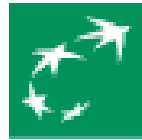




May 23rd 2011

Impact of Doubtful Loans on ALM



BNP PARIBAS
Personal Finance



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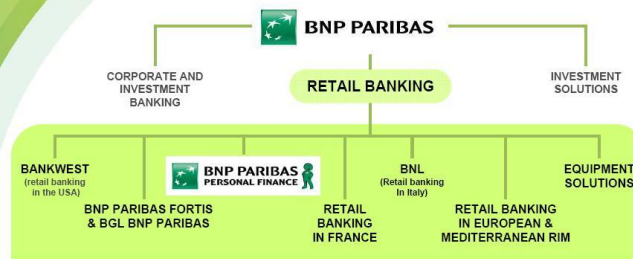
- **Short introduction to BNP Paribas Personal Finance**
- **What is Asset and Liability Management (ALM)?**
- **Basics**
- **Modelling**
- **Conclusion**



- **Short introduction to BNP Paribas Personal Finance**
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A BNP Paribas company



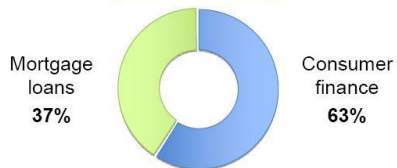
BNP Paribas Personal Finance as of 12/31/2010



N°1 in French and European personal loans

Outstanding loans under management as of 12/31/2010

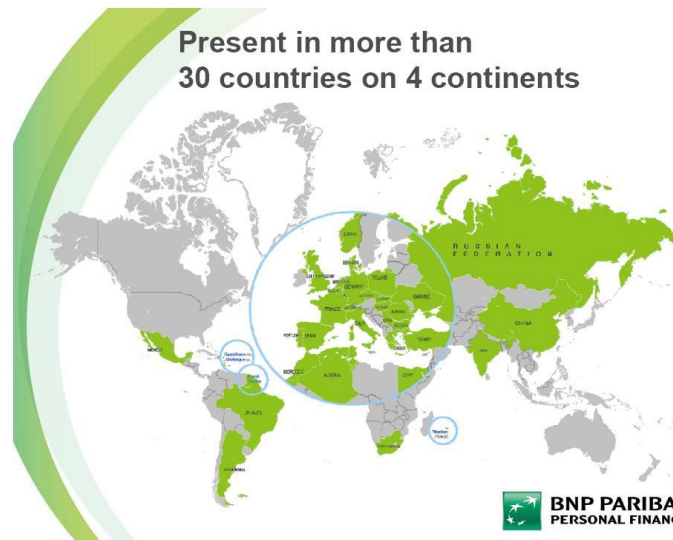
€121.8 Billion



Financial results as of 12/31/2010

Net banking income: €5,050M, 16,4% growth over 12/31/2009
 Net pre-tax profit: €893M, more than double over 12/31/09

Present in more than 30 countries on 4 continents





- Short introduction to BNP Paribas Personal Finance
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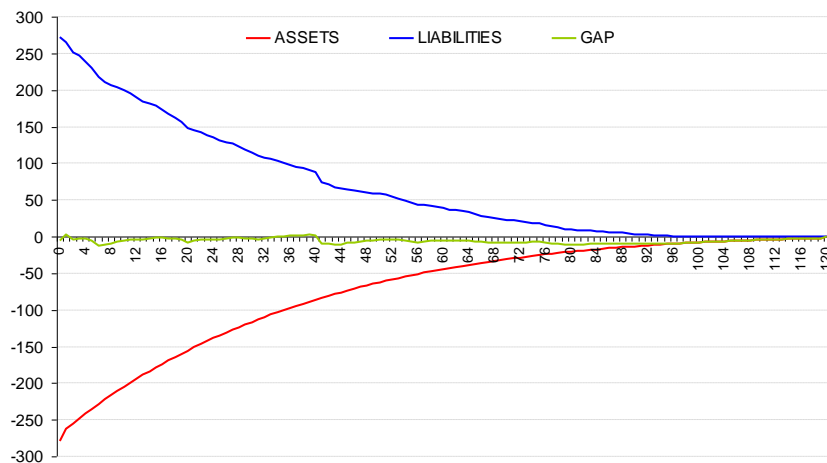
What is Asset and Liability Management (ALM)?

