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BASEL II: OPERATIONAL RISK MEASUREMENT IN THE PORTUGUESE BANKING SECTOR

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Abstract

The present work focuses on one of the principal themes associated with the New Basel Accord – operational risk and its respective methodologies for calculating minimum capital requirements. The new capital accord encourages financial institutions to gradually evolve from basic to sophisticated methodologies. Institutions applying sophisticated methods will be rewarded with deductions on capital allocated when calculating the capital ratio. The methodologies related to operational risk will be applied to a group of national banking institutions. These methodologies are referred to in Pillar I of the new capital accord: (i) the basic indicator approach, (ii) the standardized approach and (iii) the alternative standardized approach. The purpose of this practical application is to evaluate and quantify the impact on several national banks of the different approaches linked to operational risk, introduced by Basel II.

JEL Classification: G14, G21, G28, G32.

Key words: Basel II, Operational Risk, Regulatory Capital and Economic Capital.

I. INTRODUCTION

The present work briefly describes the general idea of the New Basel Capital Accord, also referred to as Basel II, focusing specifically on one of its new main themes - operational risk.

The main objectives of Basel II are to maintain international stability in the banking system and to create a unique methodology for calculating minimum

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capital requirements for internationally active banks. With complex and consecutive transformations taking place in the banking sector, the new capital accord is adapted to the modern banking reality, strengthening the minimum capital requirements in financial institutions. The ongoing transformations in the banking sector led to the emergence of different types of losses, which diverged from losses due to traditional risks, thus giving rise to operational risk.

This work investigates the benefits of the application of different methodologies introduced by Basel II for operational risk in the Portuguese banking sector. We intend to evaluate the impact of more sophisticated methodologies against a basic one, registering both the advantages and disadvantages.

The remainder of the paper is organized as follows. Section 2 presents some existing literature on operational risk, section 3 explains the methodologies for calculating the minimum capital requirements for operational risk, section 4 describes the empirical application of the methodologies developed by the BCBS, and concluding remarks are provided in section 5.

II. LITERATURE REVIEW

Basel II, ensures that the minimum capital requirements in financial institutions are sufficient to maintain bank stability. These minimum requirements can be calculated by several risk sensitive methodologies, stimulating a more efficient risk management in banks. Basel II, besides the objectives previously mentioned, has also introduced the following aims:

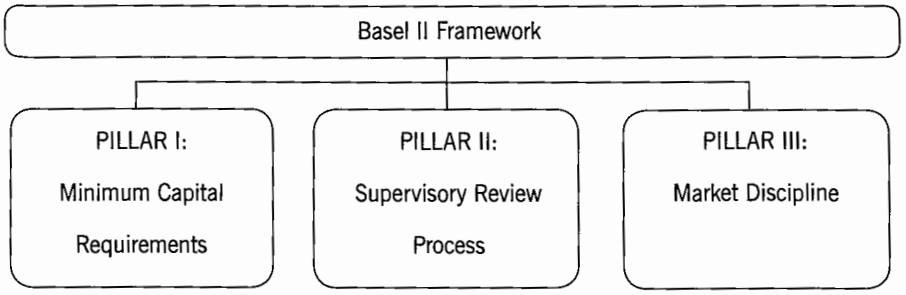
1. To improve risk measurement and management, keeping adequate levels of liquidity and solvency;
2. To approximate regulatory capital to economic capital;
3. To increase the dialogue between the national supervisor and the financial institutions, with regard to risk measurements and management; and
4. To increase market discipline, bank transparency and financial information.

The New Basel Accord aims at converging economic capital and regulatory capital. The use of more sophisticated methods for calculating an institution's risk will be rewarded with lower levels of capital (IFB, 2006). The previous President of the Basel Committee, Jaime Caruana, intended that the more risk sensitive the methodology is for calculating minimum capital requirements, the better adjusted the regulatory capital will be to the institution's risks, approximating economic capital.

Basel II was implemented on January 1, 2007 in the G10 countries. It is built on three pillars as can be observed in Figure 1.

