EUROPEAN CENTRAL BANK

EURO AREA BALANCE OF PAYMENTS AND INTERNATIONAL INVESTMENT POSITION STATISTICS

JANUARY 2005

ANNUAL QUALITY REPORT

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EXECUTIVE SUMMARY

This report is required by Article 6 of Guideline ECB/2004/15[1] (hereinafter "the Guideline"). It follows the basic principles of the International Monetary Fund (IMF) Data Quality Assessment Framework (July 2003) in terms of the different dimensions of data quality to be investigated, and includes some quantitative indicators that are based on the work of a joint ECB DG-Statistics/European Commission (Eurostat) Task Force on Quality, also involving representatives of most of the then 15 EU Member States. Key aspects for assessing quality focus on (i) methodological soundness, (ii) timeliness, (iii) revision policy and practice, (iv) stability and (v) consistency. This report is the first one encompassing various quality measures for the euro area statistics. It may also be considered as a pilot as such a wide set of quantitative indicators have rarely been published in a periodic report in any other country or for other sets of statistics. Therefore, the quantitative results should be analysed and interpreted in their appropriate context.

The methodologies observed by Member States are covered in the country chapters of the ECB's yearly publication "European Union balance of payments/international investment position statistical methods" (last update: November 2004). The ECB website also contains a methodological note on the euro area balance of payments (b.o.p.) and international investment position (i.i.p.) which focuses on common methodological issues and on the aggregation procedures.

In the first assessment of the b.o.p. current account, full information on goods and services is not yet available and estimations are often necessary to meet the deadlines. For the time being, the results of the stability indicators for the current account show that these first estimates systematically underestimate credits and debits to some extent. Nonetheless, these patterns do not seem to affect the net current account.

In general, the picture shown in the euro area b.o.p. and i.i.p. statistics appears credible and the quantitative indicators show an improvement from 1999 onwards. The results for 1999 and 2000 reflect the fact that national b.o.p./i.i.p. compilers were still in the process of adapting their data collection systems to cover the needs of euro area statistics and, hence, revisions were extensive. The level of revisions has diminished in more recent years, despite positive errors and omissions in the early b.o.p. data assessments from mid-2001 to the end of 2003. However, revisions in net i.i.p. data published in November 2004 amount to €328 billion, or 4.5% of GDP.

While there are differences in the levels for goods in b.o.p. and external trade statistics due to the underlying methodologies, the differences in their respective month-to-month growth rates decreased from 0.9 percentage point for the period 1999-2001 to 0.7 and 0.6 percentage point for exports and imports respectively for the period 2001-2003.

1 OJ L 354, 30.11.2004, p. 34. This Guideline replaced the Guideline ECB/2003/7 of 2 May 2003, itself an update of successively the Guidelines ECB/1998/17 and ECB/2000/4.

INTRODUCTION

The euro area b.o.p. and i.i.p. are based on an aggregation of statistics provided by individual euro area countries concerning transactions and positions between their own residents and non-euro area residents. The current legal framework for the provision of data to the ECB is established by the Guideline ECB/2004/15, which entered into force on 1 September 2004. This Guideline defines the requirements for the compilation of the quarterly i.i.p. as from 2005, as well as future requirements related to the valuation of direct investment positions and to the compilation of portfolio investment liabilities. In addition, in order to improve the accuracy and consistency of portfolio investment statistics, the Guideline requires the collection of quarterly stocks data through security-by-security reporting as from March 2008.

Taking into account, among other things, the variety of methods and sources at the national level, no simple assessment, whether qualitative or quantitative, can fully reflect the quality of the euro area statistics. However, some dimensions of quality have been assessed qualitatively, and quantitative indicators[2] have been designed to help users in the analysis of the data.

Key aspects for assessing quality include
- methodological soundness,
- timeliness,
- revision practice,
- stability[3] and
- consistency.

In this report, after the introduction, Section 1 concentrates on the methodological soundness from a quality perspective. In Section 2, timeliness is measured by the interval between the end of the reference period and publication. The euro area b.o.p. revision practice and policy is explained in Section 3. Quantitative indicators are calculated for measuring the size of revisions in Section 4 on stability, and the consistency within the b.o.p. ("internal") and with other related statistics ("external") in Section 5. Internal consistency results in low errors and omissions,[4] whereas external consistency is measured in relation to external trade and to financial flows derived from the balance sheets of monetary financial institutions (MFIs).[5] This report encompasses various quality measures for the euro area statistics for the first time. It may also be considered as a pilot as such a wide set of quantitative indicators has rarely been published in any other country or for other sets of statistics, although the Australian Bureau of Statistics and the Reserve Bank of India have recently used some quantitative indicators and more qualitative assessments.[6]

The calculations of quantitative indicators were performed on monthly b.o.p. observations from January 2001 to December 2003 (36 observations). Those results are compared with the periods from January 1999 to December 2001 and from January 2000 to December 2002.[7] These periods were chosen in order to produce statistically meaningful results which reflect an average for the whole period. The most recent observations were excluded to avoid underestimating the indicators of revisions. In the initial years of the periods under consideration, national compilers were still in the process of adapting their collection systems to cover the needs of euro area statistics for the conduct of the single monetary policy.

2 Documentation on the indicators used in this report are available on the Committee on Monetary, Financial and Balance of Payments Statistics (CMFB) website (http://www.cmfb.org/) in: *Joint ECB-Eurostat Task Force on Quality: Report on the quality assessment of balance of payments and international investment position statistics.*

3 This element is identified as "revision studies" in the IMF's *Data Quality Assessment Framework (DQAF) for Balance of Payments Statistics,* International Monetary Fund Statistics Department, July 2003.

4 Low errors and omissions can provide an indication of accuracy, although they can also result from the balancing out of large opposite discrepancies.

5 External consistency for the euro area will also focus on the rest of the world account within the quarterly euro area accounts. Such consistency would be achieved fully if the rest of the world account were built from the euro area b.o.p. and i.i.p., and revised simultaneously.

6 The Reserve Bank of India made an explicit reference to the report of the DG-Statistics/Eurostat Task Force on Quality, and in particular to the recommended indicators.

7 The results are based on data published in November 2004.

Some aspects of quality are interrelated. For example, there is a trade-off between timeliness and accuracy of statistics. Publishing early enough to meet user needs may imply using less information and thus making larger revisions when data from other sources, late responses and more robust estimations become available. In addition, achieving external consistency may require additional revisions related to differences in the timing of updates, in concepts, in estimation procedures and in sampling techniques. Thus revisions increase other aspects of quality, such as methodological soundness and external consistency.

The IMF has established the Special Data Dissemination Standard (SDDS) to guide member countries in the provision of their economic and financial data to the public. 57 of its member countries have subscribed to the standard, including a majority of EU Member States. The ECB conforms to it as well in order to foster international comparability of euro area statistics. References to the SDDS benchmark are made in this report where appropriate.

I METHODOLOGICAL SOUNDNESS

The methodologies observed by Member States when compiling the b.o.p. and i.i.p. are covered in the country chapters of the ECB's yearly publication *EU b.o.p. and i.i.p. statistical methods*. That publication describes the collection system in each Member State and includes details about the reporting population, administrative sources, periodicity of surveys, estimations and legal framework. The latest update, dated November 2004, covers the 25 EU Member States, as well as the two current Accession Countries (Bulgaria and Romania). The compilation methods for international reserves (flows and outstanding amounts) are described in a separate report.[8] The agreed methodology goes somewhat beyond the international standards set out in the *IMF Balance of Payments Manual*, 5th edition (BPM5) (October 1993), to meet specific user requirements and to ensure greater consistency with other monetary and financial statistics.

In 2003, one Member State introduced a more comprehensive survey in order to increase the coverage of special purpose entities created by multinational enterprises. The results of this survey were incorporated into the i.i.p. as at end-2002 and end-2003.

In addition, the "statistics" section of the ECB website contains a methodological note specific to the euro area b.o.p. and i.i.p. focusing on common methodological issues, as well as on the aggregation procedures at the euro area level. It is updated whenever changes occur.

In 2004, the b.o.p. and the i.i.p. have incorporated a significant improvement, namely a split between "currency and deposits" and "loans" in other investment of the general government and other sectors. Previously, "currency and deposits" and "loans" were recorded jointly. This split had been requested by users in order to monitor the deposits abroad by households and non-monetary companies. Moreover, this split forms part of the IMF b.o.p. standard components, and is required for the compilation of the euro area quarterly financial accounts.

