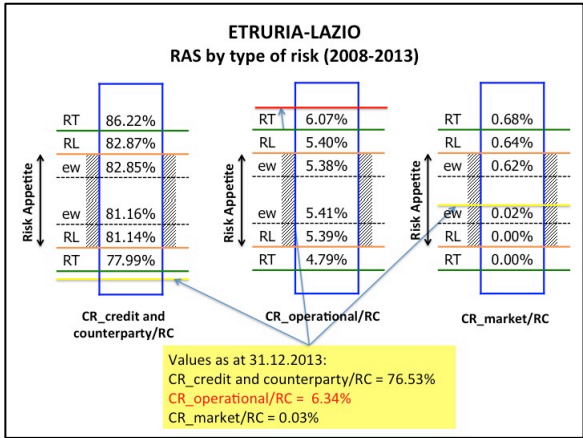
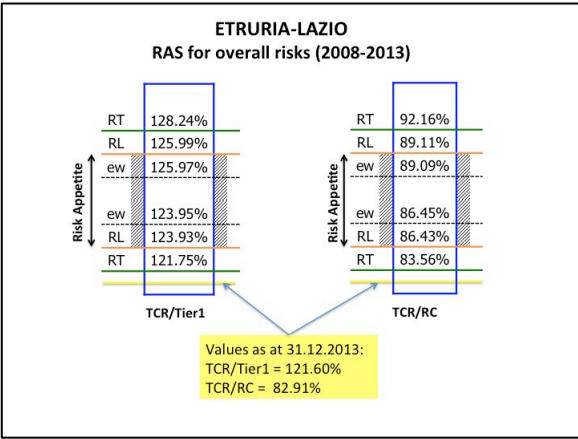
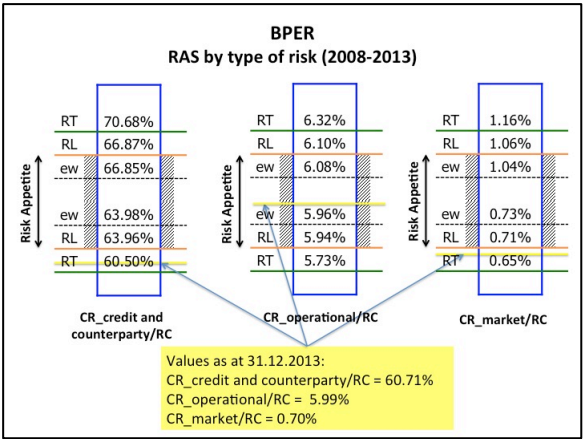
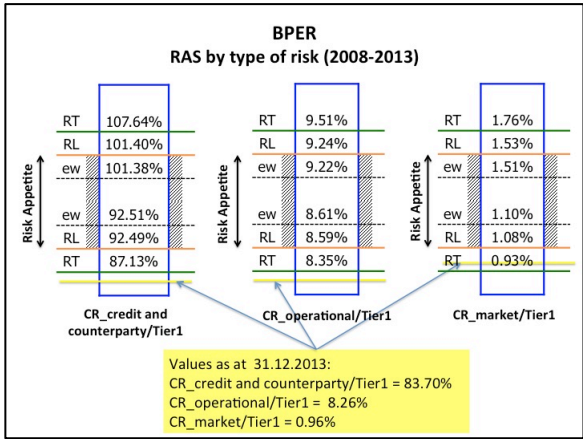
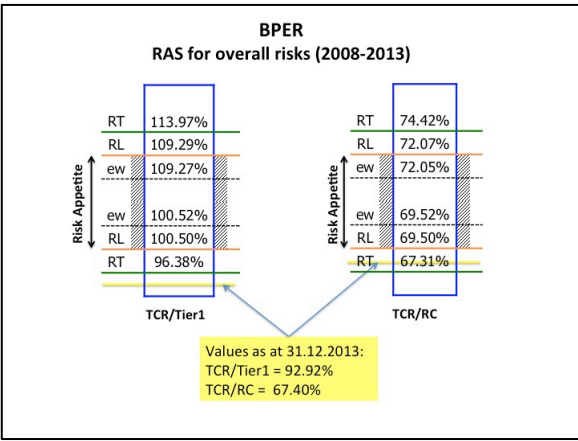