■ Missions

- Liquidity risk management: risk that an institution cannot meet obligations as they come due, even by gathering its assets
 - Massive withdrawing of deposits (term/sight deposits, savings,...)
 - Confidence crisis regarding an institution
 - Systemic liquidity crisis
- Rate risk management: risk to which a portfolio or institution is exposed because of an unfavorable evolution of interest rates
 - A 2 year bullet loan fixed rate refinanced by a 1 year borrowing. If interest rates goes up by 1%, margin loss increases by 1%
- Foreign exchange risk management: risk to which a portfolio or institution is exposed because of an unfavorable evolution of foreign exchange rates
 - Acquisition of 100\$ securities (FX rate: 1 \$/€)
 - At the end of the accounting closing => FX rate 2\$/€ => variation = -50€ (considering a euro accounting)

■ Measures

- Gap
- Net income sensitivity
- Ratios



Example of a simplified gap



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Simplified Balance Sheet at 31 december 2010 (balance in M€)

ASSETS

Available-for-sale financial assets	1 437
Loans and receivables due from credit institutions	13 328
Loans and receivables due from customers	74 572
Other Assets	5 734

Total Assets 95 071

LIABILITIES

Due to credit institutions	76 737
Due to customers	797
Debt securities	7 287
Subordinated debt	1 176
Other liabilities	2 279
Equity	6 795

Total Liabilities & Equity 95 071

• In fact, loans and receivables due from customers are, here, net of depreciation.

■ **Customer loans:**

- Customer loan before depreciation: 79.980 M€
 - Delinquent outstanding: 2.337 M€
 - Doubtful outstanding: 2.554 M€
- Depreciation: 5.408 M€

5% of the Balance Sheet



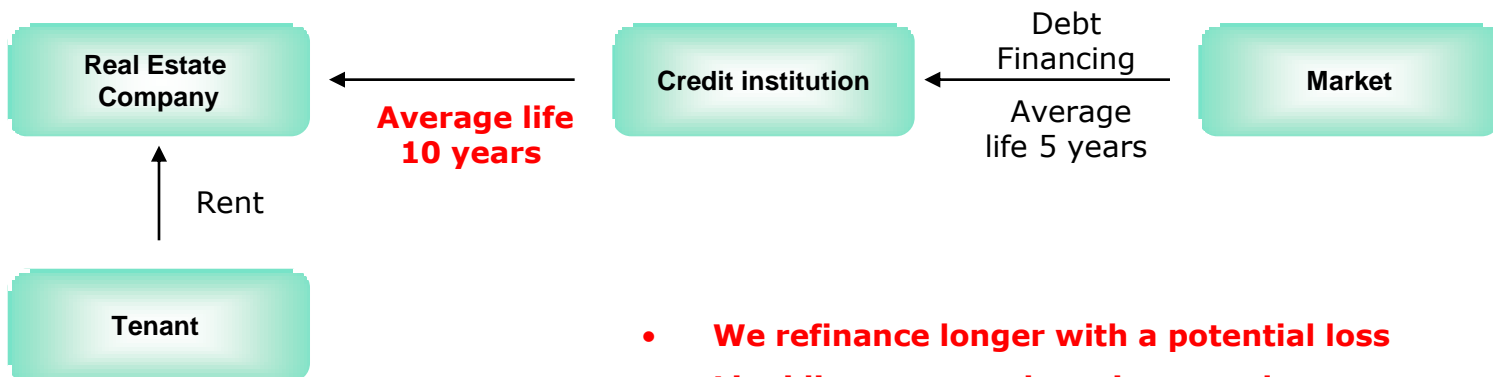
Basics : Credit event (1)

■ Mortgage – Normal situation



■ Mortgage – Stressed situation

- The customer does not pay back anymore
- It could take years to get back the property