In comparison with the international standards set out in BPM5, the euro area b.o.p. and i.i.p. still lack the sector breakdown on the liabilities side of portfolio investment, owing to difficulties in obtaining information on the final holder of securities (i.e. the actual creditor).[9]

The ECB and the national central banks of the EU Member States are involved in an action

8 *Statistical treatment of the Eurosystem's international reserves*, ECB, October 2000.

9 The data necessary to show this breakdown, important also as a contribution to the breakdown of counterparts to M3 and to the quarterly financial accounts, will be made available by Member States from 2006 onwards.

plan to enhance the collection of data on portfolio investment, complemented by a centralised securities database[10] which will be used to overcome the current difficulties. For example, the national compilers of b.o.p. and i.i.p. will use the same criteria from a common database to classify the securities in terms of maturity and sector and residence of the issuer. In addition, the database will assist the compilers when calculating the income on portfolio investment and will allow flexibility in the compilation of statistics without increasing the burden on respondents.

2 PERIODICITY AND TIMELINESS

The euro area b.o.p. statistics are published at a monthly frequency. Additional details on sector and instrument breakdowns have a quarterly frequency.

Together with the monthly release of the non-seasonally adjusted data, the ECB publishes the data resulting from the seasonal adjustment of the b.o.p. current account items. These data ease the interpretation of the latest developments in the current account by removing the seasonal pattern, as well as differences in working days and other calendar effects.

In 2004, the ECB has again met its release calendar for publication: monthly data were published seven weeks after the end of the respective months, thereby enabling an assessment of the quarterly and annual flows within two months (e.g. the full year 2003 was published on 24 February 2004).[11] Further quarterly details were published four months after the end of the respective quarters. The i.i.p. was released eleven months after the respective ends of year.[12]

3 REVISION PRACTICE AND POLICY

The euro area b.o.p. is revised according to the following schedule. Quarterly data are revised with the publication of the following quarter's data and thereafter twice a year, at the end of April and the end of October. Monthly data are revised with the publication of the following month's data, as well as with the revisions of the corresponding quarter. The annual i.i.p. is revised with the publications of data for (at least) the two subsequent years.

Revisions are necessary to improve the data coverage, as first assessments of data may be based in part on estimates due to late or error-prone responses by reporting agents, and to provide users with more accurate data for time series analysis and forecasting. However, large or biased revisions may signal weaknesses in the data collection or compilation systems that need to be checked and corrected.

Since 2003, euro area and EU b.o.p. aggregates (the former is compiled by DG-Statistics, the latter by Eurostat) have been revised simultaneously in stages, which have also enabled the publication of a reconciled euro area i.i.p. This increases the comparability of the data, while also easing the reporting by Member States. Furthermore, a common revision policy is under preparation; both practices will then converge towards a European framework revision policy.

4 STABILITY

The first release of the monthly b.o.p. for the euro area occurs seven weeks after the reference period and is based on the contributions sent by the national compilers one week earlier. The first release is revised when new information becomes available.

10 See "Measuring Euro Area Portfolio Investment – Status Five Years after Start of the Economic and Monetary Union and Outlook on Future Developments", by P. Nendorfer; Paper prepared for the 28th General Conference of the International Association for Research in Income and Wealth", Cock, Ireland 22-28 August 2004.

11 The benchmark in the SDDS is three months.

12 The benchmark in the SDDS is nine months. However, the publication date will be reviewed in 2005 when some improvements in the quality and the availability of quarterly i.i.p. data have been made.

From an analytical perspective, users wish to know how much they can rely on the initial assessment. Although the initial assessment undergoes several revisions before reaching the final stage, for practical reasons the indicators developed in Annex 1 assess the stability by analysing how close the first assessments were to the final assessments.

In the first assessment of the b.o.p. current account, goods and services may be based in part on estimates in order to meet the deadline. For the time being, the results of the indicators of stability for the current account show that revisions were systematically positive, and therefore the first estimates were revised upwards for credits and debits (see charts in Annex 2). These patterns largely offset each other for the net b.o.p. current account where no systematic pattern can be found.

Revisions to direct investment and portfolio investment assets and liabilities present a less pronounced pattern. The balances did not show a specific pattern.

Changes in the underlying collection of data and/or methodological changes in one or a few Member States, or in compiling the aggregate, may also lead to breaks in the series. While this affects previous analyses of the series, it also increases the accuracy of the data and may be expected to increase the stability of the series over time. For example, in early 2001, the aggregation method of the euro area income debits was changed, affecting the level of the series in 1999 and 2000. Moreover, in early 2003 one Member State introduced a new survey for travel, which triggered revisions to the back series.

In contrast, the euro area i.i.p. with separate assets and liabilities was published only three times, in November 2002 (positions as at end-2001), November 2003 (positions as at end-2002) and November 2004 (positions as at end-2003). Therefore, the analysis of revisions is limited to the end-2001 and end-2002 data.

Owing to recent methodological work carried out and agreements on direct investment and on portfolio investment (for both b.o.p. flows and i.i.p. stocks) reached by the ESCB Statistics Committee, assisted by the Working Group on External Statistics,[13] new collection methods are, or will be, implemented by Member States by 2007. The methods are designed to increase the methodological soundness and consistency of contributions to the euro area aggregate in the medium term, but may also be a new source of revisions in the meantime. Also with regard to direct investment, for example, the International Accounting Standards will not be implemented at the same pace and to the same extent across Member States and among companies, in particular for their individual (non-consolidated) accounts. This may also lead to some difficulties in data collection and to later revisions.

The main results of the stability indicators are included in the following sub-sections.

4.1 THE DIRECTIONAL RELIABILITY SHOWS A RELATIVE WEAKNESS IN DIRECT INVESTMENT

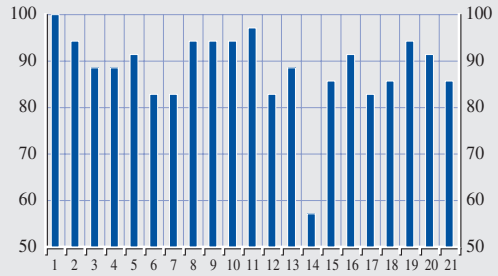
The directional reliability summarises how often the first assessments were able to correctly predict a decrease or an increase of the final value with respect to the previous observation. The indicator shows the lowest results for the direct investment item. A considerable part of direct investment is composed of reinvested earnings, which are based entirely on estimates in the first assessment of the data because no results of companies are known at that time.

The direction of the month-to-month changes constitutes a simple measure of stability, which is applicable to all b.o.p. items. Chart 1

13 See reports of the Task Force on Foreign Direct Investment, ECB (March 2004), of the Task Force on Portfolio Investment Collection Systems, ECB (June 2002), and of the Task Force on Portfolio Investment Income, ECB (April 2003).

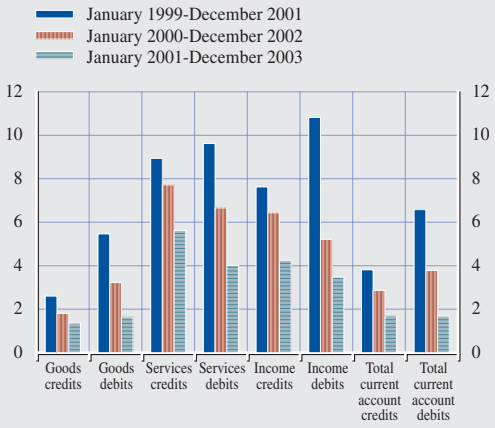
Chart 1 Overview of directional reliability

(as a percentage; Jan. 2001-Dec. 2003)



1 Goods credits
2 Goods debits
3 Goods net
4 Services credits
5 Services debits
6 Services net
7 Income credits
8 Income debits
9 Income net
10 Total current account credits
11 Total current account debits
12 Total current account net
13 Direct investment assets
14 Direct investment liabilities
15 Direct investment net
16 Portfolio investment assets
17 Portfolio investment liabilities
18 Portfolio investment net
19 Other investment assets
20 Other investment liabilities
21 Other investment net

Chart 2 Revisions of the current account as % of the respective flow (MAPE)



contains the results of the indicator on directional reliability for the main items of the b.o.p.

4.2 THE MEAN ABSOLUTE PERCENTAGE ERROR SHOWS AN IMPROVEMENT FOR INCOME

The relative magnitude of revisions was larger for services and income than for goods. In general, the initial assessments were systematically lower than the final assessments. The impact of the revisions has been reduced in all the current account items, in particular in income debits, where they decreased by more than 60%. The large revisions in 1999 were related to the initial compilation of euro area statistics (in 1999 countries compiled data according to the euro area requirements for the first time).

