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Fédération Bancaire Européenne
European Banking Federation

INTEREST MARGIN HEDGING

FBE PROPOSAL

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INTEREST MARGIN HEDGING

- PART ONE: GENERAL DESCRIPTION OF THE PROPOSAL -

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INTRODUCTION

The FBE has been engaged in dialogue with the IASB on the need to revise the hedging rules contained in IAS 39 for a substantial period of time. In the run up to the first time adoption of IFRS, these discussions culminated in the IASB building into IAS 39 an ability to apply fair value hedge accounting for a portfolio hedge of interest rate risk. It proved necessary, however, for the exposure draft to identify issues involving demand deposits and prepayment on which the IASB had been unable to reach agreement with the FBE. Irrespective of institutions advising that they shared the concerns expressed by the representatives of the European banking industry, the IASB maintained its position on these issues when incorporating the fair value hedge accounting rules into IAS 39.

While some institutions have benefited from the fair value hedge accounting rules, their application has usually been partial in nature as their applicability was significantly curtailed as a result of the outstanding issues not being resolved (e.g. hedge of core deposits, definition of criteria to assess hedge effectiveness). This played a contributory factor in the European Union determining that it should ‘carve out’ the hedge accounting rules from the obligation to follow IAS 39 until such time as a better hedge accounting model was found.

Subsequent talks between the FBE and the IASB have focused more on cash flow hedging and whether a new species of this could form the basis of a hedge accounting model. The FBE has sought to combine the need for any proposal fit within the current framework of IAS 39 with its belief that the solution must lie in developing a hedge accounting model that is recognisable when looked at from the perspective of a bank’s risk management practices.

The outcome has been the development of the Interest Margin Hedge proposal. This has been developed on the premise that all derivatives must be measured in the balance sheet at fair value and that hedge ineffectiveness should be recognised within the P&L. It follows a methodology, however, that is much more grounded in bank risk management and, as a consequence, is better suited to accounting for the hedge relationships that banks establish in practice. It is also more accommodating of risk arising from a bank’s demand deposit base within a fixed rate environment and adopts a position on hedge effectiveness that is more compatible with the stated objectives of risk management policies followed by many institutions.

It is proposed that the IMH model be seen as a third approach. It also could be seen as a sub-form of a CFH, provided the problems with some of the current interpretations, as explained in Chapter V, could be resolved. This would enable those institutions at present relying on the carve out to adopt a hedge accounting model from within IAS 39 without obliging others to revise their systems. It is envisaged, however, that over the medium to longer term the broader appeal of the IMH methodology may result in it becoming the industry standard.

The purpose of this paper is to provide the general banking community with an understanding of the net interest margin hedging proposal. Hedge accounting is now the most complex area of accounting that we as accountants have to deal with and therefore any additional proposal designed to achieve hedge accounting is likely to be equally as complex to those that already exist. To overcome this issue the group felt that this paper describing the detail of the NIMH should be written and delivered in two parts. The first part, intended as an introduction to the topic, is written in a style that attempts to simplify the proposal for ease of understanding and discussion at a high level. The second part is more detailed and gets into the complexity of the proposal and will facilitate the more challenging aspects of any theory, assessing how it could work in practice.

The remainder of this overview:

- introduces the concept of 'interest margin'
- sets out the basic features of an interest margin hedge
- explains the treatment of demand deposits and prepayment
- addresses the treatment of hedge ineffectiveness
- provides a comparative analysis of the IMH model and Cash Flow Hedging and Fair Value Hedging.

CHAPTER I: "INTEREST MARGIN"

1. The Concept of "Interest Margin"

Banks act as intermediaries between depositors and borrowers of funds. In particular, retail banks are dominated by their core business of collecting funds from depositors and investing them subsequently as loans to customers or in other investments. To remunerate the collected funds, they pay interest. For their investments they collect interest payments. The difference between interest received (income) and interest paid (expense) is net interest income, which is the main source of profitability of retail banks.

The net interest margin is a major indicator of the profitability of a bank, elaborated about in every bank's management discussion and analysis year by year and watched by an increasing number of industry observers[1]. It is also observed and compared as a general business indicator by others[2]. As this measure accounts within retail banks for a significant amount of total revenues, a small change in margin has a huge impact on profitability.

Furthermore, the net interest margin has become a dominant tool of managing and monitoring a bank's business in detail. From the margin of a single transaction to be calculated for pricing of the product to the development of transfer pricing between different units of a bank[3], the margin is indispensable.

As mentioned above the net interest margin is defined as the difference between interest received on assets less interest paid on liabilities. However there are a number of items that can impact this return both positively and negatively.

These items would be:-

1. Credit spreads
2. Credit default events
3. Absolute level of market interest rates
4. Volatility in the market interest rates
5. Portfolio mix
6. Competitive forces

When a Bank prices an asset it looks at a number of factors. Base cost would be the current market rate for the period and currency involved, to this will be added a margin related to the credit standing of the customer. Similarly when pricing liabilities the same two elements are used the difference being that the credit spread added is directly related to the Bank involved.

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[1] "Bank watchers keep eyes on margins", The Business Journal of Portland, October 17, 2005
[2] Federal Deposit Insurance Corporation, State Profiles – Regional Profile – Fall 2005
[3] For simple introduction: Journal of Bank Cost & Management Accounting, The Introduction to funds transfer pricing, 2001

So in terms of managing the overall net interest margin a Bank can split it into the component parts of credit risk and interest rate risk and manage both separately. The net interest margin hedge is associated solely with the latter risk.

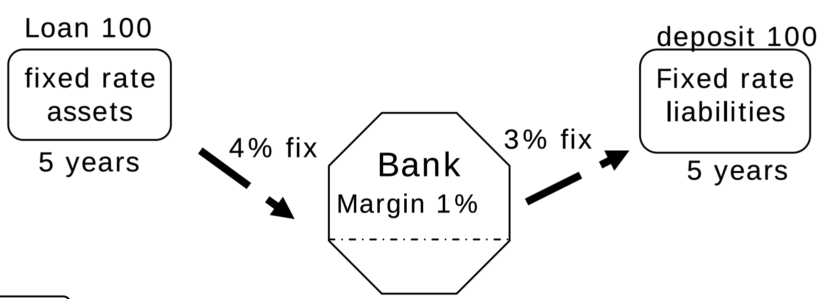
2. *Interest Margin at Risk*

As interest rates are sensitive to fluctuations in the market, banks seek protection against the adverse impact which changes in interest rates may have on their earnings. Obviously, when interest income drops while interest expense remains flat or increases, the net interest margin and the profitability decrease.

Such effects can be very large if interest rate risk is not managed carefully[4]. In many countries past experiences have shown that one of the biggest contributors to this particular risk is a mismatch in maturities of assets invested to deposits collected. As a consequence, banks have invested considerable time and efforts to monitor and manage this risk through their Asset-Liability-Management (ALM).[5]

Whether a bank's net interest margin is sensitive to interest rate risk or not depends on the composition of its balance sheet. When funds borrowed (liabilities) and funds invested (assets) are matched, i.e. have the same maturity and amount, there is no risk from market rate movements to the interest margin because refunding and reinvestment will take place at the same time, i.e. at the same interest rate level. Until then, the margin is fixed.

When a bank collects, for example, a deposit with a fixed interest rate for 5 years and invests the funds in a loan to a customer, also with a fixed rate for 5 years, changes of market rates will not impact the "portfolio": it has a fixed net interest margin for the coming 5 years.



ill. 1

The same result is obtained when matching floating rate assets and liabilities, i.e. assets and liabilities that adjust their interest rates at regular intervals under agreed procedures (called repricing): if the funds borrowed (liabilities) and funds invested (assets) are matched, i.e. have the same repricings and amount, there is no risk from market rate movements to the interest margin, the margin is fixed.

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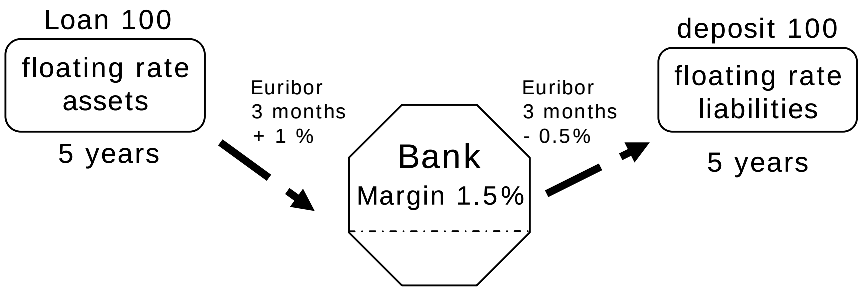
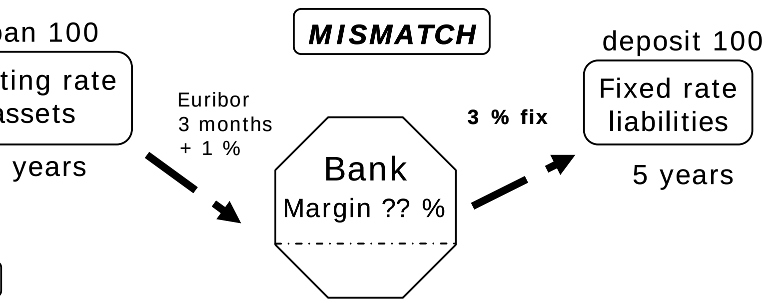
[4] BIS Quarterly Review, December 2002, p. 67; the article quotes as examples the "secondary banking crisis" in the UK and the problems of the US-thrift institutions.

[5] See Fn. 5: Research results suggest that banks have been successful in reducing the effect that volatility in the yield curve could have on the net interest margin



ill. 2

<u>Risk to the interest margin arises only when assets and liabilities in the monitored portfolio differ in their maturities for interest rate adjustments (repricing), resulting in a Mismatch:</u>



ill. 3

When interest rates drop, interest income will decrease while interest expense will remain stable: therefore, there is a risk of a negative development to the interest margin.

<u>To summarise</u>: there is no interest rate risk exposure for a bank if it succeeds in matching its funding (liability side of the balance sheet) and its loans (asset side of the balance sheet) in a perfect way.

Economically speaking, <u>the interest margin is at risk only when two components of the banking book -interest income and interest expense - do not fall under the same rate category (i.e. fixed or variable)</u>. In other words, the risk that a bank's income decreases following interest rate fluctuations in the market stems from an asset/liability mismatch.

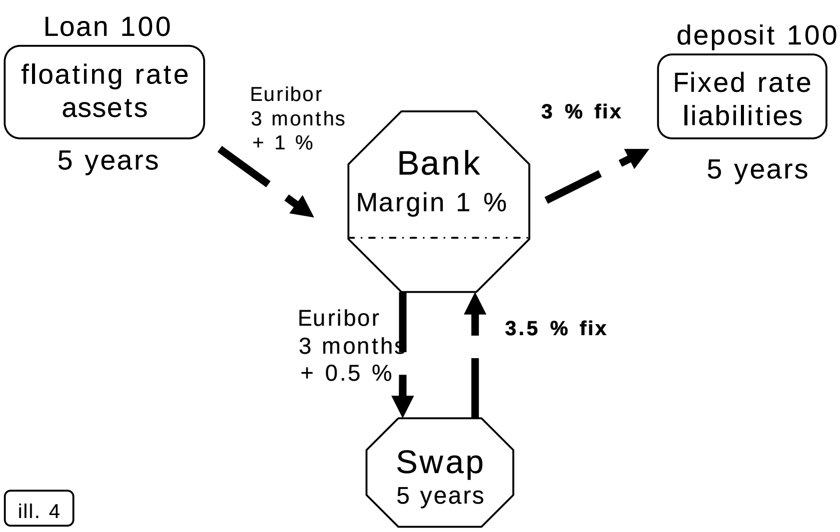
CHAPTER II: BASIC FEATURES OF AN INTEREST MARGIN HEDGE

1. Interest Margin Hedge: Description

To reduce the risk of negative changes to the interest margin of a portfolio, Asset Liability Management determines the amount of mismatch between assets and liabilities. The first step is therefore to offset the respective assets and liabilities with the same repricing periods [dates] within the portfolio against each other. The remaining mismatch represents the exposure to variability in the margin.

The objective of the IMH is to reduce the risk exposure from the asset/liability mismatch and to fix the margin by securing today's[6] interest rate levels for the for the current existing floating rate items as well as future transactions that will fill the gap. This will fix the margin because the other side of the portfolio is also fixed.

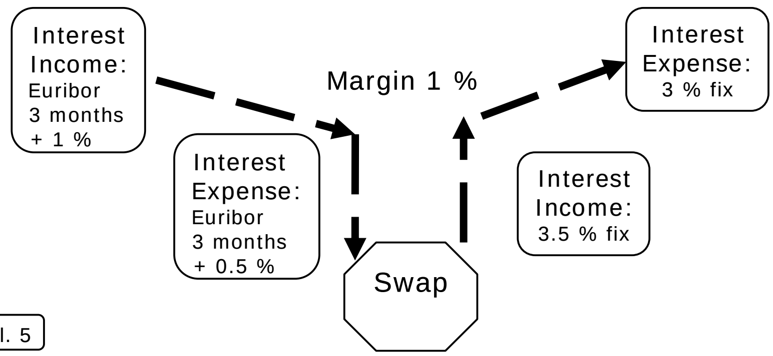
This is done by using a simple hedging instrument, a swap, which bridges the differences in the repricings of asset and liability: the bank pays to the swap-partner the floating rate received while collecting a fixed payment (ill. 4). This results in the desired fixed margin:



ill. 4

[6] i.e. market rate at time of the inception of the hedge

This Interest Margin Hedge (IMH) is a relatively simple transaction. An asset that collects interest with different repricing terms to the repricing of the interest paid for the funding liability is *matched by* an agreement (the swap) that balances the two interest payments (= cash flows) involved through two opposite payments (= cash flows), resulting – after allocation to the relevant accounting periods - in the required fixed interest margin:



ill. 5

If one looks at all four cash flow streams that – after allocation to accounting periods - constitute interest income and expense over the periods, the result is a 1% Margin over the time to maturity[7]. The Interest Margin Hedge Accounting Model which the FBE proposes aims at reflecting this margin in the accounts over the respective reporting periods.

2. The Risk

2.1. The Portfolio View

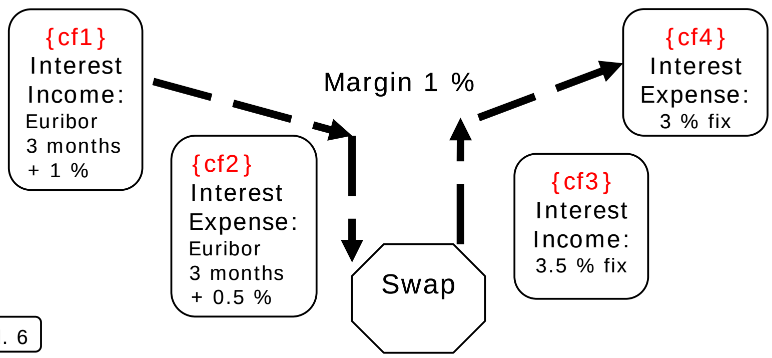
Within banks, the ALM departments are responsible for managing the bank's funding and corresponding investment, maintaining the sensitivity of their earnings within prudent levels and contributing to their stability under a moving interest rate environment.

Therefore, ALM attempts to close the mismatches between existing assets and liabilities by entering into appropriate derivative contracts. Theses contracts provide protection against interest rate risk, i.e. the change of the margin as a consequence of interest rates moves, on the level of the benchmark interest rate. Only that part of the contractual rate that corresponds to interest rate risk (often referred to as the benchmark[8] component of the contractual rate) is hedged, leaving the part that has to cover credit risk and operational costs in the responsibility of other departments. By concentrating all funding and investment streams at the bank's ALM, it enables to concentrate on the contribution of the centralised portfolio(s) to the overall margin.

When performing its task, ALM looks at individual mismatches causing individual gaps, however, always under a portfolio view of *assets as well as liabilities.*

[7] Provided there are no defaults, the fair value of the swap is irrelevant to the results over time to maturity: it starts with a value of zero and ends with the value of zero. Interim changes of that fair value reflect only a hypothetical market value on a stand alone basis (wherever it is reported).
[8] Benchmark rates are derived from the libor based swap yield curve, as swaps against libor are the commonly used hedging instrument.

The risk is an economic risk because it is an exposure to changes in cash flows. Even though interest income and expenses are accounting items, but not cash flows by themselves, they are directly relating to past and future cash flows. The hedge itself, too, influences the risk on the level of the cash flows themselves. The risk of variability in the interest margin of a specified portfolio (see ill. 3) is that a change in market rates has a negative effect on the margin, i.e. initially the sum of two cash flows (ill. 6, {cf1} & {cf4}). By offsetting the repricings of these two cash flows with the repricings of two other cash flows ({cf2} & {cf3}) the risk of variability of the net cash flows is offset. The cash flows are then allocated to relevant accounting periods as interest income and expense.



ill. 6

This combination of cash flows and their risk of variability are the targets of the hedging activity: the offsetting effects from repricings of the cash flows of the hedging instrument ({cf2} & {cf3}) to the repricings of the cash flows of the mismatched assets and liabilities ({cf1} & {cf4}).

Because these cash flows are allocated to the relevant accounting periods, this risk has a direct impact on profit and loss, as required by the Standard.

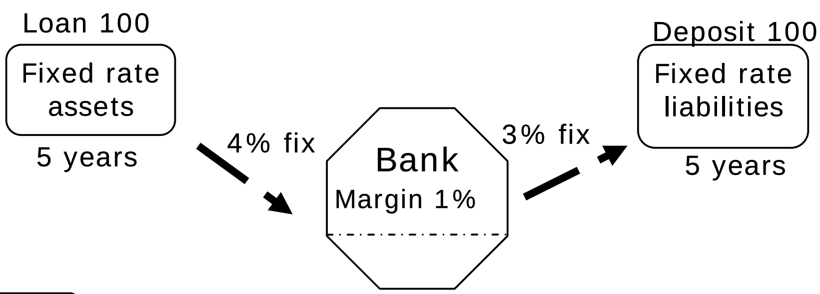
Clearly, therefore, the objective of the IMH model is to report the result of economic exposures and actions taken to manage them. The underlying interest income and expenses are the aggregation of cash flows which under IAS 39.9 – if at risk of change – represent the economic exposure that is required to permit hedge accounting. The fact that they are allocated to relevant accounting periods does not alter the direct influence of cash flow changes to interest income and expenses before and after allocation.

The key feature of the IMH is the balanced view of a portfolio instead of a view of either assets or liabilities. This difference leads to a number of consequences in theory and practise, some of which are explained below.

2.2. Risk Taking and a Balanced Portfolio

2.2.1. A Balanced Fixed Rate Portfolio

Can a portfolio that is balanced with fixed rate items, example of ill. 1, Part One, be subject of a hedge?



ill. 7

No, not when using an IMH because there is no mismatch between fixed and variable items in the portfolio; the use of a derivative would increase the variability in the interest margin of this specific maturity.

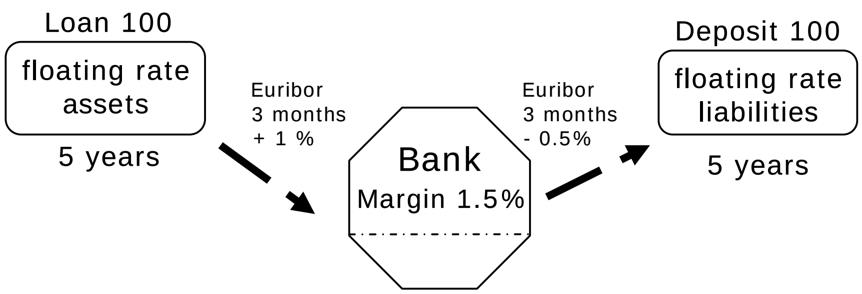
Yes, when using a FVH: as Implementation Guidance F.2.6 explains, IAS 39 does not require risk reduction on an entity-wide basis as a condition for hedge accounting. Exposure for hedge accounting purposes is assessed on a transaction basis. So, even though a FVH of either the assets or the deposits would lead to an exposure that did not exist before the hedge, it would be an effective hedge. This is consequent as the FVH determines an exposure to changes in fair value of items of either side of the balance sheet with out consideration for the balancing side, funding or investment.

However, it is important to note, that (accounting) rules do not and should not take on the responsibility of risk management. Whether or not such risk taking would be permitted from a risk perspective is subject to the risk management procedures in a bank. Issues of risk management on an enterprise wide basis are addressed by regulatory and supervisory rules that require the necessary risk management guidelines and procedures to be in place. Such risk management requirements, acting not on the level of accounting, but on the level of the risk view, may not permit the bank to open such an exposure through the hedge.

2.2.2. Where does variability come from?

When discussing the difference between a CFH and an IMH, repeatedly the issue has been raised that, for both, the variability surely would come from the variable rate item. As in the previous example, the difference of managing on a portfolio level instead of an item level leads to different exposures.

Can a portfolio that is balanced with variable rate items, example of ill. 2, Part One, be subject of a hedge?

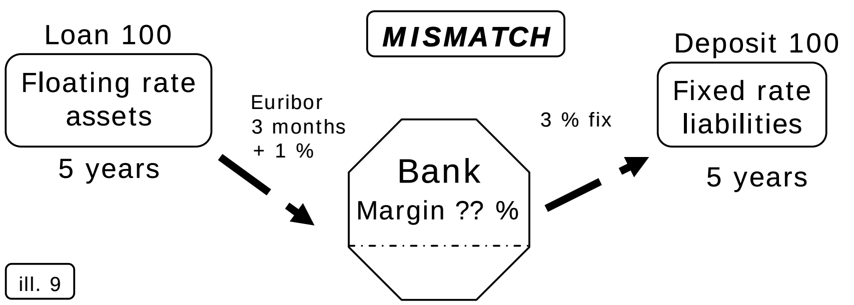


ill. 8

No, not when using an IMH because there is no variability in the portfolio, the margin is fixed. The use of a derivative would increase the variability in the interest margin for this specific maturity.

Yes, when using a CFH as the exposure for hedge accounting purposes is assessed on a transaction basis. There is a variable exposure if you look just on either side of the balance sheet with out consideration for the balancing side, funding or investment.

