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Quality of Australian Balance of Payments Statistics

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INFORMATION PAPER: QUALITY OF AUSTRALIAN BALANCE OF PAYMENTS STATISTICS

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PREFACE

This information paper broadly addresses the quality of Australia's balance of payments statistics. These statistics are an important and widely used component of the range of macroeconomic statistics published by the ABS, and their appropriate use and interpretation in part needs to be supported by an assessment of the quality of the data for the purposes to which they will be put. The purpose of this paper is to provide users with a general appreciation of the issues associated with, and factors that influence, the quality of these statistics. It provides some subjective assessments of the quality of the statistics and discusses some statistical measures of their reliability.

The analysis in this paper updates and extends the discussion in Chapter 15 (*Quality of balance of payments statistics*) of *Balance of Payments, Australia: Concepts, Sources and Methods* (5331.0) which was published by the ABS in October 1990. As well as covering a more recent time period for the monthly series under analysis, the detailed analysis of revisions has been extended in this paper to include quarterly and annual series. The analyses now also include the impact of methodologies which have been changed since 1990, that not only revise previously published statistics (affecting the perceived reliability of the published accounts) but also improve the assessment of both the accuracy of series now being compiled and the expectations about the need for future revision.

This paper directly addresses the quality of the balance of payments statistics that are published at current prices and in original terms. Many, but not all, of the issues that affect the quality of these statistics will also affect balance of payments statistics compiled at constant prices, and in seasonally adjusted and trend estimates terms.

This type of analysis also helps the ABS to assess the quality of its statistics and those areas most requiring improvements. The paper outlines the steps that the ABS takes to maintain the quality of the statistics and mentions several developments that are expected to lead to improvements in quality in the next few years. So that users can more readily assess the impact of these changes on the quality of the statistics, the ABS intends to update regularly its quality assessments and present them in articles appearing in related balance of payments publications.

The ABS invites readers to comment on the usefulness of this paper as a guide to the implications of data quality when using ABS balance of payments statistics. These comments will be used to better target user needs in establishing both the frequency and content of future quality articles. Comments can be faxed to Bob McColl on Canberra (06) 252 7219 or mailed to PO Box 10, Belconnen, ACT 2616.

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ABBREVIATIONS AND REFERENCES

ABBREVIATIONS AND OTHER USAGES

ABS	Australian Bureau of Statistics
AIA	Australian Investment Abroad
billion	one thousand million
BPM4	International Monetary Fund, *Balance of Payments Manual Fourth Edition*, Washington DC, 1977
BPM5	International Monetary Fund. *Balance of Payments Manual, Fifth Edition*, Washington DC, 1993
FIA	Foreign Investment in Australia
IMF	International Monetary Fund
SNA93	Commision of the European Communities, International Monetary Fund, Organisation for Economic Cooperation and Development, United Nations, World Bank. *System of National Accounts*, Brussels/Luxembourg, New York, Paris, Washington D.C., 1993
. .	not applicable
n.a.	not available

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INTRODUCTION

This information paper addresses the quality of balance of payments statistics published by the Australian Bureau of Statistics (ABS). It first discusses the issues associated with, and factors that influence, the quality of these statistics. It goes on to consider the accuracy and reliability of the statistics and gives an assessment of the accuracy of the broad aggregates that make up the accounts as well as providing some statistical measures of their reliability. The paper also outlines the steps that the ABS takes to maintain the quality of the statistics and mentions several developments that are expected to lead to improvements in quality in the next few years.

SECTION 1 DATA QUALITY CONCEPTS

WHAT IS QUALITY?

The quality of statistics about a topic should be judged in terms of their ability to meet users' information needs in that area. To be of high quality, statistics should be:

- relevant to users' needs (i.e. measure the concepts in which users are interested);
- accurate;
- reliable (i.e. not subject to large revisions);
- comprehensive in coverage;
- consistent with related statistics;
- timely; and
- easily accessible.

A number of issues associated with the production of balance of payments statistics that have a bearing on their quality are discussed in the following paragraphs.

THE BALANCE OF PAYMENTS CONCEPTUAL FRAMEWORK

An important aspect of quality is that the concepts, definitions and classifications used in a body of statistics are relevant to and understandable by users (domestic and international), internally coherent, and able to be linked to other bodies of statistics. The conceptual framework underlying Australian balance of payments statistics has been developed over the years with these objectives in mind.

The framework used by the ABS in the compilation of balance of payments statistics is based upon the recommendations of the International Monetary Fund's (IMF) *Balance of Payments Manual (BPM4)*[1], and the recommendations of the United Nations' *A System of National Accounts*[2]. The standards set out in these documents are generally adopted by the ABS in its economic statistics, although over the years Australia has progressively revised and harmonised its national and international accounts and further developed concepts, definitions and classifications that have been targeted closely to domestic user requirements. This has allowed Australian balance of payments statistics to be integrated with the national and financial accounts and with the international investment position statistics. As most countries follow the IMF statistical standards for balance of payments statistics, broad comparisons can be made between Australia's statistics and those of other countries.

The conceptual framework and estimation methodology for Australia's balance of payments statistics are explained in *Balance of Payments, Australia: Concepts, Sources and Methods* (5331.0) which was published in October 1990. Since then, a number of conceptual and methodological changes have been made as a result of the availability of

[1] International Monetary Fund, *Balance of Payments Manual*, *Fourth Edition,* IMF, Washington DC, 1977.
[2] United Nations, *A System of National Accounts*, New York, 1968.

new data sources or the development of improved estimation methodologies. To keep users informed, these changes have been documented, as they occurred, in the ABS monthly, quarterly and annual publications *Balance of Payments, Australia* (5301.0, 5302.0 and 5303.0, respectively).

Within this conceptual framework the ABS attempts to make the statistics as useful as possible by classifying the data in a number of ways which users have requested. For example, merchandise exports and imports are classified by commodity in various ways, and foreign borrowing transactions are classified in many ways, such as, by debt instrument, currency of the debt, and institutional sector of the borrower.

In late 1993 the IMF issued the fifth edition of its *Balance of Payments Manual* (BPM5), and together with the Commission of European Communities, the Organisation for Economic Cooperation and Development, the United Nations and the World Bank, issued the *System of National Accounts 1993* (SNA93). The ABS plans to implement BPM5 and the SNA93 as fully as possible, with the first balance of payments statistics compiled on the basis of the two new standards planned for release in late 1997. As far as possible the ABS will recast back series onto the new basis or provide a bridge on both the old and new bases for a limited time to show the impact of the changeover. Future analyses of the quality of Australia's balance of payments statistics will assess the impact of this revision to the conceptual framework (greater relevance, more comprehensive coverage of international financial transactions, greater consistency with related statistics) but will also assess the resulting one-off revisions to several key aggregates in the balance of payments.

WHAT IS MEANT BY ACCURACY?

In principle, balance of payments statistics should be compiled by summing the foreign accounts, whether actual or notional, of every economic unit (i.e. every government body, business and household) in Australia. Alternatively, each transaction, whether actual or notional, between a resident of Australia and a non-resident could, in principle, be measured. Other things being equal, if this were possible, the resulting statistics would be a true measure of balance of payments activity. In practice however, neither approach is feasible. Instead, the statistician produces estimates of the notional true values by combining data from a wide variety of sources reflecting varying valuations, coverage, frequency, detail and timeliness.

Frequently, the data available to the statistician may only approximate the concept that it is desired to measure. For example, the conceptual framework calls for the inclusion in the balance of payments of merchandise exports and imports that have changed ownership between a resident and a non-resident. In practice, international merchandise trade statistics, compiled from customs documents which measure goods crossing the customs frontier whether or not they change ownership, are used as the main source in estimating merchandise trade activity in the balance of payments. Although adjustments to a change of ownership

basis are made for all identified large transactions that are not on this basis, it is not practical to identify all such cases.

Because of this variability in the appropriateness of source data for balance of payments purposes, the data available at any particular stage in the estimating cycle will inevitably contain errors. Accuracy in this context therefore refers to how closely an estimate measures the activity it purports to measure.

The errors that are present in a statistic can be thought of as being of two types. First, the difference between a fully-revised (or final) estimate and the notional true value and, second, the difference between an earlier (or preliminary) estimate and the fully-revised estimate. Because the true value is not known, the first type of error is theoretical only and cannot be directly quantified. The second type of error is measured by the difference between a given preliminary estimate (most commonly the first estimate) and the final, fully-revised estimate that is the statistician's best approximation of the notional true value. These latter errors, that are eventually removed by revision, and are therefore quantifiable, are the focus of later analysis in this paper.

ACCURACY AND RELIABILITY

In considering the quality of balance of payments statistics, it is useful to make a clear distinction between the concepts of *accuracy* and *reliability*.

They can be defined as follows:

- accuracy is the proximity of an estimate (especially the final, or fully-revised, estimate) to some notional true value; and
- reliability is the proximity of initial and intermediate estimates for a particular period to the final estimate for that period.

Thus, in the extreme, an estimate may be completely inaccurate but entirely reliable. That is, it bears no resemblance to the true value but, because of the absence of better information, the initial estimate is never revised. The opposite extreme case may also occur. That is, it may be possible to produce highly accurate estimates at long time lags while early estimates are poor and subject to considerable revision.

In practice accuracy and reliability tend to be interwoven and reinforcing. Ideally, as the estimate for a particular period passes through a sequence of revisions, the size of revisions gets smaller (the statistic becomes more reliable) and the estimate moves closer to the true value (the statistic becomes more accurate). In balance of payments statistics this is generally the case, but not always.

FACTORS INFLUENCING QUALITY

Apart from the fact that data may only be practically available on a slightly different basis from that called for in the conceptual framework, there are a number of other factors that have a bearing on the perceived quality of balance of payments statistics.

Timeliness

There is an important trade-off between the accuracy and reliability of the estimates and the timeliness of their release. To meet the decision-making needs of users there is pressure to produce statistics on as timely and frequent a basis as possible. To the extent that complete or accurate data may not be available with the desired timing or can only be obtained at unacceptably high resource costs, there will be compromises in data quality. Generally, significant improvements in timeliness can only be made at the expense of detail, accuracy, reliability or additional resources.

The ABS releases monthly, quarterly and annual balance of payments statistics. ABS policy is to release initial monthly estimates as soon as the ABS has sufficient data to provide a broad indicator of current balance of payments trends; in practice, this currently means about 21 working days after the end of the month, once data that are sourced monthly are available on merchandise trade, official reserve assets, most general government sector transactions, and some non-official public sector investment transactions. Other components of the accounts are sourced quarterly, annually or at longer time intervals, and initial monthly estimates are extrapolations based on the trend in recent periods and adjusted using currently available indicator information.

Initial estimates for a quarter, for the restricted range of series released in monthly publications, will be available with the release of estimates for the last month of that quarter. However, the quarterly balance of payments publication is not currently released for a further 21 working days; that is, until about 42 working days after the end of the quarter. The extra time is required to generate constant price estimates for trade in goods and services, to incorporate significant additional detail becoming available from quarterly survey results, and to process revisions for earlier periods arising from those quarterly sources. As a result of the more comprehensive data sources available quarterly, initial quarterly statistics are generally more accurate than initial monthly statistics, but care is still required in interpreting statistics for the more recent quarters.

The initial estimates for a full financial year are available with the release of monthly data for June of that year. Such annual estimates will contain a mixture of relatively accurate data for the full year compiled from timely monthly sources; somewhat less accurate data from quarterly sources for the earlier quarters of the year and for which significant revisions could still be expected; and extrapolations for periods where either quarterly or annual survey results are not yet available.

Collection methodology

Where estimates are based on the results of a sample survey, rather than complete enumeration, they are subject to sampling error. Samples are designed to produce estimates of varying accuracy at various levels of detail, with standard errors lowest at the highest levels of aggregation. For some detailed estimates, relative standard errors can be high.

For those estimates based on a partial collection, in which data are collected only from units with activity above a certain threshold,

estimates of the activity of the smaller units which are not approached are based on their contribution to estimates for an earlier benchmark period. The activity of these units is checked periodically and, where it exceeds the threshold, they are added to the collection. However, this methodology may lead to inaccuracies if the activity of the units that are not approached changes significantly from the contribution they made to earlier benchmark estimates.

Time of recording

Balance of payments statistics are sensitive to the time of recording of transactions, and imbalances will be present if the credit and debit entries for a single transaction are recorded in different time periods. Such time of recording differences arise particularly where different data sources are used for capturing the two sides to any transaction. For example, merchandise imports information will generally be recorded (as a debit) in the period in which customs documents are lodged in Australia. While this time is generally a good practical approximation to the change of ownership of merchandise imports, some goods may change ownership at an earlier or later point in time. In that case, while the associated financing (payment, trade credit or other settlement) would be correctly reported for that earlier or later period by either the owner or the financial intermediary involved, the imports will be understated in the earlier or later period and overstated when the recording occurs, with consequent effects on the aggregates and balances in both periods. While efforts are made to detect and correct for any significant recording departures from the time of change of ownership in compiling the principal components of the accounts, it is not possible to compensate for them all.

Valuation

As with the time of recording of transactions, if different valuations are used in measuring the credit and debit aspects of a transaction, there will be both inaccuracies and imbalances in the accounts. Although market valuation is the standard valuation principle for the accounts (often approximated by transactions values), and a standard principle for converting from foreign currencies is prescribed, some source data may not conform. For example, if a non-resident buys shares in an Australian enterprise from a resident, the financing of the transaction may be captured through intermediaries at the actual transactions prices involved but the change in ownership of the shares may have to be approximated based on changes over time in the stock of such shares held by non-residents multiplied by an average share price for the period. While efforts are made to get as close as possible to the preferred basis of valuation, this will not always be feasible and there will be valuation errors in the statistics.

Coverage

Undercoverage of balance of payments transactors typically stems from the difficulties in identifying all the entities engaged in particular types of international transactions. For example, since the removal of most types of restrictions on international capital flows, there has not been a comprehensive source which the ABS can use to maintain its coverage of entities having international capital flows. Instead, the ABS has had to rely on several partial sources, none of which is comprehensive. On

occasions, this has meant that the existence of transactors with international capital flows has only come to notice well after the flows have occurred. In such circumstances, revisions to past periods may be necessary some time after statistics for those periods have been first released. In addition, for identified transactions, there may be deficiencies in coverage of these transactions as a result of misreporting in ABS collections.

Methodological deficiencies

Even where the population of transactors with international flows can be identified, the only data readily available from those transactors or from administrative sources may indistinguishably include domestic and international transactions. Although the ABS may apply an adjustment to isolate the international component, this can only be an approximation based on some earlier estimate of the relative proportions of domestic and international transactions. Other deficiencies can arise because the distinctions embodied in definitions and classifications are not made in the source data. Also, in cases where the existing methodology relies on assumptions and approximations, or on indirect measures, some level of inaccuracy is unavoidable.

Conceptual and methodological changes

The concepts and methods used in preparing ABS balance of payments statistics are regularly reviewed and periodically changes are made to the basis of compilation of an item in order to more closely approximate the concept described in the international standards. An example of a change in concept is the change (made in March 1992) for recording merchandise exports for a period, from primarily one based on the date of processing through Customs to one based on the date of shipment from Australia. The latter is a better practical approximation to the desired change of ownership concept. Methodological changes that change the basis of compilation result in one-off revisions to statistical series that may be substantial. Similarly, other one-off revisions to statistical series from methodological changes that improve coverage are also quite often substantial. Both types of change can be considered to improve the *accuracy* of the statistics but should not be seen to detract from their *reliability*. However, for practical reasons, only the impact of the change to the concept for recording merchandise exports has been removed prior to undertaking the reliability analysis described later in this paper.

Revisions policy

Frequency and timing of the application of revisions to data series may influence the apparent nature of errors and user perceptions of quality. For example, in some countries, revisions may be stockpiled for many periods and then applied simultaneously. Between these major updates, there will be an artificial impression of reliability in the statistics since the last major update that may be misleading for users unfamiliar with the revisions practice. On the other hand, some stockpiled revisions may offset each other which will tend to lessen the impact of the revisions when they are applied, but this will be at the cost of releasing less accurate statistics between updates.

The general policy adopted for the Australian balance of payments is to take every practical opportunity to incorporate more accurate information into the estimates for every period. However, to minimise disruption to historical statistical series, revisions to periods prior to the *current financial year* for the investment income and capital account series, and prior to the *previous financial year* for all other series, are generally only made twice a year. These revisions are made in the July and January issues of the monthly publication and, consistently, in the June and December quarterly publications that are produced shortly afterwards. Exceptions are made to this practice where significant revisions are identified; these are incorporated into the next available issue.

As a practical matter, and generally reflecting the quarterly periodicity of many of the data sources used in balance of payments compilation, revisions to series for the current (and in many cases the previous) financial year are incorporated at quarterly intervals — in each quarterly issue and in the July, October, January and April issues of the monthly publication. Other monthly issues generally carry revisions for the latest one or two months only. Again, exceptions are made where significant revisions are identified.

SECTION 2 ANALYSIS OF ACCURACY OF THE STATISTICS

Accuracy was defined above as the proximity of an estimate to some notional true value. Because the true value cannot be determined, the accuracy of an estimate can not be measured objectively. However, as a practical alternative, the *final* or *fully-revised* estimate made by the statistician is taken to be the best approximation of that true value. Because the Australian balance of payments is, in principle, always subject to further revision, the notion of a final estimate is also not strictly appropriate. In these circumstances and for the purposes of this analysis, the assumption is made that the most recent estimate made from relatively final source data is the best available estimate of the *true value*.

Because the balance of payments draws data from a wide variety of sources, each providing data of varying degrees of conceptual correctness and completeness, it is not possible to produce a single overall measure of accuracy of the accounts. Instead, assessments have to be made of individual component items within the accounts. Even at this level, the use of multiple data sources in estimating a single item, their variable accuracy over time, and changing compilation methods complicate the picture. As a result, assessment of the accuracy of an item depends substantially on a subjective judgement based on knowledge of the sources, data and compilation methods used.

There are a number of specific indicators and influences to be taken into account in reaching a judgement on the accuracy of the data. These are discussed in the following paragraphs.

SAMPLE ERROR

Sampling procedures are used in several collections from which balance of payments estimates are compiled. These include:

- the ABS Survey of Foreign Investment, which measures major components of investment income and the capital account;
- the Bureau of Tourism Research's International Visitor Survey, which provides estimates of per capita expenditure of non-residents visiting Australia and their average earnings during their stay;
- the ABS Survey of Returned Australian Travellers, which provides estimates of per capita expenditure and earnings by Australian residents while abroad;
- the ABS overseas arrivals and departures statistics which, together with the International Visitor Survey and the Survey of Returned Australian Travellers, are used in measuring parts of the travel and labour income items; and
- the ABS International Trade in Services Survey, which collects information on Australia's imports and exports of selected services and details of amounts payable and receivable by Australia for royalties, use of copyrights and licences etc.

Sample error provides a mathematical measure of the difference between an estimate derived from a sample survey and the *true value* that would be obtained if the whole population were enumerated. One measure of the likely difference is given by the standard error. Table 1 provides approximate standard errors on Australia's balance of payments statistics for the year 1993–94. When estimating sample error for aggregate series within the balance of payments, independence is assumed between each of the sample surveys used in compiling the balance of payments.

There are about two chances in three that a sample estimate will differ by less than one standard error from the figure that would have been obtained if all the population were enumerated, and nineteen chances in twenty that the difference will be less than two standard errors. For example, the table shows that income debits (broadly, income earned by non-resident owners of resources from the use of those resources by residents) are estimated as $21,597 million with a standard error of $277 million. Therefore, there are about two chances in three that the *true* figure lies within the range $21,320 million to $21,874 million and nineteen chances in twenty that it lies in the range $21,043 million to $22,151 million.

Table 1 shows that there are no standard errors associated with *merchandise exports, merchandise imports* and *unrequited transfers* (these data are not based upon sample collections). The relative standard errors for services and income debits transactions are 1% or less. *Income credits* (principally income earned on Australian investment abroad) has a higher relative standard error of 3%.

Care is needed in interpreting relative standard errors on net items (net services, net income, net transactions in each of foreign investment in Australia and Australian investment abroad, all the current and capital account balances, and the balancing item). The relative standard error will greatly increase as the value of a net item approaches zero. For example, while the relative standard error on net capital account transactions classified as *Australian investment abroad* was only 1% in 1993–94, it was 9% in 1992–93, when the net value of transactions was much smaller (–$2,959 million). In 1990–91, when the extent of netting was less, the relative standard error was 5%. In the table, relative standard errors have been shown for the balances on the current and capital account, net foreign investment in Australia and net Australian investment abroad because these measures are generally significantly different from zero and are also the focus of analytic attention.

The ABS keeps sample errors under review and attempts to ensure that they are within acceptable limits. Taking account of the issue of netting in evaluating sample errors, the sample errors shown in Table 1 for annual balance of payments series are considered to be within those limits. The relative standard errors on quarterly data are usually higher for gross measures.

1 BALANCE OF PAYMENTS, AUSTRALIA, 1993–94, ANALYSIS OF APPROXIMATE STANDARD ERRORS

Aggregate	*Value* $m	*Standard error* $m	*Relative standard error* %
Current account			
Merchandise exports	63 896	. .	. .
Merchandise imports	64 400	. .	. .
Balance on merchandise trade	*–504*	. .	. .
Services credits	18 274	51	—
Service debits	18 967	27	—
Net services	*–693*	*58*	. .
Income credits	5 835	159	3
Income debits	21 597	277	1
Net income	*–15 762*	*319*	. .
Unrequited transfers credits	2 820	. .	. .
Unrequited transfers debits	2 624	. .	. .
Balance on current account	–16 763	325	2
Capital account			
Foreign investment in Australia	30 903	309	1
Australian investment abroad	–14 580	175	1
Balance on capital account	**16 323**	**355**	**2**
Balancing item	440	481	. .

Source: Balance of Payments, Australia, December Quarter 1994 (5302.0).

NON-SAMPLE ERROR

In addition to sampling errors, other inaccuracies may occur because of insufficient coverage, inadequacies in the source of information, imperfections in answers provided by respondents and errors made in the coding and processing of data. Inaccuracies of this kind are referred to as non-sampling error and may occur in any statistical collection. Every effort is made to minimise non-sampling error by employing careful questionnaire design, trying to obtain responses from all selected enterprises and employing efficient operating procedures. Many mechanisms are employed to verify data provided by companies and individuals. These include form evaluation studies in which data providers are observed completing forms; data confrontation studies in which the same or similar data items provided in different collections are compared and reconciled on a case by case basis; and more traditional validation procedures where data provided on individual forms are checked for internal logical and empirical consistency, comparability with past data, etc. Where errors are detected, they are corrected in consultation with the provider.

A variety of procedures are also regularly used to validate compilation methods and to check the veracity of the application of those methods.

BALANCING ITEM

Nature of the balancing item

The current account of the balance of payments measures exports and imports of goods and services, income receivable and payable and unrequited transfers. Traditionally, Australia has recorded a deficit on current account. That is, the sum of imports of goods and services, income payable abroad and unrequited transfer debits exceeds the sum of exports of goods and services, income receivable and unrequited transfers credits. The capital account measures both the way in which the deficit on the current account is financed and the accumulation of international investment claims and liabilities that are not associated with current account transactions. In the latter case, because both the credit and debit sides of the investment transactions should be recorded within the capital account, these transactions should have no effect on the balance on capital account. Therefore, the net balance on the capital account should, in principle, exactly offset the deficit on the current account. However, in practice, as different data sources and methods are normally used to compile the credit and debit sides of transactions, there is inevitably a residual imbalance, known as the balancing item. It reflects the net effects of differences in coverage, timing, and valuation as well as errors and omissions which occur in compiling both the current and capital accounts of the balance of payments statistics.

An examination of the balancing item can be useful in assessing the accuracy of the balance of payments. Different patterns in this item may provide insights into possible causes of errors in the statistics. Persistently large balancing items may be taken as an indication of serious errors and omissions in the accounts. However, a small balancing item does not necessarily mean that only small errors and omissions have occurred, since the errors and omissions may be offsetting. Offsetting errors may:

- be unrelated;
- reflect a direct link in the measurement of two items. For example, an incorrect decision on the dissection of landed values for goods imports into their merchandise and freight components will result in both items being incorrect by exactly offsetting amounts; or
- result from a measurement problem affecting both sides of a transaction. For example, the one estimate for retained profits on direct investment is entered both in the current account as *reinvested earnings*, and with opposite sign in the capital account as *reinvestment of earnings*, exactly offsetting any error in measuring retained profits.

If the balancing item is predominantly in one direction (i.e. generally positive or negative), this suggests that errors and omissions are occurring systematically rather than randomly. A balancing item with a positive sign may indicate the under-recording of credits (capital inflows, exports of goods and services or other current account receivables) or the overstating of debits (capital outflows, imports of goods and services or other current account payables), or both. Similarly, a balancing item

with a negative sign may indicate under-recording of debits (capital outflows or current account debits) and/or overstating of credits (capital inflows or current account receivables).

In Australia's balance of payments statistics, initial estimates of the quarterly and annual balancing items since the mid-1980s have sometimes been quite large. These large balancing items have been of concern to both users of the statistics and the ABS. While the general causes of, and contributions to, the balancing item are discussed in more detail below, it is worth noting here that the emergence of large initial balancing items since deregulation of Australia's capital markets has focused statisticians' attention on the need for improved initial estimates.

Focus on these quality issues has lead the ABS to conclude that the large initial balancing items are primarily an indication that the quarterly estimates of capital transactions obtained from partial coverage quarterly international investment collections are deficient in measuring Australia's balance of payments capital account. The deficiencies arise partly because data providers omit transactions when required to report on a very timely quarterly basis. Estimation methods used to derive capital transactions from available quarterly levels data also have deficiencies which become more marked when financial market prices or traded volumes are moving very quickly. Finally, methods to adjust the partial coverage quarterly results to account for the population of transactors engaged in cross-border capital flows are limited in what they can achieve and can be ineffective when capital markets are moving quickly.

In recognition of these problems, the ABS keeps its capital flows estimation methodologies under review and makes adjustments to them when better measurement techniques are identified. It has also progressively expanded the scope and coverage of the quarterly international investment collections and further improvements in coverage are planned.

Revisions to the balancing item

By the time annual survey results are available, usually two quarters after the end of a financial year (and therefore up to five quarters after estimates for a September quarter are first published), many of the coverage issues are resolved. For this reason, a feature of the Australian balance of payments has been the tendency for the estimated balancing item for any period to improve over time, i.e., the balancing item becomes absolutely smaller as intermediate and final estimates replace initial estimates. This pattern has continued in recent years. This is illustrated in Table 2 which shows, for the latest 14 years, the first published estimate of the balancing item for each year; the latest estimate; the revision this represents; and the contribution to this revision from revisions to each of the current and capital accounts. In 12 of the 14 years shown, revisions to the initial estimate of the balancing item took it closer to zero.

2 BALANCE OF PAYMENTS BALANCING ITEM

				Extent of revision attributable to:	
Year	First published estimate[1] $m	Current estimate $m	Revision since first estimate $m	Net current account revisions[2] $m	Net capital account revisions[2] $m
1980–81	1 757	937	–820	–147	–673
1981–82	921	461	–460	–432	–28
1982–83	861	179	–682	–452	–230
1983–84	1 961	1 577	–384	497	–881
1984–85	–2 005	–1 254	751	298	453
1985–86	2 674	–508	–3 182	850	–4 032
1986–87	849	1 745	896	–610	1 506
1987–88	3 217	–1 625	–4 842	514	–5 356
1988–89	5 266	–2 801	–8 067	437	–8 504
1989–90	5 517	2 472	–3 045	1 134	–4 179
1990–91	2 382	–2 112	–4 494	340	–4 834
1991–92	–625	–4 268	–3 643	–347	–3 296
1992–93	1 381	–1 251	–2 632	–660	–1 972
1993–94	8 471	440	–8 031	326	–8 357

[1] Prior to 1986–87, the first estimate of the balancing item for a particular year was published in the following year's September quarter issue of 5302.0. From 1986–87, the first estimate of the balancing item has been published in the reference year's June quarter issue of 5302.0.
[2] The signs on these amounts relate to the impact of revisions on the balancing item rather than to the actual revisions themselves.

Table 2 also illustrates the relative contributions to the revisions to the balancing item that are attributable to the current account and to the capital account. It can be seen that in 12 of the 14 years shown changes to the capital account have predominated, and this has been continually the case since the substantial deregulation of Australian capital markets in the mid-1980s.

The relative contributions of current and capital account revisions to the revised balancing item measures can also shed light on the likely future revisions to those aggregates arising from initial balancing items that may be larger than usual. The net current account revisions shown in Table 2, as a proportion of initial annual estimates of the current account balance, peaked at about 7% in the early 1980s, and have averaged less than 4% over the period 1980–81 to 1993–94. (Subjective estimates of the quality of these initial estimates shown in Table 5 below are rated B, i.e., the initial estimates are expected to be within 10% of the final estimate.) However, based on past experience, regardless of the size of an initial balancing item, it is unlikely that the subsequent revisions to the annual estimate of the current account balance will be beyond that 7% range.

As discussed later in this paper, initial estimates of the balancing item through subsequent annual revisions cycles tend to be significantly negatively biased until about the third annual revision cycle is reached. Revisions therefore could be expected to flow through the usual data sources that will significantly reduce the three negative balancing item entries from 1990–91 to 1992–93, both reducing the average size of the balancing item and increasing the likelihood that residual balances in the

final accounts will reflect a significant element of timing difference in recording transactions rather than coverage or other measurement deficiencies.

In these circumstances, where initial balancing items might be considered high, but where users can with some confidence expect them to both fall over time, and fall because additional capital flows are identified, it is less likely that users with a focus on the current account and the general level of external debt will be mislead by the size of initial balancing item estimates.

Size of the balancing item

In this context, it is worth considering the relative size of Australia's balancing item estimates.

The IMF's BPM4 suggested, as an empirical rule of thumb, that a balancing item in excess of 5% of the gross sum of merchandise exports and imports was cause for concern.

While that rule of thumb may have been appropriate for the early to mid-1970s, when capital flows were generally more constrained and services and income flows were of less significance, it is no longer appropriate and has not been repeated in the recently released fifth edition of the IMF's *Balance of Payments Manual*.[3]

Table 3 shows annual estimates of Australia's balancing item from 1980–81 to 1993–94 and expresses them as a percentage of the sum of credits plus debits for current account, capital account and total balance of payments transactions. For comparison, the long-term average proportions for the period 1959–60 to 1979–80, and the balancing item to total current transactions from 1945–46 to 1958–59, are also shown. For the 14-year period up to 1993–94, the average proportion of total current account transactions represented by the balancing item is 1.3%. Estimates exceed 2% in only two of the 14 years shown, with the maximum proportion at 2.5%. On average, this experience was little different from the 20 year period to 1979–80, but is about half the proportion shown for the earlier period ending 1958–59. On the evidence of this indicator, accuracy would appear to have improved from 1959–60 when the ABS commenced compiling quarterly balance of payments statistics.

The proportion of capital account (and total transactions) represented by the balancing item needs to be viewed slightly differently. Capital account transactions are recorded on a net basis, which may mean that sizeable capital flows in successive quarters could net to annual transactions values which are at, or close to, zero, rendering proportional analysis meaningless. The lack of quarterly balance of payments statistics prior to 1959–60 means that total credits and debits transactions for the capital account, and for the balance of payments in total, cannot be provided for the proportional analysis shown in Table 3.

[3] International Monetary Fund, *Balance of Payments Manual, Fifth Edition*, Washington DC, 1993.

Looking at the period from 1959–60, the proportions of capital account transactions represented by the balancing item display an interesting pattern. In the 20 years to 1979–80 the proportion averaged 4.4%. In the four years to 1983–84 the average was lower (at 1.9%) and varied from 0.3 to 4.2%. However, following deregulation of Australian capital markets in 1993–94, the ratio falls substantially, averaging only 0.4% over the following 10 years, falling to 0.1% or less in the most recent two years as the measured capital flows increased substantially. However, even these low proportions overstate the scale of the balancing item in terms of gross capital flows. Much of Australia's international financial transactions are collected on a gross basis enabling the credits plus debits total to be derived. But some transactions values in the capital account (such as for Australian investment abroad in shares) are reported as net transactions only, while others (such as deposits transactions) are measured by differencing reported levels data to derive net transactions flows. The total gross flows in 1992–93 and 1993–94 are likely to be in excess of $2,000 billion per annum, reducing the balancing item proportion for these two years to 0.04% or less.

The direction of the balancing item may throw some light on possible causes of errors or omissions in the statistics. If positive and negative balancing items do not tend to offset each other in successive years it would suggest that the error is not predominantly one of timing differences in data reported by the different sources used to estimate the credit and debit sides of a transaction. In the 14 years to 1993–94 the number of positive and negative balancing items are equal. Also, it is worth noting that the large negative balancing item recorded in 1988–89, and the large positive values recorded in 1983–84 and 1986–87, were all followed by balancing items of similar magnitude but opposite sign. The large negative balancing items for 1990–91 to 1992–93 are followed by a much smaller positive balancing item in 1993–94 suggesting some under-recording of debit transactions for the three years to 1992–93, or possibly an over-recording of some credit transactions, or some combination of both effects.

3 BALANCING ITEM AS A PROPORTION OF GROSS BALANCE OF PAYMENTS TRANSACTIONS

		Credits plus debits			*Balancing item as a proportion of*		
	Balancing item	*Current account*	*Capital account*	*Total transactions*	*Current transactions*	*Capital transactions*	*Total transactions*
Year	$m	$m	$m	$m	%	%	%
Annual average							
1945–46 to 1958–59	. .	3 268	n.a.	n.a.	2.7	n.a.	n.a.
Annual average							
1959–60 to 1979–80	. .	16 234	4 048	20 282	1.1	4.4	0.9
1980–81	937	54 249	22 512	76 761	1.7	4.2	1.2
1981–82	461	60 064	38 835	98 899	0.8	1.2	0.5
1982–83	179	62 985	56 634	119 619	0.3	0.3	0.1
1983–84	1 577	71 995	91 466	163 461	2.2	1.7	1.0
1984–85	–1 254	89 454	152 671	242 125	–1.4	–0.8	–0.5
1985–86	–508	102 116	254 870	356 986	–0.5	–0.2	–0.1
1986–87	1 745	112 055	356 747	468 802	1.6	0.5	0.4
1987–88	–1 625	128 793	369 696	498 489	–1.3	–0.4	–0.3
1988–89	–2 801	145 264	515 117	660 381	–1.9	–0.5	–0.4
1989–90	2 472	161 946	534 711	696 657	1.5	0.5	0.4
1990–91	–2 112	165 395	607 399	772 794	–1.3	–0.3	–0.3
1991–92	–4 268	169 452	720 049	889 501	–2.5	–0.6	–0.5
1992–93	–1 251	185 623	1 137 679	1 323 302	–0.7	–0.1	–0.1
1993–94	440	198 413	1 158 229	1 356 642	0.2	0.0	0.0
Average of annual absolute values							
1980–81 to 1993–94	. .	. .	. .	. .	1.3	0.8	0.4
Average of annual absolute values							
1984–85 to 1993–94	. .	. .	. .	. .	1.3	0.4	0.3

Source: Balance of Payments, Australia, December Quarter 1994 (5302.0).

International comparisons of the balancing item

It is also useful to compare Australia's experience with that of other industrialised countries. Table 4 shows inter-country comparisons of the balancing item as a percentage of total current account transactions. It shows that Australia's overall performance of 1.8% on average over the 14 years under analysis is better than that for either the United States (2.4%) or New Zealand (3.2%), significantly worse than that for France and Germany, and a little worse than that for the other countries shown.

Interestingly, Australia's balancing item was positive on eight occasions and negative on six, providing no evidence of the systematic omission or error in measuring credit or debit transactions. The sign on Japan's balancing item was similarly balanced, whereas most other countries in Table 4 showed a preponderance of positive or negative values suggesting some bias in their accounts. The United Kingdom and Canada had eleven positive or negative entries respectively, the United States, Germany, France and New Zealand each had nine or ten positive entries and Italy had nine negative entries.

4 INTERNATIONAL COMPARISONS OF THE BALANCING ITEM AS A PERCENTAGE OF TOTAL CURRENT ACCOUNT TRANSACTIONS[1]

Year[2]	*Australia*[2]	*United States*	*United Kingdom*	*Germany*[3]	*France*	*Italy*	*Japan*	*Canada*	*New Zealand*
1981	1.1	3.3	0.4	—	–0.6	0.5	0.1	–3.9	–1.8
1982	0.5	5.6	–0.9	–0.6	–0.3	–0.3	1.3	–0.8	–5.4
1983	2.1	2.6	0.4	0.1	0.1	0.5	0.6	–2.3	–1.3
1984	1.7	2.9	2.5	0.5	0.2	1.1	1.0	–2.3	4.5
1985	–0.7	2.8	0.3	0.7	0.1	–1.8	1.0	–3.1	2.5
1986	0.7	1.6	1.4	0.2	0.2	–0.8	0.6	–0.9	–0.8
1987	–0.9	–0.4	–0.6	–0.1	0.2	0.4	–0.7	–1.0	1.4
1988	–3.8	–1.0	1.6	0.3	0.2	–0.5	0.5	–0.2	1.0
1989	1.2	3.8	0.5	0.6	–1.0	–0.4	–2.8	0.2	3.7
1990	2.3	2.7	0.1	1.5	0.2	–2.7	–2.4	–0.4	4.7
1991	–2.1	–2.6	–0.2	0.7	0.6	–1.3	–0.8	–0.7	1.4
1992	–3.0	–1.1	1.6	0.1	0.3	–1.4	–1.1	0.4	6.3
1993	–1.0	1.3	0.6	–1.5	0.3	–3.5	–	–1.5	6.5
1994	3.5	–1.8	1.1	—	–0.5	—	–1.7	0.7	n.a.
Average	1.8	2.4	0.9	0.5	0.3	1.1	1.1	1.3	3.2

[1] The sum of current account credits and debits, without regard to sign.

[2] Data for all countries including Australia are on a calendar year basis.

[3] Prior to July 1990 the statistics refer to West Germany (Federal republic of Germany) and from July 1990 includes both the former German Democratic Republic and Federal Republic of Germany.

Sources: Australia: Statistics consistent with the December quarter 1994 issue of *Balance of Payments, Australia* (5302.0); Other countries: IMF's *Balance of Payments Statistics* and *International Financial Statistics* yearbooks.

CONTRIBUTIONS TO THE BALANCING ITEM

It is unlikely that any single factor accounts for the size and direction of Australia's balance of payments balancing item in the most recent three or four years, but some possible contributory elements can be suggested for these estimates, for the significantly increased value of the balancing item since 1983–84 and for the bias in initial estimates and early rounds of revision of the balancing item.

Since October 1983 the progressive relaxation of controls on international transactions, the associated broadening and internationalisation of the Australian financial system, and the introduction of new financial instruments and methods of financing, have made it difficult to maintain coverage of international investment transactors and the transactions that should be recorded in the capital account. The impact of this liberalisation can be seen in the growth of the turnover on the Australian foreign exchange market from just over $1 billion a day average in 1983–84 to its current level of about $50 billion a day.

The volumes of transactions underlying the net capital transactions data that are presented in the balance of payments are now huge. For example, the identified gross capital flows in each of 1992–93 and 1993–94 were of the order of $1,150 billion (see Table 2). And as discussed above, these measures still obscure an enormous volume of transactions that are only reported or calculated on a net basis. As shown in Table 2, the balancing item for 1992–93 represents less than 0.1% of the value of the identified gross capital transactions, and a much smaller proportion in the following year. Transactions of single

enterprises are often volatile and sometimes very large. Ensuring adequate coverage of transactors and correct reporting of relevant financial assets, liabilities, capital transactions and income in these circumstances is a major challenge.

Problems have emerged in the measurement of transactions associated with foreign exchange trading, and the reporting in Australian dollar terms of international capital flows, particularly those involving banks. The nature and extent of these deficiencies are under investigation. It is apparent that some resident data providers are reporting significant volumes of transactions with non-residents in foreign currency denominated claims at hedged exchange rates and interest rates where the hedge has been entered into with a resident bank. Such hedges between residents should not be taken into account in recording transactions in the balance of payments. To the extent that misreporting of this kind occurs and as interest and exchange rates move up and down, entries in the capital account for the two sides to these capital flows will not be equal and offsetting. The resulting discrepancies could be significant.

Problems have also emerged in the way capital transactions are approximated from stock data reported at face value. In times of volatility of exchange rates or rapidly changing interest rates, such as in the late 1980s and early 1990s, this methodology may well result in either understatement or overstatement of capital transactions. This issue is also under investigation.

Some newer types of financial instruments, particularly those known as *derivatives*, also present measurement problems. Where foreign positions in derivatives are used to hedge other foreign assets and liabilities, the net impact should be captured (indistinguishably) in ABS surveys and reflected in balance of payments estimates. However, the impact of trading in these instruments for other than hedging purposes is not currently covered in the balance of payments accounts, due to the difficulty transactors are having in providing these very complex details to the ABS. This undercoverage will be progressively addressed as data providers improve their capacity to report these transactions to the ABS.

In addition to the difficulties of capturing all transactors and transactions, and the specific issues mentioned above, the potential for inconsistencies in the time of recording and valuation of the two different sides of a transaction has increased in recent years with the rapid growth in the volume and complexity of international transactions and more frequent exchange rate changes.

As mentioned earlier, the quarterly balancing item series displays fluctuations that are likely to be driven to some extent by timing errors in the accounts. A further factor is the large degree of estimation involved in quarterly methodologies for measuring some items in the accounts, such as portfolio investment in Australian securities. The ABS is

currently investigating several options for improving quarterly data sources and methodologies.

Of the current account components, measurement of *services debits* is particularly difficult. This is because the services purchased from non-residents are diverse and may be difficult to separately identify. The resident transactors are spread widely across all sectors of the economy and, because they may have transactions only infrequently, are also not easily identified. Although substantial progress has been made recently in improving the measurement of services transactions generally, it is likely that coverage of services debits is incomplete. Difficulties in identifying and measuring some capital account transactions are also likely to be reflected in associated *investment income* measures. Some investment income payable abroad (particularly in the form of discount income) may be unrecorded.

It is useful to also consider sample error when reviewing the balancing item. In 1993–94, it is estimated that the sample error on the balancing item was $481 million (see Table 1); this represents 0.04% of total balance of payments transactions in that year. This means that due to sample error alone there is one chance in three that the balancing item will be more than 0.04% of total balance of payments transactions and nineteen in twenty chances that it will be up to 0.08% of that aggregate. Therefore, a balancing item within 0.08% of total balance of payments transactions can come about purely from the use of current sampling procedures. As many observations in Table 2 lie outside that range, it would appear that non-sampling error (as one would expect) also affects the accuracy of the balance of payments accounts.

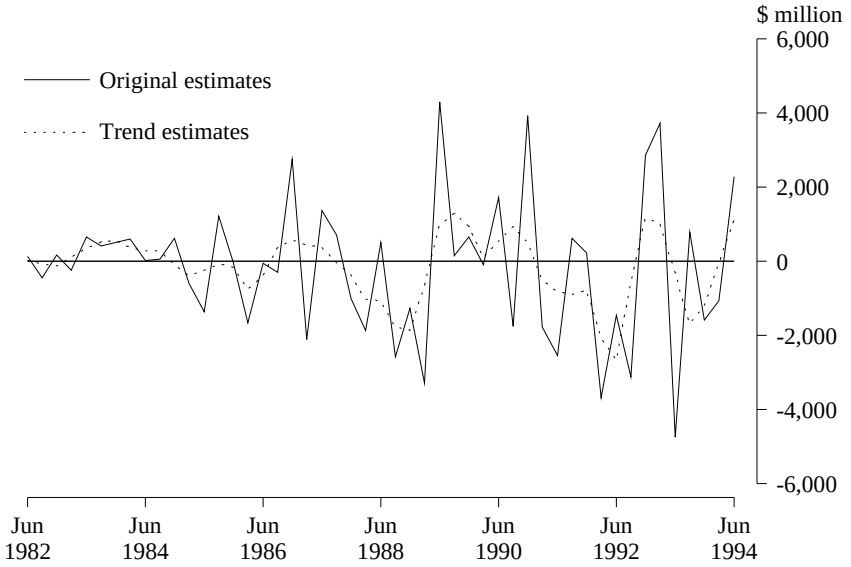
On a quarterly basis, large swings can occur in the balancing item from one quarter to the next. It is not unusual for the balancing item for one quarter to have a large negative value and for the next quarter to have a large positive value. Even when the sign of the balancing item remains the same for two consecutive quarters, movements of over $2,000 million are not unusual. Swings in the balancing item from positive to negative and vice versa, may indicate that there are timing errors in the accounts, i.e., one side of a transaction may be measured in one period and its offset in another. For example, with tens of billions of dollars in international capital flows being transacted every week in Australia, the adoption of slightly different accounting cut-off dates by transactors when reporting to the ABS could see the two sides of some transactions reported in different reference periods.

It is difficult when viewing the original quarterly balancing item series to identify whether the volatility in the series is offsetting in either the short term or long term. A useful way to examine swings is to apply a seven-term Henderson moving average to the balancing item. This has been done in Graph 1, which shows the original quarterly balancing item and a derived trend series. The graph shows that there are sharp quarterly swings in the original balancing item series but that the trend series appears to move through cycles of about six or seven quarters

when a positive balancing item predominates followed by a similar period during which a negative balancing item predominates. Further analysis would be needed to establish whether there is any relationship between these swings and movements in other economic variables such as interest rates and exchange rates, but there does seem to be a cyclical component.

An important aspect of the behaviour and scale of the quarterly balancing item revealed in the graph is the increased magnitude of the series from the mid-1980s since financial deregulation. This behaviour points to the measurement of international transactions in financial items as the probable area of largest error in the statistics.

GRAPH 1 QUARTERLY BALANCING ITEM



CONSISTENT BEHAVIOUR OF TIME SERIES

An analyst of economic statistics is usually concerned with the behaviour of series over time. Analysis of individual time series can provide important information about changing patterns occurring in the economy. By relating two or more series, information can be obtained about economic behaviour and structural relationships over time. Within the balance of payments there are many such relationships that can be established, e.g. freight earnings on imports and merchandise imports, passenger fares earnings and travel, and income on foreign investment related to the level of investment.

Various relationships may also be established between balance of payments statistics and other series. An article on *Balance of Payments Ratios*, published in *Balance of Payments and International Investment Position, Australia, 1993–94* (5363.0) gives many examples of such ratios.

