

01/07/2016

The new standard for
Interest Rate Risk in the Banking
Book defined by the
Basel Committee on Banking
Supervision:
Finally, ALM makes its revolution.



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Table of content

Summary	3
Presentation of the new regulation	4
A dual approach starting December 31 st 2017	4
9 key principles for banks	4
Principle 1: IRRBB is an important risk for all banks that must be specifically identified, measured, monitored and controlled. In addition, banks should monitor and assess CSRBB.....	4
Principle 2: the governing body of each bank is responsible for oversight of the IRRBB management framework... Banks must have an adequate IRRBB management framework, involving regular independent reviews and evaluations of the effectiveness of the system.....	5
Principle 3: The bank’s risk appetite for IRRBB should be articulated in terms of the risk to both economic value and earnings.....	5
Principle 4: measurement of IRRBB should be based on outcomes of both economic value and earnings-based measures, arising from a wide and appropriate range of IR shock and stress scenario.....	6
Principle 5: in measuring IRRBB, key behavioral and modeling assumptions should be fully understood, conceptually sound and documented. Such assumptions should be rigorously tested and aligned with the bank’s business strategies.....	7
Principle 6: measurement systems and models used for IRRBB should be based on accurate data, and subject to appropriate documentation, testing and controls to give assurance on the accuracy of calculations.....	7
Principle 7: Measurement outcomes of IRRBB and hedging strategies should be reported to the governing body or to its delegates on a regular basis, at relevant levels of aggregation	8
Principle 8: information on the level of IRRBB exposure and practices for measuring and controlling IRRBB must be disclosed to the public on a regular basis.	8
Principle 9: Capital adequacy for IRRBB must be specifically considered as part of the ICAAP	8
3 principles for supervisors.....	8
The standardized framework.....	9
Variation of the Economic Value of Equity: ΔEVE	9
Variation of NIM.....	10
Some general comments	11
IRRBB is still part of pillar 2.....	11

IRRBB is finally acknowledged as a major risk in banking.....	11
Components of interest rates.....	12
Improving the standardized framework.....	12
The variation of economic value is still neither an indicator of the sensitivity of the incomes statement to an IR variation nor of the variation of value of the bank.....	14
Duration convention on NMD still conducts to underestimate the IRRBB in most commercial banks.	14
The regulatory approach to Economic Value is not considering the risk of the bank in going concern but the opposite risk of the regulator in case of liquidation.	15
Conceptually, value of NMD is intrinsically linked to the market value of a bank	15
Conclusion.....	17
About ALM-VISION.....	19
Disclaimer.....	19

Summary

The Basel Committee released in April 2016 its new directive d368 *Interest Rate Risk in the Banking Book* (“IRRBB”). This directive finally replaces the former text of July 2004¹ which was no more adapted from a methodological point of view but which was rich in recommendations and already included the fundamental principles to follow for managing interest rate risk² in the banking book. Indeed, the new text does not appear as a break away from but rather as a continuation on an area that was neglected during the crisis. Where the text is revolutionary is that the regulator moved significantly away from a position of general but often vague principles to a much more demanding quality of management and modeling of IRRBB.

Indeed, this text appears fundamental and raises the bar at the highest technical level, requiring banks to improve their methodologies, their expertise and to review their setup in a very short period of time.

It also reassesses the responsibility of the management, a repeating leitmotiv since the crisis which should lead inevitably to the granting of licensing for executive officers of banks in the EU (and their removal in case of resolution).

The text is complex, dense and still includes some grey areas. It is based on the latest improvements made in ALM, it requires to value almost “marked to model” the full balance sheet and it definitely deserves comments.

For ALM-VISION, it is the translation into the regulation of most of the concepts that we introduced five years ago.

¹ BCBS 108, July 2004, “Principles for the management and supervision of interest rate risk”

² The text inspired both the creation of ALM-Solutions® software and a significant part of Serge Moulin’s book “*Modélisation de la gestion financière d’une banque commerciale*”, 2012, forthcoming 2016 english translation “*Modeling the financial management of a commercial bank*”.

Presentation of the new regulation

A dual approach starting December 31st 2017

The first calculation on the new standard will have to be produced with the figures of December 31st 2017.

It shall apply to all internationally active banks and very likely, national regulators will require the same methodology to be adopted by smaller institutions.

The IRRBB risk is divided into three components:

1. Gap risk which describe the impact of mismatch in term of IR duration of assets and liabilities.
2. Basis risk which describes the risk of mismatch between IR indexes.
3. Options risk which can be automatic and behavioral.

To these three risks is added the credit spread risk in the banking book (CSRBB) between assets and liabilities (this last risk actually killed Dexia): the CSRBB component is a new fundamental addition to the regulation.

The regulator finally acknowledges that two measures of risks must be made:

1. The so called “economic value” variation measure: this “static balance sheet” methodology is privileged by regulators since it avoids having to make assumptions on future production (volumes and margin) and corresponds to its concern, which is having to step in, take over the management of an institution and put it in run off.
2. The earnings-based measures, which is used by institutions as this is the only way to answer the key question: what is the impact on my earnings of the following economic scenario?

It is interesting to note that for the first time, the regulator acknowledges that the static economic value methodology “could run the risk of earnings volatility”. This is a great progress for a methodology which has serious fundamental limitations (see below) but was still recently considered as unchallengeable. The chosen dual approach seems indeed extremely reasonable:

- The first calculation appears as a conventional ratio to respect, its goal being to translate as accurately as possible a variation of economic value of a balance sheet, the equivalent of the “Value In Force” insurance notion, should the bank stop its activities, be put in run off under certain assumptions.
- The second calculation provides the real sensitivity of the incomes statement to an economic scenario.