FIGURE 1

Basel II Pillars



Pillar I ensures that banking institutions hold minimum capital requirements, sufficient to cover all existing risks. In Pillar II, the national supervisor, *Banco de Portugal*, must ensure that all national banks have sufficient minimum capital to face all incurred business risks. The national supervisor must also stimulate the development of techniques that could improve risk management in banks. Lastly, Pillar III of the New Basel Accord ensures that there is transparency in the financial situation and solvency of the institutions, allowing the market to create a more precise analysis of bank profiles and risks, applying incentives to fortify financial institutions' risk management and levels of capital (IFB, 2006).

According to Chorafas (2005), although the concept of operational risk has only appeared now, occurrences associated with this type of risk have existed in financial institutions for a long time. Fontnouvelle *et al.* (2003), refers to the importance of operational risk in regulatory capital, claiming that the minimum capital requirements for operational risk can, in some cases, have a greater influence than capital requirements for market risk.

The BCBS, as expressed in its documents, defines operational risk as the risk of loss resulting from inadequate or failed internal control, human resources and systems or from external events, including legal risk (BCBS, 2006). In line with the Basel II framework, *Banco de Portugal* in *Aviso* n.º 3/2006 defines operational risk as the risk of losses as a result of the inadequate or negligent application of internal procedures, human resources and systems or from external causes.

Similar to what happens with credit risk, financial institutions will be able to choose between three methods for calculating the minimum capital requirements for operational risk, each more sophisticated and risk sensitive than the one before (IFB, 2006).

As pointed out by Mori and Harada (2001), Sundmacher (2004), Currie (2004a, 2004b and 2005), and Jobst (2007), and as highlighted by the BCBS (2006), calculation of the minimum capital requirements can be effected by three distinct methods. The Basic Indicator Approach (BIA), as the name indicates, is

the simplest. Capital charge is a fixed percentage of the average annual gross income over the last three years, as indicated by the BCBS. In the standardized approach (TSA), institutions must map their activities in eight distinct business lines (BL). In this situation, the annual gross income for each BL is multiplied by a specific β, associated with each activity. Finally, in the advanced measurement approach (AMA), institutions will be able to use internal models with the capacity to measure operational risk and the capital to be allocated.

In the search for information based on operational risk, the Risk Management Group (RMG), a specific branch of the BCBS, obtained data from 89 financial institutions from 19 countries in Europe, North and South America, Asia, and Australia. These data were treated on order to gather information concerning operational losses during 2001, capital allocated for operational risk, and the expected operational losses associated with each bank's BL (RMG, 2003). The investigation by the RMG made it possible to conclude that the banking sector is evolving quickly with regard to the gathering of data for operational risk purposes. On the other hand, financial institutions are still developing internal models for this purpose (RMG, 2003).

Moscadelli (2004) used the data collected by the RMG in 2002, and treated these data statistically. He obtained a relationship between the average gross income and capital charge for each BL. This contribution makes it possible to calculate the average gross income for each BL, as these values can still be very difficult obtain through a financial institution's annual report. Both authors, Fontnouvelle *et al.* (2003) and Moscadelli (2004), concluded that there are two obstacles when analyzing operational losses. First, the quality of the extracted data can be dubious, and second, there are operational losses that are not registered by the financial institutions.

Sundmacher (2004) begins his work with the idea that there are advantages to applying a more advanced methodology, that is to say less capital will be allocated for operational risk, as referred to by the BCBS. Yet the author questions the case where a bank generates activities primordially with superior β´s. In this case, the institution will have to allocate more capital when using TSA than the BIA, there being no incentives to develop advanced models for operational risk. Sundmacher (2004) concluded that there should be a system of rewards, that is, an incentive for financial institutions to progress and develop advanced methodologies.

As previously stated, the use of a more sophisticated method in calculating minimum capital requirements is rewarded by a lower level of capital to be allocated. Sundmacher (2007) generated simulations, estimating the amount of capital to be allocated for the National Australia Bank. Using the bank's annual gross income from its annual reports from 2001 to 2004, the author calculated the capital charge for operational risk using both the BIA and TSA. For TSA, Sun-

dmacher (2007) distributed the annual gross income equally into the eight BL, elaborating different scenarios.