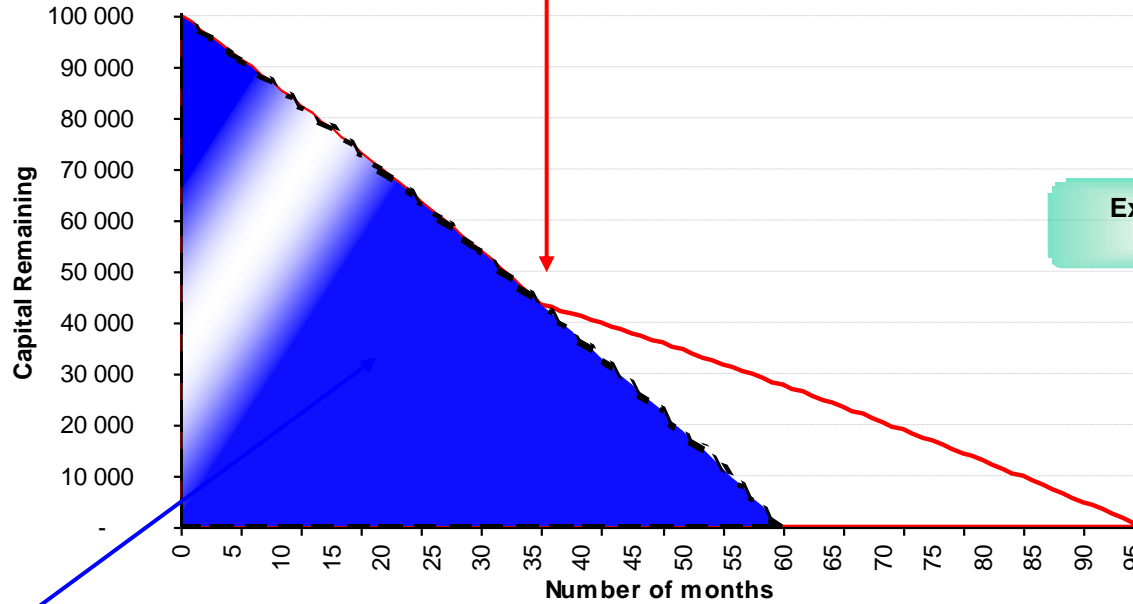


- **We refinance longer with a potential loss**
- **Liquidity cost may have increased**
- **Real estate market may have collapsed (cf Spain)**



Consumer Credit

Because Mr lost his job, Mr&Mrs can't anymore pay back their consumer loan. We They choose a loan restructuring, modifying the instalment



INITIAL REFINANCING PROFILE

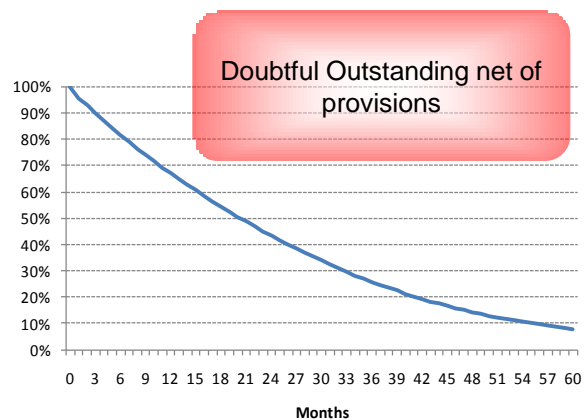
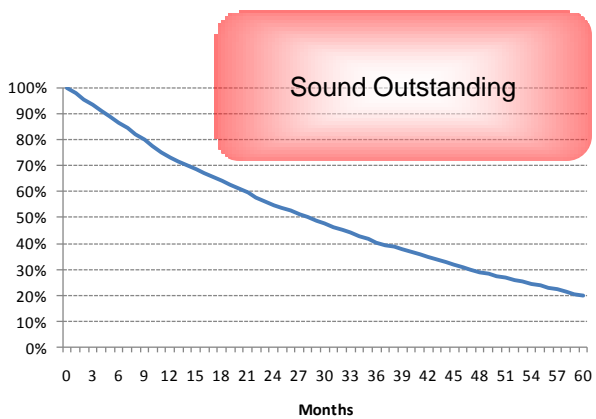
Extra refinancing needed!



- Short introduction to BNP Paribas Personal Finance
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- **Modelling**
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Liquidity / Rate Schedule



Etc

How are we going to schedule sound outstanding?

Just using contractual consideration?

Yes, but a part of sound outstanding will go to litigation

How are we going to schedule doubtful outstanding net of provisions?

Just the way sound outstanding is amortized?

