

# Greening Basel 3: towards a « Green » Basel 4

## *A journey through BNPP's Basel 3 capital ratio as of end 2015*

Mireille Martini  
Advisor, Energy and Prosperity Professorship

Dec 9 2016

# Purpose : learning, and imagining a “Green” Basel 4

---

- Learn about the Basel 3 ratio on the basis of a real example
  - Screen through the various possible entry points for « greening » Basel 3: ie, to use the prudential framework as a catalyst to channel bank finance towards the energy transition (in red).
  - We will focus on the « **credit risk** » component of the Basel 3 ratio and imagine that « green finance » could be « de- risked » in the assets risk weighting regulatory framework. This way banks would be incentivized to do more green finance.
  - At this stage we are merely envisaging how it could work, not discussing the merits.
- 
- A « Green » Basel 4 would require a definition of « **green finance** »: eg, evidence of a zero or negative carbon footprint (nb: carbon footprint can be computed for projects, companies, things, people,...). Banks could compute an internal « **green rating** » for green finance. Such rating would not rate credit risk, but the « **transitional quality** » of the green financing at stake. It would be based on the carbon footprint and come on top of the current internal or external rating used in the credit risk prudential framework.
  - We are not calling it a « green factor » so as not to confuse this with the current « green supporting factor » proposal from the French Banking Federation.

# Un-weighting (or de-risking) with a green rating

Current Basel 3 framework	Credit risk Exposure M €	Risk Credit rating	Risk Weight Basel 3	RW Assets Bâle 3
XYZ Corporation	300			
External rating		A	50%	150
Internal rating		4	30%	90

Green Basel 4 framework	Credit risk exposure M€	Risk credit rating	Green rating	Risk Weight Basel 3	Risk Weight Green Rating	RWA Basel 3 M€	RWA Basel 4 M€
XYZ Corporation	300						
External rating		A	A	50%	20%	150	30
Internal rating		4	A	30%	20%	90	18

Green rating	Multiplier Weighting	Unweighting/Basel 3
A	20%	80%
B	40%	60%
C	60%	40%
D	80%	20%
E	90%	10%

# The Basel regulatory framework – scope and systemic risk

- Designed by the Bank for International Settlements. Implemented in Europe via the ECB then transposed in domestic laws. A bank whose head office in the Eurozone reports all of its consolidated balance sheet under Basel 3, including for its non european assets.
- The Basel 3 framework was approved in Nov 2010. It was transposed into European Law in Directive 2013/36/EU (CRD 4) and Regulation EU 575 of 26 June 2013 (CRR) which together are know as **CRD IV**.The requirements are phased in over 5 years to 1 Jan 2019 transitioning from « phased in » to « fully loaded » ratios.
- This new regulatory framework had the following main impacts :
  - Strengthened **solvency** ratio
  - Introduction of a **leverage** ratio
  - **Liquidity** management
  - And the introduction of the new banking resolution scheme, which we won't discuss here.
- The Basel framework was conceived initially as a **prudential** framework to avoid **systemic** risk. No single bank is so weak as to endanger the whole banking system. Systemic risk occurs in banking because banks lend a lot to each other.
- Interbank lending seems rather limited at BNPP group level:
  - Loans to banks are 43 bn and borrowings from banks are 84 bn out of a total of 1994 bn bs (book value).
  - Banks may nowadays be lending more to non-bank actors:
    - BNPP Group credit risk exposure to Central gvts and banks is 308 bn.

# Understanding the solvency concept

---

- Solvency regulation frameworks (Mc Donoughn then Cooke, then Basel 1 and 2 frameworks) appeared in the early 1980s. The end of the Bretton Woods fixed exchange rate system, and the subsequent financial deregulation created a new wave of instability in banking. Trading rooms and **capital market activities** appeared within banks where they created and sold hedging products to their customers: first on fx, then on commodities, then on credit risk. A « derivative » is a bet on the future price of a product or currency or credit.
- The solvency ratios required banks to keep a certain amount of equity for every euro of credit granted to customers (more precisely, for each euro of exposure to risk). The idea was to oblige banks to have enough equity to withstand losses, so that no single bank failure would threaten the whole banking system.
- The exposure to risk is computed by weighting assets (say credits) by a risk weight factor: an AAA credit rating means a 0,01% risk weight, and so on (see next slide)
- Since not all counterparts have an external rating (eg retail loans are not rated), banks are allowed to use internal rating models, based on history of default, to compute RWAs.
- There are other risks than credit risks in the solvency (or capital) ratio, as we shall see: market risk for capital markets activity, and operational risks, among others.