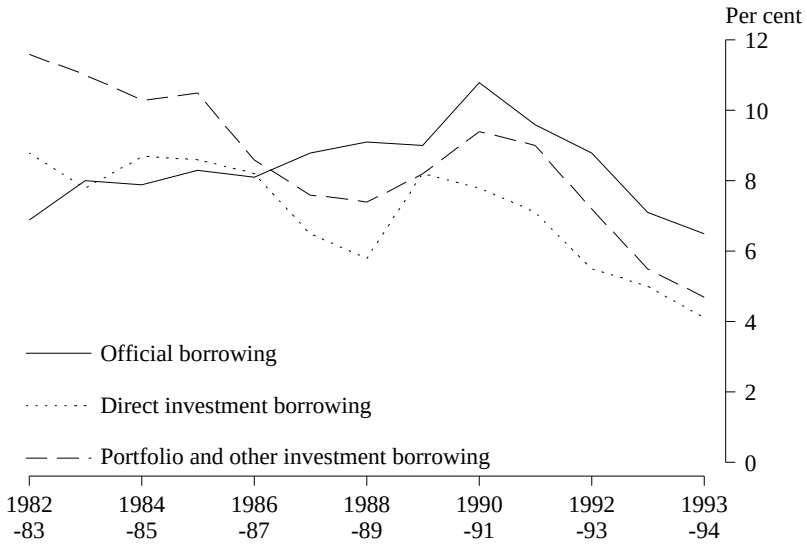
A consistent relationship over time between various series may be an indication of data accuracy. An inconsistent relationship between the series being compared (where a consistent relationship is expected) may indicate errors in the statistics, changed economic circumstances, special

factors, or significant statistical noise (i.e. the data are suspect but there is insufficient information available to resolve whether the data are accurate or not).

Some of the more direct relationships between series occur when the data sources for the series are related. For example, there is a relationship between the two balance of payments components *shipment debits* and *imports f.o.b*. The principal component of shipment debits is freight on imports earned by non-resident carriers and the main source for this estimate is international merchandise trade statistics compiled from customs documents. These statistics are also the main source for the *merchandise imports* estimates in the balance of payments. As might be expected, given the common source data, the ratio of *shipment debits* to *merchandise imports* has been largely consistent over many years, although exhibiting a gradual reduction in the last ten years. This change in ratio may, for example, have occurred as a result of competitive forces producing lower freight rates in the face of surplus carrier capacity, increased freight being carried by Australian operated craft, a compositional change from cargoes with lower to higher value-to-volume ratios or, perhaps, due to efficiency gains in cargo handling and carrier running costs.

Another example of a relationship between series comes from income yield analysis. Graph 2 shows selected investment income yield series for categories of Australia's foreign borrowing. Yields are calculated as interest payable abroad for a year expressed as a percentage of corresponding period average levels of debt. The accuracy of the underlying series may be tested by comparing the derived yields with representative market yields for different classes of debt and differing maturities, by examining the implied yields in balance of payments statistics at a finer level of disaggregation, and by looking at the contributions of individual enterprises. This type of data validation will usually identify any errors in reported data and improve understanding of the underlying data relationships. In the case of Graph 2, the broad correspondence between the series in the graph suggests that there are no fundamental errors in the underlying series. The shift, from 1986–87, in the yield on official sector borrowing relative to other yield curves is a reflection of the declining proportion of very long-term (over ten years) debt domiciled overseas in total official sector borrowing. While in 1984–85 and 1985–86 long-term debt domiciled overseas with ten years or more to maturity was about 30% of the total official sector borrowing, by 1987–88 it had fallen to about 10%. In contrast, short-term (repayable within one year) debt domiciled overseas has increased from less than 10% of official sector borrowing in the early 1980s to about 30% by 1993–94.

GRAPH 2 ANNUAL INCOME YIELDS — FOREIGN INVESTMENT IN AUSTRALIA, BORROWING



EXAMINATION OF RESIDUALS

As described earlier, some assessment of the accuracy of the balance of payments can be made by examining the balancing item. This is only one of a number of accounting balances that can be established in economic statistics that may be useful in assessing the accuracy of the balance of payments.

Within international investment statistics, for example, collections are designed to capture capital flows and stocks together. Essentially, the level of financial claims (financial assets and liabilities) at the end of a given period will be equal to the level of claims at the end of the previous period, plus net transactions in financial claims, plus other changes in financial claims during the period. For example, the level of lending by a bank at the end of a period will equal the level of lending at the end of the previous period plus drawdowns, less repayments of loans during the period, plus other changes to the actual value of claims at the end of a period. These other changes arise mainly from market price fluctuations (in the case of marketable claims), write-offs and, for claims denominated in foreign currencies, variations in exchange rates. In international investment statistics all these elements are accounted for; nevertheless there may be residual statistical errors (other than sample error) which can arise from reporting errors. These residuals are examined closely and any large discrepancies are queried with data providers to minimise errors.

COMPARISON OF DATA FROM DIFFERENT SOURCES

There are a number of cases where statistical series, which purport to measure the same activity, are measured from different sources. One example relates to the *travel debits* item in the balance of payments. Indicator data to estimate travel expenditure abroad by Australian residents in current periods come from the International Travel Enterprises component of the Survey of International Trade in Services. This component collection approaches enterprises for payments made through them (prepayment through travel industry participants,

Australian-issued travellers cheques and plastic cards, and cash). To provide benchmarks for this collection, the ABS periodically conducts a Survey of Returned Australian Travellers which approaches a sample of resident individuals returning to Australia (identified from passenger cards) for details of their expenditure abroad. Each of the two estimates of travel expenditure abroad can be expected to provide some insights into the accuracy of the other.

Further examples can be drawn from data collected in the ABS Survey of Foreign Investment where some data items can be compared with selected foreign assets and liabilities information reported in other collections, such as the ABS Survey of Balance Sheet Information and the Reserve Bank's Survey of Foreign Currencies, Assets and Liabilities of Banks. The ABS compares results from the different sources (wherever possible) on an enterprise by enterprise basis to identify and resolve any discrepancies in reporting. Such comparisons may bring to light a number of errors, such as enterprises misinterpreting questions and instructions on forms and other reporting and processing errors. The ABS has found that these comparisons have led to some notable improvements in data quality in recent years.

PARTNER COUNTRY ANALYSIS

To the extent that other countries compile balance of payments statistics by partner country on a basis largely consistent with that used by Australia, it is possible to compare partner countries' estimates of their transactions with Australia with Australia's estimates of its transactions with those countries. For example, a recent bilateral study between the ABS and the New Zealand Department of Statistics compared statistics of transactions between the two countries in the fields of services and international investment. This study has alerted both statistical agencies to possible causes of discrepancies in the statistics and has suggested areas for improvement which are being pursued.

Another investigation compared Australia's merchandise trade statistics (on an international trade basis) with those of other countries. The results of this investigation were published in an article titled *Merchandise Export and Import Statistics by Country — Factors Affecting Bilateral Comparisons* in the June 1991 issue of *Australian Economic Indicators* (1350.0). The analysis revealed no significant understatement or overstatement of exports or imports statistics for Australia. A subsequent intensive bilateral reconciliation study[4], conducted jointly by the ABS and the US Department of Commerce, analysed statistics of merchandise trade flows between Australia and the United States of America. The study revealed only minor (less than 5%) unexplained discrepancies between the two countries' sets of statistics. Further investigations of this type are underway or planned as they may give useful pointers to possible inaccuracies in the statistics and, if the discrepancies turn out to be minor, give greater confidence in the quality of the particular statistical series.

[4] Results of the US study were published in the December quarter 1993 issue of *International Merchandise Trade, Australia* (5422.0).

IMPACT OF STATISTICAL PROCESSES ON QUALITY

The methods used in collecting and compiling balance of payments statistics have an impact on their accuracy and it is therefore important that all aspects of the process be soundly based. The following paragraphs describe some of the issues involved.

First, where data are collected directly from transactors, it is necessary to identify the population of statistical units (e.g. businesses or households) from which units will be selected for inclusion in a collection. In practice, this may be difficult. ABS collections used to estimate the balance of payments often have no comprehensive sources of coverage and have to rely on using several partial sources to identify the population engaged in the activity being measured. This raises the possibility of undercoverage and the ABS needs to be particularly careful in building up collection populations in this way.

Second, it is important that the information sought is in fact available from the units approached and that they have a clear understanding of the requirements of a collection. Good forms design and adequate pilot testing are essential parts of this process; the ABS pays particular attention to this and has developed a set of forms design standards aimed at clarity and minimising reporting burden.

Third, it is necessary that near complete collection response be obtained and that the integrity of the reported data be maintained. In practice, there will be less than complete response, errors will be present in reported data and others will arise as a result of office-processing activity. Effective procedures are therefore necessary to compensate for non-response, to identify and correct errors in the data and to avoid processing errors.

Fourth, part of ensuring good quality statistics involves having effective monitoring procedures in place so that, if any aspect of the collection falls below established tolerances, it will be detected and corrective action taken. Examples of indicators of statistical quality that are typically monitored include numbers of collection units, response rates (with emphasis being given to the more important contributors), the number and value of errors identified and corrected, and the resources involved in the various tasks. The ABS has comprehensive quality monitoring procedures in place for balance of payments statistics.

Finally, in a period of rapid economic change, the changing population of transactors and the introduction of new types of transactions could both have substantial impact on quality unless action is taken to accommodate the changes within the statistics. The relatively recent rapid expansion of trading in financial derivatives is a case in point where the rapid change has meant that the transactors often do not have comprehensive reporting capabilities in their accounting systems to provide appropriate data to the ABS. The ABS is working with those entities transacting in foreign financial derivatives to bring their reporting fully within the ambit of the Survey of Foreign Investment.

SUBJECTIVE ASSESSMENT

Taking into account all the factors mentioned so far, it is possible to form some subjective assessment of the quality of balance of payments statistics. Assessments based on recent experience with current data sources and methodologies are provided in Table 5. To give an idea of the relative importance of each item, 1993–94 values are also provided. The assessments relate to the accuracy of the first-published monthly, quarterly and annual estimates of the principal balance of payments aggregates. The initial monthly and quarterly estimates appear in the monthly (5301.0) and quarterly (5302.0) publications, respectively. Initial annual estimates are a little different. The first estimates of current account items and some limited capital account items are released in the June monthly publication each year, while the remaining capital account items appear first in the June quarterly publication each year.

The items given an *A* rating (the estimate is considered to be within 5% of the true value) are:

- merchandise (all estimates);
- the aggregates of the current account credit and debit entries (annual estimates); and
- official sector capital (annual estimates and quarterly estimates for Australian investment abroad).

Those given a *B* rating (the estimate is considered to lie within 10% of the true value) are:

- services (quarterly and annual estimates);
- unrequited transfer debits (quarterly and annual estimates);
- the balance on current account (quarterly and annual estimates);
- official sector capital (quarterly estimates for foreign investment in Australia); and
- total Australian investment abroad (annual estimates).

Other estimates are considered less accurate and have been rated as *C* (within 15% margin of error) or *D* (15% or greater margin of error). The aggregates (not balances) considered to be least accurately estimated are:

- monthly estimates of income;
- monthly estimates of official sector capital; and
- quarterly estimates of non-official sector capital flows.

It should be stressed that the ratings used are assessments of the quality of the transactions estimates published in the accounts and do not necessarily reflect the quality of estimated movements in the various items and aggregates shown. For example, the initial monthly estimate of the current account deficit is shown in Table 5 with a rating of *D* (an error margin of 15% or more). However, analysis later in this paper

(under the heading Do revisions alter information provided by initial estimates?), concludes that the month-to-month movements in the current account deficit present a relatively reliable series without obvious bias.

5 SUBJECTIVE ACCURACY RATINGS OF BALANCE OF PAYMENTS AGGREGATES[1]

Aggregate	*Value 1993–94* $m	*Accuracy*		
		Initial monthly estimates in 5301.0	*Initial quarterly estimates in 5302.0*	*Initial annual estimates in 5301.0 and 5302.0*
Current account				
Merchandise				
Exports fob	63 896	A	A	A
Imports fob	–64 400	A	A	A
Services				
Credits	18 274	C	B	B
Debits	–18 967	C	B	B
Income				
Credits	5 835	D	D	D
Debits	–21 597	D	C	C
Unrequited transfers				
Credits	2 820	C	C	C
Debits	–2 624	C	C	C
Total credits	90 825	C	B	A
Total debits	–107 588	C	B	A
Balance on current account	**–16 763**	**D**	**B**	**B**
Capital account (net transactions)				
Official sector				
Foreign investment in Australia	8 374	C	B	B
Australian investment abroad	–1 607		A	A
Non-official sector				
Foreign investment in Australia	22 529	n.a.	D	D
Australian investment abroad	–12 973	n.a.	D	D
Total				
Foreign investment in Australia	30 903	n.a.	D	D
Australian investment abroad	–14 580	n.a.	D	D
Balance on capital account	**16 323**	**n.a.**	**D**	**D**

[1] The accuracy ratings used relate to the following approximate margins of error: A less than 5%; B less than 10%; C less than 15%; D 15% and greater. It should be noted that these accuracy ratings relate to estimates of the value of aggregates, not estimates of the movements in these aggregates.

Source: *Balance of Payments, Australia, December Quarter 1994* (5302.0).

As might be expected, the general pattern in this table is of improving accuracy the longer the period for which estimates are made. Compared with monthly estimates, quarterly and annual estimates are based on more complete, more thoroughly validated data.

Problems with both the coverage and measurement of international capital flows of the non-official sector are a particular concern, generally reflecting the deregulation of capital markets since the mid-1980s. The

earlier discussion under the heading *Contributions to the balancing item* outlined some of the specific problems that exist and some of the actions being taken by the ABS to address these problems.

Problems also exist with the measurement of some services, income and unrequited transfers items, but these are considered to be on a much smaller scale than those in the capital account. An example is the international trade in *other services* (other than *transportation* and *travel services*) which grew strongly during the 1980s. For a number of reasons this is a difficult area about which to compile statistics, particularly on the debits side. The types of services involved are diverse while the service providers and receivers are widespread throughout the economy and continually changing. There is no comprehensive source of coverage of either transactors or transactions. There are also conceptual and practical difficulties involved in identifying internationally-traded services without omission or overlap with other balance of payments items. Nevertheless, the ABS has made considerable strides in improving data in this area in recent years. An article on *Developments in Measuring Australia's International Trade in Services*, published in *International Trade in Services, Australia, 1992–93* (5354.0) describes the data sources currently used, changes made in the collection strategy, data quality initiatives being pursued and the future developments that are expected.

Problems currently exist with the estimation of the transfers made by non-residents migrating to Australia (included in unrequited transfers credits). In estimating this item, reliance is placed on various assumptions about the value of funds and other assets transferred and whatever data are at hand (such as occasional surveys). A longitudinal survey of immigrants being conducted by the Bureau of Immigration, Multicultural and Population Research is expected to provide the basis for much more soundly-based estimates. Preliminary results from this survey are currently being evaluated.

The accuracy of investment income estimates in the current account may also be influenced by difficulties in the measurement of related capital account items. To the extent that there has been undercoverage of financial claims, it is likely that there will also have been understatement of the associated income transactions.

SUMMARY OF ANALYSIS OF ACCURACY

This section of the paper has reviewed the accuracy of Australia's balance of payments statistics. It has focused on the various causes of error and the varying analyses regularly undertaken by balance of payments statisticians to identify and correct for error. These have included:

- implementing quality assurance measures in source data collections and methodological processes;
- analysing series for unexpectedly inconsistent behaviour that would suggest errors in series estimation;
- comparing data from different sources;

- contrasting Australian estimates of transactions with our partner countries against those partners' estimates of the bilateral transactions; and
- reviewing estimation residuals, particularly the balancing item.

It was noted that a small balancing item is no guarantee of accuracy and the ABS has pursued, and is continuing to pursue, quality improvements that lift the quality of estimation for both credit and debit series, without necessarily impacting significantly on estimated balancing items. This has been particularly so in regard to measuring Australia's international trade in services (where the net impact of the improvements has not been large), and to improvements to be implemented shortly in measuring reinvested earnings (and the offsetting reinvestment of earnings) on a quarterly basis with no impact on the balancing item.

However, significant initial estimates of the balancing item have provided pointers to balance of payments statisticians in understanding the nature of some significant errors in the measurement of capital transactions, and assisted in developing improved methodologies to prevent the recurrence of such errors. Factors that were possibly contributing to the current estimates of the balancing item were considered in some detail.

Finally, this section included a subjective assessment by balance of payments statisticians of the quality of initial estimates published for major components of the balance of payments. The assessments were made in regard to the estimated value of transactions, and did not necessarily reflect the accuracy that would apply to estimates of the period-on-period movement that the initial estimates imply. This was largely because revisions often come about from methodological improvements that change the level of an estimated series without significantly affecting the movements within the time series.

SECTION 3 ANALYSIS OF RELIABILITY OF THE STATISTICS

Another aspect of the quality of balance of payments statistics is their reliability. Reliability has been defined earlier as the proximity of a preliminary estimate of an aggregate for a period to the final estimate for that period. Attention therefore is focused on the extent to which an initially published estimate is revised as it is subsequently republished. The extent of such revisions is a measure of the reliability of the statistics. From an analytic perspective, users would like to know how much reliance to place on an estimate of an aggregate — particularly the initial estimate. If it is likely to be revised, how much is that revision likely to be and in which direction? Are decisions made on the basis of the initial estimates likely to prove ill-founded in the light of later revisions? The purpose of the following discussion is to answer questions of this type and to extend the picture of quality built up so far by providing the reader with an assessment of the impact of revisions.

As noted earlier, in the case of balance of payments statistics, estimates are always subject to revision and therefore, in principle, are never final. In practice however, estimates do settle down after a period and thereafter are usually only subject to change if an improved methodology or conceptual change is introduced. The length of this settling down period varies from item to item but, in the following analyses, generally estimates for periods which have undergone at least one year's revision (i.e. 12 monthly, 4 quarterly or 1 annual revision cycle(s)) are included. For annual data, however, it has been assumed that the December quarter 1994 issue of the quarterly publication *Balance of Payments, Australia* (5302.0) captures results for the 1993–94 reference year from most annual source surveys and therefore constitutes a reasonable approximation of an annual revisions cycle for the purpose of these analyses.

The current account estimates used in the analyses are consistent with those published in both the January 1995 issue of the monthly publication 5301.0 and the December quarter 1994 issue of the quarterly publication 5302.0; and the capital account estimates are consistent with the December quarter 1994 issue of the quarterly publication 5302.0. Estimates in these issues are taken to be the final or latest estimates for all observation periods under examination. This means that the most recent periods for which data are included in analyses of revisions after one year from initial estimation are the month of December 1993, the December quarter 1993, and the year 1993–94 (where one year revisions are simulated to coincide with the availability of annual survey results). For other analyses data through the month and quarter of June 1994 are included.

Therefore the observation periods (i.e. months, quarters and years in respect of which statistics are provided) in these analyses are either the 96 months from January 1986 to December 1993, or 102 months to June 1994; either the 32 quarters from March 1986 to December 1993, or 34 quarters to June 1994; and the 13 years from 1981–82 to 1993–94. The

aggregates examined are based on those published in Table 1 of the monthly and quarterly balance of payments publications (5301.0 and 5302.0, respectively). The annual capital account data by direction of investment, and the annual net series for services, income, transfers and the balance on goods and services are presented from 1985–86.

A number of general points need to be borne in mind when considering the analyses of reliability of balance of payments statistics presented in this paper. First, the analyses inevitably reflect past experience and this does not necessarily give any indication of the likely behaviour of the statistics in the immediate future. For example, any recent action to improve reliability will not be fully reflected. Second, the findings for aggregate or net series should be treated with particular caution as they will reflect the varying impacts of revision on component series. Third, substantial change in the volume and size of transactions for an aggregate occurring over a relatively short time will make the effect on the reliability of the series difficult to predict. Fourth, in these analyses the assumption is made that the latest estimate is always a better approximation of the notional true value than any earlier estimate.

Finally, if there has been significant change in the concept being measured in an item, comparison of the statistics before and after the change will not be valid unless steps are taken to remove the effects of these changes from the time series. However, while accuracy may improve as improved methodologies and new concepts are employed to better approximate economic reality, from the perspective of the user faced with significant and frequent revisions arising from these changes, the reliability of the series under analysis is impaired. In this study it has only been possible to exclude the effects of one significant change in concept (the move to recording merchandise exports primarily on a shipping date basis). The analyses therefore generally reflect what the users observe in the reliability performance of the published series. Cautionary notes are provided where the significant shifts in estimation levels reflecting conceptual/methodological change need to be borne in mind.

SIGN CONVENTION

The sign convention used in the revisions statistics presented in this paper is not the same as that used in published balance of payments tables. In published balance of payments tables, debit entries are normally shown as negative values. In the statistics presented here, values for gross credit and debit entries are shown in absolute terms, and negative values are recorded only for net balances (e.g. the balance on merchandise trade) and for revisions. A negative revision to a gross credit or debit item means that the absolute measure of that item has declined, while a negative revision to a net balance means that a surplus has decreased or a deficit increased. For example, in the case of the balance on current account (which has been in deficit for all periods covered in these analyses) a negative revision indicates that the revised value is a larger deficit than the earlier estimate.

BIAS AND DISPERSION

Two aspects of statistics that are useful in analysing their quality are their bias and dispersion.

Bias is a measure of the extent to which initial estimates are lower or higher than the final estimate and thus gives an indication of the direction of revisions. In this study it is calculated as the average of the differences between the initial estimate for each period and the latest estimate published for the same period, with positive and negative revisions being netted against each other. This measure can therefore be described as the average of the values of all revisions taking account of sign.

Dispersion is a measure of the *spread* of final estimates and gives an indication of the magnitude of revisions. It is calculated as the average difference between the initial estimate for each period and the latest estimate published for the same period, but with positive and negative revisions not being netted against each other. It can therefore be described as the average of the absolute values of all revisions, without regard to sign.

In this study, the measure of the average used is the median value; that is the value of the middle observation in a group of observations ranked by value. This measure is preferred to the mean value (derived by summing all observations and dividing by the number of observations), as an expression of central tendency because, in these revision statistics, there are significant outliers that exert a disproportionate influence on the mean value.

BIAS OF THE STATISTICS

To give an impression of the revisions process through which balance of payments statistics pass, Appendix A shows graphically the way in which estimates of the principal aggregates evolve over time. Graphs are included for monthly, quarterly and annual statistics which compare the latest (i.e. at December 1994) estimate with the initial estimate and successive revisions to the initial estimate. The comparison expresses estimates as a ratio of the latest estimate (i.e. a ratio of 0.50 means the value of the estimate is half the value of the latest estimate). The graph plots this ratio for the initial estimate (the first point on the horizontal axis) and a number of revised estimates — 24 revisions for monthly data, 12 revisions for quarterly data and 6 revisions for annual data. Medians of the ratios calculated at each estimation point have been used. For example, the ratio plotted at, say, revision number 3 is the median of the ratios for all observation periods, where the ratio for each period is calculated by dividing the estimate after the third revision by the corresponding latest estimate. Also shown on the graphs, as dashed lines, are the upper boundaries of the first and third quartiles of calculated ratios. The area between these bounds therefore represents the behaviour of the middle 50% of observations or, alternatively, the 25% of ratio observations that lie below the median and the 25% of ratio observations above it.

Examination of these graphs gives an indication of the bias present in preliminary estimates (and therefore in revisions to those estimates), the spread of ratios around the median ratio at different stages in the estimation cycles, and how quickly the preliminary estimates approach the latest value.

Bias in monthly statistics

Looking first at the current account, it can be seen that, *merchandise exports* and *imports* (appendix Graphs A.1 and A.2) display negligible bias and initial estimates are revised to the latest estimates very quickly. Similarly the spread of ratios calculated for the initial estimates of the middle 50% of observations is small — within about 1% of the median latest value for exports, and even closer for imports.

On the other hand, the *non-merchandise* components of the current account are less reliable. The most striking feature of the non-merchandise credits and debits aggregates (appendix Graphs A.3 and A.4) is that the median values are all estimated to be less than their latest values, and even after two years of revision, the upper boundary of the third quartile of estimate ratios remains below the final estimate. On average, the preliminary estimates can therefore be said to display a clear negative bias. Both the credits and debits median measures do improve over the first 24 months of revision, and the ratio spreads narrow.

Of the non-merchandise components, *unrequited transfers credits* (appendix Graph A.9) displays the least bias and the spread of ratios for the middle 50% of observations is initially within about 3% of the median, and at the median after one annual revision cycle. On the other hand, the initial estimates of *services credits* (appendix Graph A.7), with a median ratio of about 0.88, are the most biased. While *services credits* estimates improve in accuracy over two years of revisions, the median estimate at the end of the period remains at less than 94% of the final estimate. A number of methodological changes introduced in the June quarter 1994 contribute to this. First, improved estimates of expenditure in Australia by non-resident travellers were introduced reflecting, principally, the inclusion of expenditures on pre-paid package tours. Second, introduction of a new collection methodology for the transportation items resulted in improved coverage of port expenditures in Australia by foreign carriers and freight on exports earned by resident carriers. Third, some relatively minor upward revisions were made as a result of changes to the collection methodology for insurance services. Together these changes accounted for an increase of about 10% in total *services credits* estimates for 1992–93 and for progressively smaller proportional increases in earlier years.

Services debits (appendix Graph A.8), with a median ratio for initial estimates of about 0.94, also displays significant bias throughout the two year revision period. The ratios accounted for by the middle 50% of observations are relatively evenly spread around the median. While the median ratio improves over the revision period shown, it does not exceed 98%.

Income credits (appendix Graph A.5) has a much broader spread for the middle 50% of observations than other components exhibit, with the ratios of initial estimates to the latest estimates ranging from about 0.78 to 1.13 — indicating a marked variability in the reliability of estimates of this aggregate. However, over two years of revisions, median estimates of income credits approach the latest value and the spread of ratios narrows markedly until about the sixteenth revision. An important reason for the variability of monthly *income credit* estimates is the method used to estimate *reinvested earnings* on Australian direct investment abroad, an item that has been particularly variable and therefore difficult to forecast. At present, initial estimates are based on annual forecasts evenly distributed over the year. Once the results of the annual Survey of Foreign Investment become available, which may be up to 18 months after the initial estimate has been made, there is often a need for substantial revision (both increases and decreases).

Introduction, in the January 1994 issue of 5301.0, of an improved methodology for estimating income earned by residents of Australia while travelling outside Australia, also resulted in revisions to past periods' estimates. Revised estimates were made using the results of a new ABS survey (Survey of Returned Australian Travellers) designed to give benchmark estimates of residents' earnings and expenditure while abroad. Although these revisions were not as substantial or variable as those made to estimates of *reinvested earnings*, they have resulted in increases in total income credits estimates for 1991–92 and 1992–93 respectively of about 5% and 10%.

Income debits (appendix Graph A.6) behave quite differently. While both initial and first revision median estimates have ratios less than 0.96, from the second revision the median estimates rapidly approach the final estimate which is closely approximated from the eighth revision onwards with a narrowing band of ratios around it. While revisions to estimates of reinvested earnings debits are significant in absolute terms, they are a smaller component of the very much larger income debits total than is the case for credits.

Median initial estimates of *transfers debits* (appendix Graph A.10) are a little more accurate than most other components (with ratios close to 97%) and with ratio spreads that are reasonably tightly clustered around the median. However, median estimates after two years of revision are only marginally closer to final estimation levels, and the spreads only a little tighter.

The net result of the estimation process for the components of the current account is reflected in the behaviour of the *balance on current account* (appendix Graph A.11). Analysis of such net results needs to be undertaken with care because these series will reflect all methodological changes impacting on component series. The initial median estimate of the balance is very close to the final estimate, although the spread around this estimate is relatively large. Revisions over the two year period appear to increase the gap between the median (revised)

estimates and the final estimates, with the median estimate at the end of the period about 3% higher than the final estimate. The median ratios shown in the graph display significant positive bias developing after the seventh revision. This somewhat paradoxical pattern reflects the significant methodological improvements recently made to services credits estimates, the persistency of the negative bias that exists in initial income credits estimates, and the improving accuracy of the debits estimates over the first two years of revision. The methodological improvements to services credits estimates have a paradoxical effect because previously revisions to the various current account items tended to cancel each other out, but this is happening to a lesser extent with the improved methodology for services credits. It should be noted that a positive bias in estimates of this balance refers to an overstatement of the current account deficit.

In monthly statistics, capital account data are available only for net transactions of the *official sector* (the *Reserve Bank* and the *general government sector*) and certain non-official public sector transactions. Other capital account transactions (mainly those of the *non-official private sector*), together with the balancing item, are derived as a residual after the balance on current account has been deducted from the identified public sector capital account transactions. Graphs 12 to 14 in Appendix A show the patterns of behaviour of the official sector.

Estimates of net capital transactions of the *Reserve Bank* (appendix Graph A.12) are very reliable. Net capital transactions of the *general government sector* (appendix Graph A.13) are less reliable and display negative bias (an understatement of net inflows or overstatement of net outflows) in initial estimates (a median ratio of about 0.91) which is progressively reduced until, from about the sixth monthly revision, the estimate remains close to the latest estimate. The middle 50% of observations initially shows a wide distribution of ratios around the median (from 0.66 to 1.14). However, within about one year, this area has narrowed to span a band of ratios from 0.85 to 1.14.

Bias in quarterly statistics

The graphs in Appendix A relating to quarterly statistics, in general, display a similar picture to that for monthly statistics. Within the current account, *merchandise exports* and *imports* statistics are very reliable and unbiased (see appendix Graphs A.15 and A.16). As with monthly statistics, the non-merchandise items show clear negative bias for both credit and debit items. On average, ratios of initial estimates to latest estimates for total *non-merchandise credits* (appendix Graph A.17) have a value of about 0.92. The equivalent average ratio for *non-merchandise debits* (appendix Graph A.18) is a little better at 0.94. The quarterly ratios improve to about 97% (credits) and 99% (debits) over the three years of revision history incorporated in the graphs.

As with the non-merchandise aggregate series, quarterly component series behave very similarly to the monthly series. *Unrequited transfers credits* (appendix Graph A.23) displays the least *median* bias, with medians for initial estimates and for all subsequent revisions at or very

close to the final estimates. By the fourth revision, all estimates in the second and third quartiles are also at the final estimates.

The initial estimates that appear least reliable are *income credits* (appendix Graph A.19) and *services credits* (appendix Graph A.21) where the median ratios are about 0.92 and 0.90, respectively. The income graph is similar to the equivalent monthly graph in that it shows the wide spread of ratios displayed by the middle 50% of initial estimates and early revisions. The main reasons for this variability have been noted earlier.

The quarterly graph for *services credits* (appendix Graph A.21) is notable for the relatively large proportion of revisions that remain to be applied after the twelfth quarterly revision. The median ratio value of less than 0.95 after three years of revision is little better than achieved after the two years of revision presented in the monthly graph. It indicates that, on average, the estimates will be increased by more than 5% to reach latest values. It should also be borne in mind that 50% of quarterly estimates of that aggregate are even less reliable at that stage. The reasons for this outcome are discussed above in noting the performance of the monthly series.

The quarterly graph of the *balance on current account* (appendix Graph A.25) records the net outcome of all current account transactions. As with the monthly series, the quarterly median series shows that the initial estimate is very close to the final estimate but the second and subsequent estimates show some positive bias (i.e. an overstatement of the current account deficit) which remains for the three years of revision under analysis and primarily reflects the impact of the methodological improvements noted for estimating services credits. The spread around the median initial estimate is relatively large but it narrows progressively over the three year period.

Quarterly capital account statistics are generally less reliable than quarterly current account statistics, with most of the capital account items included in Appendix A showing negative bias. The exceptions are the estimates of the *Reserve Bank transactions*, which are extremely reliable (see appendix Graphs A.28 and A.29), and *investment abroad by general government* (see appendix Graph A.27). In the case of the general government investment abroad series, all median estimates are at final levels, but there is a wide spread of estimates for each revision period (see appendix Graph A.27). It needs to be borne in mind that the net investment transactions abroad by the *general government sector* vary significantly from period to period and in some periods may have values close to zero. When values close to zero are revised, even by small absolute amounts, large proportional changes may occur, accounting for the wide dispersion of ratios.

Of the remaining aggregates analysed, *foreign investment in the general government sector* (appendix Graph A.26) shows the least bias in initial estimates, with a median ratio at about 0.79. This bias in initial estimates

is due in part to revisions to estimates of foreign borrowing domiciled in Australia for 1989–90 and earlier years resulting from improved coverage of Australian securities held by nominees on behalf of non-residents. Median estimates are close to final levels from the sixth revision. The middle 50% of ratio observations are widely dispersed for initial estimates and early revisions but narrow rapidly until the sixth quarterly revision.

The negative bias present in estimates of transactions of the *non-official sector* (appendix Graphs A.30 and A.31) is most pronounced for *Australian investment abroad* (AIA) with the median ratio of initial estimates to latest estimates being about 0.66. On average, therefore, initial estimates are revised upward by about 50% before reaching their latest value. The middle 50% of observations classified to AIA display a spread that is very broad, from as low as 0.37 to 0.91. Reasons for the degree of variability found in quarterly AIA estimates are associated with the difficulty of measuring the *reinvestment of earnings* component of Australian investment abroad (see earlier comments in the context of estimates of the reinvested earnings component of *income credits*) and achieving satisfactory quarterly coverage of other investment flows.

Estimates of transactions of the *non-official sector* (see appendix Graph A.30) relating to *foreign investment in Australia* (FIA) are also negatively biased on average, with the median ratio for the initial estimate at about 0.69. However, the median is revised upward relatively quickly — after three revisions it is within about 10% of the latest value. After then, the revisions only slowly raise the median towards the latest values. The middle 50% of initial observations classified to FIA are clustered across a slightly tighter spread than was displayed for AIA, and this spread tightens more quickly around the median with the result that it is much narrower by the sixth revision.

Also included in Appendix A are graphs of the *balance on capital account* (Graph A.32) and the *balancing item* (Graph A.33). Because they refer to residual balances which may vary considerably in size from period to period, and in the case of the balancing item frequently change sign, care is needed in their interpretation. The quarterly graph of the balance on capital account records the net outcome of all capital account transactions. The quarterly median series shows a marked negative bias (i.e. an understatement of the capital account surplus), with the ratio for the initial estimate around 0.78 and for the estimate after three years around 0.93. The spread around the median estimates is large and volatile up to the sixth quarterly revision when it narrows; and from then to the end of the three year revision period the spread remains fairly constant.

Bias in annual statistics

Appendix A Graphs A.34 to A.52 relate to annual statistics. The graphs display generally similar patterns of bias to monthly and quarterly statistics but because only annual revisions cycles are captured, and because the period of analysis extends from 1993–94 back to 1981–82 for some series, care is needed in both interpreting the data presented

and comparing the annual series with either the monthly or quarterly series which cover a shorter time span (from January 1986 to June 1994). Three particular points should be noted. First, the ongoing improvements in methodology implemented over the last decade have given rise to often substantial revisions to item estimates for the period 1982 to 1985, which are captured in some of the annual analyses that cover this earlier period. However, this early revisions experience is excluded from the analyses for the monthly and quarterly series which commence in 1986. Some of the annual series may therefore appear to be both more biased and less reliable than the estimates with greater periodicity. Second, in the monthly graphs, the 24 months of revisions experience that is shown captures only two annual revisions cycles, while for quarterly series, 3 annual revision cycles are displayed. In both cases quite significant revisions are often shown as remaining to be applied between the last revision cycle presented and the *final* estimate produced in the December 1994 (quarterly) or January 1995 (monthly) balance of payments publications. For the annual series, the graphs capture explicitly most of the extra revisions experience so that many of the series are shown with medians rising to, or very close to, the final estimate. Third, any comparison of revisions to monthly, quarterly and annual capital account series is complicated by the net basis of recording capital account entries and the frequent turnarounds from inflows to outflows and vice versa in some series. This can mean, for example, that the annual estimate for some items in some periods is lower than some or all of the corresponding quarterly estimates, without regard to sign.

As with monthly and quarterly data, the annual *merchandise trade* estimates are very reliable and unbiased while most non-merchandise components of the current account show clear negative bias for both credit and debit items. For the non-merchandise credit and debit aggregates (see appendix Graphs A.36 and A.37) the median ratios of initial annual estimates to latest estimates (about 0.88 for credits and 0.94 for debits) are a little less reliable (i.e., lower) than the equivalent ratios for monthly and quarterly statistics. As mentioned in the previous paragraph, this reflects the revisions experience of the early 1980s.

The least reliable annual current account aggregate, in terms of the median ratio of initial estimates to latest estimates, is *income credits* which has a ratio of about 0.86 (see appendix Graph A.38). Like the quarterly statistics, the middle 50% of ratios for *income credits* is initially spread across a wide band (of about 30 ratio points) but after two revisions this narrows substantially to a band of two ratio points. Reasons for this variability have been suggested in the discussion on bias in monthly statistics.

Overall, *service credits* is the least reliable annual series. While the median initial estimate has a ratio of about 0.91 (see appendix Graph A.40) which is better than for income credits, the series is notable for the relatively large proportional revision that remains to be applied after the last revision cycle shown on the graph. Graph A.40 in Appendix A shows that the annual estimates that have passed through six

revision cycles remain to be revised upward by, on average, about 6%. This is a reflection of the revisions introduced in June quarter 1994 that have been described in the context of quarterly statistics.

Annual series for other components of the current account behave similarly to their quarterly equivalents. However, the different pattern for the second quartile of ratios in *unrequited transfer credits* (see appendix Graph A.42) is a reflection of revisions to estimates of transfers by immigrants introduced in December quarter 1985, and which are therefore not reflected in either the monthly or quarterly analyses.

Graph A.44 in Appendix A shows the reliability pattern displayed by the *balance on current account*. While this balance is an important key aggregate in its own right, it reflects the net sum of revisions to all the components of the account, including methodological revisions that shift the series across time, and therefore the usefulness of the reliability measures presented in the graph is limited. The annual median series shows relatively small bias in the 6 years of revision that are under examination. On average, the initial estimates of the current account deficit understates the final estimate by about 2%. Subsequent revisions result in the estimate fluctuating at or slightly above the latest figure. On average, after 6 revisions the estimate overstates the latest figure by 2%. Half of the initial annual estimates of the deficit fall between an understatement of 6% or an overstatement of 3%. This spread narrows progressively over the 6 year period and results in an overstatement of between 1 and 3% by the sixth year of revisions.

Graphs for annual capital account aggregates (appendix Graphs A.45 to A.52) behave similarly to their quarterly equivalents with aggregates for the Reserve Bank being completely free from bias and the median ratios for other items showing negative bias. The median ratio for transactions of the *general government sector* classified to FIA is initially a little more biased than its quarterly equivalent, reflecting revisions experience in the early 1980s. The band of ratios representing the middle 50% of ratios is more tightly clustered, as is expected in an annual analysis where initial estimates already incorporate several revisions emerging from monthly and quarterly source data. Like the quarterly series, the spread of ratios for *general government sector* transactions classified to AIA (see appendix Graph A.46) is erratic but it must be remembered that these ratios reflect estimates that are relatively small and very variable in size and direction.

Reliability of annual *non-official sector* statistics for AIA is a little better than the equivalent quarterly statistics (see appendix Graph A.50), reflecting the substantial upward revisions experienced over the first three quarterly revision periods. The middle 50% of ratios of initial estimates to latest estimates for AIA are as widely spread around the median ratio as the quarterly series, narrowing after two annual revisions to about the same spread as is displayed after eight quarterly revisions. For annual non-official sector statistics relating to FIA (see appendix Graph A.49), the initial estimates show a substantial negative bias on average (at a median ratio of 0.73) as do their quarterly counterparts (at

a median ratio of 0.69). The bias in the median series reduces sharply after one annual revision cycle and continues to fall until the final estimate is reached after five years.

As with the quarterly series, graphs for the net series *balance on capital account* (see appendix Graph A.51) and the *balancing item* (see appendix Graph A.52) should be interpreted with care. The annual graph of the *balance on capital account* records the net outcome of all capital account transactions. The annual median series shows a strong negative bias initially which reduces progressively until the final estimate is reached after five years. On average, the initial estimate of the capital account surplus understates the final estimate by around 20%. Half of the initial annual estimates of the surplus involve understatements of between 6% and 27%. This spread narrows to the point where, after five years, the understatement is between zero and 2%. The fact that estimates of the *balance on capital account* become final more quickly than estimates of the *balance on current account* largely reflects differing revisions practices with the different data sources used. In general, revisions to capital account series are not identified for periods earlier than the latest five years, whereas revisions to current account series can often be backcast for much longer periods.

DIRECTION OF ONE-YEAR REVISIONS

The previous subsection of this paper looked at the bias and dispersion of initial and revised estimates, when compared to the *final* or latest estimate, over a significant period of revision (24 months, 12 quarters and 6 years for monthly, quarterly and annual estimates respectively). The reference in the analysis to the final estimates provided a perspective on the shifts in estimation levels derived from conceptual/methodological changes as well as mapping the process of regular revision through at least one annual collection cycle.

However, many users want to review the performance of the estimates in the short term, without the concerns of the longer term shifts in estimation levels. These shifts are recognised as improvements in quality, but which usually do not change the direction of movement between periods nor alter the trends. For these users, there is a need to factor into their analyses of the estimates for the most recent periods the expectation of revision over the next year or so as quarterly data sources replace extrapolations, as annual survey results replace partial coverage quarterly estimates, and as revised annual results replace preliminary results. Once observation periods recede more than twelve months into the past, revisions become less significant to their day-to-day analysis — the focus has moved to the *sharp end* of the series.

Table 6 provides a view of the short term reliability of the statistics by quantifying the direction of revisions through a one year revision cycle. It shows, for each aggregate, measures of the *direction of one-year revisions* to initial monthly, quarterly and annual estimates. These measures indicate whether revisions have been predominately upward or downward in the short term. Median initial estimates and median revisions after one year are shown. For median revisions, *unscaled* and

scaled statistics are given. Unscaled median revisions are expressed in millions of dollars and are not related to the size of the aggregate being revised. It needs to be noted that because these estimates are expressed in original dollar terms, no account is taken of inflationary effects. Where the size of an aggregate has grown significantly over the period covered by the study, unscaled median revisions of that aggregate are not directly comparable over time. Scaled revisions, on the other hand, express the change in the estimate as a percentage of the data value being revised. Scaled median revisions therefore overcome the problem of changing dollar values but raise another difficulty in that they may provide misleading information for those aggregates which represent net transactions (e.g. balance on merchandise trade, balance on goods and services, and some net capital account items) which are close to zero in magnitude or which change signs frequently.

6 DIRECTION OF ONE-YEAR REVISIONS TO INITIAL ESTIMATES: MEDIAN INITIAL ESTIMATES AND MEDIAN ONE-YEAR REVISIONS[1]

	Median initial estimates			*Unscaled median one-year revisions*			*Scaled median one-year revisions*		
	Monthly	*Quarterly*	*Annual*	*Monthly*	*Quarterly*	*Annual*	*Monthly*	*Quarterly*	*Annual*
	$m	$m	$m	$m	$m	$m	%	%	%
Current account									
Merchandise exports	4 051	12 091	41 504	12	18	–14	0.3	0.2	–0.4
Merchandise imports	3 972	12 192	40 386	0	–2	–1	0.0	0.0	0.0
Balance on merchandise trade	*–22*	*–65*	*–504*	*8*	*29*	*25*	*–2.1*	*–3.3*	*–1.1*
Non-merchandise credits	1 745	5 173	16 662	9	9	34	0.5	0.2	0.6
Non-merchandise debits	3 115	9 435	27 767	86	271	532	3.2	3.4	1.4
Net non-merchandise	*–1 257*	*–3 734*	*–12 471*	*–47*	*–161*	*–352*	*4.4*	*4.3*	*2.2*
Services credits	987	2 971	9 517	22	–11	–44	2.7	–0.5	–0.3
Services debits	1 258	3 795	11 397	8	42	51	0.6	1.3	0.6
Net services	*–258*	*–761*	*–2 960*	*8*	*16*	*–155*	*–1.3*	*–3.9*	*6.3*
Income credits	336	1 018	3 600	1	–7	195	0.4	–0.9	5.3
Income debits	1 578	4 837	14 584	54	155	397	3.9	2.8	2.3
Net income	*–1 160*	*–3 551*	*–10 984*	*–58*	*–166*	*–303*	*5.2*	*5.0*	*4.0*
Unrequited transfers credits	314	940	3 045	0	0	0	0.0	0.0	0.0
Unrequited transfers debits	174	512	1 786	1	2	13	0.3	0.4	0.6
Net unrequited transfers	*157*	*466*	*831*	*–1*	*–7*	*–8*	*–0.5*	*–1.4*	*–1.0*
Balance on goods & services	*–256*	*–799*	*–1 974*	*33*	*65*	*252*	*–4.2*	*–8.0*	*–5.0*
Balance on current account	**–1 263**	**–3 675**	**–12 380**	**–30**	**–142**	**–327**	**2.3**	**4.2**	**2.0**
Capital account									
Official sector transactions	*363*	*1 308*	*498*	*51*	*99*	*269*	*1.0*	*[2]–4.6*	*[2]–6.7*
General government transactions	*452*	*1 037*	*2 732*	*67*	*99*	*270*	*5.1*	*[2]–3.4*	*16.0*
Foreign investment in Australia	n.a.	911	4 015	n.a.	108	625	n.a.	[2]–0.2	6.7
Australian investment abroad	n.a.	–5	192	n.a.	26	50	n.a.	0.0	0.4
Reserve Bank transactions	*–46*	*–85*	*–1 361*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*
Foreign investment in Australia	n.a.	0	0	n.a.	0	0	n.a.	0.0	0.0
Australian investment abroad	n.a.	79	1 054	n.a.	0	0	n.a.	0.0	0.0
Non-official sector transactions	*n.a.*	*2 325*	*8 073*	*n.a.*	*48*	*314*	*n.a.*	*–14.2*	*3.5*
Foreign investment in Australia	n.a.	4 044	17 796	n.a.	394	2 561	n.a.	11.2	19.7
Australian investment abroad	n.a.	1 794	590	n.a.	590	924	n.a.	45.4	13.6
Balance on capital account	**n.a.**	**3 912**	**13 950**	**n.a.**	**547**	**1 226**	**n.a.**	**–2.1**	**18.9**
Balancing item	n.a.	384	550	n.a.	55	–404	n.a.	33.5	–22.5

[1] For monthly statistics, from January 1986 to December 1993, For quarterly statistics, from the March quarter 1986 to the December quarter 1993. For annual statistics, generally from 1981–82 to 1993–94 except for the following series for which analysis commences in 1985–86: direct investment capital; the net series for services, income and transfers; and balance on goods and services.

[2] The median observations for initial estimates, one-year unscaled revisions and scaled revisions are each determined independently such that the sign of the scaled revision may be opposite to that of the unscaled revision.

To illustrate how the data in Table 6 can be used, consider *income debits.* The median initial monthly estimate of *income debits* is $1,578 million. The median revision after one year to initial estimates was an increase of $54 million, while the median-scaled one-year revision to initial estimates was 3.9%. The pattern for quarterly and annual estimates is similar. The median initial quarterly estimate was $4,837 million, the median one year revision was $155 million and the median-scaled revision was 2.8%. The corresponding annual estimates were $14,584 million, $397 million and 2.3%.