The mean absolute percentage error (MAPE) was calculated for the gross series of the euro area current account. The MAPE is equal to the average of the absolute revisions in relation to the size of the respective flow. Chart 2 contains the results for 1999-2001, 2000-2002 and 2001-2003.

4.3 THE IMPROVEMENT IN THE CURRENT ACCOUNT IS CONFIRMED BY THE ROOT MEAN SQUARE RELATIVE ERROR

For the net items of the current account and for the financial account, another type of indicator was used: the root mean square relative error (RMSRE). The RMSRE measures the distance between the first assessment and the final assessment in relation to the volatility of each time series. This denominator tries to compensate for the relative difficulty of estimating a more volatile series. The volatility of each series was estimated by its standard deviation, based on the assumption that a series fluctuates around the series average.[14]

Charts 3 and 4 contain the results for 1999-2001, 2000-2002 and 2001-2003. In the current

14 The assumption of stationarity was confirmed by standard statistical tests.

Chart 3 Revisions of the net current account as % of volatility

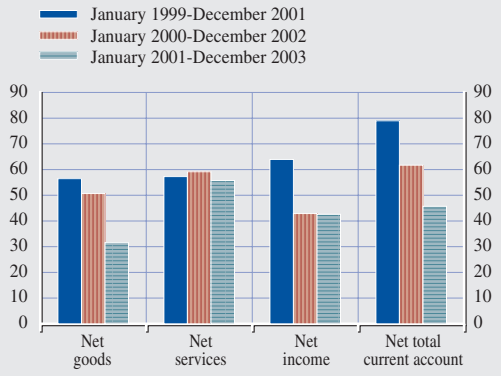
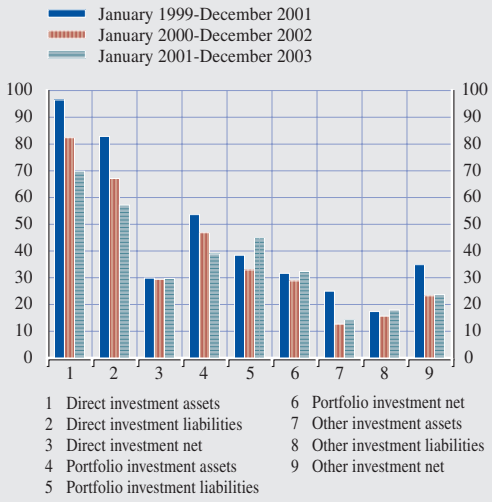


Chart 4 Revisions of the financial account as % of volatility



account, the revisions have been reducing over time.

The net items of the current account (Chart 3) present higher percentages than the items of the financial account (Chart 4). These results are not due to larger revisions as shown in the average of the revisions (see $\overline{R}$ and $|\overline{R}|$ in Annex 2) but to the lower volatility of the former (used as reference for the calculation of the indicator). The impact of the revisions has also been reduced in all the financial account items except other investment and portfolio investment liabilities. Part of the revisions in other investment liabilities was related to the introduction of a new estimation method for the banknotes held by non-residents.

Table 1 Revisions to 2002 i.i.p. assets

(EUR billions)

	Total assets	Direct investment	Portfolio investment	Other investment
Initial assessment	7,277.9	1,937.5	2,270.4	2,581.3
Second assessment	7,260.6	1,877.4	2,302.6	2,578.6
Revision	-17.3	-60.1	32.2	-2.7
Revision as %	-0.2%	-3.2%	1.4%	-0.1%

Table 2 Revisions to 2002 i.i.p. liabilities

(EUR billions)

	Total liabilities	Direct investment	Portfolio investment	Other investment
Initial assessment	7,567.5	1,512.5	3,026.7	2,897.6
Second assessment	7,878.6	1,673.2	3,181.6	2,875.9
Revision	311.1	160.7	154.9	-21.7
Revision as %	3.9%	9.6%	4.9%	-0.8%

In spite of high relative revisions of assets and liabilities, the net direct investment and net portfolio investment were somewhat less revised. Some of the revisions of the euro area transactions were due to transactions by special purpose entities which, although high in value, were neutral with regard to the balance. In addition, the revision of the initial, error-prone estimates for reinvested earnings affected both the assets and the liabilities of direct investment.

Moreover, owing to the special aggregation method followed for the liabilities of portfolio investment, revisions of the extra/intra share of assets within the country contributions had an impact both on net assets and on net liabilities, while the balance (as the sum of national balances) remained unchanged.

4.4 STABILITY OF THE INTERNATIONAL INVESTMENT POSITION

Tables 1 and 2 summarise the revisions of the main items of the euro area i.i.p. The revisions of the total asset positions as at end-2002 amounted to -€17 billion, which represents 0.2% of the total assets. On the liabilities side, the corresponding revisions were €311 billion (3.9% of the total liabilities). The highest revisions in relative terms were on direct investment liabilities (9.6%).

The revisions of direct investment were mainly related to the introduction of a new survey in one Member State, which served to better measure activities of special purpose entities. The revisions on the net i.i.p. amount to €328 billion, or 4.5% of GDP.

5 CONSISTENCY

Consistency indicators deal with two aspects: internal inconsistency, as revealed by the item on errors and omissions; and external inconsistency, as revealed by discrepancies vis-à-vis other statistics on the same variable, such as trade statistics and flows derived from the balance sheets of MFIs.

With respect to the enhanced recording of special purpose entities, overall consistency with earlier periods, or with transactions and positions as reported by other Member States has not yet been fully ensured. Discussions are ongoing to remove legal impediments to an exchange of confidential information across the ESCB that may greatly assist in this area.

5.1 INTERNAL CONSISTENCY

The b.o.p. has a natural indicator for internal inconsistency: the residual item called “errors and omissions”. In fact, the principle of double-entry bookkeeping implies that the sum of all transactions vis-à-vis the rest of the world should be equal to zero. The size of errors and omissions is a lower bound of the relative inaccuracy of the b.o.p. In any case, a large or persistent residual may impede the analysis or interpretation of the b.o.p. However, errors and omissions close to zero may indicate that the transactions covered are balanced but this is not conclusive proof of the full accuracy of the b.o.p.

Chart 5 RMSE of errors and ommissions by vintage

(EUR billions; 1999-2003)

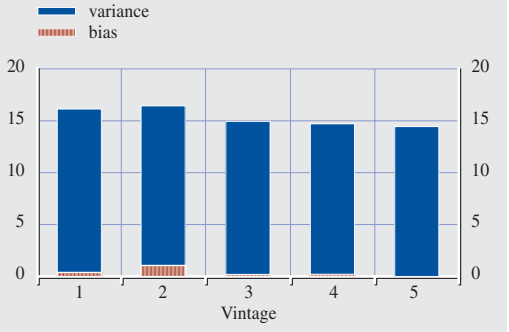


Table 3 Goods in b.o.p. and external trade

(percentages)

	Period	Exports	Imports
Directional reliability	1999-2001	97.1	97.1
	2000-2002	94.3	100.0
	2001-2003	97.1	100.0

Table 4 Goods in b.o.p. and external trade

(differences as % of average value)

	Period	Exports	Imports
Average of absolute differences	1999-2001	2.2	5.1
	2000-2002	2.2	5.1
	2001-2003	1.8	5.0

The root mean square error indicator (RMSE) was calculated from the time series on errors and omissions. This indicator is used to measure the size of the internal inconsistency, as well as to identify any potential bias.

In the period January 2001 to December 2003, the errors and omissions showed no bias and did not prove to be significantly different from zero, according to a standard statistical test. The RMSE was €15.1 billion, which amounted to 5% of the average gross flows in the current account during that period.

Chart 5 contains the results for the RMSE by vintage, for the five years 1999-2003. The first vintage represents the initial assessment of the data. The second vintage contains the data resulting from the revision with the publication of quarterly data. The remaining vintages refer to subsequent yearly revisions. The evolution of the indicator along the vintages indicates that revisions broadly increase the internal consistency of the b.o.p.

5.2 EXTERNAL CONSISTENCY

The b.o.p. series are compared with the corresponding data published by Eurostat for euro area external trade, and with the external transactions derived from the balance sheets compiled in the context of MFI balance sheet statistics. Although the methodologies of those series are not fully consistent with the b.o.p., they broadly reflect the same economic phenomenon. Therefore, the comparisons are useful for checking whether differences remain stable over time.

Table 3 shows the results of the indicators for directional reliability of goods in b.o.p. and external trade in the period from January 2001 to December 2003 compared with the results obtained in the periods from January 1999 to December 2001 and from January 2000 to December 2002. For the three periods, the direction of the month-on-month changes was the same in more than 90% of cases.