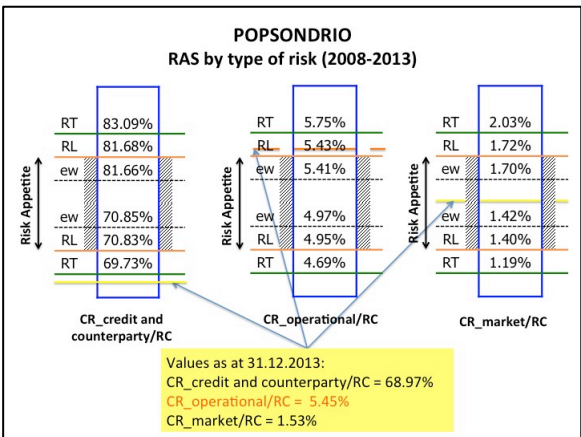
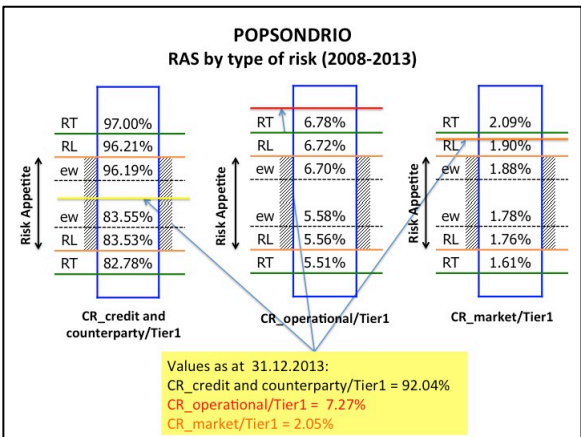
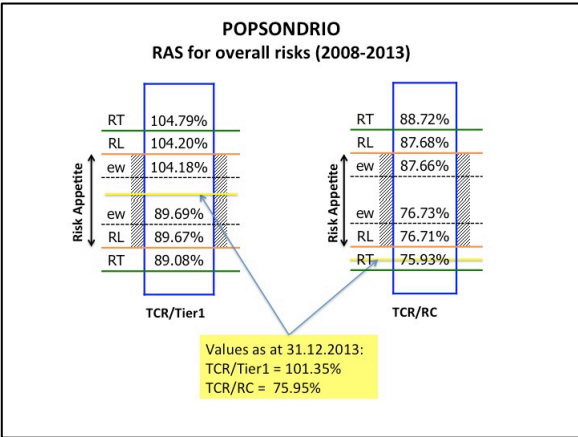
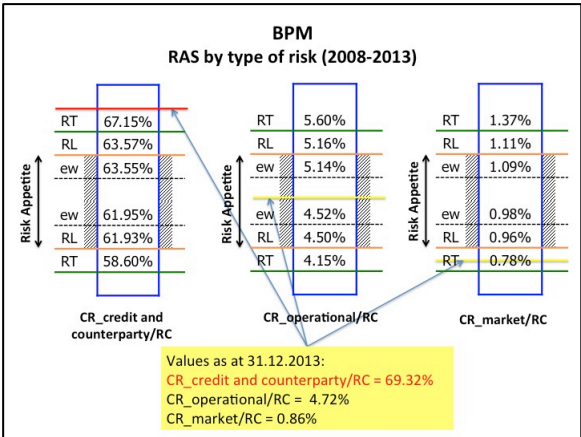
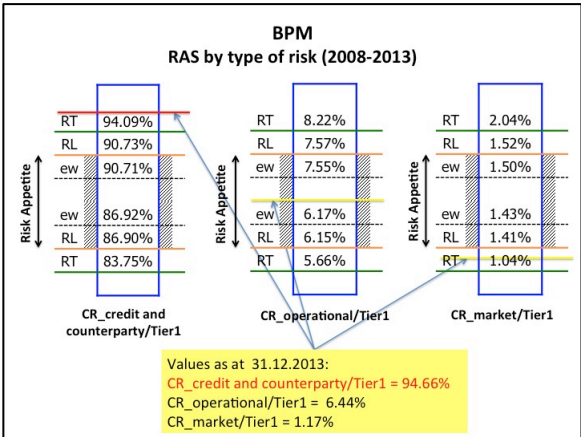
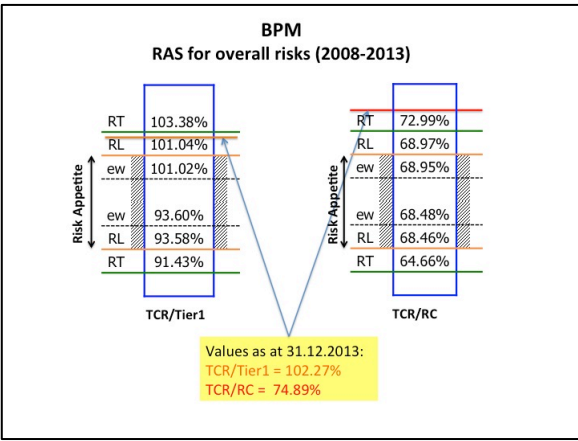
Figure A.2: RAS for separate banking groups (2008-2013)