No. You have to take into account a recovery model



Modelling: why? (2)

- **Level 0 – Amortization of (sound outstanding +doubtful outstanding – provisions) at contractual pace**

- **Level 1 – Conventional amortization issued from Risk Management studies**

- **Level 2 – Amortization of sound outstanding at contractual pace + model for doubtful, which takes into account:**
 - Transfer rate from sound outstanding to doubtful outstanding
 - Doubtful loss rate
 - Doubtful recovery rate

- ***Level 3 – Level 2 taking into account stressed situations***

Prerequisites

- Number of files large enough so that risk incidents are significant
- Long enough historical databases
- Method requiring some years of activity: the risk chain has to be stabilized otherwise unrepresentative results will distort reality in the chosen window

Principles

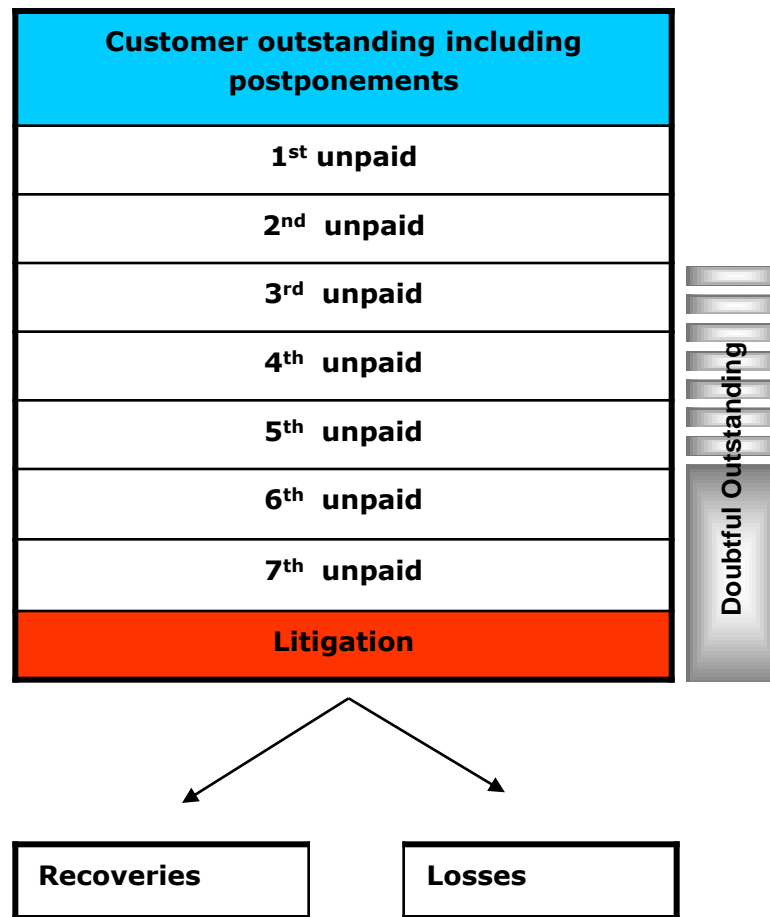
- Based on Markovian theory
- The implied hypothesis is that past behaviour is representative of the future

Enable us to:

- Set up the probability of transfer to litigation by origin of delay
- Set up the recoveries/losses in litigation

■ **Advantages:** statistical approach, results are close to the loss recorded

■ **Drawbacks:** more difficult to implement, requires backtesting and stability tests (the future may be different from the past !)





Modelling: setting up the probability to go to litigation (1)

- **We estimate the transition state probability over a sub period which has to be:**
 - Long enough so that the estimation is stable and has a predictable sense
 - Not too long to avoid giving too much weight to old data

- **We note**
 - $\pi_{Ri \rightarrow lit}$ the probability to go to litigation starting from the state R_i , over the life of the product

 - $p_{Ri \rightarrow lit}$ the probability estimated over the sub period to go to litigation

 - $p_{Ri \rightarrow Rj}$ the probability estimated over the sub period to go from the state R_i to R_j

 - Main assumptions:
 - Markovian behaviour: property that the next state depends only on the current state
 - The probability to go from one state to another does not depend on time (homogeneous chain)
 - The transition probabilities estimated are the same over each sub periods of the product life

 - Let's consider a 3 states example: no late payment(R_0), one late payment(R_1) and litigation (lit)

The credit goes to litigation over the sub period

First unpaid over the sub period, the credit goes to litigation after

The credit remains sound over the sub period and goes to litigation after

$$\pi_{R_0 \rightarrow lit} = p_{R_0 \rightarrow lit} + p_{R_0 \rightarrow R_0} \cdot \pi_{R_0 \rightarrow lit} + p_{R_0 \rightarrow R_1} \cdot \pi_{R_1 \rightarrow lit}$$