In Table 4, the indicator of differences between goods in b.o.p. and in external trade shows that the average absolute difference fluctuated around 2% for exports and around 5% for imports with a slight improvement in the last period. This indicator is measured in relation to the average of the discrepancies between the first differences of the two series concerned. The differences were systematic.[15]

Moreover, Table 5 contains the results for the average absolute differences between the

15 As shown by the average of simple values that are identical to the average of absolute values.

Table 5 Goods in b.o.p. and external trade

(percentage points; month-to-month growth rate)

	Period	Exports	Imports
Average of absolute differences	1999-2001	0.9	0.9
	2000-2002	0.8	0.7
	2001-2003	0.7	0.6
Average of simple differences	1999-2001	0.1	0.1
	2000-2002	0.1	0.0
	2001-2003	0.1	0.0

Table 6 Deposits/loans of MFIs - comparison with M&B data

Period	RMSRE (%)	Bias component (%)	Regression component (%)	Unsystematic component (%)
1999-2001	15.6	3.4	0.8	95.8
2000-2002	9.4	1.3	2.0	96.7
2001-2003	10.1	0.2	0.3	99.4

growth rates of each series. The indicators show that the average of the absolute differences between growth rates was reduced in 2001-2003, both for exports and imports. No systematic difference can be found in the same period.

In Table 6, the root mean square relative error (RMSRE) reflects the distance between comparable b.o.p. and money and banking statistics in relation to the volatility of the b.o.p. series. This indicator increased in the 2001-2003 period, while the bias component reduced to close to zero.

6 CONCLUSION

In the first assessment of the b.o.p. current account, full information on goods and services is not yet available and it is often necessary to use estimates to meet the deadlines. For the time being, the results of the indicators of stability for the current account show that these first estimates systematically underestimate credits and debits. Nonetheless, these patterns seemingly do not affect the net current account.

In general, the picture shown in the euro area b.o.p. appears credible and the quantitative indicators show an improvement since 1999. The results for 1999 and 2000 reflect the fact that national b.o.p./i.i.p. compilers were still in the process of adapting their data collection systems to cover the needs of euro area statistics and, hence revisions were large. While the levels for goods in b.o.p. and in external trade statistics show differences due to the underlying methodologies, the differences in their respective month-to-month growth rates decreased from 0.9 percentage point for the period 1999-2001 to 0.7 and 0.6 percentage point for exports and imports respectively for the period 2001-2003.

ANNEX I METHODOLOGICAL DOCUMENTATION FOR QUALITY INDICATORS[1]

This annex contains the methodology used for the quantitative indicators developed to assess reliability/stability and serviceability/consistency.

I RELIABILITY/STABILITY

In the IMF's terminology, the study of revisions is normally referred to as *reliability*, while some quality works at the European level refer to this as *stability*. The underlying concept is, however, the same and can be defined as referring "*to the closeness of the initial estimated value(s) to the subsequent estimated values*."[2] Assessing reliability involves comparing estimates over time. In other words, assessing reliability refers to revisions.

The number of revisions observed depends on the revision policy/practice of a statistical agency, which normally decides beforehand (sometimes in collaboration with the users) how many times and when the estimates should be revised and communicated to the public.

For example, with reference to a series X with N observations, the statistical agency can decide to publish it k times at predefined time lags $\{l_1, l_2, ..., l_k\}$, where the time lag indicates the time elapsed between the reference period and the publication period (e.g. if a June publication refers to a revision of January data, the time lag is thus five months). Hence k different sets $\{X(l_1), X(l_2),...,X(l_k)\}$ of the same variable-series X will be available. Simplifying the notation, the observation t published after a time lag i can be represented as x_{t_i}.

From the previous k sets of data, revisions can be easily derived, normally as the difference between two subsequent assessments. Therefore a revision variable or series can be defined as the difference $R_{ij} = X_j - X_i$, where i and j identify two specific time lags, with j > i. The Task Force on Quality (TF-QA) suggested measuring revisions by the difference between the first and latest assessments owing to simplicity and data availability, $R = X_k - X_1$. Revisions may also be calculated over a transformation of the original series, such as the respective first difference or the growth rate, if the transformation is meaningful from the user's perspective.

I.1 SIMPLE MEASURES OF REVISIONS

Simple indicators of revisions express the changes in original units of the variable X. That brings simplicity to their interpretation but might hamper the comparison of indicators for different series.

An average of the revisions ($\bar{R}$) provides an indication of how far the first assessment was from the latest assessment. The average may also be computed on the basis of the absolute revisions ($|\bar{R}|$), which adds a measure of dispersion. Dispersion can also be assessed by the standard deviation of revisions.

When useful, the simple indicators of revisions can also be calculated on the basis of a standard transformation of the series, such as the growth rate.

I.2 RELATIVE MEASURES OF REVISIONS

Simple calculations of revisions express the changes in original units of the variable X and depend on its magnitude, often hampering comparability across time, across different series and across similar series for different countries. Therefore, it is often useful to provide relative measures which relate the revisions to dimensional measures of the variable.

1 Based on the report by the joint ECB DG-S/European Commission (Eurostat) Task Force on Quality.

2 IMF working paper – Statistics Department: "Assessing Accuracy and Reliability: A Note Based on Approaches Used in National Accounts and Balance of Payments Statistics", Carson, Carol S. and Lucie Laliberté, February 2002.

GROSS DATA

In the case of gross data (data which express positive quantities), it is straightforward to devise a relative measure of revisions expressed in terms of percentage changes from the initial assessment as $P = \frac{R}{X_1}$, which is called the *percentage revision*. As X is a time series, an average can be taken across time, $\overline{P}$, the *mean percentage error* (MPE).

As revisions can be positive or negative, it is usually appropriate to take the absolute value, in order to avoid revisions of opposite signs cancelling out in the resulting indicator. So, if the average is calculated using the absolute values, we get $\overline{|P|}$, the *mean absolute percentage error* (MAPE).

As an alternative to the MAPE, the relative indicators of revisions can also be calculated after applying a standard transformation. In the case of the gross series, the transformation can apply to the b.o.p. current account, a growth rate or a first simple difference (to minimise the trend), and/or a first seasonal difference (to minimise the seasonal pattern).

As the transformed series contain positive and negative observations, the MAPE would no longer be applicable in a direct way because observations can be near zero, and this would inflate the indicator. The indicators for net data in the following paragraphs were developed to overcome this.

NET DATA

In the case of net data, the revisions cannot be related to underlying quantities if the respective series contain observations close to zero because the ratio would inflate the indicator. Therefore, if the calculation of the MAPE overestimates the size of revisions, alternative dimensional measures of the variable X may be used. A solution to this may be to choose a measure of the volatility of series X for assessing the relative size of the revision.

Ideally, the computation of volatility should be performed on the basis of the non-deterministic component of the series. This is because the information content of a series depends more on the non-deterministic component, which changes from observation to observation, than on the deterministic component, which reflects more structural aspects. Therefore, the indicators of revisions should penalise less the revisions of series whose non-deterministic component portrays high volatility.

The *mean absolute relative error* (MARE) is then defined as $\frac{\overline{|R|}}{vol(X_k)}$

There are several ways of calculating the volatility of X. The first issue to be decided is on which series the volatility should be calculated. In principle, the volatility should be calculated on the latest assessment X_k, because it is potentially the most accurate. A second issue is to decide about how to measure volatility. Three options are suggested:

1. *Standard deviation*. The standard deviation is the classic measure of volatility of a series and represents the square root of the average of the quadratic distances from the mean:
$$S = \sqrt{\frac{1}{N}\sum_{t_k=1}^{N}\left(x_{t_k} - \frac{1}{N}\sum_{t_k=1}^{N}x_{t_k}\right)^2}$$
2. *Average distance from the mean*. The average distance from the mean represents the average of the distances from the mean in absolute values. It has the advantage of expressing the volatility in the original units (not distorted by the application of the squares).
$$\overline{|D|} = \frac{1}{N}\sum_{t_k=1}^{N}\left|x_{t_k} - \frac{1}{N}\sum_{t_k=1}^{N}x_{t_k}\right|$$
3. *Median of distances from the median*. The median of distances from the median is similar to the formula in point 2, where the averages are replaced by medians owing to the fact that medians are less susceptible to the presence of outliers.

$$MDM = median\left(\left|x_{t_k} - median(x_{t_k})\right|\right)$$

Using the second option, we obtain

$$MARE = \frac{\overline{|R|}}{\overline{|D|}}$$

UPWARD REVISIONS

In principle, positive and negative revisions should occur with roughly the same frequency. If the revisions are systematically positive or negative, the underlying reasons for this should be analysed. This may be a lack of coverage in early estimates, and there should be an attempt to correct such a systematic bias. This simple indicator is the ratio between upward revisions and the number of observations (N).

upward revisions = (# upward revisions) / N

DIRECTIONAL RELIABILITY

To assess whether the information contained in the earlier estimates has been altered by the revisions, a *2 x 2* contingency table can be set up. In this contingency table the columns consist of positive and negative first differences in the early estimates $\Delta x_{t_1} = x_{t_1} - x_{(t-1)_1}$, while the rows consist of positive and negative changes in the latest values $\Delta x_{t_k} = x_{t_k} - x_{(t-1)_k}$.

