BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

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by Giovanni Pepe

April 2013

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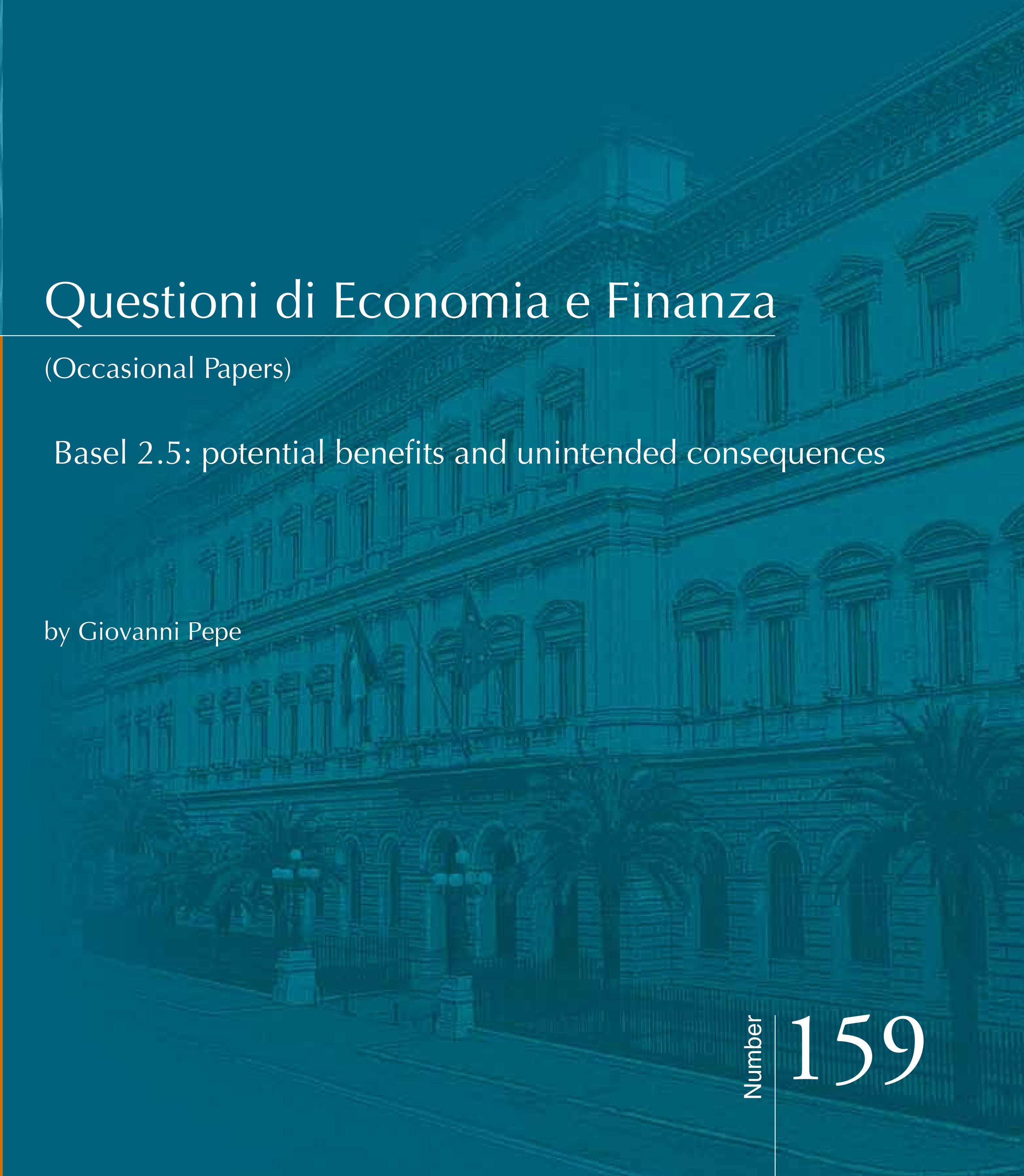

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BASEL 2.5: POTENTIAL BENEFITS AND UNINTENDED CONSEQUENCES

by Giovanni Pepe*

Abstract

Since 1996 the Basel risk-weighting regime has been based on the distinction between the trading and the banking book. For a long time credit items have been weighted less strictly if held in the trading book, on the assumption that they are easy to hedge or sell. The Great Financial Crisis made evident that banks declared a trading intent on positions that proved difficult or impossible to sell quickly. The Basel 2.5 package was developed in 2009 to better align trading and banking books' capital treatments. Working on a number of hypothetical portfolios I show that the new rules fell short of reaching their target and instead merely reversed the incentives. A model bank can now achieve a material capital saving by allocating its credit securities to the banking book, irrespective of its real intention or capability of holding them until maturity. The advantage of doing so is particularly pronounced when the incremental investment increases the concentration profile of the trading book, as usually happens for exposures towards banks' home government. Moreover, in these cases trading book requirements are exposed to powerful cliff-edge effects triggered by rating changes.

JEL Classification: G18, G21, G28
Keywords: Basel 2.5, trading book, market risk, risk-weighted-assets, capital arbitrage.

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1 Introduction*

In 1996, when amending the 1988 Capital Accord to capitalize the risks stemming from trading activities (BCBS, 1996), the Basel Committee introduced a specific prudential regime: the trading-book regime. In so doing it divided banks' balance-sheets into two broad categories: the banking-book and the trading-book. Roughly speaking the banking book comprises all assets apart from those for which the bank expresses a trading intent, while the trading book is embodied by assets and liabilities for which a trading intention exists, approximately corresponding with those classified as held for trading from an accounting perspective[1].

The two regimes have a clear economic rationale. Consider for example a bank that purchases a generic bond. If the bank intends to sell it in the short term, then it is exposed only to market risk. In other words, it faces the potential bond price volatility over the short amount of time needed to sell or hedge it; accordingly, the capital charge will only take into account of this risk. Vice-versa, the same bank intending to hold the same bond to maturity is subject to a capital charge that does not factor in market risk but considers the issuer credit risk. Since the holding intent differs, so do the risks – and hence the capital charges – to which the bank is exposed.

In the aftermath of the Great Financial Crisis a widespread consensus emerged that the regulatory treatment of assets allocated to the trading book had been too favorable. It was argue that by allocating a newly acquired asset to the trading book a bank would absorb much less capital than allocating it in the banking book. Turner (2009) argued that the leniency of the trading book treatment contributed significantly to the excessive leverage with which many banks entered into the crisis. The incentives toward a trading book allocation acted powerfully for credit assets, which when the crisis struck proved impossible to sell or hedge quickly, originating losses well in excess of the related capital charges.

The so-called Basel 2.5 package (BCBS 2009), entered into force in 2012 in Europe and Japan and one year later in the United States, set out to correcting this distortion. An important part of the rebalancing action consisted in incorporating

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[1] Accounting rules give banks with some degrees of freedom in their balance-sheet allocation of newly-acquired financial assets. Both the US GAAP and the IFRS admit three general classifications: Held for Trading, Available for Sale and Held to Maturity. The IFRS also include a fourth category: *Loans and Receivables*. The classification of financial assets in these categories depends on the banks' intent. Securities are classified as Held for Trading when the intent is profit maximization through market appreciation and resale; they are instead classified as Available for Sale when acquired with the intention to hold them for an indefinite period of time but with the possibility to be sold from time to time. The Held to Maturity classification is reserved to securities that the bank intends to hold them until maturity. The accounting regime applied is related to the original intent; assets that can be freely disposed (i.e. those classified as Held for Trading and Available for Sale) are subject to fair value accounting, while historical cost applies to assets meant to be held to maturity (i.e. those in Held for Maturity and Loans and Receivables categories).

into model-based market risk charges the capitalization of the risk stemming from credit events (i.e. default and rating migration) affecting the issuers of credit instruments, along lines conceptually similar to those adopted in the banking book context[2].

This paper provides an initial analysis of the functioning of the reform. Specifically, it assesses the effectiveness of the Basel 2.5 rules in eliminating the distortions of the capital treatment across the banking book and trading book regimes which it was aimed to tackle[3].

In principle, the comparison could be performed in a straightforward manner, by computing the risk-weighted assets (RWAs) for a newly-purchased asset according to the different rules (banking vs trading book) and comparing the outcomes – i.e. interpreting the difference between the corresponding capital charges as a measure of the relative convenience of one booking choice over the other. In practice, this comparison is straightforward only under the standardized approach (which has not been affected by the new regulation), where capital charges are obtained by applying fixed coefficients to the value of the incremental investment.[4]

For banks that compute their capital needs using internal models, i.e. the large banks targeted by the Basel 2.5 package, the capital absorption of a newly-purchased asset does not depends only on whether it is booked in the trading or in the banking book; it also reflects the assumptions underlying the internal model, as well as features of the portfolio of assets which the bank already holds in the trading book. This second factor has an important underlying economic motivation: it recognizes that the risk of an incremental investment cannot be assessed in isolation; it can only be computed in relation to its marginal risk contribution to the risk of the portfolio to which it is added – a basic principle of finance. Accordingly, model-based capital charges must reflect this contribution.

However desirable, this feature makes it impossible to tell a priori whether the regulatory treatment of a newly-purchased asset is more or less favourable depending on its booking. This paper deals with the topic by focusing on a "typical" large bank that, having made an incremental investment, has to select the regulatory portfolio in which to book it. Clearly, the complexity of the analysis lies in the appropriate definition of this "typical" bank. First, a number of assumptions have to be made for the working of the internal models deployed in the banking and trading books. Second, the incremental investment can be anything – stocks, bonds, loans, securitizations tranches, commodities and all kind of derivatives. Third, the existing trading portfolio, to which the incremental investment is added, can have infinite compositions.

[2] The new rules concerned only the banks that compute internally the capital against market risk as the standardized treatment has been left unchanged, pending a broader review of the capital regime for the trading book.

[3] A comprehensive examination of broader questions, such as what is the best approach to measure risk or predict losses for the assets concerned is beyond the scope of the paper.

[4] For banking book items these fixed coefficients reflect the issuer creditworthiness; for trading items they also take into account the interest rate risk content of incremental positions. For instance, consider a liquid fixed-coupon corporate bond with a one-year residual maturity. The banking book standard capital charge would correspond to 8% of its face value, while the trading book charge would be computed by summing up two components: a credit charge (1% of its market value) and an interest rate risk charge (up to 0.5% of its market value).

To make progress it is necessary to reduce this infinite number of configurations to a finite set that is both manageable and representative of a real-world situation. The exercises presented in the paper are as follows.

For the internal models, I refer to those that in the related literature emerge as the most common among large banks for the exposures covered by the study. As for the incremental investments I focus on the credit exposures justifying the regulatory intervention that gave rise to the Basel 2.5 package; specifically, I selected two simple bond portfolios (i.e. structured credit products are excluded from the scope of the paper). They differ as regards sovereign risk, in that one mixes a government bond with a few large European banks senior-unsecured issuances while the other comprises only bank bonds.

As to the composition of the existing portfolios, I test four ex-ante trading-books, each calibrated so as to represent a stylized version of the trading book of a typical large bank.

For each of the resulting eight combinations (two incremental investments and four ex-ante trading-books) I compute the inflation in the trading-book capital charges as the difference between the capital requirements that would emerge if the bank allocated the incremental investments to the held for trading portfolio and the charges for the initial trading book. I then compare these capital needs with the charges that the bank would incur under the banking book rules, if the incremental investments had been allocated among the securities available for sale[5].

In a nutshell, the results show that whereas the previous regulatory setup incentivized banks to book bonds in the trading book, the new regulation may have overshot its target: the more lenient regime is now the banking book. For the eight combinations of ex ante trading-book and incremental investments checked in the paper, under the banking book rules the capital charge ranges between 5% and 8% of the value of the incremental investments, whereas with the trading book rules it goes from 12% to 21%.

