

High output quality monitoring via the ECB quality reports on statistics

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Abstract

The purpose of this paper is to show how the European Central Bank (ECB) uses the regular preparation of quality reports by type of statistics to ensure that European System of Central Banks (ESCB) statistics are of high quality. The paper will present the general framework followed by all ESCB quality reports submitted to the ECB Governing Council, which include some conclusions and recommendations. Thereafter, the paper will focus on a specific example. It will show the stepped-procedure followed by the expert group on financial accounts in the preparation of the quality report on quarterly financial accounts, looking in particular at quantitative indicators. Finally, the paper will present as an example for illustrative purposes the actions undertaken by the Banco de España in the context of the ECB quality monitoring reports covering euro area financial accounts and the respective national contributions.

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1. Introduction

The ECB collects a broad range of statistics, either from National Central Banks (NCBs) or directly from economic agents. This activity spans several statistical fields: monetary and financial statistics, securities statistics, government finance, external statistics and financial accounts statistics. Mostly, these statistics are used to compile euro aggregates; but since the recent financial crisis, national data and microdata (referring to individual economic agents/transactions) have also been receiving significant attention.

The ECB aims to perform the statistical function effectively and efficiently, i.e. to compile and disseminate statistics that meet users' expectations and conform to international standards, while keeping the reporting burden of the respondents and the managers of the statistical system at a minimum. The ECB Statistics Quality Framework (SQF) reflects the strategy developed by the ECB for this purpose, in which the quality reports play an important role as they allow the soundness of the system to be periodically assessed.

The purpose of this paper is to show how the ECB uses the regular preparation of quality reports by type of statistics to ensure that ESCB statistics are of high quality, in particular in the field of financial accounts. The paper is organised in five sections. Following this introduction, the second section reviews the main elements of the statistical quality framework related to high-quality output. After that, the paper focuses on the quality monitoring and reporting on financial accounts statistics, looking in particular at quantitative indicators. Then, the paper presents the experience of the Banco de España referring to the actions undertaken following the conclusions and recommendations of the ECB quality monitoring reports on financial accounts. And finally, the paper draws some conclusions.

2. Main elements of the statistical quality framework: towards high-quality output

The ECB's statistical activity is driven by ESCB tasks, such as monetary policy, foreign exchange transactions, holdings of external reserves and the functioning of payment systems, which delimit its main areas of interest. These statistical responsibilities are entrusted to it by article 5 of the ESCB/ECB Statute, which also lays down the need for cooperation between the ECB and other competent authorities at national, EU and international (non-EU) level^[1]. The recent setting-up of the Single Supervisory Mechanism (SSM) by Regulation (EU) 1024/2013 assigns an additional supervisory task to the ECB that implies further statistical developments.

^[1] Following the Memorandum of Understanding on Economic and Financial Statistics (March 2003) between Eurostat and the ECB DG Statistics, the ECB primarily focuses on the area of monetary and financial statistics, and jointly with Eurostat on the areas of balance of payments and financial accounts.

The ECB statistical system rests on three pillars: (i) the regulations setting obligations on economic agents, (ii) the guidelines given to NCBs detailing the datasets to be transmitted and other statistical requirements, and (iii) the quality framework. The first two pillars are legal in nature while the third reflects the Public Commitment to European Statistics, which is a public statement available on the ECB's website.

The ESCB Public Commitment on European Statistics set the principles that govern the collection, compilation and dissemination of statistics by the ESCB. This public statement takes into consideration, and is in line with, declarations by the European Commission and other international organisations^[2]. On this basis, the ECB Statistics Quality Framework (SQF)^[3] combines these principles and others on good governance with the quality assurance procedures developed by the ECB^[4]. In this context, quality is defined in relation to how well statistics are fit for purpose, and, therefore, meet users' and other stakeholders' expectations. This is a multidimensional concept that can evolve over time and have peculiarities in each statistical domain.

The ESCB Public Commitment on European Statistics comprises fifteen guiding principles in three groups relating to the institutional environment, the statistical processes and high output quality.

Institutional environmental factors play an important role in the efficiency and effectiveness in the collection, compilation and dissemination of statistics, as well as in the integrity and credibility of the statistics made available to the users. In this respect, the ESCB identifies the following principles: (i) the need for professional independence of the ESCB in the performance of its statistical function, (ii) a clear legal mandate for the collection of statistics, (iii) the adequacy of human, financial and IT resources, (iv) a commitment to quality and the setting of procedures with this aim, (v) the protection of statistical confidential information, and (vi) the development, production and dissemination of statistics in an impartial and objective manner.