The direction in two or three years of revisions may also be calculated. However, for purposes of this paper, the advantage of using a shorter revision period to allow more recent data to be included in the analysis, and to reflect a common focus on the immediate past in balance of payments analyses, outweighed the advantages of presenting the analysis of a longer revisions process.

Tables 7 (monthly statistics) and 8 (quarterly statistics) analyse the direction of revisions in the same way as Table 6 but with statistics included for the following sub-periods of the overall period covered in Table 6.

Periodicity of statistics	*Sub-period*	
	1	*2*
Monthly	Jan. 86–Dec. 89	Jan. 90–Dec. 93
Quarterly	Mar. 86–Dec. 89	Mar. 90–Dec. 93

Comparing patterns of directions of revisions between the different sub-periods can highlight trends in the quality of the statistics that are not apparent in the *all periods* total. Although annual statistics can be broken down in the same way, they are not presented here because the small number of observations for each sub-period means that any conclusions drawn from comparing data between sub-periods are likely to be of questionable validity.

7 DIRECTION OF ONE-YEAR REVISIONS TO INITIAL MONTHLY ESTIMATES: MEDIAN INITIAL ESTIMATES AND MEDIAN ONE-YEAR REVISIONS TO INITIAL ESTIMATES FOR JANUARY 1986 TO DECEMBER 1993[1]

	Median initial estimates			*Median one-year revisions*					
				Unscaled			*Scaled*		
	Period 1	*Period 2*	*All Periods*	*Period 1*	*Period 2*	*All Periods*	*Period 1*	*Period 2*	*All Periods*
	$m	$m	$m	$m	$m	$m	%	%	%
Current account									
Merchandise exports	3 306	4 665	4 051	2	21	12	0.1	0.5	0.3
Merchandise imports	3 429	4 436	3 972	–6	1	0	0.2	0.0	0.0
Balance on merchandise trade	*–133*	*167*	*–22*	*6*	*22*	*8*	–3.3	*–0.4*	–2.1
Non-merchandise credits	1 314	1 884	1 745	37	–39	9	3.0	–2.1	0.5
Non-merchandise debits	2 344	3 358	3 115	94	21	86	4.4	0.6	3.2
Net non-merchandise	*–1 018*	*–1 435*	*–1 257*	*–58*	*8*	*–47*	*6.0*	*–0.4*	*4.4*
Services credits	706	1 163	987	18	35	22	2.6	3.0	2.7
Services debits	954	1 423	1 258	26	–10	8	2.6	–0.8	0.6
Net services	*–264*	*–246*	*–258*	*– 15*	*26*	*8*	*5.4*	*–9.1*	*–1.3*
Income credits	291	365	336	8	–3	1	2.8	–1.0	0.4
Income debits	1 229	1 726	1 578	65	24	54	6.6	1.5	3.9
Net income	*–952*	*–1334*	*–1 160*	*–72*	*–33*	*–58*	*8.3*	*2.5*	*5.2*
Unrequited transfers credits	297	365	314	0	0	0	0.0	0.0	0.0
Unrequited transfers debits	153	178	174	2	0	1	0.9	0.0	0.3
Net unrequited transfers	*154*	*157*	*157*	*0*	*–2*	*–1*	*0.0*	*–1.5*	*–0.5*
Balance on goods & services	*–428*	*–137*	*–256*	*–14*	*63*	*33*	*–3.0*	*–4.7*	*–4.2*
Balance on current account	**–1 179**	**–1 326**	**–1 263**	**–70**	**43**	**–30**	**6.9**	**–3.8**	**2.3**
Capital account									
Official sector transactions	47	485	363	25	94	51	0.7	3.8	1.0
General government transactions	338	552	452	57	94	67	2.8	5.6	5.1
Reserve Bank transactions	–120	25	–46	0	0	0	0.0	0.0	0.0

[1] Data are shown for the full period and for the following two sub-periods: Period 1: Jan. 1986–Dec. 1989; Period 2: Jan. 1990–Dec. 1993.

8 DIRECTION OF ONE-YEAR REVISIONS TO INITIAL QUARTERLY ESTIMATES: MEDIAN INITIAL ESTIMATES AND MEDIAN ONE-YEAR REVISIONS TO INITIAL ESTIMATES FOR MARCH QUARTER 1986 TO DECEMBER QUARTER 1993[1]

	Median initial estimates			*Median revisions*					
				Unscaled			*Scaled*		
	Period 1	*Period 2*	*All Periods*	*Period 1*	*Period 2*	*All Periods*	*Period 1*	*Period 2*	*All Periods*
	$m	$m	$m	$m	$m	$m	%	%	%
Current account									
Merchandise exports	10 167	13 831	12 091	–19	40	18	–0.2	0.3	0.2
Merchandise imports	10 146	12 859	12 192	–9	1	–2	–0.1	0.0	0.0
Balance on merchandise trade	*–672*	*463*	*–65*	*–2*	*35*	*29*	*–6.2*	*3.8*	*–3.3*
Non-merchandise credits	3 952	5 724	5 173	9	11	9	0.2	0.2	0.2
Non-merchandise debits	7 056	10 130	9 435	314	211	271	5.5	2.1	3.4
Net non-merchandise	*–3 024*	*–4 413*	*–3 734*	*–134*	*–170*	*–161*	*5.0*	*4.3*	*4.3*
Services credits	2 146	3 474	2 971	–15	74	–11	–0.7	2.1	–0.5
Services debits	2 878	4 202	3 795	67	–10	42	2.6	–0.3	1.3
Net services	*–763*	*–726*	*–761*	*–33*	*46*	*16*	*4.0*	*–9.8*	*–3.9*
Income credits	871	1 091	1 018	–7	–27	–7	–0.9	–0.9	–0.9
Income debits	3 704	5 193	4 837	127	155	155	3.7	2.8	2.8
Net income	*–2 723*	*–3 959*	*–3 551*	*–72*	*–171*	*–166*	*3.2*	*5.3*	*5.0*
Unrequited transfer credits	892	1 117	940	–2	5	0	–0.2	0.5	0.0
Unrequited transfer debits	469	593	512	6	0	2	1.3	0.0	0.4
Net unrequited transfers	*439*	*504*	*466*	*–8*		*–7*	*–1.9*	*–0.2*	*–1.4*
Balance on goods & services	*–1 376*	*–97*	*–799*	*–80*	*90*	*65*	*–5.2*	*–13.9*	*–8.0*
Balance on current account	**–3 658**	**–3717**	**–3 675**	**–146**	**–102**	**–142**	**5.1**	**3.4**	**4.2**
Capital account									
Official sector transactions	387	1 300	1 308	287	–106	99	–5.6	–4.5	[1]*–4.6*
General government transactions	*838*	*1 230*	*1 037*	*287*	*–106*	*99*	*2.7*	*–1.7*	[1]*–3.4*
Foreign investment in Australia	911	756	911	470	–123	108	14.4	–8.9	[1]–0.2
Australian investment abroad	22	–18	–5	61	0	26	–16.4	0.0	0.0
Reserve Bank transactions	*–465*	*119*	*–85*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*
Foreign investment in Australia	–1	7	0	0	0	0	0.0	0.0	0.0
Australian investment abroad	452	–79	79	0	0	0	0.0	0.0	0.0
Non–official sector transactions	*2 376*	*2 292*	*2 325*	*–182*	*186*	*48*	*–14.2*	*–14.1*	*–14.2*
Foreign investment in Australia	4 468	3 487	4 044	294	652	394	7.8	17.3	11.2
Australian investment abroad	1 845	1 744	1 794	659	214	590	56.7	22.9	45.4
Balance on capital account	**3 498**	**4 462**	**3 912**	**547**	**33**	**547**	**7.6**	**–11.8**	**–2.1**
Balancing item	675	–247	384	55	–1	55	–0.2	112.6	33.5

[1] Data are shown for the full period and for the following two sub–periods: Period 1: March quarter 1986–December quarter 1989; Period 2: March quarter 1990–December quarter 1993.

The picture that Table 6 presents is largely consistent with that shown in Appendix A. Most median revisions to gross statistics are positive or a small negative value — indicating a generally positive bias to *revisions* to offset the mainly negative biases present in *initial estimates* shown in Appendix A. Bias present in revisions to net aggregates may be positive or negative depending on whether revisions to the credit or debit components of the net item are larger.

Looking at current account items shown in Tables 6, 7 and 8, it can be seen that, on average, revisions to *merchandise exports* and *imports* are very small both in dollar terms and in scaled form. This is true for all periodicities and all sub-periods. Amongst the other current account components, median revisions to unrequited transfers are small both

absolutely and proportionally for all periodicities of statistics and all sub-periods.

Services are a little less reliable with median proportional revisions lying between –0.5% for quarterly credit estimates and 2.7% for monthly credit estimates. Interestingly, the all-period proportional revisions to monthly services debits are lower than the quarterly revisions. This reflects delays in obtaining information from several annual surveys with the result that one-year monthly revisions for some component series often exclude survey data for the reference period. The revisions to the quarterly series would capture some of the revisions sourced from these surveys. New quarterly data sources have been developed in recent years (particularly new quarterly data collections within the ABS Survey of International Trade in Services) which means both that the one-year revisions analysis for monthly series now captures survey data revisions to extrapolations (which are still required for up to six months ahead of the survey results becoming available), and that the quarterly series are only extrapolated one quarter in advance, reducing the scale of one-year revisions to these series.

Income estimates appear the least reliable of the current account items. The median one-year revisions performance for the annual credits series (5.3%) reflects the major revisions necessary to extrapolations for reinvested earnings on investment abroad when annual survey results become available. Since 1988–89, extrapolations have varied from between about half the final result to eight times the final result. Because the one-year revisions to monthly series only capture survey data for the January to June period, the monthly series (0.4% revision) appears more reliable than either the quarterly counterpart (–0.9%) that captures more of the survey data in the first year of revision, or the annual series.

For *income debits* the median proportional revisions to both monthly and quarterly estimates improve in the second sub-period (January 1990 to December 1993), reflecting on average improved coverage of income debits transactions within the first year of revision.

The net effect of all revisions to the current account components are reflected in revisions to the *balance on current account*. For all periodicities, median revisions to this balance show a bias of between 2.0% (annual estimates) and 4.2% (quarterly estimates). While the performance between sub-periods is more volatile, in general median proportional revisions to both monthly and quarterly estimates are smaller in the more recent sub-periods.

Turning to the capital account aggregates shown in Tables 6, 7 and 8, it can be seen that proportional and absolute median revisions are generally larger than those applied to aggregates in the current account. Because monthly capital account statistics only include net *official sector* transactions, only limited comparisons can be made with quarterly and annual statistics. Within monthly statistics, the size of revisions to *general*

government sector transactions has approximately doubled from sub-period 1 (median revision of $57 million or 2.8%) to sub-period 2 (median revision of $94 million or 5.6%). This deterioration in reliability largely reflects the increased significance of, and revisions to, data reported to ABS in respect of State government borrowing. Estimates for the other component of the official sector — the Reserve Bank — are completely reliable over both sub-periods.

General government sector transactions are dominated by transactions classified to FIA. While the median revision to the FIA component for all quarterly periods combined is only $108 million, the scaled one-year revisions for the two sub-periods are 14.4% and –8.9%. The annual median one-year revision is $625 million (6.7%).

Median one-year revisions to transactions of the *non-official sector* are large both absolutely and proportionally. Median revisions to initial annual estimates of FIA ($2,561 million or 19.7%) are considerably larger than revisions to the initial quarterly estimates ($394 million or 11.2%). This reflects the different pattern of revisions between the quarterly and annual estimation cycles that arises because comprehensive survey data are generally only available about six months after the end of the reference year. In particular, the one-year revision to each annual estimate includes results from the annual collections within the ABS Survey of Foreign Investment for that year. One-year revisions to the March and June quarters' estimates, will also pick up annual survey revisions to those periods. However, for the September quarter one-year revision, no annual survey results are available; and for some years for the December quarter one-year revision, only interim annual survey results are available. It should be noted that the quarterly scaled revision in the second sub-period is very much larger (17.3%) than in the first sub-period (7.8%) reflecting improvement over time in capturing annual survey data more quickly.

However, users need to bear in mind the limitations of using median estimates when assessing the reliability of net series such as foreign investment in the non-official sector. For example, while the median one-year revision to quarterly observations for this series is only $394 million, the mean revision in absolute terms is in excess of $1 billion.

Median one-year revisions to initial quarterly estimates of Australian investment abroad by the non-official sector ($590 million or 45.4%) are, as expected, more biased than the equivalent revisions to annual estimates ($924 million or 13.6%). Revisions to the quarterly estimates are large in both sub-periods shown in Table 8, although there has been some decline in the relative size of the median revision in the more recent period.

MAGNITUDE OF ONE-YEAR REVISIONS

As noted in the previous subsection, analysts want to understand the variability they are likely to see in revisions to estimates over the short term. The *direction* of revisions discussed in that subsection gives a perspective on whether the one-year revisions have been predominately upward or downward. The *magnitude* of one-year revisions discussed in this subsection provides a perspective on how large these revisions have been. Table 9 presents measures of the magnitude of one-year revisions to initial monthly, quarterly and annual estimates. The magnitude of revisions refers to the spread of revisions above and below the initial estimates without regard to sign and thus complements measures of the direction of revisions. The format of Table 9 is similar to that in Table 6; again the median value is used as the average and revisions after one year are used. Because measures of magnitude are expressed in terms of absolute revisions, the values are generally larger than the equivalent amounts in Table 6. If all revisions were in the same direction the scaled and unscaled results in both tables would be the same. Conversely, the larger the differences between the direction and the magnitude measures for a particular aggregate, the greater the variability in the direction of revisions.

As an example of the use of data in Table 9, consider *income debits.* After one year, the median absolute revision to the initial monthly estimate was $98 million or 7.3%. When compared with the equivalent direction of revision statistics in Table 6 ($54 million or 3.9%), it is clear that the predominantly positive revisions to this aggregate must be partly offset by some negative revisions. It can also be said that revisions are dispersed to some degree between increases and decreases and that, as a result, there is no evidence of any strong tendency for revisions to be in one direction within the first year.

Examination of Table 9 shows that the magnitude of revisions to the initial estimate is greatest for the capital account aggregates for both quarterly and annual statistics. This is consistent with the patterns of bias in Table 7. Of interest in the current account is the fact that the median absolute value of revisions to the annual estimate of *income debits* ($397 million) is equal to the equivalent measure of bias in Table 6. However the median scaled value for the magnitude of revisions statistic (5.9%) is larger than the equivalent direction of revisions statistic (2.3%). This indicates that, on average, revisions to this aggregate are positive but that there are some negative revisions present and that, in absolute terms, these negative revisions are individually equal to or smaller than the value of the median direction of revisions measure. Equal values are also shown for the unscaled direction and magnitude of revisions measures for revisions to annual estimates of *non-merchandise debits* and *general government sector* transactions (both for FIA and AIA, but not for the net result). These outcomes reflect, in part, the relatively few annual observations used in the analysis. No similar equivalence between the unscaled direction and magnitude of revisions measures occurs with either monthly or quarterly estimates.

One further feature displayed by Table 9 is the much larger revisions, on average, after one year to the initial quarterly and annual estimates of the *balance on capital account* than to the corresponding estimates of the *balance on current account*. The one-year revisions to the *balance on capital account* are on average nearly seven times larger than those to the *balance on current account* for both quarterly and annual series. This largely reflects the timing of availability of comprehensive data on international investment flows from the annual collections within the ABS survey of Foreign Investment. The initial estimates of these flows are based on partial data available from the monthly and quarterly collections within this Survey and significant revisions frequently occur when the more complete annual data become available about six months after the end of the reference year.

Appendix B illustrates the magnitude of revisions in another way. It contains graphs which plot the revisions, after one year, to the initial estimates of a balance of payments aggregate for the three periodicities — monthly, quarterly or annual statistics. Zero on the vertical scale represents the initial estimate for each period plotted. These graphs complement the information in Table 9 by giving an indication of the magnitude of revisions over the periods covered by the analysis and the way this pattern may have changed. They also give an indication of the direction of revisions, complementing Tables 6, 7 and 8. It should be borne in mind that the amounts plotted are in dollars and therefore may be affected by inflationary effects and by changes in the size of the aggregate being amended. It should also be noted that, because the scale is not the same on every graph, care is needed in comparing one graph with another.

The picture conveyed by Appendix B is broadly consistent with the information presented so far. Within the current account, the largest magnitude of revisions measures (in dollar terms) shown in Table 9 are for *non-merchandise debits*, mainly due to the magnitude of revisions to *income debits* and *services debits*. This pattern is also evident in the appropriate Appendix B graphs. Of interest for *income debits* is the increasing magnitude of revisions in monthly statistics (see appendix Graph B.6) and the shift in the direction of revisions to monthly statistics from being strongly positive up to about March 1990 to a more balanced pattern until March 1993, then turning positive again in later periods. The switch from positive to a more balanced pattern from 1990 is also reflected in Table 7. This pattern of magnitude and direction in revisions to the monthly series for *income debits* is also evident in the Appendix B graph for quarterly series (Graph B.20). Graph B.39 is the equivalent graph for revisions to the annual *income debits* series. It shows a predominantly positive direction of revisions. This suggests that some large monthly and quarterly revisions offset each other and are not evident in annual statistics.

The very substantial upward revision to 1992–93 annual statistics of *income debits* (see appendix Graph B.39) is due principally to the incorporation of revised estimates of *reinvested earnings* on foreign

direct investment in Australia. Information for these estimates is collected annually in the Survey of Foreign Investment, with data becoming available about six months after the end of the reference year. Prior to survey data becoming available, estimates are based on extrapolations made during the reference year. In times of rapidly changing economic conditions, such as in 1992–93, it proves particularly difficult to reliably extrapolate this item.

A similarly large upward revision was made to 1992–93 annual statistics of *income credits* (see appendix Graph B.38). Again this is principally attributable to revisions to estimates of *reinvested earnings,* in this case on Australian direct investment abroad. Essentially the same methodology is used in estimating these earnings as for those included in *income debits* but with the added complexity that, in this case, extrapolations have to take into account expectations of economic conditions and business profitability in those foreign countries in which Australia has direct investment.

9 MAGNITUDE OF REVISIONS TO INITIAL ESTIMATES: MEDIAN ONE-YEAR REVISIONS[1]

	Unscaled median one-year absolute revisions			*Scaled median one-year absolute revisions*[2]		
	Monthly	*Quarterly*	*Annual*	*Monthly*	*Quarterly*	*Annual*
	$m	$m	$m	%	%	%
Current account						
Merchandise exports	33	54	95	0.8	0.4	0.3
Merchandise imports	10	11	24	0.2	0.1	0.1
Balance on merchandise trade	*40*	*61*	*142*	*n.a.*	*n.a.*	*n.a.*
Non-merchandise credits	63	234	303	3.9	4.5	2.4
Non-merchandise debits	122	305	532	4.6	3.6	2.4
Net non-merchandise	*92*	*170*	*436*	*n.a.*	*n.a.*	*n.a.*
Services credits	48	141	210	5.4	5.3	4.1
Services debits	42	107	457	3.8	3.4	2.7
Net services	*57*	*146*	*336*	*n.a.*	*n.a.*	*n.a.*
Income credits	38	134	261	9.9	13.7	13.2
Income debits	98	198	397	7.3	5.0	5.9
Net income	*79*	*219*	*402*	*n.a.*	*n.a.*	*n.a.*
Unrequited transfers credits	7	16	22	2.2	1.9	0.6
Unrequited transfers debits	3	8	18	1.9	1.2	0.9
Net unrequited transfers	*8*	*23*	*31*	*n.a.*	*n.a.*	*n.a.*
Balance on goods & services	*73*	*141*	*377*	*n.a.*	*n.a.*	*n.a.*
Balance on current account	**110**	**191**	**327**	**9.1**	**5.8**	**3.4**
Capital account						
Official sector transactions	151	346	338	n.a.	n.a.	n.a.
General government transactions	*149*	*346*	*338*	*n.a.*	*n.a.*	*n.a.*
Foreign investment in Australia	n.a.	428	625	n.a.	43.6	21.4
Australian investment abroad	n.a.	52	50	n.a.	42.2	37.7
Reserve Bank transactions	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*
Foreign investment in Australia	n.a.	0	0	n.a.	0.0	0.0
Australian investment abroad	n.a.	0	0	n.a.	0.0	0.0
Non-official sector transactions	*n.a.*	*935*	*1 015*	*n.a.*	*n.a.*	*n.a.*
Foreign investment in Australia	n.a.	1 140	3 367	n.a	25.4	19.7
Australian investment abroad	n.a.	927	1 661	n.a	56.7	20.8
Balance on capital account	**n.a.**	**1 239**	**2 295**	**n.a.**	**n.a.**	**n.a.**
Balancing item	n.a.	1 221	2 228	n.a	n.a	n.a

[1] For monthly statistics, from January 1986 to December 1993. For quarterly statistics, from the March quarter 1986 to the December quarter 1993. For annual statistics, generally from 1981–82 to 1993–94 except for the following series for which analysis commences in 1985–86: direct investment capital; the net series for services income and transfers; and balance on goods and services.

[2] Scaled revisions to net aggregates may be misleading. They are omitted here with the exception of revisions to balance on current account which have been applied to an aggregate which has been consistently negative over the whole period.

The behaviour of revisions to the monthly *income debits* series is reflected to a large extent in the pattern of revisions to the monthly *balance on current account* shown in appendix Graph B.11. From about June 1990 there is a noticeable shift in the direction of revisions to the monthly balance on current account from strongly negative, involving increases in the deficit, to a more balanced pattern but with a positive tendency. That is, over the period from June 1990 to December 1993, one-year revisions tend to reduce the current account deficit. This change is also evident in Table 7 where the unscaled median revision to this balance in sub-period 2 is positive after being negative in the previous sub-period. This pattern is not apparent in quarterly and annual statistics (see appendix Graphs B.25 and B.44).

Table 9 shows that, over the 13 year period from 1981–82, the size of revisions made to initial annual estimates of the *balance on current account* after one year average 3.4%, rising to 5.8% for quarterly estimates (over the period March quarter 1986 to December quarter 1993) and 9.1% for monthly estimates (over the period January 1986 to December 1993). The graphs in Appendix B (B.11, B.24, B.44) show that the size of individual revisions after one year varied considerably over the period, and that these revisions were generally in a negative direction (implying upward revisions to the deficit) particularly for the quarterly and annual series. It should be recalled from the earlier analysis based on Appendix A, however, that the revisions after one year are not the final revisions to estimates for particular periods. As shown in appendix Graphs A.11, A.25, and A.44, the generally upward revisions after one year take the estimate of the current account deficit further from the final estimate than the initial estimate was in some cases. This emphasises the need for care in using the reliability indicators presented in this paper.

Within the capital account, revisions to monthly statistics are dominated by revisions to net capital transactions of the *general government sector* (see appendix Graph B.13). These transactions are predominantly borrowing by Australia. From about December 1987 the magnitude of these revisions has increased noticeably. This timing coincides with a substantial increase in the value of foreign borrowings by the State Governments and an associated increase in the size of revisions. The monthly data are collected shortly after the end of the reference period to meet monthly timetables and hence they are not as reliable as the quarterly and annual data. As appendix Graphs B.26 and B.45 show the magnitude of revisions is still substantial in quarterly and annual statistics, but the netting across time means the magnitude is not quite as marked as in the monthly series.

The magnitude of revisions to quarterly capital transactions of the *non-official sector* for both FIA and AIA (see appendix Graphs B.30 and B.31) is substantial and has been so throughout the period for which data are analysed. The greater proportional magnitude exhibited by revisions to quarterly AIA statistics (57% for AIA compared with 25% for FIA) is a reflection of the difficulties experienced in maintaining satisfactory coverage of quarterly AIA transactions. Preliminary quarterly statistics are often subject to large revisions, particularly as annual survey results become available. Appendix Graphs B.49 and B.50 plot the equivalent revisions to annual statistics. As would be expected, these are also widely dispersed and show the positive direction indicated in Table 6. Table 9 measures the average proportional magnitude of revisions to annual FIA and AIA estimates after one year as 19.7% and 20.8%, respectively.

ARE REVISIONS PREDOMINANTLY POSITIVE OR NEGATIVE?

Table 10 shows, for each of the main balance of payments aggregates, counts of positive, negative or zero revisions derived by deducting the initial estimates for each period from the latest available estimates for those periods. Revisions for the months from January 1986 to June 1994 and the quarters from March quarter 1986 to June quarter 1994 have been analysed. (Revisions to annual data are not analysed here because the small number of observations available would be unlikely to yield useful statistics.) For example the first published estimate of *merchandise exports* (on a shipping date basis) for January 1991 was $3,905 million. In data consistent with the January 1995 issue of 5301.0 that estimate had been revised to $3,969 million. This is counted as one positive revision in Table 10.

10 DIRECTION OF REVISIONS, INITIAL TO LATEST ESTIMATES — MONTHLY: JANUARY 1986 TO JUNE 1994[1] AND QUARTERLY: MARCH QUARTER 1986 TO JUNE QUARTER 1994[2]

	Number of revisions by direction			
Aggregate	*Negative*	*Zero*	*Positive*	*Total*
	MONTHLY			
Current account				
Merchandise exports	45	1	56	102
Merchandise imports	54	2	46	102
Balance on merchandise trade	*38*	*0*	*64*	*102*
Non-merchandise credits	15	0	87	102
Non-merchandise debits	19	1	82	102
Net non-merchandise	*62*	*0*	*40*	*102*
Services credits	6	0	96	102
Services debits	13	2	87	102
Income credits	37	1	64	102
Income debits	32	1	69	102
Unrequited transfers credits	46	9	47	102
Unrequited transfers debits	11	2	89	102
Balance on goods and services	*34*	*1*	*67*	*102*
Balance on current account	**52**	**0**	**50**	**102**
Capital account				
Official sector transactions	*33*	*0*	*69*	*102*
General government transactions	34	0	68	102
Reserve Bank transactions	8	86	8	102

For footnotes see end of table.

10 DIRECTION OF REVISIONS, INITIAL TO LATEST ESTIMATES — MONTHLY: JANUARY 1986 TO JUNE 1994[1] AND QUARTERLY: MARCH QUARTER 1986 TO JUNE QUARTER 1994[2] — *continued*

	Number of revisions by direction			
Aggregate	*Negative*	*Zero*	*Positive*	*Total*
	QUARTERLY			
Current account				
Merchandise exports	15	0	19	34
Merchandise imports	19	2	13	34
Balance on merchandise trade	*13*	*0*	*21*	*34*
Services credits	1	0	33	34
Services debits	4	0	30	34
Income credits	12	1	21	34
Income debits	8	0	26	34
Unrequited transfers credits	16	3	15	34
Unrequited transfers debits	1	0	33	34
Balance on goods and services	*8*	*0*	*26*	*34*
Balance on current account	**17**	**0**	**17**	**34**
Capital account				
Official sector transactions	*9*	*0*	*25*	*34*
General government transactions				
Foreign investment in Australia	8	0	26	34
Australian investment abroad	14	4	16	34
Reserve Bank transactions				
Foreign investment in Australia	0	34	0	34
Australian investment abroad	4	29	1	34
Non-official sector transactions				
Foreign investment in Australia	6	0	28	34
Australian investment abroad	7	0	27	34
Balance on capital account	**9**	**0**	**25**	**34**
Balancing item	26	0	8	34

[1] The latest estimate is consistent with the January 1995 issue of 5301.0.
[2] The latest estimate is consistent with the December quarter 1994 issue of 5302.0.

Sign convention: A negative direction for revisions to the balance on current account indicates an increase in the deficit. A negative direction for revisions to the other net balances indicates either an increase in the deficit or, in months when surpluses have been recorded, a reduction in the surplus.

The direction of revision relates to the upward (positive) or downward (negative) adjustment that the initial estimate has undergone to reach the latest estimate (estimates consistent with the January 1995 issue of 5301.0 and the December quarter 1994 issue of 5302.0). In the case of net series, such as balance on *merchandise trade, net services,* and *total general government transactions*, a positive revision indicates an increase in a surplus or a decrease in a deficit and a negative revision is a decrease in a surplus or an increase in a deficit.

Broadly, the information contained in Table 10, which in the absence of bias in the initial estimates would be expected to show approximately equal numbers of positive and negative revisions over the revisions history for any series, complements the information shown in Table 6.

Table 10 provides a long-term view of the revisions process from initial to final estimate whereas Table 6 presents a measure of the short-term performance from initial to one-year estimates. While many analysts focus on the expected short-term behaviour of revisions when assessing the significance of initial estimates, it is useful for others to place this short-term performance within a longer frame of reference.

When comparing data in Tables 6 and 10 it should not be forgotten that Table 10 shows only *counts* of revisions (without regard to size) whereas Table 6 shows only *monetary values*. The different long-term and short-term perspectives should also be kept in mind. For example, one-year revisions may be on a path that is towards the final outcome, but in some cases there may be a tendency for a one-year revision in one direction to work against a longer term tendency for revision in the other direction.

Sign of monthly revisions

Looking first at the monthly data in Table 10, it can be seen that in the long-term revisions to the *merchandise trade* items show little bias in terms of direction of revision — this is consistent with the statistics on the one-year revisions experience shown in Table 6. Both *services credits* and *services debits* are strongly positively biased in Table 10, while in Table 6, the positive direction of revisions in the short term is not nearly as marked. This tends to suggest that positive revisions continue to be made after the end of the first year. This is borne out by an examination of Graphs A.7 and A.8 in Appendix A. A similar position is evident for income. Table 10 indicates that *income credits* revisions tend to be positively biased while revisions to *income debits* are strongly positively biased (more than twice as many positive as negative revisions). Table 6 confirms this picture with the direction of one-year revisions to income debits being positive but for income credits the one-year revisions are not consistently in one direction. Appendix Graphs A.5 and A.6 are consistent with these findings from Tables 6 and 10. In particular, appendix Graph A.5 indicates that significant positive revisions to income credits are made after the end of the first year. Table 6 also indicates no clear direction in one-year revisions to *unrequited transfer debits*, while Table 10 shows a strong positive bias for longer term revisions to these estimates; both findings are in keeping with appendix Graph A.10.

The overall effect of revisions to current account items is summarised in revisions to the *balance on current account*. In Table 6 a negative direction to short-term revisions is indicated, confirmed by Graph A.11 in Appendix A which shows an increasing median ratio during the first 12 revisions (reflecting an increase in the size of the deficit on current account). Table 10, however, shows that an equal number of positive and negative revisions were required to initial estimates for the period January 1986 to June 1994 to reach the latest estimate published in the January 1995 issue of 5301.0. This is in line with the initial median estimate in appendix Graph A.11 being close to the final estimate, and the boundaries of the second and third quartiles of initial estimates being roughly evenly spread around the median.

Monthly estimates of capital transactions of the *official sector* are made up of FIA and AIA transactions of the *general government sector* and the *Reserve Bank.* In Table 6, revisions to Reserve Bank transactions have a zero median value indicating no obvious bias in the direction of one-year revisions; this is borne out by Table 10 which shows positive and negative revisions being evenly balanced. On the other hand, *general government sector* capital transactions have revisions that are strongly positive in direction in both Tables 6 and 10. The same picture is conveyed in Graph A.13 of Appendix A.

Sign of quarterly revisions

Turning to the counts of revisions to quarterly statistics shown in Table 10, it can be seen that in the *merchandise trade* items there is a tendency toward positive revisions to *exports* and negative revisions to *imports*. Table 6 is consistent for exports but indicates no clear direction for imports revisions (the median value being –$2 million) measured one year after the initial estimates. Appendix Graph A.16 provides further explanation for these findings, showing that the initial imports estimate is virtually equal to the latest estimate on average and that revisions are insignificant in value terms. In Table 10 revisions to both *services credits* and *debits* are strongly positively biased. This is consistent with Table 6 for debits but not so for credits where Table 6 indicates a slight tendency for one-year revision to be negative (–$11 million). This indicates that positive revisions to *services credits* must predominate after the end of the first four quarterly revisions. Examination of Graph A.21 in Appendix A confirms this and it can be seen that, even after 12 quarterly revision cycles (i.e. after three years), the revised estimate still represents on average less than 95% of the latest estimate.

Positively biased revisions are also indicated in Table 10 for both credit and debit estimates for *income* and for *unrequited transfers* debits. This pattern is consistent with Table 6 for one-year revisions to the debit estimates but not for income credit estimates. Table 6 shows a small negative median revision of –$7 million for *income credits*. Again, this suggests that significant positive revisions to income credits occur after the first four quarters. Appendix Graph A.19 confirms this. As with revisions to monthly estimates, Table 6 indicates a negative direction to one-year revisions to the quarterly *balance on current account* (i.e. the estimate is revised to a bigger deficit) while Table 10 presents a neutral picture. Appendix Graph A.25 indicates how these outcomes can be reconciled: further offsetting revisions, both positive and negative, are made well after the end of the first year.

Revisions are rarely made to quarterly capital account transactions of the *Reserve Bank* and there is no evidence of bias in either Tables 6 or 10. For the *general government sector* capital transactions, Table 10 indicates positive bias for revisions to quarterly estimates classified to FIA and a neutral revisions experience for transactions classified to AIA. This pattern is broadly consistent with the combined picture presented by Table 6 and Graphs A.26 and A.27 in Appendix A.

Revisions to quarterly estimates of capital transactions of the *non-official* sector are strongly positively biased for both FIA and AIA, with nearly five times more positive revisions than negative revisions to the FIA series, and nearly four times more positive revisions for the AIA series. This is consistent with the patterns portrayed in Table 6 and Appendix A.

Revisions to quarterly estimates of the *balance on capital account* are also strongly positively biased (i.e. revisions tend to increase the surplus). This is consistent with the pattern presented by Table 6 and appendix Graph A.32. Statistics are also included for revisions to the *balancing item* but, as it is residual in nature and reflects the net outcome of revisions to other components of the current and capital accounts, these measures are not examined here.

DO ALL REVISIONS REDUCE ERROR?

In addition to examining the bias of estimates and the direction and magnitude of revisions to initial estimates, it is useful to consider whether all revisions are worthwhile in the sense that they improve the accuracy of an estimate. An indication of this is given in the graphs included in Appendix A where the value of an aggregate, at various intervals after its initial estimate, is related to the latest estimate of that aggregate (the latest estimate is assumed to be the best available approximation of the true value). Tables 11 and 12 provide complementary information by quantifying the proportion of revisions which reduces the error in monthly (Table 11) and quarterly (Table 12) estimates. Error in this context is measured as the difference between the latest estimate of an aggregate and a preliminary estimate produced one year or less after the initial estimate. As with Table 10, the analysis in Tables 11 and 12 provides information on *counts* of revisions rather than *monetary values* and therefore is limited in that a revision that, say, halves an error has the same weighting as a minor amendment that alters the error only marginally.

11 PROPORTION OF REVISIONS TO MONTHLY ESTIMATES THAT REDUCES ERROR RELATIVE TO LATEST ESTIMATE: JANUARY 1986 TO JUNE 1994[1]

	Within-first-year revisions2			*One-year revisions3*		
Aggregate	*Reduce error* no.	*Increase error4* no.	*Proportion that reduces error* %	*Reduce error* no.	*Increase error4* no.	*Proportion that reduces error* %
Current account						
Merchandise exports	373	160	70	90	4	96
Merchandise imports	181	103	64	82	7	92
Balance on merchandise trade	*376*	*180*	*68*	*86*	*10*	*90*
Services credits	337	293	54	59	37	62
Services debits	327	301	52	57	39	59
Income credits	358	324	53	68	29	72
Income debits	452	270	63	78	19	81
Unrequited transfers credits	160	19	89	79	2	98
Unrequited transfers debits	125	73	63	57	25	70
Balance on current account	**529**	**432**	**55**	**77**	**19**	**80**
Capital account						
Official sector transactions	*244*	*208*	*54*	*59*	*29*	*62*
General government transactions	242	207	54	60	28	63
Reserve Bank transactions	16	2	89	14	–	100

[1] The latest estimate is that consistent with the January 1995 issue of 5301.0.
[2] Counts of successive monthly revisions to an estimate, occurring within the first 12 months after the initial estimate, according to whether each revision moves the revised estimate closer to, or further away from, the latest estimate of that aggregate.
[3] Counts of the difference between the initial estimate of an aggregate and the estimate after 12 months classified according to whether the revision moves the revised estimate closer to, or further away, from the latest estimate for that aggregate.
[4] Includes revisions that 'overshoot' i.e. they worsen the error but in the opposite direction.

In the first three columns of the tables, revisions to an estimate occurring within the first year after the original estimate are analysed according to whether they move the estimate closer to or further away from the latest estimate. The third column shows the percentage that reduces error. The last three columns are similar except that they analyse the accumulated net revision to the initial estimate after one year in relation to the latest estimate.

Do monthly revisions reduce error?

Looking at the monthly data in Table 11, it can be seen that the proportion of revisions that reduces error within the first year (that is moves an estimate closer to its latest value) varies between items. *Services debits* and *income credits* were the worst items, with only 52% and 53%, respectively, of revisions moving the estimates closer to their latest values. The corollary to this is that, for each of those items, about half the revisions made during the first year in fact worsened the accuracy of the estimate. *General government* capital transactions and *services credits* performed little better, each with only 54% of revisions in the right direction. Examination of appendix Graphs A.5, A.7 and A.8 confirms this picture for *income credits* and *services* where it can be seen that the median estimate during the first year both rises and falls.

Table 11 shows both that there are relatively few revisions to monthly *Reserve Bank* capital transactions made within the first year, and that

these almost always reduce error. It also shows that the cumulative revisions after one year always reduce error, correcting the two within-year revisions that moved the estimate in the wrong direction. This supports the evidence examined earlier which suggested that estimates of this item are very reliable.

For all items, the majority of cumulative revisions after one year reduced error, although the proportion was low for *services credits* (62%) and for *services debits* (59%). This suggests that for those items substantial revisions remained to be applied after the end of the first year. The cumulative effect of revisions to current account items constitute the revisions to the *balance on current account* which, over the course of the first year of estimation, generally reduced error (80% of one-year revisions reduced error). The pattern for one-year revisions to *official sector* capital transactions shows 69% of revisions reduced error.

Do quarterly revisions reduce errors?

Table 12 provides a similar analysis for quarterly statistics. The *unrequited transfers debits* series has the lowest proportion of revisions within the first year in the right direction (52%). As with monthly statistics, the quarterly *services* and *income* items also have low proportions of revisions within the first year that reduce error relative to the latest estimate. In the case of *services credits*, just over half the revisions within the first year reduce error (54%) and less than half of the one-year cumulative revisions reduce error (43%). This pattern is evident in the Appendix A graph for *services credits* (Graph A.21) which suggests minor negative revisions follow many of the more significant positive revisions towards the final estimates.

12 PROPORTION OF REVISIONS TO QUARTERLY ESTIMATES THAT REDUCES ERROR RELATIVE TO LATEST ESTIMATE: MARCH QUARTER 1986 TO JUNE QUARTER 1994[1]

	Within-first-year revisions2			*One-year revisions3*		
Aggregate	*Reduce error* no.	*Increase error4* no.	*Proportion that reduces error* %	*Reduce error* no.	*Increase error4* no.	*Proportion that reduces error* %
Current account						
Merchandise exports	81	22	79	29	2	94
Merchandise imports	48	19	72	25	3	89
Balance on merchandise trade	*79*	*28*	*74*	*30*	*1*	*97*
Services credits	66	57	54	13	17	43
Services debits	66	55	55	20	11	65
Balance on goods and services	*77*	*53*	*59*	*22*	*9*	*71*
Income credits	76	47	62	25	6	81
Income debits	79	46	63	28	3	90
Unrequited transfer credits	43	6	88	25	2	93
Unrequited transfer debits	32	29	52	18	7	72
Balance on current account	**71**	**58**	**55**	**19**	**12**	**61**
Capital account						
Official sector transactions	*60*	*39*	*61*	*24*	*6*	*80*
General government transactions	*60*	*39*	*61*	*24*	*6*	*80*
Foreign investment in Australia	59	30	66	25	4	87
Australian investment abroad	37	25	60	14	11	56
Reserve Bank transactions	*9*	*4*	*69*	*4*	—	*100*
Foreign investment in Australia	1	1	50	—	—	—
Australian investment abroad	8	3	73	4	—	100
Non–official sector transactions	*74*	*50*	*60*	*19*	*12*	*61*
Foreign investment in Australia	70	47	60	24	6	80
Australian investment abroad	76	44	63	27	4	87
Balance on capital account	**70**	**51**	**61**	**12**	**13**	**48**

[1] The latest estimate is that consistent with the December quarter 1995 issue of 5302.0.
[2] Counts of successive quarterly revisions to an estimate, occurring within the first 12 months after the initial estimate, classified according to whether each revision moves the revised estimate closer to, or further away from, the latest estimate of that aggregate.
[3] Counts of the difference between the initial estimate of an aggregate and the estimate after 12 months classified according to whether the revision moves the revised estimate closer to, or further away, from the latest estimate for that aggregate.
[4] Includes revisions that 'overshoot' i.e. they worsen the error but in the opposite direction.

DO REVISIONS ALTER INFORMATION PROVIDED BY INITIAL ESTIMATES?

Because of the preliminary nature of statistics for the latest months or quarters shown in balance of payments publications, care is needed in interpreting period-on-period (month-on-month or quarter-on-quarter) changes in the magnitude of balance of payments aggregates for the more recent periods. Nonetheless, it is useful to examine the extent to which the direction of an initial movement in a balance of payments aggregate is subsequently modified by revisions. For example, if a month-on-month (or quarter-on-quarter) change in an aggregate initially suggests a turning point, or a point of inflection, in the time series for that aggregate, how often is this pattern subsequently altered by revisions?

Scatter graphs included in Appendix C are intended to shed light on this question. These graphs compare the initial and latest figures for the *change in an aggregate* from the previous month or quarter. For each of

the periods covered in this analysis, the initial estimate of the movement is plotted against the latest estimate of the movement for the same period. Initial estimates are plotted on the horizontal axis and the latest estimates on the vertical axis. Graphs of annual statistics are not included here for two reasons. First, because the small number of observations available may give a misleading impression; and, second, because initial annual estimates are rarely used as the basis for assessing changes in macro-economic conditions.

A monthly or quarterly movement which has remained unchanged since initially published will be plotted on an imaginary 45° line running from the bottom left corner to the top right corner of the graph and passing through the origin. Points that lie off this line indicate periods for which the latest estimate of the period-on-period change differs from the initial estimate of that change. Examination of the proportions of points lying above or below the 45° line can also give insights into the bias of the estimates. Those points below the line correspond to movement estimates that have decreased since the initial estimate, that is, the initial estimate of movement was overstated (positively biased). On the other hand, points above the 45° line represent initial estimates that understated the latest estimate of movement (negatively biased). It can also be seen in the graphs that points lying to the right of the vertical zero axis represent observations for which the initial and latest estimates of period-on-period movement are positive while points to the left of that axis correspond to estimates of change that are negative. Similarly, points lying above the horizontal zero axis represent observations for which the latest estimates of the period-on-period movement are positive while points below that axis correspond to estimates of change that are negative.

In cases where the initial period-on-period change does suggest a significant change in trend, the question then arises as to how much subsequent revision can be considered to make the information conveyed by the initial change misleading? In other words, how often is the informed user of the statistics likely to draw the wrong conclusions about macro-economic conditions when the user's judgements are based on initial estimates? For the purposes of this analysis, subjective judgements have been made about the size of revisions that are considered acceptable in that they would be unlikely to invalidate any broad decisions taken on the evidence of the initially published period-on-period change. These judgements have been expressed in terms of bounds around the imaginary 45° line and are included on the graphs as dotted lines. The size of revision that is considered acceptable obviously varies from item to item depending principally upon the absolute size of the aggregate involved. For example, bounds of ±$300 million are used to define the acceptance region for the monthly *balance on current account* item while this acceptance region is increased to ±$700 million for the quarterly balance on current account item.

An important point to bear in mind when considering these graphs is that estimates are expressed in current dollars and therefore no account is taken of the impact of inflation or changes in the absolute size of an aggregate over the period under review. For a gross aggregate that has grown progressively bigger over the period (as most have), the impact of a variation of a fixed size will be greater the further back in the time series a particular period lies. It should also be noted that the scale is not the same on all graphs.

Points on a graph that lie in either the top left or bottom right quadrants indicate a change in sign for the period-on-period movement between the initial and latest estimate. For example, these quadrants include cases where an initial improvement in the deficit on current account was subsequently revised to indicate a worsening of the deficit, or vice versa. Other things being equal, these cases might be considered to be the most likely to mislead the user and should be of most concern.

Monthly revisions and estimates of movement

Looking first at monthly statistics (see appendix Graphs C.1 to C.14), it can be seen that the graphs for the *merchandise trade* items (see appendix Graphs C.1 and C.2) suggest very reliable statistics. With few exceptions, observations are clustered tightly along the imaginary 45° line, indicating that the month-on-month movement has changed little between the initial estimate and the latest estimate for the same month. Observations are also clustered approximately evenly around the 45° line — indicating a relative absence of bias in the estimates. There is a slight predominance of points lying to the right of the vertical axis — indicating more positive than negative movements (consistent with a gradually increasing value of traded goods). For both *merchandise exports* and *imports* items there are few observations lying outside the acceptance region — although there are more for exports than for imports — and none can be considered an extreme outlier.

Appendix Graphs C.3 and C.4 respectively show the pattern for the *non-merchandise credit* and *non-merchandise debit* items of the current account. The fact that observations are more closely clustered around the centre of appendix Graph C.3 than Graph C.4 indicates that month-on-month changes in *non-merchandise credits* are generally smaller than those for *non-merchandise debits*. This is consistent with the typical value of these aggregates — Table 6 shows that the median value of monthly estimates for *non-merchandise debits* is more than 75% larger than the equivalent credit item. Month-on-month changes to *non-merchandise debits* are not only larger than changes to credits but the spread of observations above and below the 45° line indicates that the estimates of change are also less reliable. The preponderance of positive observations above the 45° line and negative observations below the 45° line (about two-thirds of the points are in these categories) also suggests that the initial estimates of month-on-month movement for *non-merchandise debits* tend to be understated (i.e. there is a negative bias in the estimates).

An examination of the graphs for the current account aggregates that contribute to the non-merchandise items show that *income debits* (see appendix Graph C.6) is principally responsible for the variability of estimates of month-on-month movement for total *non-merchandise debits*. The graphs also show that the negative bias in initial estimates of change evident in total *non-merchandise debits* is principally due to the negative bias in *services debits* (see appendix Graph C.8). *Income debits* also has a number of observation points lying outside the acceptance region of which, importantly, six lie either in the top left or bottom right quadrants indicating month-on-month movements for which the direction of change has been reversed between the initial and latest estimate.