This author concluded that the financial incentive to evolve from the BIA to the TSA was minimal. Of the three elaborated scenes, only in one situation were there benefits in evolving from the BIA to TSA, thus challenging the concept that the application of a more sophisticated method consumes less capital.

The following section presents the methodologies for calculating the minimum capital requirements for operational risk based on the concepts of the BCBS.

III. METHODOLOGY

Basic Indicator Approach

According to BCBS (2006), the capital requirements for operational risk is equal to the average over three years of a fixed percentage of the annual Gross Income (GI) denoted as α. GI is defined as net interest income plus net non-interest income. After concluding the Quantitative Impact Studies (QIS), the Basel Committee fixed α at 15%. The BIA is expressed as follows:

$$K_{BIA} = GI \times \alpha \tag{1}$$

where:

K_{BIA} = the capital charge under the Basic Indicator Approach;
GI = average annual gross income, where positive, over the previous three years;
α = 15%.

The BIA does not consist of any specific criteria to be eligible for applying; however, banks are encouraged to comply with the committee's guidance on *Sound Practices for the Management and Supervision of Operational Risk* (February of 2003) (BSBC, 2006).

The Standardized Approach

As stipulated by the BCBS (2006), this method foresees that banks' activities are mapped into eight specific BL. Each BL is assigned a factor denoted as β, as can be observed in Table 1.

TABLE 1

Business Lines and β Factors

BL	β
Corporate Finance (β_1)	18%
Trading and Sales (β_2)	18%
Retail Banking (β_3)	12%
Commercial Banking (β_4)	15%
Payment and Settlement (β_5)	18%
Agency Services (β_6)	15%
Asset Management (β_7)	12%
Retail Brokerage (β_8)	12%

Source: BCBS (2006)

The factor β for each BL was previously defined by the Basel Committee, and reflects historical operational losses. The capital charge for TSA is the sum of GI per BL, multiplied by its respective β. TSA can be expressed by the following equation:

$$K_{TSA} = \sum (GI_i \times \beta_i) \quad (2)$$

where:

K_{TSA} = the capital charge under the Standardized Approach;
GI_i = annual gross income in a given year, as defined above in the BIA, for each of the eight BL, where i= 1, 2, 3... 8;
β_i = a fixed percentage, set by the Committee for each of the eight business lines, where i= 1, 2, 3... 8.

The Alternative Standardized Approach

The Alternative Standardized Approach (ASA) is similar to TSA, except for the treatment given to two BL: retail and commercial banking. For these BL the variable GI is substituted by the variable Loans and Advances (LA), which can be retrieved from the banks' annual reports. The values of LA associated with retail banking and commercial banking are multiplied by a fixed factor m (3.5%) and then multiplied by their respective β's, 12% and 15%. It is possible to join the

two BL by applying a β of 15%. The capital charge can be expressed by the following equation:

$$K_{ASA} = \sum (GI_i \times \beta_i) + (LA_{RB/CB} \times m \times \beta_{RB/CB}) \quad (3)$$

where:

K_{ASA} = the capital charge under the Alternative Standardized Approach;
GI_i = annual gross income in a given year, as defined above in the BIA, for each of the eight BL, where i = 1, 2, 3... 8;
β_i = a fixed percentage, set by the Committee for each of the eight business lines, where i= 1, 2, 3... 8;
$\beta_{RB/CB}$ = a fixed percentage, set by the Committee for each BL, retail banking and commercial banking, where i= 1, 2, 3...8;
$LA_{RB/CB}$ = loans and advances (average of the last three years) for retail and commercial banking;
m = 3,5%.

For TSA and ASA, it is of great importance to correctly classify an institution's activities in their respective BL, as shown in Table 2.

Advanced Measurement Approach

This last method foresees that financial institutions elaborate an internal operational risk measurement system using quantitative a qualitative criteria. Institutions will calculate capital charge as the sum of expected losses (EL) and unexpected losses (UL).

