THE HARMONISED SURVEY OF INTEREST RATES IN THE EURO AREA :
DESCRIPTION OF THE BELGIAN SURVEY

I. DESCRIPTION OF THE OLD STATISTICS AND THE NEED FOR HARMONISED EUROPEAN STATISTICS

Since 1993 the National Bank of Belgium has been conducting a monthly survey among credit institutions, ascertaining the debit and credit interest rates applied to non-financial customers. This survey has 22 voluntary reporting agents, and covers 13 types of contract[1]. It refers to specific products which are not necessarily offered by all credit institutions but which are strictly comparable with one another. For each financial instrument, the Bank calculates a weighted average, in which the weight corresponds to the value of the most similar item in Scheme A, and an unweighted average, calculated after elimination of the highest and lowest value. The weighted averages are used by the European Central Bank (ECB) as an indicator of certain families of rates[2] and are published in the statistical section of the Monthly Bulletin.

The movement in interest rates is an important source of information for the monetary policy of the Eurosystem. The ECB already knows the rates applied by credit institutions to non-financial customers, on the basis of national data. Since each country has its own definitions and its own way of calculating interest rates, making comparison difficult if not impossible[3], the ECB decided to harmonise the definitions, calculation methods, measurement periods and the procedure for selecting monetary financial institutions (MFI). This harmonisation is described in European Regulation ECB/2001/18[4] which was adopted on 20 December 2001. The purpose of that regulation is to obtain harmonised European aggregates which are not constructed in the same way as the EONIA and EURIBOR rates. The latter are designed to give only one overall result at European level; while that may be perfectly reasonable for the interbank market, the same is not true in the case of rates intended for households and non-financial firms, where geographical segmentation effects play a part. It was therefore important to have a minimum level of national details.

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[1] Standard contract means a contract in which the terms are fixed in advance, specifying the amount, the maturity, the use of the loan and the type of customer, if appropriate. This survey ended in December 2003.

[2] The name which the ECB uses here is RIR :the acronym of « retail interest rate ».

[3] See for example ECB Working Paper n°40 « Financial structure and the interest rate channel of ECB monetary policy », and « EU banks' margins and credit standards », available on the ECB website.

[4] Regulation (EC) N° 63/2002, of the European Central Bank (ECB/2001/18) of 20 December 2001 concerning statistics on interest rates applied by monetary financial institutions to deposits and loans vis-à-vis households and non-financial corporations. This document is available on the Bank's website (direct access via http://www.mfiir.be). Details of the statistical tables may be found here.

II. PRESENTATION OF THE EUROPEAN REGULATION

1. THE TWO SETS OF MIR STATISTICS: NEW CONTRACTS AND OUTSTANDING AMOUNTS

Two families of products are covered by the new monthly statistics, called MIR - Monetary Financial Institutions Interest Rates :
- the family of data on new business, corresponding to all new contracts[5] concluded during the reference period;
- the family of data on outstanding amounts, corresponding to the stock of contracts in existence [6] on the reference date – or in the reference period.

2. THE STATISTICAL ITEM

The statistical item is a combination of three variables relating to "sectors", "instruments", and "maturities, notice periods and initial rate fixation".

2.1 The sectors

The two institutional sectors used in the MIR statistics are non-financial corporations and households. The definitions coincide with those of the ESA1995[7] and are worded as follows:

- non-financial corporations (S11), the generic definition of which is given in paragraph 2.21 of the ESA1995[8] :

    "The sector non-financial corporations consists of institutional units whose distributive and financial transactions are distinct from those of their owners and which are market producers whose principal activity is the production of goods and non-financial services" (extract from § 2.21).

- households (S14), the generic definition of the sector being given in paragraph 2.75 of the ESA 1995[9] :

    "The households sector covers individuals or groups of individuals as consumers and possibly also as entrepreneurs producing market goods and non-financial and financial services (market producers) provided that, in the latter case, the corresponding activities are not those of separate entities treated as quasi-corporations. It also includes individuals or groups of individuals as producers of goods and non-financial services for exclusively own final use" (extract from §2.75).

According to Regulation ECB/2001/18, non-profit institutions serving households (S.15) can be included in the term households (S.14).

2.2 The instruments

The types of financial instruments covered – denominated in euro – correspond to categories *sui generis* for the purpose of analysing the monetary policy transmission mechanisms, and are therefore based on analytical

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5   As defined in Annex II §21 to Regulation ECB/2001/18.
6   Current contract means a contract producing its legal effects on the reference date; non-performing loans are not included.
7   ESA 1995 : European System of National and Regional Accounts, Eurostat 1996.
8   Details continue to paragraph 2.31 of ESA 1995.
9   Details continue to paragraph 2.86 of ESA 1995.

considerations rather than commercial characteristics. These types of instruments correspond to items which, in certain cases, cover very different products in the commercial sense.

The category covering deposits of households and non-financial corporations comprises the following instruments:
- overnight deposit;
- time deposit;
- deposit redeemable at notice[10];
- repo.

In the household credit category, we have :
- bank overdraft;
- consumer loan;
- loan for house purchase;
- loans for other purposes.

In the case of lending to non-financial corporations, the following distinction is made :
- bank overdraft;
- other loans depending on the amount (above or below EUR 1 million) of the loan on the contract date.

2.3   Maturities, notice periods and initial rate fixation

The third variable concerns the temporal aspect of transactions.

For the statistics on new business, a distinction is made between deposits and lending :
- deposits take account of the original maturity or period of notice ;
- lending only takes account of the initial fixed-rate periods.

The statistics on outstanding amounts only take account of the original maturity for both deposits and lending.

2.4 The new series from the regulation of 2009

The new regulation (ECB/2009/7) has introduced some additional categorizations to the regulation of 2001.