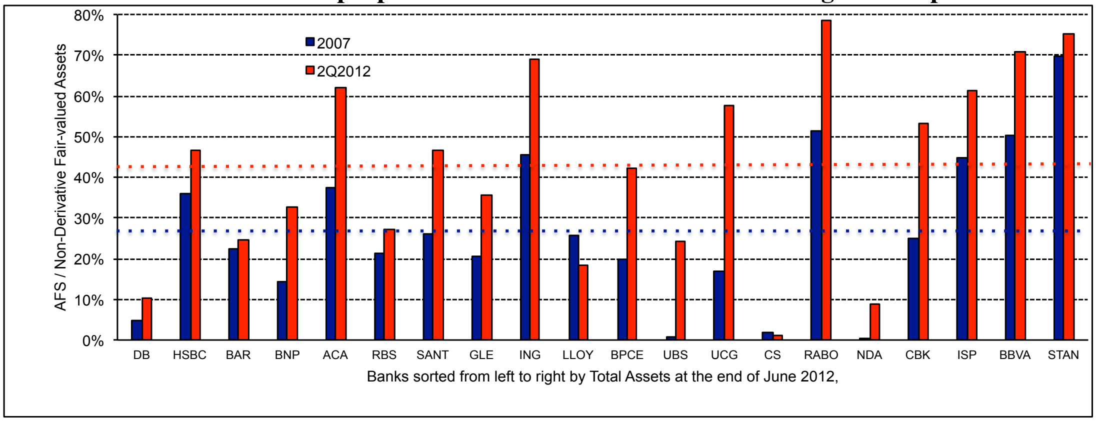
Actual agents' behavior seems to confirm these findings. While in the run-up to the Great Financial Crisis large banks inflated their trading books, since then a substantial proportion of traded credit risk (i.e. credit risk stemming from bonds and other actively traded financial instruments) has been progressively switched into banking books, mainly in the available for sale accounting category.

Among the twenty largest European banks, the average incidence of available for sale assets on the overall value of assets carried at fair value (net of derivatives positive values) increased from 28% at the end of 2007 to 42% at June 2012 (Figure 1). This shift may have been driven by a number of reasons, but it is certainly consistent with the change in the relative convenience of the trading vs. banking book regulatory capital regimes illustrated above. The capital saving motive gains further weight when we observe that the introduction of the Basel 2.5 rules lent momentum to the switch.

[5] Differently from what happens in the *trading-book*, the computation of *banking-book* charges does not request any hypothesis on the composition of the concerned portfolios previous to the insertion of the incremental investment; this is because IRB capital charges ultimately rely on the key assumption of infinite granularity that allows computing the capital need associated to each incremental position in the banking-book on a stand-alone basis.

Figure 1

Assets available for sale as a proportion of fair value assets at the 20 largest European banks



Securities available for sale as a proportion of total assets carried at fair-value in the balance-sheet of the twenty concerned banks at the end of 2007 (blue bars) and at end June 2012 (red bars). Assets carried at fair value are computed as the sum of the assets designated as: *Held For Trading* (net of derivatives positive replacement values), *Designated at Fair Value* and *Available For Sale*. Dotted lines mark the average incidence of available for sale on fair value assets at the end of 2007 (blue) and end June 2012 (red).

The remainder of the paper is organized as follows: after providing an overview of the prudential regimes for trading and banking activities, the portfolios used to perform the comparison exercises are then introduced along with the methodologies deployed to compute the related capital requirements. The results are presented together with a number of robustness checks. Finally, some policy implications are drawn.

2 Regulatory background

Banks capital requirements are expressed as percentages of "risk-weighted-assets" (RWAs), the crucial metric adopted by the Basel Committee to assess the riskiness of banks' assets and off-balance-sheet items. This means that the capital ratio for each institution depends heavily on the risk-weighting approach.

Since the Market Risk Amendment to the 1988 Basel Accord (BCBS, 1996 op. cit.), the computation of RWAs relies on the classification of assets and off-balance-sheets items into two broad categories: the banking book and the trading book. Positions in the latter give rise to *market risk* RWAs, while those in the banking book originate *credit risk* RWAs.

Due to the absence of a full correspondence between regulatory and accounting categories, while all positions in the trading book must be subject to fair value, banking book positions can be subject to either fair value or amortized cost valuation.

This section summarizes the rules governing the computation of risk-weighted-assets under the two prudential regimes.

2.1 Banking-book (BB) regime

The banking book regime is designed to capitalize the credit risk stemming from loans and other credit contracts. For this purpose banks must set aside a certain amount of capital against each credit exposure. The computation does not allow for short positions, whereas the mitigating effect of a range of credit protection techniques is recognized.

With the Basel II Accord of 2006 (BCBS, 2006) banks were given the option to compute banking book risk weighted assets internally as:

$$RWA_{IRB\_k} = K_{IRB\_k} \times EAD_k \times 12.5 \quad (1)$$

The term K_{IRB} represents the capital charge to be to set aside for each unit of the credit exposure that would remain in place toward the k-th obligor, should it default (EAD, Exposure At Default). K_{IRB} reflects the outcome of a *Credit VaR*[6] computed via a regulatory formula, which depends on three parameters that "*advanced IRB*" banks estimate internally[7]:

1) The obligor's probability of default (PD);
2) The loss given default, to be computed taking into account economic-downturn conditions (LGD);
3) The exposure's effective maturity, whose aim is to include the downgrade risk into a framework mostly aimed at capitalizing default risk (M).

In resembling the mechanics of a simplified credit portfolio model (the so-called *Asymptotic Single Risk Factor*), the regulatory *Credit VaR* relies on the assumption of infinite granularity for each of the portfolios in which the banking-book is broken down[8]. This enables "*portfolio-invariant*" capital requirements, which can be added up irrespective of the portfolio composition (Vasicek, 1987).

In the calibration of the internal rating-based (IRB) formula (see Appendix 1 for a brief description), the infinity granularity assumption is linked to the decision to model the sensitivity of each obligor to the single systematic factor with an inverse dependency on its PD. The formula is calibrated with the aim of covering the portfolio unexpected losses with a 99.9% confidence interval and a one-year capital horizon.

2.2 Trading book regime

The aim of the trading book regime is to ensure banks hold sufficient capital to absorb losses from possible adverse scenarios in the market value of inherently complex portfolios, comprising many long and short positions.

Compared with the banking book regime there are two main differences:

1) capital charges are set to reflect a market risk concept, which up until the introduction of Basel 2.5 excluded issuer default risk and encompassed credit spread, equity, interest rate, foreign exchange and commodity risks;

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[6] The term VaR is hereon used for defining the negative of the level α quantile: $VaR_\alpha(X) = -\inf\{x \in R : P(X > x) \leq 1 - \alpha\}$ where α represents the chosen confidence interval and X is the mark-to-market return of a securities portfolio over the desired time horizon.

[7] According to the permission received from their supervisors, IRB banks are divided in two categories: "Foundations IRB" banks compute internally only one of the four parameters of the IRB formula (the obligors' PD), and rely on standard values for the remaining three. "Advanced IRB" banks determine instead all parameters on their own.

[8] The IRB approach differentiates between seven classes of exposures: 1) corporates, 2) sovereigns, 3) financial institutions, 4) retail (differentiated in a number of sub-portfolios), 5) equity, 6) securitizations, 7) non credit-obligation assets and collective investment undertakings. IRB banks are required to assign each of their banking-book exposures to one of those classes. If an exposure does not fall within the definition of any class, it is categorized as a corporate exposure.

2) a portfolio approach applies allowing for a full diversification across the aforementioned risk sources.

Banks authorized to model internally market RWAs internally, for a long time measured them as:

$$RWA_{mkt\_old} = 12.5 \times \left[\left(VaR_{GMR} \times multiplier_{GMR} \right) + \left(VaR_{SMR} \times multiplier_{SMR} \right) \right] \qquad 2$$

where *VaR* is the outcome of the bank's own model, calibrated on a ten-days capital horizon and with a 99% confidence interval.

According to the prevailing risk management practices when *VaR* models became popular, banks were requested to identify two distinct sources of volatility: one reflecting the portfolio's sensitivity to systemic risk factors (VaR_{GMR}), the other driven by idiosyncratic factors relevant for equity and credit products (VaR_{SMR})[9]. The two components got a distinct regulatory multiplier, floored at three for the VaR_{GMR} and at four for the VaR_{SMR}.

Actual multipliers can be set at higher levels, reflecting the model's statistical robustness as well as the supervisory confidence in the bank's risk management practice (the rules governing the computation of market risk capital charges are detailed in the Appendix).

In principle, the broader notion of market risk RWAs might suggest that the trading book regime is more demanding than the banking book one. In fact, the allowance for fully-fledged portfolio models and the adoption of a much shorter capital horizon (ten days as opposed to 1 year) tend toward a preferential capital treatment for trading book items.

For a long time the misalignment between the two regimes was justified by the very assumption underpinning the trading book's existence: as trading items are liquid holdings meant to be held for short periods of time, their capital absorption must factor in the possibility of closing positions at market value, something prevented for buy-and-hold banking book items.

The Great Financial Crisis has put this idea to the test. Occurring at the end of a period in which the portion of credit risk held into the trading books of virtually all the large banks increased substantially, the crisis showed that when market liquidity suddenly dries up a trading intent is of little help. In such circumstances banks remain fully exposed to the worsening of credit risk, often inflated by the fair-value accounting prescribed for trading book items.

Regulators reacted to these flaws by speeding up the implementation of the long-awaited Basel 2.5 package. Initially aimed at equalizing credit-related capital requirements across tre trading and the banking books, the new rules revised more thoroughly the computation of trading book RWAs for model banks. Schematically, the former *VaR*-centric risk-weighting scheme was replaced with a two-bloc approach:

$$RWA_{mkt\_old} = 12.5 \times \left[\left(VaR \times multiplier \right) + \left(SVaR \times multiplier \right) + IRC \right] \qquad 3$$

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[9] In the regulatory jargon the systematic component of *VaR* measures is termed as *general market risk* (VaR_{GMR} in equation 2), while the idiosyncratic one is termed as *specific market risk* (VaR_{SMR}).

The first bloc relies on *VaR* models to catch the short-term volatility of trading items' fair value, with two differences with respect to the previous regime:

1) First, to dampen the capital requirements pro-cyclicality *VaR* outcomes have been supplemented by Stressed *VaR* (*SVaR*) metrics obtained by calibrating standard *VaR* models to a condition of market stress;
2) Second, risk metrics aimed at catching the specific risk were introduced eliminating the need for a regulatory distinction between the two components of *VaR* metrics.

The second bloc is specifically designed to capture the "incremental default and migration risk" content of debt instruments to address the deficiency emphasized by the crisis. This entails more complex computations of the RWAs, with different approaches depending on the nature of the financial contracts involved.

For non-tranched debt instruments, such as those examined in this study, the default and migration risks have to be measured via credit portfolio models defined as Incremental Risk Charge (IRC) models. The calibration of these models is explicitly linked to the choices adopted in the banking book context: 99.9% confidence interval and one year capital horizon[10].

When providing technical instructions for computing the IRC, the Basel Committee explicitly stated that exposures towards sovereign obligors held in the trading book fall within these models' scope (BCBS, 2011)[11]. The preferential treatment hitherto reserved to sovereign investments was therefore abolished, at least for exposures held in the trading book of model banks.

Remarkably what Basel 2.5 left unchanged is the scope of application of the trading book regime, which remains based on agents' declared intent.

This choice is crucial for the topics investigated in this paper, as the incentives for banks to declare a trading intent could have been affected by the strengthening of the trading book capital charges. In this regard it is worth noticing that while for enlisting instruments in the trading book banks have to convince regulators of their intent to trade, they are not required to show their actual capability of holding banking book assets till maturity. In fact, it is fairly common for banks to hold in the banking book long dated bonds financed on short-term maturities on the wholesale market, with the risk of seeing "the best 30-years intentions invalidated in 24 hours" (Haldane, 2011).

Box 1 - The Trading Book Boundary

Banks can choose between the trading book and the banking book regime for a wide range of financial instruments. While in the case of derivatives the choice is relatively constrained by the

[10] While the one-year capital horizon is fixed, banks can choose to adopt within their IRC models either a "*constant position approach"* (CPA) or a "*constant level of risk approach*" (CLRA). Under a CPA all positions be mapped on the one-year capital horizon. The CLRA requires instead that positions be mapped on a grid of liquidity horizons (which cannot be shorter than 3 months), depending on their intrinsic characteristics. Banks have to assume that at the end of each liquidity horizon initial trades will be replaced by new ones sharing the same "risk content" (i.e. with clones with the same rating, maturity and industrial sector) until the one-year capital horizon is reached.