The following equation expresses how to calculate capital charge under de AMA:

$$K_{AMA} = \sum (EL + UL) \quad (4)$$

where:

K_{AMA} = the capital charge under the Advanced Measurement Approach;
EL = Expected Losses;
UL = Unexpected Losses.

TABLE 2

Mapping of Business Lines

BL	Activity Groups
Corporate Finance	1. Mergers and acquisitions, underwriting, privatisations, securitisation, research, debt (government, high yield), equity, syndications, IPO, secondary private placements
Trading and Sales	1. Fixed income, equity, foreign exchanges, commodities, credit, funding, own position securities, lending and repos, brokerage, debt, prime brokerage
Retail Banking	1. Retail lending and deposits, banking services, trust and estates 2. Private lending and deposits, banking services, trust and estates, investment advice 3. Merchant/commercial/corporate cards, private labels and retail
Commercial Banking	1. Project finance, real estate, export finance, trade finance, factoring, leasing, lending, guarantees, bills of exchange
Payment and Settlement	1. Payments and collections, funds transfer, clearing and Settlement
Agency Services	1. Escrow, depository receipts, securities lending (customers) corporate actions 2. Issuer and paying agents
Asset Management	1. Pooled, segregated, retail, institutional, closed, open, private equity 2. Pooled, segregated, retail, institutional, closed, open
Retail Brokerage	1. Execution and full service

Source: BCBS (2006)

IV. EMPIRICAL RESULTS

While the Portuguese economy has grown at moderate levels, the banking sector continues to grow positively. The continuous expansion in the Portuguese banking sector is essentially due to growth in loans and advances. These expansions in the banking sector were accompanied by higher solvency levels and greater levels of bank return (Relatório de Estabilidade Financeira, 2006).

The methodologies used for calculating capital charge for operational risk were applied to seven, well known financial institutions in Portugal:

1. Banco Espírito Santo (BES);
2. Banco Internacional do Funchal (BANIF);
3. Banco Português de Investimentos (BPI);
4. Caixa Geral de Depósitos (CGD);
5. Millenium BCP (BCP);

6. Montepio Geral (MG);
7. Sistema Integrado Crédito Agrícola Mútuo (SICAM).

Due to the impossibility of retrieving internal data on operational losses, as referred by authors such as Rowe (2004), Currie (2005) and Sundmacher (2007), the AMA will not be applied to these banks in the Portuguese sector. On the other hand, GI was taken from the banks' annual reports between 2002 and 2006. These values can be observed in Table 3.

TABLE 3

Annual Gross Income

	2002	2003	2004	2005	2006
BCP	2, 353.000	2, 674.500	2, 242.400	2, 402.900	2, 703.700
CGD	1, 992.880	1, 880.102	1, 941.284	1, 772.738	2, 093.611
BES	1, 354.000	1, 432.200	1, 431.000	1, 537.700	1, 704.800
BPI	751.000	774.900	809.800	898.800	1, 018.100
SICAM	364.724	380.832	396.075	394.854	432.584
MG	311.658	294.064	306.662	347.198	367.949
BANIF	142.600	151.096	162.674	183.354	194.909

Values in Millions of Euros.

BCP leads with the highest GI, attaining 2,703.7 million Euros in 2006, distinguishing itself from the remaining institutions. CGD and BES rank second and third. Ranking last is BANIF with a GI of 194.909 million Euros in 2006.

As referred in the previous section, GI for year *n* is the average of the GI of the previous three years when positive. For example, the GI for 2007 is the average of GI from 2004, 2005 and 2006, as can be observed in Table 4. We can now proceed to calculate capital charge for the BIA and TSA. For the ASA we must first retrieve the values for LA from the annual reports and calculate the average of the previous three years for both retail and commercial banking. As observed in Table 5, BCP leads with 57,912 million Euros in LA, while CGD and BES rank, once again, second and third respectively. Ranking last, as observed with GI, is BANIF. The ranking in this table is similar to the ranking of GI with the exception of MG and SICAM, whose positions are inverted. The data in Table 6 show the average of the last three years of LA, making it possible to calculate capital charge for these Portuguese institutions using the ASA.