One have principally:

-   a more precise subdivision of the initial fixed-rate periods for the lending to non-financial corporations;

-   a more precise subdivision on the amount of the loan to non-financial corporations in order to have small amounts as a proxy to the loans to small and medium-sized businesses and industries;

-   the lending to « sole proprietors » as a subdivision of the lending to households for « other purposes. »

2.5 The case of Belgian monthly series

It has been detected that many loans/deposits to non-financial corporations with short term initial fixed-rate periods were in fact with a duration below one month. Moreover the statistics of new business is a sum of loans/deposits during the month, these very short term loans/deposits (in fact the loans are "straight loans" and the deposits are very short term fund management with duration of 3 days) have an impact on the amount of the new business (Cf. infra § 5.1 "Calculation conventions adopted"). For instance, it is possible to renegotiate 4 times in a month a loan with duration of one week. In this case the loan is recorded 4 times. To emphasize this phenomenon 4 new series have been created corresponding to the 4 series with the shortest initial fixed-rate periods.

2.5 The case of closed series

Some series have been closed by the new regulation of the ECB (ECB/2009/7). These closed series can be reconstituted with some new series. Nevertheless it has been decided to continue to publish these old series in order to have "long" series available for economics and econometric analysis.

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10 For households only.

3. THE RATES USED : AAR AND APRC

Two conventions on rates are adopted for the purpose of calculating the statistics.

A composite rate[11] which corresponds to the "effective rate" used by actuaries, permitting unambiguous conversion from one payment frequency to another; it is conventionally known as the Annualised Agreed Rate (AAR). This is expressed by the classic formula :

$$i_{AAR} = \left(1 + \frac{r_{ag}}{n}\right)^n - 1$$

The rate agreed between the contracting parties and expressed in nominal terms (here r_{ag} is expressed in decimals) therefore has to be converted according to the annual frequency of payments (here : n payments per annum).

An actuarial rate which is itself defined in two ways :
- without charges, it is the NDER[12] (« Narrowly Defined Effective Rate »);
- with charges, as defined by the European Commission, we have the TAEG[13,] : *taux annuel effectif global* referred to in Belgian national law (in English : Annual Percent Rate of Charge, APRC[14]).

This actuarial rate can allow for irregular months, successive borrowings over a period of time, irregular repayments and/or irregular capitalisation. Apart from incorporating the charges, it is more accurate in itself, in terms of price comparison, than the previous rate. On the other hand, introducing the calculation of this rate implies a high initial cost in respect of the element not yet subject to a statutory obligation.

The national central banks (NCBs) may require the NDER for certain statistical items[15]. The Bank decided to use the composite rate (AAR) as the reference rate for all statistical items, except in the cases where Regulation ECB/2001/18 explicitly requires the APRC (in the case of "consumer loans to households" and "loans to households for house purchases")

4. AGGREGATION : NATIONAL - EURO

Aggregation is a three-stage process:
- stage 1 involves aggregating the detailed data on an item supplied by the credit institution. This gives us the individual data (cf. infra);
- stage 2 aggregates the individual data of each credit institution at national level. This gives us the national data (cf. infra);
- stage 3 aggregates the national data to obtain the data for the euro area.

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[11] Cf. Regulation ECB/2001/18, Annex II §2.
[12] Cf. Regulation ECB/2001/18, Annex II §3.
[13] Cf. some comments in Annex A1, infra.
[14] Cf. Regulation ECB/2001/18, Annex II §3, §§9-11.
[15] Cf. Regulation ECB/2001/18, Annex II §3.

The data are aggregated at the level of the euro area in weighted average form. The weighting is carried out using weights which depend on the family of products :
- in the case of new business, weighting is based on the amount of new business according to the MIR survey;
- for outstanding amounts, the weighting is based on the amount outstanding – corresponding to the financial positions of the credit institutions – notified by the NCBs to the ECB (in Belgium, Scheme A in particular[16]).

Both are stated by the following classic formula:

$$r^w = \frac{\sum\limits_{j} w_j r_j}{\sum\limits_{j} w_j}$$

where r represents an interest rate and w a weighting ratio (outstanding amount or new business). The indices j represent a country in the euro area.

5. CALCULATION CONVENTIONS ADOPTED

The data for each statistical item are an aggregation of commercial products. There are two different types of data : data on new business and data on outstanding amounts.

5.1 Data on new business

Since a single statistical item may cover numerous commercial products, an average rate has to be calculated for each item, on the basis of the rates applied, weighted by the amount of new business in the products in question during the month[17]. This calculation does not need to take account of the duration in the reference period[18]. This gives us the classic formula :

$$\text{Item rate} = \sum\limits_{i \in [T1-T2]} \text{share of new business}_i * \text{Rate}_i$$

in which "share of new business" represents the relative weight of the product in terms of new business.

In graphic form we have the following charts, one showing four valid contracts in the weighting calculation and the other showing two invalid contracts:

| Contracts valid for new business | Contracts invalid for new business |

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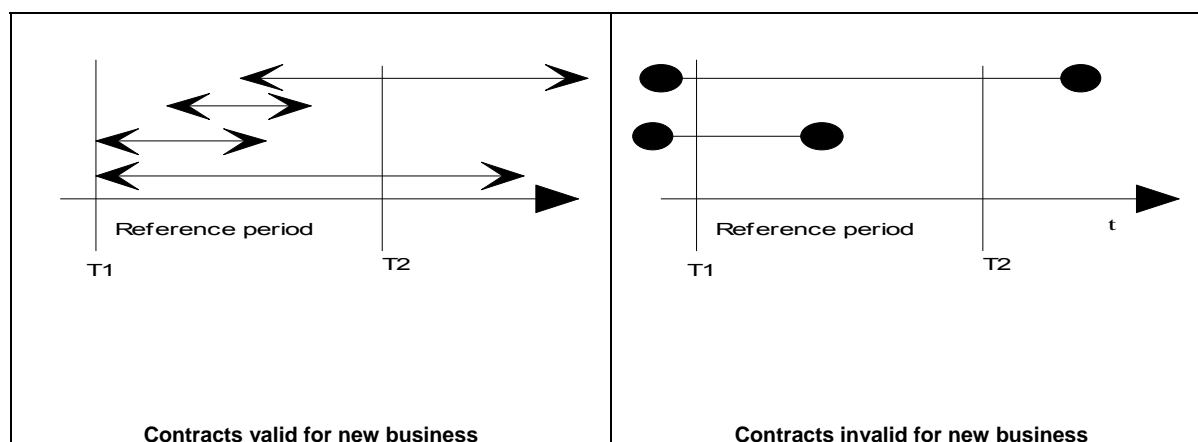
[16] Schema A covers monthly and quarterly bank returns.