Amongst the non-merchandise credit items, *services credits* (see appendix Graph C.7) appears less reliable than either income or unrequited transfers credit. There is some evidence of negative bias in the initial estimates of movement for *services credits* but it is not marked and of the points lying outside the acceptance region only two are in the top left or bottom right quadrants.

Appendix Graph C.11 shows the pattern for month-on-month movements for the *balance on current account*. This summarises movements in the component items of the current account. It indicates a relatively reliable series of observations without obvious bias or extreme points lying outside the acceptance region.

Within the monthly capital account items (see appendix Graphs C.12 to C.14), the graph for the month-on-month changes in net transactions of the *Reserve Bank* shows an unbiased and very reliable series with a wide band of monthly movements ranging from about +$3,100 million to –$2,600 million. Month-on-month changes in net capital transactions of the *general government sector* span a band of changes that is about twice as variable — ranging from approximately +$5,800 million to –$5,800 million — but with no clear evidence of bias in the initial estimates. Of the 15 observation points outside the acceptance region, only two are in the top left or bottom right quadrants and none can be considered to be extreme outliers.

Quarterly revisions and estimates of movement

Turning to quarterly statistics (see appendix Graphs C.15 to C.33), the graphs for the *merchandise trade* items indicate relatively reliable estimates of quarter-on-quarter change, with little evidence of bias and no observations lying outside the acceptance regions within which revisions are unlikely to confuse a user of the statistics. The picture for *non-merchandise credits* and *non-merchandise debits* is different. Both show a marked predominance of positive quarter-on-quarter changes (consistent with steady increases over time in the value of the items that make up these aggregates). There is evidence of negative bias in the initial estimates of quarter-on-quarter change in *non-merchandise credits*, but the debit aggregate shows no bias in this respect. The wide spread of observations above and below the 45° line indicate considerable variability in the estimates of change for both aggregates, but particularly debits.

For all current account components, a clear majority of observations indicate positive estimates of quarter-on-quarter change. Income debits (see appendix Graph C.20) contributes most to the variability in non-merchandise debits estimates of quarter-on-quarter movement and also accounts for most of the outlying observations. In spite of this variability, the graph for the *balance on current account* (see appendix Graph C.25) suggests that when all the changes are added together they result in initial estimates of movement that are relatively reliable, unbiased, and without extreme outliers. In other words, an analyst, using initial estimates of quarter-on-quarter movement in the *balance on current account* as evidence in assessing trends in broad macro-economic conditions, is unlikely to have been misled in the light of subsequent revisions to that movement.

With the exception of the *Reserve Bank* (for which estimates of movement are very reliable), components of the capital account show relatively large variability between the initial and latest estimates of movement. Sizeable revisions to quarter-on-quarter movements are evident for FIA transactions of the *non-official sector* (see appendix Graph C.30) and FIA transactions of the *general government sector* (see appendix Graph C.26). While there are few observations lying outside the acceptance regions, an analyst would need to exercise some caution in using the initial estimates of quarter-on-quarter movements in capital transactions of the *general government* and *non-official sector*s.

SUMMARY OF ANALYSIS OF RELIABILITY

This section of the paper has reviewed the reliability of balance of payments statistics. The analysis has concentrated on the process of revisions to the statistics. In considering the revisions process, evidence of bias and dispersion has been assembled and differences between periodicities of the statistics and over time have also been identified.

The general conclusion is that initial estimates of most items are negatively biased (i.e. understate the latest estimate). This implies that generally positive revisions are required in later estimates. The pattern is similar for all periodicities — monthly, quarterly and annual statistics. Merchandise trade items and the capital transactions of the Reserve Bank are exceptions that are revised little and are generally free of bias.

Of the non-merchandise components of the current account, initial estimates of *unrequited transfers* are generally revised the least — in proportional terms and within the first year of revision by an average of less than 1% for all periodicities. Initial estimates of services credits and debits are less reliable and analysis of the revisions history for services credits shows significant upward revisions occurring some years after the initial estimate due to methodological improvements.

In terms of the average value of revisions, *income debits* are the least reliable of the current account components for all periodicities. This is also true in proportional terms except for annual estimates where revisions to income credits are particularly high, reflecting the revisions experience with reinvested earnings estimates.

For all periodicities, average one-year revisions to the *balance on current account* are negative (i.e. revisions make the deficit on the current account larger). Subsequent revisions bring the estimate back down to a value close to the initial estimate. It is also interesting that in proportional terms, average one-year revisions to quarterly estimates of the *balance on current account* (4.2%) are larger than the revisions to both monthly (2.3%) and annual (2.0%) estimates of this balance.

Bias of capital account items is larger and more erratic than current account items. As noted, transactions of the *Reserve Bank* are virtually unbiased. Transactions of the *general government sector* are dominated by foreign borrowings and initial estimates of these are consistently negatively biased, with annual statistics experiencing the largest average revisions in proportional terms (6.7%). Initial estimates of *non-official sector transactions* are also strongly negatively biased (for both FIA and AIA) in quarterly and annual statistics.

Initial estimates of the current account deficit have tended to be relatively close to the final estimate, and initial estimates of movements in this balance have been relatively reliable and unbiased. On the other hand, the initial measures of net capital transactions are strongly negatively biased (implying an understatement of the surpluses) and the behaviour of revisions is erratic. This means that the initial estimates of the balancing item and subsequent sizeable revisions to it largely reflect deficiencies in measuring net capital account transactions.

SECTION 4 INITIATIVES TO IMPROVE QUALITY

A range of initiatives to improve the quality of the balance of payments are either under way or planned. These improvements are generally targeted at areas that the analyses in this paper highlight as issues of accuracy or reliability.

As an illustration of the results already achieved for international services statistics, an article on *Developments in Measuring Australia's International Trade in Services,* published in *International Trade in Services, Australia, 1992–93* (5354.0) describes the data sources currently used, changes made in the collection strategy, data quality initiatives being pursued and the future developments that are expected. The negative bias in initial estimates for *services credits* and *debits*, as revealed in the analyses in this paper, largely reflects the success which the improvements noted in that article have already had in producing better measures of international trade in services.

Another significant area for quality improvement identified in the analyses is in the measurement of *reinvested earnings*. The degree of estimation that is currently based on extrapolations of annual survey results contributes significantly to revisions to both the income credits and income debits series as well as to the associated capital account series. A quarterly survey methodology is currently being developed and it is expected that quarterly survey data will be incorporated into the accounts in the near future.

A range of other initiatives have been implemented to monitor quality and indicate areas for improvement in the current account. Work already undertaken in bilateral comparisons of data by region with our trading partners, both within the framework of the Asia Pacific Economic Cooperation initiative and more generally, has reaffirmed the quality of merchandise trade aggregates. Future work will broaden the country base for merchandise trade comparisons and extend it to cover services and investment data. A particular example of the last point will be the ABS participation, in 1997, in a global Coordinated Portfolio Investment Survey being organised by the IMF. It is expected that results from partner countries will be available to check the quality of output from existing ABS collection methodologies. The partner information may also be substituted for data from existing ABS surveys where data collection by a partner country, with better access to counterparties than can be achieved in domestic collections, can better target the required information. In a similar fashion, partner country use of ABS data from that coordinated collection may highlight further quality issues to be addressed in the Australian data.

More generally, a number of other improvements have already been made, are underway or are planned for the quarterly ABS Survey of Foreign Investment. Improvements in capturing and valuing transactions by non-residents in securities domiciled in Australia have been undertaken. However, further work is underway to collect a significantly

increased range of data quarterly to avoid the necessity for significant revisions (highlighted in the analyses in this paper) that usually flow from the more comprehensive coverage of the annual survey.

The ABS is also currently reviewing its concepts, sources and methods in light of new international standards being issued for balance of payments statistics. It is expected that the implementation of the new standards, from the September quarter 1997 and October 1997 issues of the balance of payments quarterly and monthly publications, will also bring significant improvements in data quality, particularly for the capital account. The more detailed information required by the standards regarding both transactions in financial instruments and price changes in the holdings of these instruments is expected to improve both the quality of reporting in ABS collections and the capacity of ABS compilation procedures to develop comprehensive estimates. Among the improvements will be the identification and measurement of international transactions in financial derivatives.

Other quality initiatives will be developed and implemented over time as analysis reveals the need for focus in particular areas and as resources permit identified priorities to be targeted.

APPENDIX A BIAS IN BALANCE OF PAYMENTS STATISTICS

Graphs in this appendix show the pattern of revisions through which various balance of payments aggregates pass from their *initial* estimates (denoted as *O* on the horizontal axis) through various revision points (sequentially numbered on the horizontal axis) to *final* estimates (denoted as the unitary line at ratio 1.00 on the vertical axis).

In the case of monthly statistics, initial estimates refer to the first published estimates for any month in the reference month issue of the ABS balance of payments publication (5301.0); similarly, initial quarterly estimates refer to the first published quarterly estimates appearing for that reference quarter in 5302.0; and for annual series, initial estimates refer to the first published estimates for a full financial year appearing in the June quarter issue of 5302.0 for that year. The *final* estimates are the latest available estimates and in this analysis represent data consistent with the January 1995 issue of 5301.0 and the December quarter 1994 issue of 5302.0.

Graphs are presented for monthly, quarterly and annual statistics. For monthly statistics, the initial estimate and revisions to it over the next 2 years (24 monthly revisions) are plotted against the latest estimate; for quarterly statistics, the initial estimate and revisions to it over the next 3 years (12 quarterly revisions) are plotted against the latest estimate; and for annual statistics, the initial estimate and revisions to it over the next 6 years (6 annual revisions) are plotted against the latest estimate.

The observation periods used for the graphs in this appendix are the 102 months from January 1986 to June 1994; the 34 quarters from March quarter 1986 to June quarter 1994; and the 13 years from 1981–82 to 1993–94 (other than for capital account component series by direction of investment, for which the annual periods commence in 1985–86). The chosen *final* observations mean that, for every annual observation period there is at least one revision; for quarterly observations there are at least 2 revisions and for monthly series there are at least 7 revisions. For example, this means that in the monthly graphs there will be 102 observations contributing to representations for the initial estimate through to the seventh revision, but with only 85 observations being available to contribute to representations at the twenty-fourth revision. In the annual series, sixth-round revisions will be analysed based on only 8 observations for the current account and balance on capital account. For all the components of the capital account, there is a maximum of 9 annual observations (for initial estimates) and only 3 observations for sixth round revisions.

Observations plotted for each aggregate are ratios of preliminary estimates (including the initial estimate) to the latest estimate after various numbers of revisions. For example, a preliminary estimate of 180 for which the latest estimate is 200 will have a ratio value of 0.90. The latest estimate (with a ratio value of 1.00) is shown as a horizontal line in the middle of each graph.

Median ratio values, at each revision cycle, are shown as a heavy black curve. The method used to calculate the median ratio of, say, monthly exports at revision number 3 is, first, to find, for each month, the ratio

of the estimate of exports after the third revision to the latest estimate for that month. The ratios so calculated are then ranked in ascending order and the middle value selected as the median.

Also shown on these graphs, as hatched lines, are the upper boundaries of the first and third quartiles of ratio observations (i.e. the lines corresponding to 25% and 75% of ratio observations when they are ranked in order). The area between these two lines therefore portrays the behaviour of the middle 50% of ratios or, alternatively, the 25% of ratios immediately above the median and the 25% immediately below.

Because ratios are being graphed in this appendix, all balance of payments series that are compiled on a gross basis (either as credits or debits) or which are net series that have carried the same sign for the entire period under analysis (such as the balance on current account), will generate ratios that are positive, and which will generally be within a limited span. However, care is needed in interpreting the graphs compiled for net series that change sign. For such series (all the capital account series), it is possible that initial estimates and some subsequent revisions will have a different sign to the *final* estimate, producing a negative ratio; or be proportionately very much larger than a final estimate that is close to zero, producing a very large ratio; or, for initial estimates close to zero, be a very small fraction of a final estimate, producing a ratio close to zero. Much wider scales are used to present the capital account ratios to capture the generally wider fluctuations in revisions history, and the scales widen from monthly to quarterly and then annual series where time period aggregates may generate much greater proportional revision for net series. However, occurrences of sign turnaround and movements from or to estimates close to zero cannot be readily accommodated on scales that would allow the graphs to meaningfully display the remaining ratios, particularly for the medians. Where such occurrences account for less than half the ratios lying above and/or below the median that are calculated for a revision point within the period of observation for any series, graphing the median ratios and the first and third quartiles will not involve representing these extreme ratio values. However, for annual series where relatively few observations are available for each revision point, the occurrence of extreme ratio values is evident for some net capital account series. In Graph A.46, revisions to three of the nine initial estimates have changed the sign of the net series, preventing presentation of the first quartile plot point for initial estimates. In Graph A.52, the turnarounds in the sign of the *balancing item* resulting from revisions (for example, in the case of initial estimates, the sign changes in 4 out of 13 observations) and revisions that are many times the size of the final estimate (again in the case of initial estimates, in 4 out of 13 observations the ratios were above 2.00) preclude meaningful presentation of both the first and third quartile ratios for most revision points.

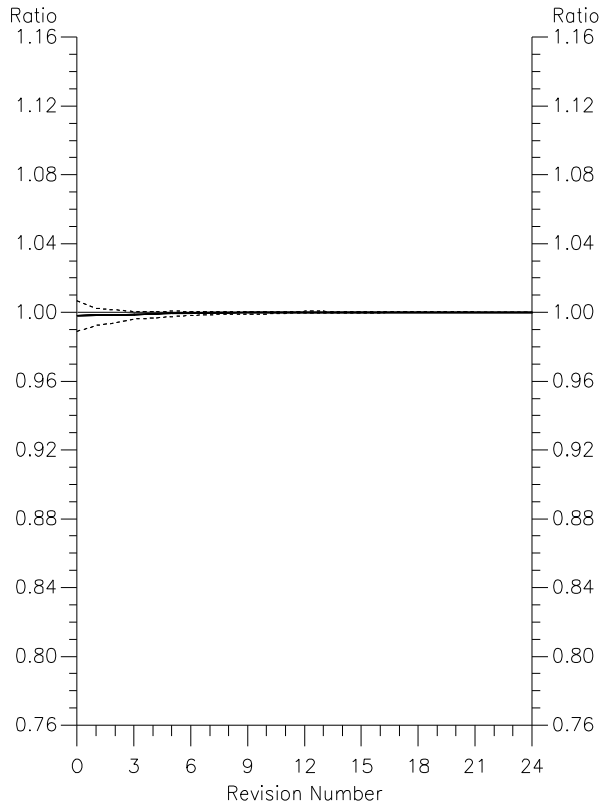
Reviewing the graphs in this appendix for the balance on current account provides an example of the interpretations that can be made from this presentation. Graph A.11 shows that the median initial estimate and the first three median revisions of the monthly *balance on current account* are very close approximations of the final median estimate. However, subsequent revisions over the following 12 to 15 months, on

average, overstate the deficit, which remains overstated through the subsequent revision points that are shown. The first and third quartiles are roughly evenly distributed around the median estimate, and narrow over the revision period under analysis.

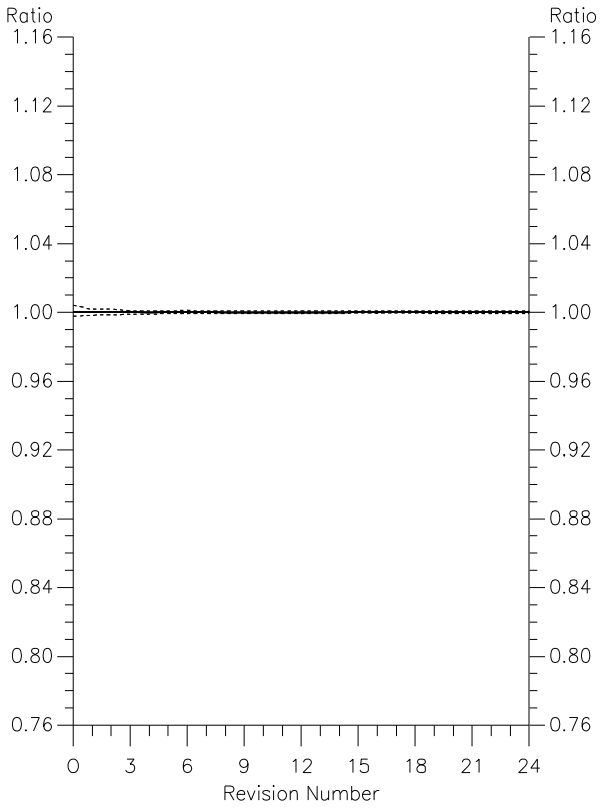
The quarterly series for the *balance on current account* (see appendix Graph A.25) displays a pattern similar to the monthly series. The median initial estimate is close to the median final estimate but moves away with the first quarterly revision and continues to worsen the overstatement of the deficit through to the fifth revision point (equivalent to the deterioration seen up to the fifteenth monthly revision point). However, by extending the revision period to three years compared with the two years shown for monthly estimates, the quarterly graph throws further light on developments with revisions to the estimates. Median estimates after the eighth revision point are all closer to the final median estimate than that eighth revision point estimate.

Graph A.44 shows the annual series for the *balance on current accoun*t. The median initial estimate shown here understates the final estimate (a result not observed in the quarterly series) and by more than was observed for the monthly series. The smaller number of initial observations used (only nine) compared with the monthly and quarterly analysis contributes to this outcome (there were five understatements and four overstatements of the deficit), as does the circumstance that understatement in only one or two quarterly estimates can result in an annual estimate being understated. However, consistent with the monthly and quarterly series, the annual revisions raise the median deficit estimate, which overstates the deficit even after six annual revision cycles.