[11] In ruling out a specific exception for sovereign exposures, the Basel Committee admitted a nil risk weighting if this is the models' result. The European Banking Authority adopted the same stance when issuing its guidelines on IRC models validation (EBA, 2012).

accounting provisions, the allocation is freer for marketable debt products, ranging from government bonds to liquid private sector debt issuances.
A specific role in this regard is played by the available for sale accounting category, where a substantial portion of marketable debt instruments is actually held. From an accounting perspective a fair-value regime applies, with fair values changes flowing directly to the firm's equity without influencing its P&L as it happens in the *Held for Trading* accounting category.
The Basel rules governing the exercise of the booking option foresaw the capital advantage originally associated with the trading book; accordingly, it was stated that all items had to be placed in the banking book unless the bank could convince the regulator otherwise. Namely, the intent to trade the concerned instrument has to be proved as the trading book regime is applicable only to items either held with a "trading intent" or for the purpose of hedging elements held with a trading intent[12].
The potential shortcomings of a boundary based on the intent of agents have been investigated by the Financial Service Authority (2010) which observed that the trading intent concept might be suited to describe the willingness of a firm to trade, but was certainly inadequate for evaluating its actual ability to do so.
Recently the definition of the trading book boundary gained new relevance in connection with the overhaul of the TB prudential regime just launched by the Basel Committee (BCBS, 2012). In restating the need for a distinction between the trading and the banking book, the Committee has put forth two alternatives.

- The first ("trading evidence boundary") continues to rely on an intent-based assessment; the only difference to the current regime would be that banks have to provide evidence of their capability to trade and risk manage instruments inserted in TB, instead that just stating their intent to trade.
- In the second ("valuation-based boundary") the border would be set in order to align the structure of capital requirements with the risks actually posed by financial instruments to a bank's regulatory capital resources. Under this option trading book capital requirements would apply to all instruments carried at fair value, irrespective of whether fair value changes are recognized in earnings or flowing directly to equity.

3 Methodology

The comparison of the regulatory regimes centers on a bank that already holds a trading book to assess the regulatory incentives for the allocation choices regarding an incremental investment in traded credit positions. The increase in the trading book RWAs triggered by the new credits will then be compared with the banking book RWAs that would be obtained if the bank had not declared a trading intent, and instead kept the positions in the banking book.

The next section describes the sample portfolios and introduces the methods adopted for estimating Equations 1 and 3 on those portfolios.

3.1 Portfolios description

Due to the portfolio approach adopted to calculate trading book capital charges, the comparative exercise does not depend only on the positions chosen but also on the broader portfolios to which they are added; i.e. as the trading book marginal charges on a given position can change materially once inserted in differently composed portfolios, the results of the banking book and trading book comparison can be generalized to the extent to which the relevant choices are deemed representative of the reality faced by real world banks.

[12] It worth noticing that this intent based definition of the trading book allows many items which accounting wise are earmarked as held for trading to belong to the banking book from a prudential perspective.

Given that the exposures for which the boundary between book and banking books matters most are traded instruments sensitive to credit risk (i.e. bonds, traded loans, securitization products and the like), prior to the crisis a quite obvious choice would have been centering the comparison on securitization products. However, in the current context there are two reasons for shifting the focus toward plain traded bonds. The first stems from the diminished relevance of structured credit assets in banks' trading books; the second, from the decision of the Basel Committee to level the capital treatment for securitizations across the trading and the banking books, with the Basel 2.5 package.

I will now illustrate the steps taken to compose the portfolios based on which the trading book and banking book regulatory regimes are compared, describing first the incremental investments and then the stylized trading books to which they are added.

Incremental investments

The incremental investments will be represented by two long-only portfolios, suitable for the allocation either in the trading or banking book. Both portfolios are composed of a few actively traded senior-unsecured bonds, selected among financial and government issuances. In aggregate those issuances represent the most important portion of the credit risk traded by European banks, as shown by the composition of trading books of the banks participating into the European Banking Authority stress test exercises (EBA, 2011).

What distinguishes one portfolio from the other is sovereign risk.

Table 1

Incremental investments

Issuer Security ISIN code	*Inc. Inv. Large*	*Inc. Inv. Small*	Not. (€ mln)	Mat. years	Orig. S&P rating*	Adj. S&P Rating**	*PD****	*LGD*
République française FR0117836652	✓	✗	50	3.0	AA	A	0.03%	46%
Erste Bank XS0176311792	✓	✓	10	1.6	A	BBB	0.21%	45%
Royal Bank Scotland XS0546218925	✓	✓	10	5.7	BBB	BB	1.27%	45%
BNP Paribas XS0525490198	✓	✓	10	3.4	AA	A	0.06%	45%
Deutsche Bank DE000DB5DDD4	✓	✓	10	14.7	A	BBB	0.21%	45%
Intesa SanPaolo XS0750763806	✓	✓	10	5.0	A	BBB	0.21%	45%
Dexia Crediop IT0004054661	✓	✓	10	0.3	BB	B	4.74%	45%

*S&P ratings rounded to whole letters as of 2 February, 2012. ** Refers to the S&P ratings adjusted for the EDF implied ratings. ***PDs correspond to the one-year jump-to-default probabilities reported in the corporate and sovereign S&P transition matrices subject to the application of a floor set to 0.03%. LGDs are computed as the 95th percentile of the distribution reported for the relevant IRB portfolio in the 2011 EBA stress test exercise (see below).

The first portfolio – termed "*Large*" – has an overall value of €110 million, 55% of which is represented by a single position in a highly-rated sovereign issuance, represented by a three-year bond of the Republic of France. The remaining 45% is evenly distributed across six Euro Medium Term Notes issued by differently rated large European banks, with maturities ranging from 0.3 to 15 years.

The second portfolio – termed "*Small*" – has an overall value of €60 million and is obtained by excluding the government bond from the *Large* portfolio. A greater name diversification is thus achieved at the cost of a further increase in the financial sector concentration.

Ex-ante trading books

The two incremental investments will be added in turn to four *ex-ante trading-books,* each aimed at stylizing the market risk profile of different types of real-world banks: Sovereign, Credits, Balanced, Balanced-No-Sovereign.

Those ex-ante trading-books are obtained by combining long and short positions on 157 actively traded cash and derivatives securities, grouped in six areas named after the prominent risk factor: Govies, Corporate, Rates, Equity, Foreign Exchange, Commodities.

The composition of the risk areas has been designed so to mimic a number of trading strategies popular among banks active in client-driven capital markets activities. As the design of these strategies remains pretty constant (Appendix 2 details the areas' composition), what differentiates the ex-ante trading-books is the extent to which each area contributes to the overall portfolio risk profile.

For the purpose of our comparison, the single most important characteristic of the four ex-ante trading-books is their exposure to credit risk, as it powerfully affects the diversification benefits achievable by the incremental investments: i.e. the higher the exposure to credit risk in the ex-ante trading-book, the lower the diversification benefits achievable for the incremental investments and hence the higher the capital absorption under the trading book regime.

Credit risk stems entirely from the Govies and Corporate risk areas, which comprise positions similar to those contained in the incremental investments.

In the *Sovereign* trading book the Govies area drives half of the overall *VaR* and the overall portion of the *VaR* driven by credit risk is at 70%. It depicts a situation where market risk stems largely from the bank's government portfolio, with a material concentration toward a single issuer (the French Republic) which accounts for roughly two thirds of all Govies credit exposures.

The *Credits* trading book has been designed so to resemble the risk profile of a bank whose trading positions are fairly sensitive to credit risk but without any strong concentration toward the public sector. While the overall portion of the *VaR* explained by the Corporate and Govies areas corresponds with the one observed for the Sovereign trading book (70%), in this case the *VaR* contribution of the two areas is leveled at 35%.

The *Balanced* trading book represents the risk profile of a bank whose trading book is less affected by credit risk; the six risk areas contribute quite evenly to the overall *VaR*, with Rates and Equity being the single most important risk sources. Noticeably, in this case the long and short credit exposures roughly correspond, with a long-to-short ratio of 59%. Even less affected by credit risk is the *Balanced-No-Govies* trading book, obtained by zeroing the Sovereign area in the Balanced version.

Although the incremental investments are fairly small in size in comparison to the ex-ante trading books (across the eight combinations they spur an average *VaR* increase by 12%), their inclusion augments the exposure to credit risk. The magnitude of this effect can be appreciated by comparing the ratio of long-to-short credit positions prior and post the insertion of the incremental investments (Table 2).

Table 2

Ex-ante trading books

	Marginal VaR **of risk areas**						***Long-to-short credit positions****		
	Govies	*Corp*	*Rates*	*Equities*	*FX*	*Comm.*	*Original*	*With Large Inc. Ptf*	*With Small Inc. Ptf*
Sovereign	50%	20%	20%	8%	3%	1%	79%	81%	80%
Credit	35%	35%	19%	7%	2%	1%	85%	86%	86%
Balanced	20%	20%	23%	22%	8%	8%	59%	67%	64%
Bal. no Sov.	0%	29%	27%	26%	9%	9%	53%	64%	60%

*Computed by dividing the notional value of long credit exposures held in the Govies and Corporate areas by the sum of the values of long and short credit exposures in the same areas.

Box 2 – Risk areas composition

The Govies area comprises Italian, Spanish and French government bonds with maturities ranging from one to ten years. It also includes two financial futures referencing a five-year (Euro-*Bobl*) and a ten-year (Euro-*Bund*) generic debt instrument issued by the German government. The area's composition is such that long exposures largely arise from bonds, while financial futures are deployed to build short positions aimed at hedging part of the interest rate risk stemming from long positions. Overall, long exposures largely predominate over short ones, with a long-to-short ratio of 90%.

In the Credits area a long position on the five-year years iTraxx IG index is combined with long and short CDS trades referencing a number of index constituents. The composition is such that long positions exceed short ones only slightly (the long-to-short ratio is around 50%) with a noticeable concentration toward financial firms.

The Rates area commingles eight interest rate derivatives: two fixed receiver interest rate swaps (five and 15 years against 3-months Euribor) and six interest rate options. The swaps account for half of the *VaR*, exposing the bank to an increase of Euro interest rates; the remaining half of the Var is driven by the risks stemming from an option strategy referencing the 1-month Euribor, where a short cap with a maturity of three years is partially hedged by a shorter maturity (one year) long cap. A straddle on the 3-month Euribor contributes only modestly to the area risk profile.

In the Equity area a long position on a future referencing the EuroStoxx 50 is combined with a call option strategy on the same index. Half of the *VaR* is explained by the future position while the remaining half stems from an option strategy with a three-year short call hedged by a long call with a shorter maturity (one year).

In the FX area a six-months long forward on the Euro-USD exchange rate is partially hedged with a long put on the same exchange rate with a longer maturity.

In the Commodities area the risk stems from a directional long position on a three-month future referencing Light Sweet Crude Oil (WTI).

3.2 RWA computation

This section describes the methods adopted for estimating the banking book and the trading book RWAs. The internal rating-based computations will be described first, followed by the approaches for market risk charges. Several discretionary choices and assumptions have been made with the objective of mimicking, to the greatest extent possible, the choices and assumptions actually made by banks in their business operations. Therefore, in rationalizing my choices I referred, whenever possible, to banks' actual practices.

IRB RWAs

IRB banks obtain banking book RWAs by summing up the IRB formula output loan by loan. This requires estimating for each credit position the exposure at default time (EAD) and the three parameters required by the IRB formula (PD, LGD, M).

For the purpose of this study these parameters will be estimated for each credit exposure comprised in the incremental investments, while there is no need to formulate hypotheses on the ex-ante composition of the banking book, due to the infinite granularity assumption on which the IRB charges rely.

The study's focus on marketable credit securities makes the EAD estimation trivial, as it corresponds to the bonds' notional value. The computation of the exposures' effective maturity is also rather simplified. Absent uncertainties on bonds repayment profile, the M parameter will be computed as a *Macaulay* duration, under the zero interest rate assumption suggested by the Basel Committee[13].

Obtaining the PD for the concerned names proves more complex, although the focus on large debtors somewhat lessens the usual intricacies of this estimation. As it has often been pointed out (FSA, 2010), the low frequency of credit events affecting large obligors prevents banks from developing approaches that are totally dependent on internal facts, leading them to track the assessment provided by external credit raters. The systems deployed for this purpose, usually called “Shadow Ratings Approaches” (SRAs), typically exhibit with a modular architecture, where statistical models’ outputs are subject to limited adjustments by credit managers to take into account information deemed relevant but not included in models’ analytics. An override process usually completes the system design, allowing rating analysts to manage cases where for specific circumstances the system did not produce appropriate results for a particular obligor.