## Internal and external ratings and expected default probability

► **TABLE 16: INDICATIVE MAPPING OF INTERNAL COUNTERPARTY RATING WITH AGENCY RATING SCALE AND AVERAGE EXPECTED PD**

	BNP Paribas Rating	LT Issuer/ Unsecured issues ratings	Average expected PD
		S&P/Fitch	
Investment Grade	1+	AAA	0.01%
	1	AA+	0.01%
	1-	AA	0.01%
	2+	AA-	0.02%
	2	A+/A	0.03%
	2-	A-	0.04%
	3+/3/3-	BBB+	0.06% to 0.10%
	4+/4/4-	BBB	0.13% to 0.21%
	5+/5/5-	BBB-	0.26% to 0.48%
Non Investment Grade	6+	BB+	0.69%
	6/6-	BB	1.00% to 1.46%
	7+/7	BB-	2.11% to 3.07%
	7-	B+	4.01%
	8+/8/8-	B	5.23% to 8.06%
	9+/9/9-	B-	9.53% to 13.32%
	10+	CCC	15.75%
	10	CC	18.62%
	10-	C	21.81%
Default	11	D	100%
	12	D	100%



## Internal and external ratings and expected default probability

**I/ Approche standard :** correspondance entre les notations de Standard and Poor's et les échelons de qualité de crédit du CRR.

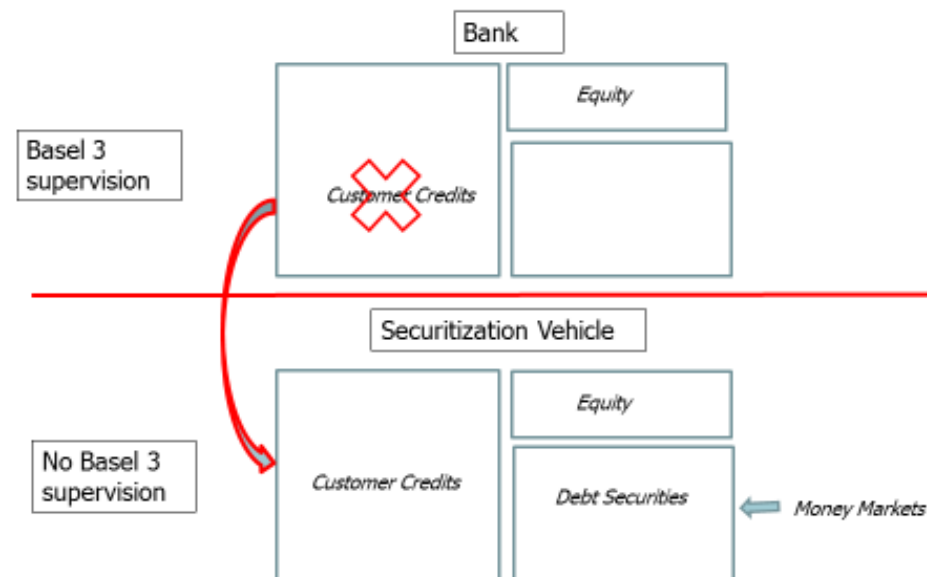
### Expositions long terme

Échelon de qualité de crédit	Notation S&P	Catégorie de pondération		
		Entreprises (art. 122)	Établissements (art. 119)	Administrations centrales et banques centrales (art. 114)
1	AAA à AA-	20 %	20 %	0 %
2	A+ à A-	50 %	50 %	20 %
3	BBB+ à BBB-	100 %	50 % ou 100 %*	50 %
4	BB+ à BB-	100 %	100 %	100 %
5	B+ à B-	150 %	100 %	100 %
6	Inférieur ou égal à CCC+	150 %	150 %	150 %

# Securitization

- After 1990, banks started to **securitize** credit. They sold credits to SPVs which were not banks and therefore not subject to solvency ratios. Those SPVs purchased loans from banks by issuing securities mainly on money markets (short term money looking for yield in a low interest rate environnement).
- The banks business model evolved towards « **originate and distribute** »: structure a credit and sell it to the non-banking (also called « shadow banking ») sector. Banks only keep on their balance sheets the credits whose risks do not require more equity than they desire to allocate, given their earnings on the credit and the Basel capital requirements. This is the RAROC concept (Risk Adjusted Return On Capital)