TABLE 4

Three Year Average of Gross Income

	2005	2006	2007
BCP	2, 423.300	2, 439.933	2, 449.667
CGD	1, 938.089	1, 864.708	1, 935.878
BES	1, 405.733	1, 466.967	1, 557.833
BPI	778.567	827.833	908.900
SICAM	380.544	390.587	407.838
MG	304.128	315.975	340.603
BANIF	152.123	165.708	180.312

Values in Millions of Euros.

TABLE 5

Loans and Advances

	2002	2003	2004	2005	2006
BCP	45, 451.000	49, 177.000	49, 939.000	54, 038.000	57, 912.000
CGD	45, 204.000	45, 006.000	46, 619.000	49, 936.000	57, 268.000
BES	25, 795.000	26, 042.000	28, 487.000	31, 662.000	35, 752.000
BPI	19, 738.000	20, 690.100	21, 958.900	24, 409.200	28, 263.000
MG	9, 970.119	10, 141.287	10, 653.708	12, 415.395	13, 660.648
SICAM	6, 136.246	6, 334.263	6, 581.144	6, 863.579	6, 965.977
BANIF	3, 948.239	4, 184.365	3, 715.532	4, 685.195	5, 342.949

Values in Millions of Euros.

TABLE 6

Three Year Average of Loans and Advances

	2005	2006	2007
BCP	48, 189.000	51, 051.333	53, 963.000
CGD	45, 609.667	47, 187.000	51, 274.333
BES	26, 774.667	28, 730.333	31, 967.000
BPI	20, 795.667	22, 352.733	24, 877.033
MG	10, 255.038	11, 070.130	12, 243.250
SICAM	6, 350.551	6, 592.995	6, 803.567
BANIF	3, 949.379	4, 195.031	4, 581.225

Values in Millions of Euros.

Basic Indicator Approach

In accordance with the BCBS (2006) and the *Aviso* n.º 9/2007 of the *Banco de Portugal*, the capital charge using equation 1 from the previous section was applied, resulting in the data in Table 7. This Table shows the capital charge for the seven Portuguese banks using the BIA. With this analysis we can easily observe a linear relation between GI and capital charge due to the fact that capital charge is a fixed percentage of GI, i.e. capital charge will be exactly 15% of GI. We can verify that BCP will allocate the most capital for operational risk with 367.450 million Euros in 2007. Ranking in last place is BANIF, allocating 27.047 million Euros in 2007.

TABLE 7

Capital Charge for BIA

	2005	2006	2007
BCP	363.495	365.990	367.450
CGD	290.713	279.706	290.382
BES	210.860	220.045	233.675
BPI	116.785	124.175	136.335
SICAM	57.082	58.588	61.176
MG	45.619	47.396	51.090
BANIF	22.819	24.856	27.047

Values in Millions of Euros.

The Standardized Approach

To apply this methodology, financial institutions must map their activities along eight BL, as pointed out in the previous section. GI will also have to be divided into each BL, each fraction being multiplied by a fixed percentage β as defined for every BL. Capital charge is equal to the sum of the products of the eight fractioned GI values and their respective β's.

Basel II introduced some difficulties into the banking sector, that is to say, banks were not prepared for more advanced methodologies. In this section we face the obstacle that the majority of institutions have, which is not having the necessary information with regard to each BL in their annual reports. The decomposition of GI per BL, that is, the classification of activities per BL as introduced by Basel II, is still not complete in many institutions. In the study elaborated by Moscadelli (2004), the author obtained some results on the decomposition of GI per BL as seen in Table 8. These results were based on data retrieved from the

RMG. This contribution by Moscadelli (2004) makes it possible to calculate, in average terms, the part of an institution's GI belonging to each BL, making it possible to calculate capital charge for operational risk for TSA and ASA.