The working of a SRA will be mimicked by assuming that the ideal bank developed the model’s statistical component in order to track the S&P long-term issuer ratings. To reproduce the outcomes of a human-driven adjustment process, S&P ratings will be then notched up or down depending on their convergence with Moody’s KMV Expected Default Frequencies (EDF^{TM})[14]. Adjustments will be triggered for obligors whose S&P rating letter as of February the 2nd 2012 does not square with the EDF-implied rating, once mapped on the S&P Master scale (the use of KMV EDF PDs in the context of SRA systems is described by Erlenmaier in Engelmann & Rauhmeier, 2006). In these cases the original S&P ratings will be notched upward or downward by up to two notches, so to reduce the distance between the two assessments (original and adjusted ratings are reported in Table 1).

Estimating LGDs is usually even more demanding than gauging PDs. Expectations on stressed recovery rates depend on a number of exposure-specific features whose assessment relies on the analysis of extended time series. However, the problem’s complexity is lessened by the study's focus on marketable credit securities that are *pari passu* to private sector investors. As matter of fact, LGDs estimates for unsecured bonds tend to be more convergent than those referring standard loans, as the former mainly reflect publicly available information.

To link the IRB RWA computation to values used by real-world banks, the LGDs on the incremental investments have been gauged by making reference to the data reported by the European Banking Authority as part of the disclosure of the 2011 European stress test exercise (EBA 2012 op. cit.). Namely, the 95th percentile of

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[13] M is computed as: $M_k = \sum_{t=i}^{n} t_i C_i \Big/ \sum_{t=i}^{n} C_i$ where C_i is the cash-flow expected in the t_i period on the k-th instrument.

[14] To map from ratings to one-year PDs the S&P corporate and sovereign transition matrices are deployed.

the LGD distribution reported for the Financial Institutions and the Sovereign IRB portfolios has been singled out, so to minimize the risk of getting values influenced by secured financing transactions[15]. The figures deployed are shown in Table 1. They are pretty aligned with the LGD values computed by Moody's over an extended period of time (2011) by analyzing bond prices in a fix time window after the default of the bond's issuer,

Market RWAs

Basel 2.5 requires banks to compute market RWAs by adding up the outcomes of three risk models: *VaR*, *Stressed VaR* (*SVaR*) and IRC. While *VaR* and *SVaR* models must comprise all trading positions, the scope of IRC is limited to credit sensitive positions.

As shown by the survey recently undertaken by the Basel Committee when investigating the reasons behind the RWA variance (BCBS, 2013), banks tend to develop these risk models along similar lines, differentiating each from the others mainly in the calibration choices. To avoid simulated trading books RWAs being overly on a specific choice, the *VaR* and IRC metrics will be obtained by averaging two different calibrations of IRC and *VaR* models.

A single approach will be instead deployed for *SVaR*, as in this case the room for different calibrations is pretty small so that differences among banks arise from the choice of the "*stressed period*".

Value at Risk (VaR) and Stressed Value at Risk (SVaR)

In gauging *VaR* RWAs two calibrations of the historical simulation technique will be deployed, diverging in the length of the look-back period, pinpointed by the Basel Committee on Banking Supervision as the single most relevant driver of divergence in *VaR* outcomes (BCBS, 2013 op. cit.):

- VaR_A is obtained by re-evaluating the portfolio with the market scenarios observed for the 250 business days spanning from February 17th 2011 to February 2nd 2012. A weighting scheme applies with the purpose of updating historical data for shifts in market volatilities[16];
- VaR_B will be computed taking into account the market scenarios observed in the equally weighted 500 business days preceding February 2nd, 2012.

In both cases *VaR* figures reflect a broad range of risk factors:

- stocks, commodities and exchange rates risks are measured taking into account shifts of the concerned factors;
- interest rate risk is measured based on a number of pillars of the concerned interest rates curves on which relevant instruments have been mapped;

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15 Since the values reported by the European Banking Authority reference to regulatory portfolios where secured exposures are pooled with unsecured ones, selecting a high percentile of the reported LGD distribution should help to get LGD values pertaining to unsecured transactions.

16 The weighting scheme follows a popular approach aimed at incorporating volatility updating into historical simulation VaR models. The approach is described by Boudouk et al. (1997) and consists in weighting the simulated daily P&L observations as it follows: $W_k = \frac{\lambda^{(k-1)} \times (\lambda - 1)}{\lambda^n - 1}$
where W_k is the weight assigned to the *k-th* P&L observation, from 1 to 250, and λ is the decay factor, here set to 0.97.

- volatilities risk is factored in by mapping options on relevant volatilities surfaces;
- credit spread risk is computed with reference to individual spread curves. Different curves are deployed for synthetic and cash instruments; for obligors that have a low number of observable bond prices a contamination approach is followed, where shifts of CDS premia are also deployed for bonds.

VaR scenarios are obtained by shocking the risk factors values as of February 2nd 2012; absolute shocks will be deployed for interest rates and credit spreads; relative shocks will apply to all the other factors.

Risk measures are computed via a full-revaluation approach. The regulatory ten-day capital horizon will be obtained by scaling up the one-day *VaR* via the well-known square root of time rule. A regulatory multiplier of three – the lowest possible – will apply to *VaR* outcomes.

Stressed *VaR* RWAs are obtained using a historical simulation metric, with a 255 business days look-back period, that corresponds to the market scenarios prevailing in the period from April 15th 2008 to March 30th 2009. The risk factors deployed for *VaR* measurements apply also in this case. Along the same lines adopted for *VaR* metrics, the ten-day capital horizon is reached via the square root of time technique and capital charges reflect the lowest possible regulatory multiplier.

Incremental Risk Charge, IRC

IRC RWAs are computed by averaging the outcomes of two models. Both refer to the "Merton approach" for pricing corporate debt (Merton, 1974) and are structured with the two-modules scheme illustrated by Martin et al. (2011) and popular among large banks:

- the first module simulates the joint dynamic of credit securities;
- the second one computes the economic effects of simulated credit scenarios.

A Montecarlo technique is deployed to obtain a number (500.000 runs) of P&L sufficient to reach an adequate level of stability and convergence for the 99.9% percentile of the distribution that corresponds to the IRC metric. To keep things as simple as possible a yearly liquidity horizon applies to all issuers[17]. The calibration procedures for IRC_A and IRC_B are detailed in the Appendix[18]. In both cases all

[17] Wilkens et al. (2012) show that, on average, replacing the one-year liquidity horizon with a three- month horizon enable a 20% reduction of IRC capital charges on investment grade names.

[18] IRC_A figures are obtained by calibrating the module governing credit events probabilities with the dynamics of relevant equity prices (for private obligors) and CDS premia (for sovereign issuers) observed from January 2009 to December 2011. IRC_B charges reflect instead a two-stage calibration: the correlation among the sectors in which the economy is broken down is obtained through the daily log-returns observed for the relevant CDS in 2011; the intra-sector correlation is modeled using the IRB formula. Defaults and migrations thresholds are obtained in IRC_A by inverting the Moody's 1970-2010 one-year corporate transition matrix and the Moody's 1970-2010 sovereign matrix (in IRC_B the S&P corporate 1981-2010 1-year transition matrix and the S&P Sovereign 1981-2010 transition matrix are instead used). Initial credit ratings are those assigned by Moody's as of 2 February 2012 (in IRC_B initial credit ratings are those assigned by S&P at the same date).

credit exposures are dealt with in the same manner apart from the use of a dedicated transition matrix for sovereign exposures.

Box 3 - Generalized Merton models for IRC

In line with the Merton approach a default is assumed to have occurred when the value of the concerned firm's assets at the relevant time (V_t, whose distribution is assumed to be log-normal) falls below the value of its liabilities (the default threshold D_i). Firms' asset returns are assumed to be conditionally independent, so that their dynamics are explained by the status of the economic cycle (*systematic factor*) and by features specific to each issuer (*idiosyncratic factor*). By referring to asset returns as a proxy for the issuer creditworthiness (CW_i, issuer creditworthiness index) we have: $CW_i = \rho_i(\beta_i \cdot \tilde{X}) + \sqrt{1-\rho_i^2\tilde{\varepsilon}_i}$ Where:

- X is a S-dimensional standard normal variable, whose marginals drive each of the X systematic factors affecting the issuers' creditworthiness. The factors distribution is assumed to be multi-variate standard normal, with correlation matrix C;
- β_i is a standard basis vector of the RX space. This means that the ith issuer can be either mapped to one or more than one systematic factors, provided that in the latter case β_i is defined with unit norm so to guarantee that CW_i is standard normal;
- ρ_i represents the correlation level between the return of the ith issuer's assets and the standardized performance of the relevant systematic factors over the relevant time horizon;
- ε_i is the idiosyncratic driver of the i-th issuer's asset returns and it is assumed to have a standard normal distribution.

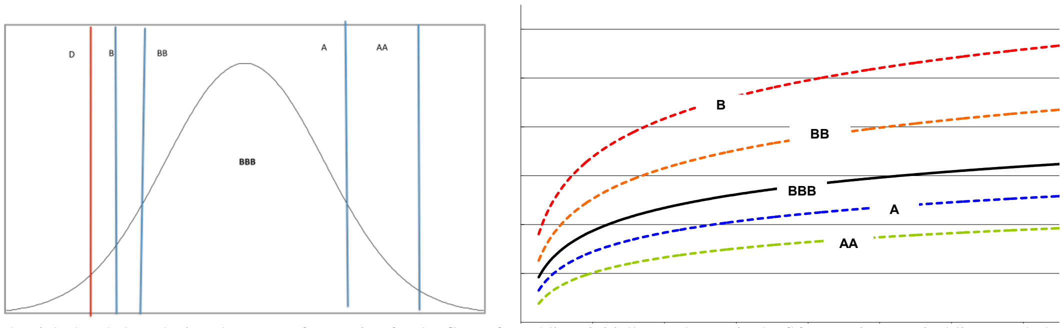
Given the assumption on log-normality for V_t, CW_i will be normally distributed $CW_i \cong N(\mu,\sigma)$.

This requires to rescale the default boundary (D_i) to the same dimension (d_i): $d_i = \ln D_i - \ln V_0$

To comply with the regulatory provision to capitalize for migration and default risk, the described Merton paradigm is generalized to monitor changes in obligors' creditworthiness, other than defaults. For each rating category a number of boundaries are defined (B_i; $B_i > D$), which when reached trigger a rating change (Figure 2, left-hand chart). As for default thresholds, the assumption of log-normality of V_i also imposes rescaling the migration boundaries too (b_i); $b_i = \ln B_i - \ln V_0$ In line with the risk measurement purpose, simulations are performed under a real probability measure obtained by extrapolating default and migration thresholds from rating agencies transition matrices (Figure 2, left-hand chart). The calibration of the pricing module is instead more along the lines of a risk-neutral approach, as the price impact of rating changes is gauged from the observation of prices of differently rated bonds (Fig. 2, right-hand chart); a fix recovery rate is deployed for defaulted obligors set at 40% for both corporate and public issuers.

Figure 2

Migration and default thresholds in generalized Merton models



The right-hand chart depicts the range of excursion for the CWI of an obligor initially rated BBB in the S&P metrics. Vertical lines mark the relevant migration and default boundaries. The left-hand chart shows the spread curves deployed to revaluate a debt instrument issued by the aforementioned BBB obligor when rating migrations occur.

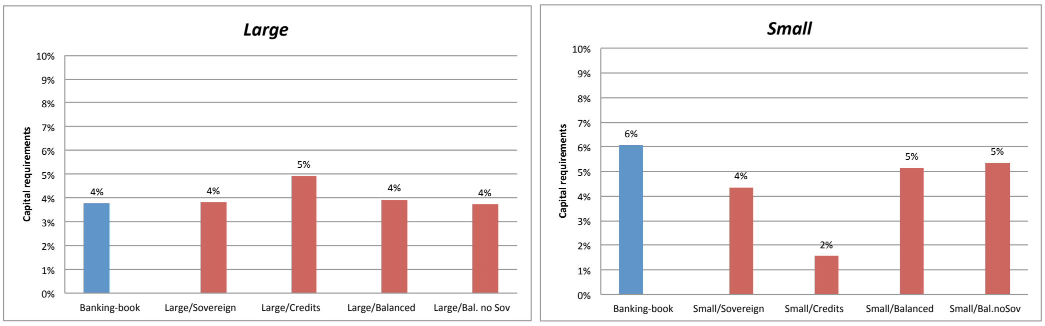
It is worth noticing that the shared methodological framework does not prevent material gaps among the models' charges. As argued by Tarashev & Zhu (2007) in the context of multi-factor credit portfolio models used for economic capital modeling, the differences between the outcomes of the two models can be largely explained in terms of the choice made for modeling the co-dependence structures within the portfolios. This is because the IRC capital charges depend on the shape of the tail of the distribution of credit-related P&L, which is heavily affected by the estimated correlation among the names in the portfolios.