[17] Cf. Regulation ECB/2001/18, Annex II §33.

[18] There is therefore a single weighting and no dual weighting incorporating the duration in the reference period as well as the amounts.

Any contract commencing during the reference period is valid even if it expired during the same period.
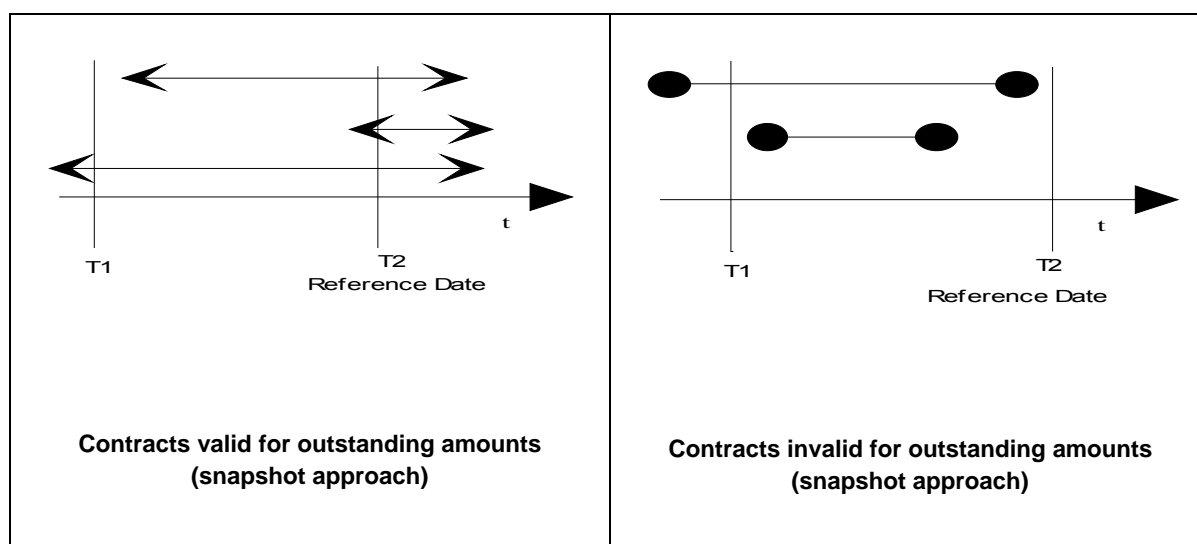
5.2 Data on outstanding amounts

In the case of data on outstanding amounts, two options are available from which the NCBs must choose only one.

5.2.1 First option : the snapshot

The first option[19], which is the one preferred by the ECB, corresponds to a photographic image ("snapshot") comprising - in the form of a weighted average - all the contracts still active on the reference date (end of period); this is formalised in the following equation for the reference date T2 :

$$\text{item rate} = \sum_{i \in T2} \text{Share of Stock}_i * \text{Rate}_i$$

in which « share of stock » represents the relative weight of the product in terms of stock.

Contracts valid for outstanding amounts (snapshot approach)

Contracts invalid for outstanding amounts (snapshot approach)

In the above chart all the contracts represented by arrows which intersect the end of period line have to be taken into account in the calculation (cf. chart "Contracts valid for outstanding amounts") .

This first option was chosen by the Bank – in consultation with the credit institutions – for the MIR statistics.

5.2.2 Second option : the quotient

The second option[20] corresponds to an implicit rate determined by a quotient in which the accumulated flow of interest is divided by the average stock of the instruments concerned. Of course, this definition does not correspond to the previous one since it covers (pro rata temporis) contracts expiring during the period as well as contracts "in" the period. It is formalised for the monthly data by the following equation:

$$\text{Implicit Rate for Item} = \frac{\sum_{Mois} \text{month Accumulated Interest}}{\text{Average Monthly Stock}} * \frac{\text{Card(A)}}{\text{Card(M)}}$$

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[19] Cf. Regulation ECB/2001/18, Annex II §27 and §30-a.

[20] Cf. Regulation ECB/2001/18, Annex II §28 and §30-b.

where :
Card(A)= Number of days in the year, according to the day convention adopted;
Card(M)= Number of days in the month, according to the day convention adopted.

Since the ECB interprets the average monthly stock in an "ideal" sense as the average of the daily stocks in the month in question, or:

$$\text{Average Monthly Stock} = \frac{1}{\text{Card(M)}} \sum_{i=1}^{\text{Card(M)}} \text{Daily Stock}_i$$

In chart form, we have a continuum over the period comprising all contracts; the contracts underlying this type of calculation are represented with a thick line showing the part included in the calculation :