As this example highlights, the exposure for an IMH can come only from the combination of a variable rate asset versus a fixed rate liability (or vice versa).



ill. 9

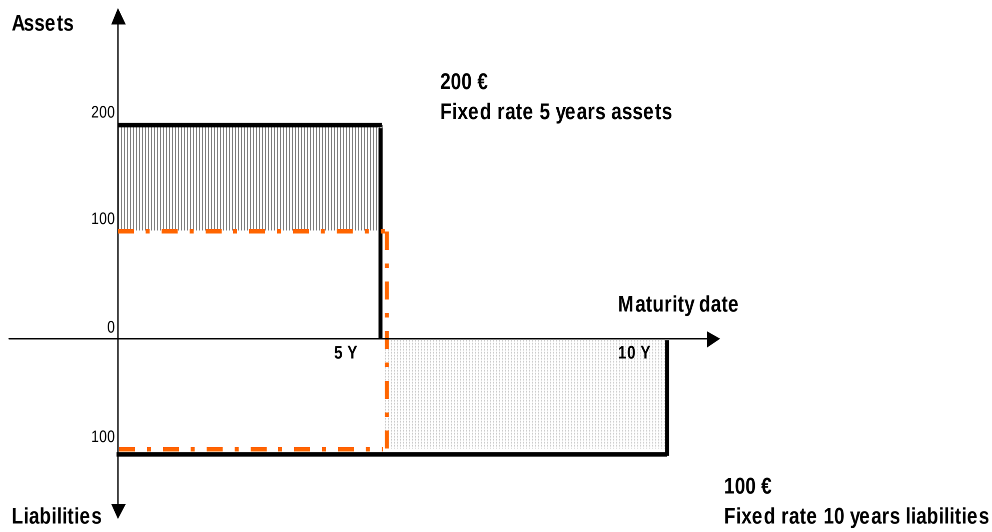
3. Analysis of the Mismatch: the gap(s)

As explained, in managing risk for protecting the interest margin requires matching assets and liabilities of the same repricing times, banks worldwide have developed similar techniques to identify mismatches: they break down the future time into re-pricing time periods – or time buckets – into which they allocate assets and liabilities with their outstanding amounts.

This means that assets and liabilities of the same repricing dates will appear in the same time bucket. As a result, it becomes easy to detect a mismatch when there are assets and liabilities of different maturities: they will appear in different time buckets. Another mismatch is also easily detectable, i.e. the mismatch between different amounts of assets and liabilities within the same time bucket.

Such mismatches are called “gaps”. Through GAP analysis, assets and liabilities are allocated to time bands based on their contractual or expected maturities in order to quantify the amount of items exposed to interest rate variation.

An example will illustrate this. Let us assume that there are assets of € 200 which are fixed for 5 years whilst there are liabilities of € 100 which are fixed for 10 years.



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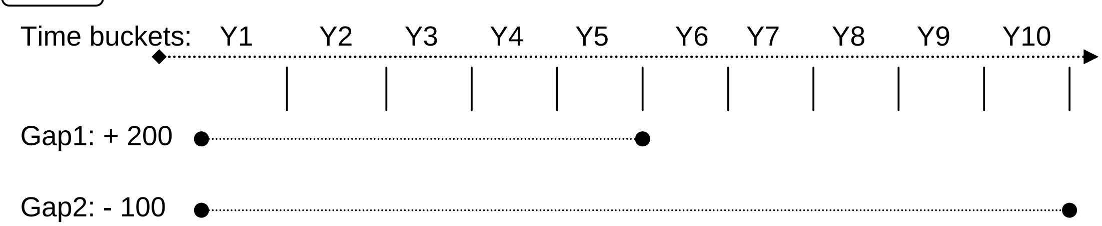
ALM-managers have developed two different approaches to define the mismatches (which are used for hedging purposes): the Due Approach and the Cum Approach[9].

3.1. The Due Approach

The Due Approach looks at assets and liabilities “when they are due”: it focuses on the different final maturities of fixed rate assets (5Y bucket) and fixed rate liabilities (10Y bucket). It defines a gap of € 200 assets from today up to the 5Y bucket and another gap of €100 liabilities from today up to the 10Y bucket[10].

ill. 11

Gaps under due approach



[9] A detailed and more complex description of the two approaches follow in Part II

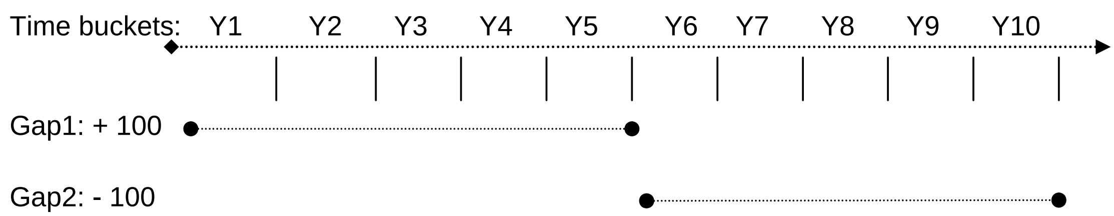
[10] It is easier to understand the logic if we amend the case to a granting of a 5Y-loan of € 200 a week before obtaining the 10Y-deposit. In this case, the loan would have to be funded immediately in the money market which would be on floating rate; vice versa the investment of the 10Y-funds would have to be invested a week later.

These two gaps would be hedged separately:
- Gap1 would be hedged by a five year pay-fix/receive float swap of € 200
- Gap2 would be hedged by a 10 year pay float/receive-fix swap of € 100

3.2. The Cum Approach

The Cum Approach takes a cumulative view: it nets €100 from the liabilities off the assets in the first five years and derives at two different gaps: one gap of €100 assets from today up to the 5Y bucket and another gap of €100 liabilities from five years on to the 10Y bucket.

ill. 12 *Gaps under cum approach*



These two different gaps would be hedged as follows:
- Gap1 with a five year pay-fix/receive float swap of € 100,
- Gap2 with a 5 year forward pay float/receive-fix 5Yswap of € 100.

Illustrations 11 and 12 make apparent that the detection of mismatches and definition of gaps depend on the approach chosen by ALM for dealing with interest rate risk[11]. The gap is defined by the amount by which fixed rate assets exceed fixed rate liabilities (or vice versa) for specific re-pricing time periods (time buckets) under either a cumulative- or a due-view.

3.3. Rationale for the Two Different Approaches

The due approach is favoured for hedging in countries where fixed-rate loans (especially mortgages) typically do not contain any free prepayment option for the borrower and the borrower has to pay a market based close out fee in case of a prepayment. The benefit of such an approach is that the banks margin is not only “locked in” but also remains unchanged over the life of each individual transaction. Such a procedure supports strongly state-of-the-art transfer pricing processes between ALM department and the bank’s branches because the internal transfer price for a fixed rate asset is directly linked to the bank’s hedging strategy.

The cum approach is favoured for hedging in countries where mortgage markets permit significant prepayment optionalities for borrowers. This requires different hedging strategies as the likelihood and timing of potential prepayments varies with changes in the yield environment but also other, uncorrelated (for example demographic) factors. In such an environment it cannot be assumed that the maturity of an individual loan remains unchanged and therefore a hedging strategy which takes into account all netting possibilities between assets and liabilities (from period to period) is superior compared to the due approach.

[11] See for further details Part Two

CHAPTER III: INTEGRATION OF EXPECTED REPRICING BEHAVIOUR

To reduce the risk of variability of the margin, ALM managers must match balance sheet items according to their repricing dates. The objective is to hedge the net interest margin of the bank on a portfolio basis.

For some items, the contractual maturity on an individual basis and the expected maturity on a portfolio basis can be very different and as a consequence, the contractual repricing characteristics (or final maturity for fixed rate item) and the expected behavioural characteristics of the same item on a portfolio basis will be quite different. Therefore, as the economic risks of some financial instruments differ from their contractual terms, they have to be modelled to reflect their true economic effect on interest rate risk management. They are therefore included based on their behavioralized repricing dates (statistical observations of customer behaviour) rather than their contractual repricing dates. These types of contracts include for example fixed rate prepayable loans on one hand and, on the other, core deposits (demand deposits and some (often regulated) saving accounts).

The interest margin is hedged on a portfolio level, and as consequence, items with an uncertain maturity have to be modelled. Even if an individual item has an uncertain maturity, it is important to model the margin risk it creates on a portfolio basis since the objective is to hedge the total net interest margin of the bank.

1. Prepayment of Fixed Rate Loans

Important examples of items for which contractual maturity and expected maturity on a portfolio basis can be quite different are mortgages with prepayment options. In most European countries, fixed rate mortgages are offered to individual clients with or no little penalty if the client wants to prepay this loan in some cases based on an agreed minimum period. As a consequence, the risk of prepayment is one of the major sources of interest margin variability for a bank with a large portfolio of prepayable fixed rate mortgages.

Illustration:

The bank grants a 6% 10 year fixed rate and funds this loan with a 5% 10 year fixed rate liability (borrowing or deposit). At the beginning of the transaction, the margin generated is 1%.
If, 2 years later, market rates decline, the client can refinance its fixed rate loan with another 8 year fixed rate loan from a competitor and will repay his 5 % fixed rate loan. At this time, long term market rates for 8 years fixed rate loan are around 4% for example. The bank now needs to reinvest its 5% liability into another asset that will pay a rate of around 4% and the margin is now –1%.

Were the bank to have been in a position to anticipate the prepayment operation with certainty, it would have financed the 10 year loans with a 2 year 4% liability for example and would have generated a higher margin.

Forecasting the prepayment of an individual loan is quite difficult, but for a large portfolio of mortgages, the law of large numbers reduce the uncertainty for the volume and timing of prepayments and enable to better forecast expected prepayments on a portfolio basis. As mentioned before, statistical observations of customer behaviour allow forecasting a stable level of notional amounts within the different repricing periods. Hedging only a portion of the total outstanding notional amounts of the respective loans, i.e. the gap that is created by the 'stable level', represents a partial hedge (i.e. under-hedging) which is supported by the IMH methodology.

The interest margin hedging solution allows banks to include prepayable assets based on their expected maturities in line with risk management practice.

2. Core Deposits

Core deposits (or "demand deposits") refer to deposit accounts without defined maturities such as current accounts. What matters is that the instrument does not have a contractual maturity in the sense that they are not automatically returned to the client after their contractual maturity. They often carry a low or zero interest rate. The holder of core deposits is, by definition, entitled to withdraw money at any time (provided the account remains positive and, in some situations, e.g. specific savings accounts, that prior notice has been given). The contractual maturity of core deposits is undefined.

In Europe, core deposits constitute a significant part of banks' liabilities as many European banks, across wide geographies, rely heavily on core deposits. The ability to invest below market rate (or 0%) in long term fixed rate items is usually one of the most important source of revenue for a European retail bank. It needs to be borne in mind that the European banking model differs substantially from the US model in this respect.

It is statistically proven that the maturity of a large portfolio of core deposits is substantially longer than the contractual "on demand" or "with notice" period. It shows a high level of notional amounts which are available as a stable source of funding, Even if core deposit balances can vary a lot individually, on a portfolio basis, due to the law of large numbers, the balance of portfolio of core deposits is an extremely stable source of funding. They need to be considered for risk management purposes as long term deposits.

Within a portfolio, diversification effects occur between the inflows to and outflows from the various individual accounts. As a result, the volatility is considerably smoothened. Mathematically, a smoothing effect comes from the Law of Large Numbers and the Central Limit Theorem: the sum of individual accounts converges towards the sum of the mean and becomes closer and closer to the mean with the number of accounts.

Banks use their historical experience within empirical models to estimate the expected lifetime of deposits. Statistical historical observations demonstrate that an important part of the core deposit base of banks to be stable over time. Taken as a whole, they behave economically like a deposit with an expected life in the range of, for example, 3 to 10 years. These assumptions tend to be matched by banks subsequently with what happened in reality ("back testing").

This explains why a bank's risk management include core deposits into the hedged portfolio by grouping them into time buckets on the basis of their expected rather than their contractual maturity dates to determine the net position in each time according to which period. This is also what banking supervisors expect banks to do. It must be highlighted that banks assign a maturity profile to the core volume of demand deposits on the basis of prudent and realistic assumptions.

In essence, core deposits are included in the IMH methodology as fixed rate deposits available with the level and for the time that resulted from the analysis of statistical historical observations used in the empirical models to estimate their expected maturity. As such, they require protection against adverse changes in the interest rate level for their corresponding investments.

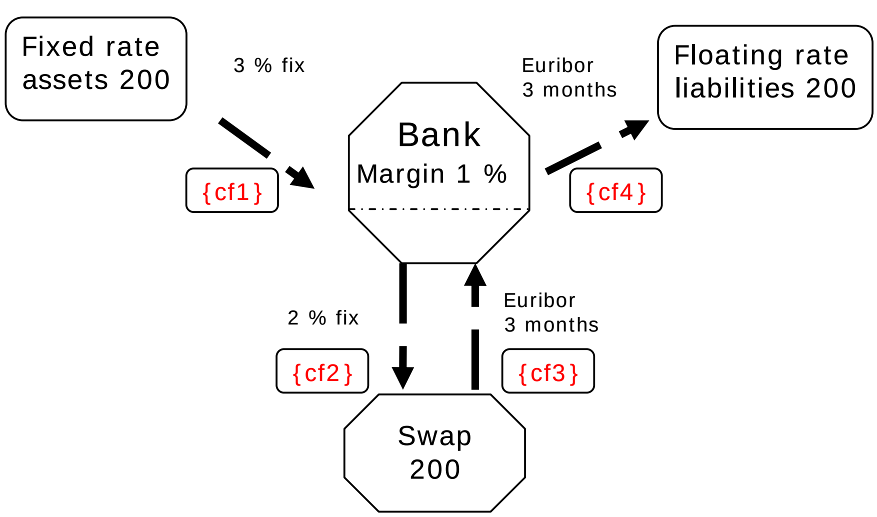
CHAPTER IV: HEDGE EFFECTIVENESS

1. What constitutes Effectiveness or Ineffectiveness?

Conceptually, effectiveness testing raises the question: to what degree has the hedging objective been met? Therefore, it needs to be performed in the light of the objectives of the hedging policy. Within the current IAS 39 framework hedge effectiveness is the degree to which offsetting changes in fair values or cash flows attributable to a hedged risk are achieved by the hedging instrument(s) (IAS 39, paragraph 10).

The objective of an IMH is the reduction of variability of the interest margin associated with a specified (gap of a) portfolio and fixing the margin by securing the interest rate level at the time of inception of the hedge for future transactions that will fill the gap[12]. An IMH is effective when it can be demonstrated that the offsetting cash flows of the derivative have reduced the variability of the net interest margin: this is the case when the swap's cash flow changes offset, during the hedging period and over the hedged period, the changes in the designated portion of cash flows of currently existing variable rate items and/or the future transactions that will fill the gap. Within the Interest Margin Hedge framework the test of effectiveness, therefore, consists in a comparison of the variability of the margin of the designated portfolio first with and then without the hedging derivative: the variability of the un-hedged margin (i.e. before the hedge) has to be higher than the variability of the margin after addition of hedging instruments.

As to our example (ill. 8), GAP 1 could be closed with a swap over the same amount and maturity.



ill. 13

[12] The term future transaction is explained in more detail below in Chapter V.2.2 and Fn. 18

The margin of the portfolio is now fixed and no longer vulnerable to changes in market rates. Even, if the repricing date for the Euribor in {cf3} differs from the repricing date in {cf4}, the variability is a fraction of, i.e. lower than, the variability of the margin of the portfolio without the swap. In this regard, it is also the vast number of transactions in the large portfolios of retail banks that have a further stabilizing effect on the margin.

If one compares the effect of cash flows ({cf2&3}) of a hedging instrument to the cash flows ({cf1&4}) of a hedged item, IAS 39, paragraph 84, the variability of the margin is less than without the hedge.

As it is not the objective of the hedge to either protect the fair value of the asset or offset the fair value change of one cash flow, e.g. {cf3}, to the fair value change of another cash flow, e.g. {cf4}, a comparison of these respective fair value changes would provide information irrelevant to the hedging objective. Effectiveness for an IMH can only be tested by comparing the variability of the portfolio margin before and after the offsetting cash flows of the hedging instrument[13].

2. Sources of Ineffectiveness arising within an IMH framework?

As mentioned, the IMH portfolio is analysed into specified time periods of the same repricing dates of the items included. This enables a Bank to ensure that ineffectiveness is measured in a manner that one would derive from differences in the dates of repricing, the same way as for normal cash flow hedges, i.e. they get tested for proximity of cash flow dates.

This leaves a possible other source of ineffectiveness, differences in notional amounts between hedged items and hedging instrument.

Effectiveness has to be assessed based on the hedging objective. Given that the hedging objective within the IMH framework is a reduction of interest margin volatility any partial hedge, i.e.under-hedging, (for example 100 mn loan, five years, refinanced variable is hedged with an 80 mn pay-fix receive-float swap) will not lead to ineffectiveness (assuming that other relevant criteria, especially the maturity are met), because any hedging with less than the full amount of the gap means reducing an existing gap and leads to less volatility in interest income. Partial hedges reduce variability of the margin, e.g. hedges with a swap over only € 80 or € 50 or hedges with a swap for only two instead of five years.

Therefore the only reason for ineffectiveness within the IMH framework would be over-hedging: ineffectiveness, initially, can occur only if the swap would have either an *amount larger than the gap*, e.g. € 200, or a *maturity longer than the gap*, e.g. 6 years.

Over-hedging might occur due to realized prepayments or the re-scheduling of either prepayable assets or core deposits. All those events could lead to a situation where the bank's hedging instruments are no longer reducing the volatility in interest margin but adding additional earnings volatility.

This case can be demonstrated by the following example (ill. 15 ff):

[13] The fair value of a hedging instrument is only relevant when it proves to be ineffective and results in a need for its change in value to be booked through P&L.

A bank granted 100 mn fixed rate loan, due in 5 years. 50 mn of the loan were refinanced by a 5 year fixed rate bond issue. The remaining 50 mn were funded on a short-term floating-rate basis.

(ill. 14)

			Maturity Schedule					
		notional	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Net-Position**
Assets	5Y	100	100	100	100	100	100	**100**
Liabilities	5Y	-50	-50	-50	-50	-50	-50	**-50**
								50

The bank hedged the gap using a 40 mn pay-fix receive-float swap.
At t0, 10 mn of the initial positions remained at risk:

==> the bank was under-hedged by 10 mn

==> the hedge is fully effective.

(ill. 15)

									Net-Position
Swaps		notional	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**		**overall**
pay fix	5Y/3m	-40	-40	-40	-40	-40	-40	-40	***10***

Within the next period 30 mn of the fixed rate loans have been prepaid and therefore 30 mn of the variable funding has been repaid. At the end of the respective period the bank shows the following position:
70 mn fixed rate loan, due in 4 years. Thereof 50 mn are refinanced by a 5 year fixed rate bond issue and the remaining 20 mn are funded on a short-term floating-rate basis. The bank still owns the 40 mn hedging derivative and therefore 20 mn net fixed rate assets are hedged by 40 pay-fix swap which clearly now leads to an over-hedging situation, meaning that the existing gap is not only closed but a new gap (with opposite economics) has appeared.

(ill. 16)

	At end of Y1		**Maturity Schedule**						
		notional	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Net-Position**	
Assets	5Y	70	70	70	70	70	70	**70**	
Liabilities	5Y	-50	-50	-50	-50	-50	-50	**-50**	
								20	
Swaps									**overall**
pay fix	5Y/3m	-40	-40	-40	-40	-40	-40	-40	**-20**

Effectiveness needs to be assessed not only based on the current structure of the hedged portfolio but also with respect to the hedging intentions of the past. This is true for any kind of hidden ineffectiveness, which has to be tracked over the whole lifetime of a hedging relationship. Ineffectiveness can occur only[14] at a later date: if the initial assets or liabilities that constitute the initial gap are changing. In our example, this would mean the asset may be prepaid or the floating liability may become a fixed one. To find such ineffectiveness requires tracking of the initial items of the portfolio which is explained in detail in Part II.

[14] Initial ineffectiveness would not qualify for hedge accounting.

In addition the characteristics of any derivative qualified as hedge within the IMH framework must ensure that the hedging objective – the reduction in interest margin volatility - will be achieved (e.g., the maturity of the swap has to be aligned to the gap structure of the hedged portfolio).

3. Prospective and Retrospective Testing

Prospective testing: At the beginning of each reporting period an entity has to ensure that all derivatives documented as hedging derivatives inside the IMH framework (already existing hedges plus newly documented derivatives) will achieve a reduction in interest margin volatility (e.g. by comparing gap profiles before and after accounting for the qualified hedging derivatives).

Retrospective testing: At the end of each reporting period an entity has to control if the initial gaps (partially) hedged at the beginning of the period still exist. For this assessment, new production (b/s items and hedges generated during the period) has to be excluded. Otherwise the outcome would be distorted by new production “hiding” prepayments.

If both tests are successful, the hedges are effective. If, however, less hedged items in a specific bucket exist compared to the start of the period, for example due to prepayments, and the reduced size leads to an over-hedging situation ineffectiveness must be accounted for.

4. Consequences of Ineffectiveness

In such a situation the (part of the) derivatives adding to the margin volatility either has to be closed or re-allocated into a trading portfolio. The current market value of the ineffective (part of the) derivative has to be booked through p&l.

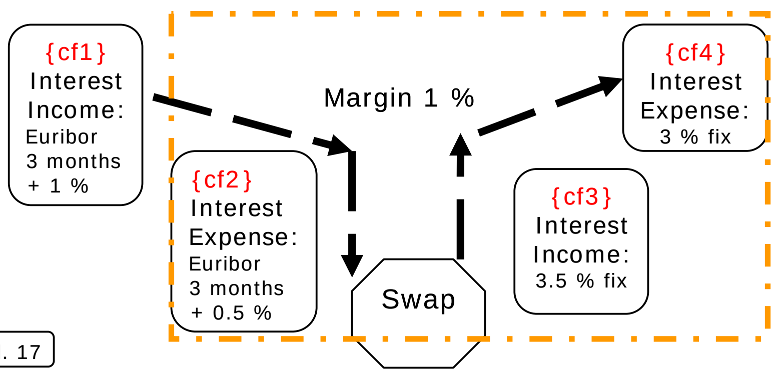
CHAPTER V: IMH VERSUS CASH FLOW HEDGE / FAIR VALUE HEDGE

Under the hedge accounting rules contained in IAS 39, a hedge transaction can only be reported as either a Fair Value Hedge (FVH) or a Cash Flow Hedge (CFH). Each of these hedge relationships is governed by quite separate accounting rules and - as a consequence - leads to different accounting results.