A second set of principles refers to the statistical processes by which statistics are developed, collected, compiled and disseminated, specifically, the ESCB public statement alludes to: (vii) the use of sound methodology based on European and international standards, guidelines and best practices, (viii) the implementation of effective and efficient procedures, either based on

^[2] European Code of Practice (European Commission, 2005), the Fundamental Principles of the United Nations Statistical Commission (1994), and the Data Quality Assessment Framework (IMF, May 2012).

^[3] ECB Statistics Quality Framework (ECB Bulletin, April 2008).

^[4] Quality Assurance Procedures within the ECB statistical function (ECB Bulletin, April 2008).

statistical surveys or adequate administrative data, (ix) the minimisation of the burden on reporting institutions, and (x) the use of resources under cost-effectiveness considerations.

Finally, the third group refers to the achievement of high output quality, which implies the following principles: (xi) to ensure statistics remain relevant, (xii) statistics provide accurate and reliable information of the phenomenon, (xiii) statistics are disseminated timely and punctually, (xiv) the consistency and comparability of statistics over time, across datasets, etc, including between countries, and (xv) the clarity and accessibility of information by users.

The ECB quality framework reflects the strategy designed by the ECB to implement the principles expressed in the ESCB Public Commitment on European Statistics. Although such strategy is oriented as a whole towards the achievement of high-quality output, a number of quality assurance procedures can be identified at the core, as shown in table 1. In this strategy, the preparation of quality reports plays an important role as they permit the soundness of the system to be periodically assessed. The main two procedures implemented by the ECB to monitor quality on statistics and report to the ECB decision-making bodies are the reports prepared by the ESCB Internal Auditors Committee and by the ESCB Statistics Committee.

Table 1 Data Quality Framework: High Output Quality

Principles	Definitions	Quality assurance procedures
Relevance	ECB statistics shall meet user needs, which may evolve over time as a result of changes in the economic environment	<ul style="list-style-type: none"> • Medium-term strategy and annual work programmes • Merit and cost exercises • Seminars and consultations with users
Accuracy and reliability (including stability)	ECB statistics shall accurately and reliably assess the phenomenon they are intended to measure	<ul style="list-style-type: none"> • Reporting schemes follow international accounting standards and best practices • Completeness and plausibility checks • Revision analysis and consistency analysis between different datasets • Regular internal quality monitoring reports
Timeliness (including punctuality)	ECB statistics shall be timely and punctual	<ul style="list-style-type: none"> • Transmission calendars • Release calendars • Compliance with IMF SDDS standards
Consistency and comparability	ECB statistics shall be consistent (over time, internally within a single release and across different frequencies) and shall enable international comparisons	<ul style="list-style-type: none"> • Reporting schemes follow international accounting standards and best practices • Regular internal quality monitoring reports
Accessibility and clarity	Information on data and metadata shall be presented in a clear and understandable form and shall be easily and freely accessible	<ul style="list-style-type: none"> • Intensive use of up-to-date electronic system for disseminating data • Press releases, regular publications • Data warehouse, joint country-tables • International standards in the denomination of variables • On-line documentation

Among other competences, the ESCB Internal Auditors Committee (IAC) is responsible for auditing the ESCB tasks and activities, inter alia those related to statistics, including their

enabling processes and risk associated with them. The IAC prepares medium-term programmes and annual audit plans covering all its activities. The main findings in each activity are reported to the lead committee of the activity, which has to provide an action plan for each recommendation, and included also in regular and ad-hoc reports of the IAC to the Governing Council. Additionally, there is a follow-up of the recommendations until they are implemented.

The preparation of quality reports is at the core of the SQF, since they review the main quality elements with the help of some usually pre-defined indicators and draw some conclusions and/or recommendations in order to enhance the quality of statistics. At present, several ECB statistical guidelines require the periodic preparation and submission to the ECB Governing Council by the Statistics Committee of quality reports, mainly focused on the compilation of euro aggregates. By these reports, the Statistics Committee can draw the attention of internal users and, above all, the highest decision-making bodies of the ECB to relevant quality problems in euro area statistics produced by the ECB statistical function, and related national contributions. These reports can exert pressure on the ECB statistical function and on national central banks to resolve major problems, in particular those considered as non-compliant with regulations and guidelines, and also to lessen technical divergences so that harmonised criteria are used across NCBs.