4 Results

The incentives surrounding the booking choice of the ideal bank will be investigated by comparing the ratio between capital requirements and notional values for each of the two incremental portfolios. The higher the ratio, the greater the marginal capital to be set aside, the lower the leverage achievable by the ideal bank when buying the incremental credit exposures.

Figure 3

Basel 2 Marginal capital requirements
on *incremental investments*



The vertical bars show the capital requirements the bank would have to set aside against the two incremental investments expressed as a share of their notional values. The blue bar depicts the capital needs corresponding to the banking book holding, while the red bars show the requirements due for each of the four combinations obtained by adding the incremental investments to the four trading books named on the horizontal axis.

As trading book capital requirements differ depending on the four ex-ante trading books, for each portfolio one banking book value will be hence compared to four trading book values. All values are reported as ratios of capital to be set aside against the face value of the newly acquired incremental investments. The exercise has been performed with two versions of the Basel Framework: Basel 2 (Figure 3) and Basel 2.5 (Figure 4).

The results can be summarized as follows:

First, under the Basel 2 rules the capital charges associated with the incremental investments differ between the trading book and the banking book, with the former being more lenient than the latter reflecting the absence of a capitalization scheme for default risk (Figure 3).

These findings square well with the expectations, even if the advantage to the trading book allocation is pretty limited for the Large version of the incremental investments (i.e. that comprising a material sovereign exposure).

Second, the Basel 2.5 Framework has proved extremely effective in curbing the incentives for banks to stockpile credit risks in the trading book. Assessed with reference to the portfolios tested here, for some combinations the surge in capital requirements goes well beyond the threefold increase forecasted by the Quantitative Impact Studies performed by the Basel Committee prior to the introduction of the Basel 2.5 package.

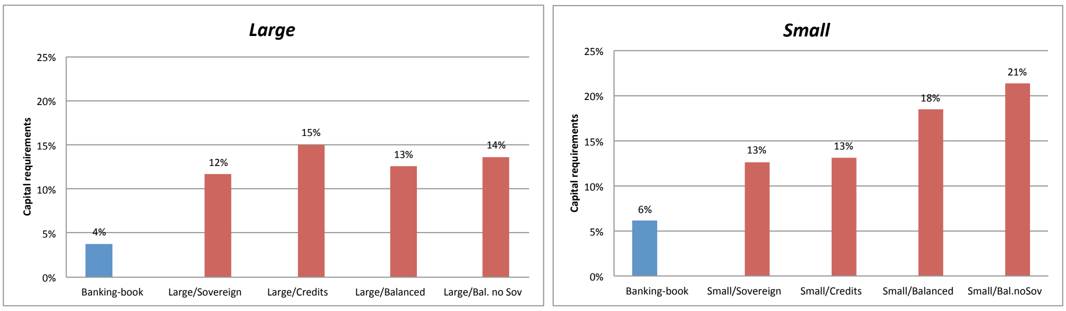
The largest effects are observed in the Small portfolio (i.e. the one that comprises relatively low-rated credits), whose average capital absorption increases from 4% to 16%, which in the RWA metric corresponds to passing from a 50% to a 200% weighting. Although material, such increases are still limited if compared with those obtained by Varotto (2011). Working on granular bond portfolios he reports estimates of up to nine times for the increase of trading book capital charges associated with the Basel 2.5 rules.

Third, and most importantly for the purpose of this paper, the material stiffening of trading book rules clearly reverted the regulatory incentive; i.e. in the current setup the stylized bank I worked with would always seize a material capital saving by booking the incremental investments in the banking book, irrespective of the assumptions formulated on its starting position (i.e. a capital saving is achieved with all ex-ante trading-books).

The overarching reasons for this gap are two, both related to the regulation design. The first consists in the banking book regime's lack of any capitalization scheme for fair-value variability, even for securities held as available for sale.

Fig. 4

Basel 2.5 marginal capital requirements on incremental investments



The vertical bars show the capital requirements the bank would have to set aside against the two *incremental investments* expressed as a share of their notional values. The blue bar depicts the capital needs corresponding to the banking book holding, while the red bars show the requirements due for each of the four combinations obtained by adding the incremental investments to the four trading books named on the horizontal axis.

The second source of divergence stems from the different approaches to credit risk measurement, with trading book requirements being sensitive to credit risk concentration phenomena whereas banking book ones rely on an infinite granularity assumption. One strategy to appreciate the materiality of this divergence consists in observing the reaction of IRC charges to an increase in the granularity of the tested portfolios.

This strategy can be pursued by splitting the exposure to each obligor among a number of clones, all sharing the original debtor's characteristics (rating and industrial sector of reference). The results achieved for the portfolios obtained with the Large incremental investments are reported in Table 3. They show that increasing the number of names fivefold would halve the initial IRC requirements.

Table 3

Granularity effect in IRC charges

	Large Within Sovereign	*Large Within Credits*	*Large Within Balanced*	*Large Within Balanced No Gov*
132 obligors Original	*100%*	*100%*	*100%*	*100%*
264	*76%*	*72%*	*75%*	*72%*
396	*66%*	*64%*	*65%*	*63%*
528	*57%*	*61%*	*60%*	*57%*
660	*54%*	*60%*	*57%*	*55%*

Values expressed as % of the initial IRC capital requirements due on the *Large* version of the *incremental investments* once added up to the four ex-ante trading books.

4.1 Robustness checks

In deriving the trading book and banking book capital requirements I had to make a number of assumptions, the most important being those related to the composition of the initial trading positions and to the working of the models deployed for capital computation.

In this section some of the most critical assumptions are altered in order to check the robustness of the results presented so far.

The first check is aimed to investigate the responsiveness of the comparison exercise to the choices made in the test portfolios composition, and specifically in the portfolios' sovereign component. After all, one could argue that the gaps found between the banking book and trading book regimes are symptomatic of portfolios concentrated toward highly-rated issuers; as such, those gaps could disappear for differently composed portfolios.

To check for this effect the French government will be replaced in its position of prominent obligor by a lower-rated public issuer. Having chosen to this aim the Italian government (BBB rating as for 2 February 2012 in the S&P metric), two changes have to be performed, one pertaining to the Govies risk area of the ex-ante trading books, the other to the Large version of the incremental investments.

The composition of the Govies area has been changed subject to the constraint to put the Italian government in the position of the most relevant public borrower, while preserving the Govies area *VaR* contribution across the four ex-ante trading books. For this purpose the exposure to French bonds have been cut while expanding accordingly Italian and German issuances (details are provided in the Appendix). The change to the Large incremental investments is simpler as it consists in replacing the 3-year French bond with an equally sized ten-year Italian note[19].

Figure 5 depicts the outcomes of the comparison with the new setup. In confirming the strong sensitivity of the exercise to changes of portfolios composition, the check highlights the extent to which the impact on booking incentives of the Basel 2.5 rules is conditioned by credit ratings.

In all portfolio combinations the incentive toward a banking book allocation is now significantly augmented, and the average distance between the capital absorption in the two regimes grows from 9% to 21%.

[19] The € 10 million position in a *Bon du Trésor à taux annuel normalisé* maturing in January 2015 (BTAN - ISIN FR0117836652) has been replaced with a position of the same amount in a *Buoni del Tesoro Poliennali* (BTP - ISIN IT0004759673) maturing in March 2022.

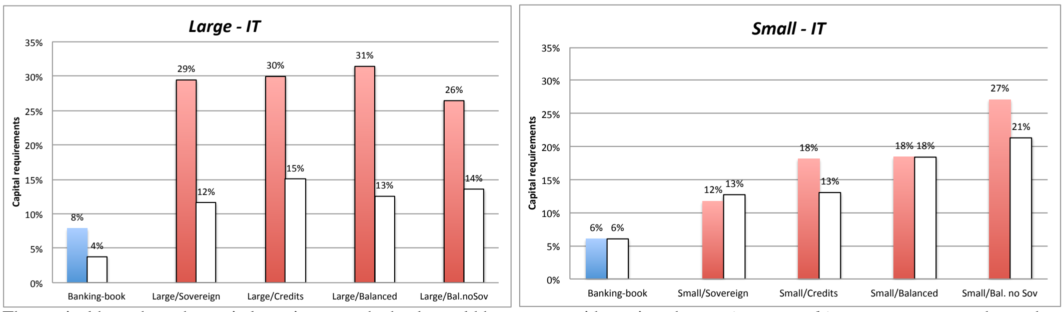
As one could expect, the effect is more noticeable for portfolios comprising a material sovereign component (i.e. those obtained with the Large incremental investments).

This robustness check also allows to investigate the responsiveness of the new trading book charges to changes in the ratings assigned to the prominent obligors in a portfolio. As IRC charges reflect the outcomes of credit portfolio models calibrated to an extremely high confidence interval, they are naturally exposed to cliff-effects triggered when changes of the obligors' PDs are able to reshape the simulated distribution of credit related P&L in the proximity of the quantile used to the capital charge.

This happens anytime the PD assigned to a prominent obligor in a trading book exceeds a threshold implicitly set by the 0.99% IRC confidence interval; i.e. when the PD associated to the rating of the concerned name gets higher than 0.1%.

Figure 5

Basel 2.5 marginal capital requirements on incremental investments



The vertical bars show the capital requirements the bank would have to set aside against the two *incremental investments* expressed as a share of their notional values. The blue bar depicts the capital needs corresponding to the banking book regime, while the red bars show the requirements due for each of the four combinations obtained by adding the incremental investments to the four trading books named on the horizontal axis. The white bars show the trading and banking book requirements computed with the original (i.e. French) version of the portfolios.

To appreciate this effect in the "Italian" versions of the tested portfolios it is sufficient to shift up mildly the PD of the Italian government.

Table 4

Cliff-edge effects in IRC models

	Sovereign and Large	*Credits and Large*	*Balanced and Large*
IRC with distinct transition matrices corporate and government issuers	17%	16%	16%
IRC with the corporate transition matrix for all issuers	28%	27%	27%

Values expressed as capital requirements on the *Large incremental investments* added to the Italian version of the *ex-ante trading books*.

The rating assigned to Italy at the time of this study (BBB in the S&P metric) allows this effect to be obtained without the need to simulate a downgrade, but just by changing a parameterization choice common to both the IRC models, which consists in the use of a dedicated transition matrix for public issuers[20]. Renouncing this feature to deploy the corporate transition matrix also for public obligors, provokes a sevenfold rise of the PD assigned to BBB-rated governments, from 0.03% to 0.21%. As a consequence, the IRC requirements for the Large

[20] The BCBS reports the use of a dedicated transition matrix for sovereign exposures as a common feature of IRC models (BCBS, 2013 op. cit).

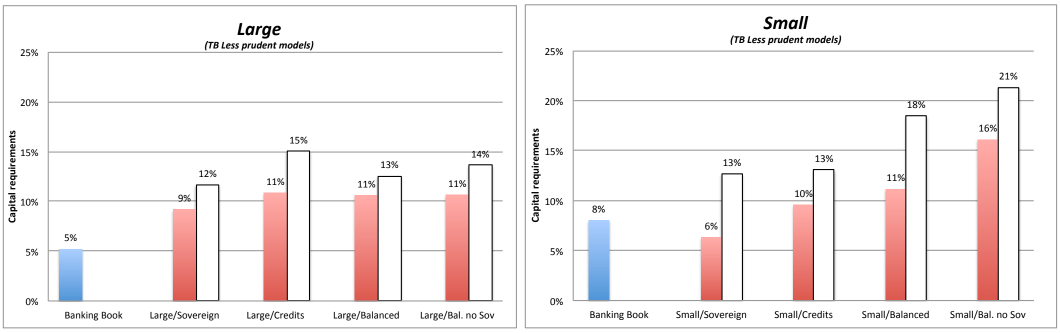
version of the incremental investments experience a steep increase (Table 4) driven by an extremely severe weighting of the Italian government bonds.

A second set of robustness checks assesses the impact of the choice of the models used to compute the capital requirements in the trading book.