1. Fair Value Hedge (FVH)

A Fair Value Hedge is meant to protect the fair value of designated instruments against an exposure to changes in fair value of an asset or liability. It assumes that the hedging objective is protection of the item with fixed rates (in our case the liability) against changes in market value. Therefore it requires focussing on the fixed interest payments, whilst ignoring the 1st (variable) interest payments, the interest income from the asset.

The graphic below illustrates that such a view distorts the results of the portfolio and results in reporting of information which is incomplete.



ill. 17

A FVH has offsetting cash flows that create exposure to variability in cash flows, whereby the IMH aims at reducing variability of cash flows.

Furthermore, a FVH does not permit integration of core deposits into the hedge portfolio because – under IAS 39 – a demand liability cannot qualify for fair value hedge accounting for any time period beyond the shortest period in which the counterparty can demand payment.

2. Cash Flow Hedge (CFH)

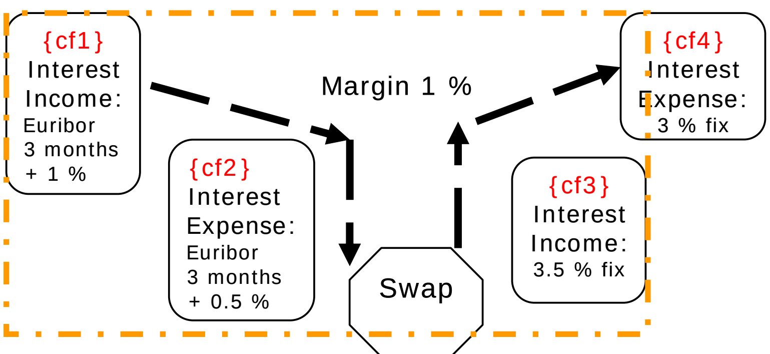
Whereby the FVH is an obvious case for difference in objective, it is not quite so obvious for the CFH versus IMH.

IAS 39.9 defines hedge effectiveness involving cash flows as "the degree to which changes in cash flows of the hedged item that are attributable to a hedged risk are offset by changes in cash flows of the hedging instrument."
Therefore, the focus is in the offset of the changes, not just offset of cash flows. Offsetting of changes in cash flows requires offsetting of repricings. IMH and CFH are the same insofar as they generate offsetting repricings that eliminate exposure to variability in cash flows.

2.1. The Portfolio View

A Cash Flow Hedge is designed to protect future cash flows of the designated instrument to variability in future cash flows. Therefore, it requires focussing on the variable interest payments without consideration of the item that balances the portfolio. As it has been explained before[15], this leads to different scenarios under which a hedge is possible.

However, this also implies ignoring the 4th cash flow, the fixed rate interest payment on the deposit (interest expense). Its valuation compares only the fair value changes of the variable payments at any valuation date. It can clearly be seen from the graphic that such partial view will distort the results of the portfolio: reporting of incomplete information.



ill. 18

2.2. Designation

In most cases of interest rate risk management, designation for a CFH involves the designation of a forecast transaction. This forecast transaction must be highly probable and its characteristics must be known with quite some detail so "that when the transaction occurs, it is clear whether the transaction is or is not the hedged transaction."[16] This leads to the problem that – under today's interpretations the following example of an IMH cannot be accepted as a CFH:
A bank has analysed a portfolio with funding of 100 € available for 5 years. It, currently, can invest the funds in a 2 year fixed rate loan, but does not know exactly what the investment will be in year 3 (following).

[15] Chapter II.2.2
[16] F.3.10

(ill. 19)

			Maturity Schedule				
		notional	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Assets	5Y	100	100	100	0	0	0
Liabilities	5Y	-100	-100	-100	-100	-100	-100
	Net-Position	0	0	0	**-100**	**-100**	**-100**
Forward Swap pay float	**3Y/3m**				**100**	**100**	**100**

The aim of risk management is to fix the interest margin of that gap at the interest rate level of today whatever the investment will be in year 3 – 5. The bank therefore uses a Forward pay-float/ receive-fix Swap. However, as the bank does not know exactly of what kind the follow up investment will be, it is not possible to successfully designate for cash flow hedging as it is interpreted today.

If today's forward rate for Y3-Y5 is 3%, the forward swap will fix this level. Therefore, the (fixed) interest rate of the swap is essential. This holds true whether at the beginning of Y3 we originate a variable-rate or a fixed-rate asset to match the gap. So, if the interest rate level at the beginning of Y3 is eventually 5%, it will not matter if a variable rate asset is originated. But, if a fixed rate asset is generated, the hedge requires some adjustment – explained below - to achieve its original objective: to fix the interest level of 3%.

It is crucial to remain aware of the objective of the IMH: fixing the margin by securing today's interest level for the periods from Y3 to Y5 for any item that will fill the gap.

For the CFH, the Standard comes from the understanding that the entity has to know the transaction today and has to know the characteristics of the transaction today.

For the IMH, the 'future transaction'[17] is highly probable, it actually is certain. The existence of a gap is clear. This will lead to a future interest bearing transaction, however, the terms of which regarding fixed or float is unknown. Nevertheless, for both, the objective is to secure today's interest rate level (of the forward yield curve).

The swap does not loose its purpose, i.e. serving the business with interest payments till maturity, because of the 'non-arrival' of a variable item, i.e. the arrival of a fixed rate item: it has been originated to fix their interest contribution to the level of the time at inception of the hedge (to maturity).

The example has used the risk analysis of the cum approach. It becomes even more poignant when using the risk analysis of the due approach. If an entity uses the risk analysis of the due approach for the previous example, a full hedge would imply 2 swaps that would offset each other in the first 2 years. A synthetic forward swap has been created:

[17] We use the term 'future transaction' as a working term, because it is a forecast transaction that differs in probability not of occurrence but in certainty of its characteristics from today's use of the term

(ill.20)

		notional	Maturity Schedule Y1	Y2	Y3	Y4	Y5
Assets	5Y	100	100	100			
Swap1 pay fix		-100	-100	-100			
Liabilities	5Y	-100	-100	-100	-100	-100	-100
Swap2 pay float		100	100	100	100	100	100

The problem of designation as a CFH increases: How can the entity prove that there are variable items that could be designated?

Problem 1: Where to find the variable items to be hedged for gap Y2 and the first two years of gap Y5: for these first two years the liabilities are funding the assets, there are no variable items; obviously the variable legs of Swap 1 and 2 are netting each other off.
At the inception of both hedges, there are no current variable items.

Problem 2: How do we prove that there will be variable items after Y2?

2.3. Offsetting of variable repricings?

The problems described are not issues of the IMH, but the lack of suitability of the CFH to interest rate risk management and its hedging needs.
The same problem can be seen from the examples of IGC F.6.3, when they are amended to a more realistic scenario (see the schedules) whereby in future time periods the gaps are not just one side, i.e. have the same sensitivity. If they have opposite sensitivities, it will have to come to netting of variable rate items!

The issue that requires addressing is not the probability of a future transaction, but the uncertainty whether a variable rate or a fixed rate item will be filling the initial gap. As we've said before, with interest margin hedging it is not enough to look at just one side of the balance sheet or just one leg of the swap.

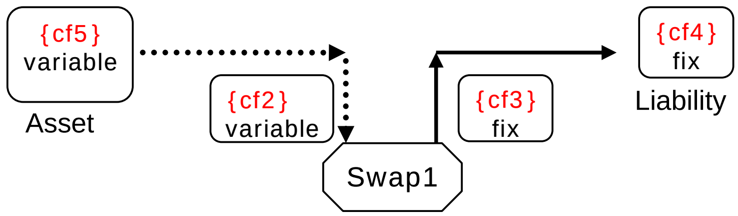
This shall be explained by playing through the hedging scenario at a future date after an initial hedge:

Case 1): The future gap is filled by origination of a variable rate item:

(ill. 21)

		notional	Maturity Schedule Y3	Y4	Y5
Assets	5Y		0	0	0
Liabilities	5Y	-100	-100	-100	-100
	Net-Position	-100	**-100**	**-100**	**-100**
Forward Swap pay float	**3Y/3m**	100	**100**	**100**	**100**
Assets	**Var. 3m**	100	**100**	**100**	**100**

The repricing of variable asset matches the repricing of the variable leg of the swap while the fixed rate liability offsets for the remaining time to maturity the fixed rate leg of the swap:



ill. 22

The cash flows of the assets fill the gap as assumed. Let’s keep in mind that an entity could originate a variable asset at any time – even if a fixed rate asset is originated - provided the going-concern assumption remains valid. It is demonstrated below that this, however, though common practise, does not make sense.

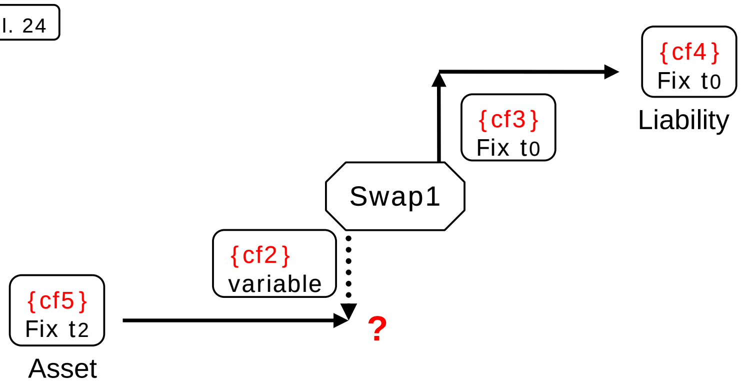
Case 2): The future gap is filled by origination of a fixed rate item:

(ill. 23)

			Maturity Schedule		
		notional	**Y3**	**Y4**	**Y5**
Assets	3Y	100	100	100	100
Liabilities	3Y	-100	-100	-100	-100
	Net-Position	0	**0**	**0**	**0**
Forward Swap pay float	**3Y/3m**	100	**100**	**100**	**100**

The repricing of the variable rate is not matched by the fixed rate asset:

ill. 24



The new fixed rate production that fills the gap requires a rebalancing to the hedge in order to ensure that the objective of the hedge is kept, i.e. the new production in combination with the swap generates the interest rate that was secured previously at the inception of the hedge. There are different ways to achieve this.

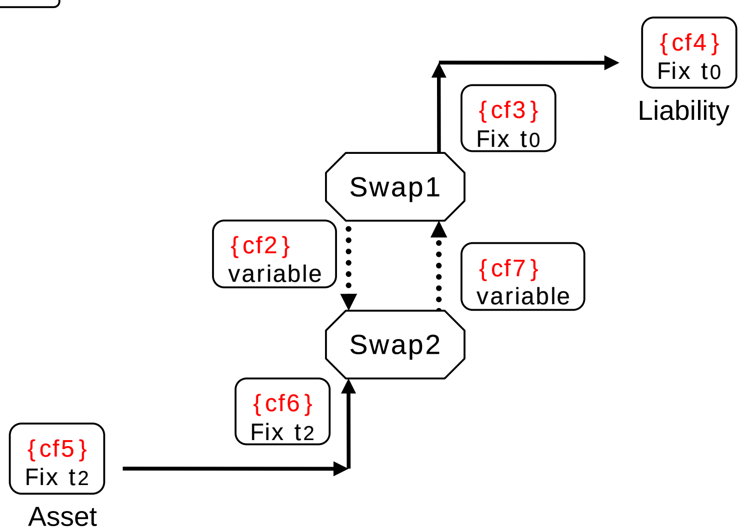
To find an appropriate solution, again, it is vital to keep the objective of this hedging activity in mind: "The aim of risk management is to fix the margin by securing the interest rate level of today for whatever investment will be in year 3 – 5." The underlying business that is managed by this hedging activity serves its purpose by 'delivering interest' until maturity of the items in the portfolio. The same holds true for the derivative: the swap, as well, is meant to stay until maturity.

Therefore, the solution is to use an adjusting swap2 with the markets return structure of the time of inception of the new production added. Whereby the variable legs would have the same terms, the fixed rates would differ from the fixed rates of swap1 and the corresponding liability. Thus the two swaps would deliver the interest differential between the interest yield levels of the different dates (to versus t2) as intended compensation.

(ill. 25)

			Maturity Schedule		
		notional	**Y3**	**Y4**	**Y5**
Assets	3Y	100	100	100	100
Liabilities	3Y	-100	-100	-100	-100
	Net-Position	0	**0**	**0**	**0**
(Forward)[18] **Swap pay float**	**3Y/3m**	100	**100**	**100**	**100**
Swap[19] **receive float**	**3m/3Y**	-100	**-100**	**-100**	**-100**

ill. 26



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[18] At market rate of 2 years ago
[19] At market rate of today (end of Y2)

2.4 Today's Gross Solutions

Under the Standard today, the same result could be achieved by a gross approach: the origination of the future, fixed rate asset could be funded by a variable rate liability, instead of the existing fixed rate liability which could be invested in a variable rate asset. This would render the initial swap effective. It's obvious that this would not make much sense in practical terms of cost and complexity, but it would be possible. The gross solution would look like this:

The bank funds the new fixed rate asset with a new variable liability (2) and hedges the mismatch with a swap (2) as a Fair Value Hedge:

(ill. 27)

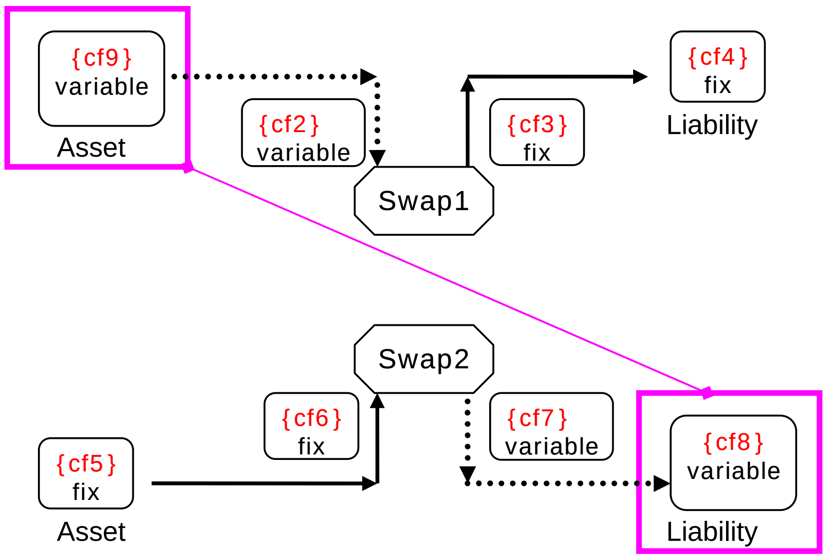
			Maturity Schedule		
		notional	**Y3**	**Y4**	**Y5**
Assets	3Y fix	100	100	100	100
Liabilities, variabel	3m	-100	-100	-100	-100
	Net-Position	0	**0**	**0**	**0**
Swap 2					
receive float	**3m**	100	**100**	**100**	**100**
Pay fix	**3Y**	-100	**-100**	**-100**	**-100**

As there is now excess funding from the initial fixed rate liability (1) remaining still for 3 years, it can be invested in a variable asset (2) which would keep the initial swap effective:

(ill. 28)

			Maturity Schedule		
		notional	**Y3**	**Y4**	**Y5**
Assets(2), variable	3m	100	100	100	100
Liability (1)	3Y	-100	-100	-100	-100
	Net-Position	0	**0**	**0**	**0**
Swap 1					
Pay float	**3m**	-100	**-100**	**-100**	**-100**
receive fix	**3Y**	100	**100**	**100**	**100**

The following graphical illustration highlights how little sense the currently permitted use of cash flow hedges makes for this form of hedging:



ill. 29

The (artificially separate) two hedges could be managed in two separate portfolios (which could be monitored on risk management level on a consolidated basis) or two separate hedges in one portfolio[20]. And, even though the initiation for the hedge would come from the arrival of the fixed-rate asset, it could be designated as a FVH. It just would require taking up a variable liability which could be done at any time. As the liquidity isn't needed, it could be invested in the variable asset that is needed for hedge1 to remain effective.

The generation of variable assets and liabilities is easy, but unnecessary complex and costly, i.e. unnecessary work of effectiveness calculation and documentation, paperwork and margin differences. The easy, simple solution is shown in illustration 26, whereby the offsetting swap2 would have to have the market rates of the date of inception for the time to maturity of swap1.

The acceptance of the variable exposure deriving from swaps is already noted in the Implementation Guidance for interest rate risk. According to IGC F.6.3, 'Identifying, assessing and reducing cash flow exposure' (3), variable rate assets and liability balances are included in a schedule for determining the exposure, even though, the principal amounts are not actually paid, thus not creating a cash flow. However, "since the interest is computed on the principal amounts each period based on the then current market interest rate, such principal amounts expose the entity to the same interest rate risk as if they were cash flows being reinvested or refinanced". Similarly, the variable rate components of swaps are repriced to the current market rates quarterly. Thus, "their notional amounts create an exposure to interest rates that in part is similar to the principal balances of variable rate assets and liabilities"[21].

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[20] One member bank of FBE reports for this reason 240 CFHs in one portfolio
[21] IGC, as above, Schedule III

Unless, the netting of variable rate items of offsetting gaps is accepted, the normal CFH will not function unless other variable items, not deriving from the business that is subject to hedging, such as trading, is used for artificial and arbitrary 'designation'. Even this is not a solution for banks without other activities that create enough 'variable items', e.g. such as mortgage banks. Illustration 29 shows that all of these banks would have to create such gross exposures of variable rate assets and liabilities and unnecessarily blowing up their balance sheet.

A solution (as in ill. 26) would require amendments to IAS 39 or its interpretations, restricted to IMH. The future transaction that is highly probable would be either a variable item (asset in our example) or a fixed rate item, whereby in the latter case an offsetting swap would have to be added for the remaining time to maturity of the fixed rate item, but not longer than the hedging swap, at the then prevailing market rates.

However, with the Standard today, the IMH cannot be designated as a CFH.

3. Summary

The hedging rules of IAS 39 do not permit consideration of *all cash flows* (interest payments) involved in the risk position of the bank, but only some of them. Neither cash flow hedging nor fair value hedging reflects appropriately the hedging transactions which banks undertake when managing interest rate risk. Both methods assume that <u>either</u> assets <u>or</u> liabilities are being hedged whereas banks hedge interest margins, which derive from cash flows of both assets and liabilities. Neither methodology permits the integration of core deposits in the hedging portfolio which is vital for a large number of European retail and savings banks.

Retail banks perceive those two models as being rather artificial and, in particular, have difficulties understanding that a hedge which is designed to protect the banks against one single risk exposure can be reported in two different ways in the financial statements which, moreover, result in an outcome which is substantially different from an accounting perspective.

As a result, many banks feel not comfortable about not being able to designate within the current accounting framework hedged items in a way which corresponds to the designation process used within the framework of their risk management practices. As such designations are being done for accounting purposes only they oblige banks to establish two separate reporting systems which are, moreover, difficult to reconcile.

Fédération Bancaire Européenne
European Banking Federation

INTEREST MARGIN HEDGING

- PART TWO: INTEREST MARGIN HEDGE IN DETAIL -

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[1] Implementation Guidance F.2.6

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APPENDIX 1: CHANGING PORTFOLIO GAPS AND INTEREST RATES

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1.2 Steps of Analysis of the Ineffective Portion of a Derivative
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CHAPTER I: HEDGING THE INTEREST MARGIN IN A PORTFOLIO

Portfolio Hedging, Uncertainty and Under-Hedging

One of the key features of the IMH is the balanced view of a portfolio instead of a view of either assets or liabilities.

The underlying business to portfolio hedging is extremely dynamic: every day, thousands and thousands of deposits are placed with a bank by its clients; every day, thousands and thousands of loans in multiple forms are originated by banks for their clients. Each and every of those transactions have one thing in common: they contribute to the bank's interest margin through interest paid and received.

As said[2], if the funds borrowed (liabilities) and funds invested (assets) are matched, i.e. have the same repricings and amount, there is no risk from market rate movements to the interest margin, the margin is fixed. This is the same whether the match is fixed:fixed or variable:variable. Risk to the interest margin arises only when assets and liabilities in the monitored portfolio differ in their maturities for interest rate adjustments (repricing), resulting in a mismatch.

The easiest way to find such mismatches is by combining the fixed rate assets and fixed rate liabilities in one portfolio, analysing them by their repricing dates. Due to the vast amount of transactions involved, they are clustered into time buckets[3]. Thus, assets and liabilities with the same or close repricing dates are to be found in the same time bucket. This permits to easily detect the natural offset where one fixed rate item (or group) is balanced by another fixed rate item. As a by-product, any excess of one side of fixed rate items over the other becomes apparent. By definition, any excess in a given maturity, i.e. time bucket, will be funded or invested in a floating rate item, thus creating the mismatch.

As all assets and liabilities included in one particular time bucket have the same or close repricing date, they are – on the basis of the same notional amount – fungible or interchangeable regarding the repricing risk. They are also interchangeable regarding their contribution to the mismatch of the particular time bucket, i.e. the gap. Because of this interchangeability, the mismatch or gap is defined in terms of a notional amount, not of specific items. It would be completely arbitrary to identify specific items of the fixed rate excess side as being hedged because any of them or any combination of them up to the amount of the mismatch would 'qualify'.

It is only the residual risk of the mismatch that is managed by ALM departments. When hedging, a swap is chosen that matches the repricing dates of the mismatch in that specific time bucket and the amount to the extent hedging has been decided. The timing of all the cash flows from the cash positions (assets and liabilities) and the timing of the swap's cash flows match each other in the same time bucket.

[2] Part One, Chapter I.2
[3] The lengths of the time buckets vary, but they correspond to periods during which historical data show that the benchmark rate will move for only an insignificant amount.

Banks can have different approaches to risk-taking. Some institutions adopt a fully hedged approach (all the interest risk is concentrated in the trading portfolios), others accept some gap exposures along the yield curve leading to pre specified levels of earnings at risk. The form and extent to which the banking book interest rate risk exposure can be taken is governed by Board-approved guidelines and limits.

However, in addition to the level of risk coverage chosen, there is some uncertainty to the future composition of the portfolio that needs to be considered. The composition of any of these portfolios over time can change due to prepayments, withdrawals of deposits and potential loan defaults. We have pinpointed before that some financial instruments included in the banking book encompass some embedded optionality features and their effective duration differ from the contractual one; the result is a divergence between the contractual and the actual cash flows attached to such products. As effective maturities depend on customers' behaviours, behaviouralized durations are calculated, based on historical statistics to allocate these instruments to the period of their economic maturities. Though based on sophisticated econometric models, these stated maturities bear some degree of uncertainty due to modelling assumptions.