## Securitization





# BNPP Group – Basel 3 capital ratio as of end 2015

---

- **Insurance** subsidiaries (Cardif and others) are consolidated using the equity method in the prudential scope: in this instance, some 183 bn € are subtracted from book value for capital ratio calculations: insurance companies are subject to their own solvency regulations (**Solvency II**).
- **Securitization** vehicles are excluded from the prudential scope « if the securitization transaction is deemed effective, that is, provided the credit risk is effectively transferred » from the bank to the vehicle.
- Total (solvency) capital:
  - Book value of equity 100 bn €
  - Solvency capital 86 bn €
  - Of which 70 bn € are Tier 1 (« hard equity », as opposed to Tier 2 capital made of super subordinated or perpetual subordinated debt)

# BNPP Group – Basel 3 capital ratio as of end 2015

## CAPITAL RATIOS

► TABLE 1: CAPITAL RATIOS<sup>(\*)</sup>

In millions of euros	Phased in	
	31 December 2015	31 December 2014 <sup>(**)</sup>
<b>COMMON EQUITY TIER 1 (CET1) CAPITAL</b>	<b>69,562</b>	<b>64,519</b>
<b>TIER 1 CAPITAL</b>	<b>76,854</b>	<b>70,427</b>
<b>TOTAL CAPITAL</b>	<b>85,920</b>	<b>77,217</b>
<b>RISK-WEIGHTED ASSETS</b>	<b>629,626</b>	<b>614,449</b>
<b>RATIOS</b>		
Common Equity Tier 1 (CET1) capital	11.0%	10.5%
Tier 1 capital	12.2%	11.5%
Total capital	13.6%	12.6%

In millions of euros	Fully loaded <sup>(**)</sup>	
	31 December 2015	31 December 2014 <sup>(***)</sup>
<b>COMMON EQUITY TIER 1 (CET1) CAPITAL</b>	<b>68,867</b>	<b>63,711</b>
<b>TIER 1 CAPITAL</b>	<b>74,046</b>	<b>66,934</b>
<b>TOTAL CAPITAL</b>	<b>82,063</b>	<b>72,472</b>
<b>RISK-WEIGHTED ASSETS</b>	<b>633,527</b>	<b>619,827</b>
<b>RATIOS</b>		
Common Equity Tier 1 (CET1) capital	10.9%	10.3%
Tier 1 capital	11.7%	10.8%
Total capital	13.0%	11.7%

(\*) Subject to the provisions of article 26.2 of (EU) Regulation No. 575/2013.

(\*\*) In accordance with grandfathered Additional Tier 1 and Tier 2 eligibility rules applicable as of 2019.

(\*\*\*) Restated according to the IFRIC 21 interpretation.

# Capital ratio – Green transition

---

With a phased in CET1 ratio of 11%, Tier 1 ratio of 12.2% and total capital ratio of 13.6% at 31 December 2015, the Group largely complies with the requirements which are respectively 4.5%, 6% and 8% at that date.

Following the notification by the ECB of the results of the 2015 annual Supervisory Review and Evaluation Process (SREP), the Group is required to have a Common Equity Tier 1 (CET1) capital ratio of 10% in 2016, including the G-SIBs capital buffer of 0.5%. The anticipated level of fully loaded Basel 3 CET1 ratio requirement is 11.5% in 2019 given the gradual phasing-in of the G-SIB capital buffer to 2% in 2019.

The Group plans to reach a fully loaded CET1 ratio of 11.5% by mid-2017, thanks to its organic capital generation and active capital management policy (about 35 basis points per year) and, in addition, the sale or initial public offering of First Hawaiian Bank that could raise the CET1 ratio by 40 basis points<sup>(1)</sup>. Beyond, BNP Paribas' target is a CET1 ratio of 12% as of 2018. This target is taking into account a 50 basis point management buffer.

The objective of BNP Paribas is a total capital ratio above 15% as at 1 January 2019.

- One could imagine a « negative capital buffer » (eg -1% in the capital ratio constraint) to reward a given bank's active participation in the energy transition, measured by a certain % of its lending activity dedicated to the transition.

# Capital ratio and leverage ratio are quite different

- A **leverage ratio** was introduced in CRD IV. The US banking regulation (also strengthened, with the Volcker Rule and more recently the Dodd-Frank Act) is using leverage ratios rather than solvency/capital ratio. It is a “complementary measure” and does not have a regulatory minimum.
- The difference is simple: the leverage ratio is computed on **book values** vs risk weighted assets.
- It does use a “prudential” balance sheet which is different from the book value mainly due to insurance adjustments (insurance is deducted because regulated on a separate basis).