The first check leverages on the availability of two *VaR* and IRC models, reflecting different calibrations of the same conceptual models. It consists in computing the trading book capital charges using for each of the eight portfolios the combination of *VaR* and IRC models that qualifies as the less demanding, instead of relying on the average between the outcomes of the two approaches

Figure 6

Basel 2.5 marginal capital requirements on incremental investments



The vertical bars show the capital requirements the typical bank would have to set aside against the two incremental investments expressed as a share of their notional values. The blue bars depict the capital needs corresponding to the banking book regime, while the red bars show the trading book requirements (computed with the combination of the "less prudent" models) due for the combinations obtained by commingling the incremental investments with the ex-ante TB named on the horizontal axis. For each combination the white bars show the trading book requirements computed averaging the models outputs.

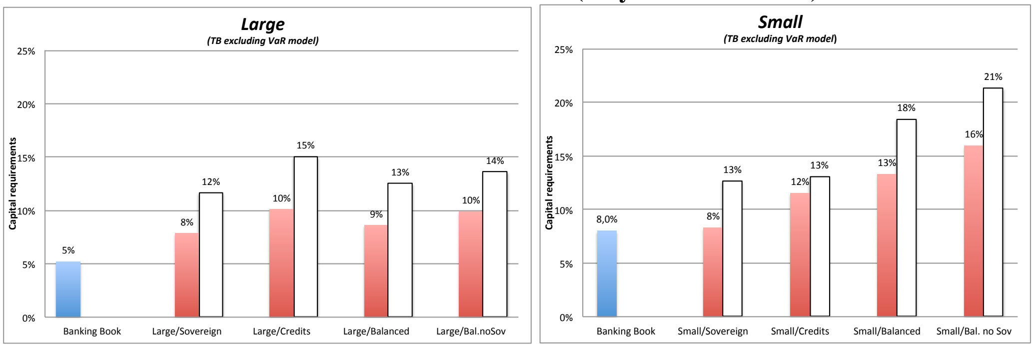
Figure 6 reports the results so obtained on the original test portfolios (i.e. those where the French government is the prominent public obligor). It shows that an opportunistic choice of the risk management models would compress significantly the trading book requirements but not enough to invalidate the results presented so far, for all portfolios but the one obtained by adding the Small version of the incremental investments to the Sovereign ex-ante trading book.

The second check investigates the impact of the period chosen to calibrate market risk models. The rationale behind this check is to verify whether the imbalance found between the two prudential regimes can be interpreted as a temporary manifestation of the distressed conditions of financial markets during the models' calibration period (2010-2012). If so, the gap would disappear as soon as markets' conditions return to a more benign status.

Before explaining the strategy chosen to investigate this issue, it is worth recalling that one of the targets of the Basel 2.5 rules was to dampen the pro-cyclicality of TB capital; for this purpose the previously *VaR* driven charges have been supplemented by a more stable layer of capital, obtained with *SVaR* and IRC models. It follows that an extreme approach to check for the influence of market conditions on TB requirements consists in excluding outright the *VaR* contribution.

Figure 7

Basel 2.5 marginal capital requirements
on incremental investments (only SVaR and IRC)



The vertical bars show the capital requirements the typical bank would have to set aside against the two incremental investments expressed as a share of their notional values. The blue bars depict the capital needs corresponding to the banking book holding, while the red bars show the trading book requirements (excluding VaR and taking into account only IRC and SVaR) due for the combinations obtained by commingling the incremental investments with the ex-ante trading book named on the horizontal axis. For each combination the white bars show the trading book requirements computed summing up VaR, IRC and SVaR.

Figure 7 depicts the results of this strategy, where trading book charges are computed by summing up *Stressed VaR* and IRC outcomes. It shows that the gap between the two regimes would remain in place in all but one case, even if TB charges were computed by summing up only the stable component of TB capital.

5 Conclusions and policy implications

In the years leading to the Great Financial Crisis the size of the trading books of many of the most profitable banks increased materially, mainly driven by the allocation of credit sensitive positions that often took the form of structured products.

When the crisis struck, the fair value losses reported on these instruments turned out to be much greater than the associated capital requirements. It emerged that the higher returns posted by these firms did not reflect any comparative advantage in managing risks and operations but rather had to do with an enhanced leverage, not entirely caught by the Basel metrics.

To improve the reliability of the RWA computation the Basel Committee changed the way *trading-book* risks are measured. One of the aims of the new rules – the so-called Basel 2.5 package - was to prevent banks from arbitraging the prudential framework by allocating assets across the regulatory buckets in pursuit of capital savings.

I empirically investigated the impact of the new rules on two simple bond portfolios inserted in broader and more complex context designed to resemble actual banks' trading books. I found evidence that while the package has been effective in curbing the incentive for banks to hold credit positions in the trading book, it may have missed the target of eliminating the perverse incentives for banks to make allocation choices based on the need to save capital.

Whereas under the previous regulatory setup banks had incentives to declare a trading intent to make a capital saving, the situation is now clearly reversed. Moreover, the incentive to move assets across the balance-sheets in search of capital savings seems more powerful now than in the past, with the distance between the trading and the banking regimes magnified when incremental investments further increase the trading book concentration profile. In those cases trading book capital requirements can be also exposed to powerful cliff-edge effects, triggered by changes in the external ratings assigned to the largest obligors.

Based on these results one cannot exclude that capital saving considerations concurred in driving the switch of marketable securities carried at fair value from the held for trading to the available for sale portfolios that many of the largest European banks recently experienced.

In principle, making capital savings by shifting assets into the banking book is even simpler than the reversed strategy pursued in the run-up to the Great Financial Crisis. Whereas to allocate assets in the trading book an intention to trade has to be argued, when shifting assets in the banking book banks are not requested to demonstrate their capability to hold positions till maturity.

As the Basel Committee is currently reviewing the entire trading book regime, it will be important to bear in mind that as long as capital treatments for trading and banking book remain so distant, shifting positions across the boundary in search of capital savings will remain the name of the game. TA

Appendix

a. Banking book capital requirement computation

Under the IRB approach the capital *K* and the corresponding *RWA* for a generic *k*-th exposure is obtained as:

$$K_{IRB\_k} = \left[CEL_k - \left(PD_k \times LGD_k\right)\right] \times \frac{1 + \left(M - 2.5\right) \times b\left(PD_k\right)}{1 - 1.5 \times b\left(PD_k\right)} \quad 1$$

$$RWA_{IRB\_k} = K_{IRB\_k} \times EAD_k \times 12.5 \quad 2$$

Where:

6. CEL_k (Conditional Expected Loss) is a Credit VaR estimated at 99.9% confidence interval with a holding period of one year
7. The term $\left(PD_k \times LGD_k\right)$ is the expected loss for the *k*-th exposure, expressed as percentage figure of the *Exposure at Default* (*EAD*); it is taken out of the Credit VaR[21] in order to calibrate IRB capital requirements against unexpected losses only[22].
8. The term $\left[\frac{1 + \left(M - 2.5\right) \times b\left(PD_k\right)}{1 - 1.5 \times b\left(PD_k\right)}\right]$ is a "Maturity adjustment" that can be thought of as covering the economical consequences of a mark-to-market valuation of credits that suffered a downgrade at the end of the capital horizon. The adjustment reflects a 2.5 years "*standard maturity*" and drops to zero for a maturity of one year. Adjustments are linear and increasing in M; the slope of the function (*b*) with respect to M decreases as the PD increases.

In resembling the mechanics of a simplified credit portfolio model (the so-called Asymptotic Single Risk Factor model), crucial to the conditional expected loss formula is the assumption of infinite granularity of banking book portfolios. It allows us obtaining "*portfolio-invariant*" capital requirements suitable to be added up:

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[21] The term VaR is hereon used for defining the negative of the level α quantile:

$$VaR_{\alpha}\left(X\right) = -\inf\left\{x \in R : P\left(X > x\right) \le 1 - \alpha\right\}$$

where α represents the chosen confidence interval and X is the mark-to market return of a securities portfolio over the desired time horizon.

[22] The economic rationale for calibrating IRB capital requirements against unexpected losses only is that banks are expected to cover expected losses on an ongoing basis, as these represent a cost component of their lending business. According to this concept, capital would only be needed for absorbing potentially large losses that occur rather infrequently.

$$CEL_k = LGD_k \times \Phi\left[\frac{\Phi^{-1}(PD_k)}{\sqrt{1-\rho_k}} + \sqrt{\frac{\rho_k}{1-\rho_k}}\Phi^{-1}(0.999)\right] \qquad 3$$

Where:

- Φ and Φ^{-1} are the cumulative density function (cdf) and the inverse cdf of standard normal distribution, respectively;
- ρ_k is the asset correlation parameter, expressing the sensitivity of the *k*-th obligor to the single systematic factor considered in the model.

For exposures belonging to corporate, financial institutions and sovereign portfolios ρ is computed according to an exponentially weighting function, which compresses asset correlation within a pre-defined range (12%-24%), with an inverse dependency on PD[23]:

$$\rho_k = 0.12 \times \left(1 - e^{-50 \times PD_k}\right) / \left(1 - e^{-50}\right) + 0.24 \times \left[1 - \left(1 - e^{-50 \times PD_k}\right) / \left(1 - e^{-50}\right)\right] \qquad 4$$

b. Trading-Book capital requirement computation

Due to different national implementations of the 1996 Market Risk Amendment, untill to the implementation of Basel 2.5 the computation of trading book capital requirements differed somehow across jurisdictions. While in the Europe and Japan *VaR* models were allowed for a broader use, in the US their deployment for the computation of credit risk in the trading book was more restricted.

Fully-fledged model banks (i.e. European banks that obtained a comprehensive recognition of their *VaR* model) computed trading-book RWAs as:

$$RWA_{mkt\_OLD} = 12.5 \cdot K_{mkt\_OLD} \qquad 5$$

$$K_{mkt\_OLD} = \max\left\{VaR_{t-1}; \left(\sum_{t-60}^{t} VaR_t \Big/ 60\right) \times \left(floor_i + add\_multiplier\right)\right\} \qquad 6$$

Where:

- *VaR* designates the *Value at Risk* measure computed on the overall trading-book with a confidence interval of 99% and a holding period of ten days;
- *the floor* is set to three for all trading book positions but the ones subject to credit risk, for which it is set to four. Over the time the value of *floor* can increase according to the following rule, based on a *VaR* back-testing programme and aimed at penalizing less robust models:

[23] Broadly speaking, the internal rating-based (IRB) approach differentiates between seven classes of credit exposures: 1) corporates, 2) sovereigns, 3) financial institutions, 4) retail (differentiated in a number of sub-portfolios), 5) equity, 6) securitizations, 7) noncredit-obligation assets and collective investment undertakings. If an exposure does not fall within the definition of any class, it will be categorized as a corporate exposure.

$$floor = \begin{cases} 3 & if\ \kappa \le 4 \\ 3 + 0.2 \times (\kappa - 4) & if\ 5 \le \kappa \le 9 \\ 4 & 10 \le \kappa \end{cases}$$

where κ counts the number of days over an interval of 250 trading days in which trading-book losses exceed the *VaR* (so-called back-testing exceptions).

- *the add_multiplier* (additional multiplier) is aimed at supplementing the quantitative floor in buffering models' outcomes. Its size is left to the discretion of banks' supervisors and reflects their appreciation of the inherent robustness of the bank's risk management practice.

Due to the introduction of Basel 2.5, the trading-book RWA computation changed materially. Focusing on the kind of positions examined in the study, model banks obtain RWAs as it follows:

$$RWA_{mkt\_NEW} = 12.5 \times \left(K_{VaR\_NEW} + K_{IRC} \right) \quad 7$$

$$K_{VaR\_NEW} = \max\left\{ VaR_{t-1}; VaR_{avg} \times floor_c \right\} + \max\left\{ SVaR_{t-1}; SVaR_{avg} \times floor \right. \quad 8$$

Where:

- *VaR* and *SVaR* represent, respectively, the *VaR* and Stressed *VaR* capital requirements, both obtained as in Equation 6
- $floor_c$ and $floor_s$ are the multipliers for *VaR* and *SVaR*. Usually set at the same value, they encapsulate the two terms (*floor*, *add_multiplier*) listed in Equation 6. A notable difference with respect to the previous regime is that credit sensitive items are now subject to the same *floor* as all other positions, due to the introduction of specific approaches aimed at catching default and migration risks.
- K_{IRC} designates the *Incremental Risk Charge* (IRC) measure computed on the portfolio comprising all the non-securitized credit exposures held in the trading-book; the metric is obtained with a confidence interval of 99.9% and a holding period of one year.

c. IRC models calibration

The IRC models deployed in the study (IRC_A and IRC_B) represent two implementations of the two-module scheme popular among large banks, whose working has been illustrated by Martin et al. (2011):

- the first module is aimed at simulating the joint dynamic of credit securities;
- the second one is instead devoted to compute the economic effects of simulated credit scenarios.