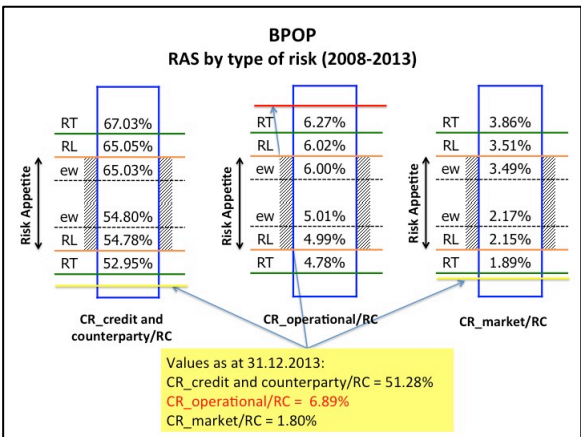
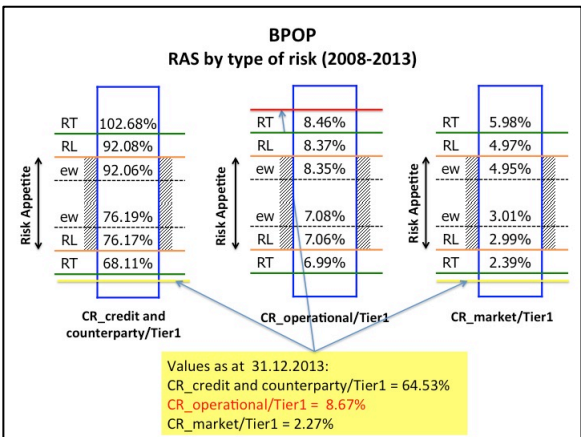
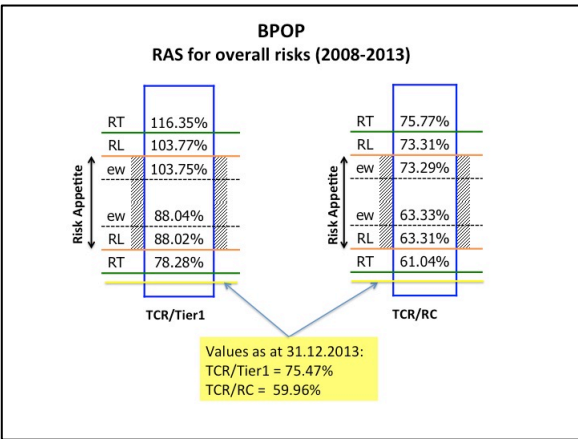
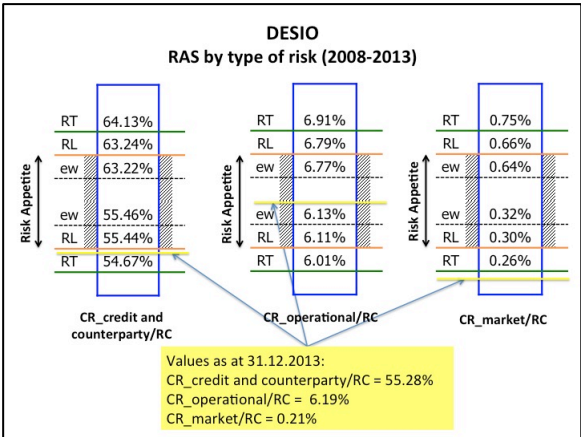
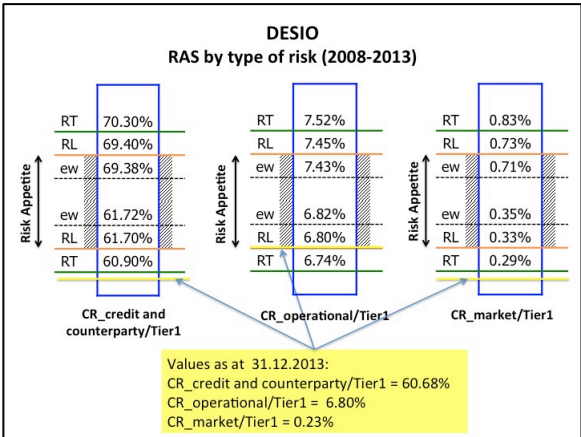
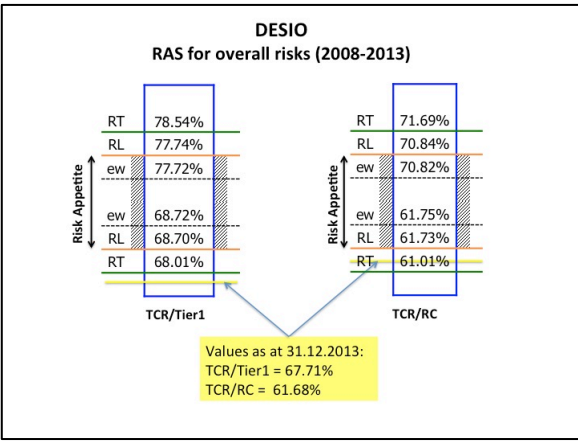