## ► TABLE 14: LEVERAGE RATIO

### ► Leverage ratio and reconciliation of prudential balance sheet and the leverage exposures

In billions of euros	31 December 2015	31 December 2014
Tier 1 (fully loaded) capital(*)	74	71
Total prudential balance sheet	1,808	1,898
Adjustments for derivative financial instruments	(105)	(24)
Adjustments for securities financing transactions “SFTs”	3	1
Adjustments for off-balance sheet items (i.e. conversion to credit equivalent amounts of off-balance sheet exposures)	155	140
Other adjustments	(25)	(25)
<b>Total leverage exposures</b>	<b>1,836</b>	<b>1,990</b>
<b>LEVERAGE RATIO</b>	<b>4.0%</b>	<b>3.6%</b>

(\*) In accordance with the eligibility rules for grandfathered debt recognised as additional Tier 1 capital as from 2019. As at 31 December 2014, includes the future replacement of Tier 1 instruments that became ineligible with equivalent eligible instruments for EUR 4 billion.

## Risk weighted assets (in € bn)

A.Credit risk	449
B.Securitization risk	13
C.Counterparty credit risk	29
D.Equity risk	59
E.Market risk	24
F.Operational risk	60
Total Capital Ratio Risk Weighted Assets	634

FIGURE 1: RISK-WEIGHTED ASSETS BY RISK TYPE(\*)



# Market exposure is highly derisked compared to credit exposure

- Market risks as measured by the Basel 3 methodology are quite small in view of their accounting book value (and comparatively to credit risks).

Prudential assets (book value ) € bn		Risk Weighted Assets (€ bn)	
Cash and Central Banks	135	Counterparty credit risk	29
<b>Financial instruments at fair value through profit or loss, trading book</b>	<b>596</b>	<b>Market and equity risk</b>	<b>82</b>
Loans to customers and institutions	728	Credit risk + banking securitization	463
Other	348	Operational risk	60
<b>Total prudential assets (book values)</b>	<b>1807</b>	<b>Total risk weighted assets</b>	<b>634</b>

## A. Credit risk (RWAs = 449 bn €/634)

- That's the main risk in the capital ratio as 70% of RWAs are related to credit risk exposure. The 449 bn rwas relate to a 1512 € bn total exposure.
- Each credit exposure is weighted with either an Internal Based Rating Assessment approach (IRBA) or an external rating (Standardised Approach). When there is no rating available (retail credits, non rated corporates,...), IRBA is based on an assessment from within the Bank, Standardized approach on external data (credit default statistics from other sources).
- The Exposure At Default (EAD) is the amount the bank may lose if the customer defaults: guarantees received are deducted from the book value, and so on
- The EAD is multiplied by the risk weight associated with the rating (internal or external) and the Probability of Default (PD) and that gives the Risk Weighted assets.

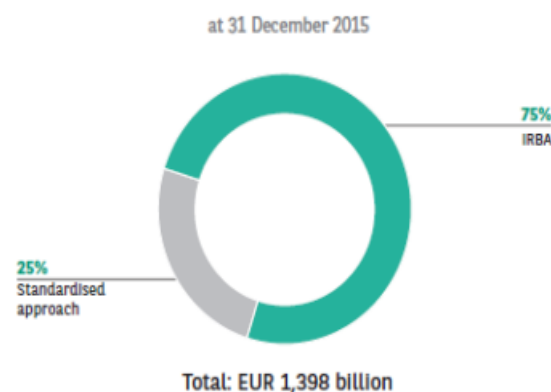
➤ **TABLE 24: IRBA EXPOSURE BY INTERNAL RATING AND ASSET CLASS – SOVEREIGN, FINANCIAL INSTITUTION, CORPORATE AND SPECIALISED FINANCING PORTFOLIOS**

In millions of euros	Internal rating	31 December 2015									
		Average PD	Total exposure	Balance sheet exposure	Off-balance sheet exposure	Average off-balance sheet CCF	EAD	Average LGD	Average RW	Expected Loss	RWAs
Central governments and central banks	1	0.01%	203,057	202,591	465	85%	202,986	1%	0%	0	488
	2	0.03%	55,737	55,641	96	55%	55,694	1%	0%	0	163
	3	0.08%	5,201	5,194	7	52%	5,197	18%	13%	1	651

# Credit risk details

Cash and due from central banks	135
Fixed income available for sale	126
Loans to banks	39
Loans to customers	689
Accrued income	103
Property	22
Guarantees given	398
<b>Total credit exposure</b>	<b>1512</b>

► **FIGURE 3: CREDIT RISK EXPOSURE<sup>(\*)</sup> BY APPROACH**



(\*) Excluding other non credit-obligation assets.