The Statistics Committee has to submit to the Governing Council quality reports in five statistical domains. These are the report on *Euro Area Balance of Payments and International Investment Position Statistics* (biannual), *Government Finance Statistics (internal)*, the *Euro Area Monetary and Financial Quality Report*, the *Euro Area Quarterly Financial Accounts Quality Report*, and the *Centralised Securities Database Quality Report (internal)*. All these reports are based on a common framework, although they are tailored to each specific statistical domain and so their content is not fully homogenous. The preparation of these reports by the ECB with the assistance of the expert groups can be seen as the final step of the quality monitoring process carried out by these groups, which also includes other internal quality reports.

3. Quality monitoring and reporting on financial accounts

Financial accounts cover financial flows and positions between resident sectors and between these and the rest of the world. Like other parts of national accounts, financial accounts are compiled from primary statistics from different data sources. In the case of the ECB, it compiles euro area financial accounts on the basis of national financial accounts transmitted under Guideline ECB/2013/24 and also further information arising from other datasets already available in the ECB data warehouse from other ECB guidelines. The most important are:

banking statistics, securities statistics, government finance, and external statistics. Throughout the compilation process, the ECB gives great importance to achieving, as far as possible, consistency between the financial accounts and other macro-financial statistics for the euro area. The ECB, with the assistance of the expert group on euro area accounts, regularly monitors the entire production process.

Guideline ECB/2013/24 requires the transmission of national quarterly financial accounts, stocks, financial transactions, and other changes in volume, broken down by sector and financial instrument, including counterpart information for loans (assets), deposits (liabilities) and securities issued for the compilation of euro area quarterly financial accounts. Also, information on major events and revisions has to be provided by NCBs. Moreover, the ECB is mandated to produce an annual quality report to the Governing Council covering, at least, the issues of data coverage and compliance with relevant definitions and revisions. Nevertheless, the preparation of the ECB quality report on financial accounts cannot be seen as a stand-alone report but as the final step of the quality monitoring process carried out by the expert group, which also includes several internal reports.

4.1 Internal quality reports

Internal quality monitoring reports on financial accounts are addressed to compilers and internal users. The main focus is the compilation process, in particular compliance by countries with the provisions laid down in the guideline and the quality of national contributions. These internal reports are: (i) *feedback individual country reports* following each transmission, (ii) *regular euro area transmission reports*, including relevant cross-country problems meriting discussion in the expert group, (iii) *integration reports*, explaining how the problems that arose in the compilation process have been resolved, and (iv) when needed, *ad-hoc methodological notes* about particular problems. Table 2 shows the main quality aspects analysed in each report. These exercises allow the ECB to identify potential data problems and to have an insight into national compilation systems, and, occasionally, make the case for further work to harmonise national practices, in particular when euro aggregates are affected.

4.2 The euro area quarterly financial accounts report

In accordance with Guideline ECB/2013/24 on quarterly financial accounts, the ECB regularly submits to the Governing Council the euro area quarterly financial accounts report, the last one being that corresponding to 2013 which has recently also been disseminated on the ECB's website on April 2014.

Table 2. Coverage of quality monitoring reports on financial accounts

		Periodicity	Orientation	Production		
				Collection	Compilation	Dissemination
Internal quality monitoring reports	Feedback country report	Quarterly	Compilers	Data coverage Plausibility checks Internal consistency Major revisions		
	Regular transmission report (EA level, information by country)	Quarterly	Compilers	Timeliness Data coverage Internal consistency Major revisions Major events	External consistency (MFS, SEC, GFS, BOP&IIP, IF)	
	Integration report (EA level)	Quarterly	Compilers/ internal users		Timetable Internal inconsistencies Balancing exercise	
	Methodological notes (EA level)	Ad-hoc	Compilers/ internal users		Specific issues	
Quality report (EA level, public)		Annual	Internal users/ public	Data coverage Compliance with relevant definitions	External consistency (with non-financial accounts)	Quantitative indicators on revisions

MFS=monetary and financial statistics, SEC=securities statistics, GFS= government finance statistics, BOP&IIP=balance of payments and international investment position, IF=investment funds