Contracts and parts of contracts valid for outstanding amounts

(quotient approach)
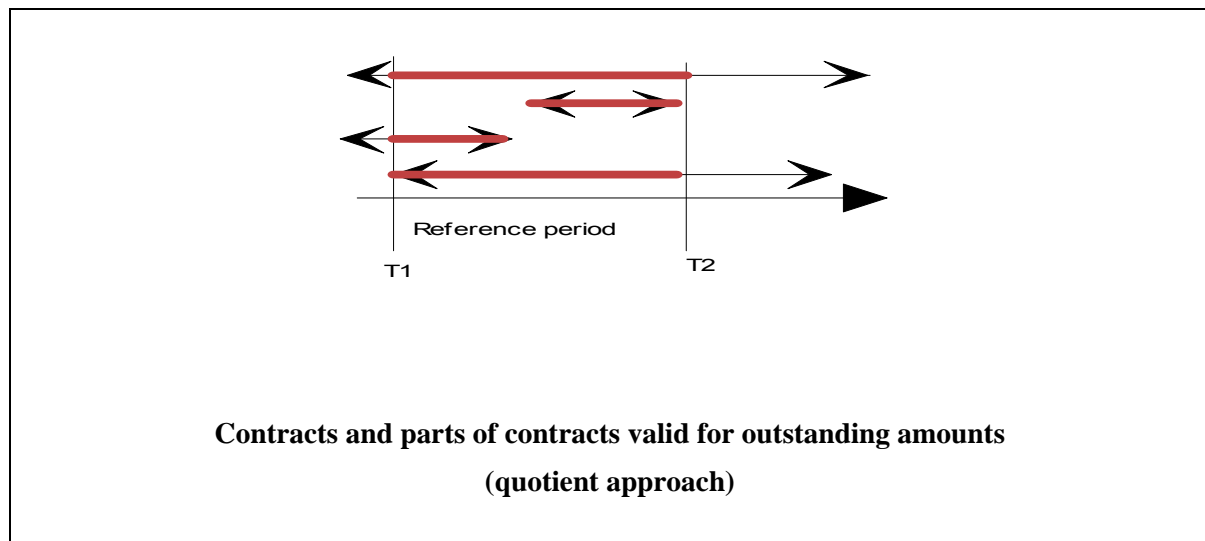
Regulation ECB/2001/18 provides for varying treatments for different products and offers derogation options in the formula for calculating the average monthly stock :
- in the case of overnight deposits, deposits redeemable at notice and bank overdrafts[21], the formula for calculating the average monthly stocks must be based on daily stocks;
- in the case of other products[22], the ECB recommends calculating the average monthly stocks on the basis of daily stocks, but permits the use of weekly or more frequent balances. For the item "loans with an agreed maturity of over 5 years", the ECB permits the use of end-of-month stocks as a proxy for the average for a derogation period of two years from January 2003.

5.2.3 Important point

Regulation ECB/2001/18 specifies that, in the case of overnight deposits, deposits redeemable at notice and bank overdrafts, the method of calculation is the same for both new business and outstanding amounts :

"in the case of overnight deposits, deposits redeemable at notice and bank overdrafts, the concept of new business shall be extended to the whole stock. "(ECB/2001/18, Annex II, § 17)

The reference period has been fixed, by agreement, as the end of period (cf. above, the snapshot option). That implies that the rate is calculated on the basis of all contracts current on the last working day of the month.

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[21] Cf. Regulation ECB/2001/18, Annex II §30-b.

[22] Cf. Regulation ECB/2001/18, Annex II §28.

Another important point is that regulated savings deposits do form part of the item "Deposits redeemable at notice of less than three months".

III. SELECTION OF THE PARTICIPANTS IN BELGIUM

1. SAMPLING OR EXHAUSTIVE SURVEY IN EUROPEAN LEGISLATION : ECB CRITERIA ON RANDOM SAMPLING

In Regulation ECB/2001/18 of 20 December 2001, the ECB describes the conditions which random sampling must satisfy if an NCB decides to use that method of selecting credit institutions.[23]. Those conditions[24] correspond to certain principles and accuracy requirements. Thus, the sample must be stratified, i.e. the credit institutions must be selected from a population previously divided into separate sub-populations from which at least one is selected per sub-population. If the stratification is not achieved by quantitative techniques, it is foreseen that a stratum will comprise universal credit institutions, i.e. credit institutions active in all the areas covered by the statistics.

The sample size must be sufficient to achieve an accuracy of 10 basis points (b.p.) at the threshold ("α") of 10% for each instrument[25]. For the first drawing, selection based on threshold has been authorised (75% coverage of the relevant total or 30% of the resident potential reporting population), so long as an additional sample is selected when the population changes, regardless of the level of accuracy achieved.

The Bank opted for random sampling, and also decided not to make use of the available derogations. For the purposes of selecting the credit institutions, the legal basis for the Bank's methods is paragraph 5 of Annex I of Regulation ECB/2001/18, which permits the use of "proxies" and "suitable models" in cases where existing sources do not perfectly match the definitions of the Regulation.

2. STRATIFICATION

In order to establish its sample of credit institutions, the Bank decided to use methods which conform as closely as possible to the recommended "correct" way of constructing a sample, by using structural information – wherever possible – rather than administrative categories. For that purpose, the Bank constructed strata in the population of credit institutions on the basis of the items in Scheme A relating to the various instruments generating debit and credit interest rates; those strata were obtained by using an automatic technique for constructing divisions[26] (into classes or "clusters") on the basis of data previously filtered through Principal Component Analysis (PCA). This method was used in order to eliminate statistical noise and obtain synthetic descriptive characteristics of the credit institutions and their relative positions in terms of activity.

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[23] The ECB recommends using this method, which is the only one with a sound theoretical basis.

[24] Cf. Regulation ECB/2001/18, Annex I.

[25] It is believed that this accuracy of 10 b.p. must correspond to a certain degree of probability; for example, in 90% of cases the "true" rate lies within the confidence interval (i.e. in 9 out of 10 samples). This leaves a risk of 10% (in 10% of cases the "true" rate will not lie within the confidence interval); that risk is traditionally represented by the letter α. This concept of risk is essential, since in selecting a sample we take the risk of being farther away from or closer to the "true" value of the parameter sought; a risk of zero corresponds to a census.

[26] Known as automatic classification methods.

3. FILTERING

Factor analysis[27] consists in "reducing" a matrix of statistical data **X** (generally structured as : "individuals in lines X variables in columns")[28] to obtain a set which may be smaller, in terms of variables, so that these new variables are uncorrelated. The matrix of correlation of these variables is then a diagonal matrix[29] in which the new variables are in orthogonal pairs. The reduction of the matrix **X** is effected by creating new axes (i.e. new variables) each of which is a linear combination of the original axes (i.e. the original variables), each reduction retaining a decreasing amount of information (i.e. the total variance). Each new axis is called a factor axis[30] and is followed by a number indicating its order of succession, and hence its position in a descending order of information (F(1) > F(2) > F(3), etc.). The intersection of two factor axes gives a factor plane; it is usual to refer to plane [F(1) ; F(2)] or plane [F(1) ; F(3)] and specify the quantity of variance explained per axis and per plane.