These changes can increase the size, i.e. its amount, of the mismatch or reduce it. As explained in Part One, an increase in size would not change the effectiveness of the hedge. However, a decrease in the mismatch to an amount of less than the notional amount would cause ineffectiveness of the hedging derivative as not all of its cash flows would be offset. As the object of the hedge is to reduce variability only, such ineffectiveness has to be avoided by considering the extent of potential error in assumptions on expected prepayments, withdrawals or loan defaults. Therefore, banks take into consideration risk measurement uncertainties by applying a conservative view on hedging mismatches, and hedge only a fraction of them, measured by its "volume at risk". The uncertainty is matched by careful hedging.

This means hedging less than the full amount of the notional mismatch, i.e. under-hedging. This under-hedging is to ensure that there are always enough items on the fixed rate excess side to compensate for any unexpected prepayments, withdrawals or loan defaults, so they will not cause ineffectiveness of the hedge. This technique has some similarity with the designation in the so called "first-payments-received technique", used to identify the hedged items within a rolling portfolio. In both, the portfolio is considered as a whole and a hedged subset (amount) of similar items is defined at the inception of the hedge, without identifying any of these items specifically. In both cases, all the items are similar in regards to the hedged risk; as the timing of the hedged cash flows are in the same time bucket, they also are similar to those of the hedging swap(s) included in the same time bucket. In all these cases, there are sufficient amounts of cash flows for offset between the hedging instrument and the hedged items for the designated risk over the reporting period and consequently, no ineffectiveness to be recognised in earnings.

CHAPTER II: DUE APPROACH VERSUS CUM APPROACH

1. *Description of the concepts*[4]

The interest margin of a specific period is at risk as soon as there is a mismatch between fixed rate assets and fixed rate liabilities which are *outstanding* during this specific time period. Every fixed rate asset or liability contributes to increasing / reducing the interest margin concerning every period before its maturity date, due to its interest rate component yield. This leads to consider the outstanding notional of each fixed rate asset and fixed rate liability in the portfolio in every period before their maturity dates, as a replication of its benchmark interest rate risk profile.

Within the European banks, the IMH is currently practiced in two major forms, based on two different approaches to liquidity management and interest risk measurement. This leads to two different concepts of what form of Gaps ought to be managed and hedged: The due approach and the cumulative approach. In the due approach, assets with any residual maturity have to be funded by liabilities of the same residual maturity for considering there is no liquidity - and rates mismatches. In the cumulative approach, an asset with a 5 year residual maturity can be partially funded by a liability of 3years maturity: the bank has ”transformed” the funding on a longer basis and the gap is a forward one, two years in three years. The rationale for the two approaches are two different ways of transformation.

The due approach could be described as a *horizonta*l view on the variability of interest margin whilst the cumulative approach would represent a *vertical* view. Depending on the direction chosen to analyze the same risk, the hedged interest margin is either horizontal (example: margin of the next 5 years) or vertical (example: margin of (in) year 2010). Whilst the nature of the interest rate risk is the same, the measurement processes are different. The identified gaps under the two methods are different, and, as a consequence of partial hedging of each gap, the resulting hedging relationships are not the same, and also, the unhedged portions of the portfolio differ.

In the due (horizontal) approach, assets and liabilities are “sliced” in the horizontal direction, which enables to calculate the reimbursed (due) capital during each future time band: the notional is considered at its due reimbursement date. On every period prior to their due reimbursement date, the notional is outstanding. In general, the due approach Gaps could be described as consisting of

• fixed rate assets and liabilities [of a designated portfolio] within a specified range (e.g. 3months, 1 year, 5 years…) of their final, remaining maturities.

In the cumulative (vertical) approach, assets and liabilities are “sliced” in the vertical direction, which enables to calculate the outstanding capital of each future time band, cumulating the notionals (vertically) across different final maturities. In general, the cumulative approach Gaps could be described as consisting of all fixed rate assets and liabilities [of a designated portfolio] within a specified range of time (e.g. 3months, 1 year), independent of their final maturities.

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[4] See for initial explanation Part One, Chapter II.3

The two approaches analyze the total portfolio into Gaps of different consistencies and accordingly different hedging strategies.

The due approach defines specific Gaps within a portfolio by grouping assets and liabilities according by similar final maturities. The cumulative approach defines a Gap by looking at the impact of all assets and liabilities of the portfolio to the interest margin of a specified time period (e.g. 3 month, 1 year), and associates hedging instruments accordingly.
The following examples are intended to highlight the differences of the interest risk matching and hedging concepts between the due and the cumulative approach.

2. *Example – Basis Case*

The base example (A1) uses a portfolio consisting of two fixed rate assets and two fixed rate liabilities of maturities between 2 and 5 years (ill. A1).

The **due approach** will analyze these into **4 Gaps** as documented in the column **'due net position'**. The Gaps are defined by the nominal or notional amounts of assets and liabilities and their respective maturities[5], though the impact of the Gap will be in each of the years up to the respective maturity.

The **cumulative approach** will analyze the portfolio into **5 Gaps** according to the years of maturity. It reveals open Gaps only for year 3 to 5 as documented in the row **'cumulative net position'**.

(ill. A1)

			Maturity Schedule Y1	Y2	Y3	Y4	Y5	*due* Net-Position	
Assets	5Y	100	100	100	100	100	100	**100**	**Y5**
	3Y	200	200	200	200			**200**	**Y3**
Liabilities	4Y	-200	-200	-200	-200	-200		**-200**	**Y4**
	2Y	-100	-100	-100				**-100**	**Y2**
	cumulative Net-Position		**0**	**0**	**100**	**-100**	**100**		
					Y3	**Y4**	**Y5**		

In order to hedge this exposure by 50%, the *due approach* requires 4 hedging swaps to each of the Gaps as shown (ill. A1-1) in the column "net position due" thus reducing the variability in each of the Gaps by 50% (compare column "overall" to the due position in ill. A1).

[5] In this example, the time-bands of the maturity-schedule are one year long. In practice, banks use shorter intervals to identify mismatches, such as months or quarters.

(ill.A1-1)

Swaps	due		Y1	Y2	Y3	Y4	Y5	***Net-Position*** **due**	**overall**
pay fix	5Y	-50	-50	-50	-50	-50	-50	**-50**	***50***
	3Y	-100	-100	-100	-100			**-100**	***100***
rec fix	4Y	100	100	100	100	100		**100**	***-100***
	2Y	50	50	50				**50**	***-50***

The *cumulative approach*, on the other hand requires for its exposure 3 forward swaps to the three open Gaps as shown (ill. A1-2), also reducing the variability in each of the Gaps by 50% (compare column "overall" to the cumulative Net -position in ill. A1).

(ill. A1-2)

FwdSwaps cum		**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
payfix	4Y/1Y					-50
recfix	3Y/1Y				50	
payfix	2y/1Y			-50		
		0	0			
cumulative Net-Position		**0**	**0**	**-50**	**50**	**-50**
overall		***0***	***0***	***50***	***-50***	***50***

It can be seen from the initial portfolio representing the same risk that the difference between the two methods is less conceptual, but rather a matter of practical measurement methodology. Moreover, the portfolio is hedged the same way: the four swaps entered into for the due approach create synthetically the effect of the three forward swaps needed for the cum approach. It is future changes to the portfolio that create different consequences for exposure and hedging.

2.1. Example - prepayment Case A2

Case A2 extends the base case (A1) by prepayments of the 3Y-loans by 150 € at the next re-measurement date which represent changes to the initial Gaps (ill. A2).

(ill. A2)

	prepayment 3Y: -150		**Maturity Schedule**						
			Y1	**Y2**	**Y3**	**Y4**	**Y5**	**Net-Position** ***due***	
Assets	5Y	100	100	100	100	100	100	**100**	**Y5**
	3Y	50	50	50	50			**50**	**Y3**
Liabilities	4Y	-200	-200	-200	-200	-200		**-200**	**Y4**
	2Y	-100	-100	-100				**-100**	**Y2**
	cumulative Net-Position		**-150**	**-150**	**-50**	**-100**	**100**		

For the position under the *due approach* this leads to ineffectiveness of the hedging swap of the specific Gap in Y3 by a notional amount of 50 (ill. A2-1). The original swap of notional -100 is overhedging the amended initial Gap by 50:

(ill. A2-1)

								Net-Position		
Swaps	**due**	original	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	***due***	**overall**	
pay fix	5Y	-50	-50	-50	-50	-50	-50	**-50**	***50***	**Y5**
	3Y	-100	-100	-100	-100			**-100**	***-50***	**Y3**
rec fix	4Y	100	100	100	100	100		**100**	***-100***	**Y4**
	2Y	50	50	50				**50**	***-50***	**Y2**

For the *cumulative approach*, changes occur within Gaps 1Y to 3Y (ill. A2-2). However, no hedging derivative is associated with Gap 1Y and 2Y; the change is just a reduction of the natural hedges of the fixed rate assets and liabilities in these periods, leading to open Gaps that have not been hedged. As there has not been any derivative been designated for these Gaps, there is no ineffectiveness to be measured.

But in Gap 3Y the prepayments lead to ineffectiveness of the associated hedging forward swap in full. The impact beyond the notional amount of 50 relates again to a reduction of the initial natural hedges of the fixed rate assets and liabilities and a new Gap in this period with which no (further) hedging derivative has been associated.

(ill. A2-2)

FwdSwaps cum		original	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
payfix	4Y/1Y						-50
recfix	3Y/1Y					50	
payfix	2y/1Y				-50		
			0	0			
	cumulative Net-Position		**0**	**0**	**-50**	**50**	**-50**
		overall	***-150***	***-150***	***-100***	***-50***	***50***
		ineffective			50		

2.2. Example - prepayment Case A3

Case A3 extends the base case (A1) by prepayments of the 5Y-loans by 60 € at the next re-measurement date which represent changes to the initial Gaps (ill. A3).

(ill. A3)

	prepayment 5Y: - 60		**Maturity Schedule**						
			Y1	**Y2**	**Y3**	**Y4**	**Y5**	***Net-Position due***	
Assets	5Y	40	40	40	40	40	40	**40**	**Y5**
	3Y	200	200	200	200			**200**	**Y3**
Liabilities	4Y	-200	-200	-200	-200	-200		**-200**	**Y4**
	2Y	-100	-100	-100				**-100**	**Y2**
	cumulative Net-Position		**-60**	**-60**	**40**	**-160**	**40**		

For the *due approach* this leads to ineffectiveness of the hedging swap of the specific Gap in Y5 by a notional amount of 10 (ill. A3-1).

(ill. A3-1)

Swaps	**due**	original		**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	***Net-Position*** ***due***	**overall**	
pay fix	5Y		-50	-50	-50	-50	-50	-50	**-50**	***-10***	**Y5**
	3Y		-100	-100	-100	-100			**-100**	***100***	**Y3**
rec fix	4Y		100	100	100	100	100		**100**	***-100***	**Y4**
	2Y		50	50	50				**50**	***-50***	**Y2**

For the *cumulative approach*, changes occur within Gaps 1Y to 5Y (ill. A3-2). However, as no hedging derivative is associated with Gap 1Y and 2Y, the change is just a reduction of the natural hedges of the fixed rate assets and liabilities in these periods. The prepayments in Gap 4Y lead to no ineffectiveness of the associated hedging forward swap because they have caused a widening of the initial Gap in that period: the initial swap is still effective in full to the amount hedged. The initial hedge remains effective in reducing the variability of the interest margin for that period. The new Gap is just 'underhedged'.

However, partial ineffectiveness of the hedging derivatives associated with Gap 3Y and Gap 5y has occurred.

(ill. A3-2)

FwdSwaps cum			**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
payfix	4Y/1Y						-50
recfix	3Y/1Y					50	
payfix	2y/1Y				-50		
			0	0			
	cumulative Net-Position		**0**	**0**	**-50**	**50**	**-50**
		overall	***-60***	***-60***	***-10***	***-110***	***-10***
		ineffective			10		10

As can be seen from these introductory examples, the differences between the due and the cum approach from changes to the initial position occur because of the two different methods of gap measurement that lead to two different methods of assessing effectiveness. This requires following the risk positions and their respective hedging separately.

CHAPTER III: EFFECTIVENESS TESTING – THE HEDGE MATRIX

As explained in Part One (Chapter III), effectiveness has to be assessed based on the hedging objective. Given that the hedging objective within the IMH framework is a reduction of interest margin volatility for an identified gap, the only reason for ineffectiveness within the IMH framework would be over-hedging: Ineffectiveness, initially, can occur only if either a hedging derivative would have an ***amount larger than the Gap***, (in case of the example in Part One, Chapter III, e.g. € 200), or a ***maturity longer than the Gap***, (in case of the example in Part One, Chapter III, e.g. 6 years).

Assuming that initial hedging is performed correctly, over-hedging might occur at a later stage, due to realized prepayments or the re-scheduling of either prepayable assets or core deposits. All those events could lead to a situation where the bank's hedging instruments are no longer reducing the volatility in interest margin but adding additional earnings volatility to any initial Gap.

Testing for effectiveness of any hedged gap requires following (tracking)

- the Gap(s) of a portfolio as initially analysed and
- the derivative(s) chosen to hedge this Gap.

Therefore, it is necessary to document in the hedging process the Gap (and its initial composition) designated to be hedged and the chosen derivative to be designated as a hedging instrument. For this purpose, a schedule – like the one used for the examples in Chapter II – can be used: the Hedge Matrix. It has to document the fixed rate assets and fixed rate liabilities that create the Gap, the hedging instrument and the result of the combination of the two: the net Gap.

To hedge partially or totally the interest margin variability, asset and liability managers enter into receiver swaps when the position is liability sensitive (fixed rate liabilities amount greater than fixed rate assets amount), or into payer swaps when the position is asset sensitive (fixed rate assets amount greater than fixed rate liabilities amount). Like the fixed rate assets and fixed rate liabilities in the portfolio, swaps contribute to the variability in every period prior to their maturity dates. They equally need to be considered for their outstanding notional amount in each of those periods. The method is exactly the same as the one used to build the schedule of fixed rate assets and fixed rate liabilities.

As the interval of fixing the variable rate of the swap is frequent- 3 or 6 months-, any mismatch with variable interest paid or received on the variable cash positions cannot be material

For a simple example, this hedge matrix, could look like the following, representing the prospective Test:

(ill. B1)

Outstanding	1 Y	2 Y	3 Y	4 Y	5 Y	6 Y	7 Y	8 Y	9 Y	10 Y
Assets	100	100	100	100	100					
Liabilities	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80
Gap	20	20	20	20	20	-80	-80	-80	-80	-80
Swap	-10	-10	-10	-10	-10					
Net Gap	10	10	10	10	10	-80	-80	-80	-80	-80
Effective?	Yes	Yes	Yes	Yes	Yes					

The first thing to become apparent is the fact that, obviously, the interest rates between a five year maturity versus a 10 year maturity would be different. Even if assets and liabilities have been originated at exactly the same time, they bear a different fixed benchmark rate since rates on the benchmark yield curve depend on the maturity. However, assets and liabilities of different maturities contribute to every period prior to their maturity dates independently of the fixed rates which they bear. The variability of the interest margin *does not depend on the absolute level of fixed rate assets and fixed rate liabilities* but on the net open position (the difference in the amount) between fixed rate assets and fixed rate liabilities. The difference in level of the respective fixed rates has no impact on the effectiveness of the IMH, only the difference in amount.

The Matrix shown represents an effective hedge under the cumulative approach whereby the liabilities (- 80) have a maturity of 10 years, matching (partially) assets (100) of maturity 5 years. The example will remain simple for the moment; therefore, it can be used under the due approach as well (we just need to assume the maturity of the liabilities to be 5 years).

The hedge is an effective partial hedge, leaving an amount of 10 and the Gap in years 6 to 10 unhedged.

At the end of the respective accounting period, the test needs to be repeated using the same assets and liabilities that created the initial Gap(s) versus the initial swap(s). In other words, at the end of each testing period, the effectiveness must be tested using:

- the same assets and liabilities that were outstanding at the beginning of the tested period
  - adjusted for prepayment during this period, and
  - adjusted for any re-scheduling of either prepayable assets or liabilities,
- the derivatives outstanding at the beginning of the tested period.

Since ineffectiveness occurs when over-hedging occurs, and since the net position was necessarily fully- or under-hedged at the beginning of the testing period, *the ineffectiveness can only come from the disappearance of initially outstanding assets and/ or liabilities*.

In fact, there are two ways in which assets and liabilities can disappear:

- *realized disappearance*: for instance, assets have been prepaid unexpectedly in the tested period, or the demand deposit balance at the end of the tested period is less than the synthetic fixed rate bond issuances built at the beginning of the tested period;
- *anticipated disappearance*: expected prepayment of assets or expected withdrawals of liabilities could be greater than schedules calculated at the beginning of the tested period.

1. *Ineffectiveness due to Realized Prepayment*

Amending the previous example: At the end of Y 1, an amount of 20 is unexpectedly prepaid (ill. B2). It leads to ineffectiveness of the hedging derivative for the remaining time to maturity.

(ill. B2)

Outstanding	**1 Y**	**2 Y**	**3 Y**	**4 Y**	**5 Y**	**6 Y**	**7 Y**	**8 Y**	**9 Y**	**10 Y**
initial		100	100	100	100					
prepayment		-20	-20	-20	-20					
Assets		80	80	80	80					
Liabilities		-80	-80	-80	-80	-80	-80	-80	-80	-80
Gap		0	0	0	0	-80	-80	-80	-80	-80
Swap		-10	-10	-10	-10					
Net Gap		-10	-10	-10	-10	-80	-80	-80	-80	-80
Effective?		No	No	No	No					

2. *Ineffectiveness Due to Re-assessment of Expected Re-Pricing*

If market rates change, the expectation of prepayments has to be re-assessed. In our example, market rates drop in forecast for the following years. Therefore, the portfolio has to reconsider its expected prepayments to further 20 in Y4 (ill. B3). The result is that the derivative becomes ineffective for Y4 and Y5, while remaining effective for the first two years.

(ill. B3)

Outstanding	**1 Y**	**2 Y**	**3 Y**	**4 Y**	**5 Y**	**6 Y**	**7 Y**	**8 Y**	**9 Y**	**10 Y**
initial		100	100	100	100					
new prepayment expectation		0	0	-20	-20					
Assets		100	100	80	80					
Liabilities		-80	-80	-80	-80	-80	-80	-80	-80	-80
Gap		20	20	0	0	-80	-80	-80	-80	-80
Swap		-10	-10	-10	-10					
Net Gap		10	10	-10	-10	-80	-80	-80	-80	-80
Effective?		Yes	Yes	No	No					

3. *Effectiveness and New Production?*

A particular situation arises when overhedging of the initial Gap is not separated from the origination of new products, e.g. in our case (B2) by the origination of a new loan of 20 for Y2 to Y6. If considered with existing balance sheet items from the opening of the period, new production could camouflage the overhedging of the initial Gap. Therefore, the ineffectiveness test has to ensure that it captures ineffectiveness due to the disappearance of assets and liabilities *from the initial hedging relationships* without being deceived by assets and/ or liabilities that entered the hedged portfolio at later dates (hidden ineffectiveness", i.e. new business replacing "initial fixed items" the disappearance of which would have caused ineffectiveness of the hedge without the arrival of the new business).

(ill. B4)

Outstanding	**1 Y**	**2 Y**	**3 Y**	**4 Y**	**5 Y**	**6 Y**	**7 Y**	**8 Y**	**9 Y**	**10 Y**
initial		100	100	100	100					
prepayment		-20	-20	-20	-20					
new loan		20	20	20	20	20				
Assets		100	100	100	100					
Liabilities		-80	-80	-80	-80	-80	-80	-80	-80	-80
Gap		20	20	20	20	-60	-80	-80	-80	-80
Swap		-10	-10	-10	-10					
Net Gap		10	10	10	10	-60	-80	-80	-80	-80
Effective?		No	No	No	No					

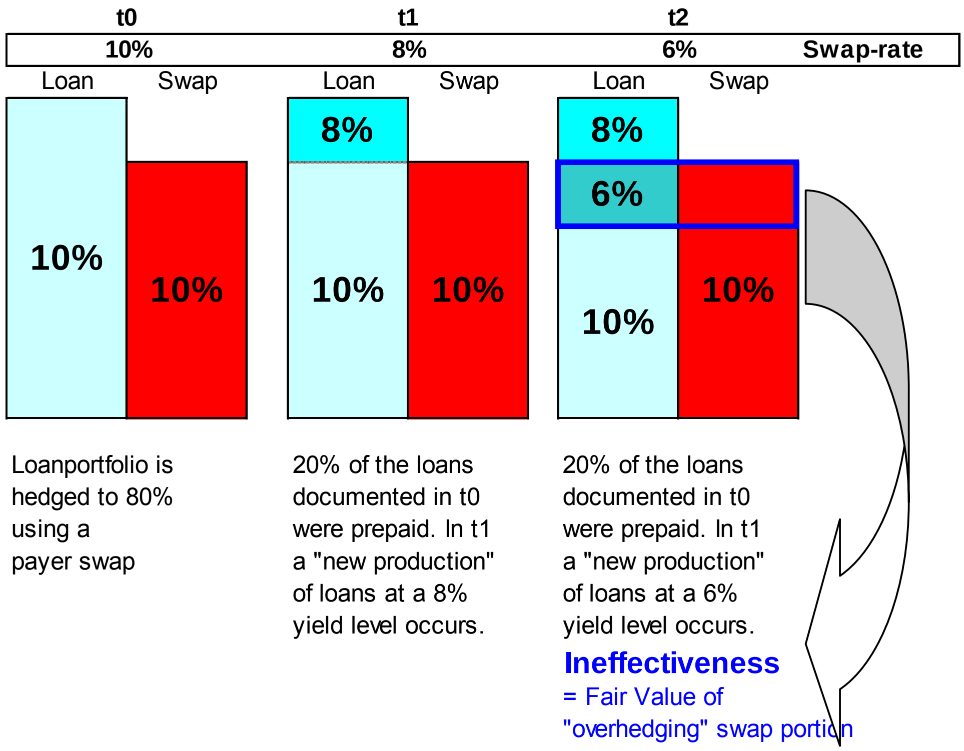
The reason for tracking "hidden ineffectiveness" lies in the objective of the initial hedge: to secure for future transactions the market level of interest rate at the time of inception (when reducing variability of the gap). New production, therefore, cannot be hedged by older hedges as the intention for the hedge was designated to gaps of different times.