TABLE 8

Fraction of Gross Income per BL

BL	% PB
Corporate Finance	10.6%
Trading and Sales	17.3%
Retail Banking	36.0%
Commercial Banking	18.4%
Payment and Settlement	3.0%
Agency Services	3.8%
Asset Management	4.6%
Retail Brokerage	6.4%

As a result of the application of equation 2, we obtained the capital charge to be allocated according to TSA. (Table 9). In this case, the ranking of capital charge per institution is identical to that of the BIA, that is, BCP continues to rank first and BANIF ranks last, but it is important to notice that capital charge has now decreased to 14.52% of the gross income, when GI is fractioned as Moscadelli (2004) foresaw. In this approach, the decomposition of GI per BL is identical for all the financial institutions, as Moscadelli (2004) pointed out, but in reality this may not be linear because bank activities can differ significantly from institution to institution.

TABLE 9

Capital Charge for TSA

	2005	2006	2007
BCP	351.904	354.320	355.733
CGD	281.443	270.787	281.122
BES	204.136	213.028	226.224
BPI	113.061	120.215	131.988
SICAM	55.261	56.720	59.225
MG	44.165	45.885	49.461
BANIF	22.091	24.064	26.184

Values in Millions of Euros.

Alternative Standard Approach

In this methodology, as in the previous one, financial institutions must classify their activities into the eight BL. This methodology differs from previous one with respect to retail and commercial banking. For these two BL, GI will be substituted by the value of LA associated to these two BL. Similar to what happened in TSA, in this approach we notice that LA are not divided into BL in banks´ annual reports. Therefore the results obtained by Moscadelli (2004) for GI were used, as decomposed in Table 8. As can be observed in the Table, the combined weight of GI for retail and commercial banking is 54.4%. This reference was used to distinguish the fraction of LA for both retail and commercial banking. This decomposition of LA may not be a rigorous representation of reality, but significant divergences are not expected. Table 10 represents the values referring to 54.4% of the initial value obtained for LA for every institution.

TABLE 10

LA for Retail and Commercial Banking

	2005	2006	2007
BCP	26, 214.816	27, 771.925	29, 355.872
CGD	24, 811.659	25, 669.728	27, 893.237
BES	14, 565.419	15, 629.301	17, 390.048
BPI	11, 312.843	12, 159.887	13, 533.106
MG	5, 578.741	6, 022.151	6, 660.328
SICAM	3, 454.700	3, 586.589	3, 701.140
BANIF	2, 148.462	2, 282.097	2, 492.187

Values in Millions of Euros.

Appling equation 3, we obtain Table 11, which represents capital charge for the ASA. As can be observed in Table 11, capital charge for the ASA results in a ranking similar to TSA, with the exception of MG and SICAM, whose positions are inverted. This is due to the fact that MG has a greater amount of LA than SICAM.

This occurred because an independent variable (LA) was introduced into the equation. The more independent variables are introduced into the equations used to calculate minimum capital requirements, the more capital charge begins to approximate the banking reality. Basic methodologies, based on fixed values, result in capital charges which may not be a clear image of the operational risk existing in a bank. Once again, we can verify how capital charge varies percent wise versus gross income. In Table 12, we see how LA can have various implica-

tions on capital charge: for some institutions less capital will be allocated with this approach, in other cases we will see the inverse situation.

TABLE 11

Capital Charge for ASA

	2005	2006	2007
BCP	318.098	327.511	336.552
CGD	274.596	273.636	290.610
BES	181.157	191.303	207.314
BPI	117.375	125.490	138.737
MG	51.938	55.148	60.332
SICAM	46.477	47.918	49.804
BANIF	22.608	24.332	26.512

Values in Millions of Euros.