The variables used for the ACP are those which, in a Scheme A balance sheet, come closest to the financial instruments defined by the ECB. The items used were therefore the ones closest to the new business statistics; these variables are merely proxies, the important point being their discriminatory power in the construction of the strata, and not their strict correspondence with the financial instruments defined by the ECB. Certain items are grouped together to avoid too many empty boxes.

To obtain robust data, it was decided to use the accounting mean of several months. A number of preliminary treatments must be applied before the PCA. It was therefore necessary to take account of the high degree of skewness of the data: the five largest credit institutions represented 75% of the overall balance sheet total. A logarithmic transformation was therefore applied to the basic data, which – as a monotonic function – preserves the original composition of the strata (clusters) but facilitates comparison between individuals. In addition, this transformation reduces the "size effect[31]" of the first principal component.

4. CONSTRUCTION OF THE CLASSES

The methods of constructing classes[32] consist in using a table of distances or coordinates as a basis for arranging the elements which are closest according to certain criteria. The algorithms may be very different. They may start from individual elements and successively aggregate the closest individuals, constructing an aggregation tree which, when cut determines the classes; this is called ascending classification. They may also start from a predetermined number of classes, and individuals regarded as the temporary centre of these classes, aggregate the close individuals, calculate an average individual, aggregate again, form a new class centre, etc. ; in this case we talk about moving centres or « k-means ».

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[27] We also talk about "multivariate analysis" in the English-speaking world where the PCA is often used.

[28] Or the result of the previous transformation (by centring or centring and reduction) of a matrix **R** of basic data.

[29] The expression "diagonalisation of the matrix" is therefore used for this family of methods.

[30] As this article only uses the technique of analysis into main components, the terms "factor axis" and "principal component" will be used to mean the same thing.

[31] In the circle of correlations of a factor plane of the PCA – with reduced centred data – a "size effect" appears when all the vectors representing variables are pointing in the same direction and when they are close to the edge of the circle (*i.e.* close to 1 and therefore well represented in the factor plane). All the variables are therefore positively correlated in pairs. The directional axis of the variables of this factor plane is the size axis.
The "size effect" concept is important because it permits the indication of a multidimensional average which is not simply an aggregation. Moreover, this "size effect", limited by construction with a single factor axis, permits analysis of the other dimensions revealed by that effect (this is a consequence of the orthogonality of the factor axes). This size effect is generally important in terms of its ability to "explain" the sample (60%, 70% of the total variance). By reducing the size effect, we reveal the "forms" of the data other than the scale of activity.

[32] In this article, the terms "class" and "stratum" are used interchangeably. "Stratum" is the usual term in the world of sample surveys while "class" is used in data analysis.

After numerous simulations and in order to obtain a manageable number of strata, four strata[33] were adopted. The strata are formed by the "hierarchical ascending" classification technique[34], based on the 4 principal components[35], which act as new variables and cover 85 p.c. of the total variance.

Of the 4 strata used, the first 3 correspond to a breakdown of credit institutions according to their volume of activity and the more or less specific sphere of their activity. In contrast, the fourth stratum is made up of "universal credit institutions", i.e. credit institutions active in almost all the fields covered by the variables adopted (in fact, the first principal component highlighted these credit institutions).

5. SAMPLING DESIGN

After determination of the composition of the strata in the preceding stage, the allocation per stratum, i.e. the number of credit institutions to be selected from each stratum, must also be calculated. The only way to do that is by using information on the rate dispersion which is closest to that required by the ECB. The RIR survey data[36] on the debit and credit rates of credit institutions were adopted. This survey was extended, during December 2001, in order to obtain around sixty participants and thus improve the coverage of the rate dispersion in all strata.

Next, in view of the large number of instruments and the corresponding impossibility of calculating the Neyman optimum[37], the sample size per stratum was calculated by the linear programming technique.

In practice, the columns contain the 4 strata and the lines contain the 10 instruments of the RIR used as a basis for the model. This means that we can impose a constraint per instrument, the constraint being expressed in terms of variance corresponding to the ECB's requirements. The economic function, which represents the optimum achievable in the linear programme, is a function of cost to be minimised and corresponds to minimalisation of the number of credit instruments to be sampled per stratum.

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[33] The 4 classes (strata) were adopted on the basis of good discrimination given by an index of distance between classes.

[34] The method used is the automatic ascending hierarchy classification with consolidation of the divisions by moving centres. It is based on the Ward ascending classification criterion and on the principle of moving centres for the part dedicated to consolidation.

[35] The first 4 principal components were adopted according to the "angle [?]" rule (i.e. detection of the presence of a "plateau" in the histogram of decreasing size of own values) and the total variance rule.

[36] This survey makes it possible to calculate the rate dispersion per financial instrument and to estimate the accuracy of the average rate (i.e. a confidence interval or a coefficient of variation) ; it also permits measurement of the change in that accuracy over time. The data from this survey are used for preparing the sampling plan (variance calculation) for selecting the participants in the harmonised survey.

[37] Neyman's optimum is a reference formula in the sampling world. This formula can be used to determine, for a given budget, the number of individuals to be sampled per stratum according to the dispersion of each stratum and the processing cost associated with each stratum. If the costs are equal, the higher the variance in a stratum, i.e. the richer the information content, the higher the number of individuals that should be taken from that stratum. This formula permits the optimum allocation of resources, but can only be used subject to certain conditions, one of which is extremely restrictive : it must be possible to summarise the survey in one variable enabling the calculation of the variance, which will determine the optimum. This condition is not fulfilled, by definition, in surveys covering several subjects at once.