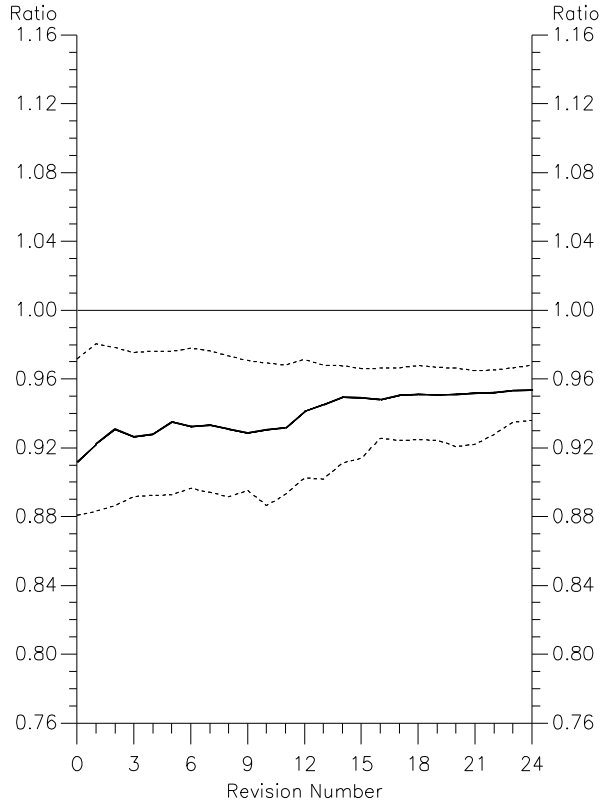
A.1 Merchandise Exports



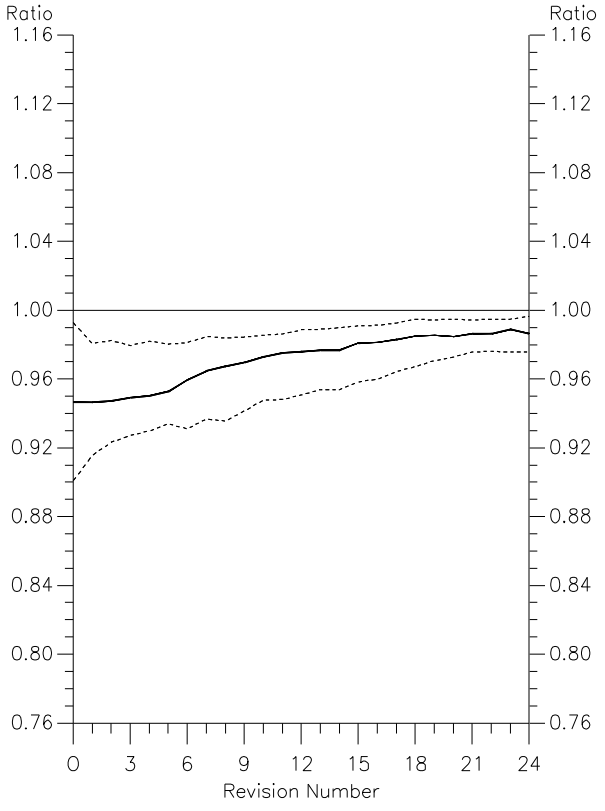
A.2 Merchandise Imports



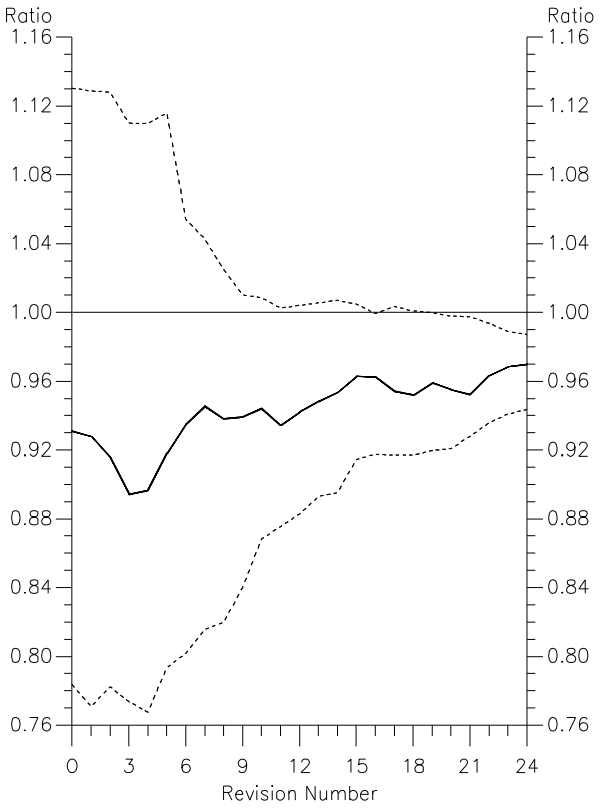
A.3 Non–merchandise credits



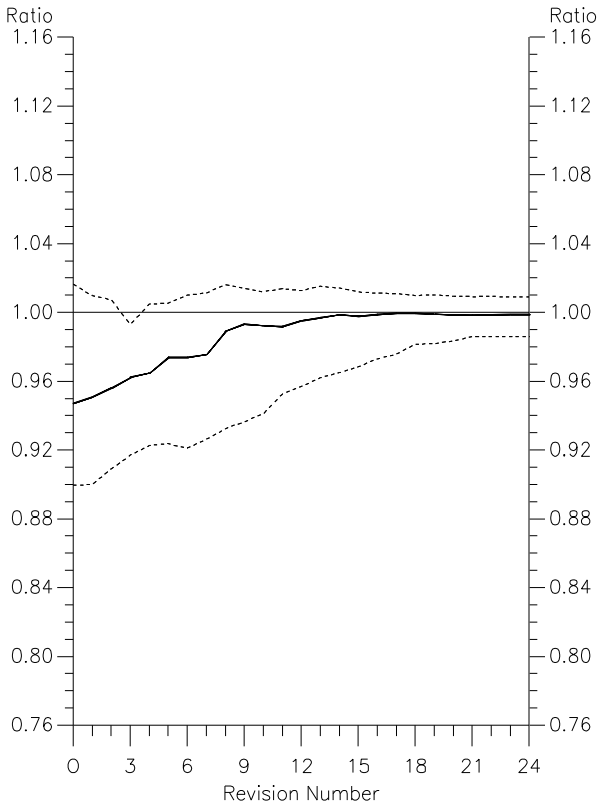
A.4 Non–merchandise debits



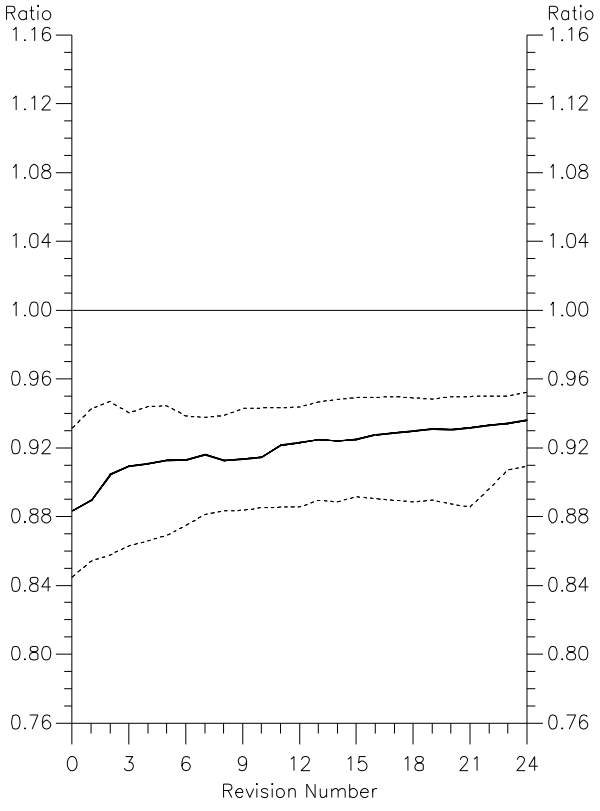
A.5 Income – Credits



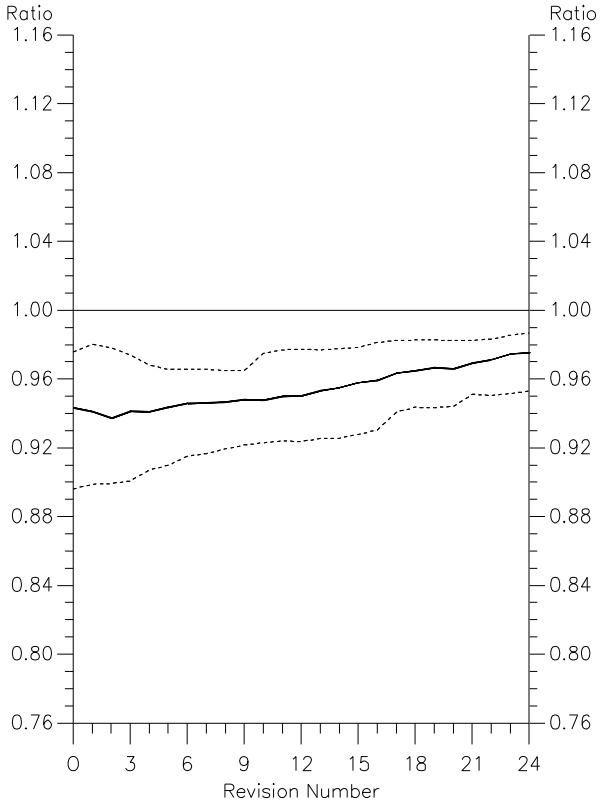
A.6 Income – Debits



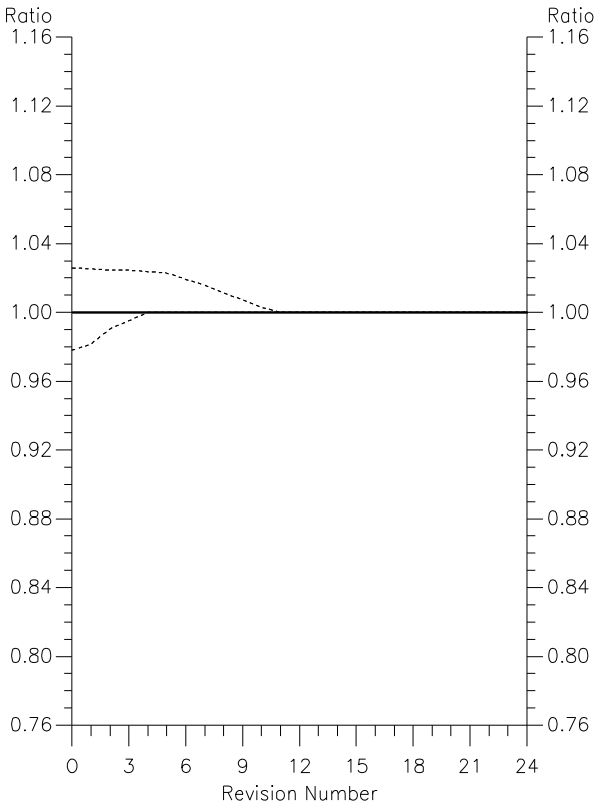
A.7 Services – Credits



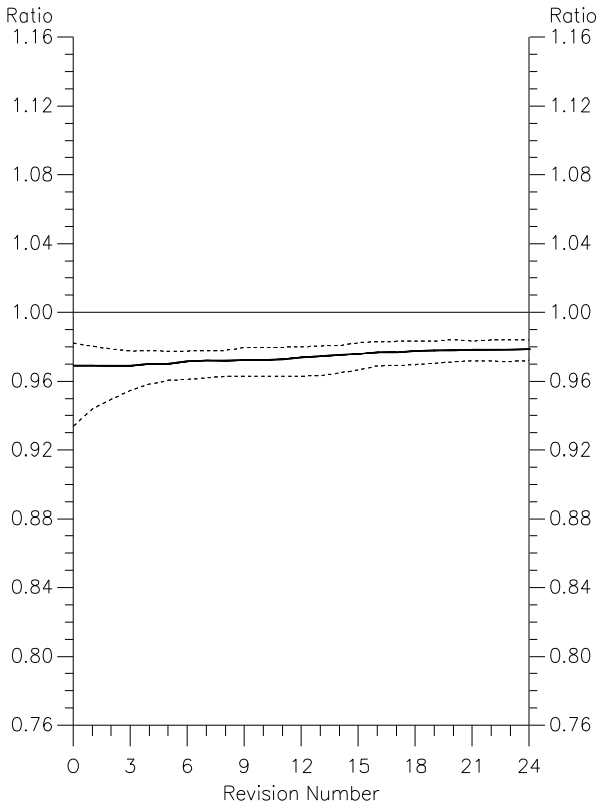
A.8 Services – Debits



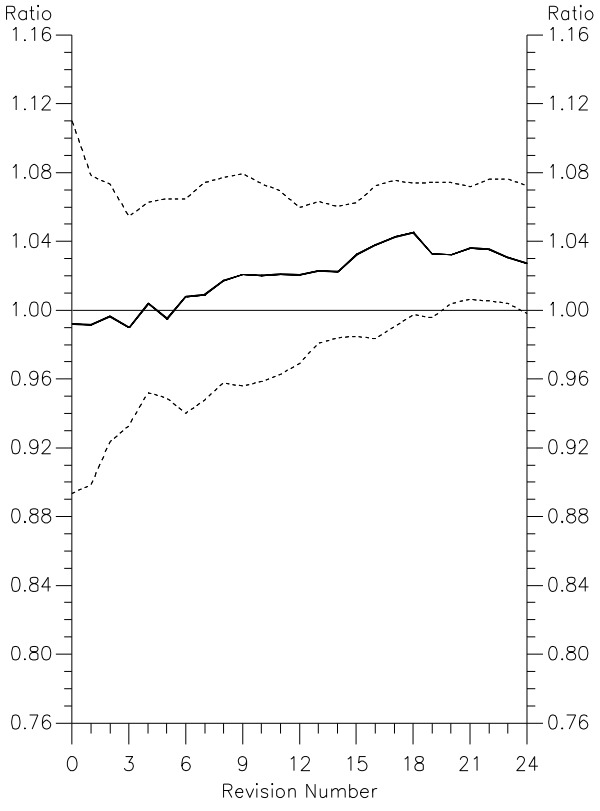
A.9 Unrequited Transfers – Credits



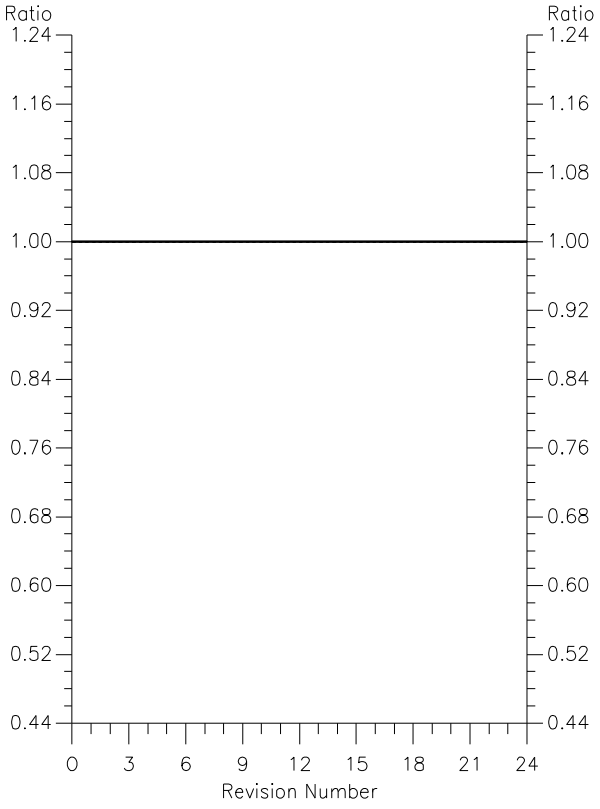
A.10 Unrequited Transfers – Debits



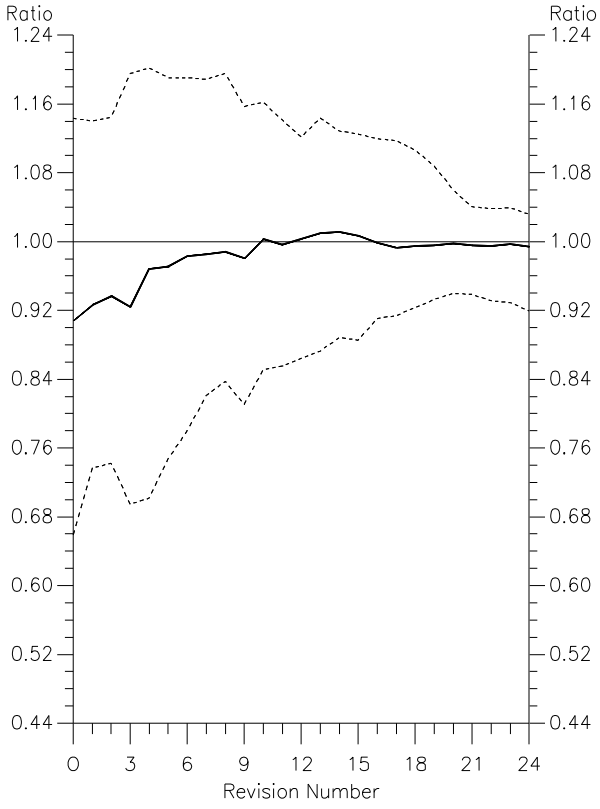
A.11 Balance on Current Account



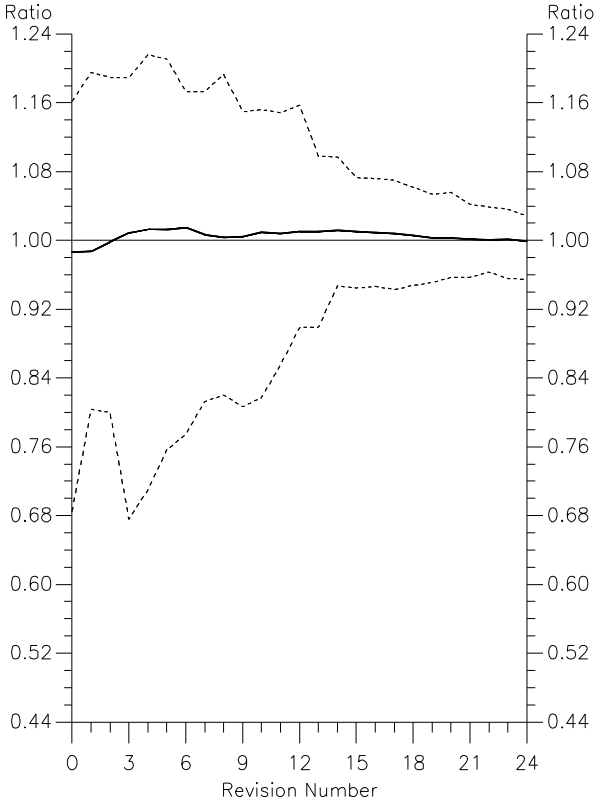
A.12 Net Capital – Reserve Bank



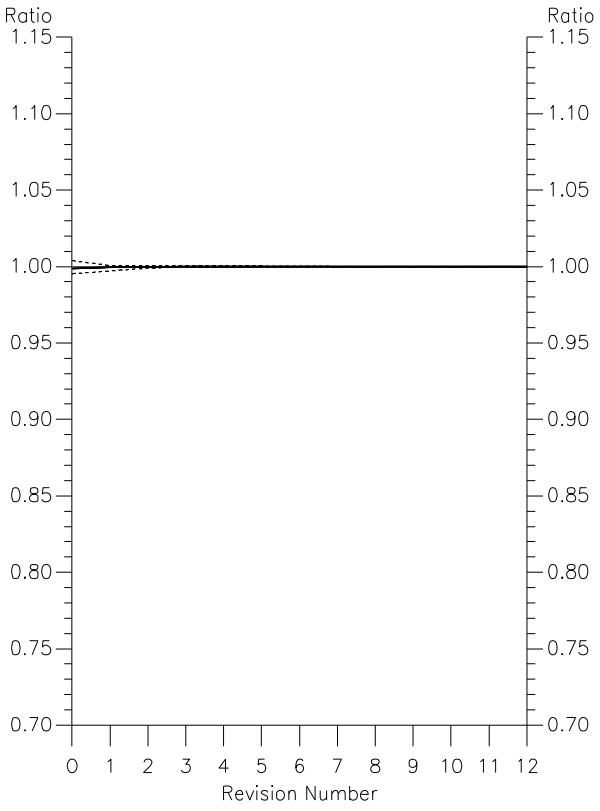
A.13 Net Capital – General Government



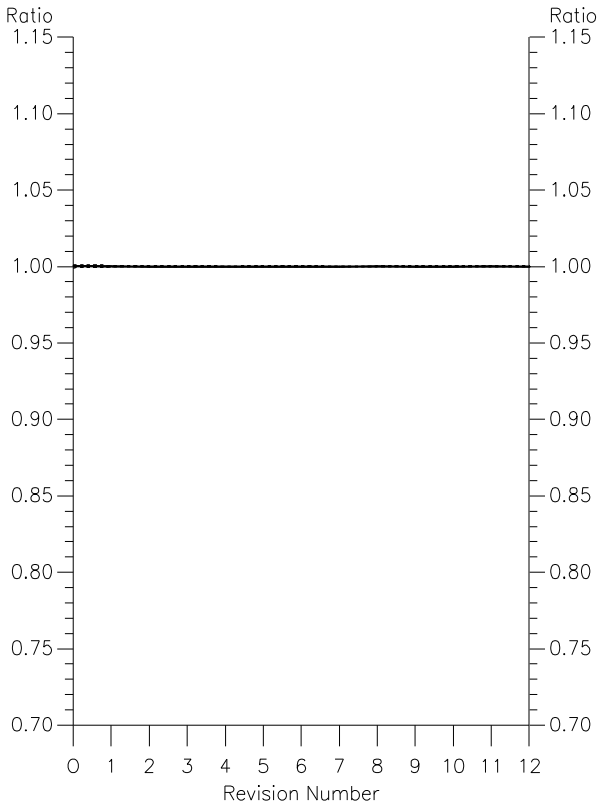
A.14 Net Capital – Official Sector



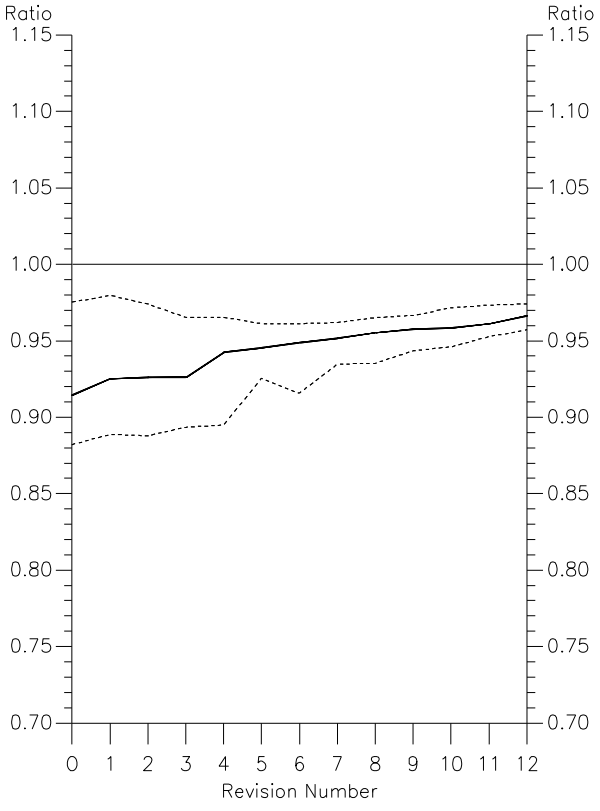
A.15 Merchandise Exports



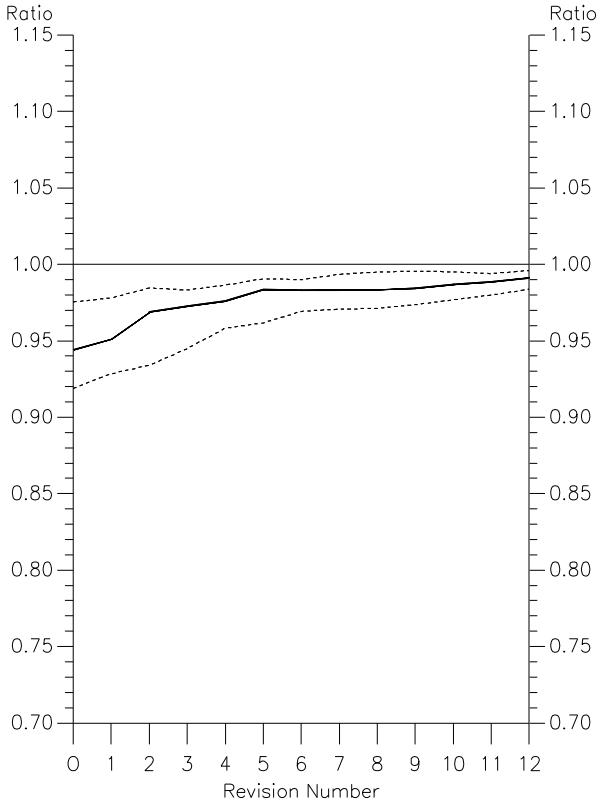
A.16 Merchandise Imports



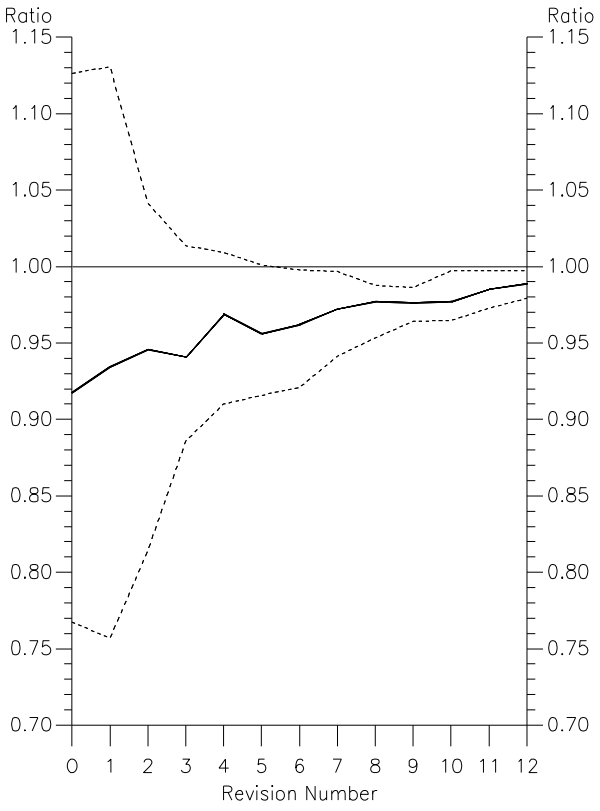
A.17 Non–merchandise credits



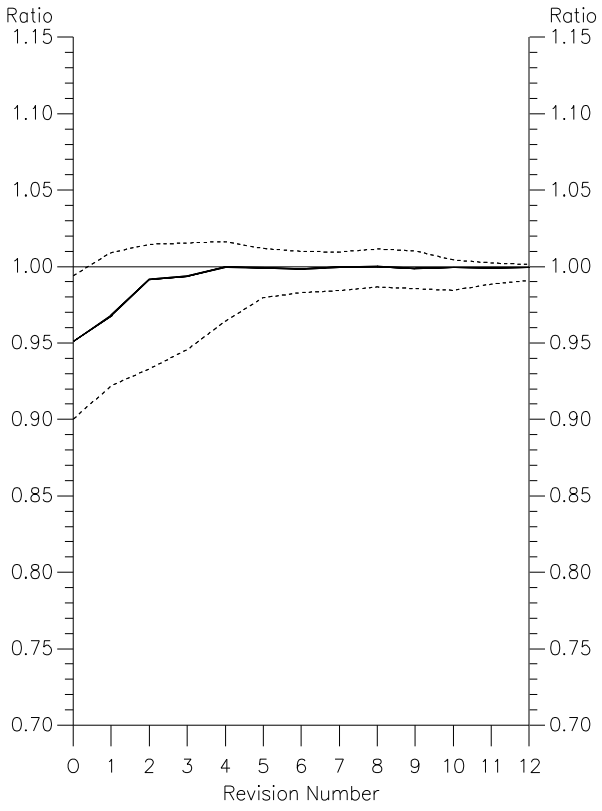
A.18 Non–merchandise debits



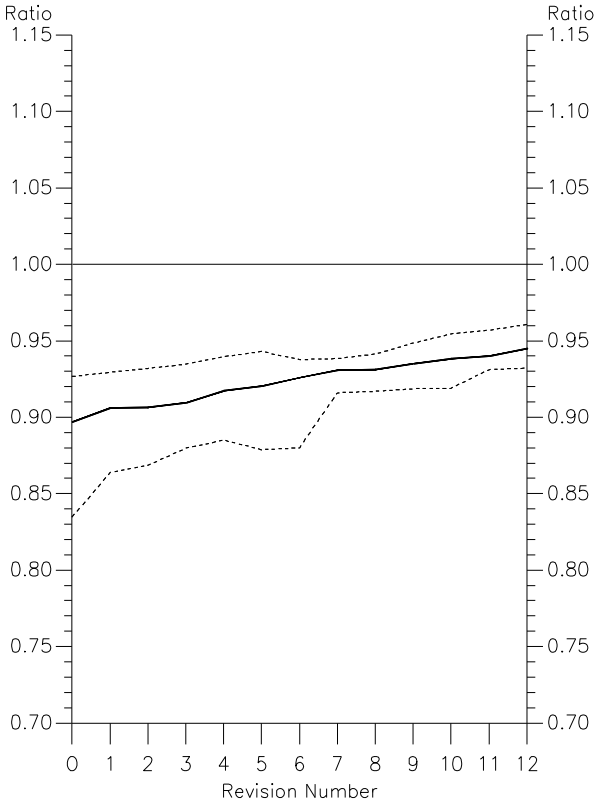
A.19 Income – Credits



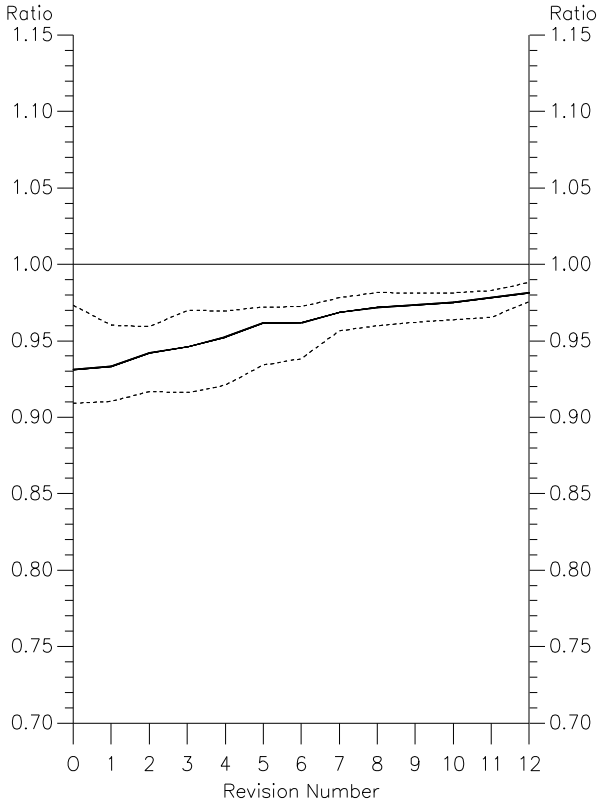
A.20 Income – Debits



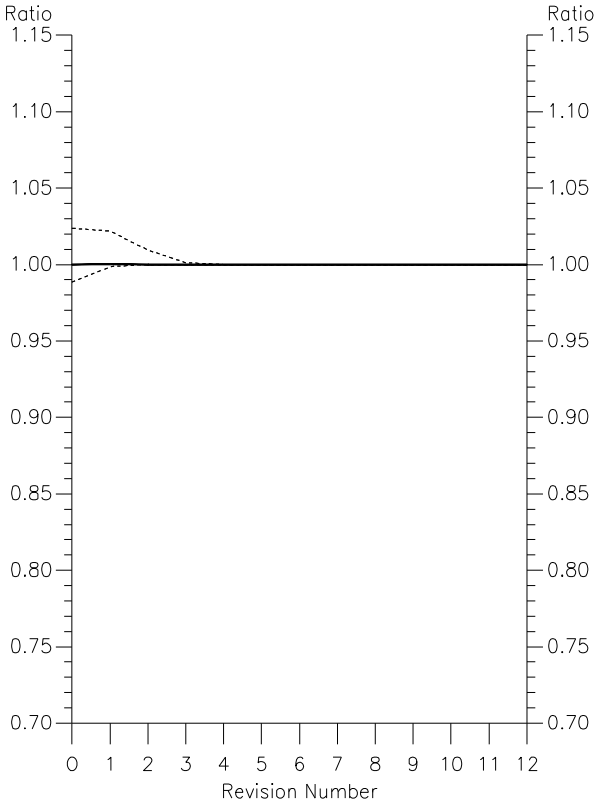
A.21 Services – Credits



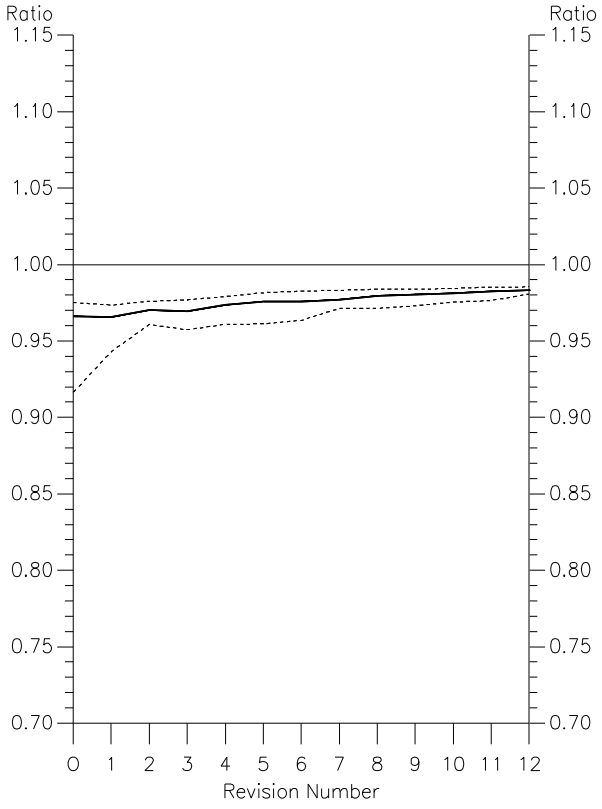
A.22 Services – Debits



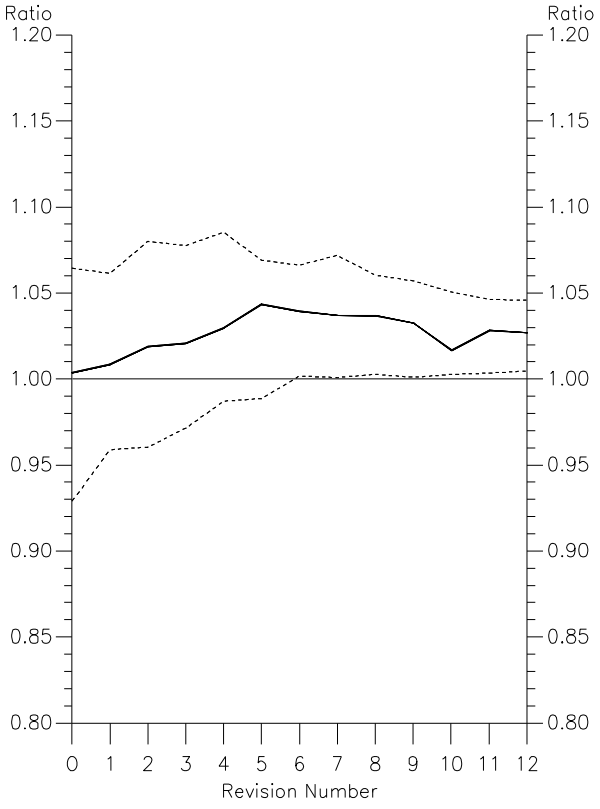
A.23 Unrequited Transfers – Credits



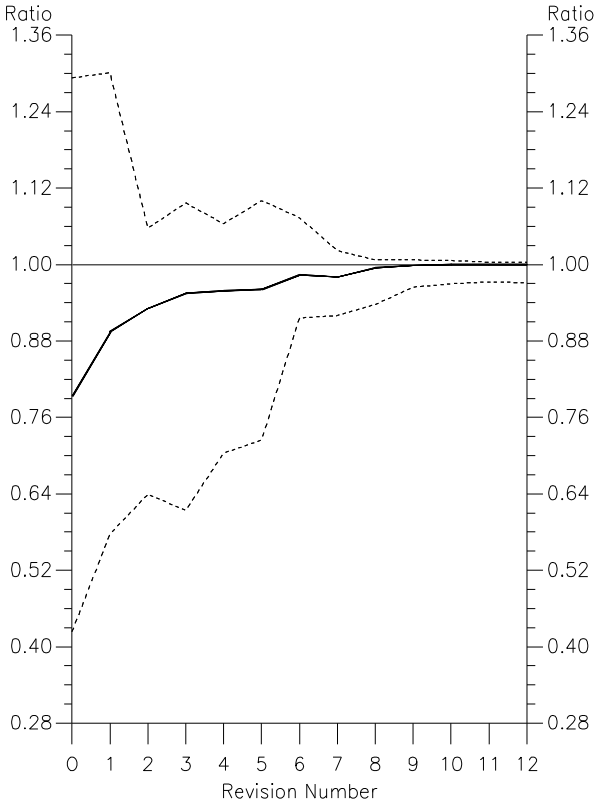
A.24 Unrequited Transfers – Debits



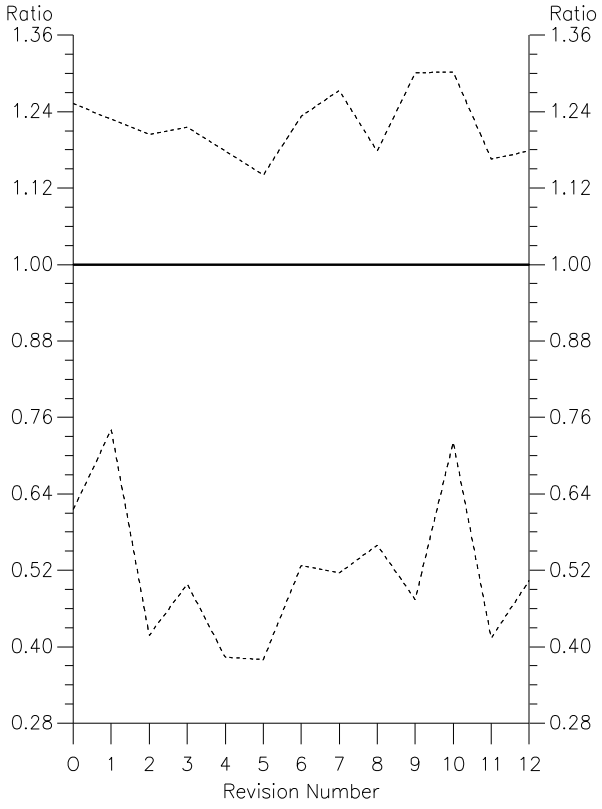
A.25 Balance on Current Account



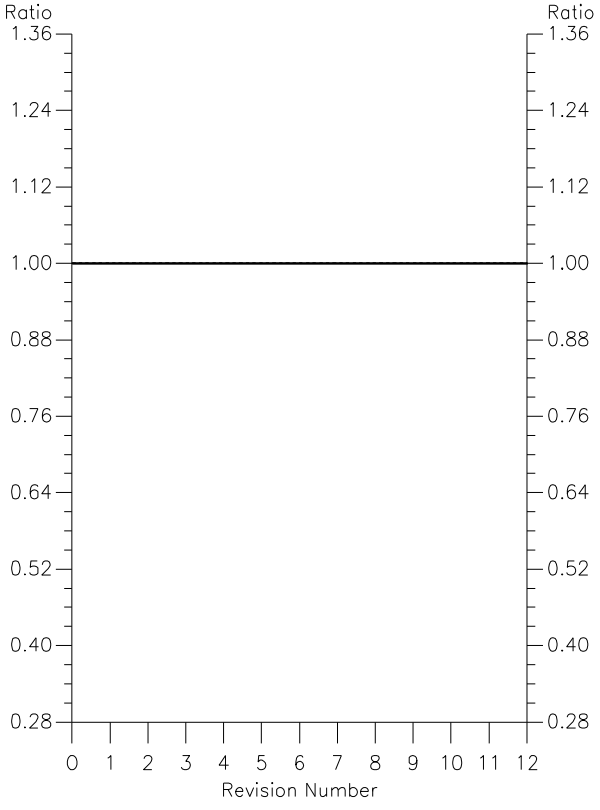
A.26 FIA – General Government



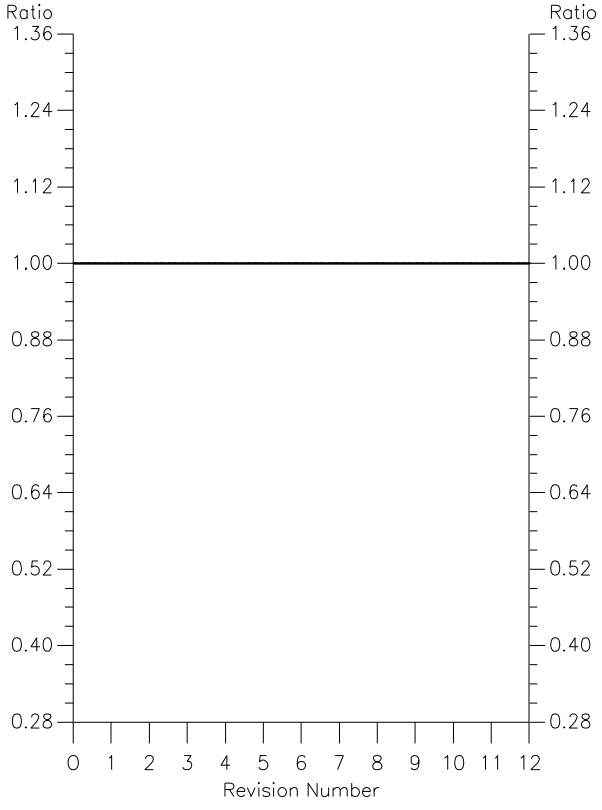
A.27 AIA – General Government



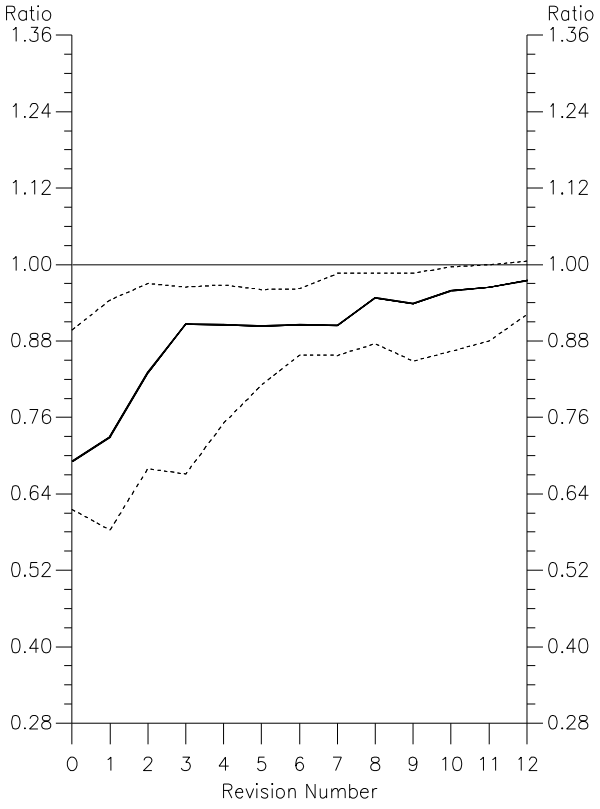
A.28 FIA – Reserve Bank



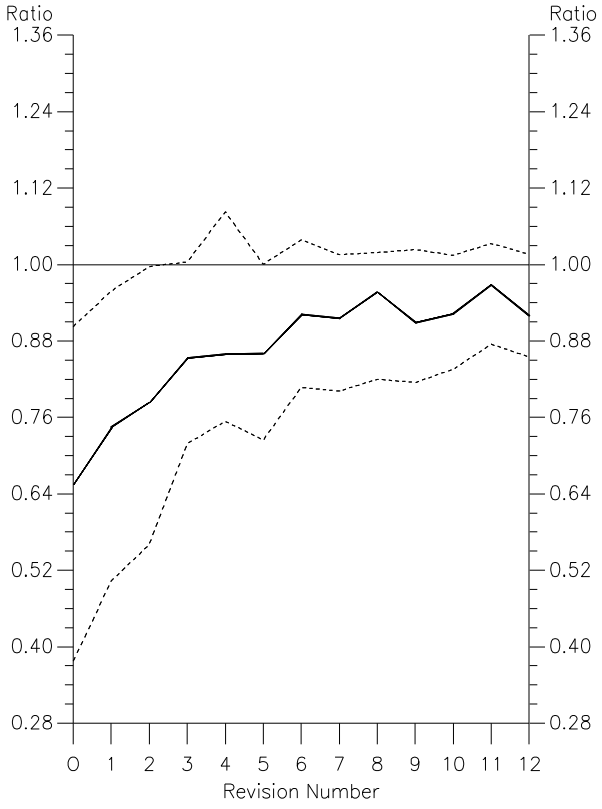
A.29 AIA – Reserve Bank



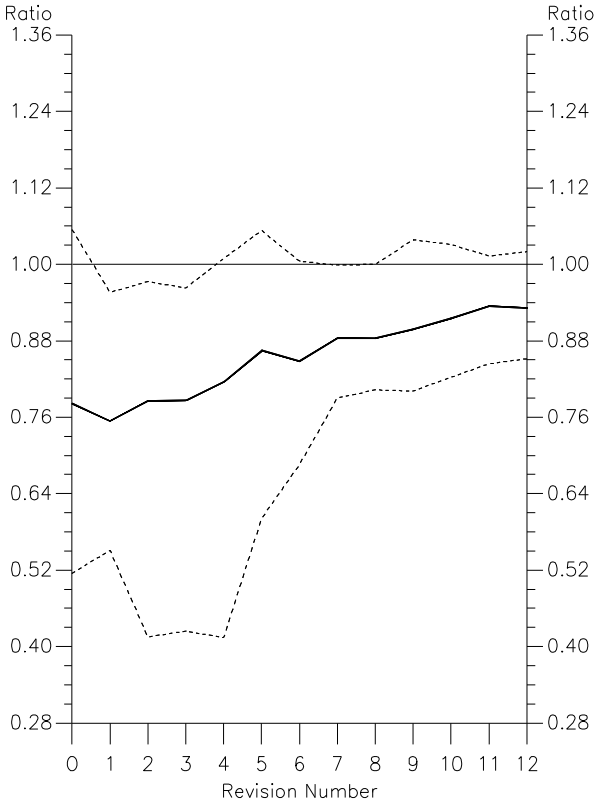
A.30 FIA – Non–official Sector



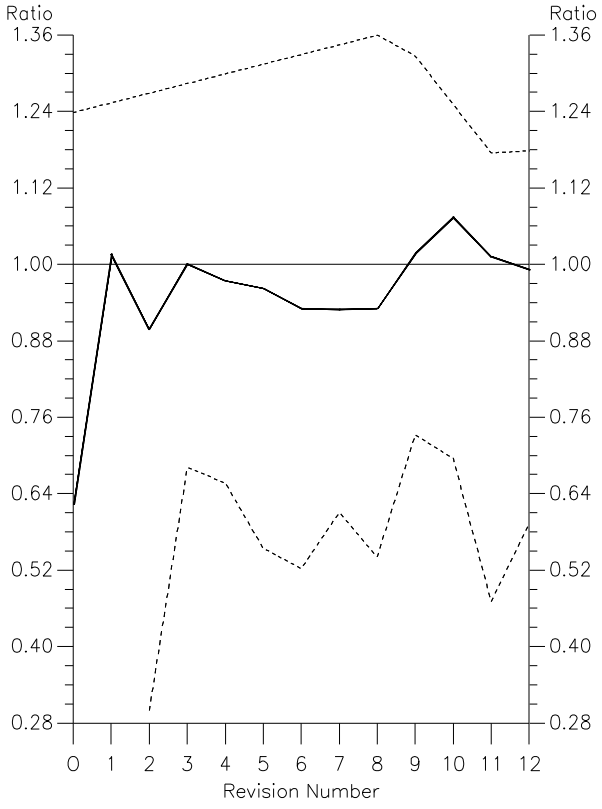
A.31 AIA – Non–official Sector



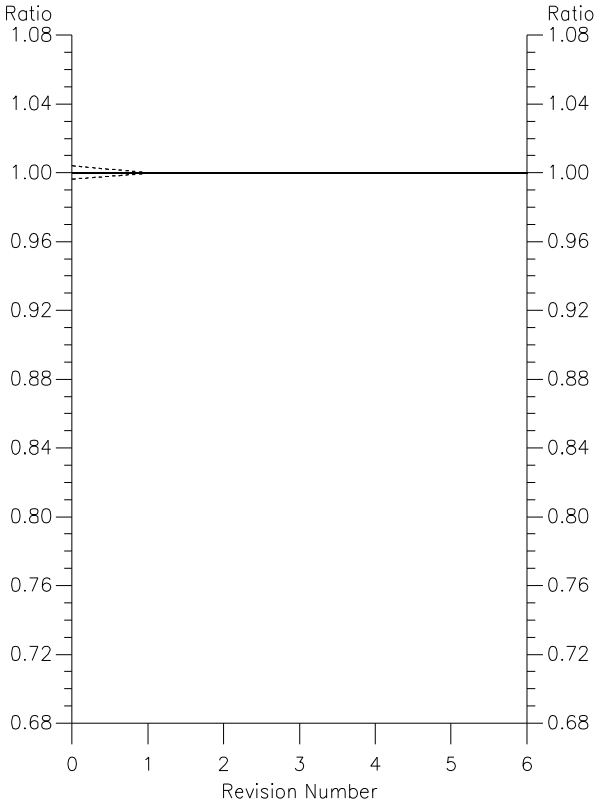
A.32 Balance on Capital Account



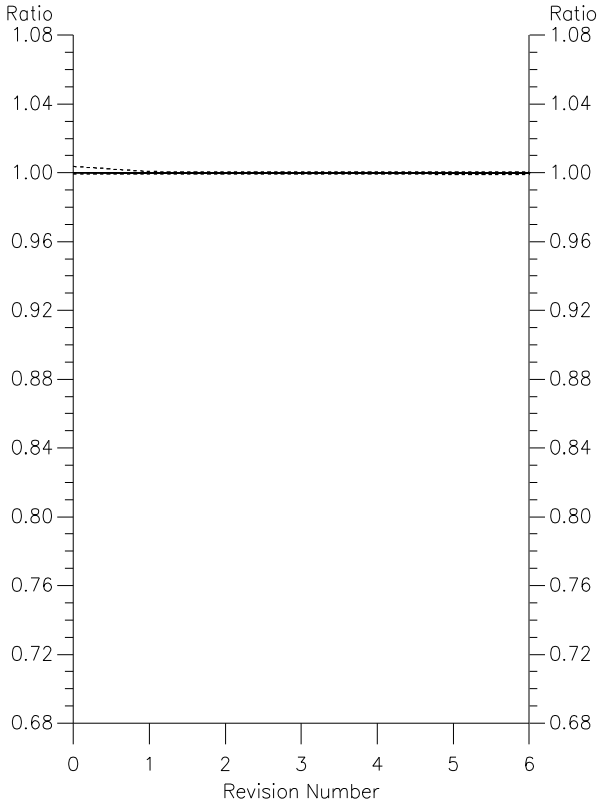
A.33 Balancing item



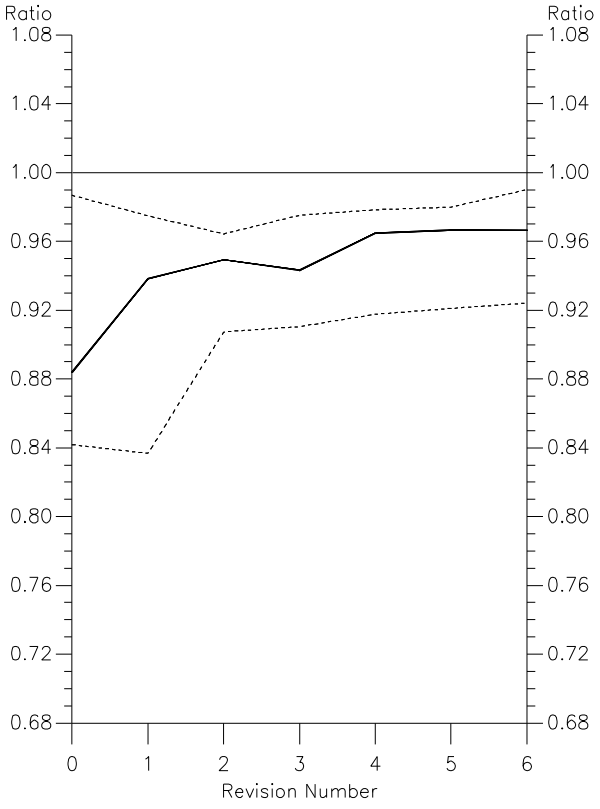
A.34 Merchandise Exports



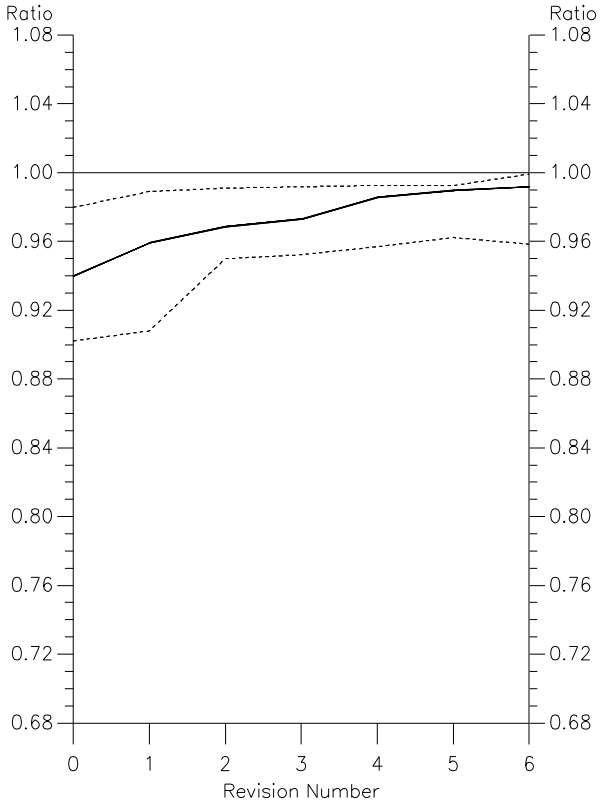
A.35 Merchandise Imports



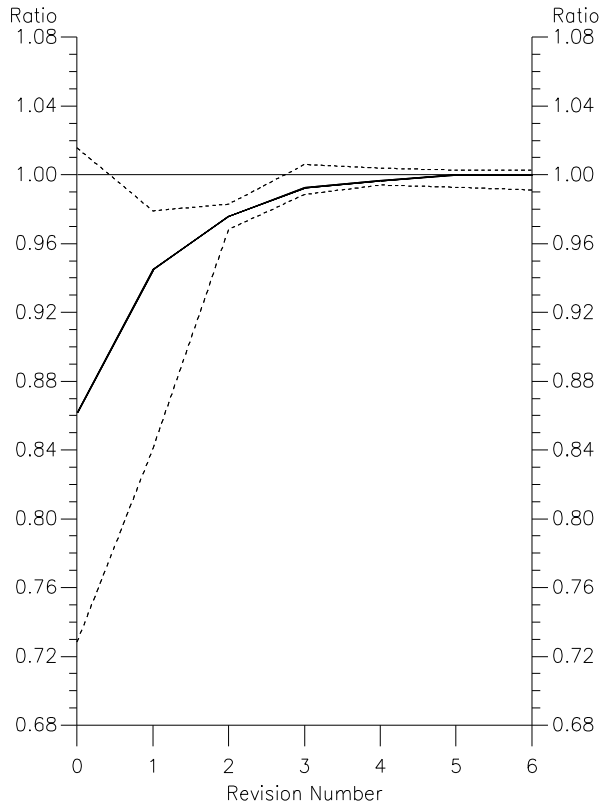
A.36 Non–merchandise credits



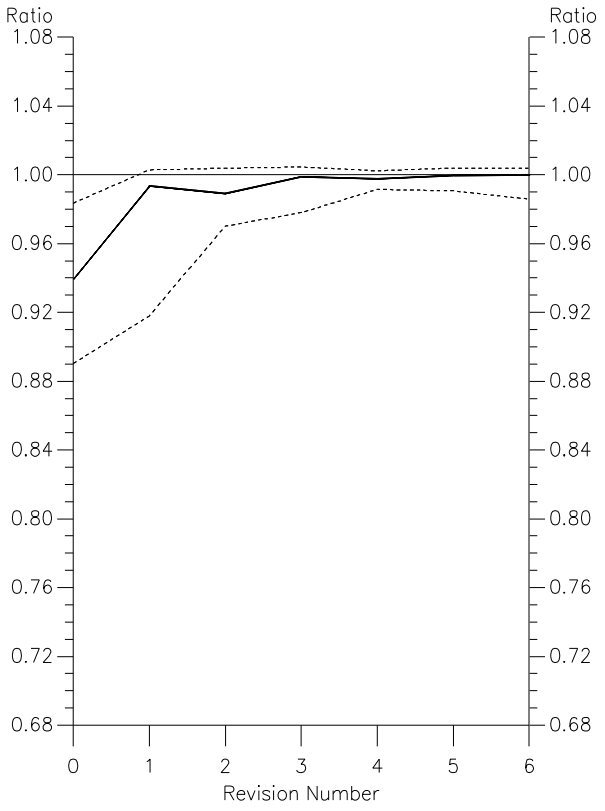
A.37 Non–merchandise debits



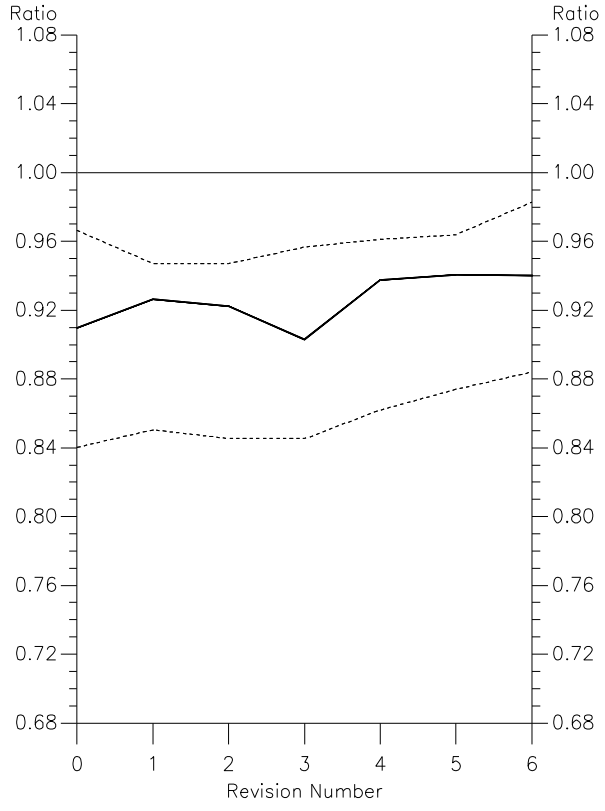
A.38 Income – Credits



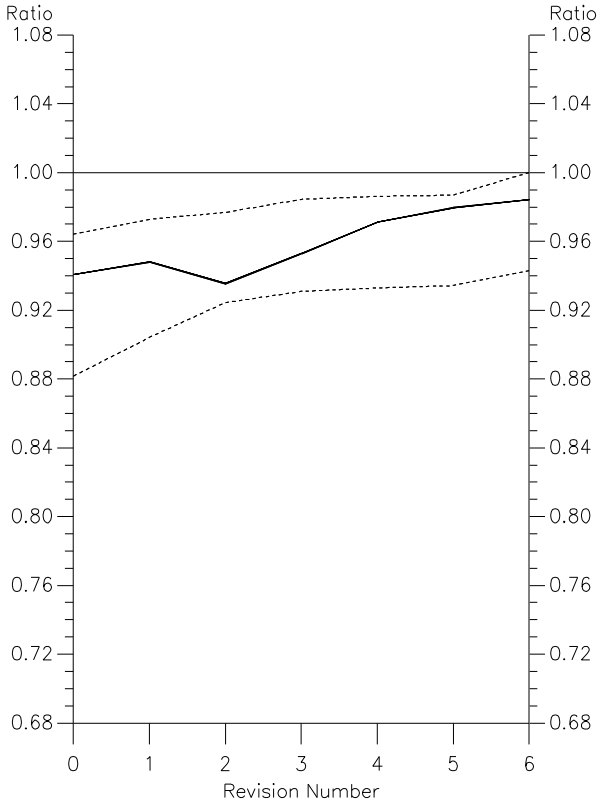
A.39 Income – Debits



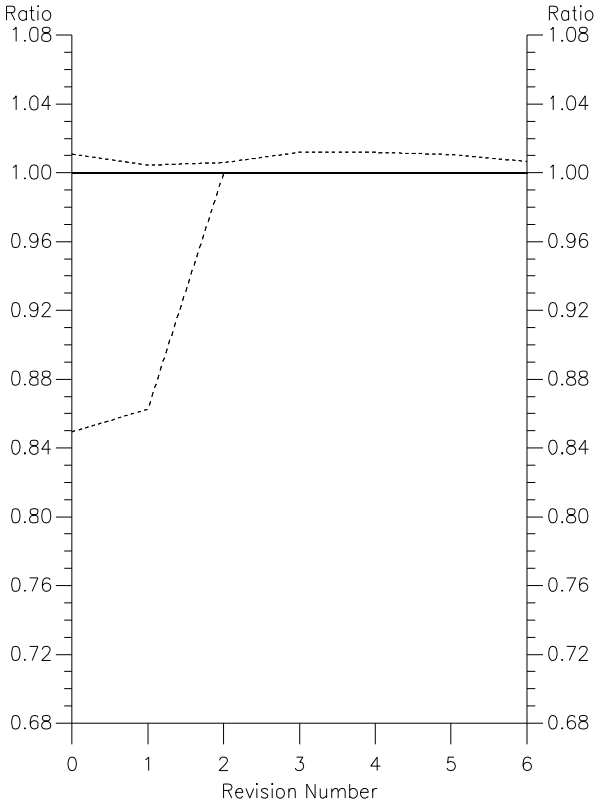
A.40 Services – Credits



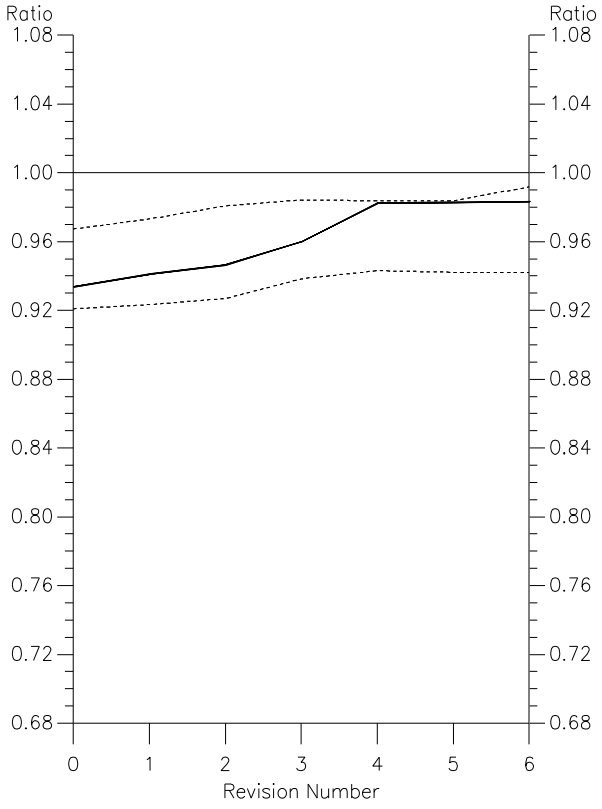
A.41 Services – Debits



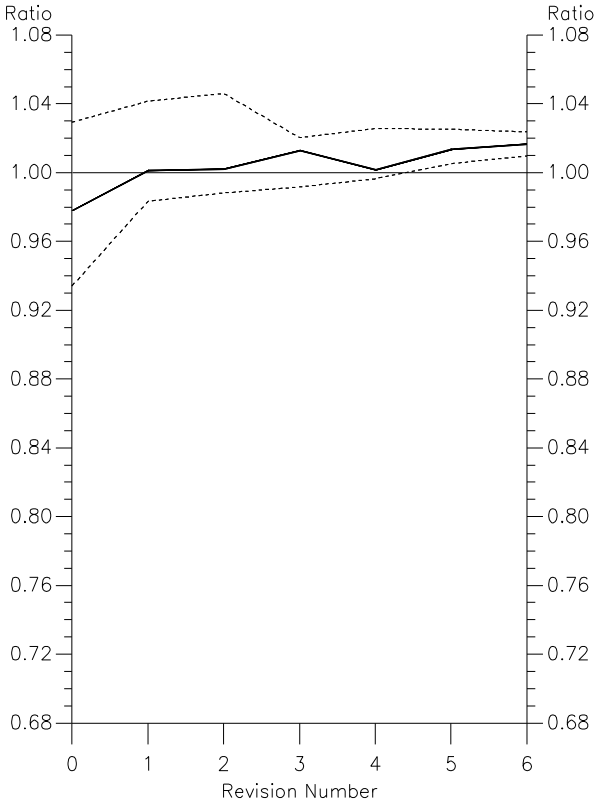
A.42 Unrequited Transfers – Credits



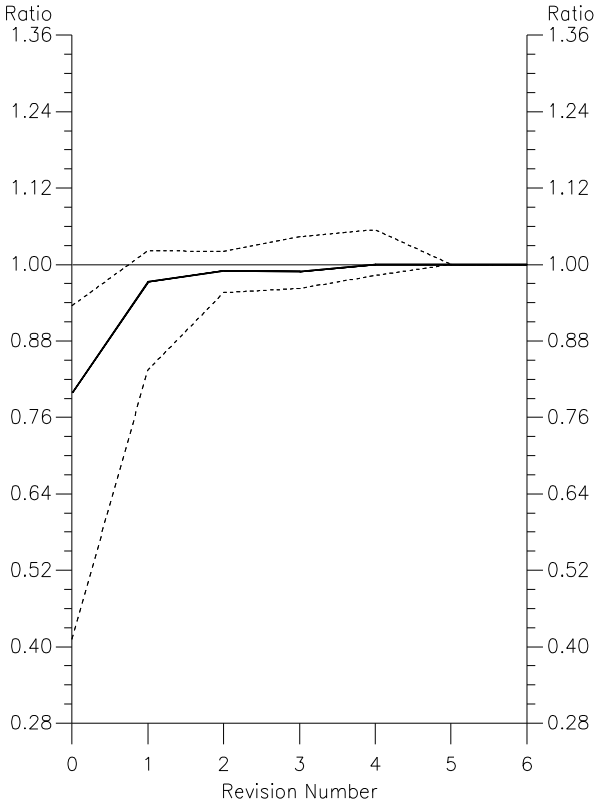
A.43 Unrequited Transfers – Debits



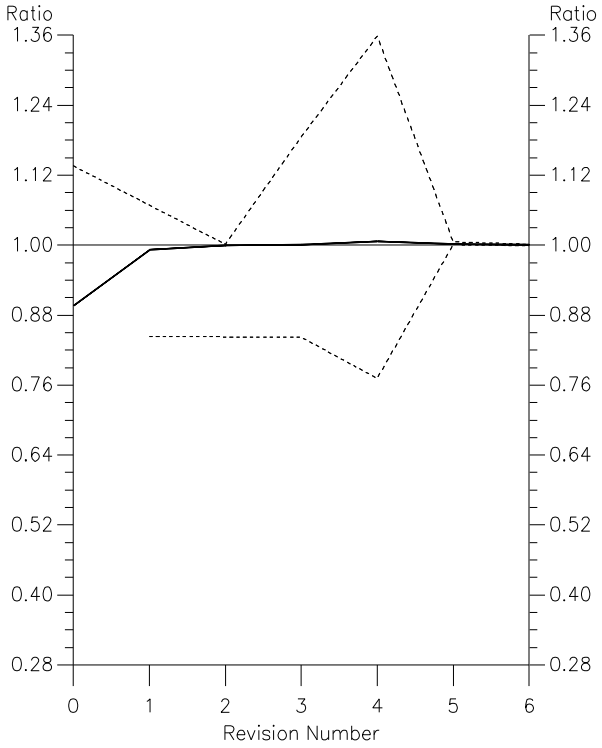
A.44 Balance on Current Account



A.45 FIA – General Government

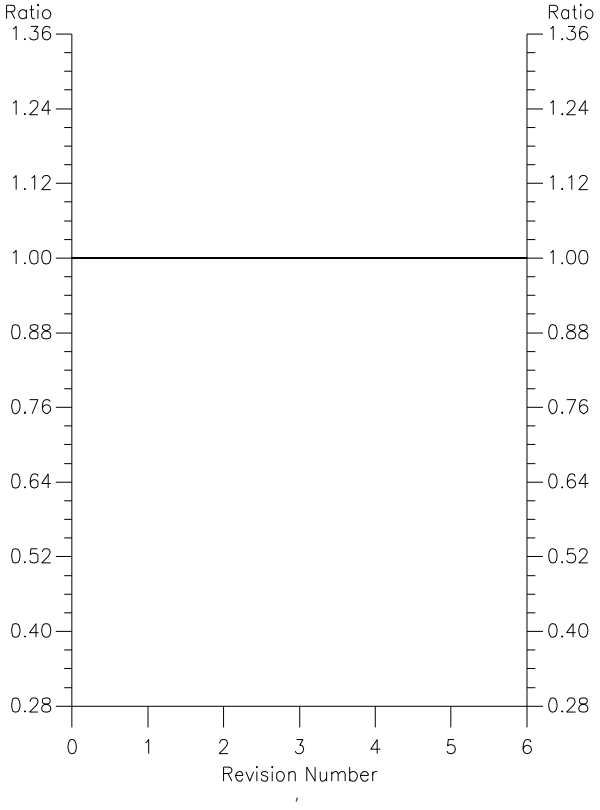


A.46 AIA – General Government (a)

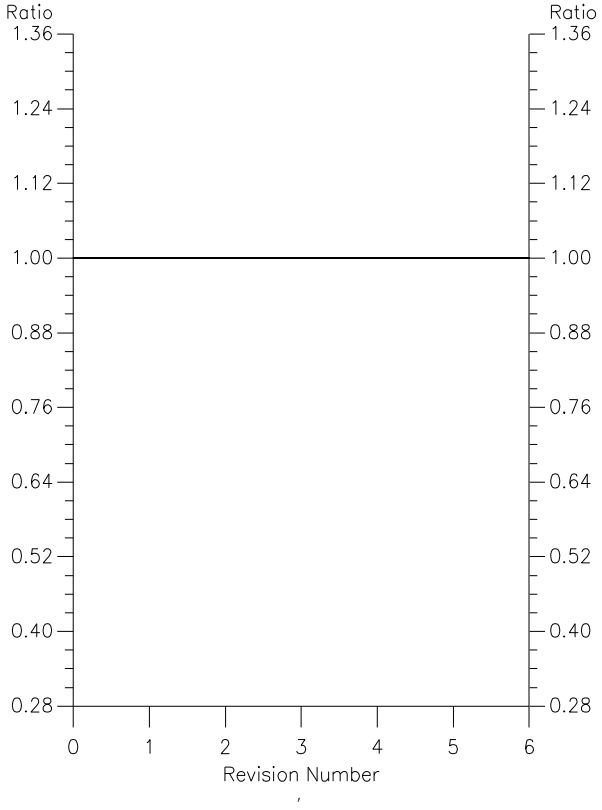


(a) See introductory comments to this appendix for an explanation of missing quartile plot points

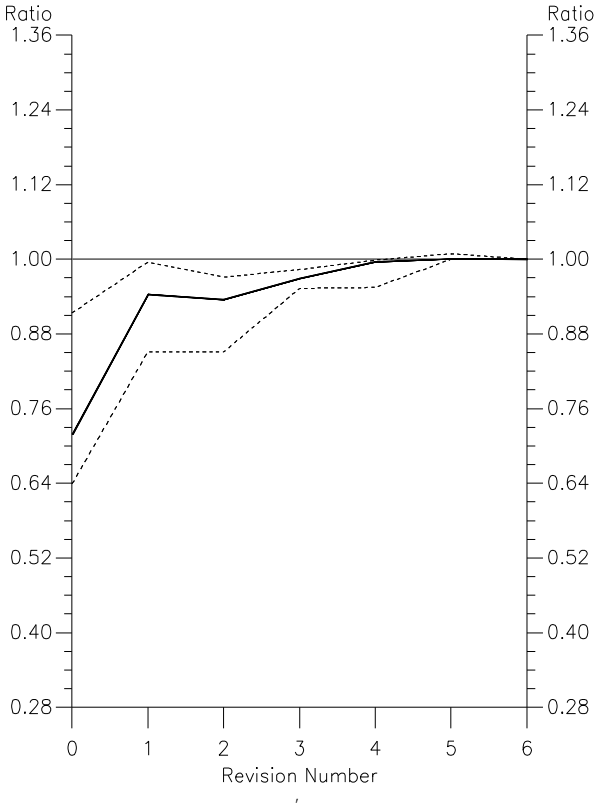
A.47 FIA – Reserve Bank



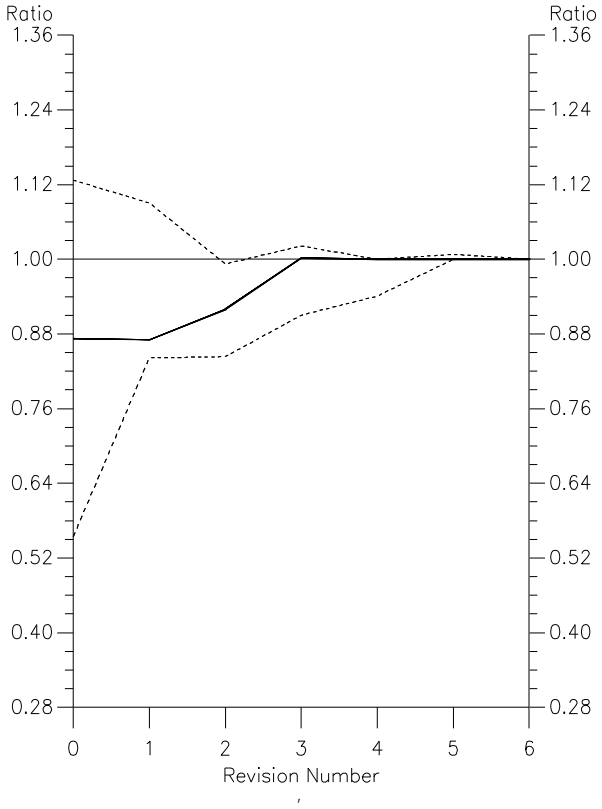
A.48 AIA – Reserve Bank



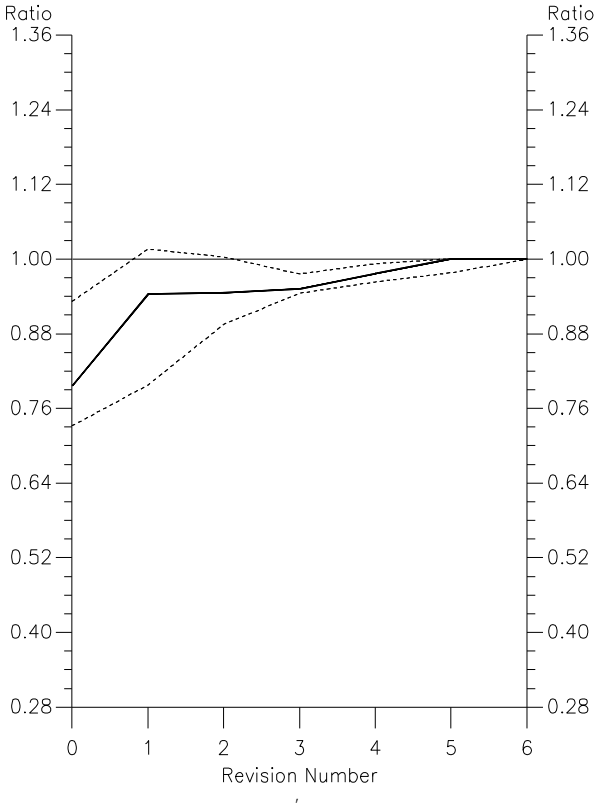
A.49 FIA – Non–official Sector



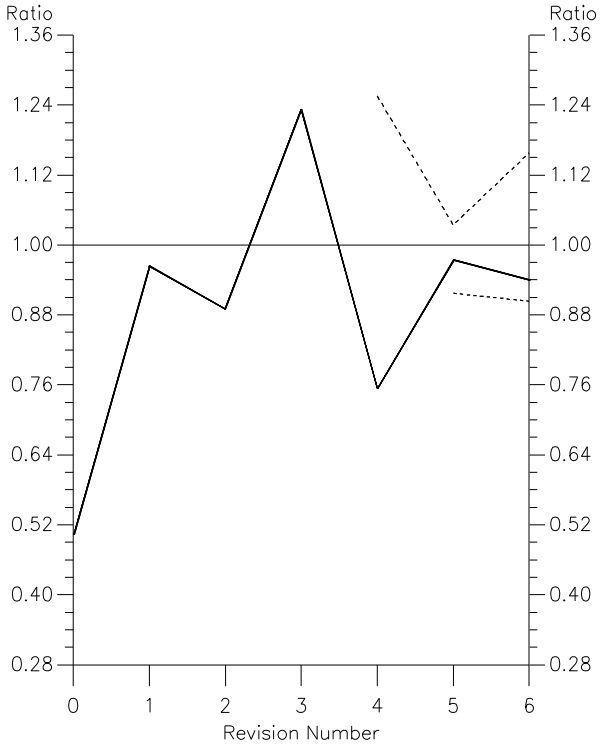
A.50 AIA – Non–official Sector



A.51 Balance on Capital Account



A.52 Balancing item (a)



(a) See introductory comments to this appendix for an explanation of missing quartile plot points

APPENDIX B ONE-YEAR REVISIONS TO INITIAL ESTIMATES

Graphs in this appendix illustrate, over the period January 1986 to December 1993, the direction (bias) and magnitude (dispersion) of revisions made to initial monthly and quarterly estimates of balance of payments aggregates after one year. For annual estimates, the series under analysis generally commence in 1981–82.