The text is made of two parts: a definition and methodology of calculation of IRRBB risk and a set of operational requirements, the principles, in term of organization of ALM.

9 key principles for banks

Principle 1: IRRBB is an important risk for all banks that must be specifically identified, measured, monitored and controlled. In addition, banks should monitor and assess CSRBB.

If this principle appears as common sense, it is the first time that the regulation requires a real global approach in term of modeling of the balance sheet, one that is thorough and consistent.

The regulator also emphasizes the fact that since modeling a balance sheet is a heavy task, this should be made also for “business planning and budgeting activities”. This is very important in order to get a rational and homogeneous approach of the financial management of the balance sheet: a good modeling allows to produce and modify budgets quickly, to plan its strategy over the next years, to understand its liquidity risk and its IRRBB.

The text integrates the IRRBB into the complete chain of processes of the bank and requires it to perform a full ALM analysis before entering into a new product or activity.

Finally, commercial margin and spread risk (CSRBB) must be monitored (that is building historical data and analyzing it).

Principle 2: the governing body of each bank is responsible for oversight of the IRRBB management framework... Banks must have an adequate IRRBB management framework, involving regular independent reviews and evaluations of the effectiveness of the system.

This second principle is in the continuation of the Basel III strategy of making the board and top management accountable. This obvious and positive reaction to the abuses of the financial crisis where no management was really threatened for wrong-doing is yet to be fully implemented. If some regulators begin to refuse accrediting as fit and proper for top positions some candidates, who, despite their obvious political qualities, are clearly not experienced or technically equipped to assume their responsibilities, the broad majority of regulators still simply register the decisions of the banks. It is our opinion that this principle shall be translated into formal licenses with formal check on expertise and experience. And with the automatic and systematic removal of the license in case of involvement in a serious issue³.

The second significant evolution of the regulation is that it now requires regular independent reviews and evaluations of the effectiveness of the system: the regulator leaves the banks to choose if this must be made by the internal control or a specialized external entity (§27). It is our opinion that the matter is so technical that only specialized independent external firms could provide board and top management with an effective independent review⁴ and that it would be wise for the institution to benchmark and challenge their teams on a regular basis or in case of significant change.

The regulator insists again (as in the previous text) to get “comprehensive IRRBB reporting and review”, that is “no black box”.

The rest of the principle expands to the IRRBB, the good practices of documentation, defined limits, segregation of duties, independence between the actors involved and adequate systems and control...

It requires a (at least) semiannual information to the board on the IRRBB exposure with complete and comprehensive documentation. It also requires some members of the board to be fit and proper to understand this information and to engage into a dialogue with the specialists involved (which means that some boards will have to be trained or reinforced).

Principle 3: The bank’s risk appetite for IRRBB should be articulated in terms of the risk to both economic value and earnings...

Policy limits must be applied on a consolidated basis and individually or per book depending on the complexity of the activity.

Limits must be enforced. Situations that are over the limit must be escalated.

³ We are aware of two recent examples of this toughening of the behavior of regulators: one in Europe refused to accredit someone obviously not technically qualified as fit and proper for the position of CRO. The other example is in Russia where the central bank, after taking over a financial institution during the recent crisis, removed all the licenses of the top management without entering into the exercise of asserting each individual involvement in the collapse of the entity. We consider this firmness as the only way for the regulators of having efficient whistleblowing and accountable management.

⁴ We have been involved in several emergency reviews recently where internal audit did not raise the fundamental issue, just focusing on the formalizing of the ALM policy because they did not have the adequate experience, expertise and independence.

The hedging strategy must be modeled MtM, formally analyzed and validated: this point is made in order to avoid a Dexia-like situation where the hedging book itself becomes part of the issue, one of the major dangers of micro-hedging (including margin call financing).

Stress scenarios used to define limits must take into account historical data, observed volatility and time required by the management to mitigate exposure: this requirement means that institutions must have a real scientific approach to the generation of their stress scenarios. It is in the spirit of the Basel III recommendation to consider any type of possible scenario, “even the most unlikely”.

Principle 4: measurement of IRRBB should be based on outcomes of both economic value and earnings-based measures, arising from a wide and appropriate range of IR shock and stress scenario.

The regulator put officially the two methodologies, equity economic value variation and earnings variation, at the same level as “complementary”⁵.

If variation of the economic value of equity does give an indication of the change in value of the balance sheet under certain assumptions of sensitivity for no maturity assets, it however does not capture the real sensitivity of the value of the bank to IR shocks since new production is not taken into account.

Inversely, earnings sensitivity is more accurately estimated short-term but as it is done in ALM-Solutions, serious modeling must always be longer term⁶ even though accuracy decreases in time. It allows indeed to capture through a dividend discount model the global impact of the economic scenario on the value of the bank. This point is developed below since it is key to understanding the limits of the new rule on such a complex subject.

However, since the regulator requires both approaches and gives the possibility to the local regulator to expand the duration of the earnings simulation (the average duration of a balance sheet is around 5 years), there is no obvious loophole in the regulation⁷ anymore.

The last interesting point to notice in this principle is that the regulator uses officially for the first time the concept of roll -“assume rollover”-, a notion that ALM-solutions was one of the first to introduce in Europe at a time where both regulators and most professionals refused to try to model the incomes statement globally: this is a fundamental improvement after years of useless debates about NIM (Net Interest Margin) modeling.