In the same way we have:

$$\pi_{R_1 \rightarrow lit} = p_{R_1 \rightarrow lit} + p_{R_1 \rightarrow R_0} \cdot \pi_{R_0 \rightarrow lit} + p_{R_1 \rightarrow R_1} \cdot \pi_{R_1 \rightarrow lit}$$

$$\Rightarrow \begin{pmatrix} \pi_{R_0 \rightarrow lit} \\ \pi_{R_1 \rightarrow lit} \end{pmatrix} = \begin{pmatrix} 1 - p_{R_0 \rightarrow R_0} & -p_{R_0 \rightarrow R_1} \\ -p_{R_1 \rightarrow R_0} & 1 - p_{R_1 \rightarrow R_1} \end{pmatrix}^{-1} \begin{pmatrix} p_{R_0 \rightarrow lit} \\ p_{R_1 \rightarrow lit} \end{pmatrix}$$

Unknown to determine

Estimated over one sub period



Modelling: setting up the probability to go to litigation (3)

- At 2003/31/12, the outstanding of society X is split according to the number of unpaid instalments. We have 7 categories (R0,R1,...,R7). For each categories, we extract the outstanding. Then, we observe these files 3 years later. Files are split according to the same categories and litigation (for litigation, the outstanding corresponds to the effective amount transmitted).

		outstanding 2006								
	déc-03	r0	r1	r2	r3	r4	r5	r6	r7	trans lit.
r0	54 363,39	3 926,81	191,98	118,60	61,60	28,33	25,43	22,85	153,69	939,57
r1	1 824,70	154,80	41,78	2,72	1,63	13,00	1,29	1,58	26,89	152,45
r2	976,60	37,65	0,67	4,48	1,11	0,17	3,18	-	42,89	287,52
r3	146,91	0,01	0,16	0,18	2,78	-	-	-	7,30	57,29
r4	174,65	0,01	-	0,81	0,31	-	-	1,43	6,51	77,81
r5	122,90	2,89	-	0,61	-	-	0,60	-	0,55	54,89
r6	142,18	1,67	-	-	-	-	-	-	-	48,31
r7	844,97	1,45	16,17	1,42	0,35	-	0,39	-	33,20	504,34
	58 596,30	4 125,29	250,76	128,82	67,78	41,50	30,89	25,86	271,03	2 122,18

- Using the previous method, we obtain the transition matrix which gives the probability to go to litigation.

r0	2,29%
r1	10,19%
r2	32,63%
r3	42,96%
r4	47,39%
r5	45,38%
r6	34,00%
r7	62,43%

- **On the basis of past observations of the recoveries made in litigation by generation of transfer to litigation, we calculate**
 - A residual recovery rate on the doubtful outstanding (outstanding that has already been treated in litigation)
 - A recovery rate (1-loss rate) on future transfer to litigation

- **Next step is to calculate for a litigious file the loss probability. We have to focus on historical recovered amounts:**
 - We work generation by generation, a generation being defined as all the files transmitted to litigation within a year

Recovery by generation

Gén°	Year 2000	Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006
Gén 2000	13 069 €	37 828 €	37 253 €	35 340 €	21 461 €	8 361 €	4 276
Gén 2001		41 603 €	68 475 €	61 232 €	47 207 €	27 298 €	10 620
Gén 2002			27 795 €	80 353 €	73 621 €	44 975 €	24 499
Gén 2003				27 003 €	100 939 €	81 462 €	43 114
Gén 2004					67 142 €	148 231 €	99 642
Gén 2005						55 942 €	88 910
Gén 2006							34 947
Total	13 069 €	79 431 €	133 522 €	203 927 €	310 369 €	366 269 €	306 008 €

Litigious outstanding amortization at the end of 2006

Gén°	Transmiss°	Outstanding 06
Gén 2000	228 110 €	9 292 €
Gén 2001	364 910 €	36 046 €
Gén 2002	496 585 €	146 621 €
Gén 2003	584 155 €	226 088 €
Gén 2004	870 725 €	505 071 €
Gén 2005	1 262 594 €	1 079 973 €
Gén 2006	1 434 141 €	1 407 527 €
		3 410 617 €

Modelling: setting up the recoveries/losses in litigation (2)

25.636€ = 5.16% * 496.585

Losses = Litigious Outstanding - Recoveries

Litigious outstanding amortization at the end of 2006

Gén°	Transmiss°	Outstanding 06
Gén 2000	228 110 €	9 292 €
Gén 2001	364 910 €	36 046 €
Gén 2002	496 585 €	146 621 €
Gén 2003	584 155 €	226 088 €
Gén 2004	870 725 €	505 071 €
Gén 2005	1 262 594 €	1 079 973 €
Gén 2006	1 434 141 €	1 407 527 €
Mean / Year 2006		3 410 617 €

Recovery rate seen in 2006 of generation -1, -2, -3 ...