The organisation of the report ^[5] draws on the basic principles of the SQF and focuses especially on the elements set out in article 7 of the Guideline. In particular, the report covers sections on: (i) institutional and legal framework, (ii) quality assurance procedures and user involvement, (iii) coverage, (iv) revision analysis, (v) consistency and comparability, (vi) timeliness of national contributions, (vii) data accessibility and (viii) recent developments. Additionally, a more comprehensive version of the report, available to the ESCB only, also includes a section on NCB-specific assessment, recommendations and non-compliance cases. The report uses a set of quantitative indicators for the analysis of revisions and consistency which are described in the following items.

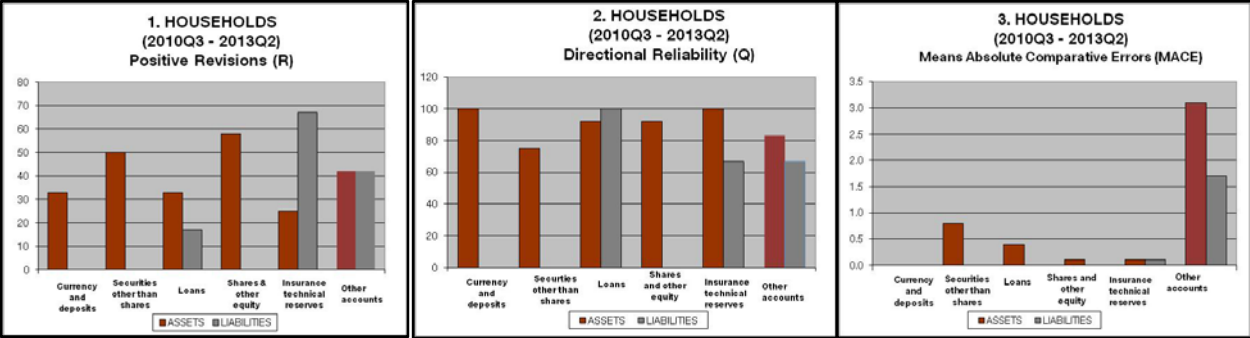
Quantitative indicators for revision analysis. Financial accounts statistics integrate information arising from different data sources, which are subject to different revision policies and, therefore, introduce a certain degree of variability into the financial accounts output. In order to assess the reliability of information, the availability of a set of indicators is very useful, although their interpretation may not always be straightforward. Therefore, complementary information on major revisions is highly appreciated by compilers and users.

^[5] See <http://www.ecb.europa.eu/pub/pdf/other/euroaareafinancialaccountsquarterlytreport2013en.pdf> .

The quality report on financial accounts uses four indicators to assess accuracy and reliability. These are: (i) positive revisions (R), (ii) directional reliability (Q), (iii) MACE (Means of Absolute Comparative Errors), and (iv) Bias (%) which is the weight of the bias component in the RMSRE indicator (Root Mean of Square Relative Error)^[6]. These four indicators are presented in the ECB Quality Report for the eight main institutional groupings and seven financial instruments categories at euro area level, and are discussed later.

Graphs 1 to 3 present the results of the positive revisions of the indicators (R), directional reliability (Q) and MACE for households, which can be illustrative of the usefulness of this information. In general, these indicators suggest that, with few exceptions, revisions are not sizable and do not show a significant bias. Financial transactions on other accounts receivable/payable seem to be the most volatile items for this sector, which can be explained by their residual nature in the compilation process.

Euro area quality reliability indicators for households



Quantitative indicators for consistency analysis. Financial accounts are internally consistent by definition, and, in principle, their balancing item net financial transactions should be consistent with the balancing item of net lending/net borrowing in the capital account. This is supported by the accounting framework of national accounts and is one of its major assets. Usually, financial

^[6] Positive revisions (R): Percentage of positive revisions (on transactions) in relation to total observations. A significant deviation from 50% may imply some bias, and if it is systematically above 50% would mean some under-coverage.

Directional reliability (Q): Percentage of first release of data with the same sign as the last release. A percentage significantly below 100% may mean some difficulties in interpreting early estimates.-

MACE (Means Absolute Comparative Errors). Errors or revisions are defined as the difference between the current values of a variable and the values when they were released for the first time. This indicator is compiled for transactions as a percentage of stocks.