The regulator also clarifies in this fourth principle the fundamental difference between the two approaches:

- The economic value measures must provide an estimate of the instantaneous variation of value of the book of the bank (both assets and liabilities) in case it has to be liquidated. Strangely, the regulator did not push the logic further by simply considering NMD (No Maturity Deposit) as cash (that would very likely be the reality).
- The earning variation is the indicator useful for management to appreciate its exposure to IR on a going concern basis.

Both risks are normally opposite! (c.f. below). Notice that the regulator provides an explicit warning on the strategy of only hedging the economic value: “the Committee acknowledges the importance of managing IRRBB through both economic value and earnings-based measures. If a bank solely minimizes its economic value risk by

⁵ We disagree with §34 under which economic value variation would price the change in value of the balance sheet whereas earnings analysis should be only short-term. Earnings analysis in our view should be longer term as the text mentions in the next lines.

⁶ We usually recommend about 5 years with a minimum of 3 years, figures that figure also in the text.

⁷ Reminder that “static view + roll including of no maturity items roll = dynamic view”, c.f. “*Modeling the financial management of a commercial bank*”, forthcoming 2016, chapter “static or dynamic gaps”

matching the repricing of its assets with liabilities beyond the short term, it could run the risk of earnings volatility". So the correct strategy is to minimize the variation of NIM the first years under the constraint of respecting the maximum EVE variation on stock allowed by the regulator.

Principle 4 requires to have a system in place that allows to run both analyses on multiple scenarios, not only on the 6 prescribed IR shocks. As we mentioned previously, defining a scenario becomes a complete exercise in ALM and regulation is requiring to get a formal process in place or to follow one provided by a specialized entity.

More surprisingly, "banks should assess the possible interaction of IRRBB with its related risks, as well as other risks (eg credit risk, liquidity risk)" (page 9. 41): modeling needs to be global and scenario must integrate cross effects: IR down, spread and LGD up for example or inflation up, LGD and spread stable, IR up and currency down...

Indeed, modeling must also integrate spread risks.

Finally, the regulator requires qualitative and quantitative reverse stress testing and back testing of its modeling.

Principle 5: in measuring IRRBB, key behavioral and modeling assumptions should be fully understood, conceptually sound and documented. Such assumptions should be rigorously tested and aligned with the bank's business strategies.

This principle first reassesses the former request by the regulator of "no black box". But it is much more demanding in term of methodology:

- prepayment modeling must be rigorous, both on loans and deposits with estimates to be done per scenario and exogenous variables to be integrated as much as possible.
- No Maturity Deposits "NMD" must also be analyzed accurately including in term of liquidity per scenario.
- Analysis must be made per currency as well as globally, integrating the correlation between IR, FX and other variables: this is a major change.
- Cap, floor, swaptions and other automatic options must be integrated in an exact way (many banks were still using pseudo-matrix of delta).

Assumptions and models must be constantly reviewed and challenged.

Principle 6: measurement systems and models used for IRRBB should be based on accurate data, and subject to appropriate documentation, testing and controls to give assurance on the accuracy of calculations...

This principle mentions implicitly that perfect accounting reconciliation is not required. This is important since it is useless and extremely expensive and time consuming. Indeed, the text makes it clear that input must be "accurate", automated as much as possible (the regulator implicitly acknowledges that some treatment will have to remain manual) and should capture "the major sources of IRRBB exposure". "The Management Information System should capture IR risk data on all the bank's *material* IRRBB exposures". The regulator validates that the goal is not to get reconciled at one euro with the books and records (an argument of the vendors of massive system to justify their high prices) but to have a good estimate of the major risks.

What is interesting is that the regulation really focuses on the modeling rather than on the tool. This was a leitmotiv in our vision of ALM: the most important asset is the ALM manager, his work, his capacity in analyzing and modeling. The system remains only a tool, designed to help him to think more freely, to focus on what is adding value: the models themselves. In the text, the regulator makes it very clear that it is only concerned by the modeling and results, not the system (which needs to work!).

Logically, a system must be flexible enough to allow for quick changes in assumption: this implicitly means that banks must get an adapted system. The system must allow for static as well as dynamic analysis and must be capable of adapting to new regulatory requirements⁸.

The regulator adds a recommendation (point 53): “banks should not rely on a single measure of risk, given that risk management systems [notice the plural] tend to vary...”. This implies the requirement to have different methodologies of risk quantification but also implicitly, it implies to get at least a separate system for the ALM team and the ALM risk control team (even though both use the same data). Having the same system for both teams increases the risk of missing a component of the IRRBB even though it ultimately simplifies the work of the Risk Control Team.

In terms of the governance process of the models, the regulator requires the same quality than for other risk measurement processes making of ALM a full position in the bank with the classical triptych: financial management manages ALM, risk department measures and control the limits, and internal audit reviews that the process is respected. Executive management supervises and validates by delegation of the board, and in the end the board is the final decision maker.

Notice that “IRRBB models might include those developed by third-party vendors”. This is the first text where the role of the external expert is mentioned so fundamentally.

Principle 7: Measurement outcomes of IRRBB and hedging strategies should be reported to the governing body or to its delegates on a regular basis, at relevant levels of aggregation

This principle is the translation of one of the Basel committee’s key finding following the crisis: boards and executive management must be accountable. They must meet their responsibilities and can’t find excuse for not being informed of their risks. This very positive and good commune sense approach is now a repeated leitmotiv of regulators since the crisis. It should lead inevitably to the granting of licensing for executive officers of banks in the EU (and their removal in case of resolution). It is our opinion that these licenses or registrations should be expanded to some key risk functions, ALM risk supervisor being one of them.

Principle 8: information on the level of IRRBB exposure and practices for measuring and controlling IRRBB must be disclosed to the public on a regular basis.

