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Analysis on the errors and omissions in the Finnish balance of payments: restless capital movements, floating exchange rate and errors since 1991

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BANK OF FINLAND DISCUSSION PAPERS

4/95

Jorma Hilpinen

Information Services Department
27.1.1995

Analysis on the Errors and Omissions in the Finnish Balance of Payments:

Restless Capital Movements, Floating
Exchange Rate and Errors Since 1991

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Analysis on the Errors and Omissions in the Finnish Balance of Payments:

Restless Capital Movements, Floating
Exchange Rate and Errors Since 1991*

* Kari Takala and Mari Hietala have contributed to the study by giving statistical advise and making calculations.

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Abstract

The pressures on the markka's exchange rate caused substantial swings in capital movements during 1991 and 1992. The markka was let to float in September 1992, and since then exchange rate changes have been volatile.

The Bank of Finland has complete monthly information for the BoP statistics since January 1991, allowing the calculation of detailed capital movements as well as a proper monthly errors and omissions item. The information system was planned in fixed exchange rate circumstances. The last four years have challenged the system more than expected, raising the risk of major errors and omissions.

The early data on current account is one item of economic information most eagerly awaited. The period of exchange rate turbulences also posed many practical problems in recording visible and invisible current account transactions.

In view of quality of the BoP-statistics measured with the errors and omissions, the last four years of exchange rate turbulence did not cause outstanding errors and thus a sudden weakening in the quality of statistics.

In the circumstances of floating currencies in many European countries the need and scope for revisions of early indicators of current account and other items may increase. So far our error even in the first current account estimates has been moderate, though it has been systematic, and the estimates have given a fairly reliable picture of the developments of the foreign stability of the Finnish economy.

Tiivistelmä

Paine markan kurssia kohtaan aiheutti suuria pääomanliikkeitä vuosien 1991 ja 1992 aikana. Markka laskettiin kellumaan syyskuussa 1992 ja sen jälkeen markan ulkoinen arvo on vaihdellut voimakkaasti.

Suomen Pankilla on vuoden 1991 alusta lähtien ollut kuukausipohjainen tiedonhankintajärjestelmä maksutasetilastoa varten, joten kuukausittaisten pääomanliikkeiden ja siten myös virhetermin laskeminen on mahdollista. Tiedonhankintajärjestelmä suunniteltiin kiinteiden valuuttakurssien oloissa. Viimeiset neljä vuotta suurine pääomavirtoineen ja valuuttakurssivaihteluineen ovat asettaneet järjestelmälle odotettuja hankalampia tehtäviä ja lisänneet suurten tilastovirheiden riskiä.

Vaihtotaseen ennakkotiedot ovat eräitä eniten odotettuja talousindikaattoreita. Viime vuosina myös vaihtotase-erien nopeassa kirjaamisessa on ollut monia käytännön ongelmia.

Virhetermin tilastollisilla ominaisuuksilla mitattuna maksutasetilaston laatu ei ole viimeksi kuluneiden neljän vuoden aikana äkillisesti huonontunut eikä suuria virheitä ole esiintynyt, vaikka valuuttamarkkinat ovat olleet levottomia.

Valuuttakurssien kelluessa useissa Euroopan maissa vaihtotaseen ja muiden erien ennakkotietojen korjaukset saattavat lisääntyä. Toistaiseksi meillä ensimmäistenkin vaihtotase-ennakoiden virhe on ollut kohtuullinen. Virheessä on kuitenkin havaittavissa systemaattista suhdannevaihtelua, mutta silti ennakkotietojen antama kuva talouden ulkoisesta tasapainosta on luotettavaa.



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1 Introduction

Finnish exchange rate policy encountered severe credibility problems in 1991 and 1992. The changes in expectations of market participants concerning the markka's exchange rate caused substantial swings in capital movements during those years. These expectations were realized both in 1991 and 1992. Finally, the markka was let to float in September 1992, and since then exchange rate changes have been volatile.