The sampling design – i.e. the number of institutions to be sampled per stratum as calculated after resolution of the linear programme – is set out in the table below :

Stratum	Number of credit institutions in the stratum[38]	Number of credit institutions to be selected from the stratum
Class 1/4	35	8
Class 2/4	26	9
Class 3/4	30	8
Class 4/4	15	13

6. PROBABILITY OF SELECTION IN PROPORTION TO SIZE

Once the stratification and the sampling plan have been designed, the units can be selected. Since the stratification took account of the element of variability in the activity of the credit institutions, allowance now has to be made for the level of distortion in the size distribution within the strata (skewness). The sampling method is based on the principle of selection with probability proportional to size (known as "p.p.s.[39] samples"). The relevant size is the total of the accounting items relating to the rates, since the amount outstanding is correlated with new business.

The selection algorithm is the "Rao-Hartley-Cochran" algorithm which is used to select the units making up the sample and calculate the latter's variance.

To avoid obtaining a sample which is abnormal in relation to a "balanced" sample, it was decided to draw several hundred samples. Since the population is very small, that does not present any special technical problems. For each sample, the coverage ratio in relation to the population was calculated. This ratio is made up of the accounting value of suitable items in Scheme A. These ratios are then expressed as the statistical distribution within each stratum; since the sampling method involves unequal probabilities, the distribution is distorted to the right (the density is greater for high values of the ratio). In order to avoid obtaining an "extreme" sample (comprising only large or only small credit institutions), the median sample of each distribution was the one ultimately used.

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[38] Credit institutions with an activity covered by the MIR statistics.

[39] P.p.s. stands for "probability proportional to size".

7. CHARACTERISTICS OF THE SAMPLE

The sample actually taken can be described by the following table, with stratum 4 (class 4) made up of universal banks. Coverage in terms of value takes the items in Scheme A which concern the MIR statistics.

Stratum	Number of credit institutions in the stratum[40]	Sample taken		
		Number of institutions	Coverage in terms of number (percentages)	Coverage in terms of value (percentages)
Class 1/4	35	8	23	48
Class 2/4	26	9	35	54
Class 3/4	30	8	27	44
Class 4/4	15	13	87	96
Total	106	38	36	91

The sample may also be described by a number of additional, general factors :
- 92 p.c. coverage of the balance sheet total ;
- 90 p.c. coverage of total loans taken into account by the MIR ;
- 91 p.c. of deposits taken into account by the MIR.

As may be seen from the table above, the stratum 4 – which contains the universal banks and, *ipso facto*, the big banks – implies a high coverage in terms of value for both the balance sheet total and the total of the relevant items.

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[40] Credit institution with an activity covered by the MIR statistics.

IV. PROCESSING OF THE DATA BY THE NATIONAL BANK

1. "HOUSE PRODUCTS"

By arrangement with the credit institutions, and without there being any obligation, the Bank asks for the "house products" for each set of statistics (new business and outstanding amounts), i.e. details of the products included in the ECB's statistical item. These details permit the following operations:

- if a product is reclassified, the Bank can reconstruct the historical data, easing the reporting burden of calculation for the participating credit institution;

- as regards quality checks on national results, carried out by the ECB in the second place, questions concerning doubt about the data can be more precise and enable the credit institution to give a speedier answer;

- as regards the granularity of the quality checks, the establishment of validations per "house product" makes it possible to take account of the product's inherent characteristics, and hence to adapt the validation programmes to fit those characteristics, in collaboration with the credit institution concerned in the case of highly specific products;

- monitoring of the products included in an item, obviating the need to conduct ad hoc surveys on the relevance of the product classification.

2. DATA VALIDATION : THE STAGES

2.1   Stage 1 : Receipt and verification in the data base[41][42]

This stage corresponds to receipt of the data in a suitable format – which is verified on receipt – and within the specified time.

2.2   Stage 2 : Individual validation[43]

This stage covers all the automated validations developed over time by the Bank, on its own initiative or at the instigation of the ECB. These validations include the following elements:
- rate curve normality test;
- detection of critical values for rates in the distribution of the rates in the sample ;
- detection of critical values for rate variations in the distribution of the rate variations in the sample;
- test on the relationship between rates and risk or commercial weight;
- the course pattern of rates ;
- the course pattern of the interquartile interval[44];
- relation between new business and stocks.

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[41] Cf. Regulation ECB/2001/18, Annex III §§ (a), (b), (c), (d), (h), (i).

[42] Cf. for temporary derogations from the timetable : Regulation ECB/2001/18, Annex IV §§ 1, 2.

[43] Cf. Regulation ECB/2001/18, Regulation Article 4 and Annex III §§ (e), (f), (g), (j), (k), (l).

[44] I.e. the difference between the third quartile and the first quartile of the distribution of the rates in the sample.

2.3 Stage 3 : Validation of the aggregates, the sample and the weights

The final stage in the validation is essentially a chronological validation stage taking data "in cross-section". Its purpose is to detect "abnormal" variations in both the rates and the weights relating to credit institutions. It therefore cannot be carried out until after the data dilatation (see below).

This stage includes :
- rate curve normality test;
- test on the relationship between rates and risk or commercial weight;
- course pattern of rates ;
- course pattern of weights.

3. DILATATION OF THE DATA : NEW BUSINESS

Since this is a sample survey, it is important to estimate the true weight of Belgium in the aggregate figure for new business[45] in the euro area. The estimated weight of Belgium is calculated by dilating the sample data on new business. This is done by using a data coefficient of expansion (sampling weight), calculated by using statistical relationships between the variables available for the population as a whole and taking account of the method of constructing the sample.

Since the sample is stratified, and since each component of the sample has a selection probability in proportion to its size – i.e. a probability which is different for each individual[46] -, it is necessary to dilate the data on new business to take account of this selection probability.