► **TABLE 15: CREDIT RISK EXPOSURE<sup>(\*)</sup> BY ASSET CLASS AND APPROACH**

Exposure <i>In millions of euros</i>	31 December 2015		
	IRBA approach	Standardised approach	Total
Central governments and central banks	273,203	36,129	309,332
Corporates	465,838	134,361	600,199
Institutions <sup>(**)</sup>	68,447	19,668	88,114
Retail	243,394	157,229	400,623
Other non credit-obligation assets <sup>(***)</sup>	329	113,428	113,758
<b>TOTAL</b>	<b>1,051,211</b>	<b>460,814</b>	<b>1,512,026</b>



# From Exposure At Default to Risk Weight

## Risk weighted assets, € bn

	Average Probability of default PD  Or av. rating	Exposure  At Default EAD	Avge Risk Weight  RW	RWAs Risk Weighted  Assets
<b>IRBA exposure</b>				
Central banks and governments	0,11%	272	2%	4
Corporates	5,85%	344	47%	163
Institutions	1,17%	59	17%	10
Retail	7,28%	237	22%	51
<i>Of which mortgage</i>	<i>3,80%</i>	<i>141</i>	<i>14%</i>	<i>20</i>
<b>Standard Approach</b>				
Central banks and governments	AA	36	nd	5
Corporates	nd	104	nd	95
Institutions	BBB+	16	nd	6
Retail	nd	128	nd	75
<i>Of which mortgage</i>		<i>nd</i>	<i>nd</i>	
Other	nd	201	nd	40
<b>Total credit risk</b>		<b>1398</b>		<b>449</b>

- Out of a total of € 449 bn of credit risk RWAs, 57% are corporate exposures and 28% are retail exposures.
- If we consider the ratio of RWAs to EAD, ie how much risk remains in the capital ratio compared to the initial exposure, we see that the IRBA approach takes away more risk than the standard approach (53% for corporate exposure and 78% for retail for the IRBA approach, versus 9% of corporate and 42% of retail for the standard approach).

# Greening credit risk

- In terms of « greening » the capital ratio, as far as credit risk is concerned :
  - Green credits should be labeled: by general or specialized credit rating agencies, or via internal bank models, based on carbon equivalent Green House Gases footprint (GHG emitted – GHG saved, several methodologies are well developed.
  - Labeling would deliver an estimate of the « transition contribution level » on a scale, eg from A to E
  - This rating would come, for green credits only, on top of existing Basel 3 credit risk methodologies. It would permit a relative alleviation of the Basel 3 capital charge, and incentivize banks into getting increased credit exposure to green finance.

Green rating	Multiplier Weighting	Unweighting/Basel 3
A	20%	80%
B	40%	60%
C	60%	40%
D	80%	20%
E	90%	10%

# Huge impact of guarantees ( and other credit risk mitigation techniques ) on reducing corporate credit risk exposure

► **TABLE 34: IRBA – CREDIT RISK MITIGATION FOR SOVEREIGN, FINANCIAL INSTITUTION, CORPORATE AND SPECIALISED FINANCING PORTFOLIOS**

<i>In millions of euros</i>	31 December 2015				31 December 2014			
	Total exposure	Risk mitigation			Total exposure	Risk mitigation		
		Guarantees and credit derivatives	Collateral	Total guarantees and collaterals		Guarantees and credit derivatives	Collateral	Total guarantees and collaterals
Central governments and central banks	273,203	5,039	36	5,075	221,680	5,290	29	5,319
Corporates	465,838	62,297	57,859	120,156	436,716	64,563	54,604	119,167
Institutions	68,447	3,982	685	4,666	71,289	2,977	726	3,703
<b>TOTAL</b>	<b>807,488</b>	<b>71,317</b>	<b>58,579</b>	<b>129,897</b>	<b>729,685</b>	<b>72,830</b>	<b>55,359</b>	<b>128,189</b>

► **TABLE 35: STANDARDISED APPROACH – CREDIT RISK MITIGATION FOR SOVEREIGN, FINANCIAL INSTITUTION, CORPORATE AND SPECIALISED FINANCING PORTFOLIOS**

<i>In millions of euros</i>	31 December 2015				31 December 2014			
	Total exposure	Risk mitigation			Total exposure	Risk mitigation		
		Guarantees and credit derivatives	Collateral	Total guarantees and collaterals		Guarantees and credit derivatives	Collateral	Total guarantees and collaterals
Central governments and central banks	36,129				28,493			
Corporates	134,361	717	19,082	19,799	131,790	264	8,808	9,072
Institutions	19,668		1	1	20,512		54	54
<b>TOTAL</b>	<b>190,157</b>	<b>717</b>	<b>19,083</b>	<b>19,800</b>	<b>180,795</b>	<b>264</b>	<b>8,862</b>	<b>9,125</b>

The increase on the Corporate portfolio arises from the improvement in taking existing guarantees into account.