This principle is the logical extension of the previous one and a way for the regulator to hold boards and executive management accountable: in case of a problem, a lawsuit from shareholders becomes very likely.

Banks shall disclose both Δ EVE and 12-months Δ NII with high accuracy both in term of quantitative figures (table B, see p.17 of d368) and methodology (table A, see p.16 of d368).

Principle 9: Capital adequacy for IRRBB must be specifically considered as part of the ICAAP

“Banks are responsible for evaluating the level of capital that they should hold”: the responsibility is on the board and executive management first, not the regulator. For that, they should not rely only on supervisory assessments (point 73): this is a key point since some banks have a tendency to just calculate ratios because they have to, without actually understanding the function of these ratios. On the contrary, banks should perform a full exercise of appreciating the adequate level of risk and capital they consider adapted to their business⁹.

3 principles for supervisors

- Principle 10: supervisors must monitor the overall exposure of the market and compare banks.

⁸ To our dear customers accusing us of having sponsored the new regulation, we deny firmly this assertion even though we acknowledge that we could not have done better... :-)

⁹ Notice point 74, the typo “IRBBB”... The Basel Committee itself starts to get lost into its numerous acronyms!

- Principle 11: regulators should review on a regular basis IRRBB and for that, they should employ specialist resources.
- Principle 12: supervisors must publish their criteria for identifying outlier banks... When a review reveals inadequate management or excessive risk, supervisors must require mitigation actions and/or additional capital.

The standardized framework

The framework is not mandatory and banks can do better! This is just a minimum in term of methodology.

Two calculations must be performed.

Variation of the Economic Value of Equity: Δ EVE

The methodology remains based on the previous static gap approach.

- Automatic embedded options are ignored for the estimation of gaps.
- Common Equity Tier 1, fixed assets, intangible assets and equity exposures are considered as perpetual, never amortizing.
- All other assets and liabilities or equivalent off-balance sheet assets are split between 19 time buckets depending on their amortizing or repricing date.
- Coupons and spreads above variable rates have to be included (point 102) but rather (point 103) banks can choose to exclude spreads and deduct commercial margin on fixed rates loans.
- No Maturity Deposits “NMD” are split between retail transactional, retail non-transactional and wholesale. The conventional amortizing profile is free with limits in term of overnight and average duration (cap at 5, 4.5 and 4 years).
- CPR must be included with a cap at 100%. They shall vary per scenario. Interest and notional CF must take into account prepayments. They apply to both assets and liabilities (term deposits).

EVE is calculated per scenario and per currency representing more than 5% of the banking book assets or liabilities as follow:

- The discount factor is exponential¹⁰. The rate is not defined and can include a spread, but this shall have a low impact in variation since this spread shall be constant per scenario.
- The time buckets are considered at their mid-point (not weighted which is another simplification) or at their maturity point (which may generate wrong effects in case of curve in backwardation for example).
- The actualized value of the cash flows is then calculated per currency and per scenario.
- There is one reference scenario which is the current rate curve, that is without taking into account the forward (another weakness) and 6 stressed scenarios:
 - 2 translations: Parallel up and down
 - A steepener and a flattener
 - 1 scenario short rates up and one short rates down

¹⁰ The choice of the “continuous” exponential discount factor is not justified. We believe that the national regulator will not make an issue of banks using classical actuarial interest rates. This is an example of undue technicality in regulation.

Automatic IR options are calculated MtM per scenario, with an increase in volatility of 25% in the stressed scenarios¹¹. The perimeter is global, even though there may be some flexibility for non micro-hedging derivatives (point 131).

EVE by currency is equal to the sum of the actualized CF (in the currency) and MtM of options:

$$EVE_{currency} = \sum DF_t \cdot CF_t + MTM_{options}$$

The variation of EVE by currency is equal to the difference between the EVE of the base scenario and the EVE in one of the six scenarios:

$$\Delta EVE_{scenario\ i, currency} = EVE_{scenario\ base, currency} - EVE_{scenario\ i, currency}$$

The standardized EVE risk measure is equal to the worst variation taking into account only the currencies for which the variation is negative:

$$\text{Standardized EVE risk measure}^{12} = \max_{i \in \{1, 2, \dots, 6\}} \left(\sum_{c \text{ such as } \Delta EVE_c \geq 0} fx_c \cdot \Delta EVE_c \right)$$

So there is no compensation between net long and short positions between two currencies.

The different scenarios are summarized in the following table, knowing that:

- The base scenario is the current IR curve,
- Regulators can set up IR floor at 0 or below
- Shock shall be reviewed every 5 years. They are currently calculated as a weighted average of past observations from 2000 to 2015 with a floor at 100 bps and cap at 500 bps for short term, 400 bps for parallel and 300 bp for long-term.

Scenario (t in year)	Parallel up	Parallel down	steepener	flattener	Short rate up	Short rate down
Parameter ρ €	+2%	-2%	$\rho_{Short} - 2.5\% / \rho_{Long} + 1\%$	$\rho_{Short} + 2.5\% / \rho_{Long} - 1\%$	$\rho_{Short} + 2.5\%$	$\rho_{Short} - 2.5\%$
$\Delta r(t)$ formula	+ ρ		$0,65 \cdot \rho_{short} \cdot e^{-t/4} + 0,9 \cdot \rho_{long} \cdot (1 - e^{-t/4})$		+ $\rho_{short} \cdot e^{-t/4}$	
$\Delta r(t)$ for €	+2%	-2%	$-0,65 \cdot 2,5\% \cdot e^{-t/4} + 0,9 \cdot 1\% \cdot (1 - e^{-t/4})$	$0,65 \cdot 2,5\% \cdot e^{-t/4} - 0,9 \cdot 1\% \cdot (1 - e^{-t/4})$	$+2,5\% \cdot e^{-t/4}$	$-2,5\% \cdot e^{-t/4}$
CPR assets	Min(1, $\gamma_{scenario} \cdot CPR_{portfolio}$)					
γ_{assets}	0.8	1.2	0.8	1.2	0.8	1.2
$\gamma_{deposits}$	1.2	0.8	0.8	1.2	1.2	0.8