The Bank of Finland has complete monthly information for the BoP statistics since January 1991, allowing the calculations of detailed capital movements as well as a proper monthly errors and omissions item. The information system was planned in fixed exchange rate circumstances. The last four years have challenged the system more than expected, raising the risk of major errors and omissions.

The early data on current account is one item of economic information most eagerly awaited. The period of exchange rate turbulences also posed many practical problems in recording visible and invisible current account transactions.

The data collection and compilation system for the statistics can be regarded as a model to describe the phenomena. This model should have well behaving residuals and estimation errors. Since the Finnish balance of payments is based on more than one source and includes sampling, the errors may come from measurement, sampling and timing differences in various sources.

- The paper discusses briefly in section 2 the recent history of capital movements and exchange rate changes.
- In section 3, the record of the errors and omissions-term is discussed. Did the information system encompass all the plentiful and volatively changing capital movements or is the error term in the BoP larger during those months the speculative attacks and capital flows were strongest and/or large exchange rate changes occurred? The statistical properties of the error are also considered analysing both longer and shorter time series. Is the error term stable and random?
- Since the early preliminary data appear with only four weeks' delay, it is subject to revisions. The study also discusses in section 3 the effects of the revisions on the error.
- As a quantitative tool, in section 4, the study uses correlations between the error and various items of the balance of payments. Given the definitions employed below, if the error term correlates markedly positively with some BoP items, it can be assumed that only a part of the inflows, net, belonging to those items have been registered by the information system. On the other hand, if the correlation is negative, some excessive inflows, net, have been recorded for the item in question. However, the analysis below is based on the variations of the time series and says nothing about the level or the size of the error. As above, the effects of revisions are displayed.

- The effects of exchange rate changes to the errors are discussed in section 5.
- The quality of preliminary current account data is discussed in section 6 below: Were the first preliminary statistics of current account worse in the months of large crossborder movements and exchange rate changes than otherwise? Are the errors in the first preliminaries systematic or random?

The standard practise in quality-control work is to observe the behaviour of time series. The reader is invited to become familiarized with the charts attached describing the variations of the errors and omissions and various balance of payments items.

The main results of the statistical time series analysis are outlined in the statistical appendix. The econometric modelling system PCGIVE-versions 7 and 8 were used as well as the STAMP-timeseries-package.

2 Capital movements and exchange rate changes in 1991 – mid 1994¹

The underlying trend in capital movements are composed of two main features: The central government financed its large deficits mainly from abroad by issuing bonds in international markets. On the other hand, the private sector was in 1991–1993 amortizing its foreign loans taken in 1986–1989. The volatility of capital movements was mainly caused by the high activity on the forward markets which led to extensive spot flows for hedging purposes. Current account was in deficit to mid 1993.

Given the credibility problem, rumours concerning possible FIM exchange rate changes came and went during 1991 and early 1992. It also occurred that domestic and foreign market participants acted differently.

The first rumour about the devaluation of the markka moved in international markets as early as in March 1991. Foreign investors reacted and hedged their markka receivables. Domestic markets remained calm until May. After the Swedish crown was linked to the ECU, some pressure against the markka was felt, but confidence was restored after the subsequent tying of the markka to the ECU.

Again in the August–October period in 1991, the lack of confidence of domestic firms in the prevailing foreign exchange rates led to capital exports, mainly by banks in order to cover their risks in the forward market. Markka interest rates were high and foreign investors increased their markka investments, thus acting for the markka.

The markka was devalued on November 15th, 1991, and the domestic markets calmed down and capital returned to Finland. However, foreign investments in the markka had become unprofitable, causing withdrawal from the currency after the devaluation.

¹ See, for example, Economic Developments and Monetary Policy sections in Bank of Finland Yearbooks, issues 1991–1993 and Economic Developments, Inflation and Monetary Policy in Bank of Finland Bulletin, June–July 1994, vol. 68, No. 6–7.