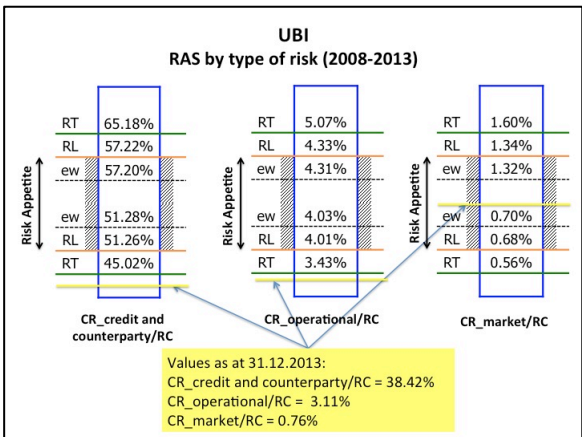
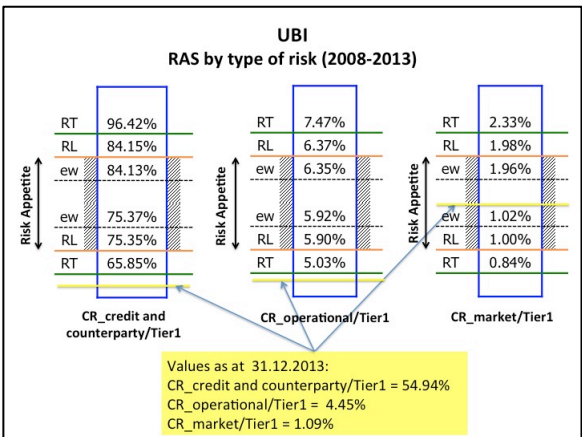
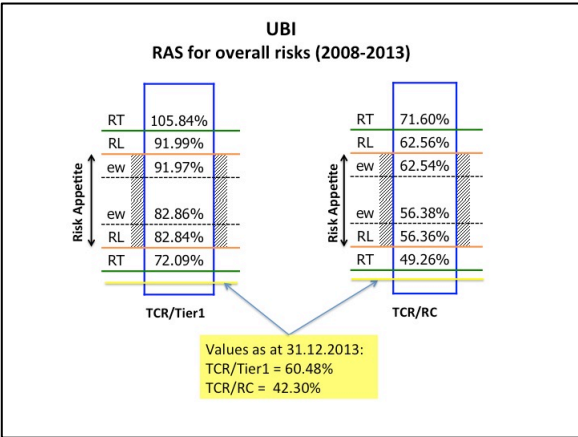
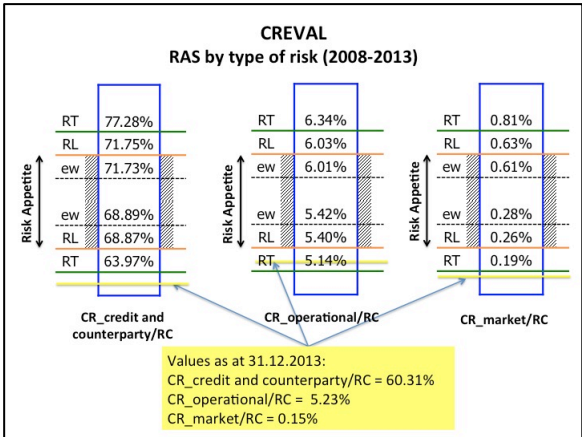
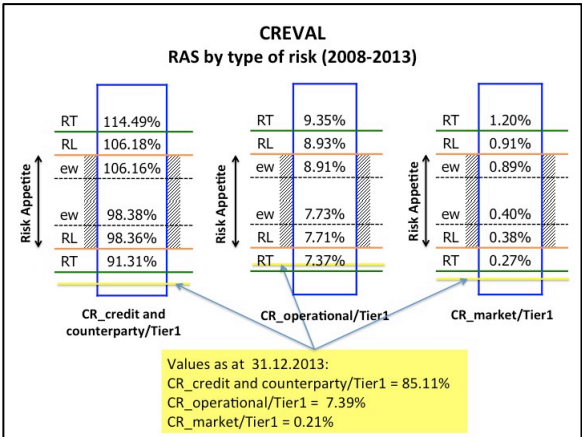
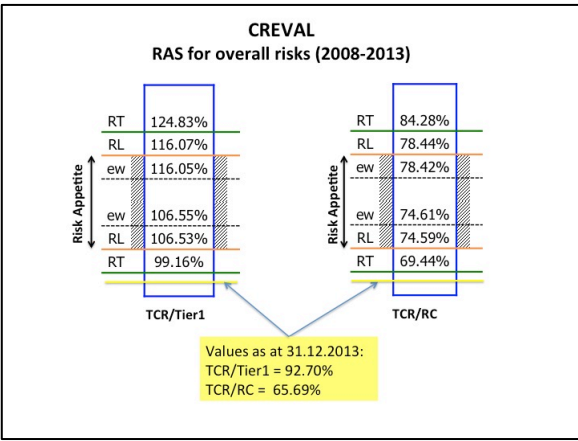