The impact of different interest rate levels can be visually demonstrated by the following, slightly more complicated example:

t0) The gap (of notional 100) of a loan portfolio, generated at a 10% yield level, has been hedged with a swap by 80 % at the beginning of the period (t0).

t1) One period later 20% of the original loan portfolio has been prepaid, without causing any ineffectiveness (because the initial gap is still effectively hedged, though now at 100%). At the same moment additional loans were generated by the bank (carrying 8% interest p.a.) which where left unhedged.

t2) At the end of the second period the bank recognizes that additional 20% of the original loan portfolio has been prepaid. Due to the prepayments in t1 and t2, only 60% of the originally generated loans still remain while the 40% of the gap have been replaced by loans carrying a lower interest that was not intended to be offset by the initial hedge at a 10% yield.



As a consequence, 20% of the hedging derivative need to be closed (or offset) in order to enter the amount of cumulated fair value change of that ineffective part into P&L. Additionally if the clients that had prepaid have to pay a fair (or market based) close out fee, this additional interest income would off set in the same period the ineffectiveness caused by the swap close out.

The general principles for detecting overhedging (ineffectiveness) and hidden ineffectiveness are the same for the due and the cum approach. However, due to the different consistencies of the identified Gaps there is a need for correctly identifying the initial hedging relationships in different hedge matrices.

The due approach defines specific Gaps within a portfolio by grouping assets and liabilities according to similar final maturities. The cumulative approach defines a Gap by looking at the impact of all assets and liabilities of the portfolio to the interest margin of a specified time period (e.g. 3 month, 1 year), and associates hedging instruments accordingly. Therefore, a prepayment will always affect only one Gap under the due approach (the Gap of its maturity), but under the cumulative approach all Gaps up to the related maturity will be affected. Therefore, it is necessary to follow the risk positions and their respective hedging decisions differently under the due and the cum approach.

CHAPTER IV: THE MATRIX UNDER THE DUE APPROACH

1. Detecting Ineffectiveness

Under the due approach, specific Gaps are defined within a portfolio by grouping assets and liabilities according to similar final maturities. Even though the absolute level of fixed interest rates have no bearing for effectiveness, as mentioned before, products originated at the same time with the same maturity have the same (or similar) benchmark interest rates. In general, different maturities have also different interest rates.

Therefore, the hedge matrix under the due approach will cluster fixed rate items of the same production, i.e. the same maturity (within a reasonable range, e.g. 3 month) and the same benchmark rate (within a reasonable range, e.g. 0.25%), when determining the Gap that should be hedged.

To illustrate, the previous example (B1) would show two Gaps of 5 and 10 years:

(ill. C1)

Gap1: 5 Y, 3%-3.25%	1 Y	2 Y	3 Y	4 Y	**5 Y**
Assets	100	100	100	100	**100**
Liabilities	?	?	?	?	?
Gap	?	?	?	?	?
Swap	-10	-10	-10	-10	-10
Net Gap	?	?	?	?	?

Gap2: 10 Y, 3.5%-3.75%	1 Y	2 Y	3 Y	4 Y	5 Y	6 Y	7 Y	8 Y	9 Y	**10 Y**
Assets	0	0	0	0	0	0	0	0	0	0
Liabilities	-80	-80	-80	-80	-80	-80	-80	-80	-80	**-80**
Gap	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80
Swap										
Net Gap	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80

Both ranges for the Gaps are determined by the need to select a suitable derivative of the same maturity and benchmark rate. Even though any swap can hedge any fixed rate effectively for reducing variability of the margin of the Gap, normal business has led to the effect that hedging derivatives tend to be close in their benchmark rate to the benchmark rate of the fixed items of a certain production.

As the due hedge matrix allocates items with reference to their respective benchmark interest rates and maturity date, hedges are normally put in place in or around the same time as the underlying transactions. Therefore, hedging derivatives will naturally fall into the correct Gap sections as the positions they are hedging.

The previous examples (B1) and (B2) look in the short form of the due hedge matrix like this:

(ill. C2)

Gap1: 3%-3.25%	**5 Y**
Assets	100
Liabilities	-80
Gap	20
Swap	-10
Net Gap	10

(ill. C3)

Gap1: 3%-3.25%	**5 Y**
initial	100
prepayment	-20
Assets	80
Liabilities	-80
Gap	0
Swap	-10
Net Gap	-10

Effectiveness and ineffectiveness are clearly visible.

As different interest rate level occur over time, the same range of interest rate of different maturities will appear in the matrix. Furthermore, the matrix will contain all ranges according to their remaining maturity, e.g. a 3%-3.25% range for initially 5Y maturity will after one year have a remaining maturity of 4 years and appear in the matrix accordingly. The matrix for maturities up to 6 years and the range of 3%-3.25% – on a Gap level - could therefore look like the following:

(ill. C4)

3% - 3.25%	**1 Y**	**2 Y**	**3 Y**	**4 Y**	**5 Y**	**6 Y**
Net Asset Gap + / Net Liability Gap -	-50	100	150	120	150	10
Swap -Portfolio (Rec Fix + / Pay Fix -)	50	-100	-150	-120	-120	0
Net-Position (Fix Rate Gap after Hedge)	0	0	0	0	30	10
Effectiveness?	Yes	Yes	Yes	Yes	Yes	Yes

The Gaps of Y1 to Y4 are fully hedged, the Gap of Y5 is underhedged and the Gap of Y6 was left unhedged.

1.1. Unexpected prepayment

We amend the previous example by the occurrence of an unexpected prepayment in the 4Y Gap of 60 reducing the initial Gap to 60. This leads to an ineffective amount of the hedging swaps of 60:

(ill. C5)

Step 1
Impact of Realized Prepayments: CU 60

Net Asset Gap + / Net Liability Gap -

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	-50	100	150	60	150	10

Swap -Portfolio (Rec Fix + / Pay Fix -)

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	50	-100	-150	-120	-120	0

Net-Position (Fix Rate Gap after Hedge)

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	0	0	0	-60	30	10

It becomes apparent that the variability in interest margins increases from earlier than expected prepayments because they give rise to over-hedging in the respective gaps from the hedging derivatives previously entered into.

1.2. Re-assessment of expected prepayments

Any unexpected prepayment as well as changes in the level of interest rates have to be followed by a re-assessment of the expected repricing dates for future periods. For our example, we assume that a further shift of expected prepayments of 50 will occur from Y5 to Y4, leading to the following matrix:

(ill. C6)

Step 2
Re-assessment of expected repricing

Net Asset Gap + / Net Liability Gap -

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	-50	100	150	110	100	10

Swap -Portfolio (Rec Fix + / Pay Fix -)

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	50	-100	-150	-120	-120	0

Net-Position (Fix Rate Gap after Hedge)

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	0	0	0	-10	-20	10

Effectiveness?

	1Y	2Y	3Y	4Y	5Y	6Y
3% - 3.25%	YES	YES	YES	NO	NO	YES

The final result of the re-assessment shows over-hedging in the 4 year gap of CU -10 and in the 5 year gap of CU -20.

Once ineffectiveness for the designated Gaps has been detected precisely and reliably, it has to be followed by the identification of the ineffective derivative and its cumulated fair value change to be taken out of equity into P&L.

2. Identification of the Ineffective Derivative

The primary objective that any method of testing ineffectiveness needs to meet is to identify ineffective derivatives (or portions thereof) within a specified portfolio. Ineffective derivatives (or portions thereof) are required to be treated like trading derivatives with their fair value accounted for through the P&L. Any cumulative gain or loss of the derivative that has been booked in equity while being effective as a hedge has to be recognised in P&L immediately when and to the extent that ineffectiveness occurs.

The secondary objective that any method of testing ineffectiveness needs to meet is the prevention of management discretion in choosing the cumulative gains or losses of an ineffective (portion of a) derivative ('cherry picking'). Otherwise, management would be in a position to influence the reported performance of the business. Therefore, any chosen method needs to be of a systematical and rational quality that prevents, as much as possible, subjective choices.

In a micro hedge, one hedged item is associated with *one* hedging derivative by definition. However, the IMH portfolios contain large numbers of transactions within each of the Gaps defined to be hedged. The derivatives are associated with the defined Gaps under both approaches (cum and due) and ineffectiveness can occur at times, normally driven by unexpected prepayment. Under these circumstances, a reasonable approach to the choice of method for selection of the ineffective derivative (or portion thereof) should be taken which offers a suitable compromise between auditibility and practical ability for implementation, documentation and tracking.

One advantage of the due matrix is that it clusters fixed rate items of the same production, i.e. the same maturity (within a reasonable range, e.g. 3 month) and the same benchmark rate (within a reasonable range, e.g. 0.25%), when determining the Gap that should be hedged. Both ranges are determined by the need to select a suitable derivative of the same maturity and benchmark rate. Even though any swap can hedge any fixed rate effectively for reducing variability of the margin of the Gap, normal business has led to the effect that hedging derivatives tend to be close in their benchmark rate to the benchmark rate of the fixed items of a certain production. Hedging derivatives and their fair value changes in equity are characterised by their interest rates which are closely connected to specific generations of hedged items marked by their (benchmark) interest rate. Thus, the hedging derivatives associated with the relevant Gap of the matrix will have approximately the same proportionate cumulative gain or loss.

This way, the method overcomes the identification issue that arises if a hedged item is derecognised (e.g. because of prepayment), with the result that the respective gain or loss on the hedging derivative has to be recognised in profit or loss.

However, there are situations where the tracking of the initial hedge relations as well as the necessary identification of the related ineffective derivative and its cumulative fair value becomes more complicated. For instance, if hedging occurs some time after the inclusion of the financial instrument in the portfolio, the rule of fixing the benchmark rate of an item is not clear: we have to choose between:

- the value date of the item,
- the date it is included in the hedged portfolio
- the date it is hedged effectively – if we choose this one , we have to define a rule to identify the hedged item within an underhedged portfolio.

As rates may have moved in either direction, the assumption of closely related benchmark rates becomes invalid. In such a case, the instruments added later require some manual intervention for correct allocation to the relevant Gap section.

Any balance sheet item added to the IMH portfolio has to be allocated to the relevant Gap which is defined by (a) the remaining maturity and (b) the benchmark interest rate prevailing at the date when the contract is included in the IMH portfolio.

If a derivative is hedging a different (i.e. older) production/generation of fixed rate items than the current one, it has to be linked to the associated production it intends to hedge (e.g. by a flagging mechanism in the bank's derivative F/O and / or B/O system).

Appendix 1 contains an example (with four cases) in which a hedged portfolio gap is changed in regards to the amount hedged amidst an environment of changing interest rates.

If ineffectiveness occurs the bank has to identify the hedging derivative (or portion thereof) "responsible" for the over-hedging situation. Therefore the bank has to define a consistent approach/method to identify - out of (potentially) several derivatives hedging one production/gap - the ineffective derivative(s).

One method for the due approach of identifying the amount to be taken out of equity into P&L that clearly prevents subjective cherry picking is the use of an algorithm, which detects – within the same remaining maturity - the derivative with the yield closest to the prepaid balance sheet item. The use of this algorithm would render the question of appropriate size of a benchmark rate range irrelevant.

However, using a FIFO or LIFO method would also provide a – potentially more practical - systematic and rational method of identifying the ineffective derivatives (or portions thereof), thus preventing subjective choices that would allow cherry picking. However, it may be necessary to limit the size of ranges used for defining the Gap in order to prevent counterintuitive results.

CHAPTER V: THE MATRIX UNDER THE CUM APPROACH

1. Detecting Ineffectiveness

Under the cumulative approach, every fixed rate asset or liability contributes to increasing / reducing the interest margin concerning every period before its maturity date. This leads to consider the outstanding notional of each fixed rate asset and fixed rate liability in the portfolio in every period before their maturity dates.

Our previous example: a portfolio, seen from the 1st January 2006, is built of a 100 fixed rate asset of maturity 5 year (i.e.: maturity date = 01.01.2011), and of a 80 fixed rate liability of maturity 10 year (i.e.: maturity date = 01.01.2016), the interest margin is at risk for a notional amount of:

- 20 for all the periods before 01.01.2011 (asset sensitive),
- 80 for all the periods between 01.01.2011 and 01.01.2016 (liability sensitive),
- 0 (i.e. no risk) for periods after 01.01.2016.

The bank decides to partially hedge just the first 3 years of the interest margin variability, it enters into a 3 year swap fixed rate payer / floating rate receiver swap for a notional amount of 10.

(ill. D1)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets	100	100	100	100	100					
Liabilities	-80	-80	-80	-80	-80	-80	-80	-80	-80	- 80
Net Gap	20	20	20	20	20	-80	-80	-80	-80	-80

Swap	-10	-10	-10							

Effective?	Yes	Yes	Yes	-	-	-	-	-	-	-

1.1. The initial hedge relationship

The *cumulative approach* defines a Gap by looking at the impact of all fixed rate assets and liabilities of a portfolio on the interest margin of a specified time period (e.g. 3 month, 1 year), and associates hedging instruments accordingly. Each Gap encompasses assets and liabilities with different maturities and, therefore, even if they are issued during the same period, those assets and liabilities do not share the same benchmark rate level. As there is no direct link between the bench mark rates of the fixed rate items and the derivatives, other methods have to be applied to ensure that the objectives described above are met.

For the detection of “hidden ineffectiveness” from addition of new production under the cumulative approach, a test has been developed which consists in comparing origination dates of fixed rate items to the hedging derivative. This test is explained in detail in Appendix 2. It is based on the concept that hidden ineffectiveness will be detected if the excess of fixed rate items is not allowed to consist of younger items than the respective hedging derivative.

Let us amend the example over time: a realized prepayment of 10 occurs during year 1:

(ill. D2)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets		~~100~~ 90	~~100~~ 90	~~100~~ 90	~~100~~ 90					
Liabilities		-80	-80	-80	-80	-80	-80	-80	-80	- 80
Net Gap		~~20~~ 10	~~20~~ 10	~~20~~ 10	~~20~~ 10	-80	-80	-80	-80	-80
Swap		-10	-10							
Effective?		Yes	Yes	-	-	-	-	-	-	-

The hedging relationship is still effective since the net position was partially hedged and the net hedged position still exists at the end of year 1 after the prepayment. However, a new fixed rate asset is originated during year, leading to the following matrix:

(ill. D3)

Outstanding		2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets + New asset		90 + 10	90 + 10	90 + 10	90 + 10					
Liabilities		-80	-80	-80	-80	-80	-80	-80	-80	- 80
Net Gap		20	20	20	20	-80	-80	-80	-80	-80
Swap		-10	-10							
Effective ?		Yes	Yes	-	-	-	-	-	-	-

During year 2, a realized prepayment of 10 occurs:

(ill. D4)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets + New asset			~~90~~ 80 + 10	~~90~~ 80 + 10	~~90~~ 80 + 10					
Liabilities			-80	-80	-80	-80	-80	-80	-80	- 80
Net Gap			~~20~~ 10	~~20~~ 10	~~20~~ 10	-80	-80	-80	-80	-80
Swap			-10							
Effective?			Yes or NO ?	-	-	-	-	-	-	-

As mentioned before, the effectiveness test has to track the initial hedging relationship as documented at the beginning of Year 1. Therefore, again the hedging relationship is not effective because only "old" assets can be considered in relation to only "old" derivatives.

When a swap is entered into, it aims at hedging the interest margin variability of the then existing assets and liabilities in the hedged portfolio: assets and liabilities are “older” than the hedging derivatives.

At later dates, the effectiveness test should take into account that assets and liabilities building up the net position must be “older” than the derivatives, i.e. it has to test on the basis of the initial hedging relationship.

1.2. Distinction between “older” and “younger” hedge relations

To round the picture, we vary the previous, starting example (ill. D1) by adding a new liability of 20 in year 2, e.g. issuance of a 4 Y fixed rate bond:

(ill. D5)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets		100	100	100	100					
Liabilities + New		-80 + -20	-80 + -20	-80 + -20	-80 + -20	-80	-80	-80	-80	- 80
Net Gap		~~20~~ 0	~~20~~ 0	~~20~~ 0	~~20~~ 0	-80	-80	-80	-80	-80
Swap		-10	-10							
Effective?		Yes	Yes	-	-	-	-	-	-	-

As the fixed rate bond issuance “naturally” fills the gap, it leads to a new net position. However, it has not been part of the initial hedging relationship as described in the previous chapter. The initial hedging relationship remains effective when the change in a net position is due to adding new products, i.e. assets or liabilities added to the balance sheet later than the initial hedge.

Yet, the new net position appears to be over-hedged as seen from the beginning of year2. To lead to a fully- or under-hedged position, a new swap needs to be entered into after adding the new fixed rate bond issuance:

(ill. D6)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets		100	100	100	100					
Liabilities + New		-80 + -20	-80 + -20	-80 + -20	-80 + -20	-80	-80	-80	-80	- 80
Net Gap		0	0	0	0	-80	-80	-80	-80	-80
Swap + New swap		-10 + 10	-10 + 10							
Effective?		Yes	Yes	-	-	-	-	-	-	-

This example shows that it is necessary to concentrate on the initial hedging relationship by taking into account the "ages" of the assets and liabilities and compare them to the ages of the hedging derivatives. An ineffectiveness test should track any ineffectiveness coming from over-hedging of assets and liabilities that are "younger" than the hedging swap. This can be done by looking at the oldest hedging relationship, and then progressively, looking at younger and younger hedging relationships.

The hedging relationships in our example that have been originated at or before the beginning of year 2 comprise the (older) hedging relationship that has been originated at or before the beginning of year 1 as well as the new hedge relationship, entered into in year2:

(ill. D7)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Assets originated before year 2			100	100	100					
Liabilities originated before year 2			-80 + -20	-80 + -20	-80 + -20	-80	-80	-80	-80	- 80
Net Gap 2			~~20~~ 0	~~20~~ 0	~~20~~ 0	-80	-80	-80	-80	-80
Swaps entered before year 2			-10 + 10 = 0							
Effective?			Yes	-	-	-	-	-	-	-

In a more abstract way, the effectiveness of different hedge relations can be proven by successive effectiveness tests:

(ill. D8)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Effectiveness Test on the oldest hedging derivatives : 10 years ago										
Net Gap built with A / L originated more than 10 years ago	$NG_{10}1$	$NG_{10}2$	$NG_{10}3$	…	…	…	…	…	…	…
Derivatives entered 10 years ago	$D_{10}1$	$D_{10}2$	$D_{10}3$	…	…	…	…	…	…	…
Effective?	?	?	?	-	-	-	-	-	-	-

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Effectiveness Test on the hedging derivatives entered more than 9 years ago										
Net Gap built with A / L originated more than 9 years ago	$NG_9 1$	$NG_9 2$	$NG_9 3$	…	…	…	…	…	…	…
Derivatives entered more than 9 years ago	$D_9 1$	$D_9 2$	$D_9 3$	…	…	…	…	…	…	…
Effective?	?	?	?	-	-	-	-	-	-	-

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Effectiveness Test on all hedging derivatives entered since last effectiveness date										
Net Gap built with A / L originated before last effectiveness test date	$NG_0 1$	$NG_0 2$	$NG_0 3$	…	…	…	…	…	…	…
Derivatives entered up to last effectiveness test date	$D_0 1$	$D_0 2$	$D_0 3$	…	…	…	…	…	…	…
Effective?	?	?	?	-	-	-	-	-	-	-

A more synthetic way to present those tests takes the form of a comparison of two grids:

(ill. D9)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Net GAP < 10 y	$NG_{10}1$	$NG_{10}2$	…	…	…	…	…	…	…	…
Net GAP < 9 y	$NG_{9}1$	$NG_{9}2$	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…
Net GAP	$NG_{0}1$	$NG_{0}2$	…	…	…	…	…	…	…	…

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Swaps < 10 y	$D_{10}1$	$D_{10}2$	…	…	…	…	…	…	…	…
Swaps < 9 y	$D_{9}1$	$D_{9}2$	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…
Swaps	$D_{0}1$	$D_{0}2$	…	…	…	…	…	…	…	…

Since the tests are performed on a dimension which is based on the “age” to determine a condition of the type “older than”, the “age” dimension can be analysed as “cumulating all the assets and liabilities (respectively derivatives)” on the age axis (ages greater than a considered age). The successive effectiveness tests consist in testing, row by row, and subsequently, on each row, cell by cell, whether ineffectiveness has occurred.

Whenever ineffectiveness occurs in a specific cell of the row which is due to overhedging of derivatives, the ineffective swaps have to be disqualified as hedging swaps. Due to the cumulation on the age axis, disqualifying a swap has consequences on the effectiveness tests on the row corresponding to younger ages, and will potentially generate over-hedging situations that were not apparent without this disqualification.

A detailed example of an ineffectiveness test involving several cases of ineffectiveness in different cells of the matrix is included in Appendix 2.

2. *Identification of the Ineffective Derivative*

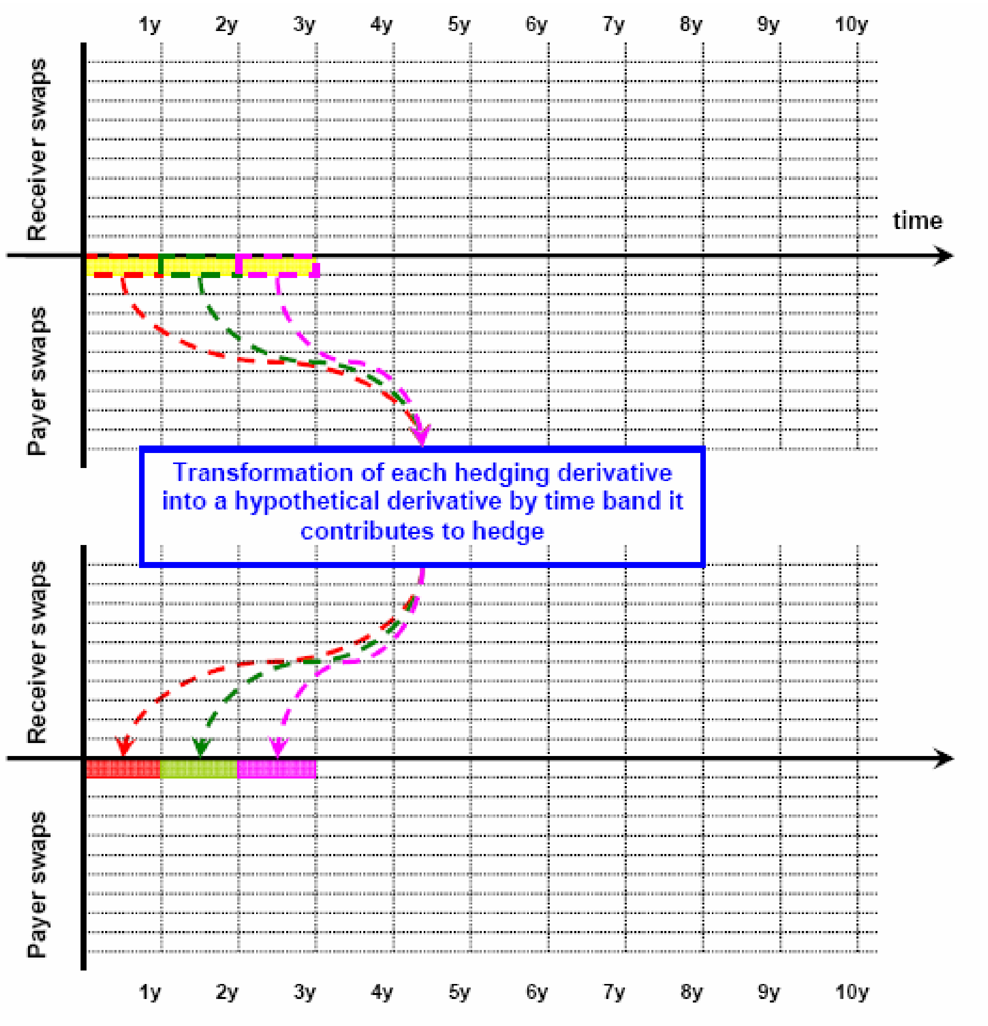
It is a specific phenomenon to the cum approach that ineffectiveness can occur on *some, but not necessarily on every Gap*, as a swap impacts several gaps, it can be ineffective for some of them, but not as a whole. Ineffective derivatives require a method that takes into account this specificity: that the cumulative method may associate portions of a derivative to a specific Gap, but not the derivative as a whole.