Each graph plots, for an aggregate, the difference between the initial estimate for a period and the estimate for that same period 1 year later (that is, after 12 monthly revision cycles, 4 quarterly cycles or one annual cycle). Graphs are included for monthly, quarterly and annual statistics.

Revisions to gross series in this appendix (that is, for the components of the current account) can be readily interpreted as magnitude changes. Movements above the origin mean an estimate of greater magnitude — a credit series is a larger credit or a debit series is a larger debit — and movements below the origin mean an estimate of smaller magnitude. For example, a movement above the origin in Graph B.1 (*merchandise exports*) indicates that exports have been revised upward (a larger credit) while movements above the origin in Graph B.2 (*merchandise imports*) indicates that imports have been revised upward (a larger debit). Movements below the line for either series would mean an estimate of smaller magnitude. Similarly for all net series other than balances (that is, all the capital account component series) movements above the origin mean increased credits or increased debits. For the balances on current and capital accounts, movements are not unambiguously movements in magnitude. Movements above the origin mean increased surpluses or decreased deficits, and movements below the origin mean smaller surpluses or larger deficits.

Care should be used in interpreting the graphs presented in this appendix because not all revisions are in place after one year. As shown in Appendix A, for many series significant revisions remain to be processed several years after the initial estimates have been made before *final* (or latest) estimates are reached.

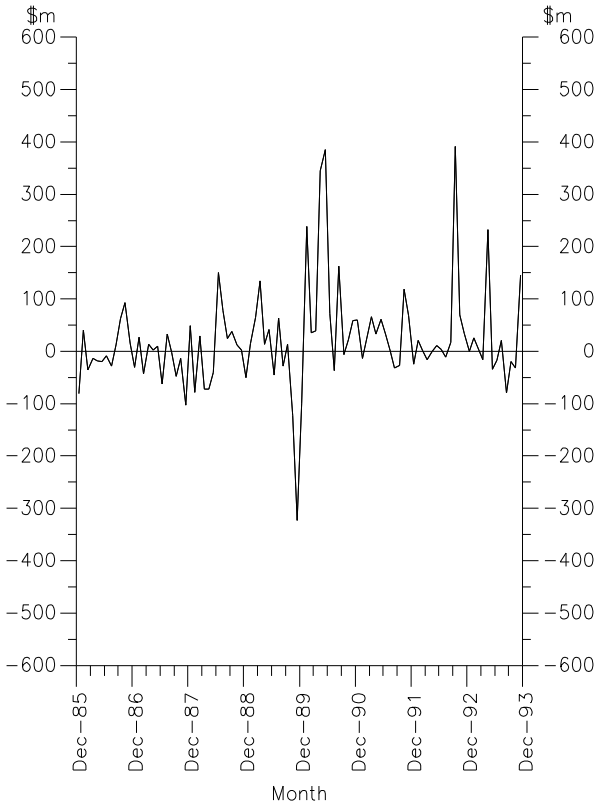
It should be noted in interpreting these graphs that not all graphs use the same scale. Quarterly and annual revisions can be multiples of the monthly revisions experience, requiring wider scales for effective presentation. Also, in the case of balances (the balances on current and capital accounts), the aggregated revisions estimates may be augmentations of those shown for components (if the net revisions do not offset), requiring a scale that has a larger range of values either above or below the origin to capture the direction of the cumulative effect of these revisions. For the net series shown for the capital account, much wider scales are used to capture the magnitude of the swings experienced in revising estimates of the net effect of the very large gross flows involved.

Also, because revisions in this appendix are expressed in millions of dollars at current prices, no account is taken of inflationary effects or any change in the size of the aggregate being amended.

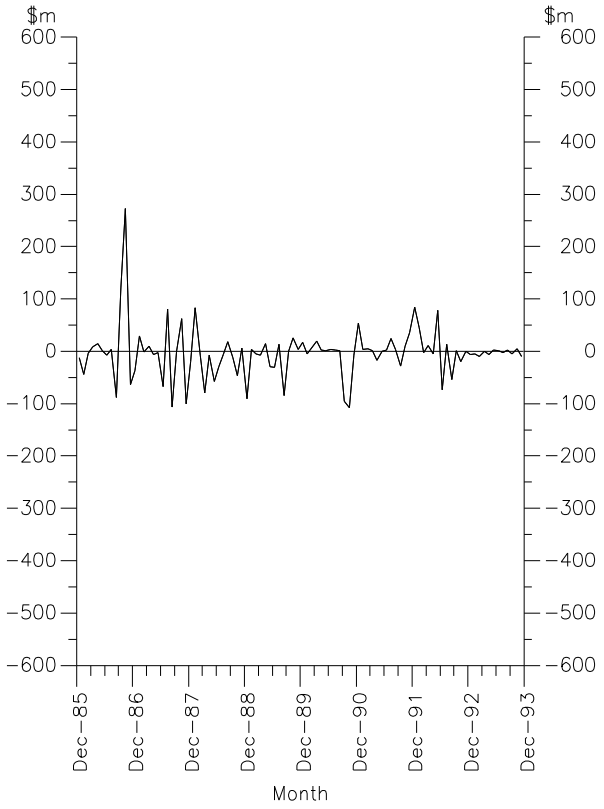
Graph B.6 provides an example of the interpretation of bias in revisions shown in the graphs in this appendix. The preponderance of observations above the origin up until June 1990 indicates that revisions after one year generally increased the size of the debit being measured (a positive bias in revisions, or an understatement in initial estimates), followed by a few years of negative bias (up until December quarter 1992) with revisions reducing the debits measures and correcting overstatements in the initial magnitudes being measured. From March quarter 1993, positive bias in revisions re-emerges. This revisions experience largely reflects a fall in the size of *reinvested earnings* of direct investment enterprises in Australia (due to falling profits) on a scale greater than initially forecast and corrected only when annual survey data became available.

Graph B.1 for *merchandise exports* provides an example of the interpretation of the dispersion of revisions shown in this appendix. Up until September quarter 1989, the magnitude of revisions to merchandise exports is somewhat muted, reflecting the stable nature of the administrative by-product source used in the estimation procedure. From that point on, the dispersion increases with swings above and below the origin largely reflecting increased estimation variability with a new administrative data source.