Variation of NIM

The regulator doesn't set up a limit in term of duration of modeling and just requires to disclose the effect on the first 12 months (even though it recommends to do calculation over 3 years), that is a small part of the issue since balance sheet on average requires about 5 years to get renewed. It requests also to perform only the two translation scenarios under the assumption of a constant balance sheet ("roll at 100%"). This is clearly insufficient since impacts are most visible with moves above 200 bp and CPR clearly higher than 120% of the original ones during the wave of prepayments. Finally, notice the concern of the regulator that "earnings based measure do not necessarily identify the risks to capital that can arise from revaluation of AFS portfolio" (since AFS moves

¹¹ Page 29-130.1 the rule requires to deduct the premium received, which means that banks need to keep the data or reverse engineer it. However, since this should be a constant and we focus on the variation of value, we do not understand why the text includes it...

¹² The formula in the Basel document is unnecessarily complex including the maximum between 0 and positive numbers. It has been simplified. We added an FX rate because without it, it would make no sense.



don't impact NIM but OCI): this is the reason why we always recommend to model the full balance sheet and incomes statement.

Some general comments

IRRBB is still part of pillar 2

The regulator hesitated to impose a pillar 1 ratio and gave up for technical reasons, considering situations were not homogeneous enough. It also did not want to add an undue additional capital requirement in the current environment except for establishments clearly significantly exposed to an interest rate risk. The question this assertion raises is if IRRBB shall stay in pillar 2 or if, in a second step, the regulator shall move it into pillar 1.

Actually, the regulatory IRRBB calculation requirement is de facto similar to a pillar 1 approach, with a ratio to respect, a standard methodology and an advanced approach. In time, banks will adapt and the first argument against pillar 1 shall vanish.

Indeed, imposing a capital requirement in front of this risk below the current threshold would be simple. However, as of today, few banks were hit by direct IR mismanagement in such a way that they collapsed totally, out of the Savings and Loans crisis¹³. But many were hit in significant ways, even though the losses remained often confidential. In addition, the current environment is a real concern. With most of their assets insensitive to IR (the current accounts and in a certain way some savings accounts), commercial banks shall see their Net Interest Margin ("NIM") under massive pressure, should the current negative rates environment last. They shall react by expanding their balance sheet but, with the quantitative easing and the lack of growth pushing the spreads down, with liquidity being so cheap, balance sheets will weaken and one can expect some "accidents".

What we anticipate is rather a two-step approach: with this text, the regulator requires banks to put in place the adequate modeling systems. In a second step, it shall imagine other scenarios, than the 6 ones mentioned, more directly related to our current environment. And while remaining in pillar 2, it may require additional actions to mitigate risk. By doing so, regulators will simply stick to the recommendations of the Basel committee. Indeed, the text explicitly states that regulators have broad freedom to (1) expand the regulation to smaller banks and (2) define additional parameters to identify "outlier banks", that is banks with excessive interest rates exposure.

Banks have indeed nowadays no choice than to restructure and reduce their cost. In parallel, they must improve technology and expertise to set up lighter financial teams that are technically stronger.

IRRBB is finally acknowledged as a major risk in banking

Bankers believed before the crisis that only market risk and credit risk could push down their houses. With the crisis, they discovered that liquidity risk was as well deadly: Dexia was refunding more than 40% of its very long-term assets at less than 3 months, Bear Stearns¹⁴ and Lehman were also too short of liquidity...

With the negative IR, they are actually discovering long-term damage of the IRRBB. But already in the past, many institutions were hit by IRRBB: the savings and loans crisis is the quintessential example of the collapse of a group

¹³ The S&L were refunding short-term long-term loans. When the Reagan administration freed IR, short-term rates soared and the S&L embarked into a strategy of expansion of their balance sheet to generate new revenues through the acquisition of junk bonds.

¹⁴ Bear was long subprime when it collapsed. The trigger was its \$30bn stock of Freddie Mac and Fannie Mae bonds. As one of the top market maker on this \$5 trillion market, the size of the stock was not huge. However, when market value when down by 10%, the NAV of the bank fell to zero. Its refunding was too short. Two key hedge funds decided to transfer their assets in custody, around \$20bn, which was enough to generate a default of payment.

of banks which were refunding long term assets at short term rates¹⁵. Other examples of IRRBB losses are less known but are as consistent and damaging¹⁶.

The regulator finally acknowledges the interest rate risk structural to the banking activity as “excessive IRRBB can pose a significant threat to bank’s current capital base and/or future earnings if not managed appropriately” (page 3 §8).

Components of interest rates

The annex includes a decomposition of client rate in 5 components:

1. Risk free rate on the maturity
2. A market duration spread defined as part of the additional spread relating to duration only. Practically, this is challenging to calculate.
3. A market liquidity spread which is supposed to correct for the difference in balance between buyers and sellers of the specific duration (a distortion on the RFR!).
4. A general market credit spread: that is the part of the spread charged for the market credit risk (not liquidity nor balance between buyers and sellers but including a risk margin)
5. The idiosyncratic credit spread which includes also a risk margin.