To resolve this issue, we consider the breakdown of swaps as a suite of swaplets: a swaplet is the portion of the swap that impacts a specific gap[6]. Conceptually, modelling the swap as combinations of swaplets is not different from analysing it as a sequence of FRA’s. The difference lies in the fact that repricing dates do not match generally the gaps intervals, so, the swaplets have not the same maturity dates than the FRAs: the point of expiration of any FRA is a settlement date for the swap.

[6] In the current literature, the hypothetical derivative refers to the hedged position, it is the derivative that replicate this position with a zero market value at the hedge inception. Here, we deal with the hedging instrument, the swap, that can be modeled as a combination of swaplets

The following examples explain in detail how the cumulative value change of such a portion of an ineffective swap can be reliably calculated using the idea of a zero-coupon calculation for the respective ineffective period in question. To summarize: the rationale is simple: it consists in defining for each derivative a hypothetical swaplet per hedged time band:

(ill. D10)



The fixed rate of each swaplet comes from the fixed rate of the hedging swap from which it is built.

The cumulated gain or loss, which is the present value, on the hedging swap is simply the sum of the cumulated gains or losses (PVs) on the swaplets:

PV (hedging swap) = $\Sigma_{\text{time band k}}$ PV(swaplet on time band k)

This leads logically to the solution for ineffectiveness in a specific time Gap: the ineffectiveness to be transferred from Equity to P&L comes from the PVs of the swaplets corresponding to the over-hedged Gaps.

In the example the whole swap becomes ineffective, the sum of all the PVs associated with all its swaplets, which coincides with the PV of the swap, should be accounted for as ineffectiveness.

When over-hedging occurs only on a specific Gap (partial time over-hedging), the PVs of the swaplets are used to determine the ineffectiveness to account for.

When on an over-hedged Gap only a proportion of the swap is over-hedging, only a proportion of swaplet PV should be accounted for as being ineffective. Ineffectiveness is then the sum of all those “elementary” ineffectiveness on the overhedged Gap.

Let us illustrate by means of an example:

(ill. D11)

Outstanding	1 y	2 y	3y	4y	5y	6y	7y	8y	9y	10y
Swap PV = 12	-10	-10	-10							

Hypothetical Derivatives										
Hyp. Swap 1 PV = 3	-10									
Hyp. Swap 2 PV = 4		-10								
Hyp. Swap 3 PV = 5			-10							

Overhedging Swap	0	-5	-10							

Over hedging Hypothetical Derivatives			
Hyp. Swap 1 PV = 3	- => no ineffectiveness to report		
Hyp. Swap 2 PV = 4		-5 => ineffectiveness to report = 2 (= 4 * 5 / 10)	
Hyp. HD3 PV = 5			-10 => ineffectiveness to report = 5 (= 4 * 5 / 10)
	Ineffectiveness to report = 7 (=0 + 2 + 5)		

When a swap needs to be disqualified because of ineffectiveness on some of the Gaps it contributes to hedge, it should be disqualified, *but only in regards to the fraction of its PVs corresponding to the over-hedged Gaps*.

The hypothetical method described before explains how to distinguish the ineffectiveness that needs to be accounted for: the PVs of the swaps regarding those hedged Gaps that are not accounted as ineffective need to remain in Equity and taken out of Equity into P&L over future periods.

Yet, keeping a cumulated gain or loss in Equity is permitted only as long as the initially hedged risk still exists. Therefore, an ineffectiveness test needs to consider previously terminated hedging relationships (which can have occurred due to ineffectiveness or due to voluntarily ending hedging relationships).

The method consists in applying the ineffectiveness test previously described to:

- the existing hedging derivative;
- the existing hedging derivatives plus the past previously terminated

Appendix 3 contains an example for the application of the method for the situations described.].

CHAPTER VI: INTEGRATION OF CORE DEPOSITS AND PREPAYMENTS

Core Deposits refer to deposit accounts without defined maturities such as current accounts and some forms of savings accounts. They constitute a significant portion of banks' liabilities, especially as far as European retail banks are concerned. Having in mind that these deposits either bear no interest or only a low - not market linked - yield for retail clients, they are crucial for the profitability of banks. The assumed stability of a bank's core deposit basis is derived from the sluggish behaviour of retail costumers in response to changing market conditions. In contrast, interbank or other wholesale financial markets respond instantaneously and completely to changing circumstances.

Even though the maturity and volume of a single core deposit cannot be planed, it is common and best practice to treat the whole portfolio of core deposits as a stable and medium- up to long-term funding resource (from an interest rate risk and liquidity risk perspective). According to the Basel Committee, for interest risk measurement, key assumptions of customer behaviour should be reasonable, consistent with economic circumstances and well documented. Based on the past experience[7], banks model the behaviour of core deposits by using stochastic models. Thus banks calculate the opportunity to invest those funds over a longer horizon, which – in general – increases the profit potential inherent in core deposits without taking additional risk (assuming that the modelled behaviour fits to the "ex post" observed maturity).

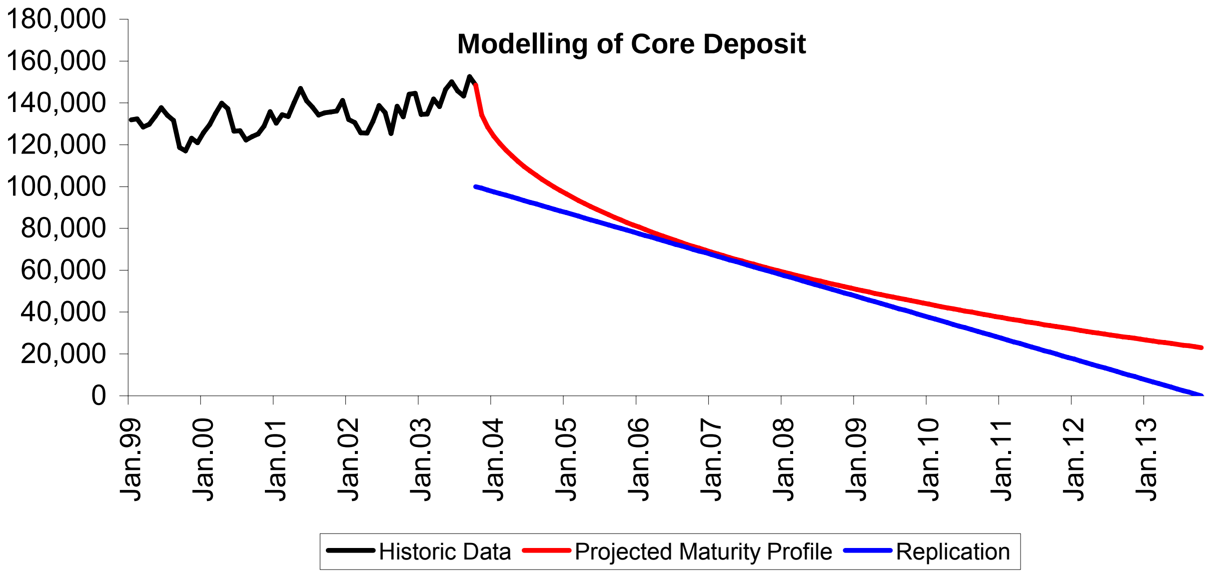
The integration of core deposit volumes in the bank's risk management approach is based mostly on two concepts:

(a) Core Volume approach: The bank defines – based on historic data – a stable core volume for which a longer maturity can be assumed. The remaining volume functions as a volume buffer and is assumed to be due daily and covers volatile and cyclical costumer behaviour. Such an approach covers all those deposits, where the client rate has a low correlation with the market yield (e.g. EURIBOR).

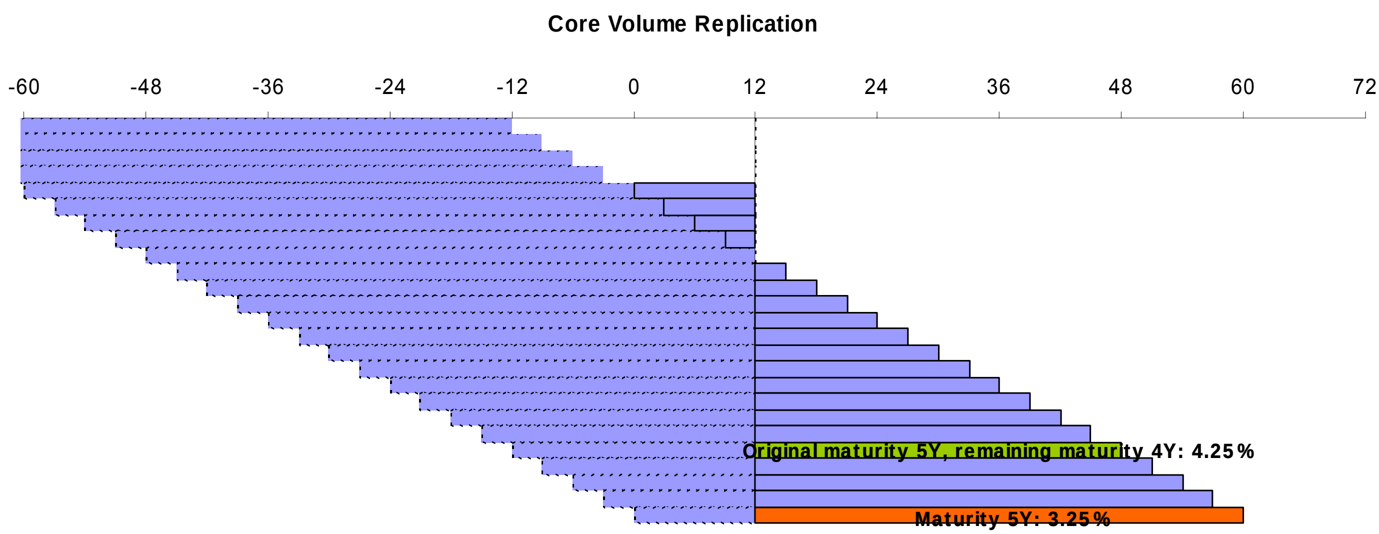
(b) Replication portfolio: The maturity profile of the core volume is also derived using historic data by applying commonly used stochastic calculus. The bank tries to replicate the maturity profile by slicing the volume in regularly due (e.g. monthly) equally sized tranches. Those tranches are treated as synthetic fixed rate bond issues. A tranche becomes due regularly and is replaced by a new tranche. All tranches are assumed to have the same original maturity. Therefore the bank has to "roll over" regularly a predefined portion of the portfolio and during this roll over process has to re-invest the amount over an also predefined maturity. The benchmark interest rate prevailing at the roll over data is assigned to each rolled over tranche.

The following chart shows how a future maturity profile can be derived, based on observed volume development. In this case a diffusion process is used, assuming a decent confidence level (e.g. 99%).

[7] E.g. concerning the extent to which changes in market rates passed over to the bank's costumers - the "path through rates / customer elasticity"



The next chart (ill. Xy) explains the composition of the replicating portfolio, for which a maturity of 5 years and a quarterly role over process have been chosen.



Without core deposits the bank would be obliged to refinance itself using capital markets instruments, especially bond issues. Therefore treasuries usually treat the market risk of roll over tranches of core deposits equal to the market risk of issued fixed rate bonds.

Based on the above described modelling the bank's treasury has to invest the core volume medium or long term and by this – on average – generates additional interest income to the bank (compared to a pure investment of those funds in the short dated money markets).

Integration in the IMH framework:

The Integration in the hedge accounting context needs to be based on the modelled maturities as well as the assigned benchmark interest rates. Therefore from an IMH perspective a roll over tranche of modelled core deposits has identical characteristics as a fixed rate issued bond (with similar notional, similar maturity and issued at the same date). This is true for both, the due and the cum approach.
Any roll over tranche is integrated in the hedge matrix based on the assumed maturity and the assigned benchmark interest rate (due approach) or roll over date (cum approach).

Potential Ineffectiveness:

The model should be back tested regularly. Ineffectiveness could arise if either the core volume (and therefore all replicating roll over tranches) needs to be reduced or the assumed maturity has to be shortened. Both cases have the identical impact on the hedge effectiveness as a prepayment on a fixed rate liability (e.g. long dated term deposit).

An increase in the core volume assumed is identical to a new production of deposits and therefore would never lead to ineffectiveness.

CHAPTER VII: FREQUENTLY ASKED QUESTIONS

1. Would non-banks be able to benefit from IMH as well?

Non-financial institutions are less prone to interest rate risk due to the nature of their business. Moreover, Asset and Liability Management is generally conducted in a different way in industrial and commercial sectors and, more particularly, dealt with on a more piecemeal basis.

Nevertheless, if some companies would wish to manage interest rate risk in a similar way as banks do, there should be no theoretical rationale to exclude them from the benefit of the IMH methodology. Prerequisites for implementing such method in other economic sectors would however, need to be defined as non-financial institutions are not subject to regulatory oversight. Our recommendation would be that the use of the IMH methodology be made subject to the company's adherence to the "Principles for the Management and Supervision of Interest Rate Risk" which were issued by the Basel Committee on Banking Supervision in September 2003 (to the extent that they are relevant to non-financial institutions).

2. Can an entity use its ALM mechanisms for implementing IMH?

Most retail banks use an interest rate gap to monitor the interest rate risk. The interest rate gap is recommended by the Basel Committee on Banking Supervision in its July 2004 document titled 'Principles for the Management and Supervision of Interest Rate Risk':

> 'The simplest techniques for measuring a bank's interest rate risk exposure begin with a maturity/repricing schedule that distributes interest-sensitive assets, liabilities, and off-balance sheet positions into "time bands" according to their maturity (if fixed-rate) or time remaining to their next repricing (if floating-rate). These schedules can be used to generate simple indicators of the interest rate risk sensitivity of both earnings and economic value to changing interest rates. When this approach is used to assess the interest rate risk of current earnings, it is typically referred to as *gap analysis*.'

The hedge matrix described in chapters III / IV and V and used to track ineffectiveness is exactly the same thing than an interest rate gap. As a consequence, to monitor the interest rate risk, retail banks already need to build a maturity/repricing schedule; this schedule may also be used to track ineffectiveness.

An entity will need to use its ALM mechanisms for implementing IMH and to track ineffectiveness. The implementation costs of interest margin hedge will be limited since the ALM mechanisms already provide most of the information needed to track ineffectiveness.

3. *Under IAS39, a hedge can qualify for hedge accounting even though the risk exposure may be increased on an entity-wide basis[8]. Is this the same for the IMH?*

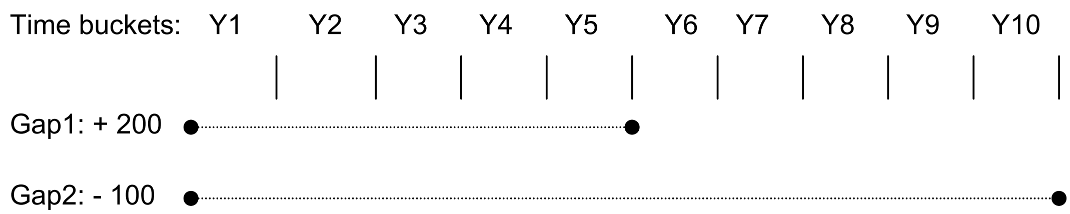
No, not on the level of the specified and designated gap. However, yes, on the level of a larger portfolio or on the level of enterprise-wide risk management an effective hedge of a specified gap may have the effect of increasing variability of the overall margin.

The IMH is – like FVH or CFH – measured on a transaction basis[9]. The objective of an IMH is the reduction of variability of the interest margin associated with a specified Gap of a portfolio. An IMH is effective when it can be demonstrated that the offsetting cash flows of the derivative have reduced the variability of the net interest from that Gap.

For instance, see the example in Part One, Chapter II. 3.1. (ill. 11):

ill. 8

Gaps under due approach



If the bank decides to hedge Gap1 in full, but not to hedge Gap2 at all, it could achieve hedge accounting for the appropriate hedge of Gap1, even though the effect of the hedge would be an increase in the overall risk position of the bank. The qualification for hedge accounting will be determined by the hedging derivatives' ability of reducing the variability of the interest margin associated with this specific Gap.

However, as explained in Part One[10], risk management requirements, acting on a different level of risk view, may not permit the bank to leave Gap2 fully unhedged.

4. *Considering the complexity involved in tracking ineffectiveness, what is the advantage of the IMH over the current hedge forms?*

Firstly, concentrating on the portfolio view in the IMH rather than a selective view of either assets or liabilities aligns risk management practise and accounting for hedging activities as far as possible. Therefore, a significant number of banks should be able to leverage the existing risk management / treasury / ALM systems and build upon the existing IT framework an IMH compliant solution. Though the IMH represents an accounting framework, which can be applied in different banks executing hedging activities under deviating regulatory and legal frameworks, it is obvious that a perfect match between risk management tools prevailing in a bank and the IMH is almost impossible to achieve.

[8] Implementation Guidance F.2.6
[9] See Part One, Chapter II, 2.2.
[10] See Part One, Chapter II, 2.2.

One source of potential complexity while implementing an IMH reporting will be the necessary tracking of “hidden ineffectiveness”, which is part of both the due and the cum approach. However, the approach from a portfolio view in a dynamic hedging environment and the protection of interest rate levels for future transactions of either variable or fixed rate characteristics should enable reducing ineffectiveness significantly.

Finally, the implementation of either fair value (where possible) or cash flow hedge accounting have significant complexity as well, but generate IT needs disconnected from the risk management process. The current concerns about the disconnection of accounting control and risk management actions are of much less relevance under the IMH proposal.

Fédération Bancaire Européenne
European Banking Federation

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23.05.2006

INTEREST MARGIN HEDGING

APPENDICES TO PART TWO

APPENDIX I: CHANGING PORTFOLIO GAPS AND INTEREST RATES

Introduction

This appendix contains an example in which a hedged portfolio gap is changed in regards to the amount hedged amidst an environment of changing interest rates.

The example consists of four cases (E1-4). The outcome is the same under the due and the cumulative approach.

The base case (E1) describes a net asset portfolio, hedged initially by 90% at a benchmark rate of 10% with a decrease in the hedged amount to 50% at a benchmark rate of 12% after 1 year (partial de-designation). After further changes in interest rates a prepayment of €m 50 occurs in the 4th year, however not large enough to cause ineffectiveness. The example describes the treatment of the amortization following the de-designation after year 1.

In E2, the base case is amended to a prepayment amount of €m 85 in the 4th year, describing the steps of analysing the ineffective portion of the derivative.

Example E3 describes a net asset portfolio, hedged initially by 90% at a benchmark rate of 10%. After some changes in interest rates, the benchmark rate at the end of year 4 stands at 10% for the remaining maturity of 6 years, a fixed rate liability of €m 40 at market rates has been originated and added to the portfolio with the subsequent partial de-designation of the hedging derivative.

E4 starts with the base case, a net asset portfolio, hedged initially by 90% at a benchmark rate of 10% with a decrease in the hedge amount to 50% at a benchmark rate of 12% after 1 year (partial de-designation). But in years 2 and 3, the bank increases the hedge ratio by €m 20 each at different benchmark rates. In year 4, a prepayment occurs of €m 85, causing partial ineffectiveness of the hedging derivatives. The example describes a systematic method to determine the ineffective derivatives (and portions thereof).