Bias. Weight (%) of bias component in the RMSRE indicator (Root Mean Square Relative Error). The square of the RMSRE can be broken down into three components: bias + regression + random. Here *i* refers to the first assessment and *j* to the last release. This indicator relates error/revisions to the variability of series:

$$RMSRE = \sqrt{\frac{\sum_{t=1}^N (x_t^j - x_t^i)^2}{\sum_{t=1}^N (x_t^j - \bar{X}^j)^2}} \quad RMSRE^2 = MSRE = \left[\frac{\bar{X}^j - \bar{X}^i}{S_{x^j}} \right]^2 + \left[r_{x^i x^j} - \frac{S_{x^i}}{S_{x^j}} \right]^2 + [1 - (r_{x^i x^j})^2]$$

accounts compilers calls this *vertical consistency*, whereas they refer to the identity uses = resources for each financial instrument category as *horizontal consistency*.

National financial accounts contributions are transmitted in an internally consistent fashion to the ECB (for institutional sectors and financial instruments), although in some cases showing imbalances with national non-financial accounts; i.e. their balancing items are not equal, due to the different data sources used at national level and other data problems. In order to produce euro area financial accounts, national contributions are combined with other euro area statistics being available at the ECB from other guidelines. This creates initially a number of *horizontal/vertical inconsistencies* across the system that have to be worked out by the ECB. That is, the work of the ECB is to integrate different data sources at euro area level, which is similar to the work done by national compilers at national level.

The ECB quality report uses the indicator RMSE (Root Mean Square Error)^[7] to assess the horizontal and vertical consistency of euro area accounts before data are reconciled by the ECB during the balancing process. The RMSE indicator shows (for the last eight quarters) values at the euro area level of around Eur 45 bn for certain financial instruments (*horizontal discrepancies*), and Eur 75 bn for some institutional sectors (*vertical discrepancies*), which represent less than 0.5% - 0.8% of euro area GDP, respectively.

4. Output enhancement from the ECB quality monitoring reports: the experience of the Banco de España.

The Banco de España considers the exercises carried out by the ECB to monitor output quality in the field of financial accounts to be very useful. Although the Banco de España contribution is fully compliant with ECB data reporting requirements, the Banco de España takes note of the conclusions and recommendations of these exercises to enhance, as far as possible, the Financial Accounts of the Spanish Economy (FASE) and, therefore, the national contributions to the ECB.

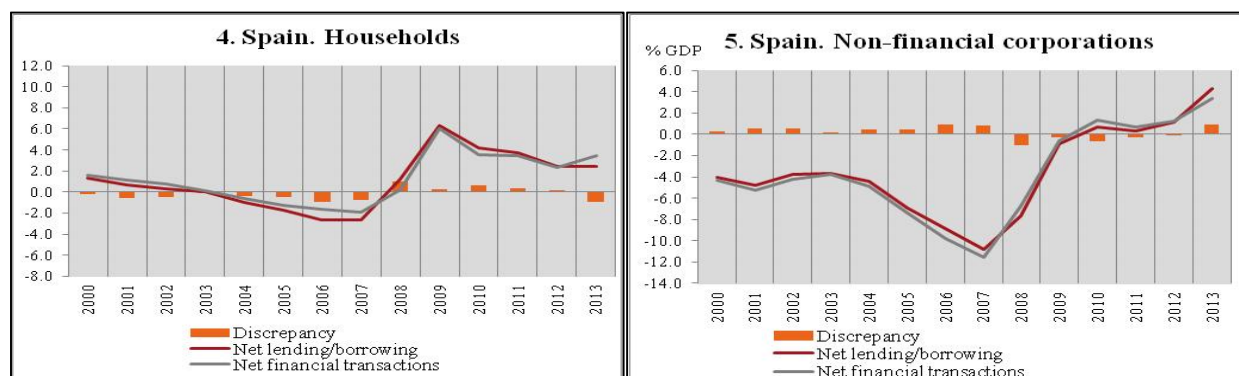
For illustrative purposes, Table 3 shows the main changes introduced in the FASE following the ECB consistency checks included in the internal quality monitoring reports. They refer to discrepancies across statistical domains and across countries. Additionally, ECB reports are