The main credit risk mitigation instruments are third party guarantees, collaterals and Credit Default Swaps

# Green credit risk mitigation techniques

---

- The development of specific **green finance mitigation tools** could be a powerful help for banks to derisk their green credit exposure. Possible instruments are:
  - State **guarantees** , possibly via specific Guarantee funds (provided the guarantees are effectively funded)
  - The development of Green Credit Default Swaps (« **Green CDSs** ») with the State as an initial counterpart, then developing into a private trading market with private counterparts also active
  - The acceptance of specific **collateral** for green credits, such as Carbon Reduction Certificates as proposed by France Stratégie (<http://www.strategie.gouv.fr/publications/une-proposition-financer-linvestissement-bas-carbone-europe>) (Aglietta, Espagne, Perissin-Fabert).

## B.Banking Book securitization risk ( RWAs = 13 bn €/634)

- Banks are structuring (originators and sponsors) and lending to securitization vehicles (SPVs). They may also hold position in securitization vehicles for trading purposes. The first activity is recorded under this item, the second activity under market risk (see E below). When they hold equity position in SPVs they are recorded in equity (see D below).
- Securitization vehicles are excluded from the prudential scope « if the securitization transaction is deemed effective, that is, provided the credit risk is effectively transferred » from the bank to the vehicle. This means that if a securitized credit defaults, the loss is for the securitization vehicle and not for the Bank.
- Banks grant liquidity guarantees to securitization SPVs to enable certain investors in SPVs (money market investors purchasing debt securities) to get an AAA rating.
- RWAs are roughly half the exposure at default for this asset class

► **TABLE 42: SECURITISATION POSITIONS AND RISK-WEIGHTED ASSETS BY APPROACH**

<i>In millions of euros</i>	31 December 2015		31 December 2014		Variation	
Calculation approach	Securitisation positions held or acquired (EAD)	RWAs	Securitisation positions held or acquired (EAD)	RWAs	Securitisation positions held or acquired (EAD)	RWAs
IRBA	24,539	11,905	21,801	13,430	2,739	(1,525)
Standardised	616	720	971	558	(355)	162
<b>TOTAL</b>	<b>25,155</b>	<b>12,625</b>	<b>22,772</b>	<b>13,988</b>	<b>2,383</b>	<b>(1,362)</b>

Risk-weighted assets corresponding to securitisation positions held or acquired by the Group amounted to EUR 12.6 billion at 31 December 2015, or 2.0% of BNP Paribas total risk-weighted assets, compared with EUR 14 billion at 31 December 2014 (2.3% of Group total risk-weighted assets).

## C. Counterparty credit risk (RWAs 29 bn€/634)

- Counterparty credit risk is the risk that a trading (vs lending) operation incurs losses not because of market price movements, but because the counterparty defaults or is unable to deliver on its commitments. Counterparts include clearing houses.
- Those exposures are nearly totally (99%) internally rated (IRBA), with a methodology closer to market risk (see E below) than credit risk. 75% of the exposure (€ 88 bn) are on derivative products, and mostly on corporate counterparties.

RWAs on this asset class are(€ bn) :

		<b>EAD Exposure At Default</b>		<b>Risk Weighted Assets</b>
<b>Counterparty credit risk, IRBA</b>				
Central banks and governments		22		4
Corporates		64		17
Institutions		30		5
Retail		0		0
		0		0
Other				
<b>Total IRBA</b>		<b>117</b>		<b>26</b>

## D. Equity risk (RWAs € 58 bn/634)

- The equity trading book is the single most important component of the trading book as a whole.

► **TABLE 66: EQUITY RISK-WEIGHTED ASSETS**

<i>In millions of euros</i>	RWAs		
	31 December 2015	31 December 2014	Variation
Simple weighting method	48,260	50,171	(1,911)
Private equity in diversified portfolios	3,484	3,189	295
Listed equities	6,820	9,536	(2,716)
Other equity exposures	37,956	37,446	510
Standardised approach	9,819	8,525	1,294
<b>EQUITY RISK</b>	<b>58,079</b>	<b>58,696</b>	<b>(617)</b>

- Since stocks may also be green-labeled, one could propose that green stocks receive an additional de risk in a Basel 4 equity risk approach. .