Contingency table for directional reliability

	$\Delta\chi_{t1} > 0$	$\Delta\chi_{t1} \leq 0$	Subtotal
$\Delta\chi_{tk} > 0$	n_{11}	n_{12}	$n_{11}+n_{12}$
$\Delta\chi_{tk} \leq 0$	n_{21}	n_{22}	$n_{21}+n_{22}$
Subtotal	$n_{11}+n_{21}$	$n_{12}+n_{22}$	N

The directional reliability indicator (Q) is constructed as follows:

$$Q = \frac{n_{11} + n_{22}}{N}$$

This coefficient (Q) is equal to 1 when the early estimate changes and the observed value changes follow the same pattern ($n_{11} + n_{22} = N$), while it is equal to 0 when there is a total dissociation ($n_{11} + n_{22} = 0$). The directional reliability indicator (Q) expresses the percentage of cases in which earlier and later assessments move in the same direction. High values are optimal in terms of increasing the reliability of the data.

1.3 DECOMPOSABLE INDICATORS

Other measures are used to detect possible bias or persistent patterns in the revisions. According to the literature on forecast quality measures, the most appropriate for the analysis of revisions is based on mean square errors, which allow a decomposition into bias and variance.

The indicator is very similar to the MARE but it is calculated as the square root of a ratio between average squares of revisions and the variance of the series. It is designated as *root mean square relative error* (RMSRE):

$$RMSRE = \sqrt{\frac{\overline{R^2}}{S^2}}$$

The value of the RMSRE is 0 when the forecast is perfect, 1 if the forecast is only as accurate as the reference forecast, and greater than 1 when the forecast is less accurate than the average for the series.[3] The square of the RMSRE can be decomposed as:

$$RMSRE^2 = \left[\frac{\overline{X_k} - \overline{X_1}}{S_{X_k}}\right]^2 + \left[r_{X_k X_1} - \frac{S_{X_1}}{S_{X_k}}\right]^2 + \left[1 - (r_{X_k X_1})^2\right]$$

where $r_{X_k X_1}$ is the correlation between the two series and S_{X_k} and S_{X_1} are the respective standard deviations.

3 Other measures of distribution location, like the median and the trimmed mean, were tested. Assuming that the b.o.p. financial net flows are stationary, the average was chosen owing to its simplicity, ease of interpretation, and because it makes the decomposition of the indicator possible. Although not implemented by the TF-QA, when the series are not stationary the indicator can still be applied using the previous value of the series as the reference value, or using the first difference of the series.

The three components of the square of the RMSRE can also be presented as proportions of the RMSRE, which added together will equal 1.

$$1 = \frac{RMSRE^2}{RMSRE^2} = \frac{\left[\frac{\overline{X_k} - \overline{X_1}}{S_{X_k}}\right]^2}{RMSRE^2} + \frac{\left[r_{X_k X_1} - \frac{S_{X_1}}{S_{X_k}}\right]^2}{RMSRE^2} + \frac{\left[1-(r_{X_k X_1})^2\right]}{RMSRE^2}$$

The three components can be interpreted as follows:

1. The *unconditional* or *bias component* is an indication of systematic error (revision), since it measures the extent to which the average values of the early and later assessment series deviate from each other. The revisions can be considered biased if the mean revision is significantly different from zero.[4]

2. The *conditional* or *regression component* is another systematic component which reflects whether the overall pattern of the series with the early estimates was close to that of the series with the later estimates. If the forecast correctly reflects the pattern/volatility of the later estimate series, the correlation between both series will be quite high and the component close to zero.

3. The *unsystematic* or *disturbance component* is the variance of the residuals obtained by regressing the early estimates data on the later estimates. It can be assumed to have a random nature without any predictable pattern.[5]

GENERAL INDICATOR

The indicators for net flows (MARE and RMSRE) can be expressed in a general formula as follows:

$$MRE(\rho) = \left[\frac{\sum_{t=1}^{N} |R|^{\rho}}{\sum_{t=1}^{N} \left|\Theta_t - x_{t_k}\right|^{\rho}}\right]^{\frac{1}{\rho}}$$

where ρ is the power parameter (e.g. $\rho = 1$ for MARE and $\rho = 2$ for RMSRE*)*.

Instead of the average value of x_k, Θ_j can be set as a forecast to test against the early assessments. For instance, it could be the forecast of a benchmark model used to evaluate the time series.

As explained before, the average is very useful from an analytical point of view, but in the case of non-stationary series, the average and the MSE decomposition become meaningless. In this case, the appropriate use of a relevant transformation is of utmost importance to preserve the analytical decomposition of the indicator. If the transformation is not feasible, a different reference forecast will be more convenient.

2 SERVICEABILITY/CONSISTENCY

In the IMF's DQAF, *consistency* is defined as either (i) over time; (ii) between data collected at different frequencies; (iii) internationally; or (iv) across variables, vertically (across transactions), horizontally (across institutional sectors), and/or between flows and stocks. The TF-QA decided to follow the IMF's DQAF for b.o.p. 2001 principles by mostly concentrating on this element and dividing it into the following sub-categories:

- internal consistency (e.g. within the integrated statistics (b.o.p./i.i.p. or national accounts));
- consistency over time (e.g. in the case of methodological or institutional changes, such as enlargement, historical data are reconstructed as far back as is reasonable); and
- external consistency (between different sources of data and/or different statistical frameworks, including mirror statistics – international statistics should be comparable even when compiled by

4 Normality is assumed for revisions in order to apply the t test; it needs to be tested statistically.

5 This indicator only accounts for linear relationships. The unsystematic part could still have non-linear patterns within it.

different institutions or by different units of the same institution).

2.1 INTERNAL CONSISTENCY

The b.o.p. statistics have a *natural indicator* for internal consistency: the net errors and omissions series (EO). The principle of double-entry bookkeeping used in b.o.p. implies that the sum of all international transactions should be equal to zero. Nevertheless, *"Data for balance of payments estimates often are derived independently from different sources; as a result, there may be a summary net credit or net debit (i.e., net errors and omissions in the accounts). A separate entry, equal to that amount with the sign reversed, is then made to balance the accounts. Because inaccurate or missing estimates may be offsetting, the size of the net residual cannot be taken as an indicator of the relative accuracy of the balance of payments statement.*[6] *Nonetheless, a large, persistent residual that is not reversed should cause concern. Such a residual impedes analysis or interpretation of estimates and diminishes the credibility of both. A large net residual may also have implications for interpretation of the investment position statement"* (IMF, BPM5, 1993, p.17).

According to the IMF's DQAF for b.o.p. 2001, internal consistency implies checking that "over the long run [the] errors and omissions item (1) has not been large and (2) has been stable over time".

A measure of the size can be provided by the *average of the absolute errors and omissions,* $\overline{|EO|}$.

As with revisions, an alternative measure of the size can be provided by the *root mean square error of the net errors and omissions* (RMSE (EO)).

$$RMSE(EO) = \sqrt{\overline{EO^2}}$$

As before, this indicator can be decomposed into bias and variance components:[7]

$$RMSE^2 = bias\ component + variance\ component$$

$$RMSE^2 = \overline{EO}^2 + S^2$$

where S is the standard deviation of the errors and omissions.

Further to the previous indicator, the number of positive EOs divided by the number of observations can be used to assess the relative frequency of positive EOs:

$$CP(EO) = \frac{Count(EO_t > 0)}{N}$$

where N is the timeframe data.

2.2 EXTERNAL CONSISTENCY

Although minor discrepancies arising from methodological differences can still be present in two sets of data stemming from different sources and/or different statistical frameworks,[8] the comparison can still provide a useful measure of consistency and contribute to the overall increase in quality.

GROSS FLOWS OR STOCKS

Simple indicators of external consistency express the differences in original units of the variables under comparison, X and Y. A simple indicator measuring the consistency between b.o.p. and international trade statistics (ITS) can be computed on the latest assessment of each series.