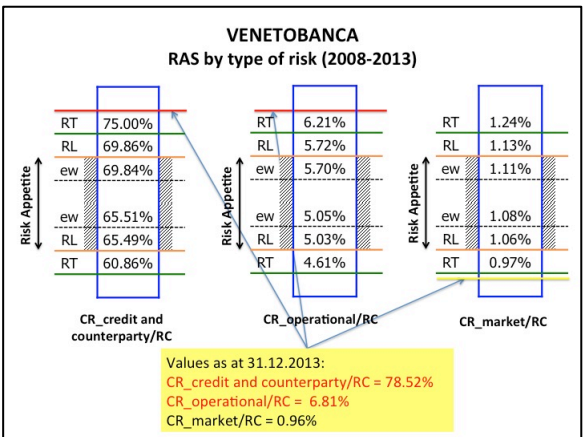
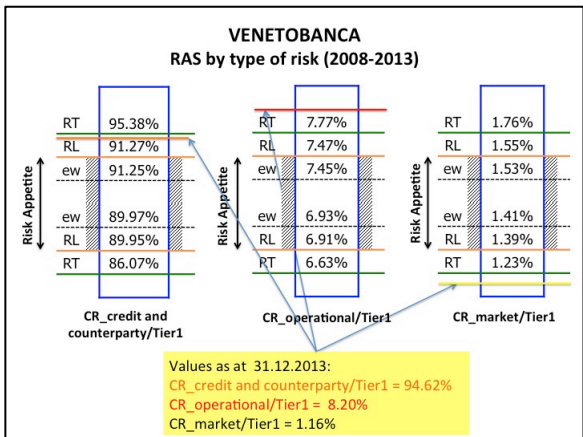
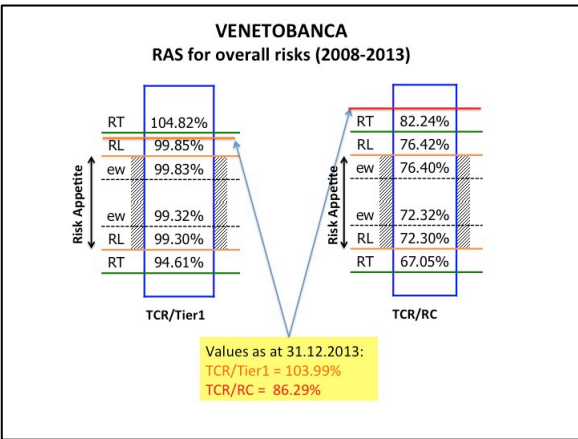
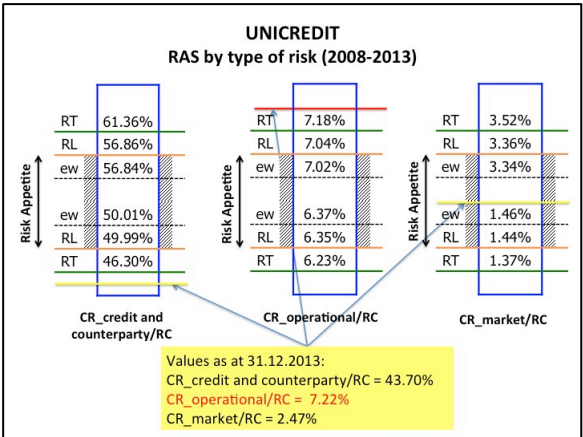
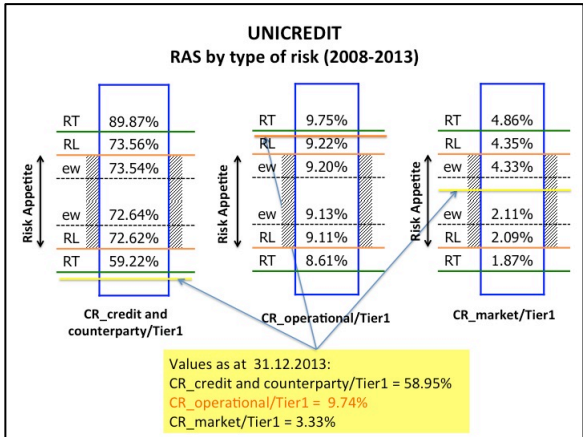
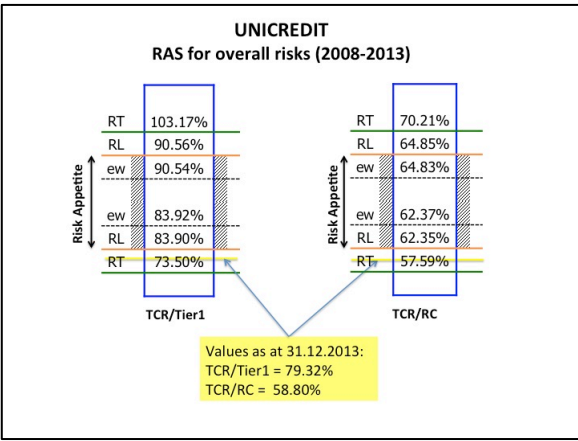