## E. Market risk (RWAs € 24 bn/634)

---

- Market risks relates to the **trading book** of Corporate and Investment Banking activities : Fixed Income, Equities, Derivatives products. It reflects the risk of change in interest and exchange rates, stock market valuations, commodity markets, credit spreads, volatility and correlation between markets.
- Most market risks are measured using the **Value at Risk** methodology. The VaR measures the global potential loss on a given portfolio, at a given time horizon, with a given confidence interval (usually 99%). The VaR does not measure the maximum potential loss, particularly in case of abnormal (from an historical standpoint) market conditions.



# Market risk methodology based on internal models

- Most market risks are weighted using an internal model and the Value at Risk technique.

► **TABLE 55: MARKET RISK CAPITAL REQUIREMENT AND RISK-WEIGHTED ASSETS**

<i>In millions of euros</i>	RWAs			Capital requirements		
	31 December 2015	31 December 2014	Variation	31 December 2015	31 December 2014	Variation
Internal model	21,039	18,341	2,698	1,683	1,467	216
VaR	7,714	5,209	2,505	617	417	200
Stressed VaR	8,590	8,967	(377)	687	717	(30)
Incremental Risk Charge (IRC)	3,849	3,228	621	308	258	50
Comprehensive Risk Measure (CRM)	886	937	(51)	71	75	(4)
Standardised approach	1,986	1,342	644	159	107	52
Trading book securitisation positions	739	674	64	59	54	5
<b>MARKET RISK</b>	<b>23,764</b>	<b>20,357</b>	<b>3,407</b>	<b>1,901</b>	<b>1,628</b>	<b>273</b>

- Commodity markets are likely to be affected by climate change. Increases in prices and volatility may benefit some, but not all players. One could imagine a « VAR reward » for selected counter-cyclical market products that would be designed to ease market tensions (price and/or volatility) on certain commodities. Such products could be designed by regulators, with state counterparts, or directly between private market players.

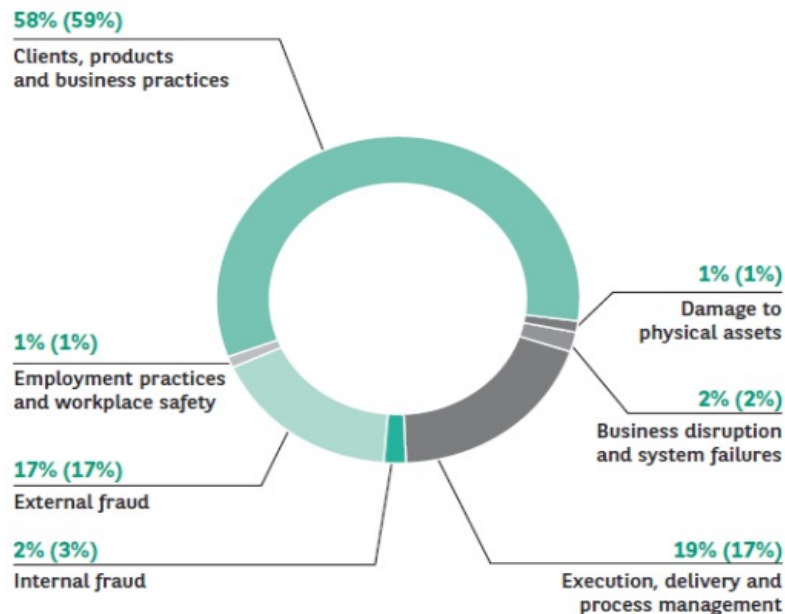
## F. Operational risk (€ 60 bn/634) dominated by the risk of fraud

- It is mostly measured using the Advanced Management Approach consisting in allocating an appropriate amount of risk weighted assets to face estimated future losses on the following risks :

### OPERATIONAL RISK EXPOSURE

The chart below shows the losses linked to operational risk, according to the event classification defined in the current regulation.

► **FIGURE 10: OPERATIONAL LOSSES – BREAKDOWN BY EVENT TYPE (AVERAGE 2008-2015)<sup>(\*)</sup>**



(\*) Percentages in brackets correspond to average loss by type of event for the 2008-2014 period.

In the period 2008-2015, the main type of operational risk falls within the category of "clients, products and business practices", representing on average more than half of the Group's financial impacts. The magnitude of this category is related to the financial terms of the comprehensive settlement concluded in June 2014 with the US authorities with respect to the review of certain US dollar transactions. Process failures, mainly including execution or transaction processing errors, and external fraud are the types of Group incidents with the second and third highest financial impact, respectively.

BNP Paribas Group pays the utmost attention to analysing its operational risk incidents in order to continuously improve its control system.