The coefficient of expansion is calculated on the basis of the Horvitz-Thompson estimator, which takes account of the selection probability for each individual in order to dilate the data of each credit institution in each stratum. This estimator is based on auxiliary information[47] in the form of tables of supplementary descriptions for Scheme A. This auxiliary information corresponds to the items closest to the MIR variables. The estimator for a total corresponds to the following generic formula :

$$\hat{w} = \sum_{i \in s} \frac{w_i}{\pi_i}$$

in which π_i represents the probability of inclusion[48] of credit institution i in sample s, and w is the amount of new business. This ratio is calculated for each stratum.

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[45] For the part relating to the outstanding amount, the relevant total outstanding figure in Scheme A is taken (exhaustivity).

[46] In this case we refer to unequal probability sampling.

[47] This information cross-references "products" x "counterparty sectors" in Scheme A.

[48] More precisely, the order 1 probability of inclusion. The order 1 probability of inclusion corresponds here to the quotient of the volume of the amount outstanding of the credit institution divided by the total volume outstanding for the population for the item in Scheme A used as an auxiliary variable.

4. AGGREGATION PROCESS : HOUSE PRODUCTS (PER INSTITUTION) - STRATUM - NATIONAL

The "house products" of each reporting credit institution are aggregated in accordance with a weighting scheme corresponding to the statistics (new business or outstanding amounts), for each item in the statistics in question. This can be represented by the classic formula :

$$r_j^w = \frac{\sum\limits_i w_i r_i}{\sum\limits_i w_i}$$

in which the index i represents house product i, index j = bank j, r = a weighted average rate and w is the amount of new business.

The data used for weighting purposes – corresponding to the statistics in question (new business and outstanding amounts) – are dilated by a coefficient of expansion calculated for each stratum. This coefficient of expansion is applied to each credit institution ; this can be expressed by the algebraic equation:

$$w_j^d = w_j \times d_j$$
$$w_j = \sum\limits_i w_i$$

in which d represents a coefficient of expansion. Since the latter is linked to the Horvitz-Thompson estimator, it is equal to :

$$d_j = \frac{1}{\pi_j}$$

National aggregation takes place in the form of a weighted average, using the dilated volumes (new business or outstanding amounts) as the weight. It is these weighted average rates (after dilatation) and the dilated volumes that are forwarded to the ECB. This is written as the classic formula :

$$r^{wd} = \frac{\sum\limits_j w_j^d r_j^w}{\sum\limits_j w_j^d}$$

5. CALCULATION CONVENTIONS APPLIED IN BELGIUM

A number of products or situations[49] require special treatment. The principle ones are set out below.

5.1 The APRC ("Annual Percentage Rate of Charge")

The APRC is applicable only if the European legislation has been transposed into Belgian national law. Since the European legislation covers only consumer credit and since the Belgian legislature has not extended these rate calculation rules to mortgage lending, i.e. loans intended for private house purchase under Belgian law, it is not legally possible to calculate an APRC for the latter.

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[49] Since Regulation ECB/2001/18 applies only to borrowing and deposits, the statistics do not cover securities; in that respect there is a difference in relation to the RIR survey which also covers savings notes. However, to ensure continuity of information on this financial instrument, participants have been asked to report rates and new business in relation to savings notes. These data are not strictly speaking part of the MIR statistics.

5.2 Regulated savings deposits, and the fidelity and growth premium

Since regulated savings deposits come under the item "Deposits redeemable at less than 3 months' notice", they are calculated in the same way as outstanding amounts (cf. supra). This particular case is covered by a specific paragraph of Regulation ECB/2001/18. Fidelity and growth premiums should be included in new business. The interest rate granted should be reported, including the fidelity premium if such premium was paid.

V. LIMITS OF COMPARABILITY BETWEEN MIR STATISTICS AND THE OLD SURVEY

There are major differences between the MIR statistics and the RIR statistics. These differences, which have already been discussed above, lie both in the nature of the product coverage (items) and in the weighting and nature of the rates recorded. Strictly speaking, it is therefore impossible to compare the two sets of statistics; at the very most, we can indicate formal points of connection between the two worlds[50].

1. THE STANDARD CONTRACT VIS-À-VIS THE STATISTICAL ITEM

The RIR statistics consisted of standard contracts, i.e. contracts which had been standardised, permitting almost perfect comparability of the results. However, that comparability covered products which might not be very representative of the activity of the reporting credit institution, products for which a tariff existed but which were seldom sold.

In the MIR statistics, the items cover very varied products, which are standardised by calculating the rates and the weighting. The aggregate for the euro area may therefore cover products with characteristics which vary greatly between countries.

2. WEIGHTING

The RIR statistics were weighted by the outstanding amounts of items in Scheme A which formally covered the standard contract. This was therefore an approximation which corresponded only to the bank's importance for certain activities. In fact, the rate offered on the standard contract might very well not have been sold, and might be weighted on the basis of a large figure shown for a similar or not so similar item in Scheme A.

In contrast, in the MIR statistics the weighting is based on the amounts of actual contracts. Thus, the rates of new business are weighted by the volume of corresponding new business. It is therefore possible that some credit institutions with exceptional activity in certain items may have a substantial influence on the weighted average rate, whereas their outstanding amount need not actually be large (e.g. following a promotion campaign).

3. AGREED RATES VIS-À-VIS OFFERED RATES

The rates in the RIR statistics were offered rates, disregarding any negotiation of terms. These rates tended to correspond to list prices rather than notionally standardised rates.

The MIR statistics give rates which correspond to the rates actually applied, i.e. the rates which the credit institution applies in its contractual relationship with the customer.

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[50] Cf. Table below.