The text considers these components as “more readily identifiable in traded instruments”. Even on a liquid market, this sounds challenging to quantify and rather theoretical. However, the analysis of the different factors is relevant and introduces the notion of internal rate of cession (IRC) implicitly in the ALM approach.

It also expresses the importance of credit spread risk in the banking book (CSRBB) which “needs to be monitored and assess”¹⁷.

Improving the standardized framework.

The standardized framework does not appear as a heavy simplification versus more sophisticated modeling. It captures already almost all the IRRBB. A higher sophistication should not bring much more but would probably clarify the process. Actually, what else could have a more accurate framework?

- Smaller steps: the 19 times bucket are a false simplification since banks will still have to gather data. Smaller buckets make more sense because in ALM the most expensive work is data collection. Using small steps shall allow banks to use this data not only for ALM but also for budget, business plan and capital planning. We have always recommended monthly steps because smaller steps (daily) would not bring any additional useful accuracy for a risk developing progressively. Still monthly steps will allow avoiding estimations of average buckets for not a very expensive additional data treatment.
- Automatic embedded options (loans with caps, floors...) should be integrated for their intrinsic value into the NIM calculation even for Δ EVE. It would provide a more accurate view. The time value variation can then be calculated separately as it is done in solvency 2.

¹⁵ When the Reagan administration free the short term rates and subsequently these ones jumped, they had no choice than to embark into a strategy of expansion of their balance sheet in order to compensate the collapsing of their NIM: the savings and loans didn’t have the commercial opportunity to do so, so they bought junk bonds until these ones collapsed.

¹⁶ Most files remained confidential but losses have been regularly massive. The last public ALM error concerned the \$6.2 billion losses of the JPM London office. However, the loss was not related to an IR move but rather regarded a macro-position on CDS.

¹⁷ The regulator emphasizes the complexity of the evolution of the credit spread. Cf “pricing of bonds with risk premium, market value versus economic value”, ALM-Vision, March 2016.

- The cap on CPR at 100% is not a drama for the current defined scenarios. However, last IR move (2015) resulted in CPR above 100% for one month for some portfolio of our customers (keep in mind that CPR is annualized, a CPR at 120% over one month means that 10% of the portfolio was renegotiated).
- The use of the forward curve as base scenario would give a more accurate estimate of the future NIM.
- The regulation does not go beyond the NIM¹⁸ whereas the 2005 text clearly included commissions as IR sensitive. Answering the key question of the top management “what shall be the impact of this scenario on my incomes and capital” requires to integrate the AFS and MtM effects linked to the IR also. This is all the more important that the LCR pushed banks to build up big portfolios of liquidity, often put in AFS. Obviously integrating AFS impact in earnings-based approach has always been a necessity¹⁹.
- Treasury on the net position for the EVE isn’t taken into account whereas coupons and spreads are to be included. This is obviously a strong assumption assuming that treasury shall be always available at the actualization curve price.
- A bond with a coupon at CMS 5 Years resetting every 3 months is considered as a three months maximum fixed rate bond. That is assuming that CMS 5 Years indexed bonds are valued at par at each time of reset. This is obviously an approximation²⁰, most of the time acceptable but not always. Only bonds with coupons equal to the forward rate of the concerned period of reset calculated using the same actualization curve are equal to par at each reset date.

A more fundamental disappointment in this regulation is that the regulator still sticks with the static gap methodology with its net position per time bucket. It would have been much easier to request a simulation of the variation of market value of the balance sheet under the 6 scenarios’ assumptions of run-off. The result would have been more accurate, integrating treasury effects, easier to understand, easier to explain for the same amount of work required. Indeed, it is more complicated for an institution to implement the rules of truncation for variable rates bonds, with separation of the spread than to simply reprice them. And results would be better. Notice that institutions are allowed to do so but obviously, they may feel less confident in front of their regulator.

Indeed, if one considers the value of a set of cash flows to be their actualized sum. The new static gap methodology requires to sum the CF per period and then actualize them whereas a “Marked to model” methodology would require to actualize the CF of a line and then sum them, which is absolutely identical!

$$\underbrace{\sum_t \beta_t \cdot \left[\sum_{lines} CF_{line}(t) \right]}_{\text{static gap methodology}} = \underbrace{\sum_{lines} \left[\sum_t \beta_t \cdot CF_{line}(t) \right]}_{\text{marked to model methodology}}$$

This fact is even more obvious that the text requires to price the options too. It only stops short requiring to price the very complex prepayment options²¹.

Notice that it would be easier for a bank starting from scratch its ALM system to simply re-price MtM the derivatives (swaps) instead of having to integrate them into the gap methodology. Still, most banks had already in place some kind of static gap analysis and the regulator tried to simply expand the previous methodology to

¹⁸ Even though page 37 it mentions “the impact of any fees collected/paid for exercise of options”.

¹⁹ Indeed the assertion page 43 saying that “last but not least, earnings-based measures do not necessarily identify the risks to capital that can arise from revaluation of AFS portfolios” is the denunciation of a weakness we have observed in main banks.

²⁰ CMS bonds even include a convexity effect and so a sensitivity to volatility.

²¹ Cf “modeling and pricing prepayments: a market approach”, ALM-Vision papers, June 2016

its new requirement. This raises the strategic question for a bank of adapting its current systems or simply redoing one new.

The variation of economic value is still neither an indicator of the sensitivity of the incomes statement to an IR variation nor of the variation of value of the bank.