An average of the differences ($\overline{D}$) provides an indication of how far the series deviate on average. The average may also be computed on the absolute differences ($\overline{|D|}$).

Yet another alternative indicator is similar to the MAPE $\left(\overline{|P|}\right)$, but with the percentage differences calculated as proportions of an

6 Therefore, the net errors and omissions constitute a lower bound for overall inaccuracies.

7 Following the simplest MSE decomposition. See *Elements of Forecasting*, Diebold, Francis X. 2001

8 E.g., the comparison between the euro area goods item (b.o.p.) and Eurostat's external trade data, or the comparison between the b.o.p. flows of the monetary financial institution (MFI) sector and flows derived from the consolidated MFI balance sheet from money and banking statistics.

average of the two time series.[9] The indicator captures the magnitude of the discrepancies in absolute value, and frames it in proportion to the average size of the series.

As with revisions, it is also possible to compute relative indicators of external consistency over the transformed series. For example, the impact of different levels in the series of imports can be removed by calculating the indicator on the first differences.

Another simple measure is based on the average differences of the series after transforming them into growth rates. This has the advantage of abstracting from differences in levels between the time series: the imports of goods are measured on a c.i.f. basis for ITS and on an f.o.b. basis for b.o.p., while both exports are measured on an f.o.b. basis. A simple indicator of external consistency then becomes:

$$G = \overline{|G_x - G_y|}$$

NET FLOWS

Differences between b.o.p. transactions and similar transactions derived from the MFI balance sheet can be attributed to a variety of factors: dissimilar timeliness in terms of recording and reporting, different revision policies and different valuation methods.

It is proposed that the relative indicators for assessing reliability will also be used for assessing consistency between comparable net flows. The indicator similar to the MAPE, "C"[10], the MARE and the RMSRE are calculated over the latest assessment of each series. The volatility can be assessed over the mean of both series.

DIRECTIONAL CONSISTENCY

No less important is the consistency of the information provided by the two sources, i.e. if the signs of the first differences coincide in both sources. In the contingency table for external consistency, the columns are the positive and negative changes for b.o.p. series $(\Delta x_t = x_t - x_{t-1})$, and the rows are the positive and negative changes for the mirror series $(\Delta y_t = y_t - y_{t-1})$

Contingency table for directional consistency

	$\Delta x_t > 0$	$\Delta x_t \leq 0$	Subtotal
$\Delta y_t > 0$	n_{11}	n_{12}	$n_{11}+n_{12}$
$\Delta y_t \leq 0$	n_{21}	n_{22}	$n_{21}+n_{22}$
Subtotal	$n_{11}+n_{21}$	$n_{12}+n_{22}$	N

where n_{11} is the number of cases when both Δx_t and Δy_t are positive, and n_{22} the number of cases when they are negative.

For a maximum directional consistency, one would expect a high sum for the main diagonal ($n_{11}+ n_{22}$). As before, the *directional consistency indicator* (Q_C) is constructed as follows:

$$Q_C = \frac{n_{11} + n_{22}}{N}$$

9 $C = \frac{1}{a} \sum_{t=T-a}^{T} \frac{|x_t - y_t|}{(x_t + y_t)/2}$

Based on *Some elements of a quality framework for CMFB statistics*, Keuning, S. and Algera, S.

10 As with the MAPE, the "C" indicator may become inflated in the presence of observations close to zero.

ANNEX 2

Chart 1 Euro area goods – credits

(EUR billions)

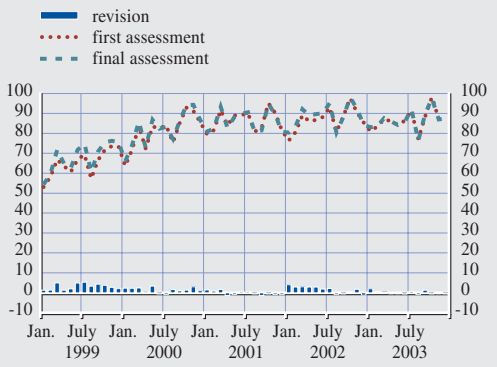


Chart 2 Euro area goods – debits

(EUR billions)

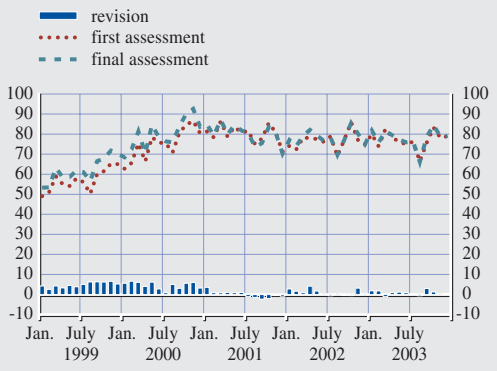


Chart 3 Euro area goods – net

(EUR billions)

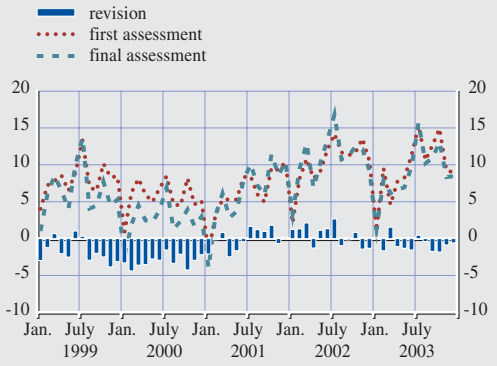


Table 1 Stability indicators for goods

Quality indicator	Reference period	Goods		
		Credits	Debits	Net
$\overline{R}$	Jan99 - Dec01	1.53	3.17	-1.64
	Jan00 - Dec02	1.06	1.95	-0.90
	Jan01 - Dec03	0.60	0.72	-0.12
$\lvert\overline{R}\rvert$	Jan99 - Dec01	1.88	3.60	2.11
	Jan00 - Dec02	1.50	2.44	1.84
	Jan01 - Dec03	1.16	1.28	1.18
MAPE/ RMSRE	Jan99 - Dec01	0.03	0.05	0.56
	Jan00 - Dec02	0.02	0.03	0.51
	Jan01 - Dec03	0.01	0.02	0.32
Q	Jan99 - Dec01	97.14%	94.29%	88.57%
	Jan00 - Dec02	97.14%	94.29%	88.57%
	Jan01 - Dec03	100.00%	94.29%	88.57%

Chart 4 Euro area services – credits

(EUR billions)

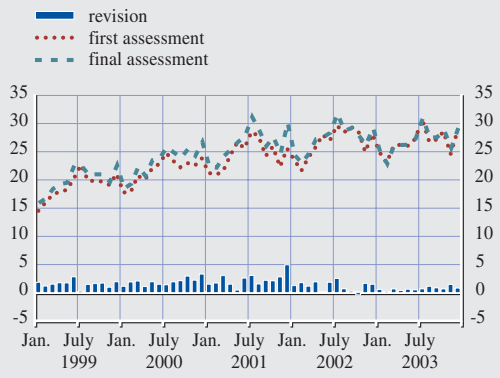


Chart 5 Euro area services – debits

(EUR billions)

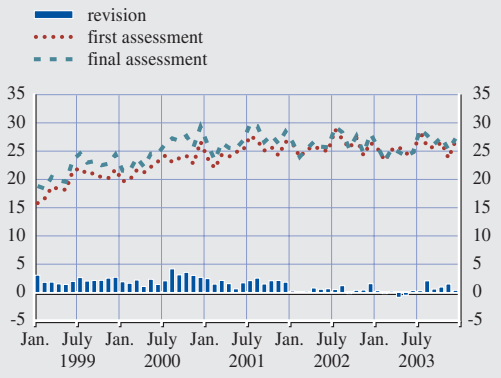


Chart 6 Euro area services – net

(EUR billions)