In the course of spring 1992, bouts of speculation reoccurred and both domestic and foreign market participants put pressures on the markka. The domestic private sector was almost constantly exporting capital via banks.

Capital exports also continued after the decision to float the markka (September 8th). Especially firms with no export revenues repaid their foreign currency loans from domestic banks, even in advance. Consequently, the banks in turn kered their foreign financing, which dominated private capital movements in the balance of payments.

Similar developments continued during the first months of 1993. The outflow of private capital was offset by the ample import of foreign finance by the central government. At the same time, the markka depreciated substantially.

Money and exchange markets calmed down in March 1993 and private capital outflow ceased. However, due to abolition of legal obstacles in Jan 1, 1993, the sales of Finnish shares to foreigners continued to be brisk throughout the year. Central government also continued to acquire foreign finance especially during the first half of the year. During the spring and early summer months, the markka appreciated in relation to the ECU basket.

In August 1993, international pressures against the European Exchange Rate Mechanism accentuated, which led to a weakening of some currencies, including the Swedish crown. This was accompanied by the subsequent fall of the markka which coincided with an outflow of capital.

During the remaining months of 1993 the markka floated upwards, current account was mainly in surplus and capital movements were calm. However, the withdrawal of foreigners from the FIM-denominated bond-market continued in autumn 1993. In 1994, the rising markka interest rates have also contributed to this development.

During the first half of 1994, the value of the markka remained fairly stable but weakened slightly during early summer months. The foreign borrowing of central government continued, though on a slower pace than a year before. At the same time, the outflow of private capital diminished sharply compared to the previous year. During autumn months a clear appreciation of the markka took place coinciding with surpluses in the current account, capital inflows and increasing foreign exchange reserves.

3 Errors and omissions time series

The errors and omissions and other time series are defined below so that the net capital inflow is positive. Thus missing inflows and excessive outflows elsewhere add to the positive error and excessive inflows and missing outflows add to the negative error.

Monthly error term is by definition additive to quarterly error. In general, changes from month to month in monthly error are smaller than changes from quarter to quarter in quarterly error, but the extreme values in monthly error are of the same magnitude as in quarterly error. This means that in relation to current revenues monthly errors are very large (sometimes more than 20 per cent, chart 1A).

Notwithstanding extensive capital flows and considerable changes in exchange rates in certain months, the errors and omissions do not have very

significant peaks during the last four years. The average of the error over 42 months is only 55 mill. FIM and the maximum values are 3.7 billion FIM in Feb 1993 and -4.5 billion FIM in May 1991. The cumulative sum of the errors is 2.3 billion FIM.

If the time series of the errors and omissions are constructed always using the first preliminary estimates published, the maximum and minimum errors are considerably larger, 6.0 billion in Dec. 1993 and -5.8 in Oct. 1993. The average of the errors in the first preliminaries is slightly more than 300 million and standard deviation 2388. In the time series in use, the historical data are always revised. The monthly errors and omissions as in December 1994 are shown in chart 2 as well as the errors according to first preliminary data.

Instead of single peaks, times of speculative or otherwise large capital flows and exchange rate changes appear in the error term as large changes. The error term jumps from local minima to local maxima or vice versa in May-June 91, Sept-Oct 91, and Sep-Oct 92, Feb-March 93, May-June 93, Oct-Nov 93 and May-June 94. Some of these scissors-like-movements coincide with a vigorous weakening or strengthening of the floating markka. This naive analysis suggests that the floating of exchange rate is a new error factor.

The monthly errors are very slightly negatively autocorrelated (-0.14, not significant at 5 % risk level). Negative first order autocorrelation suggests that at least a part of the error is compensated in the next month by an error of the opposite sign. If the error were almost totally compensated (high negative autocorrelation) in the next period, this would indicate timing problems in recording transactions. The fact that autocorrelations up the order four are negative (see chart 3A) may suggest that the compensation process of a single large error takes more than one month. However, according to Ljung-Box test even the cumulation of the autocorrelation up to the fourth order is not significant. The cumulation of negative the autocorrelation becomes significant as the lag reaches one year.