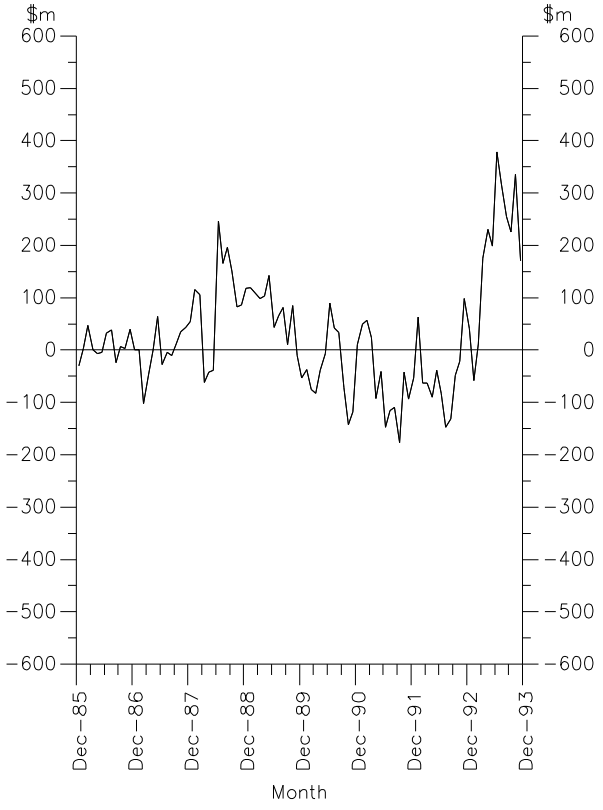
B.1 Merchandise Exports



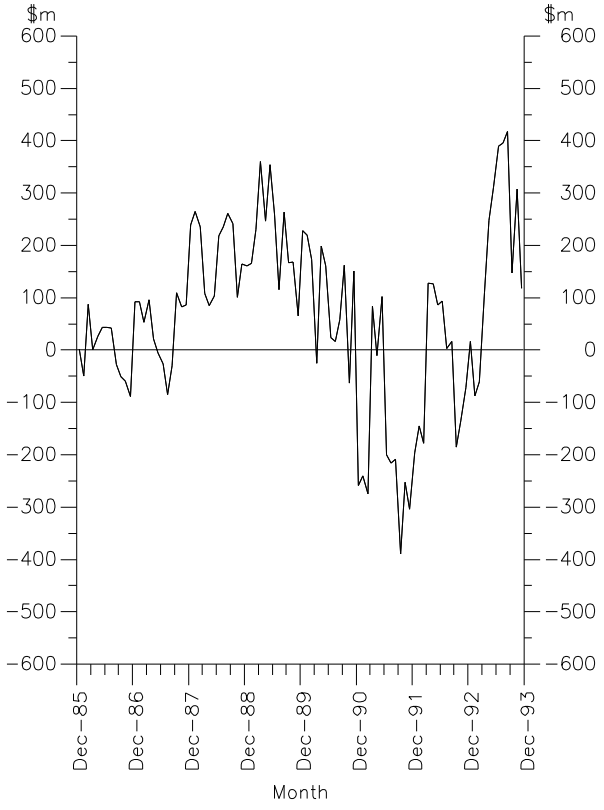
B.2 Merchandise Imports



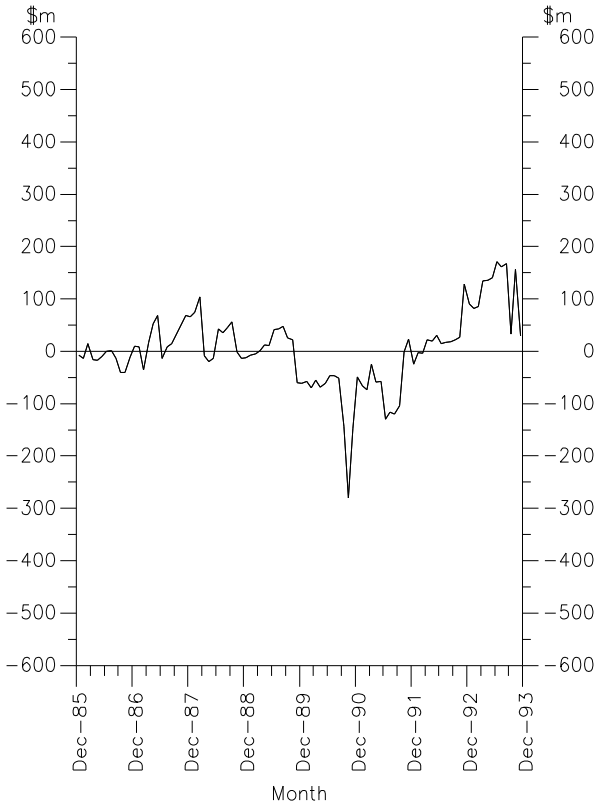
B.3 Non−merchandise credits



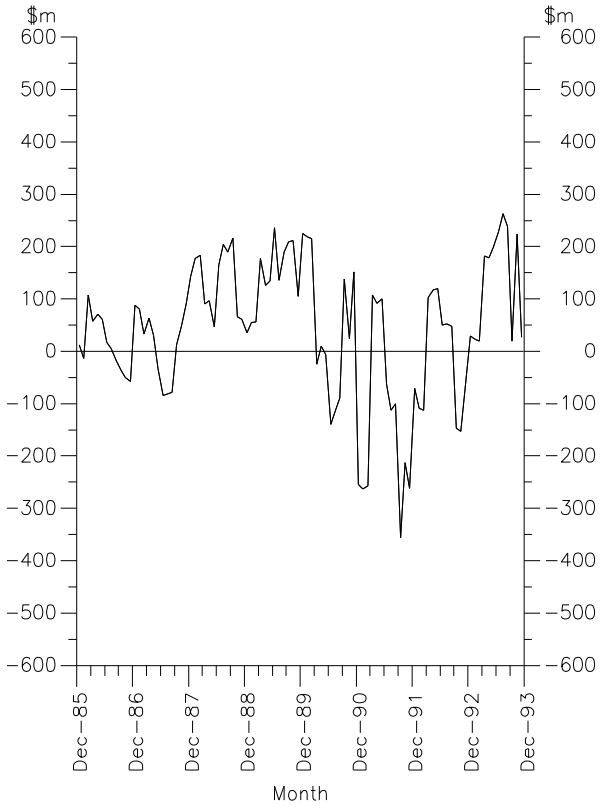
B.4 Non−merchandise debits



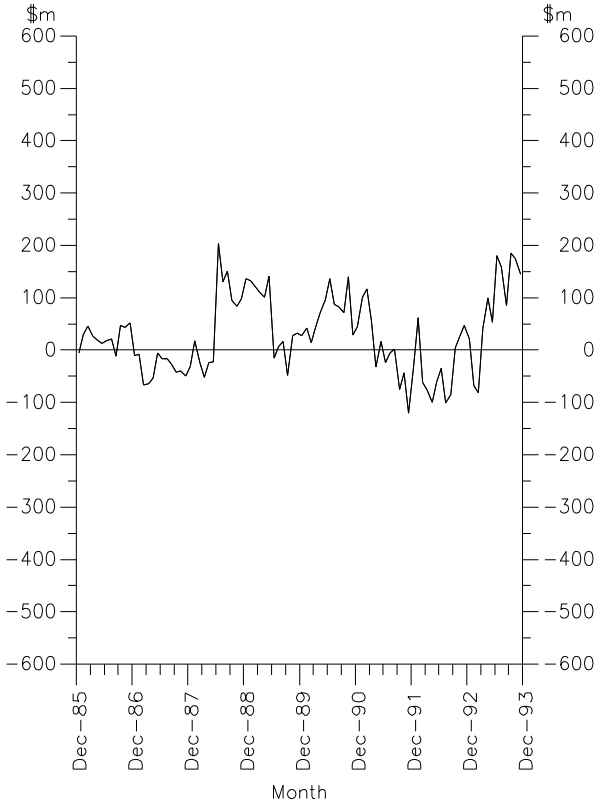
B.5 Income – Credits



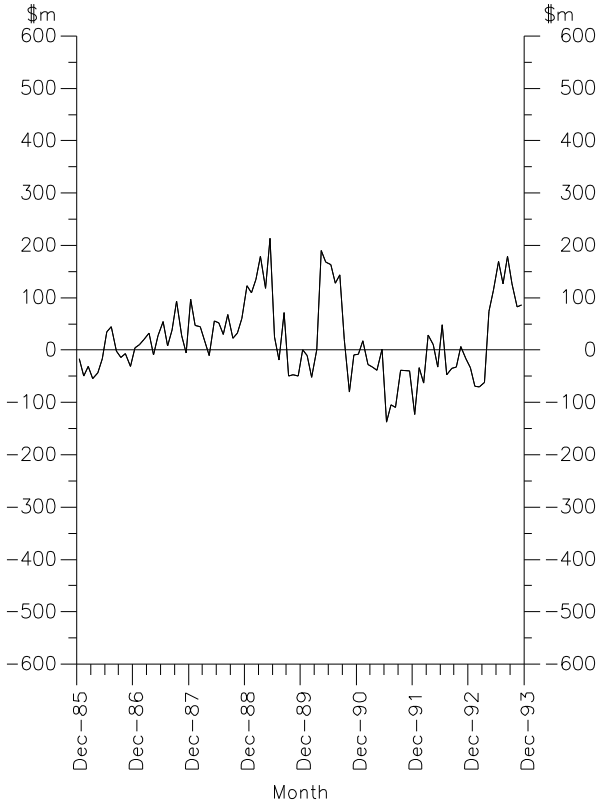
B.6 Income – Debits



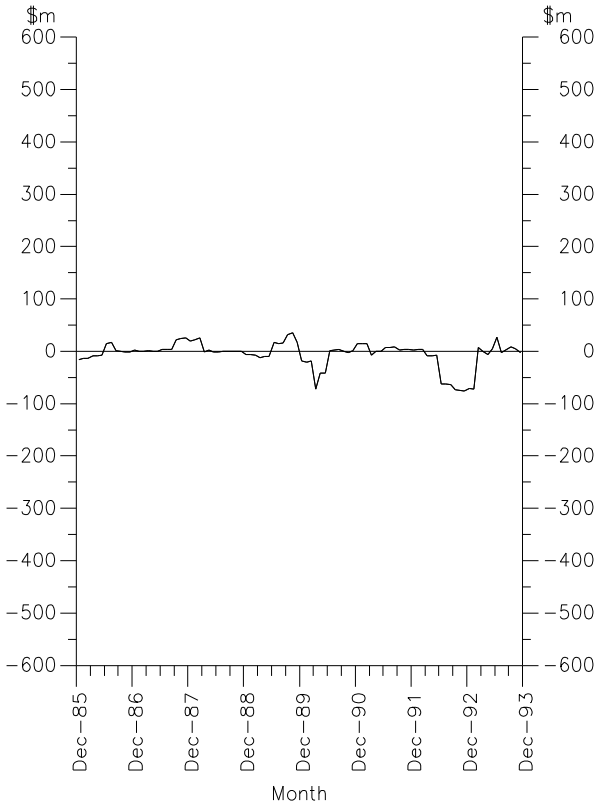
B.7 Services – Credits



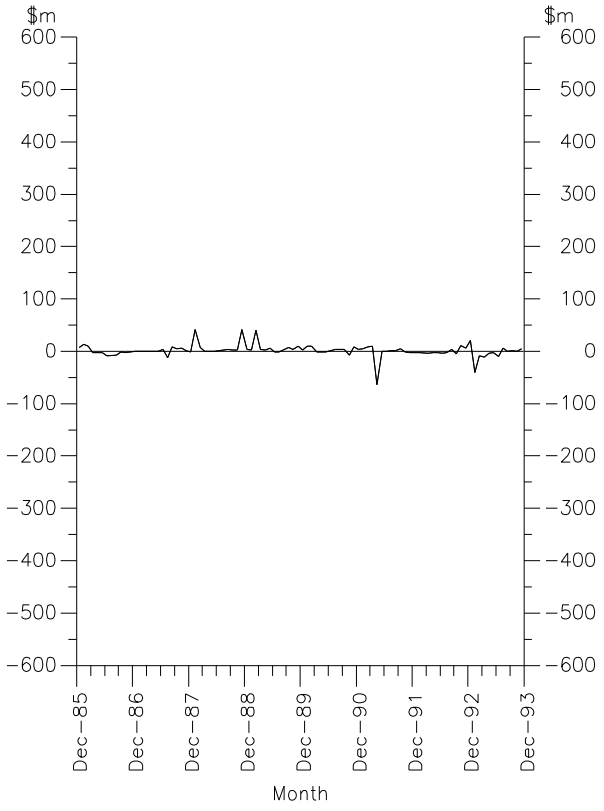
B.8 Services – Debits



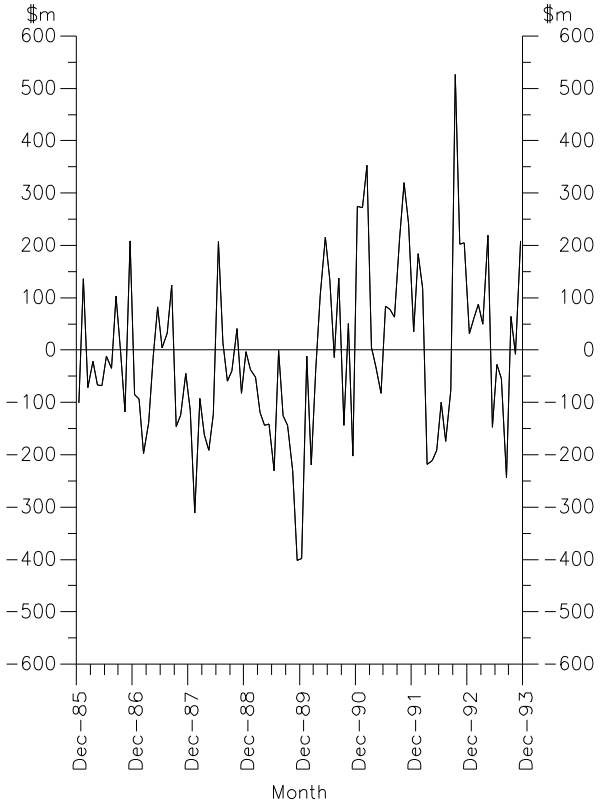
B.9 Unrequited Transfers – Credits



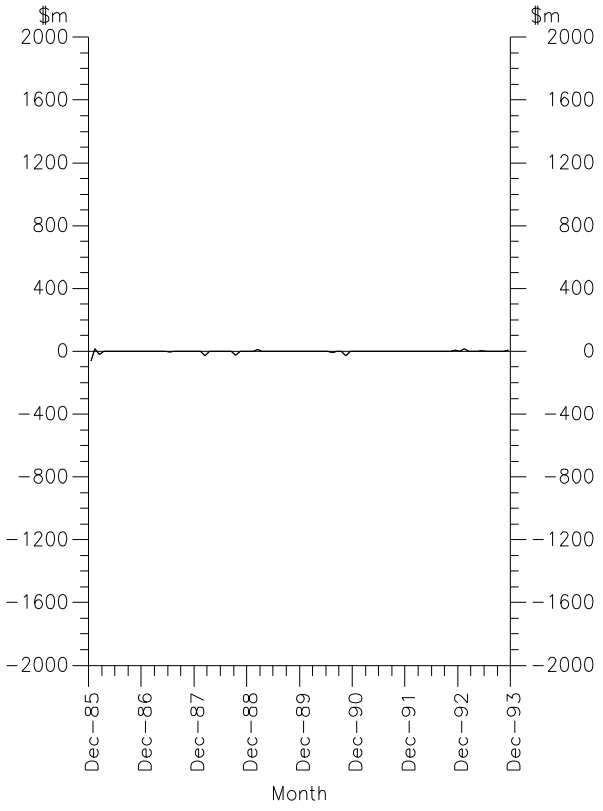
B.10 Unrequited Transfers – Debits



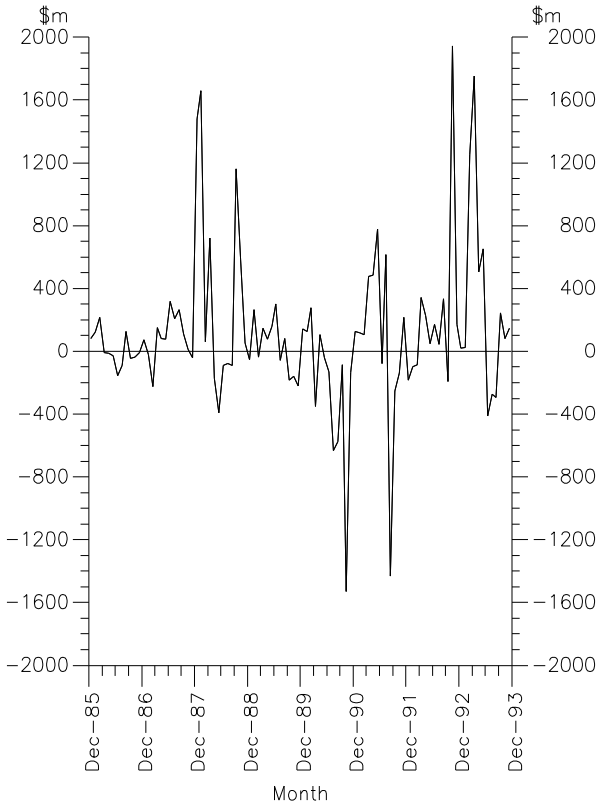
B.11 Balance on Current Account



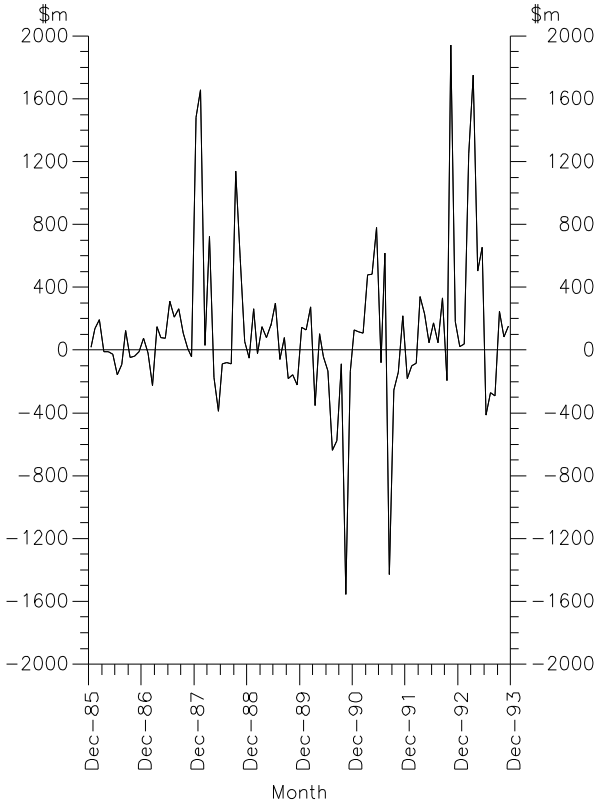
B.12 Net Capital – Reserve Bank



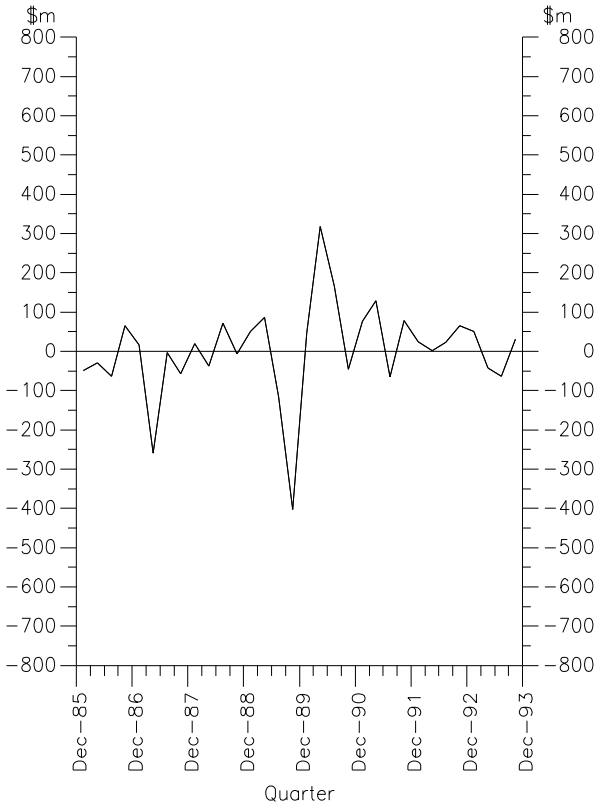
B.13 Net Capital – General Government



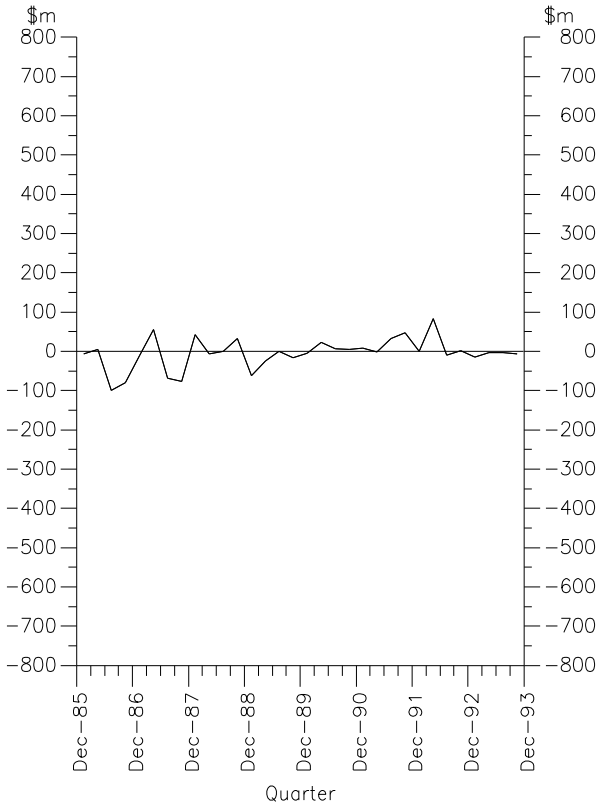
B.14 Net Capital – Official Sector



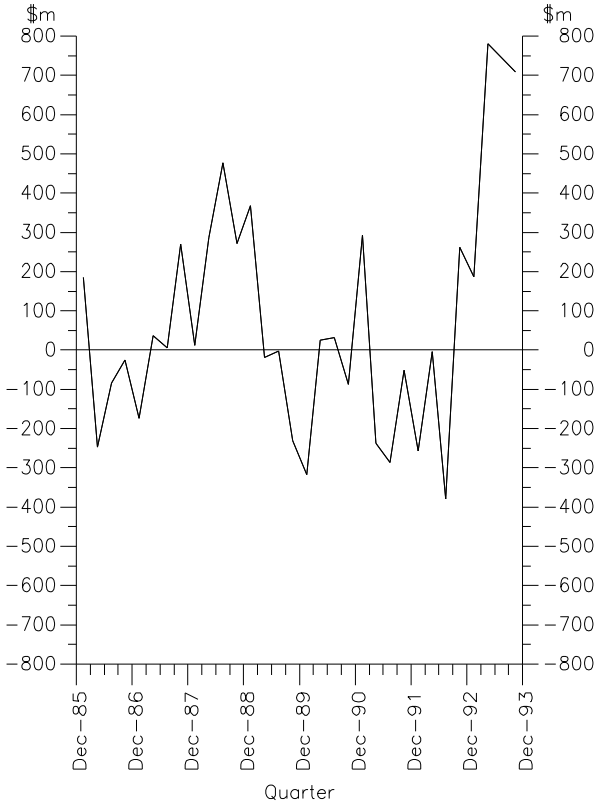
B.15 Merchandise Exports



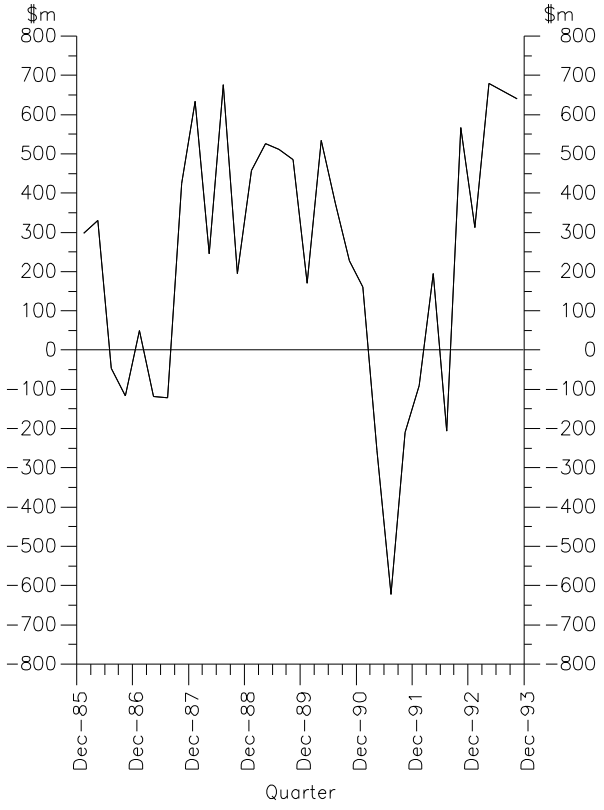
B.16 Merchandise Imports



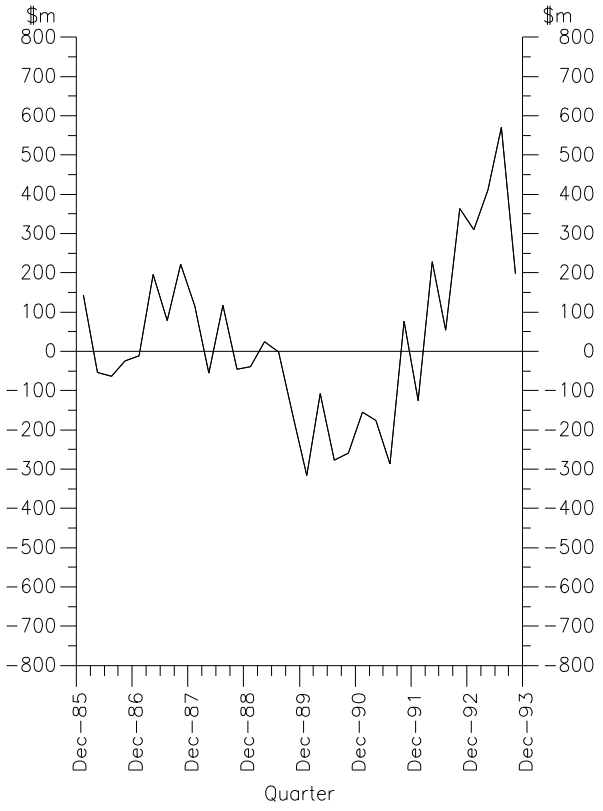
B.17 Non−merchandise credits



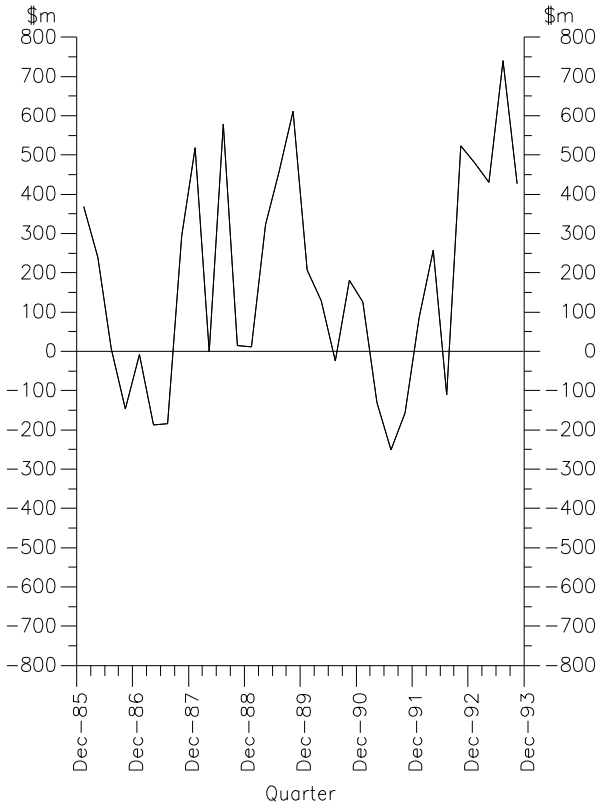
B.18 Non−merchandise debits



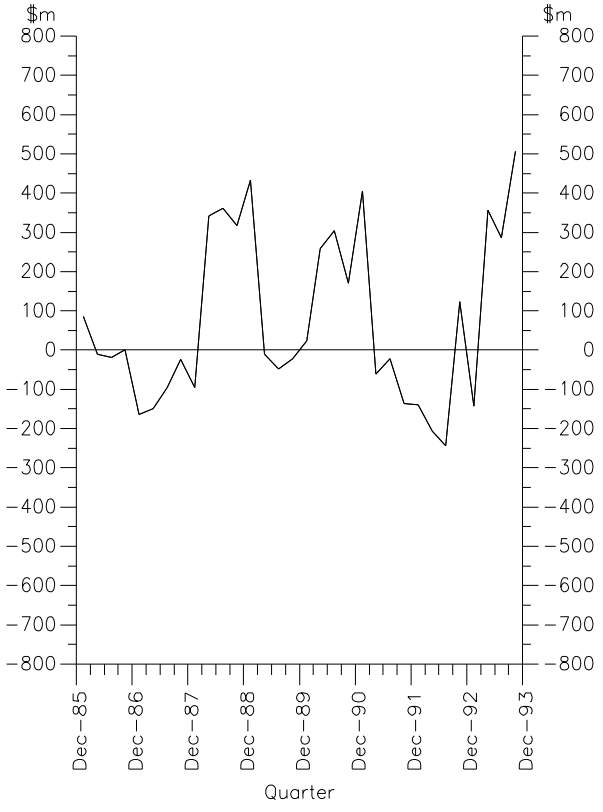
B.19 Income – Credits



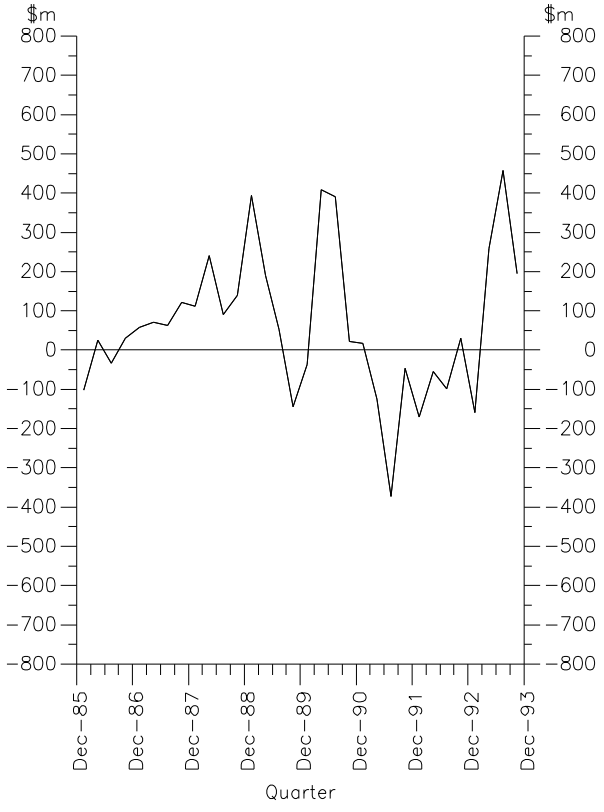
B.20 Income – Debits



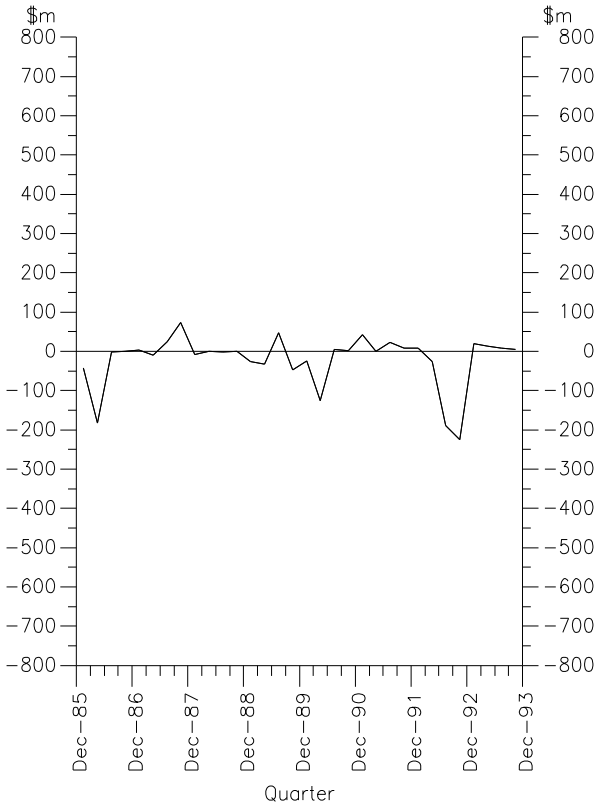
B.21 Services – Credits



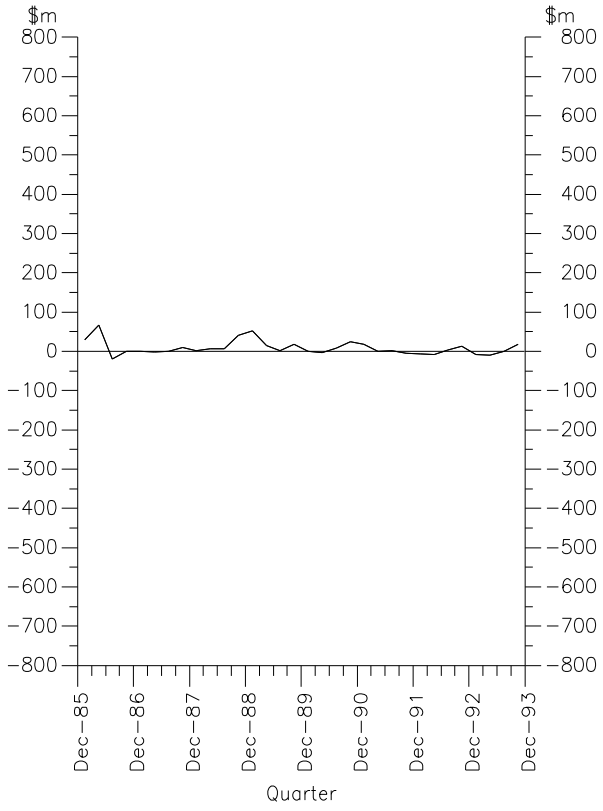
B.22 Services – Debits



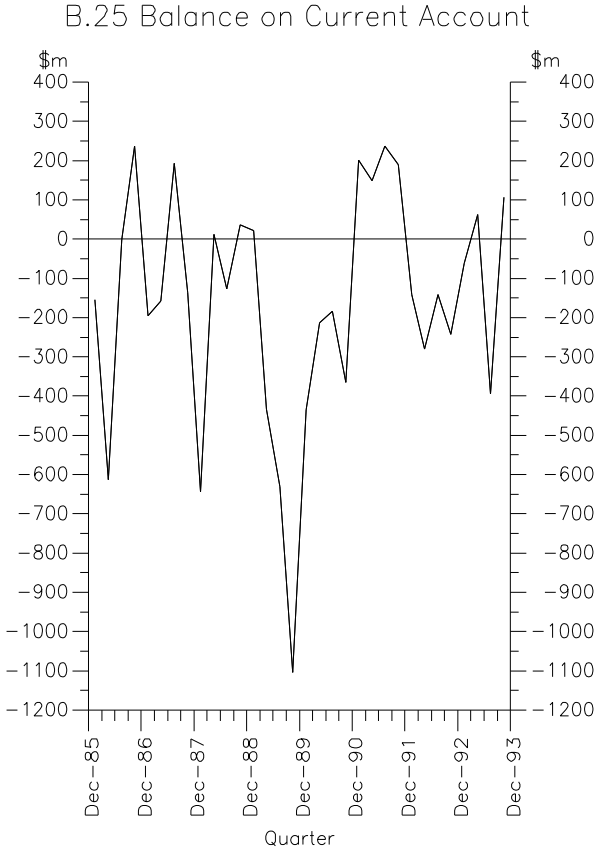
B.23 Unrequited Transfers – Credits



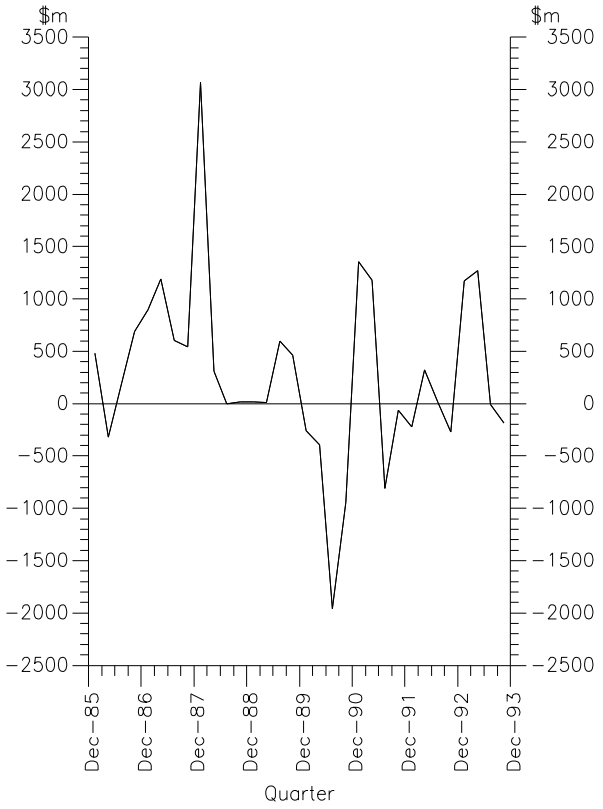
B.24 Unrequited Transfers – Debits



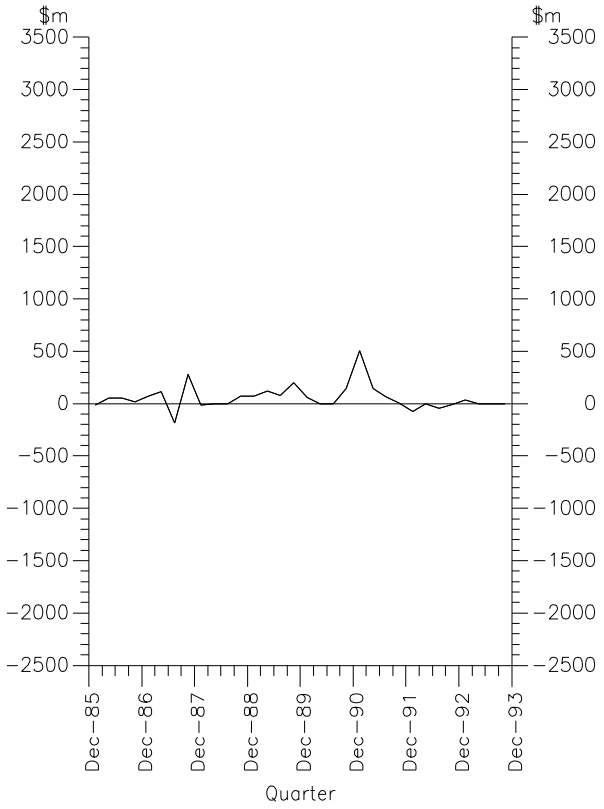
B.25 Balance on Current Account



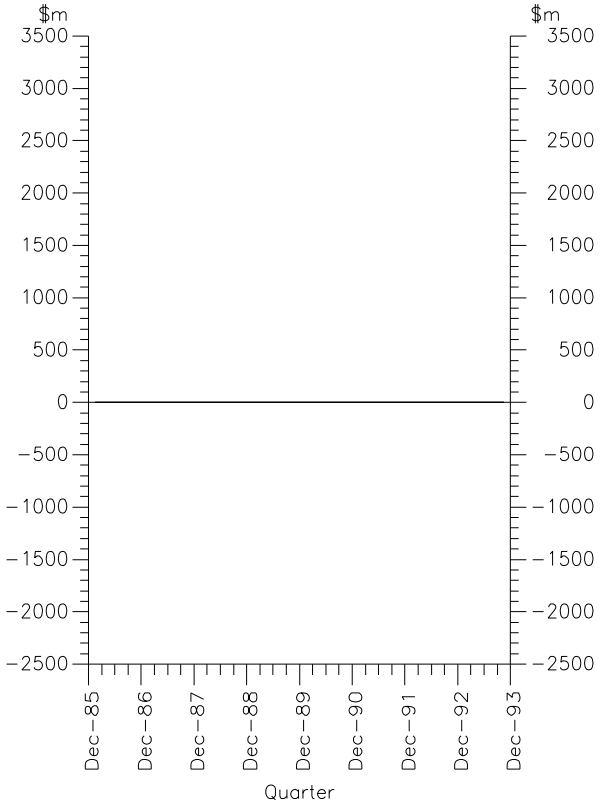
B.26 FIA – General Government



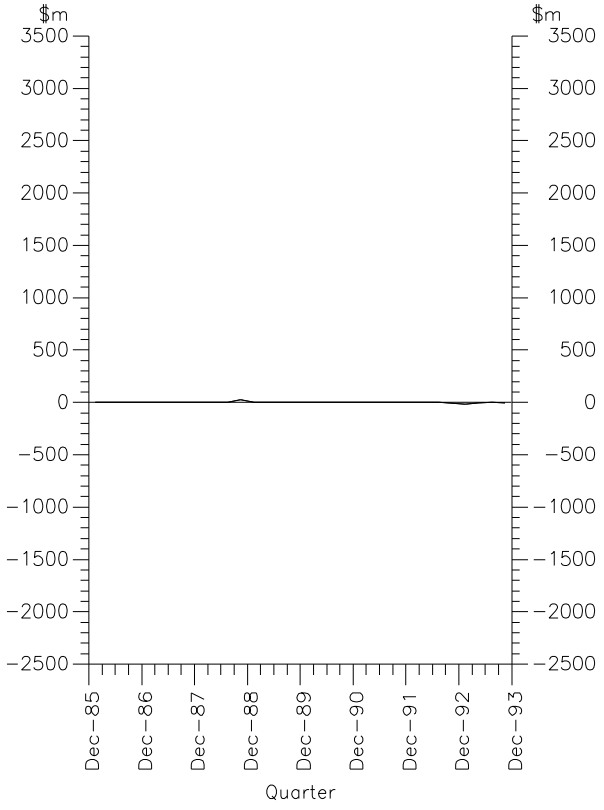
B.27 AIA – General Government



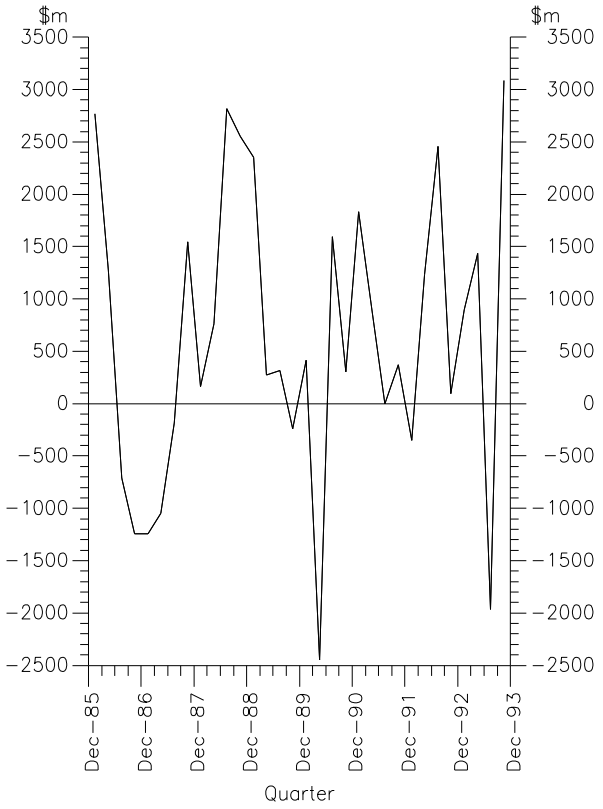
B.28 FIA – Reserve Bank



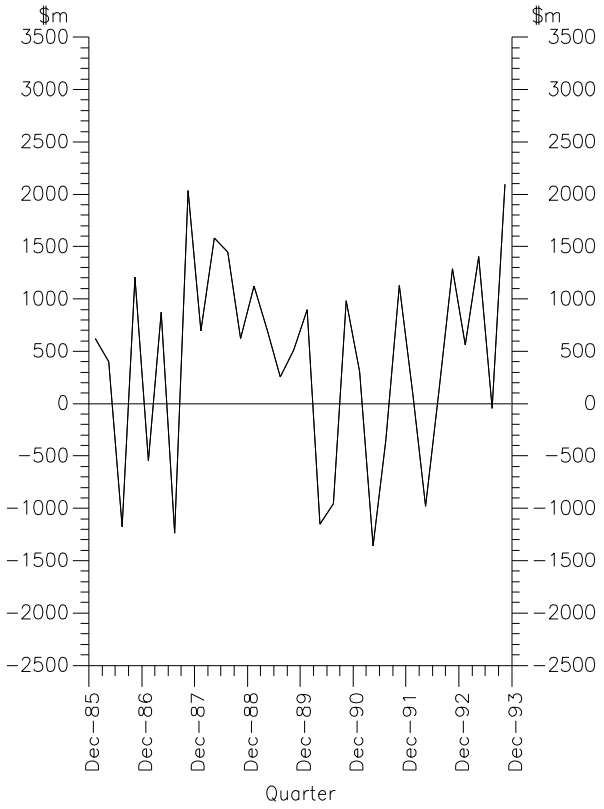
B.29 AIA – Reserve Bank



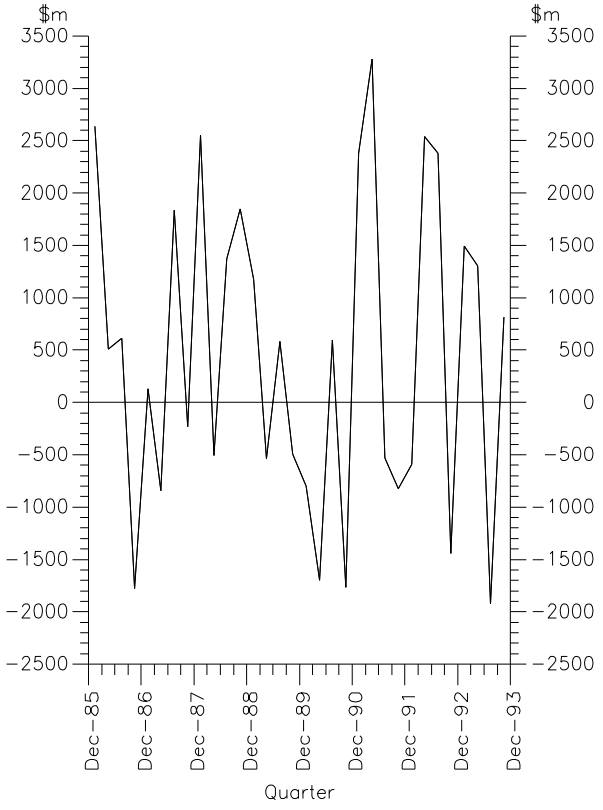
B.30 FIA – Non–official Sector



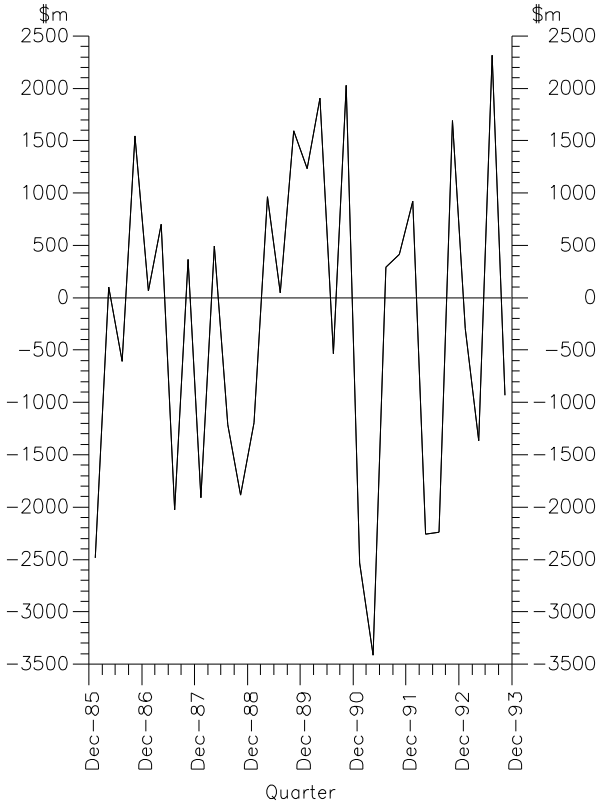
B.31 AIA – Non–official Sector



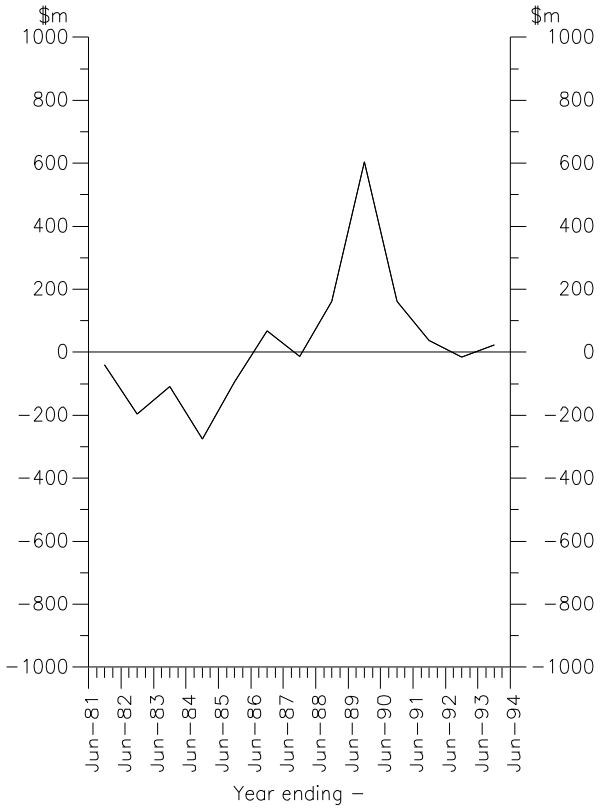
B.32 Balance on Capital Account



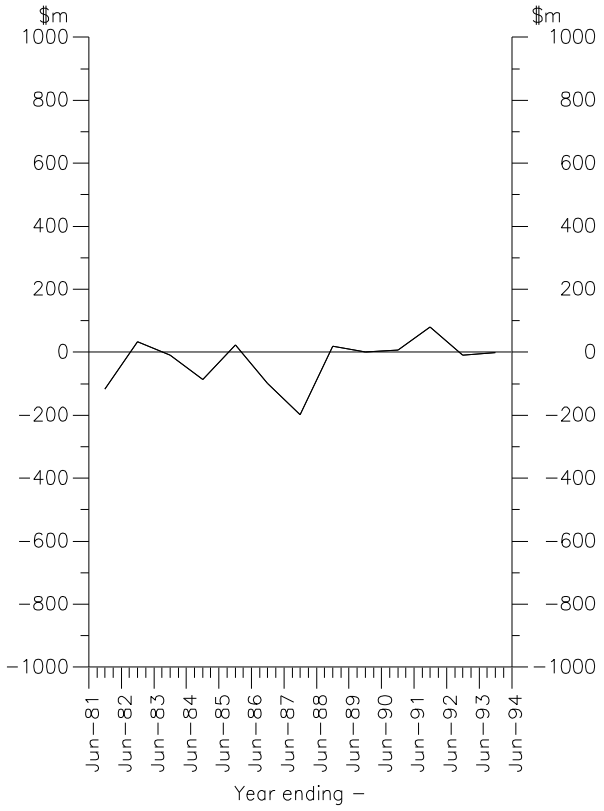
B.33 Balancing Item



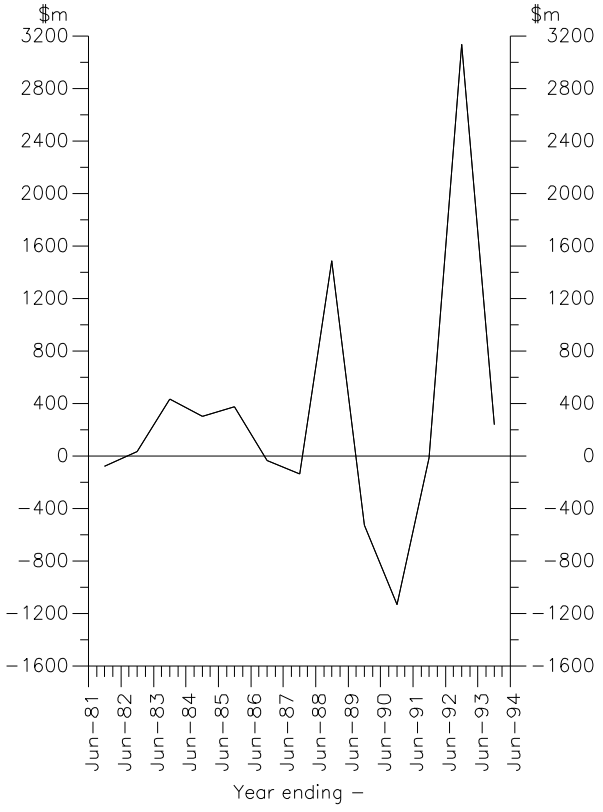
B.34 Merchandise Exports



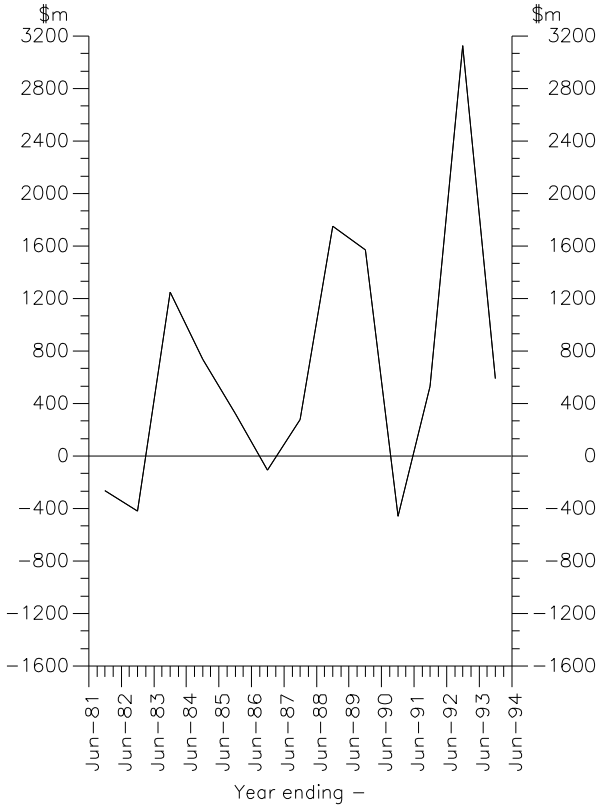
B.35 Merchandise Imports



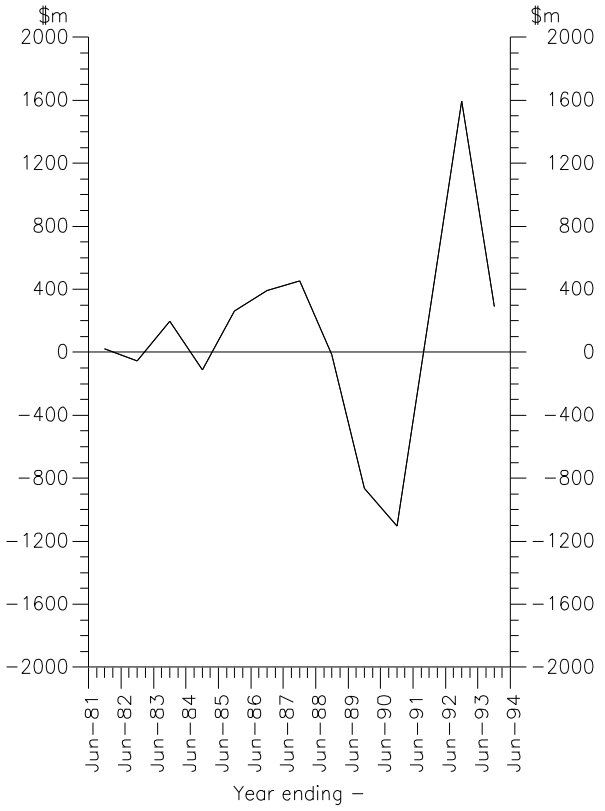
B.36 Non−merchandise credits



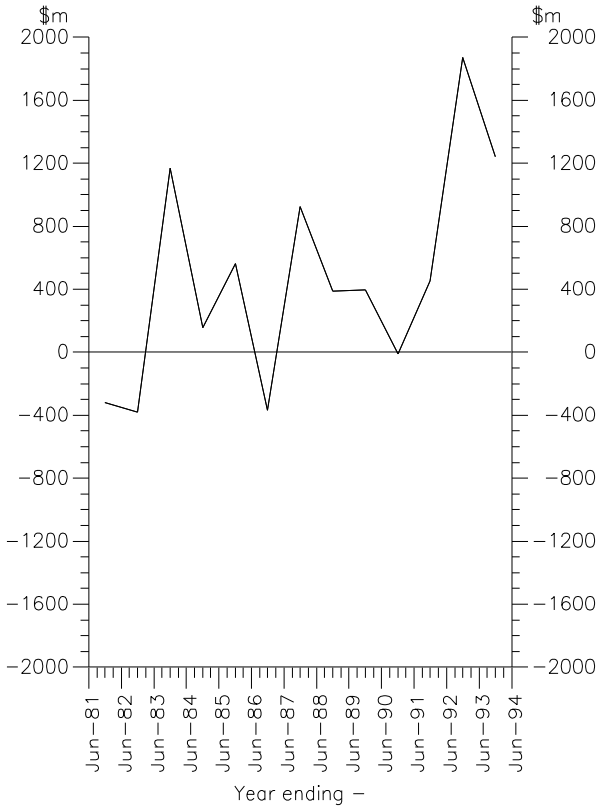
B.37 Non−merchandise debits



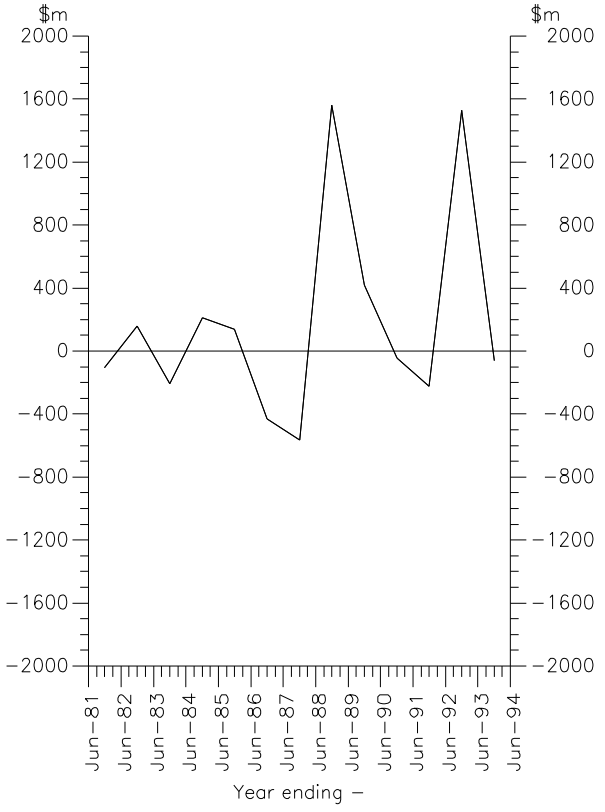
B.38 Income – Credits



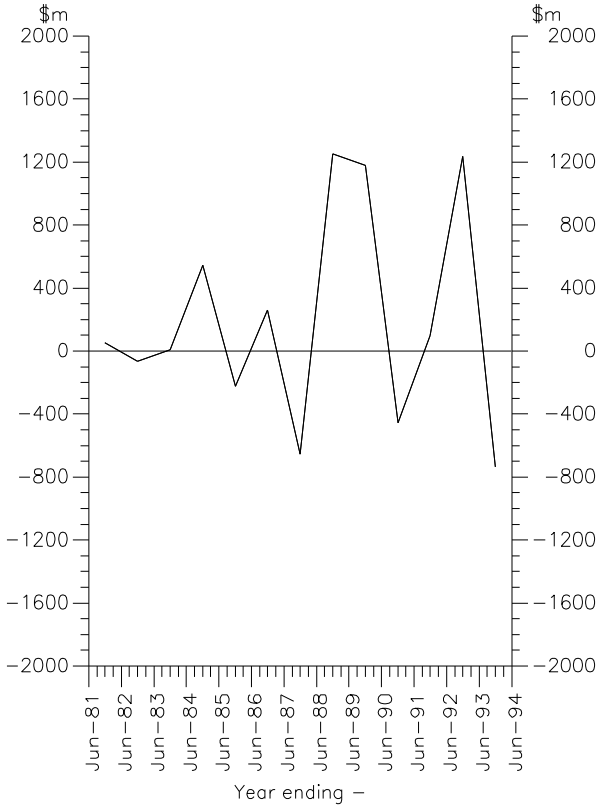
B.39 Income – Debits



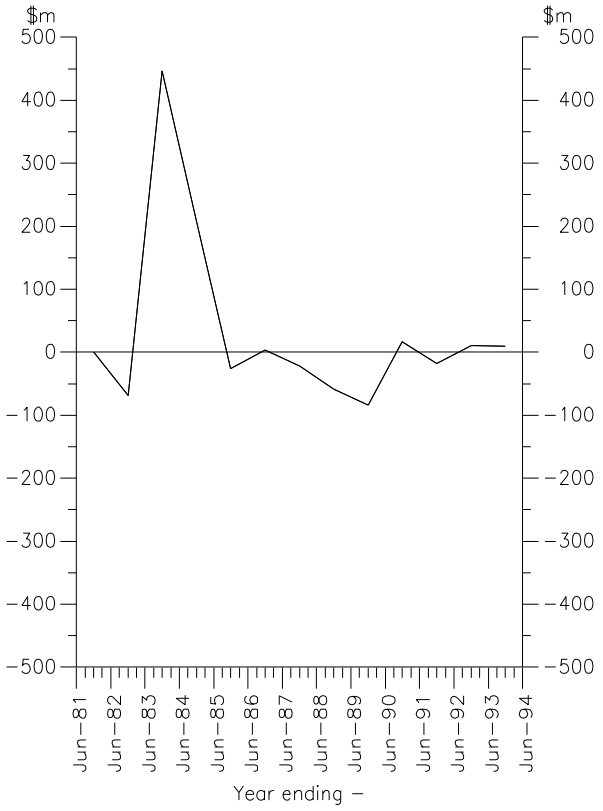
B.40 Services – Credits



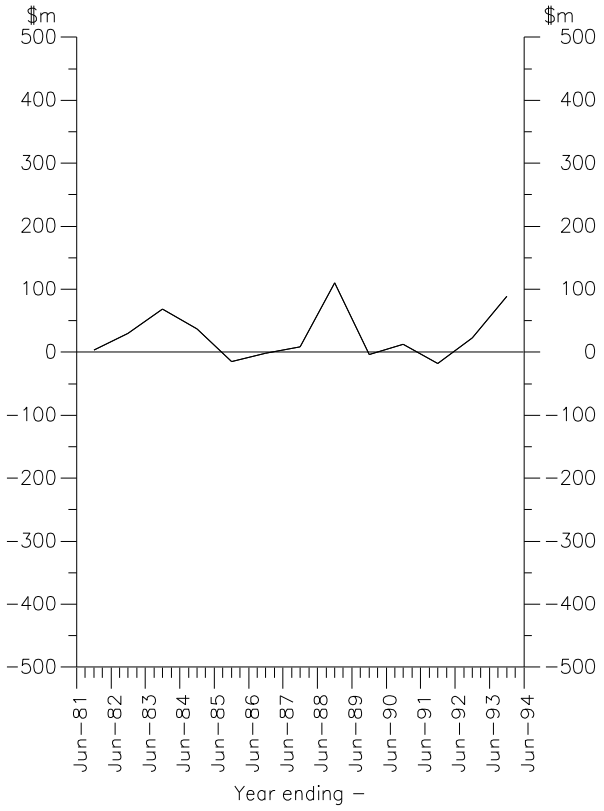
B.41 Services – Debits



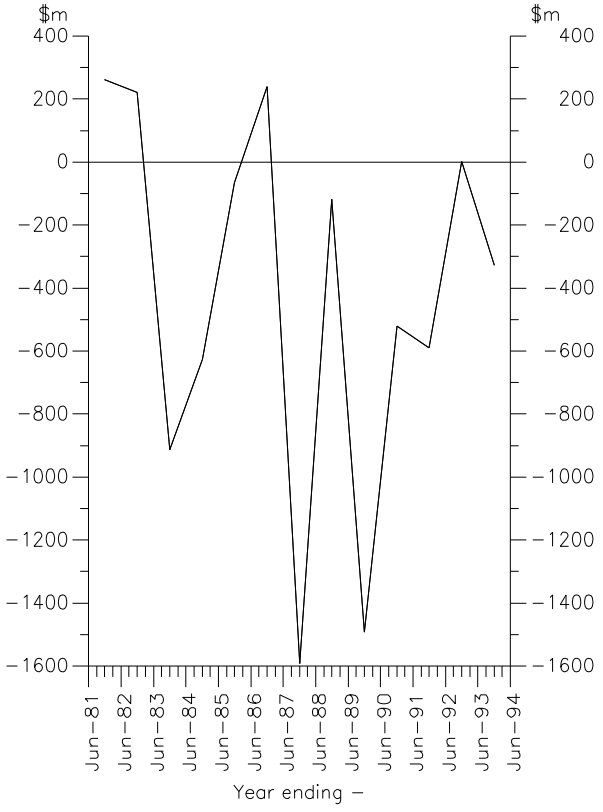
B.42 Unrequited Transfers – Credits



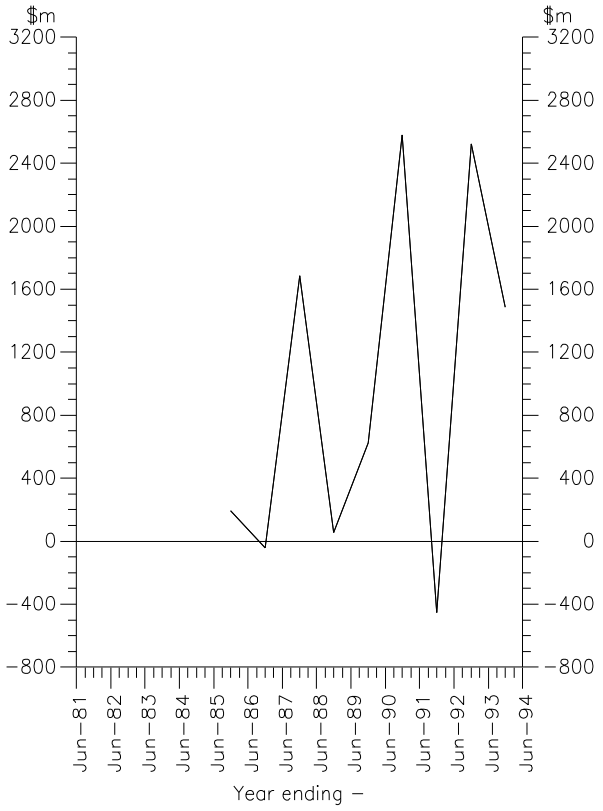
B.43 Unrequited Transfers – Debits



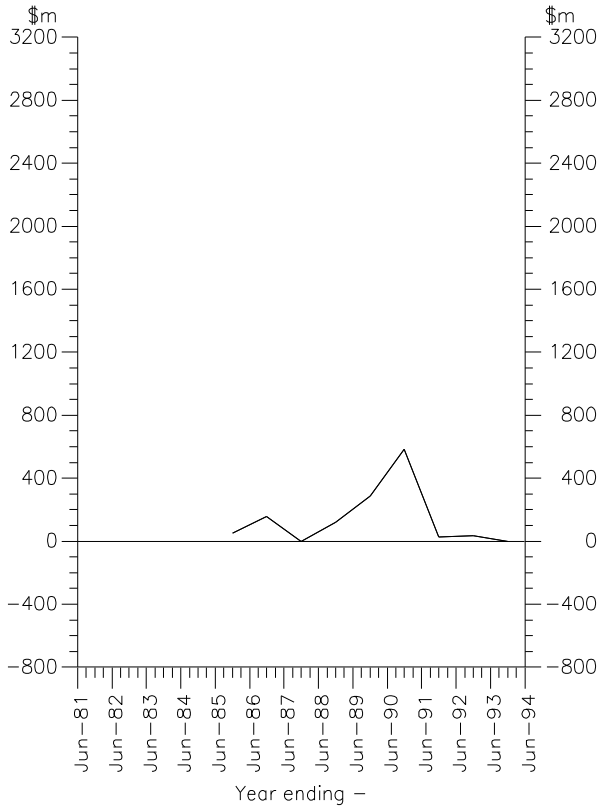
B.44 Balance on Current Account



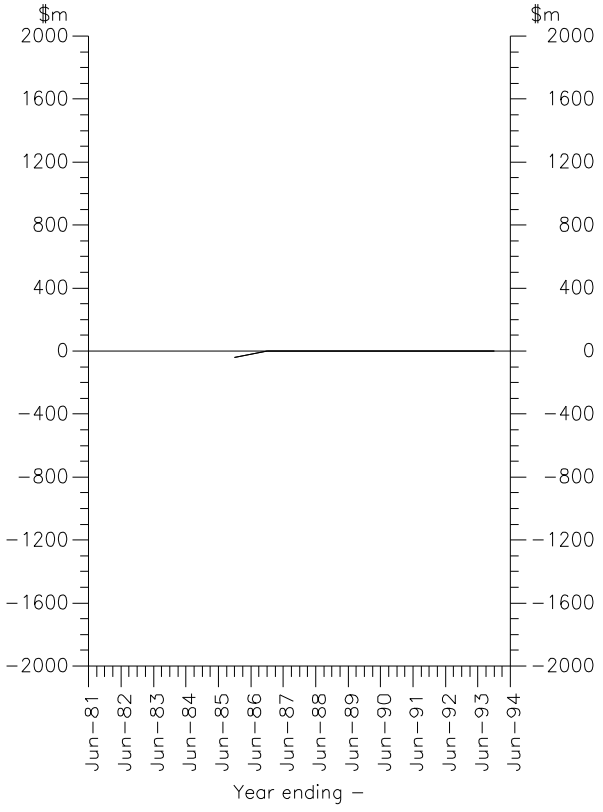
B.45 FIA – General Government



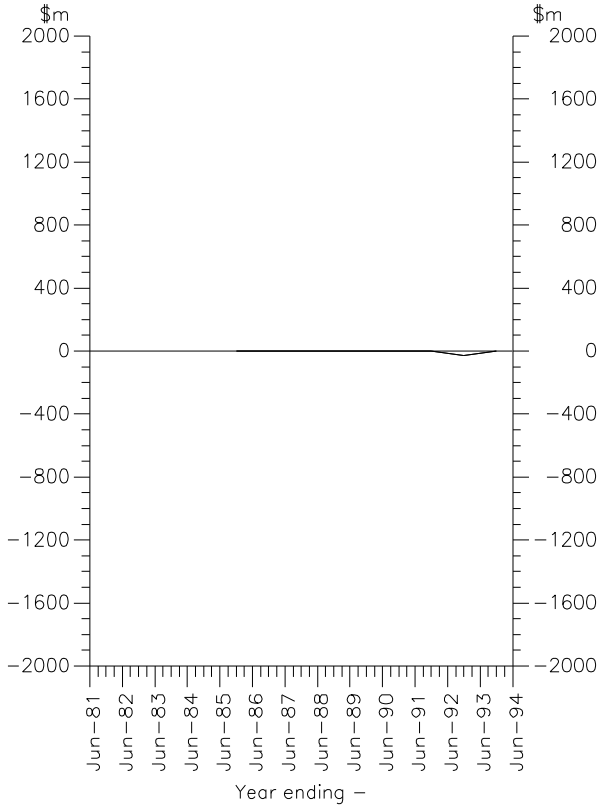
B.46 AIA – General Government



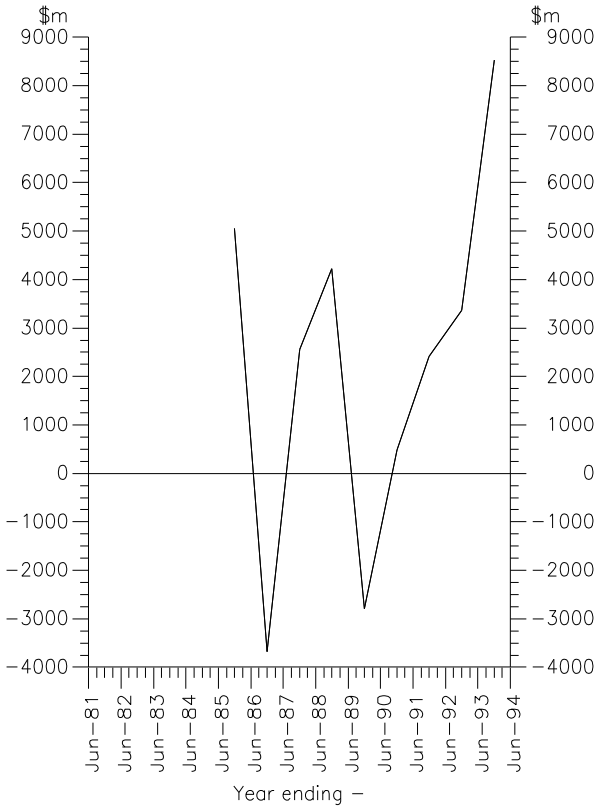
B.47 FIA – Reserve Bank



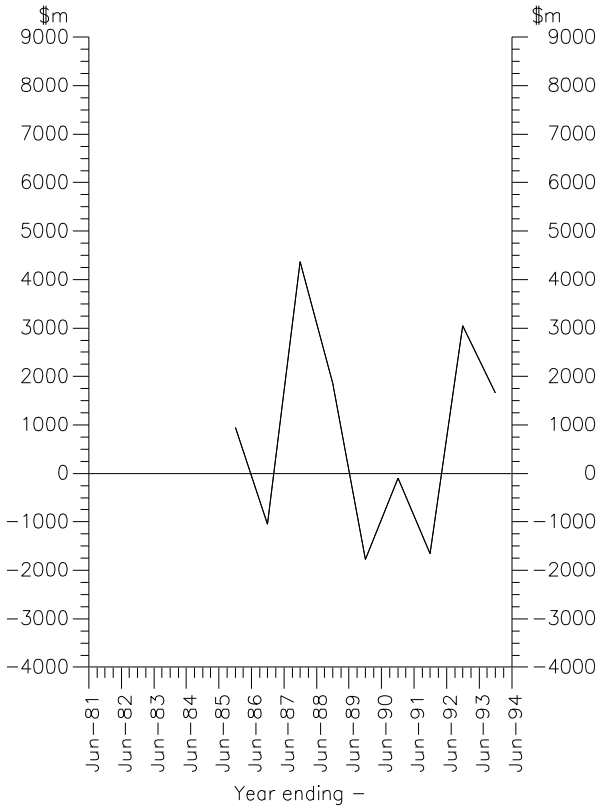
B.48 AIA – Reserve Bank



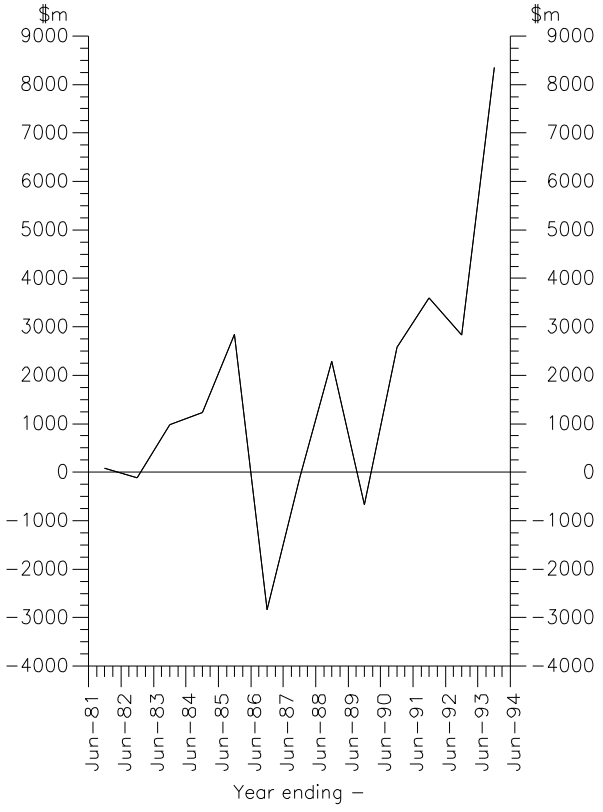
B.49 FIA – Non–official Sector



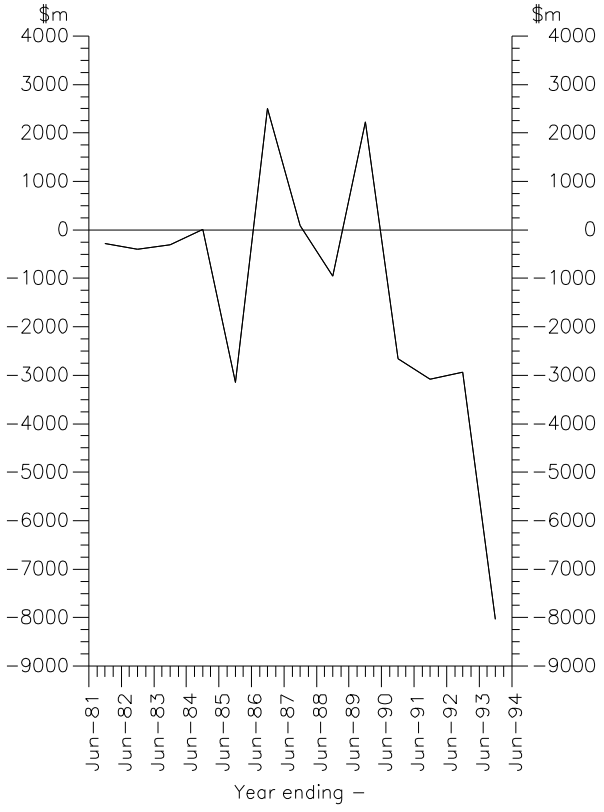
B.50 AIA – Non–official Sector



B.51 Balance on Capital Account



B.52 Balancing Item



APPENDIX C COMPARISON OF INITIAL AND LATEST PERIOD-ON-PERIOD MOVEMENTS

This appendix contains scatter graphs based on the *movement in the estimate from one period to the next* for each of the principal balance of payments aggregates. Movement in an estimate represents the *change in the aggregate* from the previous month or quarter. Points plotted on a graph represent the intersection of the initial estimate of the movement for a period with the latest estimate of the movement for that period. Each + point plotted on the graphs therefore represents two estimates of movement between two periods. The initial estimate of movement is measured on the horizontal axis and the latest estimate of movement on the vertical axis. Graphs are included for monthly statistics for the period from February 1986 through June 1994 and for quarterly statistics from the June quarter 1986 through June quarter 1994.

It can be seen that a period-on-period movement that has not changed between the initial estimate of that movement and the latest estimate of the movement will lie on an imaginary 45° line drawn from the bottom left corner of a graph to the top right corner passing through the origin. Points below the line correspond to periods for which the latest estimate of the period-on-period movement is less than the initial estimate of the movement in the case of increases or more than the initial estimate of movement in the case of decreases. Conversely, points above the 45° line correspond to periods for which the latest estimate of the period-on-period movement is greater than the initial estimate in the case of increases or smaller than the initial estimate in the case of decreases.

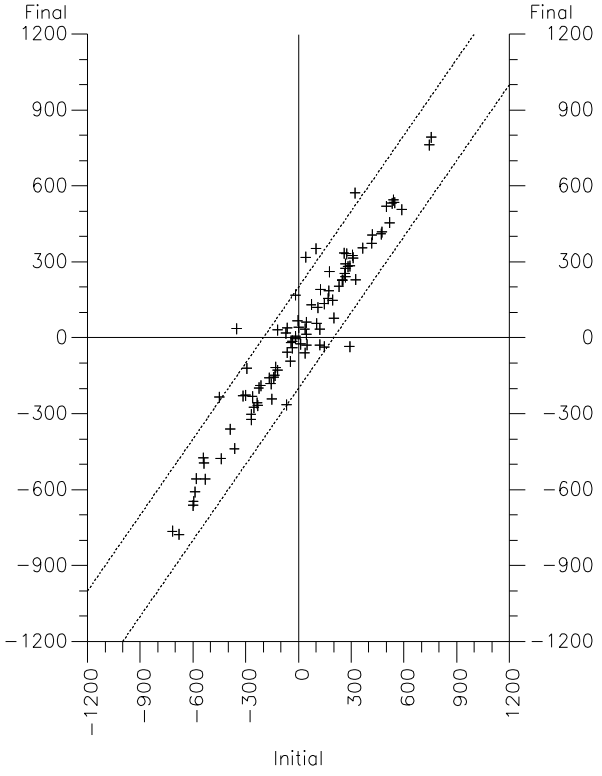
Points that lie in the top left or bottom right quadrants of the graph correspond to periods for which the direction of movement has changed between the initial estimate and the latest. That is, an initially positive period-on-period movement has changed to a negative movement or vice versa. Prima facie, initial data for these periods can be considered the most likely to present the user of the statistics with misleading information.

The extent by which a period-on-period movement has changed can be gauged by the distance a point lies from the 45° line. Subjective judgements have been made on what amount of change is likely to result in a user drawing the wrong conclusions based on initial estimates of period-on-period movement. Bounds of these dimensions above and below the 45° line, roughly equivalent to two standard deviations or less, are shown on each graph. Note that the value of these bounds vary from item to item. For example, while bounds of plus or minus $300 million have been used for the monthly balance on current account, for the quarterly series this has been increased to $700 million to reflect the larger movements likely for the aggregated time period, and therefore the less likelihood of interpretation error on the smaller movement revisions.

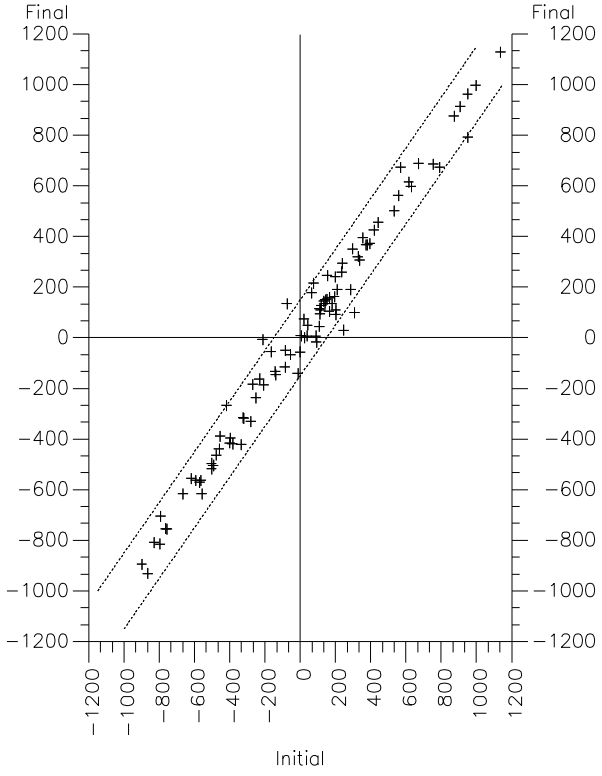
Graphs C.3 and C.4 provide an example of the interpretation of the graphs presented in this appendix. In Graph C.3 for *non-merchandise credits*, the observations are more closely clustered around the centre

than for the *non-merchandise debits* series shown in Graph C.4, reflecting the much smaller scale of movements in the credit aggregates. Looking at Graphs C.15 and C.16 for the quarterly *merchandise exports* and *imports* series, respectively, shows series that are very tighly clustered, reflecting the generally low incidence of significant revision to movements in the these series.