Gén 0	Gén -1	Gén -2	Gén -3	Gén -4	Gén -5	Gén -6	Cumul	Recovery	Losses	L / L+R
							0,00%	0 €	9 292 €	100,00%
						1,87%	1,87%	6 841 €	29 205 €	81,02%
					3,29%	1,87%	5,16%	25 636 €	120 985 €	82,52%
			9,79%	7,27%	3,29%	1,87%	12,44%	72 649 €	153 439 €	67,87%
			9,79%	7,27%	3,29%	1,87%	22,23%	193 544 €	311 527 €	61,68%
		13,40%	9,79%	7,27%	3,29%	1,87%	35,63%	449 896 €	630 077 €	58,34%
	4,86%	13,78%	9,79%	7,27%	3,29%	1,87%	49,41%	708 672 €	698 855 €	49,65%
Year 2006	2,44%	7,04%	11,44%	7,38%	4,93%	2,91%	1,87%			
Year 2005	4,43%	17,02%	13,95%	9,06%	7,48%	3,67%				
Year 2004	7,71%	17,28%	14,83%	12,94%	9,41%					
Year 2003	4,62%	16,18%	16,78%	15,49%						
Year 2002	5,60%	18,76%	16,33%							
Year 2001	11,40%	16,58%								
Year 2000	5,73%									

% I recover in 2005 from generation 2004

49.41% = 13.78%+13.40%+9.79%+7.27%+3.29%+1.87%

1 457 237 €	1 953 379 €	57,27%
-------------	-------------	--------

Loss rate on the litigious outstanding

From the column "Cumul"

Sum of recoveries / transmission

Losses rate on litigious transmission

gén°	Recoveries		
	Observed	Futures	Total
Gén 2004	36,18%	22,23%	58,41%
Gén 2005	11,47%	35,63%	47,11%
Gén 2006	2,44%	49,41%	51,85%
Mean:			52,45%

L/L+R to apply on new transmission : 47,55%

Loss rate (1 - recovery rate) on future transfer to litigation



■ Level 2

■ Step 1: amortization

- Get the outstanding month by month
- Split of the files according the kind of product in order to have homogenous pools in terms of characteristics, amortization, recovery process/efficiency,...
- Calculus of amortization coefficients
 - formula: $1 - \frac{\text{outstanding month } M}{\text{outstanding month } M-1}$