TABLE 12

Capital Charge expressed in percentage

	2005	2006	2007
BCP	13.13%	13.42%	13.74%
BPI	15.08%	15.16%	15.26%
CGD	14.17%	14.67%	15.01%
MG	17.08%	17.45%	17.71%
BES	12.89%	13.04%	13.31%
BANIF	14.86%	14.68%	14.70%
SICAM	12.21%	12.27%	12.21%

Results Analysis

As can be observed, the results of the application of the three methodologies, BIA, TSA and ASA are presented in Table 13, we verify that the impact of progressing from BIA to TSA is identical in all the institutions. This occurrence is due to the decomposition of GI, which is identical for every institution. We can observe a decrease of approximately 3.20% in capital charge in using TSA. The ASA showed that the introduction of LA to the equation had significant results for the various institutions. Specifically, BCP, BES and SICAM, decreased their capital charge, varying from 5% to 16%. The inverse situation also occurs. BPI, MG and BANIF showed an increase in capital charge, varying from 1% to 22%. The case of CGD is peculiar: capital charge starts by decreasing in 2005 and then

increases in 2006 and 2007. Another analysis also evidenced here, is the option of an institution progressing directly from the BIA to the ASA. This analysis shows that this option is favorable to all the financial institutions, with the exception of BPI and MG. BPI would have an increase in capital charge of about 1%, which is insignificant. The case of MG is more severe, the increase in capital charge would reach 18% in 2007. Maintaining TSA in this case is more advantageous for MG. The increases in capital charge for BPI and MG are due to the introduction of the variable LA. The remaining institutions showed significant reductions in capital, for example for SICAM, the decrease reached 18.5%.

TABLE 13

Results Analysis

		Capital Charge					Percentage Variation		
		2005	2006	2007			2005	2006	2007
BCP	BIA	363.495	365.990	367.450	BCP	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	351.904	354.320	355.733		TSA/ ASA	-9.61%	-7.57%	-5.39%
	ASA	318.098	327.511	336.552		BIA/ ASA	-12.49%	-10.51%	-8.41%
CGD	BIA	290.713	279.706	290.382	CGD	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	281.443	270.787	281.122		TSA/ ASA	-2.43%	1.05%	3.38%
	ASA	274.596	273.636	290.610		BIA/ ASA	-5.54%	-2.17%	0.08%
BES	BIA	210.860	220.045	233.675	BES	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	204.136	213.028	226.224		TSA/ ASA	-11.26%	-10.20%	-8.36%
	ASA	181.157	191.303	207.314		BIA/ ASA	-14.09%	-13.06%	-11.28%
BPI	BIA	116.785	124.175	136.335	BPI	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	113.061	120.215	131.988		TSA/ ASA	3.82%	4.39%	5.11%
	ASA	117.375	125.490	138.737		BIA/ ASA	0.51%	1.06%	1.76%
SICAM	BIA	57.082	58.588	61.176	SICAM	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	55.261	56.720	59.225		TSA/ ASA	-15.90%	-15.52%	-15.91%
	ASA	46.477	47.918	49.804		BIA/ ASA	-18.58%	-18.21%	-18.59%
MG	BIA	45.619	47.396	51.090	MG	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	44.165	45.885	49.461		TSA/ ASA	17.60%	20.19%	21.98%
	ASA	51.938	55.148	60.332		BIA/ ASA	13.85%	16.36%	18.09%
BANIF	BIA	22.819	24.856	27.047	BANIF	BIA/TSA	-3.19%	-3.19%	-3.19%
	TSA	22.091	24.064	26.184		TSA/ ASA	2.34%	1.11%	1.25%
	ASA	22.608	24.332	26.512		BIA/ ASA	-0.92%	-2.11%	-1.98%

Values in Millions of Euros.

V. CONCLUDING REMARKS

Basel I satisfied its initial objectives for many years, guaranteeing the financial stability of the international banking system. However, rapid transformations in the banking sector made revision to the Basel I framework necessary. The new capital accord, Basel II, came to strengthen minimum capital requirements in financial institutions, improving the levels of solvency and solidity of each institution.

In the present work, beyond the application of the methodologies for operational risk, we verified the axiom that is constantly referred to in the Basel Framework and studies elaborated by other authors. This axiom is based on the fact that the application of an advanced or sophisticated methodology will benefit a bank, decreasing capital charge for operational risk. According to the analysis elaborated in the previous section and considering the results pointed out by Moscadelli (2004), we verify that, when abdicating from the BIA and adopting TSA, the financial institutions will benefit from a capital charge reduction of, approximately, 3.2%. This conclusion was similar to the one Sundmacher (2007) obtained: opting for TSA over the BIA, capital charge will decrease albeit insignificantly.