# Physical, transition and liability risks linked to climate change are not accounted for

- The only mention of climate related risk we could find in the 166 pages of Section 5 “Risk and Capital Adequacy- Pillar 3” of the BNPP 2015 Registration Document is the following, under the “Emerging Risks” heading. We must admit not to have reviewed the 374 remaining pages of the document.

■ besides, BNP Paribas recognises the importance of the energy transition process and the impact it is having or is likely to have on economic players, in particular energy-producing and energy-consuming companies. BNP Paribas is helping its customers manage this transition and is monitoring the risks it poses for the players in the various economic sectors concerned. In November 2015, BNP Paribas announced a number of measures aimed at reinforcing its carbon risk management framework.

The Group regularly conducts portfolio reviews. Concerning the changes in commodity and energy prices – an emerging risk identified in 2014 – the Group conducted several reviews in 2015 focused on portfolios in certain industries exposed to this risk. BNP Paribas’ exposure to the energy sector (Oil & Gas) is diversified. It ranges across the entire oil industry value chain, and particularly concerns large players in the field (oil majors and national oil companies) in many countries. For further details, see section 5.4 *Credit risk diversification*.

- One could imagine that banks be encouraged to measure these 3 kinds of risks as soon as possible. Being aware of the threat that climate change poses to them is probably the strongest incentive for them to start financing massively the transition to a low carbon economy.
- A transition which is also an opportunity to fight secular stagnation and to stabilize the macroeconomic environment, given in particular the maturity issues:

# Maturity issues: less than 20% of banks assets over 5 years.

► **TABLE 77: CONTRACTUAL MATURITIES OF THE PRUDENTIAL BALANCE SHEET**

In millions of euros	31 December 2015							
	Not determined	Overnight or demand	Up to 1 month (excl. overnight)	1 to 3 months	3 months to 1 year	1 to 5 years	More than 5 years	TOTAL
Cash and amounts due from central banks		134,672						134,672
Financial instruments at fair value through profit or loss								
Trading securities	133,505							133,505
Loans and repurchase agreements		41,047	53,445	28,557	12,246	1,802	675	137,771
Instruments designated as at fair value through profit or loss		2	141	105	260	1,013	1,087	2,608
Derivative financial instruments	336,578							336,578
Derivatives used for hedging purposes	17,971							17,971
Available-for-sale financial assets		113	7,886	5,901	14,585	57,260	69,084	154,831
Loans and receivables due from credit institutions and customers		30,713	68,580	41,542	105,594	262,570	218,705	727,704
Remeasurement adjustment on interest-rate risk hedged portfolios	4,564							4,564
Held-to-maturity financial assets			1	24	7	481	57	569
<b>Financial assets</b>	<b>492,619</b>	<b>206,547</b>	<b>130,053</b>	<b>76,130</b>	<b>132,692</b>	<b>323,126</b>	<b>289,609</b>	<b>1,650,774</b>
Other non-financial assets		76,591	9,350	12,125	6,540	16,457	35,736	156,800
<b>TOTAL ASSETS</b>	<b>492,619</b>	<b>283,138</b>	<b>139,403</b>	<b>88,255</b>	<b>139,232</b>	<b>339,582</b>	<b>325,345</b>	<b>1,807,574</b>
Due to central banks		2,385						2,385
Financial instruments at fair value through profit or loss								
Trading securities	82,548							82,548
Borrowings and repurchase agreements		15,837	82,518	45,083	10,182	1,974	1,177	156,771
Instruments designated as at fair value through profit or loss		1,841	4,626	10,143	10,406	14,128	10,710	51,855
Derivative financial instruments	325,750							325,750
Derivatives used for hedging purposes	21,101							21,101
Due to customers and to credit institutions		543,733	100,584	51,313	44,406	35,764	8,720	784,519
Debt securities and subordinated debt		624	15,630	36,042	37,076	50,603	38,556	178,530
Remeasurement adjustment on interest-rate risk hedged portfolios	3,946							3,946
<b>Financial liabilities</b>	<b>433,345</b>	<b>564,419</b>	<b>203,358</b>	<b>142,581</b>	<b>102,069</b>	<b>102,469</b>	<b>59,163</b>	<b>1,607,405</b>
Other non-financial liabilities		62,980	12,505	7,836	3,149	3,922	109,777	200,169
<b>TOTAL LIABILITIES AND EQUITY</b>	<b>433,345</b>	<b>627,399</b>	<b>215,863</b>	<b>150,417</b>	<b>105,219</b>	<b>106,391</b>	<b>168,940</b>	<b>1,807,574</b>