Below the working of the two modules is illustrated and the differences between IRC_A and IRC_B are detailed below.

Simulation of the joint dynamic of credit securities

The module aimed at simulating the joint dynamic of credit securities is structured along the same lines in both IRC_A and IRC_B. A Montecarlo technique is deployed to obtain a number (500.000 runs) of P&L sufficient to reach an adequate level of stability and convergence for the 99.9% percentile of the distribution that corresponds to the IRC metric. Where the two models differ one from the other is in the estimation of the co-dependance structure among obligors represented in the trading-book.

IRC_A

In IRC_A the specification of the co-dependence structure follows a CreditMetrics-wise approach (Gupton, 2007). This requires estimating for each obligor the following OLS regression over a time period sufficiently extended to capture the structural interdependencies among the concerned obligors:

$$X_i = a_{i1}Z_1 + a_{i2}Z_2 + b_i \quad 9$$

where:

- X_i represents the daily equity log-return of the i_{th} issuer and can be interpreted as a *proxy* for the term CW in the Box 3
- Z_1 and Z_2 are the systematic factors associated with the concerned issuer; following a common specification for this class of models the systematic factors can be identified with two equity indices: one is the overall equity index of the firm's country; the other is a sub-index representing the industry to which the concerned firm belongs;
- $\hat{a}_{i1}$ and $\hat{a}_{i2}$ are the issuer's loadings for the systematic factors, corresponding to the regression coefficients[24];

[24] To insure the distributional properties required for the latent variable, equity log-returns have to be normalized. This requires estimating first the variance-covariance matrix (Σ) of the systematic factors, and then using its Cholesky's decomposition to obtain the variance of each obligor's equity log-return. Assuming one works with two systematic factors (two equity indexes, for instance) this means writing X_i as it follows:

$$X_i = \begin{bmatrix} a_{i1} & a_{i2} \end{bmatrix} = [L] \begin{bmatrix} \bar{Z}_1 \\ \bar{Z}_2 \end{bmatrix} + \varepsilon_k$$

Where Z represents the independent standard normal variables and L is the Cholesky decomposition of Σ. In this setting, what we call as independent factor loadings are:

$$\begin{bmatrix} \bar{a}_{i1} & \bar{a}_{i2} \end{bmatrix} = \begin{bmatrix} a_{i1} & a_{i2} \end{bmatrix} [L]$$

Then, the variance of the latent variable is nothing but: $\sigma_i^2 = \bar{a}_{i1}^{\ 2} + \bar{a}_{i2}^{\ 2} + 1$ where the addition of one is due to the IID normally distributed error term ε_i. This approach enables the determination for each obligor of the systematic and non-systematic factor loadings as it follows:

$$\hat{a}_{i1} = a_{i1}\frac{\sigma_1}{\sigma_i} \quad \hat{a}_{i2} = a_{i2}\frac{\sigma_2}{\sigma_i} \quad \hat{b}_i = 1/\sigma_i$$

- b_k is the unexplained portion of the log-return, which in the context of Equation 11 can be thought of as the idiosyncratic driver for the k_{th} issuer; it corresponds to 1-R^2 statistic of the regression.

The inclusion of sovereign issuers in this setting raises an issue, due to the unavailability of equity prices. The problem is handled by assuming that for sovereign obligors the relevant credit driver is represented by a variable explanatory of their creditworthiness. In our implementation this variable is represented by the *hazard rate* of the concerned issuer backed out from the relevant CDS premium:

$$SP_i = \frac{1 - e^{-cds_i \times T}}{1 - RR_i} \qquad 10$$

Where:

- SP_i indicates the survival probability of the i-th sovereign issuer;
- cds_i represents the spread quoted for the concerned issuer;
- RR_i is the recovery rate used in the CDS quotation, set for all issuers at 0.4.

By avoiding recourse to the regression analysis, we implicitly assume the irrelevance of non-systematic factors for sovereign issuers, making them dependant exclusively on the selected credit variable.

It is worth noting that in this implementation of the Merton model the pairwise correlation among obligors, the key parameter in explaining the extent to which issuers in the portfolio can be simultaneously affected by credit events, depends on the factor loadings of the concerned issuers as well as on the the variance-covariance matrix (Σ) of the systematic factors.

IRC_B

The specification of the co-dependence structure in IRC_B is along the lines of the IRB framework previously described, from which it deviates in dropping the single risk factor assumption. A set of risk factors is hence singled out to identify the status of the economic cycle in each of the industrial sectors in which the economy is broken down.

In this specification the standardized return of the k-th obligor's assets can be described as it follows:

$$CW_k(r_k, s_k) = \rho_k(\alpha_k \cdot \eta) + \sqrt{1 - \rho_k^2}\,\varepsilon_k \qquad 11$$

Where:

- CW_k is the credit worthiness index of the k-th obligor, with a credit rating r_k and belonging to industrial sector s_k
- ρ_k represents the correlation between the return of the obligor and the standardized performance of the sector to which it belongs to;
- η is a S-dimensional standard normal variable, whose marginals drive each of the S sectors in which the economy is broken down. The factors

distribution is assumed to be multi-variate standard normal, with correlation matrix C.

- α_k is a standard basis vector deployed for mapping obligors to their industrial sectors;

The first step of the model calibration procedure requires choosing the relevant industrial sectors; next it comes the identification of the data useful to track sectors' standardized performances. In our implementation private sector obligors will be mapped on a parsimonious number (S-1) of industrial sectors, according to their prevailing industrial specialization. All public issuers will be instead bucketed in the remaining sector.

Sectors performances will be proxied via CDS spreads. For each sector a set of representative issuers actively traded in the market for CDS will be accordingly singled out. Sector representative time series will be then obtained by averaging over a sufficiently extended period of time the log-returns of equally weighted single-name CDS spreads.

The correlation among the S time series yields the correlation structure *C,* embodying the co-movement tendency among sectors performances. In this framework the inclusion of sovereign obligors is quite smooth, at least for issuers whose debt is traded in the market for CDS.

Crucial in this implementation of the Merton model is the sensitivity of each issuer to the status of the sector to which it belongs, represented by ρ_k. Instead of being empirically estimated, this parameter is obtained by reverting to the function deployed in the IRB framework to derive obligors' responsiveness to the single systematic risk factor, as showed by Equation 4.

Aimed at avoiding overly large differences among the capital absorption between banking and trading-book positions, this choice assumes the pairwise correlation among obligors being governed by two drivers: the *PDs* of the concerned issuers and the correlation between the CDS log-returns of the S sectors which they belong to:

$$\left\{CW_k\left(r_k,s_k,t\right),CW_j\left(r_j,s_j,t\right)\right\}=\rho_k\rho_jC_{sk,sj} \qquad 12$$

In this regard, it is worth noting that due to the shape of the IRB correlation function, the average *pairwise* correlation among the names in the portfolios examined in the study tends to be aligned with the highest value admitted in the IRB formula (24%).

Simulation of the pricing effects associated to credit events

The computation of the pricing effects associated with defaults and rating migrations events is performed along similar lines in IRC_A and IRC_B.

Both models rely on a deterministic approach, where a fixed recovery rate assumption is deployed, while the economic effects of rating changes are estimated comparing actual prices of differently rated liquid bonds.

Namely, Loss Given Default (LGD) values reflect the different seniority of debt instruments. For senior unsecured issuances – the only ones relevant in the study - LGDs are set at 60% in line with the market convention adopted for CDS pricing. No differentiation is made between private and public issuers.

Price impacts associated with rating migrations are obtained by revaluating long and short positions referencing to migrated issuers with shifted credit spread curves.

For this purpose for each couple of industrial sectors and rating letters a curve of *asset swap spreads* is backed out of current prices of a large set of liquid instruments[25]:

$$Sp_k^{sim} = Sp_k^{initial} + \left(Sp_R^{arrival} - Sp_R^{initial}\right) \qquad 13$$

Where:

- Sp_k^{sim} is the simulated spread used for revaluating the *k*-issuance at the end of the concerned scenario;
- $Sp_k^{initial}$ is the actual spread yielded by concerned issuance;
- $Sp_R^{arrival}$ is the average spread among issuances sharing the *k*-issuer arrival simulated rating and falling into the same maturity bucket;
- $Sp_R^{initial}$ is the average spread among issuances sharing the *k*-issuer initial rating and falling into the same maturity bucket.

The two models differ in the frequency adopted to refresh the matrix and in the length of the data considered.

In IRC_A data are refreshed weekly.

In IRC_B the spread matrix is refreshed quarterly and spreads are averaged over the previous three months to avoid an overly strong dependence on the market conditions prevailing at the end of each quarter.

[25] For Credit Default Swaps hazard rates are averaged across instruments falling in the relevant ratings/sectors/maturities intersections.

d. *Composition of risk areas across ex-ante trading books*

Govies Risk Area						
		Ex-ante Trading Books (€ mln)				
Risk Factors	**Strategy**	***Sovereign***	***Sovereign IT version***	***Credits***	***Balanced***	***Balanced No Govies***
○ *Interest Rates* ○ *Credit Spread*	**Italian Government Bonds** - 1-year zero coupon bond (BOT Mat. 14 Dec 12) - 5-year coupon bond (BTP 5.25% Mat. 1 Aug 17) - 10-year coupon bond (BTP 5% Mat. 1 Mar 22)	Long 5.1 Long 1.8 Long 154.7	Long 10.2 Long 1.8 Long 89.4	Long 5.1 Long 1.8 Long 11.5	Long 0.5 Long 5.3 Long 22.9	/
	Spanish Government Bonds - 4-year coupon bond (BONOS 3.25% Mat. 30 Apr 16)	Long 15.4	Long 15.4	Long 15.4	Long 30.8	/
	French Government Bonds - 3-year coupon bond (BTAN 2.5% Mat. 15 Jan 15)	Long 488.3	Long 11.6	Long 495.4	Long 20.6	/
	Futures on German Government Bonds - Eurex Future Bobl 5 years (Mat. Mar 12) - Eurex Future Bund 10 years (Mat Mar 12)	Short 2.0 Short 57.0	Short 2.0 Short 91.2	Short 2.0 Short 28.5	Short 2.0 Short 22.8	/