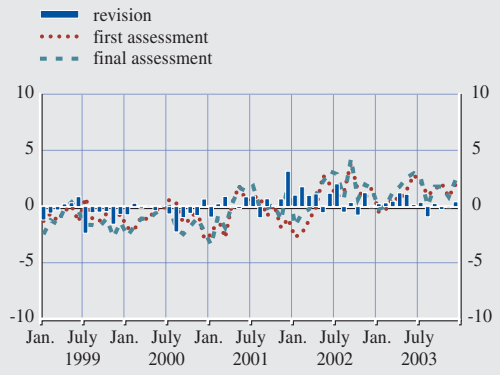


Table 2 Stability indicators for services

Quality indicator	Reference period	Services		
		Credits	Debits	Net
$\overline{R}$	Jan99 - Dec01	1.94	2.13	-0.19
	Jan00 - Dec02	1.81	1.60	0.21
	Jan01 - Dec03	1.39	0.93	0.46
$\lvert\overline{R}\rvert$	Jan99 - Dec01	1.94	2.13	0.75
	Jan00 - Dec02	1.83	1.60	0.80
	Jan01 - Dec03	1.41	1.02	0.75
MAPE/ RMSRE	Jan99 - Dec01	0.09	0.10	0.57
	Jan00 - Dec02	0.08	0.07	0.59
	Jan01 - Dec03	0.06	0.04	0.56
Q	Jan99 - Dec01	91.43%	82.86%	85.71%
	Jan00 - Dec02	94.29%	88.57%	77.14%
	Jan01 - Dec03	88.57%	91.43%	82.86%

Chart 7 Euro area income – credits

(EUR billions)

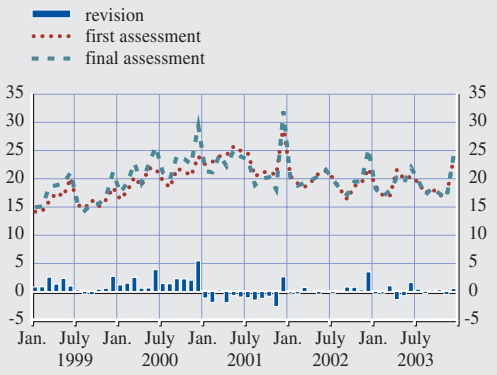


Chart 8 Euro area income – debits

(EUR billions)

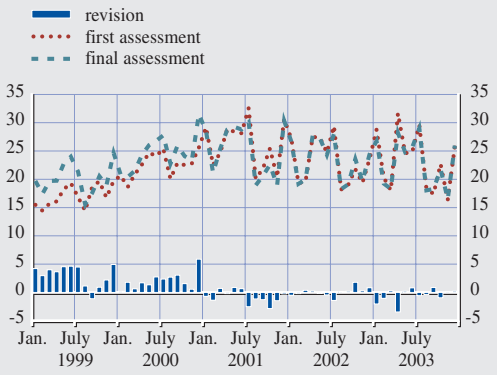


Chart 9 Euro area income – net

(EUR billions)

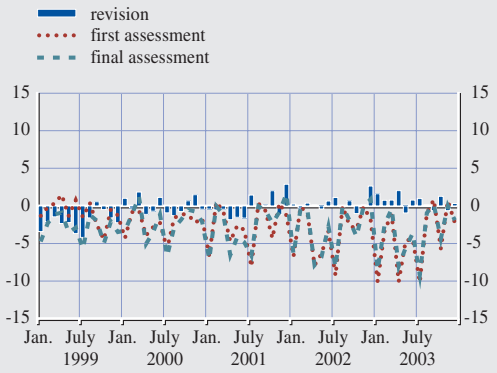


Table 3 Stability indicators for income

Quality indicator	Reference period	Income		
		Credits	Debits	Net
$\overline{R}$	Jan99 - Dec01	0.71	1.43	-0.72
	Jan00 - Dec02	0.53	0.45	0.08
	Jan01 - Dec03	-0.16	-0.40	0.24
$\lvert\overline{R}\rvert$	Jan99 - Dec01	1.54	2.14	1.44
	Jan00 - Dec02	1.38	1.24	0.93
	Jan01 - Dec03	0.91	0.86	0.90
MAPE/ RMSRE	Jan99 - Dec01	0.08	0.11	0.64
	Jan00 - Dec02	0.06	0.05	0.43
	Jan01 - Dec03	0.04	0.03	0.43
Q	Jan99 - Dec01	85.71%	85.71%	88.57%
	Jan00 - Dec02	85.71%	88.57%	88.57%
	Jan01 - Dec03	82.86%	94.29%	94.29%

Chart 10 Euro area current account – credits

(EUR billions)

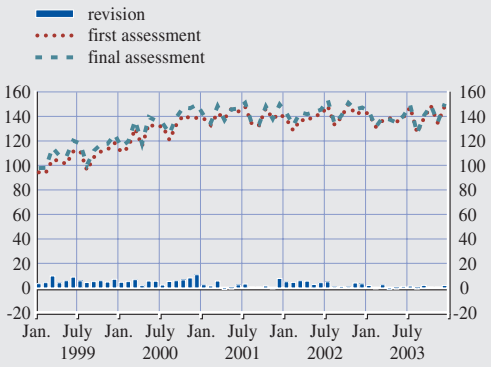


Chart 11 Euro area current account – debits

(EUR billions)

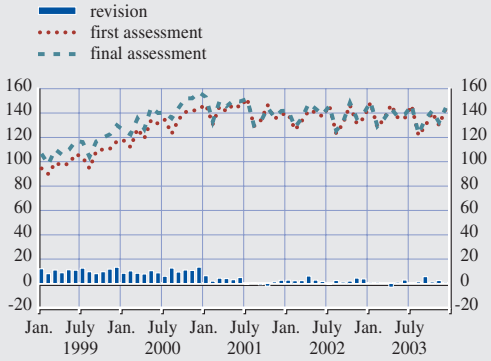


Chart 12 Euro area current account – net

(EUR billions)

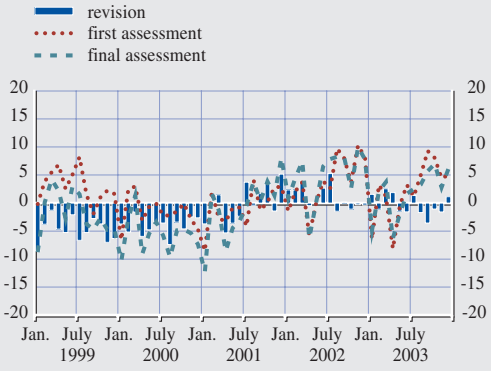


Table 4 Stability indicators for current account

Quality indicator	Reference period	Current account		
		Credits	Debits	Net
$\overline{R}$	Jan99 - Dec01	4.48	7.47	-2.99
	Jan00 - Dec02	3.76	4.80	-1.04
	Jan01 - Dec03	2.14	1.93	0.21
$\lvert\overline{R}\rvert$	Jan99 - Dec01	4.59	7.68	3.86
	Jan00 - Dec02	3.87	5.02	2.83
	Jan01 - Dec03	2.37	2.32	2.05
MAPE/ RMSRE	Jan99 - Dec01	0.04	0.07	0.79
	Jan00 - Dec02	0.03	0.04	0.62
	Jan01 - Dec03	0.02	0.02	0.46
Q	Jan99 - Dec01	88.57%	94.29%	82.86%
	Jan00 - Dec02	94.29%	97.14%	91.43%
	Jan01 - Dec03	94.29%	97.14%	82.86%

Chart 13 Euro area direct investment abroad

(EUR billions)

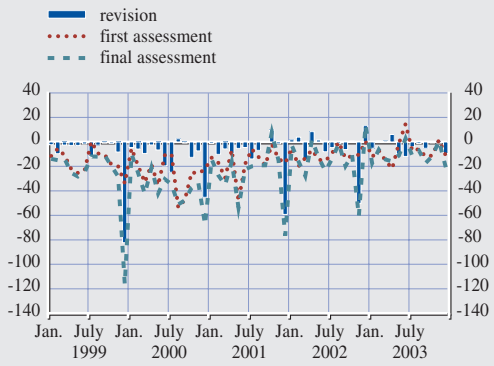


Chart 14 Direct investment in the euro area

(EUR billions)

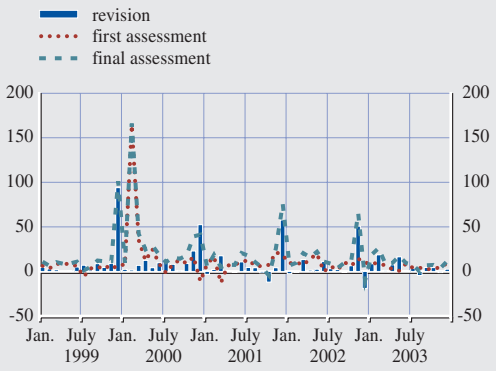


Chart 15 Euro area direct investment – net

(EUR billions)