1. Treatment of Amortization following a De-designation

Example:	t0	t1 before de-designation	t1 after de-designation	t2	t3	t4 before prepayment	t4 after prepament	t5	t6	t7	t8	t9	t10
Loan	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000
Maturity	10Y	9Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
historic Benchmark Yield	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Hedge 1	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000
Maturity	10Y	9Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Benchmark Yield	*10%*	*12%*	*12%*	*6%*	*7%*	*8%*	*8%*	*9%*	*10%*	*9%*	*7%*	*5%*	*4%*
							Ineffectiveness						
Notional Swap Hedge 1	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000		€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000
Fair Value Swap 1	€ 0	**€ 9,594,000**	**€ 5,330,000**	**-€ 12,420,000**	**-€ 8,085,000**	**-€ 4,625,000**	**€ 0**	**-€ 1,945,000**	**€ 0**	**-€ 1,265,000**	**-€ 2,710,000**	**-€ 2,380,000**	**€ 0**
Carrying Value Trading Swap			**€ 4,264,000**										
Amortisation				€ 288,688	€ 323,306	€ 362,075		€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Investment CloseOutValue				€ 511,312	€ 476,694	€ 437,925							
							P&L Impact € 3,289,931						

1. In t_0 a net asset portfolio of € 100 mln is hedged by 90%
2. In t_1 the bank intends to reduce the amount of hedging down to 50% (due to a modified yield expectation), therefore € 40 mln of the payer swap is either closed out or allocated in the trading book (against a payment of the swaps fair value). The closeout value is not shown in p&l in t_1, but amortized of the swap's original tenor.
3. No portfolio adjustments in t_2 & t_3
4. In t_4 € 50 mln of the initial net asset portfolio has been prepaid, the portfolio still consists of € 50mln net assets
   4.1. The swap (with the reduced notional of € 50 mln) is still effective as the swap still covers by 100% the remaining asset portfolio
   4.2. A further amortization of the closeout realized in t_1 is no longer justified, because of the original loan business in t_0, which had been covered by originally € 90 mln swaps, only € 50 mln still exist (which stand against the still existing swap of € 50 mln notional).
   4.3. The not yet amortized part of the t_1 closeout have to been shown in p&l
5. No further actions in $t_5 – t_{10}$

Profit & Loss Account

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Loan	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	5,000,000.00	5,000,000.00	5,000,000.00	5,000,000.00	5,000,000.00	5,000,000.00
Cash Funding Loan	-10,000,000.00	-12,000,000.00	-6,000,000.00	-7,000,000.00	-4,500,000.00	-5,000,000.00	-4,500,000.00	-3,500,000.00	-2,500,000.00	-2,000,000.00
Swap 1 PayFix	-9,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00
Swap 1 RecFloat	9,000,000.00	6,000,000.00	3,000,000.00	3,500,000.00	4,500,000.00	5,000,000.00	4,500,000.00	3,500,000.00	2,500,000.00	2,000,000.00
Amortization		288,688.37	323,306.03	3,652,005.60	-	-	-	-	-	-
Investment CloseOutValue		511,311.63	476,693.97	437,925.17						
Ineffectiveness				-						
Net Income	-	**-200,000.00**	**2,800,000.00**	**5,589,930.78**	-	-	-	-	-	-
thereof b/s item(s)	-	*-2,000,000.00*	*4,000,000.00*	*3,000,000.00*	*500,000.00*	-	*500,000.00*	*1,500,000.00*	*2,500,000.00*	*3,000,000.00*
thereof derivative(s)	-	*1,800,000.00*	*-1,200,000.00*	*2,589,930.78*	*-500,000.00*	-	*-500,000.00*	*-1,500,000.00*	*-2,500,000.00*	*-3,000,000.00*

Amortisation is stopped completely

2. Steps of Analysis of the Ineffective Portion of a Derivative

Example:	t0	t1 before de-designation	t1 after de-designation	t2	t3	t4 before prepayment	t4 after prepament	t5	t6	t7	t8	t9	t10
Loan	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000
Maturity	10Y	9Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
historic Benchmark Yield	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Hedge 1	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000
Maturity	10Y	9Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Benchmark Yield	*10%*	*12%*	*12%*	*6%*	*7%*	*8%*	*8%*	*9%*	*10%*	*9%*	*7%*	*5%*	*4%*
							Ineffectiveness						
Notional Swap Hedge 1	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000		€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000
Fair Value Swap 1	€ 0	**€ 9,594,000**	**€ 5,330,000**	**-€ 12,420,000**	**-€ 8,085,000**	**-€ 4,625,000**	**-€ 3,237,500**	**-€ 583,500**	**€ 0**	**-€ 379,500**	**-€ 813,000**	**-€ 714,000**	**€ 0**
Carrying Value Trading Swap			**€ 4,264,000**										
Amortisation				€ 288,688	€ 323,306	€ 362,075							
Investment CloseOutValue				€ 511,312	€ 476,694	€ 437,925							
							Sum Ineffectiveness **-€ 3,237,500**						
							P&L Impact Amo. **€ 3,289,931**						

1. From t_0 to t_3 the example E2 is unchanged to E1
2. In t_4 € 85 mln of the initial net asset portfolio has been prepaid, the portfolio now only contains € 15 mln of net assets
   - 2.1. The swap (with the reduced notional of € 50 mln) is partially ineffective as the swap now covers far more than 100% of the remaining asset portfolio.
   - 2.2. The "over-hedging" part of the swap – € 35 mln – is assumed to be ineffective, and therefore the carrying value of the € 35 mln swap quantifies the amount of ineffectiveness booked through p&l.
   - 2.3. A further amortization of the closeout realized in t_1 is no longer justified, because of the original loan business in t_0, which had been covered by originally € 90 mln swaps, only € 15 mln still exist (which stand against the still existing swap of € 15 mln notional, after closeout due to ineffectiveness).
   - 2.4. The not yet amortized part of the t_1 closeout has to been shown in p&l.
3. No further actions in $t_5 – t_{10}$

Profit & Loss Account

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Loan	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	1,500,000.00	1,500,000.00	1,500,000.00	1,500,000.00	1,500,000.00	1,500,000.00
Cash Funding Loan	- 10,000,000.00	- 12,000,000.00	- 6,000,000.00	- 7,000,000.00	- 1,350,000.00	- 1,500,000.00	- 1,350,000.00	- 1,050,000.00	- 750,000.00	- 600,000.00
Swap 1 PayFix	- 9,000,000.00	- 5,000,000.00	- 5,000,000.00	- 5,000,000.00	- 1,500,000.00	- 1,500,000.00	- 1,500,000.00	- 1,500,000.00	- 1,500,000.00	- 1,500,000.00
Swap 1 RecFloat	9,000,000.00	6,000,000.00	3,000,000.00	3,500,000.00	1,350,000.00	1,500,000.00	1,350,000.00	1,050,000.00	750,000.00	600,000.00
Amortization		288,688.37	323,306.03	3,652,005.60	-	-	-	-	-	-
Investment CloseOutValue		511,311.63	476,693.97	437,925.17						
Ineffectiveness				- 3,237,500.00						
Net Income	-	**- 200,000.00**	**2,800,000.00**	**2,352,430.78**	-	-	-	-	-	-
thereof b/s item(s)	-	*- 2,000,000.00*	*4,000,000.00*	*3,000,000.00*	*150,000.00*	-	*150,000.00*	*450,000.00*	*750,000.00*	*900,000.00*
thereof derivative(s)	-	*1,800,000.00*	*- 1,200,000.00*	*- 647,569.22*	*- 150,000.00*	-	*- 150,000.00*	*- 450,000.00*	*- 750,000.00*	*- 900,000.00*

Amortisation is stopped

3. New Production and partial De-designation of a Derivative

Example:	t0	t1 before de-designation	t2	t3	t4 before new business	t4 after new business	t5	t6	t7	t8	t9	t10
Loan	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000
Maturity	10Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
historic Benchmark Yield	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Hedge 1 Payer Swap	€ 90,000,000	€ 90,000,000	€ 90,000,000	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000
Maturity	10Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Liability 1						€ 40,000,000	€ 40,000,000	€ 40,000,000	€ 40,000,000	€ 40,000,000	€ 40,000,000	€ 40,000,000
Maturity						6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon						10%	10%	10%	10%	10%	10%	10%
Benchmark Yield	*10%*	*12%*	*6%*	*7%*	*10%*	*10%*	*9%*	*10%*	*9%*	*7%*	*5%*	*4%*
						Ineffectiveness						
Notional Swap Hedge 1	€ 90,000,000	€ 90,000,000	€ 90,000,000	€ 90,000,000	€ 90,000,000		€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000
Fair Value Swap 1	€ 0	**€ 9,594,000**	**-€ 22,356,000**	**-€ 14,553,000**	**€ 0**	**€ 0**	**-€ 1,945,000**	**€ 0**	**-€ 1,265,000**	**-€ 2,710,000**	**-€ 2,380,000**	**€ 0**
						Sum Ineffectiveness						
						€ 0						

1. The bank did hedge a net asset portfolio of € 100 mln in t_0 by 90%.
2. In t_1 to t_3 the portfolio is unchanged.
3. In t_4 the benchmark yield for the remaining maturity of the observed portfolio is back at 10% (equal to the 10 year yield in t_0). The bank generates new fixed rate liabilities with a 6-year maturity, which are assumed to belong to the observed production (due to same remaining maturity & same benchmark interest rate).
   3.1. No ineffectiveness exists because based on the banks production until t_3 no over-hedging could be observed.
   3.2. To retain the existing hedging position (€ 10 mln un-hedged net assets), the bank closes or de-designates € 40 mln payer swaps.
   3.3. As the yield level is back at 10% the swap closeout is p&l neutral, and therefore no amortization is necessary.
4. No further actions in $t_5 – t_{10}$

Profit & Loss Account

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Loan	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00
Cash Funding Loan	- 10,000,000.00	- 12,000,000.00	- 6,000,000.00	- 7,000,000.00	- 9,000,000.00	- 10,000,000.00	- 9,000,000.00	- 7,000,000.00	- 5,000,000.00	- 4,000,000.00
Swap 1 PayFix	- 9,000,000.00	- 9,000,000.00	- 9,000,000.00	- 9,000,000.00	- 5,000,000.00	- 5,000,000.00	- 5,000,000.00	- 5,000,000.00	- 5,000,000.00	- 5,000,000.00
Swap 1 RecFloat	9,000,000.00	10,800,000.00	5,400,000.00	6,300,000.00	4,500,000.00	5,000,000.00	4,500,000.00	3,500,000.00	2,500,000.00	2,000,000.00
Liability					- 4,000,000.00	- 4,000,000.00	- 4,000,000.00	- 4,000,000.00	- 4,000,000.00	- 4,000,000.00
Investment Cash					3,600,000.00	4,000,000.00	3,600,000.00	2,800,000.00	2,000,000.00	1,600,000.00
Ineffectiveness				-						
Net Income	-	**- 200,000.00**	**400,000.00**	**300,000.00**	**100,000.00**	-	**100,000.00**	**300,000.00**	**500,000.00**	**600,000.00**
thereof b/s item(s)	-	*- 2,000,000.00*	*4,000,000.00*	*3,000,000.00*	*600,000.00*	-	*600,000.00*	*1,800,000.00*	*3,000,000.00*	*3,600,000.00*
thereof derivative(s)	-	*1,800,000.00*	*- 3,600,000.00*	*- 2,700,000.00*	*- 500,000.00*	-	*- 500,000.00*	*- 1,500,000.00*	*- 2,500,000.00*	*- 3,000,000.00*

4. A Systematic Method to Determine the Ineffective Derivative(s)

Example:	t0	t1 before de-designation	t1 after de-designation	t2	t3	t4 before prepayment	t4 after prepament	t5	t6	t7	t8	t9	t10
Loan	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 100,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000
Maturity	10Y	9Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
historic Benchmark Yield	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Hedge 1	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Maturity	10Y	9Y	9Y	8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Hedge 2				€ 20,000,000	€ 20,000,000	€ 20,000,000	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Maturity				8Y	7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon				6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Hedge 3					€ 20,000,000	€ 20,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000
Maturity					7Y	6Y	6Y	5Y	4Y	3Y	2Y	1Y	Matured
Coupon					7%	7%	7%	7%	7%	7%	7%	7%	7%
Benchmark Yield	*10%*	*12%*	*12%*	*6%*	*7%*	*8%*	*8%*	*9%*	*10%*	*9%*	*7%*	*5%*	*4%*
							Ineffectiveness						
Notional Swap Hedge 1	€ 90,000,000	€ 90,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000	€ 50,000,000		€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Fair Value Swap 1	€ 0	**€ 9,594,000**	**€ 5,330,000**	**-€ 12,420,000**	**-€ 8,085,000**	**-€ 4,625,000**	**-€ 4,625,000**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**
Carrying Value Trading Swap			**€ 4,264,000**										
Amortisation				€ 288,688	€ 323,306	€ 362,075		€ 152,060	€ 170,294	€ 190,714	€ 213,583	€ 239,195	€ 267,878
Investment CloseOutValue				€ 511,312	€ 476,694	€ 437,925		€ 147,940	€ 129,706	€ 109,286	€ 86,417	€ 60,805	€ 32,122
Notional Swap Hedge 2				€ 20,000,000	€ 20,000,000	€ 20,000,000		€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Fair Value Swap 2				**€ 0**	**€ 1,078,000**	**€ 1,850,000**	**€ 1,850,000**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**
Notional Swap Hedge 3					€ 20,000,000	€ 20,000,000		€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000	€ 15,000,000
Fair Value Swap 3					**€ 0**	**€ 924,000**	**€ 231,000.0**	**€ 1,167,000**	**€ 1,426,500**	**€ 759,000**	**€ 0**	**-€ 285,000**	**€ 0**
							Sum Ineffectiveness						
							-€ 2,544,000						
							P&L Impact Amo.						
							€ 2,056,207						

1. In t_0 a net asset portfolio of € 100 mln is hedged by 90%.
2. In t_1 the bank intends to reduce the amount of hedging down to 50% (due to a modified yield expectation). Therefore € 40 mln of the payer swap is either closed out or allocated in the trading book (against a payment of the swaps fair value). The closeout value is not shown in p&l in t_1, but amortized of the swap's original tenor.
3. The bank increases its hedging ratio in t_2 as well as in t_3 by € 20 mln each (each time at the prevailing market conditions but with the intention to reduce the exposure of the production carrying a 10% yield and maturing in t_{10})
4. In t_4 <u>€ 85 mln</u> of the initial net asset portfolio has been prepaid, the portfolio now only contains € 15 mln of net assets
   4.1. Identification of ineffective swaps: The bank utilizes the FIFO (first-in, first-out) rule for the identification of ineffective hedging derivatives. Therefore the whole remaining € 50 mln swap with a coupon of 10% (as of t_2), € 20 mln swap with a coupon of 6% (as of t_0)

and € 5 mln out of € 20 mln swap with a coupon of 7% (as of t_3) are assumed to be responsible for any ineffectiveness. Those swaps are either closed-out or transferred into the trading portfolio and the cumulative fair value of those swaps is shown in p&l.

4.2. The remaining € 15 mln of the 7% swap represents the still effective portion of the hedging activities.

4.3. Of the loan production as of t_0 still € 15 mln net assets exist, whereas all active derivatives traded in t_0 are either closed in t_1 or assumed to be ineffective in t_4. Therefore the € 15 mln remaining net assets can justify an amortization of 15/40 of the in t_1 realized close out

5. No further actions in $t_5 – t_{10}$

Profit & Loss Account

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Loan	10,000,000.00	10,000,000.00	10,000,000.00	10,000,000.00	1,500,000.00	1,500,000.00	1,500,000.00	1,500,000.00	1,500,000.00	1,500,000.00
Cash Funding Loan	-10,000,000.00	-12,000,000.00	-6,000,000.00	-7,000,000.00	-1,350,000.00	-1,500,000.00	-1,350,000.00	-1,050,000.00	-750,000.00	-600,000.00
Swap 1 PayFix	-9,000,000.00	-5,000,000.00	-5,000,000.00	-5,000,000.00	-	-	-	-	-	-
Swap 1 RecFloat	9,000,000.00	6,000,000.00	3,000,000.00	3,500,000.00	-	-	-	-	-	-
Amortization		288,688.37	323,306.03	1,133,152.35	152,059.70	170,293.72	190,714.26	213,583.49	239,195.06	267,877.81
Investment CloseOutValue		511,311.63	476,693.97	437,925.17	147,940.30	129,706.28	109,285.74	86,416.51	60,804.94	32,122.19
Swap 2 PayFix			-1,200,000.00	-1,200,000.00	-	-	-	-	-	-
Swap 2 RecFloat			1,200,000.00	1,400,000.00	-	-	-	-	-	-
Swap 3 PayFix			-	-1,400,000.00	-1,050,000.00	-1,050,000.00	-1,050,000.00	-1,050,000.00	-1,050,000.00	-1,050,000.00
Swap 3 RecFloat			-	1,400,000.00	1,350,000.00	1,500,000.00	1,350,000.00	1,050,000.00	750,000.00	600,000.00
Ineffectiveness				-2,544,000.00						
Net Income	-	**-200,000.00**	**2,800,000.00**	**727,077.53**	**750,000.00**	**750,000.00**	**750,000.00**	**750,000.00**	**750,000.00**	**750,000.00**
thereof b/s item(s)	-	*-2,000,000.00*	*4,000,000.00*	*3,000,000.00*	*150,000.00*	-	*150,000.00*	*450,000.00*	*750,000.00*	*900,000.00*
thereof derivative(s)	-	*1,800,000.00*	*-1,200,000.00*	*-2,272,922.47*	*600,000.00*	*750,000.00*	*600,000.00*	*300,000.00*	-	*-150,000.00*

Amortisation is stopped partially (25/40), reflecting the reduced amount in assets Only 15/40 of the initial amortisation is left unchanged

APPENDIX II: CUM APPROACH - INEFFECTIVENESS TESTING - Examples

Whenever there is ineffectiveness in a specific cell of the row which is due to over-hedging of derivatives, the ineffective swaps should be disqualified as hedging swaps.
Due to the cumulation on the age axis, disqualifying a swap has consequences on the effectiveness tests on the row corresponding to younger ages, and will potentially generate over-hedging situations that were not apparent without this disqualification.

Let us take an example:

Assets + Liabilities	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	500	550	450	300	180	10
Trade Date < 7 y	850	700	550	600	580	110
Trade Date < 5 y	1'300	1'050	1'000	970	830	310
Trade Date < 4 y	1'175	900	950	995	655	285
Trade Date < 3 y	1'300	925	825	845	455	235
Trade Date < 2 y	1'600	1'025	825	945	505	335
Trade Date < 1 y	1'700	1'225	875	995	505	285
Trade Date < 0 y	2'000	1'325	1'000	1'070	605	335
Derivatives	**1Y**	**2Y**	**3Y**	**4Y**	**5Y**	**6Y**
Trade Date < 10 y	-440	-490	-390	-240	-120	0
Trade Date < 7 y	-815	-690	-590	-640	-520	-100
Trade Date < 5 y	-1'140	-940	-965	-890	-670	-250
Trade Date < 4 y	-1'015	-815	-940	-940	-570	-250
Trade Date < 3 y	-965	-665	-690	-690	-320	-200
Trade Date < 2 y	-1'115	-665	-590	-740	-320	-250
Trade Date < 1 y	-1'215	-865	-690	-840	-370	-250
Trade Date < 0 y	-1'465	-965	-790	-890	-420	-250
A + L + Derivatives	**1Y**	**2Y**	**3Y**	**4Y**	**5Y**	**6Y**
Trade Date < 10 y	60	60	60	60	60	10
Trade Date < 7 y	35	10	-40	-40	60	10
Trade Date < 5 y	160	110	35	80	160	60
Trade Date < 4 y	160	85	10	55	85	35
Trade Date < 3 y	335	260	135	155	135	35
Trade Date < 2 y	485	360	235	205	185	85
Trade Date < 1 y	485	360	185	155	135	35
Trade Date < 0 y	535	360	210	180	185	85

The ineffectiveness test is detailed below: from the oldest age band to younger and younger age band.

Begin by the oldest time band: age band "older than 10 years"

Assets and liabilities originated more than 10 years ago are considered first:

Assets + Liabilities	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	500	550	450	300	180	10

Derivatives originated 10 years ago are considered:

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	-440	-490	-390	-240	-120	0

This shows that the oldest derivatives still under-hedge net open position built of older assets and liabilities originated before those derivatives where entered into: those derivatives are effective:

Over-hedging Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0

This leads to the same obtained net position considering only the effective derivatives:

A+L+Derivatives without over-hedging derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	*60*	*60*	*60*	*60*	*60*	*10*

Then, the following "age band" is considered.

Age band "older than 7 years":

Assets and liabilities originated more than 7 years ago are considered:

Assets + Liabilities	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 7 y	850	700	550	600	580	110

(they comprise assets and liabilities which have been originated more than 10 years ago)

and derivatives originated 7 years ago or before:

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 7 y	-815	-690	-590	-640	-520	-100

(they comprise derivatives which have been originated more than 10 years ago)

this shows that time bands 4 and 5 are over-hedged:

Over-hedging Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 7 y	0	0	-40	-40	0	0

The over-hedging derivatives have been originated between 7 years ago and 10 years ago. They should be disqualified as hedging derivatives and their PVs have to be transferred from Equity to PnL.

After having disqualified the over-hedging derivatives, this leads to a new derivatives position of:

Effective Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 7 y	-815	-690	-590	-640	-520	-100

instead of:

Trade Date < 7 y	850	700	550	600	580	110

And the net open position, including effectie derivatives, is changed into:

A+L+Derivatives without over-hedging derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 7 y	*35*	*10*	*0*	*0*	*60*	*10*

The following "age band" is then considered.

Age band "older than 5 years":

Assets and liabilities more than 5 years ago are:

Assets + Liabilities	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 5 y	1'300	1'050	1'000	970	830	310

Derivatives originated 5 years ago and before are:

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 5 y	*-1'140*	*-940*	*-925*	*-850*	*-670*	*-250*

This schedule is different from the schedule with over-hedging derivatives identified and disqualified during the analysis of the older age bands:

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 5 y	-1'140	-940	-965	-890	-670	-250

Then, after having excluded the over-hedging derivatives on the previous age bands, the derivatives of age greater or equal to 5 year are shown to under-hedge net position built of assets and liabilities older than 5 years ago.

Over-hedging Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 5 y	0	0	0	0	0	0

The net position is:

A+L+Derivatives without over-hedging derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 5 y	*160*	*110*	*75*	*120*	*160*	*60*

… Age bands are successively considered …

Over-hedged cells can be localized, which enables to identify and disqualify the over-hedging derivatives.

… Conclusion:

This can be summarized by the following grids:

Over-hedging Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	0	0	-40	-40	0	0
Trade Date < 5 y	0	0	0	0	0	0
Trade Date < 4 y	0	0	0	0	0	0
Trade Date < 3 y	0	0	0	0	0	0
Trade Date < 2 y	0	0	0	0	0	0
Trade Date < 1 y	0	0	0	0	0	0
Trade Date < 0 y	0	0	0	0	0	0
A+L+Derivatives without over-hedging derivatives	**1Y**	**2Y**	**3Y**	**4Y**	**5Y**	**6Y**
Trade Date < 10 y	*60*	*60*	*60*	*60*	*60*	*10*
Trade Date < 7 y	*35*	*10*	*0*	*0*	*60*	*10*
Trade Date < 5 y	*160*	*110*	*75*	*120*	*160*	*60*
Trade Date < 4 y	*160*	*85*	*50*	*95*	*85*	*35*
Trade Date < 3 y	*335*	*260*	*175*	*195*	*135*	*35*
Trade Date < 2 y	*485*	*360*	*275*	*245*	*185*	*85*
Trade Date < 1 y	*485*	*360*	*225*	*195*	*135*	*35*
Trade Date < 0 y	*535*	*360*	*250*	*220*	*185*	*85*

Over-hedging swaps are those that have been originated between 7 and 10 years ago, on the time bands 3 y and 4 y.