TABLE SUMMARISING THE MAIN CHARACTERISTICS

CHARACTERISTICS	MIR	RIR
Offered rates		X
Agreed rates	X	
Weighting according to outstanding amounts (rates on outstanding amounts)	X	
Weighting according to new business (rates on new business)	X	
Weighting according to outstanding amounts (rates on new business)		X
Standard contract		X
Item	X	
Weighted average rate	X	X
Simple average rate (arithmetical mean)		X
Robust measures	X	
Measures of dispersion	X	X
Stratified random sample	X	
Panel monitoring in terms of accuracy	X	

TABLE SHOWING FORMAL CORRESPONDENCE BETWEEN MIR AND RIR STATISTICS

RIR CONTRACT	CORRESPONDING SCHEME A ITEM	MIR CODE NUMBER[51]
Flat rate loan	121.4	NB14
Mortgage loan with redemption	121.52	NB17
Loan for a maximum term of 1 year (6 months)	121.62	NB24
Loan for a term of more than 1 year (5 years)	121.61	NB25
Overdraft	121.7	NB23
Overnight deposit	221.1	NB01
Deposit for a term of less than 1 month	221.2	NB02 NB08
Deposit for a term of between 1 month and 1 year (3 months)	221.3	NB02 NB08
Deposit for a term of more than 1 year (3 years)	221.4	NB04 NB10
Regulated savings deposits	221.6	NB05

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[51] The numbering follows that of the indicators in Regulation ECB/2001/18 (Appendices 1 et 2). NB indicates new business.

A1 : RATE FORMULAS : ANNUAL PERCENTAGE RATE OF CHARGE (APRC)

The APRC and its scope are set out in the following European legislation :
- Directive 87/102/EEC of 22 December 1986;
- Directive 90/88/EEC of 22 February 1990, which defines the actuarial formula for calculating the APRC, which is the equation expressing the equivalence between discounted opposing flows ;
- Directive 98/7/EC of 16 February 1998 which stipulates the method of calculating the APRC formula on a calendar basis.

In Belgian law, the foundation text is the Royal Decree of 4 August 1992 on consumer credit charges, rates, maturities and repayment terms, published in the Moniteur Belge on 8 September 1992. This text incorporates the APRC equation from Directive 90/88/EEC using different symbols (Article 4 §1 of the Royal Decree) and has an Annex ("Determination of the annual percentage rate of charge") indicating an iterative method of resolution which can be used to deal with all the complex cases covered by the formula. This is the document that refers to the APRC (annual percentage rate of charge) for Belgium.

The generic formula for the APRC is as follows :

$$\sum_{K=1}^{m} \frac{C_K}{(1+i)^{t_K}} = \sum_{L=1}^{m'} \frac{D_L}{(1+i)^{s_L}}$$

in which :
K is the serial number of a loan;
L is the serial number of a repayment or a payment of charges;
C_k is the amount of loan n°K;
D_L is the amount of the repayment or payment of charges n°L;
m is the serial number of the last loan;
m´ is the serial number of the last repayment or the last payment of charges;
t_k is the interval, expressed in years and fractions of years, between the date of loan °1 and the date of drawing m;
t_L is the interval, expressed in years and fractions of years, between the date of loan n°1 and that of repayments or payments of charges on loans n°1 to m.

A2 : LIST OF INSTITUTIONS SELECTED AT THE TIME OF SAMPLING (DECEMBER 2001)

STRATUM	BIC CODE	NAME OF CREDIT INSTITUTION
Class ¼	BHBEBEB1	BHW Bausparkasse
Class ¼	CAFFBEB1	Caterpillar Finance France
Class 1/4	DEPFBEB1	DePfa Bank AG
Class 1/4	DHBNBEBB	Demir-Halk Bank (Nederland)
Class 1/4	GEBAHKKW	Fortis Bank Asia HK
Class 1/4	PUILBEBB	De Laet, Poswick & C°
Class 1/4	SBINBE2X	State Bank of India
Class 1/4	VOWABEB1	Volkswagen Bank GmbH
Class 2/4	ABNABEBR	ABN AMRO Bank Nederland (Belgian Branch)
Class 2/4	BNPABEBB	BNP Paribas
Class 2/4	COBABEBB	Commerzbank Belgium
Class 2/4	DEUTBEBE	Deutsche Bank A.G.
Class 2/4	IRVTBEBB	Bank of New York
Class 2/4	JPMGBEBB	J.P. Morgan International Bank Limited
Class 2/4	LOYDBEBB	Lloyds TSB Bank plc
Class 2/4	SCHABE41	Bank Delen & de Schaetzen N.V.
Class 2/4	SMBCBEBB	Sumitomo Mitsui Banking Corporation
Class 3/4	BMPBBEBB	Banca Monte Paschi Belgio
Class 3/4	BPOTBEB1	Bank van De Post N.V. / Banque de La Poste S.A.
Class 3/4	CEKVBE81	Centrale Kredietverlening NV / Centrale Kredietverlening SA
Class 3/4	CPBQBE51	Banque de Credit Professionnel
Class 3/4	CRARBE21	Naviga Bank / Naviga Banque
Class 3/4	EXTEBEBX	Banco Bilbao Vizcaya Argentaria
Class 3/4	HBKABE22	Mercator Bank N.V. / Mercator Bank S.A.
Class 3/4	SEFBBE41	Record
Class 4/4	ANYPBE22	AXA Bank Belgium
Class 4/4	ARSPBE22	N.V. Argenta Spaarbank
Class 4/4	ARTEBEBB	Artesia Banking Corporation
Class 4/4	BACBBEBB	Bacob
Class 4/4	BBRUBEBB	Bank Brussel Lambert NV / Banque Bruxelles Lambert SA
Class 4/4	BDCHBE22611	Deutsche Bank NV / Deutsche Bank SA
Class 4/4	BNAGBEBB635	Bank Nagelmackers NV / Banque Nagelmackers SA
Class 4/4	CTBKBEBX	Citibank Belgium NV / Citibank Belgium SA
Class 4/4	GEBABEBB	Fortis Bank NV / Fortis Banque SA
Class 4/4	GKCCBEBB001	Dexia Bank België / Dexia Banque Belgique
Class 4/4	JVBABE22	Bank J. Van Breda & C° G.C.V. / Bank J. Van Breda & C° S.C.S.
Class 4/4	KREDBEBB	KBC Bank
Class 4/4	SPAABE22	Centea