^[7] Statistical Discrepancy (SD): RMSE (SD) indicator stands for Root Mean Square Errors. $RMSE (SD)^2$ can be broken down into two components: bias + variance components

$$RMSE (SD) = \sqrt{\frac{1}{N} \sum_{t=1}^N SD_t^2} \quad RMSE (SD)^2 = MSE (SD) = \left[\frac{\sum_{t=1}^N (SD_t)}{N} \right]^2 + \frac{\sum_{t=1}^N (SD_t - \overline{SD})^2}{N}$$

concerned about the size of imbalances between the capital and the financial accounts as measured by its balancing items (i.e. vertical consistency), in particular for non-financial corporations and households. Certainly, large discrepancies may have an impact on EA aggregates when countries' discrepancies do not cancel one another out. The Banco de España and the National Statistical Institute monitor and cooperate closely on this issue. Graphs 4 and 5 show annual discrepancies since 2000. At present, the average for this period amounts to 1.4 bn, 0.1% of ES GDP, and the RMSE indicator is 5.9 bn, 0.6% of ES GDP.

Spain. Discrepancies between net lending/borrowing and net financial transactions



6. Conclusions

The main conclusions are:

- (i) The ECB is fully committed to the production of high quality statistics. The ECB Statistics Quality Framework reflects the strategy developed by the ECB for this purpose. This combines the principles laid down in the ESCB Public Commitment on European Statistics with a number of quality assurance procedures.
- (ii) Monitoring and reporting on quality is an essential element of this strategy. This covers internal audit reports and above all annual ECB quality reports. These are mandated by ECB guidelines and to some extent represent the final step of the quality monitoring process carried out by the ECB with the assistance of the expert groups. By means of ECB quality reports the Statistics Committee can draw the attention of the highest decision-making bodies of the ECB to relevant quality problems on euro area statistics, and related national contributions, so that the ECB and national central banks can resolve underlying problems.
- (iii) In the area of financial accounts, the ECB regularly produces an annual quality report which recently has been made available to the public in the ECB's website. This and other internal quality monitoring reports cover the compliance by countries with the ECB regulations and other quality aspects, in particular revisions and consistency with other statistics, which are examined on the basis of a set of quantitative indicators.

(iv) The Banco de España is very keen to apply the conclusions and recommendations from ECB reports monitoring quality on statistics. Although the Banco de España contribution fully complies with ECB requirements, it takes note of the conclusions and recommendations of these exercises to enhance national financial accounts and, therefore, national contributions to the ECB. Consequently, several methodological changes have been introduced during recent years.

Table 3. Recent enhancement in Spanish financial accounts

Consistency checks	Main changes	Implementation date
Consistency across statistical domains		
Consistency with security issues statistics	Discrepancies are due to the different valuation criteria applied in financial accounts (market value for stocks, and transactions including accrued interest) as regards securities issues statistics. The treatment of own securities issued by MFIs and held for use as collateral at the ECB led also to some inconsistencies up to the 2011 edition. At present, MFIs' debt securities issues are presented gross in the FASE, in line with securities statistics, while until then these positions had been netted out following MFIs' accounting rules.	2011
Consistency with MFIs balance-sheets: positions against non-MFIs	In the FASE, MFIs balance-sheets are used as data source for all MFI's counterpart sector positions except loans/deposits against non-MFIs subsectors, and loans granted to general government. Regulated accounting statements of non-MFIs are used as primary data source for their loans/deposits against MFIs. There are inconsistencies between both data sources mainly due to time-lags in recording transactions, and difficulties in classifying counterparts correctly.	Differences are regularly monitored
Consistency with MFIs balance-sheets: loans granted to general government	For MFIs' loans granted to general government, financial accounts statistics as well as government finance showed growing discrepancies (in 2012, 0.5% of GDP) with MFIs balance-sheets due to the different treatment of factoring operations on loans granted (by companies) to general government. In 2012, it was agreed to reclassify factoring transactions where the general government is the ultimate debtor as public debt, so discrepancies dropped significantly.	2012
Consistency across countries		
Consistency on MFIs' repos	This is a good example of the difficulties in building up euro area accounts from national contributions. Exercises carried out by the ECB made it clear that the treatment of MFIs' repos was not homogenous across countries. To overcome this difficulty, a number of working recommendations were agreed. Among the most relevant recommendations are to record all MFIs' repos as deposits and all non-MFIs' repos against non-MFIS as loans, in all intra-EA positions.	2005