The motivation of the regulator to stick on the static methodology is well known:

1. It is an approach matching its concern: if an institution is in difficulty and the regulator has to step in and take control of the institution in order to wind down the assets and liabilities, it wants to avoid a major loss. Under this hypothesis, there shall be no significant new activity and it is logical for the regulator to focus on the existing balance sheet only, making sure its variation of value remain reasonable.
2. The new production modeling raises more uncertainty in term of volume and prices and regulators don't want to enter into endless discussion²² with managements about what they may achieve commercially tomorrow.
3. The static approach seems to better match the new fashion of the so-called "marked to market". This trend is still very strong despite the numerous articles criticizing its assumptions (absence of arbitrage opportunities, liquidity, short selling...) or describing the disappearing of the market during the crisis.

Still it faces several weaknesses.

Duration convention on NMD still conducts to underestimate the IRRBB in most commercial banks.

The first weakness is obviously on the conventions on assets without defined maturity, mainly the current accounts and savings accounts. Assuming an "interest rate amortizing convention" for current accounts is equivalent to defining a sensitivity of current accounts to the interest rates.

The regulator provides a cap on Non Maturity Deposits ("NMD"). Its goal is to get a homogeneous methodology between banks, which is legitimate. However, this methodology under-estimate the exposure to IR and inversely over-estimate the impact of an IR shock on the liquidation value of the stock in the balance sheet of the bank (we will call it Value In Force –VIF- by analogy with insurance business).

Let take the classical simple example of a bank with 100 of NMD funding an annual production of 20 of bullet loans with 5 years²³ of initial duration. At equilibrium, the bank has 100 as stable assets²⁴ with an average duration of 2.51 years (at 5% flat interest rate).

- If the bank assumes a linear amortizing over 5 years of its NMD, it has no gap and subsequently no EVE exposure (out of the spread) to IR,
- If the bank assumes a linear amortizing over less than 5 years of its NMD, it is in risk in case of increase of the interest rates in term of NIM. In term of EVE, it is at risk in case of decrease of interest rates (but the result is an underestimation).

²² This point is expressly written in footnote 9 page 8.

²³ This example seems very simple but actually it is a good rough simplification of the position of most retail banks, if you add in addition some short-term deposits.

²⁴ 20 at 5 years, 20 at 4 years (coming from the previous year's production), 20 at 3 years, 20 at 2 years and 20 at 1 year.

- If the bank assumes a linear amortizing over five years of its NMD, it is in risk in case of decrease of the interest rate in term of NIM, but since average duration is capped at 5 years, it still underestimates its risk. In term of EVE, it is in risk in case of increase of the IR but here again the result is underestimated.

The true answer in stable regime (renewal of the balance sheet by rolling at 100%) is that every decrease of the IR by 100 basis points shall reduce the NIM progressively over 5 years by 100 bps (20 bps per year).

In case of increase of the IR by 100 bp, the MtM of the loan portfolio shall go down by -2.5%, a loss for the liquidator, since deposits shall be simply reimbursed at par.

The regulatory approach to Economic Value is not considering the risk of the bank in going concern but the opposite risk of the regulator in case of liquidation.

Indeed, the previous example shows clearly that the scenarios generating a loss are different between MtM of the stock and variation of incomes in going concern.

The text gives a clear definition of the EVE: “EVE measures the theoretical change in the net present value of the balance sheet excluding equity. The measure therefore depicts the change in equity value resulting from an interest rate shock”. The regulatory approach is not taking into account the risk of the bank in going concern but the risk of the regulator in case it has to liquidate the portfolio. However here also it shall provide a false estimate of the true liquidating value since in liquidation, NMD are worth simply the par and the IR shock only impact the loan book. Indeed, the reality of our example is that if interest rates are going down, the value of the loan book shall appreciate instantaneously but the new production will be done at a lower rate, which shall impact progressively the value of the bank. Inversely if IR are going up, the value of the stock shall depreciate but progressively, the stock will disappear and the new production will be generated at better rate.

Indeed, the new regulation did not abandon the wrong model for NMD and the calculation is not going to give to regulators a true estimate of its risk: its real risk would be to assume that NMD are interest rates insensitive (or do the exact sensitivity calculation). It is to the advantage of most of the banks to choose a duration of deposits at the allowed maximum since it shall reduce their capital requirement.

We do not speak here about liquidity. Amortizing convention of NMD is absolutely relevant for liquidity management, representing the target reinvestment strategy the bank choose (as “cautious and reasonable”) for reinvesting its deposits.

Conceptually, value of NMD is intrinsically linked to the market value of a bank

Formally, the stable part of NMD can be seen as perpetual liabilities²⁵ with a cost c , which can be correlated with IR and isn't null since there are always cost of collecting NMD (banks provide account management services through internet and phone platforms and branches for the brick and mortar players). Price is therefore in a flat IR environment with positive rate r :

$$P(c, r) = \lim_n \left[\sum_{t=1}^n \frac{c}{(1+r)^t} + \frac{1}{(1+r)^n} \right] = \lim_n \left[\frac{c}{r} + \frac{1}{(1+r)^n} \cdot \left(1 - \frac{c}{r} \right) \right] = \frac{c}{r}$$

- If $c=r$, $P=100\%$. The bank has no advantage to collect NMD.
- If $c<r$, $P<100\%$. The NMD being registered at 100% in the liabilities of the bank, this one enjoys an underlying profit on deposit activity. This is the normal model.
- If $c>r$, $P>100\%$. This situation, which may be the case currently, translates the fact that then NMD are more expensive for the bank than market long term resources.
- Obviously, $r<0$ generates an infinite price for deposit.

²⁵ Current accounts are M1 and M1 is moving like inflation plus an additional parameter depending on the speed of circulation of currency and the IR.