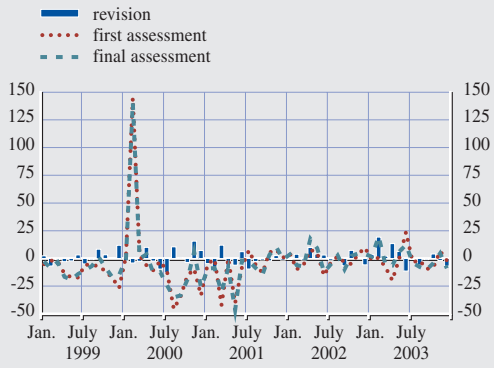


Table 5 Stability indicators for direct investment

Quality indicator	Reference period	Direct investment		
		Assets	Liabilities	Net
$\overline{R}$	Jan99 - Dec01	-10.40	10.21	-0.20
	Jan00 - Dec02	-8.37	8.23	-0.14
	Jan01 - Dec03	-5.73	5.99	0.26
$\lvert\overline{R}\rvert$	Jan99 - Dec01	11.09	11.18	5.41
	Jan00 - Dec02	10.68	10.42	5.33
	Jan01 - Dec03	8.31	8.48	5.19
RMSRE	Jan99 - Dec01	0.96	0.83	0.30
	Jan00 - Dec02	0.82	0.67	0.29
	Jan01 - Dec03	0.70	0.57	0.30
Q	Jan99 - Dec01	77.14%	62.86%	77.14%
	Jan00 - Dec02	80.00%	65.71%	85.71%
	Jan01 - Dec03	88.57%	57.14%	85.71%

Chart 16 Euro area portfolio investment – assets

(EUR billions)

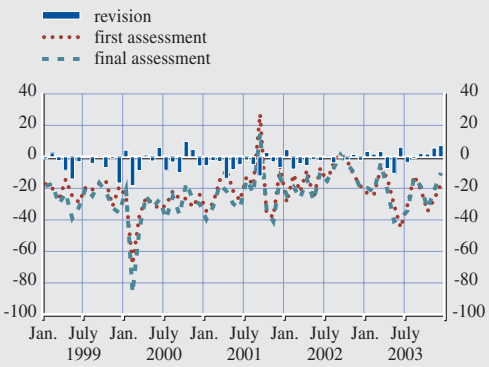


Chart 17 Euro area portfolio investment – liabilities

(EUR billions)

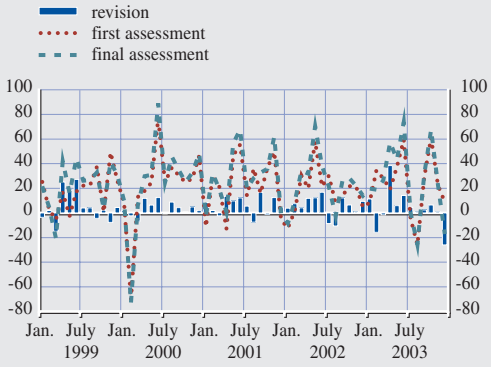


Chart 18 Euro area portfolio investment – net

(EUR billions)

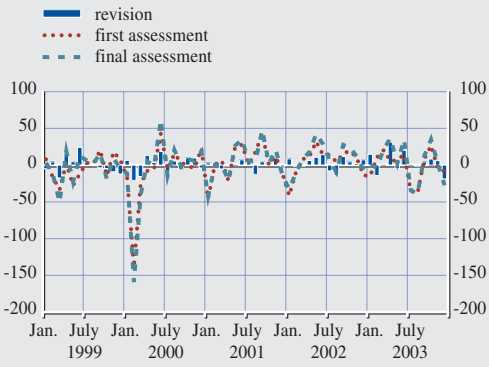


Table 6 Stability indicators for portfolio investment

Quality indicator	Reference period	Portfolio investment		
		Assets	Liabilities	Net
$\overline{R}$	Jan99 - Dec01	-4.19	4.86	0.68
	Jan00 - Dec02	-3.28	5.11	1.82
	Jan01 - Dec03	-2.17	5.02	2.85
$\lvert\overline{R}\rvert$	Jan99 - Dec01	5.96	7.69	7.72
	Jan00 - Dec02	5.25	7.29	7.26
	Jan01 - Dec03	4.44	9.09	7.41
RMSRE	Jan99 - Dec01	0.54	0.38	0.32
	Jan00 - Dec02	0.47	0.33	0.29
	Jan01 - Dec03	0.39	0.45	0.32
Q	Jan99 - Dec01	74.29%	94.29%	91.43%
	Jan00 - Dec02	88.57%	94.29%	91.43%
	Jan01 - Dec03	91.43%	82.86%	85.71%

Chart 19 Euro area other investment – assets

(EUR billions)

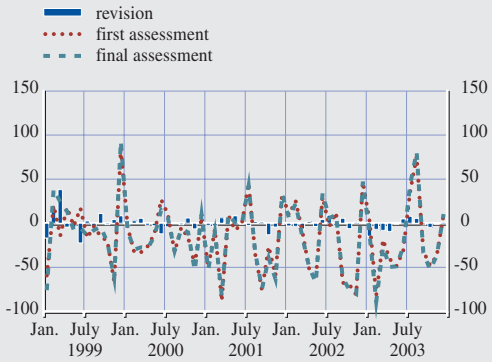


Chart 20 Euro area other investment – liabilities

(EUR billions)

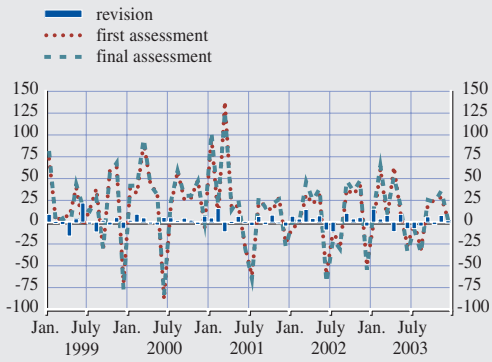


Chart 21 Euro area other investment – net

(EUR billions)

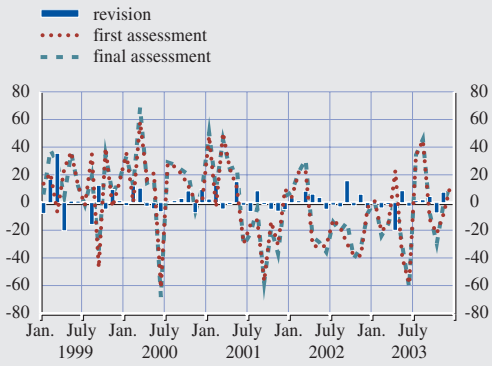


Table 7 Stability indicators for other investment

Quality indicator	Reference period	Other investment		
		Assets	Liabilities	Net
$\overline{R}$	Jan99 - Dec01	0.21	1.37	1.58
	Jan00 - Dec02	-0.68	2.28	1.61
	Jan01 - Dec03	-1.00	1.65	0.66
$\overline{\lvert R \rvert}$	Jan99 - Dec01	6.50	5.47	7.30
	Jan00 - Dec02	4.00	5.34	5.47
	Jan01 - Dec03	4.37	6.44	5.10
RMSRE	Jan99 - Dec01	0.25	0.17	0.35
	Jan00 - Dec02	0.13	0.16	0.23
	Jan01 - Dec03	0.14	0.18	0.24
Q	Jan99 - Dec01	85.71%	91.43%	94.29%
	Jan00 - Dec02	91.43%	91.43%	85.71%
	Jan01 - Dec03	94.29%	91.43%	85.71%

Chart 22 Euro area errors and omissions

(EUR billions)

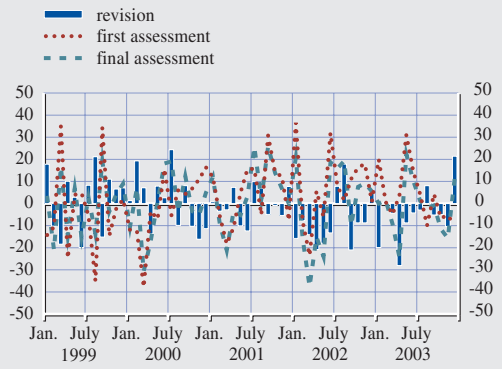


Table 8 Stability indicators for errors and omissions

Quality indicator	Reference period	Errors and omissions
$\overline{R}$	Jan99 - Dec01	0.64
	Jan00 - Dec02	-2.67
	Jan01 - Dec03	-4.55
$\lvert\overline{R}\rvert$	Jan99 - Dec01	9.77
	Jan00 - Dec02	10.05
	Jan01 - Dec03	9.68
RMSRE	Jan99 - Dec01	0.80
	Jan00 - Dec02	0.82
	Jan01 - Dec03	0.82
Q	Jan99 - Dec01	65.71%
	Jan00 - Dec02	68.57%
	Jan01 - Dec03	77.14%