On the other hand, we must be conscious that these results will depend on the dominant activities within each institution. As Sundmacher (2004) stated in his study, an institution in which BL with greater β´s - for example 18% - predominate, will allocate more capital in an advanced methodology, so it is more advantageous to apply the BIA, which has an α of 15%. The opposite may also occur, when an institution's dominant BL have smaller β´s, for example, 12%. In this situation, the institution will allocate less capital using TSA. In the last methodology, ASA, we verified diversified results; the introduction of the variable LA gave rise to an increase or decrease in capital charge in comparison with TSA. We also verified that in the majority of the banks, progressing from BIA to ASA is, in general, advantageous, that is, lower values of capital can be allocated.

This work sought to evaluate the benefits of the use of a more sophisticated methodology set out by the Basel Committee for each one of the seven Portuguese banking institutions. As mentioned previously, progressing from BIA to TSA is beneficial for all institutions. The second choice - progressing directly from BIA to ASA - is equally favorable. The use of the more advanced methodologies - TSA and ASA - is limited by the mapping of the banks' activities, which, as we can observe in their annual reports, are still in need of some structuring. With respect to the application of the ASA, institutions will have to evaluate their situations better. In the case of four institutions, CGD, BPI, MG and BANIF, it is preferable to remain in TSA, especially in the case of MG, where capital charge increases by approximately 22%. On the other hand, BCP, BES and SICAM benefited with the application of the ASA. SICAM benefited with a decrease of approximately

16%. In progressing directly from BIA to ASA, institutions can save up to 18.5% of capital, as is the case for SICAM; however, they can lose up to 18%, as is the case for MG.

As Currie (2004b) stated in her work, significant increases in capital charge can have negative consequences for institutions, that is, they may desire to increase the general level of prices, which can result in a credit crunch.

Although there has been significant progress in recent years, Holmes (2003) argues that there are still obstacles when analyzing operational risk. First, operational risk is very hard to quantify correctly. Second, while credit risk can be identified easily, it is difficult to evaluate if all operational risk situations have been included. Third, certain risks can lose their relevance in an institution over time. Finally, the difficulty in validating a good method for calculating capital charge decreases its own reliability. Currie (2005) claims that the greatest obstacle in operational risk is that non-measurable factors cannot be controlled, arguing that quality cannot be measured, and, therefore, cannot be controlled.

Throughout the years, Basel II will undergo various changes, improving every detail. Information for analysis will become easier to retrieve from annual reports due to rigorous requirements from both the supervisory review process and market discipline. In this perspective, it is important to analyze the advanced methodologies (AMA) and evaluate their impact on financial institutions.

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Resumo

Com este trabalho, pretende-se efectuar uma abordagem genérica sobre a origem do Novo Acordo de Basileia, que tem como objectivo a estabilidade do sistema bancário internacional, no qual é dado especial ênfase à convergência entre capital regulamentar e capital económico através de metodologias do tipo *risk sensitive*. Pretende-se ainda, focalizar numa das principais novidades do Basileia II - o risco operacional e respectivas metodologias de cálculo dos requisitos mínimos. O Novo Acordo pretende encorajar as instituições financeiras a evoluíram gradualmente para metodologias mais complexas, sendo estas recompensadas por deduções no volume do capital a ser alocado para fundos próprios. Neste sentido, foi efectuada uma aplicação das metodologias associadas ao risco operacional a um conjunto de instituições bancárias nacionais. Das metodologias referentes a este tipo de risco destacam-se no Pilar I do Novo Acordo: (i) método básico, (ii) método *standard* e (iii) *standard* alternativo. O objectivo deste trabalho visa avaliar e quantificar o impacto decorrido da aplicação do Basileia II.

Palavras-chaves: Basileia II; Risco Operacional; Capital Regulamentar; e Capital Económico.

JEL Classification: G14; G21; G28; G32.