- $C=0$ gives $P=0$. A free resource for the bank.

Actually, the price doesn't matter. What matters is the sensitivity of the price to r : $-\frac{\partial \ln P}{\partial r} = \frac{1}{r}$ which is much higher than defined by the regulation. However, since NMD are not value MtM in the balance sheet, this sensitivity has no direct impact on the value in force of the business.

In our example, let us assume that loans are made at 5% and cost/incomes ratio is 50%, cost of risk 0.5 point, SCR 10%, risk free rate is at 3% flat.

- Before IR shock, the bank generates $5\% - 50\% \cdot 5\% - 0.5\% = 2\%$ incomes per year and ROE is 20%, that is 17 points above long term rates.
- After IR shock, incomes decrease each years by 0.2 pts to 1% incomes per year (in year 5) and ROE is 10%, that is only 8 point above long term rates.

It is difficult to anticipate the impact on the market value of the bank but assuming a constant PER of 10, before shock the bank is worth 20 that is a goodwill of 10 ; after the shock (after 5 years) it is worth 10 that is at book value. This very simple example explains part of the mechanisms on current valuation of banks²⁶.

If the regulator was going to take over the institution and put it in run-off, after the shock, it shall have to liquidate a portfolio of loans of duration 2.5 made 100 bps above market. It would generate a profit of +2.5. The value of NMD would have reduced significantly from their high valuation (let assume $c=1.5$ pts then $P=50$ before shock that is an underlying profit of 50 and $P=75$ that is an underlying profit of 25 after shock). But the regulator still would simply reimburse the deposit at par in case of liquidation generating a final profit of +2.5.

If it finds a bank to buy the deposits, it would generate a profit of 27.5 instead of 50 before the shock assuming the buyer prices the deposits at their real value. In reality, no buyer would invest above its market PER. A market value of a deposit collection activity without a loan book (and capital) would rather be 15 before shock and 5 after. But again, this is a free option for the regulator. Inversely, in case of increase of the interest rates, obviously the bank would be in better shape but for the regulator having to step in, the liquidation of the loan book would generate a loss.

A simple example – key figures	Before shock	5 years after IR down 1%	5 years after IR up 1%
Risk free rate	3%	2%	4%
Loan rate	5%	4%	6%
Total balance sheet	100	100	100
Capital (assumed no return on capital, no IR risk)	10	10	10
Net Interest Margin (out of capital investment)	5	4	6
Costs ($C/I = 50\%$)	-2.5	-2.5 (unchanged)	-2.5
Risk	-0.5	-0.5	-0.5
Incomes before tax	2	1	3
Market cap. PER=10 unchanged	20	10	30
PBV	2	1	3
Revenues on reinvesting NMD at RFR	3	2	4
Cost of collecting NMD	-1.5	-1.5	-1.5
Incomes made on NMD	1.5	0.5	2.5
Value of NMD under formula c/r	50	75	37.5
Value of NMD priced with PER=10	15	5	25
Incomes made on loan activity	0.5	0.5	0.5
Value of loan book	100	102.5 just after shock	97.5 just after shock
Value of loan activity with PER=10	5	5	5
Economic value if NMD linear 5 years	10	10	10
Economic value if NMD linear 3 years	10	10.73	9.27
Economic value if NMD linear 7 years	10	9.37	10.63

²⁶ Currently, other phenomena are impacting the valuation of banks: higher capital needs, global decrease of the risk premium on equity following the quantitative easing...



Conclusion

The April 2016 D368 Basel regulation is a revolution in the sense that it shall finally impose the best practices inside banks in term of ALM. The text unfortunately suffers from unnecessary technicity and one can regret that the regulator did not go one step further²⁷. However, it faces every key issue in ALM modeling and finally acknowledges the importance for banks to balance both approaches: variation of EVE and variation of NIM.

The timing of implementation is very ambitious and banks should react quickly first to train their staff and second to build the required data.

²⁷ It is our opinion that a tidying-up of the text shall take place in a couple of years.



About ALM-VISION

ALM-Vision is a quantitative modeling company founded in 2011. Its mission is to provide quantitative analysis and scientific support to financial institutions.

The core of our business activity is Asset Liability Management (ALM) modeling. Our modeling tool ALM-Solutions® is proprietary software developed internally by our team for highly precise state of the art modeling of banking assets and liabilities to monitor the financial institutions' interest rate, credit and liquidity risk and to understand the impact of a variety of economic scenarios on the balance sheet and income statements, including stress testing. We have also high quality pricing capacities for complex structured financial products.

In addition to ALM modeling, ALM-Vision provides advisory services to financial institutions and is called in to intervene on technical matters that require high pricing capacity and substantial and extensive experience in the financial markets (CVA, FVA, deal structuring, ABS, NBT, inflation-linked products, commodity derivatives and modeling, credit restructuring...).

Most bank ALM and/or risk teams are left alone to handle the new regulatory environment. With the current difficult environment for the financial industry, both human and technological resources are scarced and the teams have neither the time nor the capacity to develop the scientific part of their job. We provide our customers with this technical support and act as a bridge for best practices between our customers. Indeed, each customer brings us new needs, new issues, new requirements which reinforce our expertise. Our rule is to systematically share new non-client specific developments as a way to diffuse best practices around the industry. We strongly believe that our success is based on the fact that we aren't a simple IT provider but a true scientific support team, with strong financial expertise assisting our customers in the whole modeling and analysis of their balance sheet.

In ALM, software is just the tool. The core of the added value is the modeling and the analysis. Leveraging on our strong financial and market experience, we help our customers to focus on this core in the most efficient way.

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