■ Step 2: transfer from non litigious outstanding to litigation

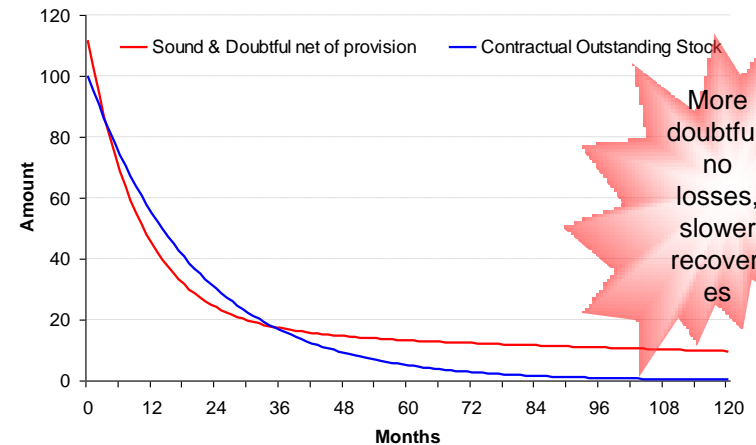
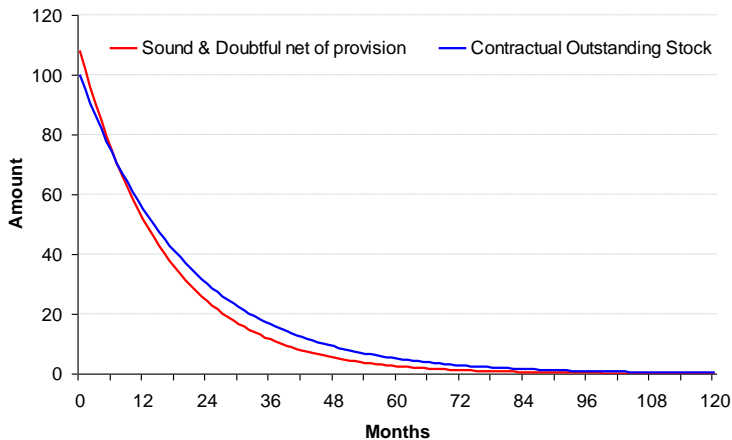
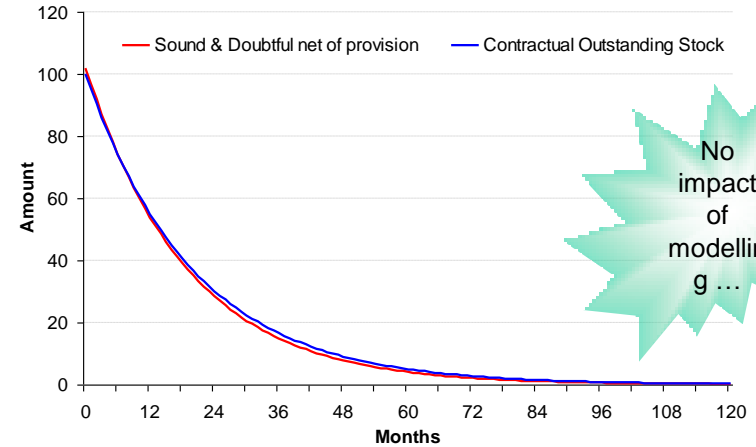
- Method based on monthly average transition matrices observed on the last 12 months
- These matrices are also used for provisioning rates to apply (mean of matrix observed upon 5 years) and for the forecast of unpaid instalments.
- Matrices are built by observing all the outstanding flows from one late payment level to another (including losses in litigation). There are as many matrices as (kind of products)*(subsidiaries)

■ Step 3: by simulating outstanding flows between and among late payment levels, which take into account outstanding amortization phenomenon and by using transition matrix, we can forecast the evolution of the litigious outstanding.



Modelling: Consequences on schedules

- Depending on the model parameters, the final schedule used in gaps will be shorter or longer than the contractual schedule
- Strong dependence upon the recovery & default models
- Consequences on:
 - Gaps
 - Refinancing profile
 - Net sensitivity income





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- **Modelling the evolution of your balance sheet items allows us to catch the future of your outstanding. It allows you to refinance your activity correctly.**

- **Modelling doubtful outstanding is all the more important as**
 - The amount of doubtful is significantly important in your balance sheet
 - Your strategy of refinancing depends partially on this item

- **What if occurs a stressed scenario?**



Appendix: Definitions

- **Cost of risk:** Cost of risk includes movements in provisions for impairment of fixed income securities and loans and receivables due from customers and credit institutions, movements in financing and guarantee commitments given, losses on irrecoverable loans and amounts recovered on loans written off. This caption also includes impairment losses recorded with respect to default risk incurred on counterparties for over-the-counter financial instruments, as well as expenses relating to fraud and to disputes inherent to the financing business.
- **Doubtful loans** are defined as loans where the Bank considers that there is a risk that the borrowers will be unable to honour all or part of their commitments. This is the case for all loans on which one or more instalments are more than three months overdue (six months in the case of real estate loans or loans to local governments), as well as loans for which legal procedures have been launched. When a loan is classified as doubtful, all other loans and commitments to the debtor are automatically assigned the same classification.



■ **Provisioning (according IAS 39 paragraph 63)**

- If there is objective evidence that an impairment loss on loans and receivables or held-to-maturity investments carried at amortized cost has been incurred, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows (excluding future credit losses that have not been incurred) discounted at the financial asset's original effective interest rate (ie the effective interest rate computed at initial recognition). The carrying amount of the asset shall be reduced either directly or through use of an allowance account. The amount of the loss shall be recognized in profit or loss.

■ **Interest income after impairment recognition**

- Once a financial asset or group of similar financial assets has been written down as a result of an impairment loss, interest income is thereafter recognized using the rate of interest used to discount the future cash flows for the purpose of measuring the impairment loss.