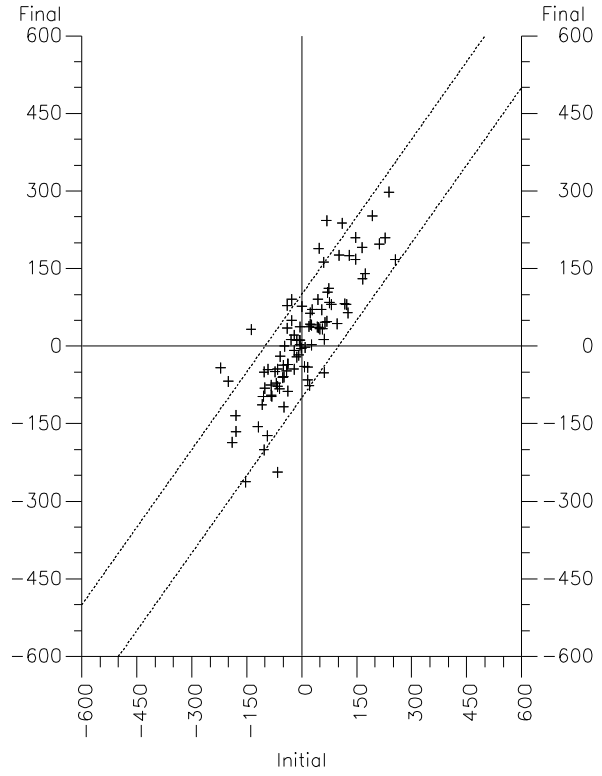
C.1 Merchandise Exports
($ million)



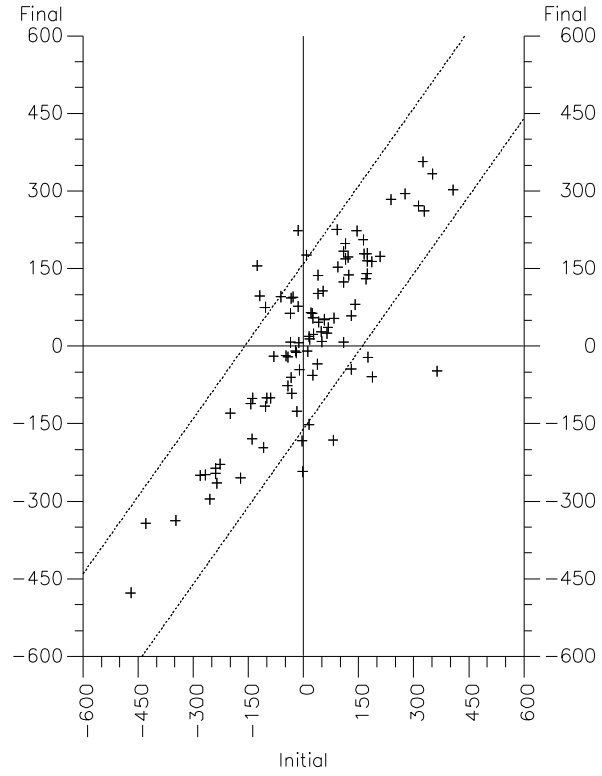
C.2 Merchandise Imports
($ million)



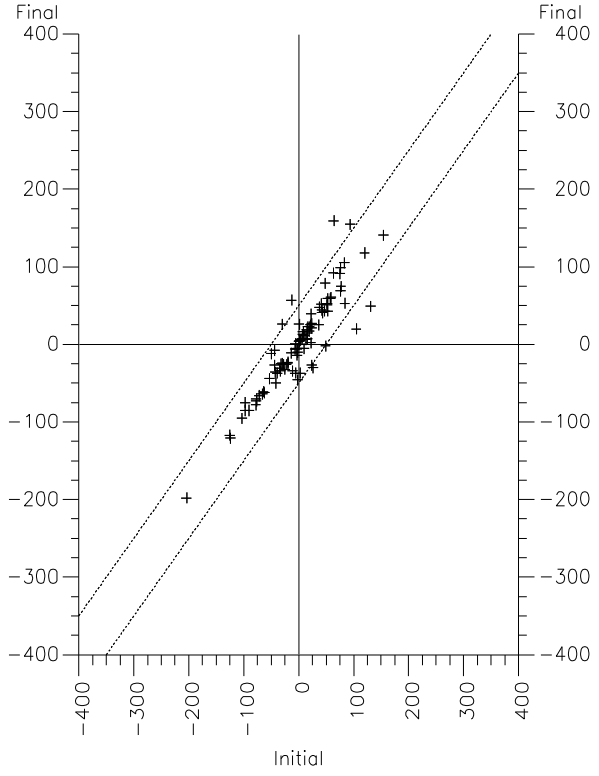
C.3 Non−merchandise − Credits
($ million)



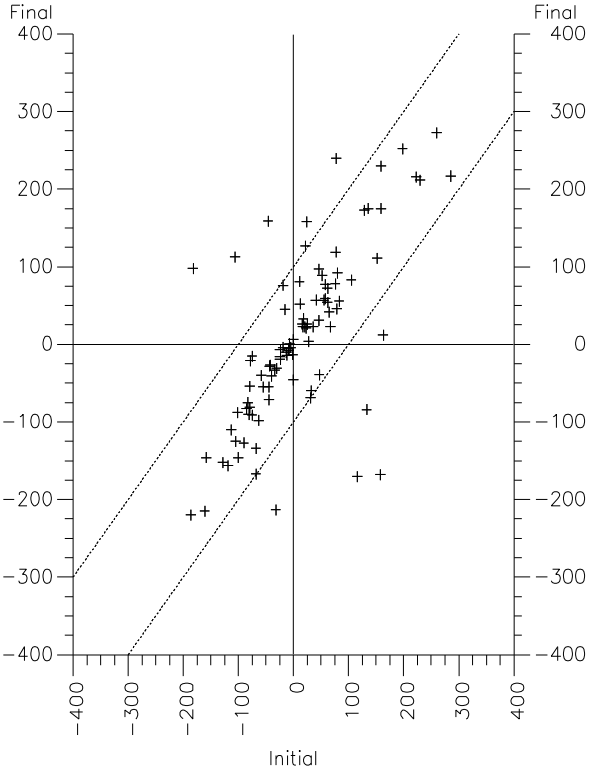
C.4 Non−merchandise − Debits
($ million)



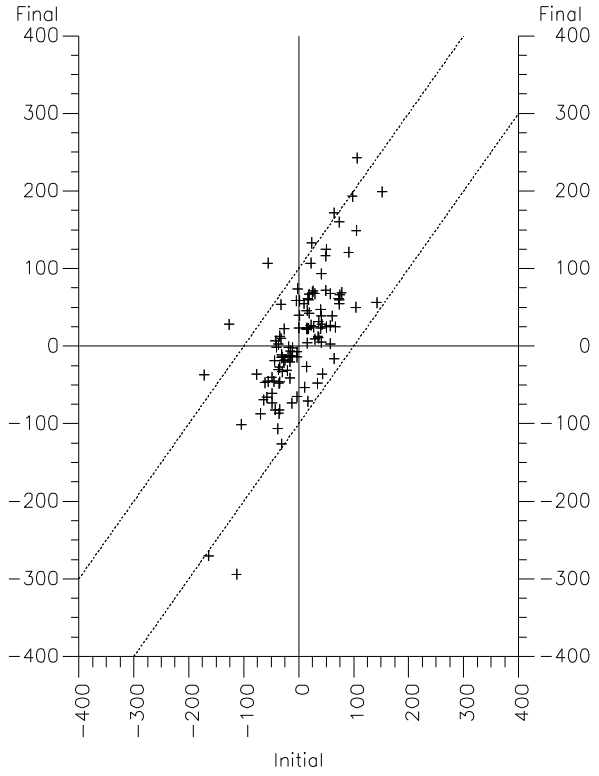
C.5 Income – Credits
($ million)



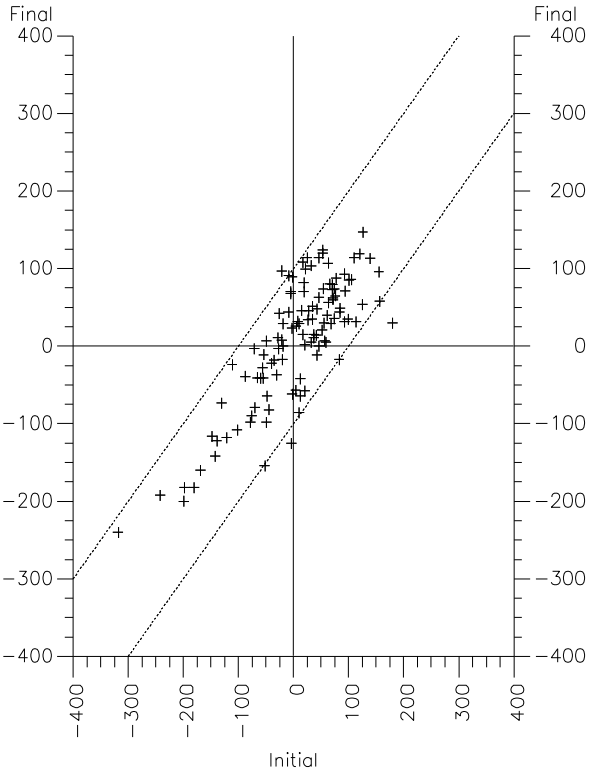
C.6 Income – Debits
($ million)



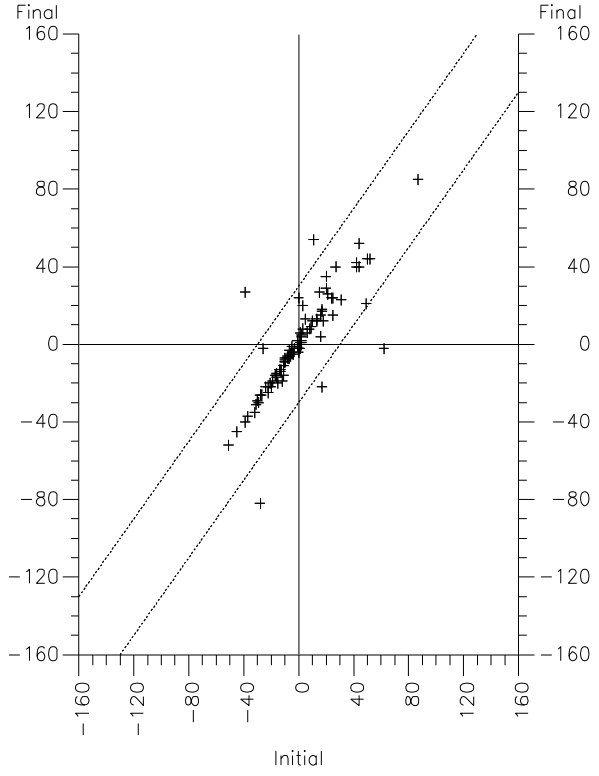
C.7 Services – Credits
($ million)



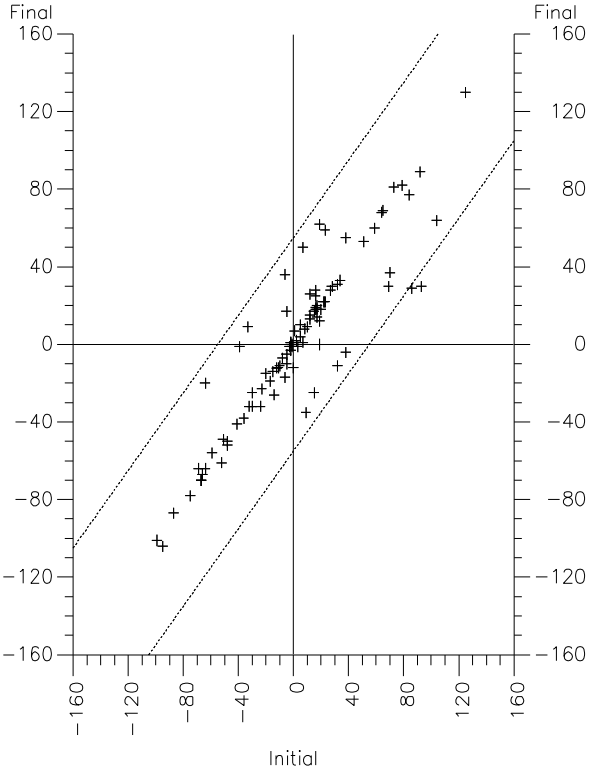
C.8 Services – Debits
($ million)



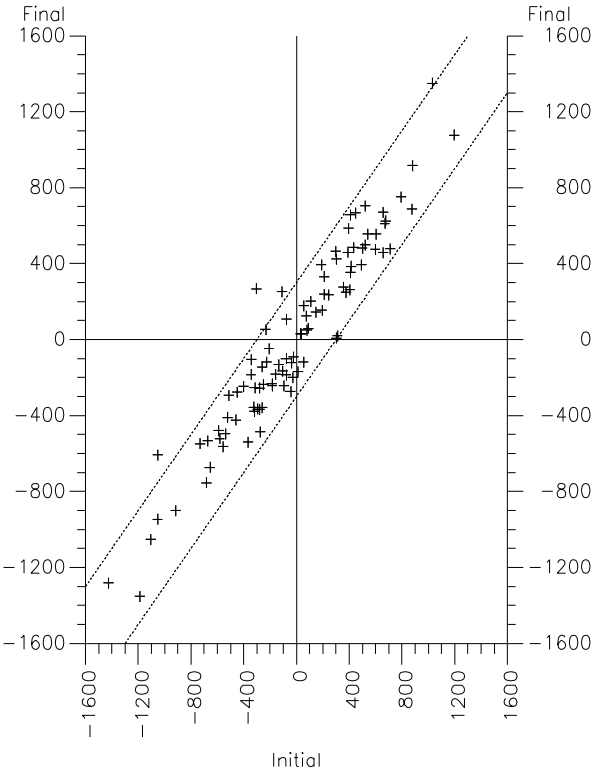
C.9 Unrequited Transfers – Credits
($ million)



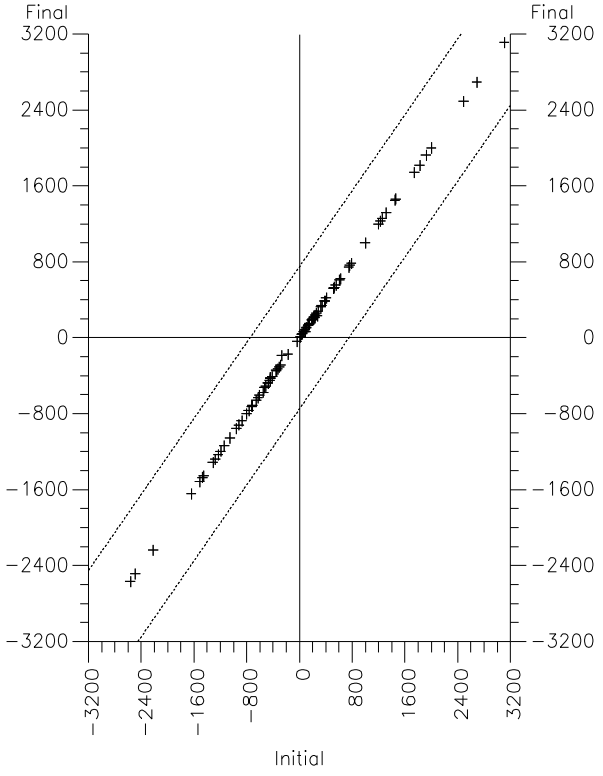
C.10 Unrequited Transfers – Debits
($ million)



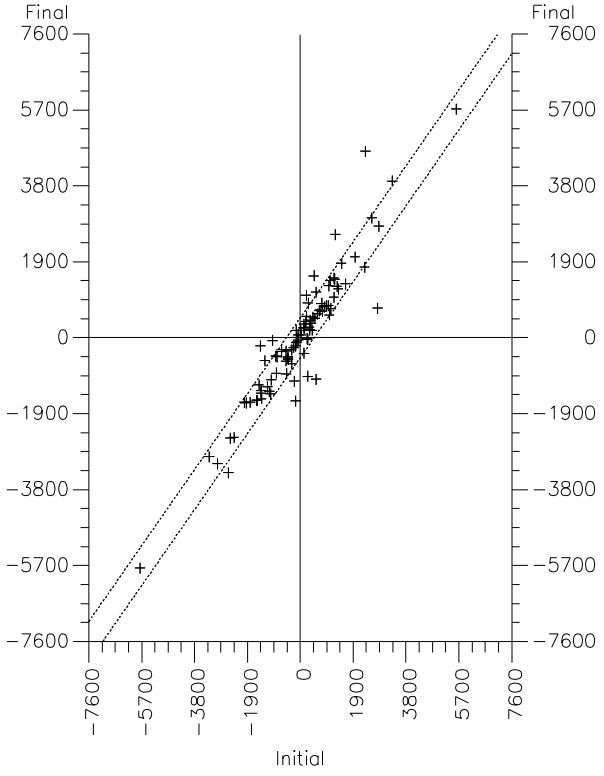
C.11 Balance on Current Account
($ million)



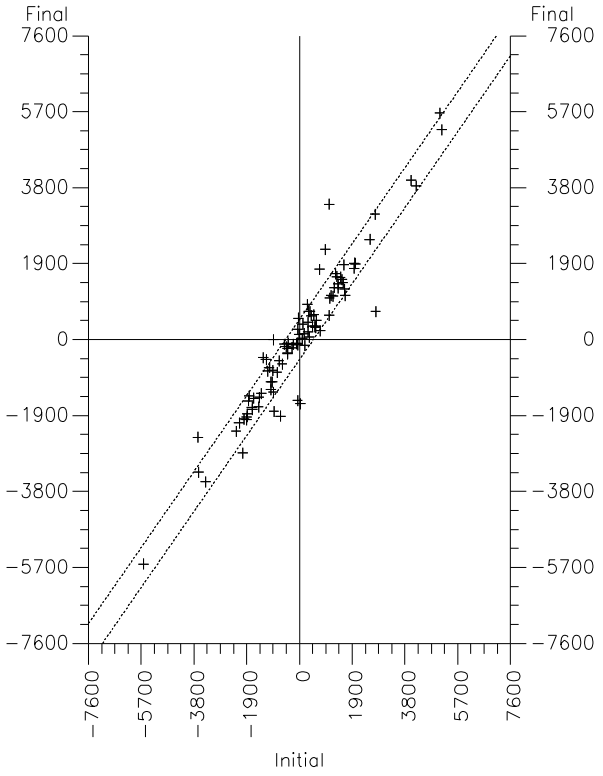
C.12 Net Capital – Reserve Bank
($ million)



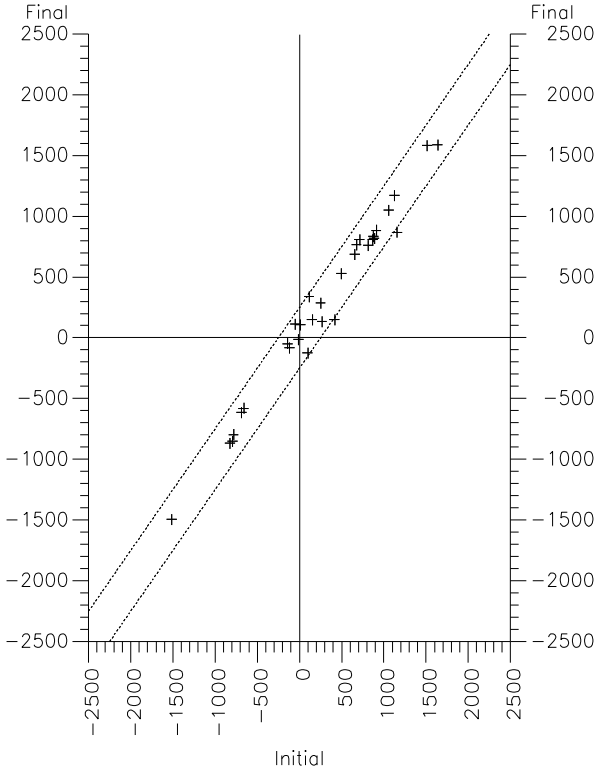
C.13 Net Capital – General Government
($ million)



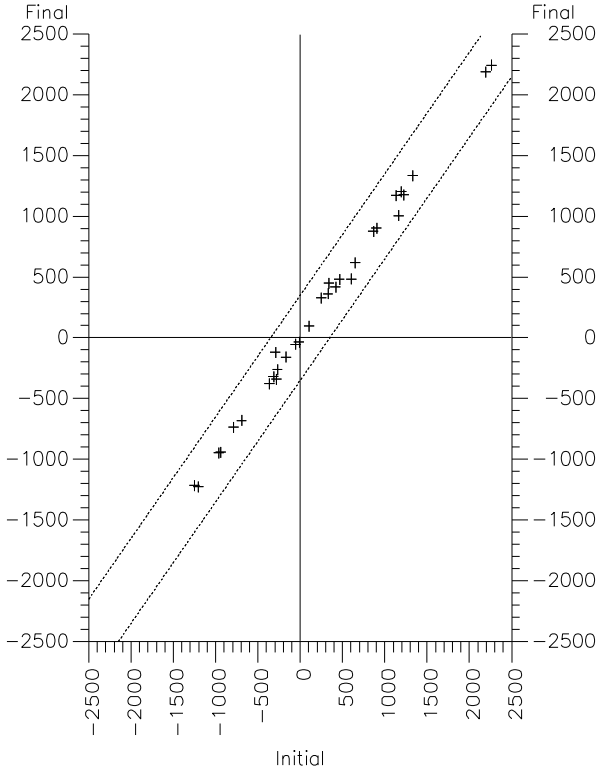
C.14 Net Capital – Official Sector
($ million)



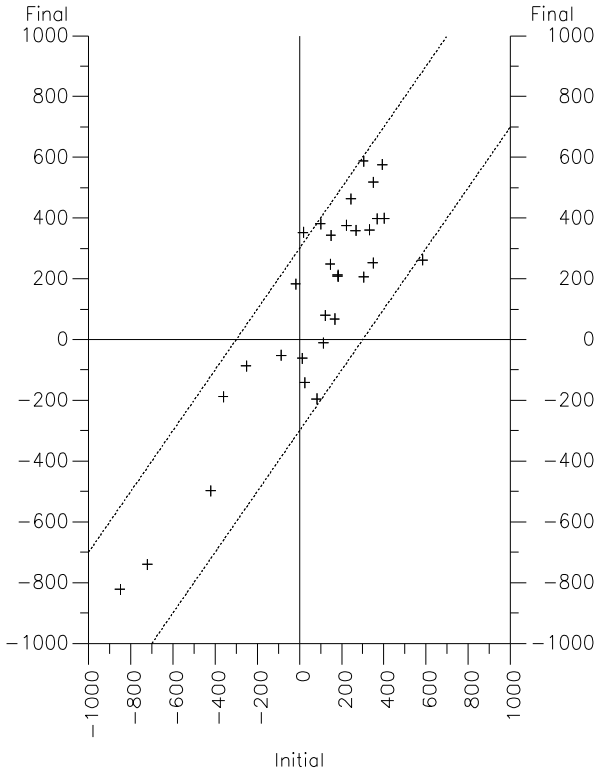
C.15 Merchandise Exports
($ million)



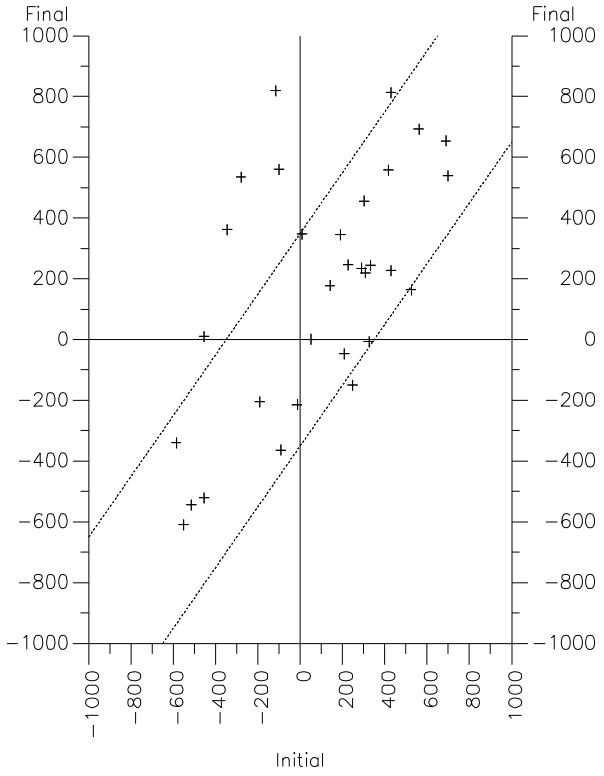
C.16 Merchandise Imports
($ million)



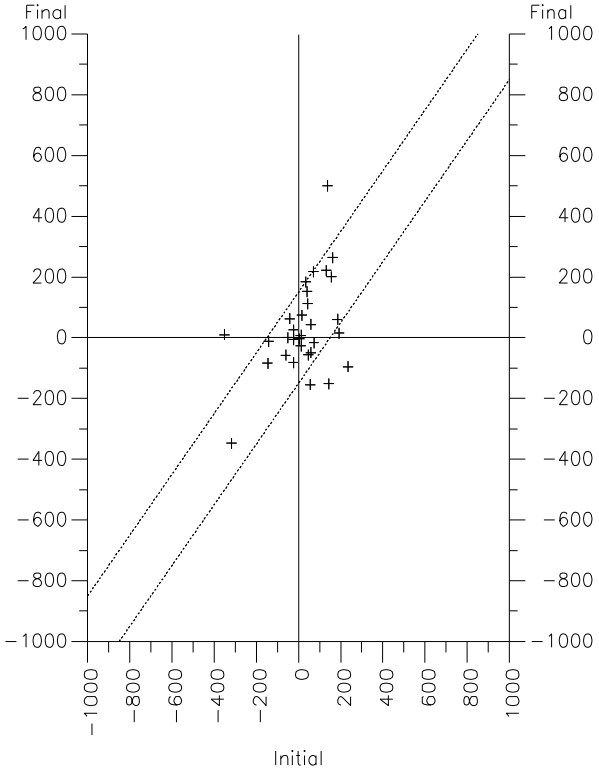
C.17 Non−merchandise − Credits
($ million)



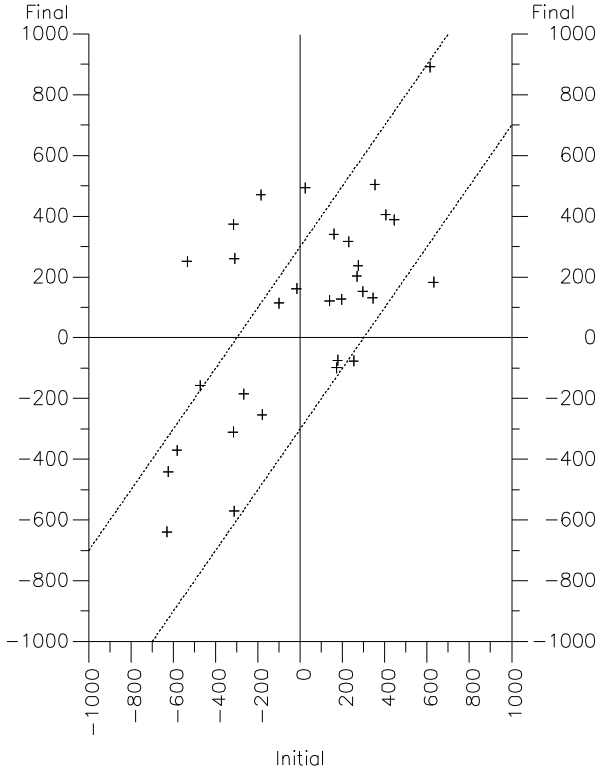
C.18 Non−merchandise − Debits
($ million)



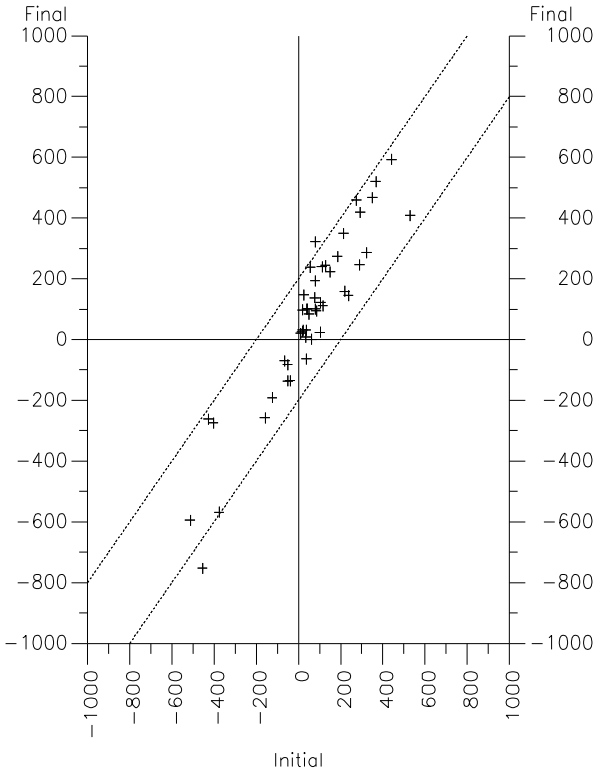
C.19 Income – Credits
($ million)



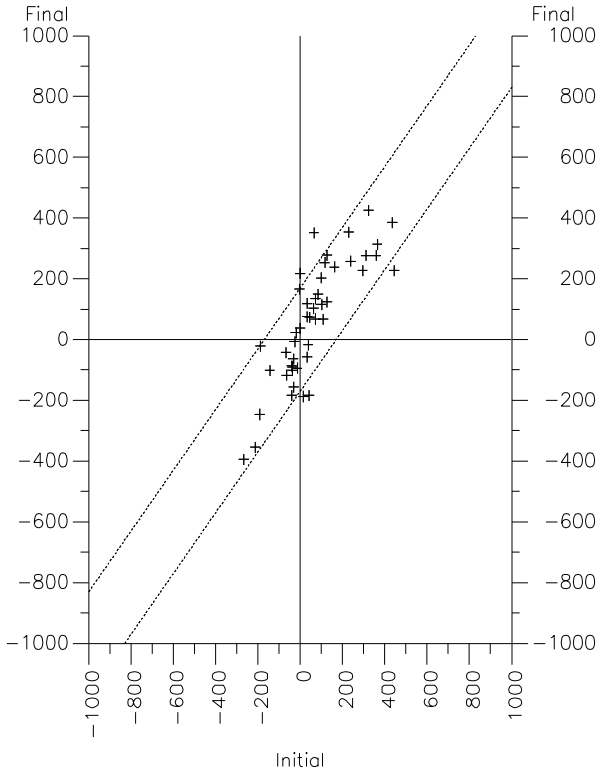
C.20 Income – Debits
($ million)



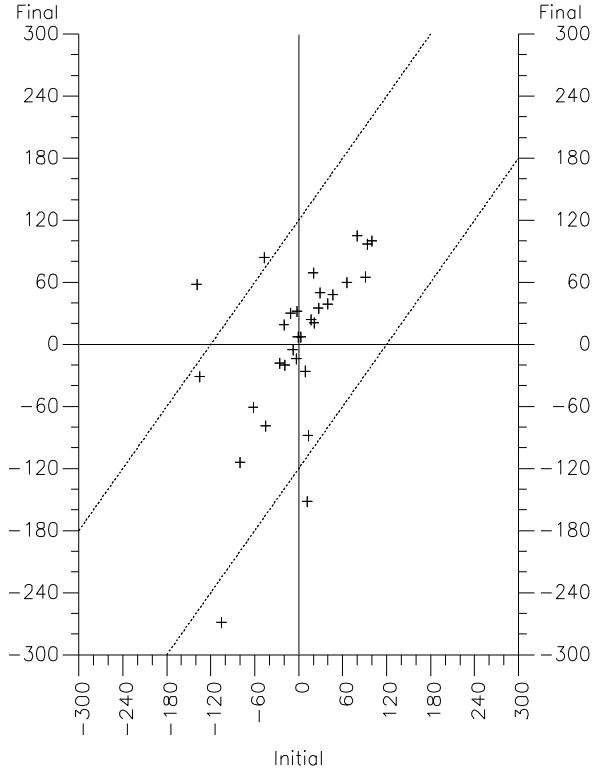
C.21 Services – Credits
($ million)



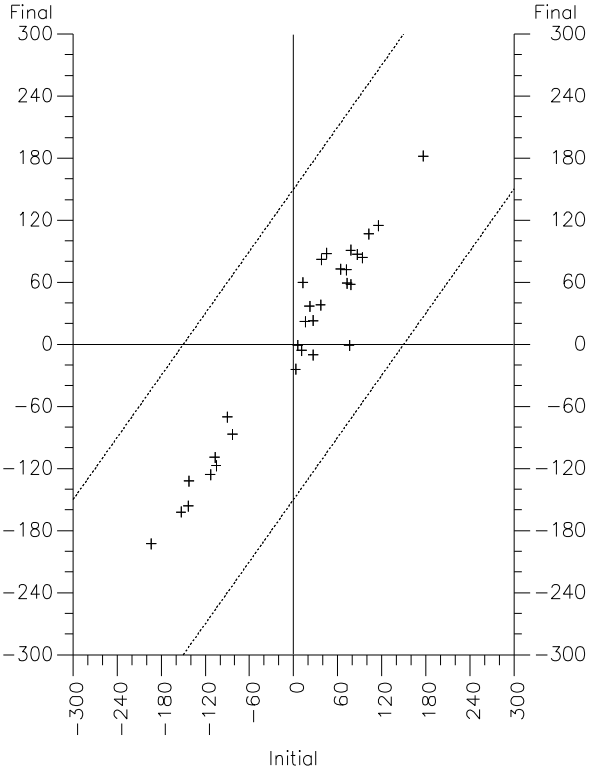
C.22 Services – Debits
($ million)



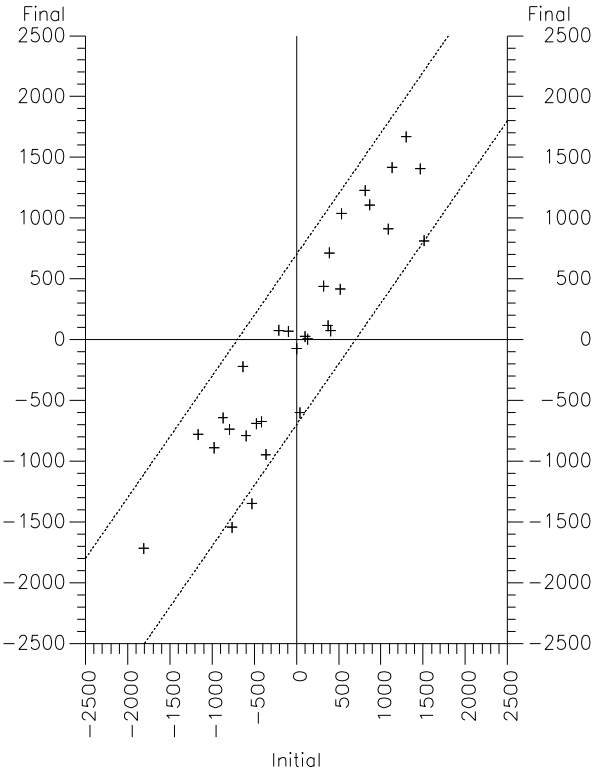
C.23 Unrequited Transfers – Credits
($ million)



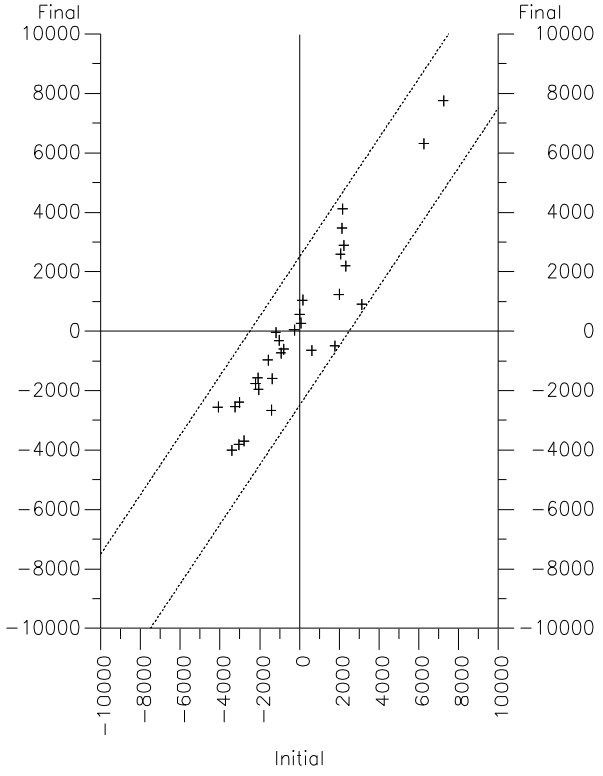
C.24 Unrequited Transfers – Debits
($ million)



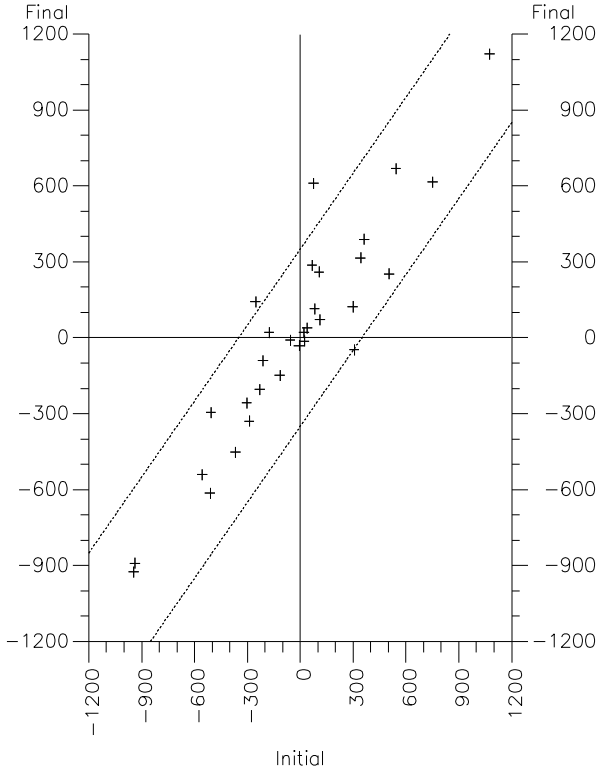
C.25 Balance on Current Account
($ million)



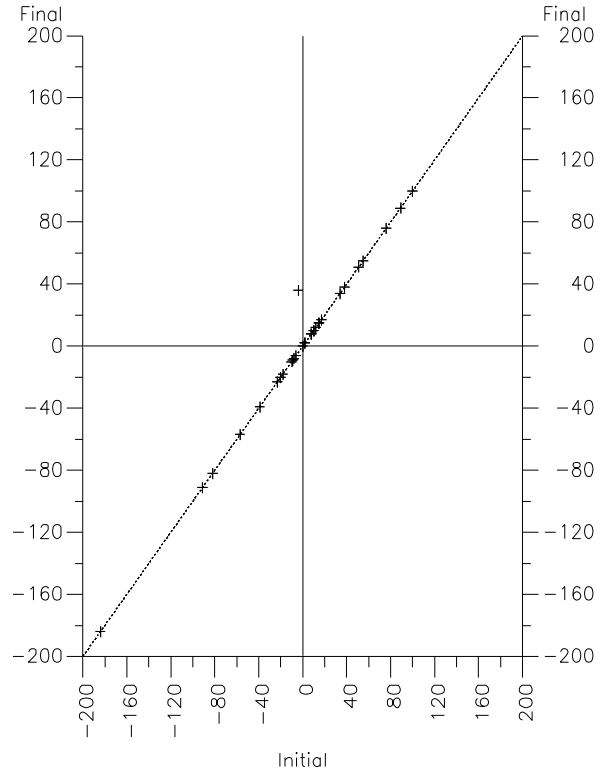
C.26 FIA – General Government
($ million)



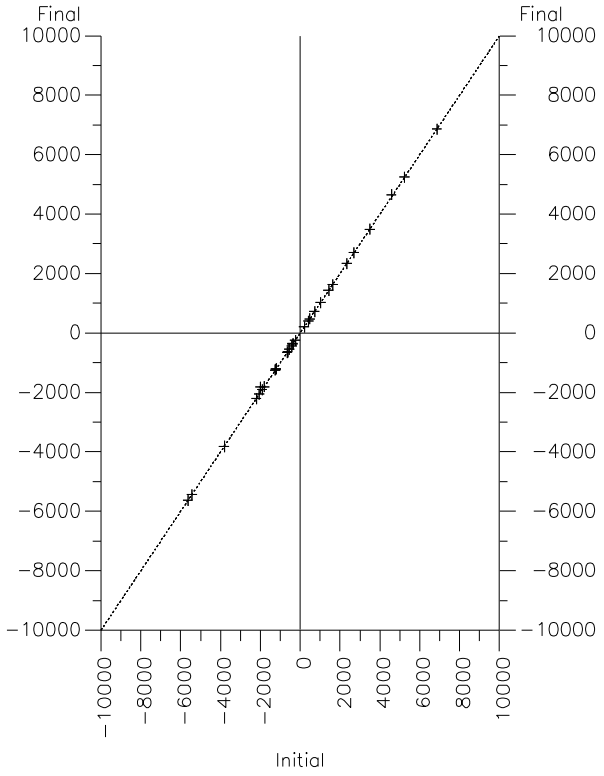
C.27 AIA – General Government
($ million)



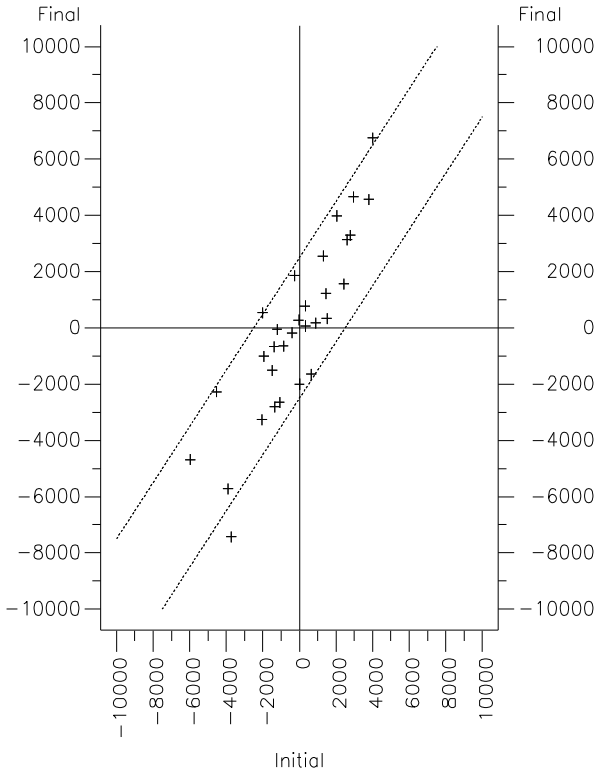
C.28 FIA – Reserve Bank
($ million)



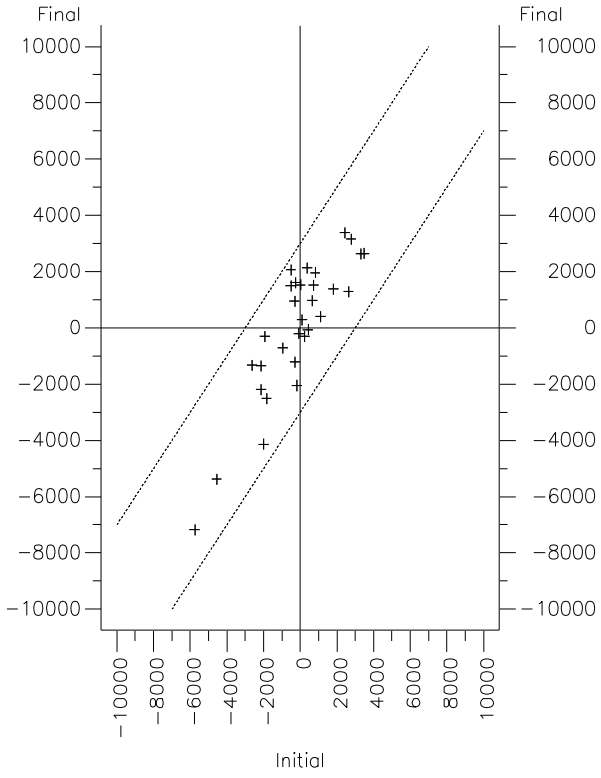
C.29 AIA – Reserve Bank
($ million)



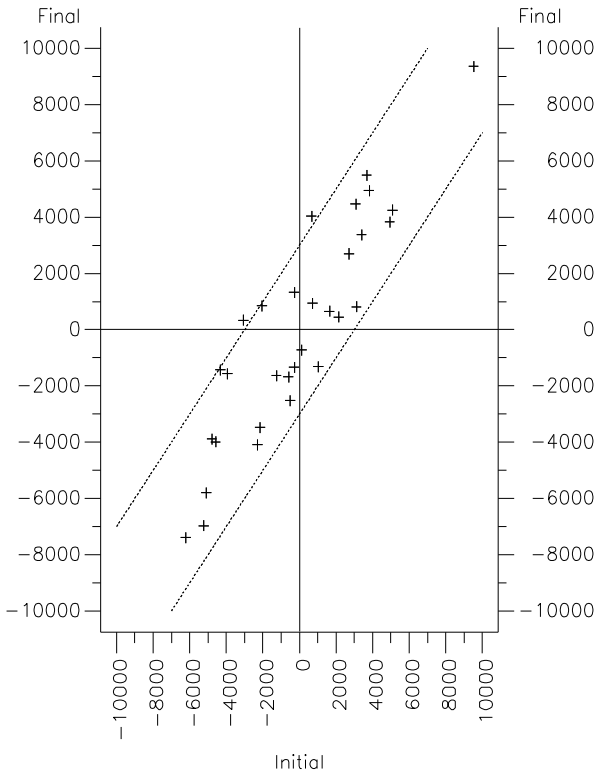
C.30 FIA – Non–official Sector
($ million)



C.31 AIA – Non–official Sector
($ million)



C.32 Balance on Capital Account
($ million)



C.33 Balancing Item
($ million)