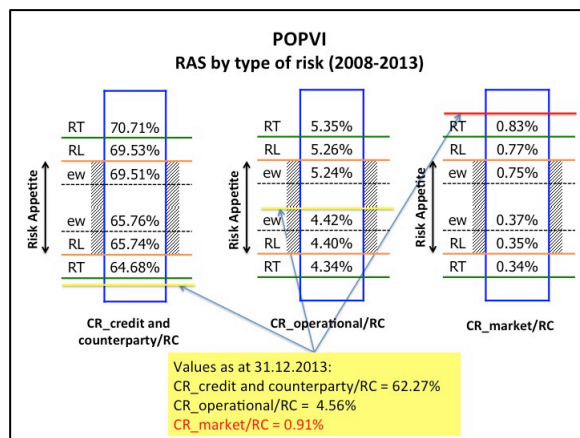
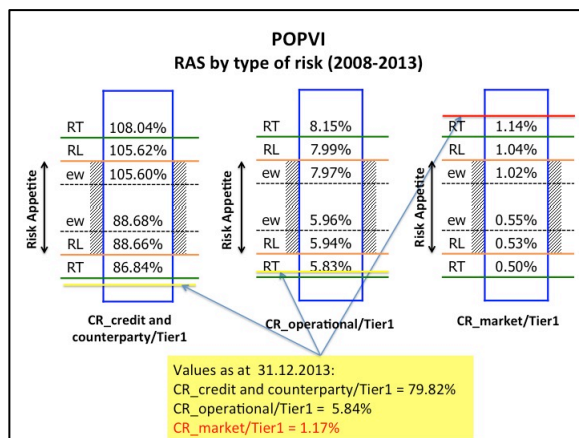
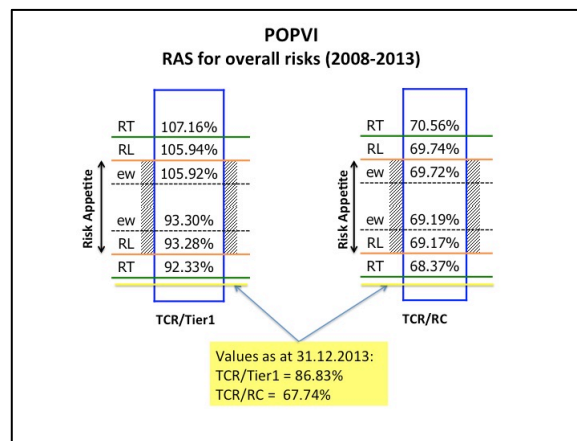