APPENDIX III: CUM APPROACH: IDENTIFICATION OF THE INEFFECTIVE DERIVATIVE

3.1 Early termination of hedging relationships and consequences on ineffectiveness tests

When a swap needs to be disqualified because of ineffectiveness on some of the time bands it contributes to hedge, it should be disqualified, *but only in regards to the fraction of its PVs corresponding to the over-hedged periods*.

The hypothetical method described before explains how to distinguish the ineffectiveness that needs to be accounted for: the PVs of the swaps regarding those hedged periods that are not accounted as ineffective need to remain in Equity and taken out of Equity into PnL over future periods.

Yet, keeping a cumulated gain or loss in Equity is allowed only as long as the initially hedged risk still exists.

This shows that an ineffectiveness test needs to consider previously terminated hedging relationships (which can have occurred due to ineffectiveness or due to voluntarily ending hedging relationships).

The method consists in applying the ineffectiveness test previously described to:

- ✓ **the existing hedging derivative;**
- ✓ **the existing hedging derivatives plus the past previously terminated**

Let us re-consider our previous example without the over-hedging swaps ("-40" over-hedging on age band "< 7 years" on time bands 3 y and 4 y):

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	-440	-490	-390	-240	-120	0
Trade Date < 7 y	-815	-690	-550	-600	-520	-100
Trade Date < 5 y	-1'140	-940	-925	-850	-670	-250
Trade Date < 4 y	-1'015	-815	-900	-900	-570	-250
Trade Date < 3 y	-965	-665	-650	-650	-320	-200
Trade Date < 2 y	-1'115	-665	-550	-700	-320	-250
Trade Date < 1 y	-1'215	-865	-650	-800	-370	-250
Trade Date < 0 y	-1'465	-965	-750	-850	-420	-250

The ineffectiveness test as explained before shows that there is no ineffectiveness to report.

Yet, if there are previously unwound derivatives that correspond to previously terminated hedging relationships, a second ineffectiveness test has to be performed to ensure that the cumulated gains or losses on these unwound swaps could remain in Equity instead of being immediately transferred into PnL, if the risks they initially hedge have not disappeared.

Let us consider a case were there have been previously unwound hedging relationships. This can be represented by the position of the hedging derivatives before they were unwound:

Unwound Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	0	0	-40	-40	0	0
Trade Date < 5 y	0	0	-40	-40	0	0
Trade Date < 4 y	0	0	-40	-40	0	0
Trade Date < 3 y	0	0	-40	-40	0	0
Trade Date < 2 y	0	0	-40	-40	0	0
Trade Date < 1 y	0	0	-40	-40	0	0
Trade Date < 0 y	0	0	-40	-40	0	0

This leads to a total derivatives position (still existing derivatives and unwound derivatives) of:

Derivatives + Unwound	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	-440	-490	-390	-240	-120	0
Trade Date < 7 y	-815	-690	-590	-640	-520	-100
Trade Date < 5 y	-1'140	-940	-965	-890	-670	-250
Trade Date < 4 y	-1'015	-815	-940	-940	-570	-250
Trade Date < 3 y	-965	-665	-690	-690	-320	-200
Trade Date < 2 y	-1'115	-665	-590	-740	-320	-250
Trade Date < 1 y	-1'215	-865	-690	-840	-370	-250
Trade Date < 0 y	-1'465	-965	-790	-890	-420	-250

The ineffectiveness test explained before is applied to this derivatives position built of existing and past derivatives that have been unwound.

This enables to make apparent that the hedged risk corresponding to previously unwound derivatives has disappeared:

Over-hedging Unwound Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	0	0	-40	-40	0	0
Trade Date < 5 y	0	0	0	0	0	0
Trade Date < 4 y	0	0	0	0	0	0
Trade Date < 3 y	0	0	0	0	0	0
Trade Date < 2 y	0	0	0	0	0	0
Trade Date < 1 y	0	0	0	0	0	0
Trade Date < 0 y	0	0	0	0	0	0

And the part of the cumulated gains or losses on those past hedging relationship have to be taken out of Equity into PnL.

3.2 Ineffectiveness and unwound derivatives

When ineffectiveness occurs, some derivatives must be disqualified as hedging derivatives.

Yet, the time bands on which ineffectiveness occurs can be some of the time bands that the derivatives were hedging.

Let us take the example analysed before ():

Assets + Liabilities	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	500	550	450	300	180	10
Trade Date < 7 y	850	700	550	600	580	110
Trade Date < 5 y	1'300	1'050	1'000	970	830	310
Trade Date < 4 y	1'175	900	950	995	655	285
Trade Date < 3 y	1'300	925	825	845	455	235
Trade Date < 2 y	1'600	1'025	825	945	505	335
Trade Date < 1 y	1'700	1'225	875	995	505	285
Trade Date < 0 y	2'000	1'325	1'000	1'070	605	335

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	-440	-490	-390	-240	-120	0
Trade Date < 7 y	-815	-690	-590	-640	-520	-100
Trade Date < 5 y	-1'140	-940	-965	-890	-670	-250
Trade Date < 4 y	-1'015	-815	-940	-940	-570	-250
Trade Date < 3 y	-965	-665	-690	-690	-320	-200
Trade Date < 2 y	-1'115	-665	-590	-740	-320	-250
Trade Date < 1 y	-1'215	-865	-690	-840	-370	-250
Trade Date < 0 y	-1'465	-965	-790	-890	-420	-250

A + L + Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	60	60	60	60	60	10
Trade Date < 7 y	35	10	-40	-40	60	10
Trade Date < 5 y	160	110	35	80	160	60
Trade Date < 4 y	160	85	10	55	85	35
Trade Date < 3 y	335	260	135	155	135	35
Trade Date < 2 y	485	360	235	205	185	85
Trade Date < 1 y	485	360	185	155	135	35
Trade Date < 0 y	535	360	210	180	185	85

No derivatives were previously unwound:

Unwound Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	0	0	0	0	0	0
Trade Date < 5 y	0	0	0	0	0	0
Trade Date < 4 y	0	0	0	0	0	0
Trade Date < 3 y	0	0	0	0	0	0
Trade Date < 2 y	0	0	0	0	0	0
Trade Date < 1 y	0	0	0	0	0	0
Trade Date < 0 y	0	0	0	0	0	0

Which leads to the ineffectiveness test:

Over-hedging Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	0	0	-40	-40	0	0
Trade Date < 5 y	0	0	0	0	0	0
Trade Date < 4 y	0	0	0	0	0	0
Trade Date < 3 y	0	0	0	0	0	0
Trade Date < 2 y	0	0	0	0	0	0
Trade Date < 1 y	0	0	0	0	0	0
Trade Date < 0 y	0	0	0	0	0	0

A+L+Derivatives without over-hedging derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	*60*	*60*	*60*	*60*	*60*	*10*
Trade Date < 7 y	*35*	*10*	*0*	*0*	*60*	*10*
Trade Date < 5 y	*160*	*110*	*75*	*120*	*160*	*60*
Trade Date < 4 y	*160*	*85*	*50*	*95*	*85*	*35*
Trade Date < 3 y	*335*	*260*	*175*	*195*	*135*	*35*
Trade Date < 2 y	*485*	*360*	*275*	*245*	*185*	*85*
Trade Date < 1 y	*485*	*360*	*225*	*195*	*135*	*35*
Trade Date < 0 y	*535*	*360*	*250*	*220*	*185*	*85*

We have seen before that the hypothetical derivatives technique enables to measure and account for ineffectiveness: it comes from the hypothetical derivatives of swaps originated between 7 and 10 years ago, on time bands 3 y and 4 y.

Moreover, it is necessary to unwind derivatives.

If the ineffectiveness comes from a notional of 40 with a 4 year (residual) life, disqualifying the whole swap would lead to a new derivatives position:

Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	-440	-490	-390	-240	-120	0
Trade Date < 7 y	-775	-650	-550	-600	-520	-100
Trade Date < 5 y	-1'100	-900	-925	-850	-670	-250
Trade Date < 4 y	-975	-775	-900	-900	-570	-250
Trade Date < 3 y	-925	-625	-650	-650	-320	-200
Trade Date < 2 y	-1'075	-625	-550	-700	-320	-250
Trade Date < 1 y	-1'175	-825	-650	-800	-370	-250
Trade Date < 0 y	-1'425	-925	-750	-850	-420	-250

and a new global position (assets + liabilities + derivatives):

A + L + Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	60	60	60	60	60	10
Trade Date < 7 y	75	50	0	0	60	10
Trade Date < 5 y	200	150	75	120	160	60
Trade Date < 4 y	200	125	50	95	85	35
Trade Date < 3 y	375	300	175	195	135	35
Trade Date < 2 y	525	400	275	245	185	85
Trade Date < 1 y	525	400	225	195	135	35
Trade Date < 0 y	575	400	250	220	185	85

Disqualifying these derivatives avoids to have any ineffectiveness:

Over-hedging Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	0	0	0	0	0	0
Trade Date < 5 y	0	0	0	0	0	0
Trade Date < 4 y	0	0	0	0	0	0
Trade Date < 3 y	0	0	0	0	0	0
Trade Date < 2 y	0	0	0	0	0	0
Trade Date < 1 y	0	0	0	0	0	0
Trade Date < 0 y	0	0	0	0	0	0

Yet, part of the cumulated gain or loss of this derivative is relative to periods on which the derivative is still effective (on the first two time bands). As seen before, this part of the cumulated gain or loss can be measured through the hypothetical derivatives.

That is why the unwound derivative is analysed

- ✓ **as a disqualification of an ineffective derivative on the time band 3 and 4, and**
- ✓ **as a early termination on the time bands 1 and 2.**

The unwound derivatives grid become:

Unwound Derivatives	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	0	0	0	0	0	0
Trade Date < 7 y	-40	-40	0	0	0	0
Trade Date < 5 y	-40	-40	0	0	0	0
Trade Date < 4 y	-40	-40	0	0	0	0
Trade Date < 3 y	-40	-40	0	0	0	0
Trade Date < 2 y	-40	-40	0	0	0	0
Trade Date < 1 y	-40	-40	0	0	0	0
Trade Date < 0 y	-40	-40	0	0	0	0

And the “existing + unwound derivatives” grid becomes:

Derivatives + Unwound	1Y	2Y	3Y	4Y	5Y	6Y
Trade Date < 10 y	-440	-490	-390	-240	-120	0
Trade Date < 7 y	-815	-690	-550	-600	-520	-100
Trade Date < 5 y	-1'140	-940	-925	-850	-670	-250
Trade Date < 4 y	-1'015	-815	-900	-900	-570	-250
Trade Date < 3 y	-965	-665	-650	-650	-320	-200
Trade Date < 2 y	-1'115	-665	-550	-700	-320	-250
Trade Date < 1 y	-1'215	-865	-650	-800	-370	-250
Trade Date < 0 y	-1'465	-965	-750	-850	-420	-250

This enables to account for ineffectiveness precisely on the time bands (Gaps) it appears.

APPENDIX IV: RISK DESIGNATION AND MEASUREMENT

Fluctuations in net interest margins can be an important source of uncertainty in bank profitability. The interest margin is at risk when rates on assets reprice faster than rates on liabilities, or vice versa. Every time a mismatch exists between repricing dates of assets and liabilities, the spread on earning assets or on liabilities can be compressed in the event of adverse rates changes. Such effects can be very large if interest rate risk is not adequately managed.

Banks have spent considerable time and effort in recent years to develop systems for monitoring and managing interest rate risk. Interest rate risk (IRR) is inherent to the operations of banks. Unless properly managed, it can become excessive and threaten the institution's earnings. Accordingly, an effective risk management process that maintains IRR within prudent levels is essential to maintaining the safety and soundness of financial institutions. Such an appropriate risk management must be adequately translated in financial statements.

1. How to define the hedged risk?

To assess the scope of its exposure, a bank must consider all types of IRR and capture all material sources of IRR. The IRR potential of an institution cannot be assessed by looking only at the asset side of the balance sheet or only at the liability side. It cannot either be assessed on a transaction basis. It is properly measured only when considering together both assets, liabilities and off balance-sheet instruments.

ALM focuses for risk measurement purposes on the existing balance sheet. Simulations of assets and liabilities which are not yet on the institution's balance sheet are data which are of interest to assess the adequacy of the institution capitalization under different interest rate scenarios, particularly stress scenarios, and to evaluate the impact of alternative policies. However, these future assets and liabilities do not contribute anything to the bank current risk. It is necessary to hedge operations at the time at which they are recorded in the balance sheet, and not before, because these transactions are priced at market conditions prevailing on their origination date. This explains why IRR assessment is based on all fixed future cash flows anticipated from an institution's existing assets, liabilities and off balance sheet contracts.

Interest rate risk can be categorized into different components:

- mismatch risk, which arises from timing differences in maturity/repricing dates of assets , liabilities and off balance sheet items;
- yield curve risk, which results from unequal changes of the term structure of the yield curve;
- option risk which, in retail banking, refers to embedded options which give their holders (e.g. customers) the right to alter contractual cash flows of the underlying financial instrument;
- basis risk, which, associated with floating rates instruments, arises when the assets and the liabilities that fund them do not share the same repricing index.

IMH aims to manage the exposure resulting from the first three components of IRR listed above: mismatch risk, yield curve risk and options risk. Basis risk is often hedged separately when the exposure to this type of risk is deemed significant, with specific instruments like basis swaps.

IRR also affects activities that generate fee-based revenue and other non interest income. However, exposure of P&L to rates changes cannot be hedged with financial instruments.

Prepayment risk is a form of option risk:

An important part of the cash flow generation on retail financial assets is random due to features like prepayment and default.

- As IAS 39 states, a prepayable item can be viewed as a combination of a non prepayable item and a prepayment option (39.BC 178).

- For interest rate gap measurement purposes, banks incorporate the impact of prepayment in the maturity' schedules by representing the prepayable item as a non prepayable one with a state expected maturity, shorter than the contractual one. This method is equivalent to a designation of a portion of the prepayable financial instrument as the hedged item. The non linear risk caused by customer's options is captured by the expected duration of prepayable assets and liabilities, which give the hedged cash flow of these prepayable instruments

- To cope with uncertainties related to the expected duration of behaviouralized products, additional protection against option risk can be obtained by using swaptions as hedging instruments. These strategies are not included in IMH as they involve optionality features to demonstrate hedge effectiveness and, therefore, other measurement techniques.

Default risk is generally considered as immaterial for IRR measurement, but it can also be incorporated in expected assets durations' calculus.

2. How to measure IRR?

The hedged risk is defined as the swap component of the contractual rates[1]. Swaps are the benchmark commonly admitted for such interest risk' measurement. Therefore, the other portions of the contractual cash flows are not protected by the hedging instruments (commercial margins, default premiums)

To measure the risk being hedged, several techniques can be implemented:

- gap analysis;
- earnings simulation;
- earnings at risk;
- duration analysis;
- economic or market value of equity;
- etc

[1] So, there is only one existing term structure of interest rates in this cash portfolio

Each of these methods has its merits and drawbacks. As banks prefer to protect net interest margins rather than the market value of equity, because the underlying assets and liabilities are not effectively traded and have no observable market value, methods centred on interest margins are the preferred ones on the operational ground[2].

For its simplicity, gap analysis is the method which is most commonly used to evaluate IRR and also the first necessary step to hedge interest rate risk in the banking book. An institution may choose additional methods of risk measurement but these will always lead to hedge interest rates gaps.

- gap analysis segregates rate sensitive cash flows of assets, liabilities and off balance sheet items into intervals of consecutive maturities (called time buckets) according to their repricing dates. The difference between the quantity of assets and liabilities repricing within a period is called the period gap. If more assets than liabilities reprice within a period (other factors being equal), the bank is exposed to a decrease in interest rates which will lower bank net interest margin, as assets will reprice more frequently than the corresponding funding liabilities. The cost of the funds will decline more slowly than the yield on assets. The gap size determines the main part of the institution's exposure to IRR for the relevant period: as a gap widens, the change in net interest income grows if rates change.

- natural offset is the main protection again interest rate risk in retail banking. Natural offset within one particular time bucket arises when the amount of asset repricing within this period matches the corresponding amount of liabilities. Natural offset can be viewed as an operational proxy for matching duration of assets and duration of liabilities

- the length of a time bucket is chosen to ensure that the natural offset assumption is valid because actual repricing within each short period cannot significantly vary. The shorter the bucket interval, the more easily this assumption is validated.[3]

If the risk is measured under this method on a gap basis, IRR management is performed globally along all the maturities of the existing book. Nevertheless, due to the constraint imposed by IAS 39 to demonstrate hedge effectiveness of each derivative on a stand alone basis, it is easier to designate the risk hedged as the risk inherent in one time bucket taken separately, even if, in fact, buckets' risks are correlated. This type of risk designation allows introducing a layer approach of the hedged portfolio to demonstrate effectiveness for the all hedging period.

To summarize, the hedged risk in the IMH methodology is the interest rate risk (swap portion of the rates) stemming from mismatches between assets and liabilities repricing within a short period of time and called time bucket. The length of time of this period is determined in order to consider the repricing risk within this period insignificant.

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[2] Conversely, banking regulators focus more on market value of equity as a proxy of institutions' liquidation value to assess the effects of interest rates shocks on firms' solvability.

[3] Without entering into details, it is worth to pinpoint that time buckets do not need to be equal for all cash flows maturities. The magnitude of residual mismatch effects inside one particular time bucket is minimal at the long end of the term structure of interest rates.

Depending of the risks limiting policies adopted by an institution, the ALM department will often not fully hedge the measured risk but only reduce the risk within the boundaries determined by management. Hedging has a cost and it is not always justified to hedge some marginal risk. Underhedging a gap does not have a different impact in term of global risk effective reduction compared to hedging only a designated portion of the whole portfolio.

CASH FLOW HEDGE

If a bank is positively gapped[4] for a future period (assets re-price quicker than liabilities) it needs to invest this supply of funding in some financial instruments for the period corresponding to this gap at unknown conditions. Under IAS 39, on a transaction basis, such a situation can be analysed as either a fair value exposure of the existing fixed rate gap component or as a cash flow exposure related to the future investment of the surplus funding. As core deposits are excluded from the scope of fair value hedge in IAS 39.49, fair value hedges cannot be used in such a situation.

A cash flow hedge is a hedge of future cash flows related to an existing variable rate instrument or a future transaction. To be able to assess hedge effectiveness based on cash flows changes measurement, the entity must know precisely the characteristics of the future transaction to be able to calculate these future cash flows. At the point in time where it calculates its interest rate risk exposure, the bank does not know in what kind of instrument it will invest in the future because such investments will be driven by customers demand and not by bank preferences. It can be an investment with a shorter maturity than the gap duration followed by a reinvestment on the remaining period or an investment with a greater maturity, partially funded by the liability surplus during the gap period. It can also be an investment in a variable rate instrument or in a fixed rate instrument.

If an entity has at all times a large pool of variable items justifying that such a forecast transaction is highly probable, it will have no difficulty establishing a cash flow hedge relationship which justifies a hedge on the accounting ground. However, for entities which operate in a fixed rate environment, such a designation is a bet on future production or may be prohibited in some investment configuration.

IAS 39 allows portions of risk to be designated as the hedged risk of a financial asset or of a financial liability such as a portion or a selection of contractual cash flows. For example, a swap may be designated as hedging the fair value exposures of interest payments of fixed rate bonds for x years and the change in value of the principal payment due at maturity ***to the extent affected by changes in the yield curve relating to the x years of maturity of the swap***. This requirement (“to the extent…”) is not elaborated upon in the IFRS literature. The closely related notion of Libor component of spot rates for different maturities, used in IG F 6.3, is neither defined in this guidance.

As the behaviour of a yield curve term structure in the future is not limited to parallel shifts, the value changes of cash flows of a future ten year loan for its first two years cannot be assumed to be identical to the value changes of a future two year loan. Assuming that

[4] A symmetric reasoning is valid for negative gapped institutions

changes in future cash flows are is not dependent on maturities is not a realistic assumption because parallel shift of the rate term structure is not a realistic assumption. The spot short term rate move is not the single factor of the rates term structure evolution.

To avoid the sweeping assumption that the dynamics of the whole yield curve are only parallel shifts[5] one needs to consider the term structure of interest rates on the date of investment. Any long term rate corresponding to an investment realized on that date can be viewed as equal to the geometric mean of the yields on a series of short term instruments. A swap protects against rates changes for the rates corresponding to its maturity. That means that only a portion of a rate for a longer instrument is hedged.

For example, a 10 years loan rate is equal to the geometric mean of the yield of the existing Libor one year and the nine following forward one year rates. If the maturity of a specific gap is three years and it is hedged by a forward 3 Y receiving fixed rate swap, only the three first short term rates components of the 10 y rate are hedged. Therefore, to recycle the swap's market value acquired on the investment date, one needs to modify these hedged components of the loan rate for the hedged period only.

In terms of banking information systems such an imputation can be a first serious challenge. However, the bank also needs to define a rule to identify what the hedged cash flows are and to which instrument they are related. As the investment characteristics are unknown during the hedging period, only a technique such as the first payment received can be implemented. This is also an operational challenge in the context.

Setting aside the practical problems that arise from such a methodology, cash flow hedge can work if the institution bets that it will have future transactions with a maturity longer[6] that the hedged gap. If this is not the case, such method does satisfy IAS 39 requirements. Although an investment for a shorter period followed by a new investment for the remaining period of the hedge permits to obtain the synthetic yield corresponding to the term structure of interest rates existing at the beginning of the hedging period, these two successive investments do not satisfy the criteria set by IAS 39.83 to designate groups of items as hedged items as they bear different rates[7].

Another problem arises when the dynamics of macro hedging is considered: as the bank's balance sheet changes randomly over time, a gap can be closed in subsequent periods before its expected starting date, as assessed on the hedging inception date. In this event the investment occurs before the gap period and no subsequent investment is made during the gap/hedged period. On the operational ground, the hedge is amended accordingly to the new exposure, but on the accounting ground, it is unclear if such a common issue to identified gaps cannot challenge the ability of Management to identify properly forecasted transactions (as discussed in the last paragraph of IG F 3.7).

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[5] Under this assumption, changes in interest rates are independent from the maturity of the instrument. Therefore, unknown maturities are not an obstacle for implementing cash flow hedge: swap of 5 years can hedge the first five years of a 10 years loan.

[6] This methodology supposes also an upward sloping yield curve. If the yield curve is inverted, the test introduced by IAS 39.99A may be not satisfied, depending of the slope of curve

[7] And, therefore, their sensitivities are different