	Credit Risk Area					
		Ex-ante Trading Books (€ mln)				
Risk Factors	**Strategy**	***Sovereign***	***Sovereign IT version***	***Credits***	***Balanced***	***Balanced No Govies***
	iTraxx Index					
	- CDS on the iTraxx IG IG Series 16 Mat. 20 Dec 2016	Long 58.5	Long 45.0	Long 270	-	Long 45.0
	Single name CDS					
	- 5-year CDS on Adecco (BBB)	-	-	-	-	-
	- 5-year CDS on Aegon (A)	-	-	-	-	-
	- 5-year CDS on Electrolux (BBB)	-	-	-	-	-
	- 5-year CDS on Volvo (BBB)	-	-	-	-	-
	- 5-year CDS on Akzo Nobel (BBB)	Short 10.8	-	Short 10.8	Short 10.8	Short 10.8
	- 5-year CDS on Allianz (AA)	-	-	-	-	-
	- 5-year CDS on Alstom (BBB)	-	-	-	-	-
	- 5-year CDS on Anglo American (BBB)	-	-	-	-	-
	- 5-year CDS on Arcelor Mittal (BBB)	-	-	-	-	-
	- 5-year CDS on Assicurazioni Generali (A)	Long 3.6	-	Long 18	Long 3.6	Long 3.6
	- 5-year CDS on Atlantia (A)	-	-	-	-	-
	- 5-year CDS on Aviva (A)	Short 36.0	-	Short 36.0	Short 36.0	Short 36.0
	- 5-year CDS on Axa (A)	Long 7.2	-	Long 7.2	Long 7.2	Long 7.2
	- 5-year CDS on BAE System (A)	-	-	-	-	-
	- 5-year CDS on Banca Monte Paschi Siena (BBB)	Long 7.2	-	Long 7.2	Long 7.2	Long 7.2
	- 5-year CDS on Banco BBVA (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Banco Popolare (BBB)	Short 3.6	-	-	-	-
	- 5-year CDS on Banco Santander (AA)	Long 7.2	-	Short 3.6	Long 7.2	Short 3.6
	- 5-year CDS on Barclays Bank (A)	Long 7.2	-	Long 7.2	Long 7.2	Long 7.2
	- 5-year CDS on Basf (A)	-	-	-	-	-
	- 5-year CDS on Bayer (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on BMW (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Bertelsmann (BBB)	-	-	-	-	-
	- 5-year CDS on BNP Paribas (AA)	Long 10.8	-	Long 10.8	Long 7.2	Long 7.2
	- 5-year CDS on BP (A)	Long 7.2	-	Long 7.2	Long 7.2	Long 7.2
	- 5-year CDS on British American Tobacco (BBB)	-	-	-	-	-
	- 5-year CDS on British Sky Broadcasting (BBB)	-	-	-	-	-
	- 5-year CDS on BT (BBB)	-	-	-	-	-
○ *Credit Spread*	- 5-year CDS on Cadbury (BBB)	-	-	-	-	-
○ *Rec. Rate*	- 5-year CDS on Carrefour (BBB)	-	-	-	-	-
	- 5-year DS on Casino Guichard Perrachon & Cie (BBB)	-	-	-	-	-
	- 5-year CDS on Centrica (A)	Short 7.2	-	Short 7.2	Short 7.2	Short 7.2
	- 5-year CDS on Commerzerbank (A)	Long 7.2	-	Long 3.6	Long 3.6	Long 3.6
	- 5-year CDS on Cie de St Gobain (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Comp Financier de Michelin (BBB)	-	-	-	-	-
	- 5-year CDS on Compass Group (A)	-	-	-	-	-
	- 5-year CDS on Credit Agricole (A)	Long 7.2	-	Long 7.2	Long 3.6	Long 3.6
	- 5-year CDS on Credit Suisse (A)	Long 7.2	-	Long 7.2	Long 3.6	Long 3.6
	- 5-year CDS on Daimler (BBB)	-	-	-	-	-
	- 5-year CDS on Danone (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Deutsche Bank (A)	Long 10.8	-	Long 10.8	Long 7.2	Long 7.2
	- 5-year CDS on Deutsche Telekom (BBB)	-	-	-	-	-
	- 5-year CDS on Diageo (A)	Long 7.2	-	Long 7.2	Long 7.2	Long 7.2
	- 5-year CDS on E.ON (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Electricite de France (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on EnBW Energie Baden-Wuerttember (A)	-	-	-	-	-
	- 5-year CDS on Enel (A)	-	-	-	-	-
	- 5-year CDS on ENI (A)	-	-	-	-	-
	- 5-year CDS on EADS (BBB)	-	-	-	-	-
	- 5-year CDS on Experian (A)	-	-	-	-	-
	- 5-year CDS on Finmeccanica (BBB)	Short 7.2	-	Short 7.2	Short 7.2	Short 7.2
	- 5-year CDS on Fortum (A)	Long 10.8	-	Long 10.8	Long 7.2	Long 7.2
	- 5-year CDS on France Telecom (A)	-	-	-	-	-
	- 5-year CDS on Gas Natural (BBB)	-	-	-	-	-
	- 5-year CDS on GDF Suez (A)	-	-	-	-	-
	- 5-year CDS on Glencore International (BBB)	Long 7.2	-	Long 7.2	Long 7.2	Long 7.2
	- 5-year CDS on Groupe Auchan (BBB)	-	-	-	-	-
	- 5-year CDS on Hannover Rueckversicherung (AA)	Long 10.8	-	Long 10.8	Long 10.8	Long 10.8
	- 5-year CDS on Henkel (A)	Short 14.4	-	Short 14.4	Short 14.4	Short 14.4
	- 5-year CDS on Holcim (BBB)	-	-	-	-	-
	- 5-year CDS on Iberdrola International (A)	-	-	-	-	-
	- 5-year s CDS on Imperial Tobacco (BBB)	-	-	-	-	-
	- 5-year CDS on Intesa Sanpaolo (A)	Long 10.8	-	Long 10.8	Long 10.8	Long 10.8
	- 5-year CDS on JTI Finance (A)	-	-	-	-	-
	- 5-year CDS on Kingfisher (BBB)	-	-	-	-	-

○ *Credit Spread* ○ *Rec. Rate*	**Single name CDS**		-			
	- 5-year CDS on Koninklijke Ahold (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Koninklijke DSM (A)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Koninklijke KPN (BBB)	-	-	-	-	-
	- 5-year CDS on Koninklijke Phillips Electronic (A)	-	-	-	-	-
	- 5-year CDS on Lanxess (BBB)	-	-	-	-	-
	- 5-year CDS on Linde (A)	-	-	-	-	-
	- 5-year CDS on Llyods TSB Bank (A)	-	-	-	-	-
	- 5-year CDS on LVMH (A)	Long 3.6	-	Long 3.6	Long 3.6	Long 3.6
	- 5-year CDS on Marks & Spencer Group	-	-	-	-	-
	- 5-year CDS on Metro (BBB)	-	-	-	-	-
	- 5-year CDS on Muenchener Rueckversicherungs (AA)	-	-	-	-	-
	- 5-year CDS on National Grid (A)	-	-	-	-	-
	- 5-year CDS on Nestle (AA)	Short 18.0	-	Short 18.0	Short 18.0	Short 18.0
	- 5-year CDS on Next (BBB)	-	-	-	-	-
	- 5-year CDS on Pearson (BBB)	-	-	-	-	-
	- 5-year CDS on TNT (BBB)	-	-	-	-	-
	- 5-year CDS on Pinault Printemps Redout (BBB)	-	-	-	-	-
	- 5-year CDS on Publicis Group (BBB)	-	-	-	-	-
	- 5-year CDS on Reed Elsevier Group (BBB)	-	-	-	-	-
	- 5-year CDS on Rentokil (BBB)	-	-	-	-	-
	- 5-year CDS on Repsol YPF (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Royal Dutch Shell (AA)	-	-	-	-	-
	- 5-year CDS on RWE (A)	-	-	-	-	-
	- 5-year CDS on SABMiller (BBB)	-	-	-	-	-
	- 5-year CDS on Safeway (A)	-	-	-	-	-
	- 5-year CDS on Sanofi-Aventis (AA)	-	-	-	-	-
	- 5-year CDS on Siemens (A)	Short 10.8	-	Short 10.8	Short 10.8	Short 10.8
	- 5-year CDS on Societe Generale (A)	Long 10.8	-	Long 10.8	Long 10.8	Long 10.8
	- 5-year CDS on Sodexo (BBB)	-	-	-	-	-
	- 5-year CDS on Solvay (BBB)	-	-	-	-	-
	- 5-year CDS on Statoil (AA)	-	-	-	-	-
	- 5-year CDS on STMicroelectronics (BBB)	-	-	-	-	-
	- 5-year CDS on Suedzucker (BBB)	-	-	-	-	-
	- 5-year CDS on Svenka Cellulosa (BBB)	Long 3.6	-	Long 3.6	Long 3.6	Long 3.6
	- 5-year CDS on Swiss Reinsurance (AA)	Long 10.8	-	Long 10.8	Long 10.8	Long 10.8
	- 5-year CDS on Tate & Lyle (BBB)	-	-	-	-	-
	- 5-year CDS on Telecom Italia (BBB)	Short 3.6	-	Short 10.8	Short 3.6	Short 3.6
	- 5-year CDS on Ericsson (BBB)	-	-	-	-	-
	- 5-year CDS on Telefonica (BBB)	-	-	-	-	-
	- 5-year CDS on Telekom Austria (BBB)	-	-	-	-	-
	- 5-year CDS on Telenor (A)	-	-	-	-	-
	- 5-year CDS on TeliaSonera (A)	-	-	-	-	-
	- 5-year CDS on Tesco (A)	Short 18.0	-	Short 18.0	Short 18.0	Short 18.0
	- 5-year CDS on Royal Bank of Scotland (A)	Long 10.8	-	Long 10.8	Long 10.8	Long 10.8
	- 5-year CDS on Total (AA)	-	-	-	-	-
	- 5-year CDS on UBS (A)	Long 10.8	-	Long 18.0	Long 10.8	Long10.8
	- 5-year CDS on UniCredit (A)	Long 18.0	-	Long 18.0	Long 18.0	Long 18.0
	- 5-year CDS on Unilever (A)	Short 7.2	-	Short 7.2	Short 7.2	Short 7.2
	- 5-year CDS on United Utilities (BBB)	-	-	-	-	-
	- 5-year CDS on Valeo (BBB)	-	-	-	-	-
	- 5-year CDS on Vattenfal (A)	-	-	-	-	-
	- 5-year CDS on Veolia Environment (BBB)	Short 3.6	-	Short 3.6	-	Short 3.6
	- 5-year CDS on Vinci (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Vivendi (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Vodafone Group (A)	Long 3.6	-	Long 3.6	Long 3.6	Long 3.6
	- 5-year CDS on Volkswagen (A)	-	-	-	-	-
	- 5-year CDS on Wolters Kluwer (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on WPP (BBB)	Short 3.6	-	Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Xstrata (BBB)	Short 3.6		Short 3.6	Short 3.6	Short 3.6
	- 5-year CDS on Zurich Insurance (AA)	Long 3.6		Long 3.6	Long 3.6	Long 3.6

	Rates Risk Area					
		Ex-ante Trading Books (€ mln)				
Risk Factors	**Strategy**	***Sovereign***	***Sovereign IT version***	***Credits***	***Balanced***	***Balanced No Govies***
○ Interest rates	**Fixed rate receiver interest rate swap** - 15 years vs 3 months - 5 years vs 3 months	Long 7.5 Long 110		Long 7.5 Long 110	Long 50.0 Long 55.0	Long 5.0 Long 55.0
○ Interest . rates ○ Interest rates Vega	**Euribor Cap & Floor** - Cap 1-month Euribor strike 1% (Mat. 15 Sept 2015) - Cap 1-month Euribor strike 0.9% (Mat. 21 Jan 2013) - Straddle on the 3month Euribor (Mat. 27 Aug 2012) ○ Cap 3-month Euribor strike 1.14% ○ Floor 3-month Euribor strike 1.14%	Short 340.0 Long 330.0 Long 15.0 Short 15.0		Short 340 Long 330 Long 15.0 Short 15.0	Short 340 Long 330 Long 15.0 Short 15.0	Short 340 Long 330 Long 15.0 Short 15.0

	Equity Risk Area					
		Ex-ante Trading Books (Values in thousands of index units)				
Risk Factors	**Strategy**	***Sovereign***	***Sovereign IT version***	***Credits***	***Balanced***	***Balanced No Govies***
○ Equity	**Euro STOXX 50 Index Future** - Future on the SX5E Index Mat. Dec 2014	Long 1.0		Long 1.0	Long 2.0	Long 2.0
○ Equity ○ Equity Vega	**Euro STOXX 50 Call** - Call on the SX5E Index strike 3,600 Mat. Dec 2014 - Call on the SX5E Index strike 2,500 Mat. Dec 2012	Short 2.4 Long 2.5		Short 2.4 Long 2.5	Short 4.8 Long 5.0	Short 4.8 Long 5.0

	FX Risk Area					
		Ex-ante Trading Books (€ mln)				
Risk Factors	**Strategy**	***Sovereign***	***Sovereign IT version***	***Credits***	***Balanced***	***Balanced No Govies***
○ FX	**<u>EUR/USD Forward</u>** - Outright Forward EUR/USD 1.1315 (Mat. 20 Aug. 2012)	Short 37.4		Short 37.4	Long 74.8	Long 74.8
○ FX ○ FX Vega	**<u>EUR/USD Put</u>** - Put on the EUR/USD exchange strike 1.1315 (Mat. 19 Sept. 2012)	Long 37.5		Long 37.5	Long 75.0	Long 75.0

	Commodity Risk Area					
		Ex-ante Trading Books (Values in barrels)				
Risk Factors	**Strategy**	***Sovereign***	***Sovereign IT version***	***Credits***	***Balanced***	***Balanced No Govies***
○ *Oil price*	**<u>Oil Future</u>** - Future on Light Sweet Crude Oil (WTI)	Long 1000		Long 1000	Long 70	Long 70

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