Source: authors' elaboration

### Caption

ITALY = Italian Banking System

CREDEM = Gruppo Bancario Credito Emiliano – Credem  
([http://www.credem.it/EN\\_International/Pages/Home\\_International.aspx](http://www.credem.it/EN_International/Pages/Home_International.aspx))

INTESA SANPAOLO = Gruppo Bancario Intesa SanPaolo  
([http://www.group.intesasanpaolo.com/scriptIsir0/si09/eng\\_index.jsp](http://www.group.intesasanpaolo.com/scriptIsir0/si09/eng_index.jsp))

CARIGE = Gruppo Banca Carige - Banca CARIGE S.p.A. - Cassa di Risparmio di Genova e Imperia (<http://www.gruppocarige.it/grp/>)

MPS = Gruppo Banca Monte dei Paschi di Siena (<http://english.mps.it/>)

BPER = Gruppo Banca Popolare dell'Emilia Romagna – Bper  
([http://www.gruppobper.it/wps/gruppo/banca/bper\\_istzgruppo\\_content/sitoen/homepage/ilgruppo/](http://www.gruppobper.it/wps/gruppo/banca/bper_istzgruppo_content/sitoen/homepage/ilgruppo/))

ETRURIA-LAZIO = Gruppo Banca Etruria (<http://www.bancaetruria.it/en/WELCOME.html>)

BPM = Gruppo Banca Popolare di Milano (<http://www.gruppobpm.it/en-ist.html>)

POPSONDRIO = Gruppo Banca Popolare di Sondrio  
(<http://www.popso.it/cm/pages/ServeBLOB.php/L/EN/IDPagina/1>)

DESIO = Gruppo Banco Desio (<http://www.bancodesio.it/index.php/home>)

BPOP = Gruppo Banco Popolare (<http://www.bancopopolare.it/en/>)

CREVAL = Gruppo Bancario Credito Valtellinese (<https://www.creval.it/index.asp>)

UBI = Gruppo UBI Banca (<http://www.ubibanca.it/pagine/Home-EN.aspx>)

UNICREDIT = Unicredit S.p.A. (<https://www.unicreditgroup.eu/en.html>)

VENETOBANCA = Gruppo Veneto Banca (<http://www.gruppoventobanca.it/en/>)

POPVI = Gruppo Banca Popolare di Vicenza (BPVI - <http://www.popolarevicenza.it/bpvi-web/home/englishVersion.html>)



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