The the variation of the error was decomposed with STAMP time series-package to level, seasonal and irregular parts.² During 1991-1994, 99 per cent of the variance of the monthly time series of the errors and omissions is of irregular type.

The quarterly and annual balance of payments statistics are composed of more complete information and have fewer timing problems. Annual errors and omissions can be reduced to less than one third of those quarterly. This is due to the natural effect of aggregation and also the autocorrelation structure of the time series. Errors of less than 5 per cent of current receipts on annual basis are regarded as acceptable. The long-term history of the errors and omissions is shown in charts 1B and 1C.

The long term statistical properties of the errors and omissions in relation to current receipts were analyzed using quarterly time series from 1970 to 1994. When the variations of the longer time series were decomposed, even more than 99 per cent was found to be irregular.

The variance of the errors and omissions increases markedly in mid eighties after the major liberation of exchange controls. The consequential growth of the variance of the errors and omissions was noted already in early

² See STAMP user guide, chapter 4.2.

nineties.³ In 1985–1994 period the variance of the errors and omissions was almost doubled compared to the 1970–1984 period. However, in late eighties few exceptional reasons for errors occurred: DP-system changes at the Bank of Finland in 1986, the change in the system of foreign trade statistics in the beginning of 1988 and the bankstrike in early 1990. These outliers provide evidence against the normality assumption in the long time series. After 1990, the variance is smaller than in 1985–1994 as a whole.

The hypothesis of the time dependency of variance over time was rejected in ARCH-tests.⁴ This not surprising given the stepwise increase of the variance referred above, see chart 1.

The autocorrelation of the order one is -0.18 and of order four is -0.25 of the long quarterly time series (see chart 3B). The latter is significant at five per cent risk. Also the cumulated cluster of autocorrelation up to the fourth order (one year) becomes significant as in monthly series. This can be interpreted as a sign of timing problems between periods of a length of a year. It also tells that the error term has balancing properties to even out during a longer period of time than just one quarter.

The Finnish balance of payment system has certain deficiencies causing errors. The first provisional monthly statistics are always based on incomplete information, especially on the corporate sector. Later survey responses are completed which might reduce the error reported in the preliminary statistics. Banks often revise their data and because of the importance of banks as a data source, revisions are visible also in statistics. The enterprise surveys employed have a good coverage on the debt side but in assets the coverage might be worse. Similarly, the notification of foreign accounts cannot be fully controlled and may contribute to missing data.

The household sector is not very systematically covered and neither is the export and import of the markka banknotes. One problem is quality variation of the bank data.

More emphasis should be placed on the coverage of surveys. The coverage should be considered by item and avoiding in the Finnish case the overemphasis of the debt side. International organisations try to improve the quality of data by adding details in reporting. In our view this only helps to a certain point and after that the detailed breakdowns become more or less random.

4 Correlations of various capital movements and current balances with errors and omissions

Below, some private capital movements items are monitored together with errors and omissions. In reality, errors may come also from current account. The central government and the Bank of Finland data are expected to be correct. When looking for potential errors in capital movements, it is assumed

³ Hilpinen 1991.

⁴ According to tests performed, the variance of the errors was not contaminated by autocorrelation, see e.g. PC-Give 8.0 manual, p. 335.

that current account is 'correct'. On the other hand, when comparing current account items and errors and omissions, capital movements are given.

Calculations were made twice, with preliminary data 1991M1-1993M6 and again in September 1994 when the revised data for the same period were available. Unfortunately, the reform of IMF Balance of Payments Manual led to difficulties in comparisons for some items. The revisions made later in autumn 1994 are not included in the correlation analysis.

Simple correlations are calculated. The correlations are statistically significant at 5 % risk measured with t-statistics in the sample period used if they exceed 0.35. Items are aggregated and monitored by institutional sector in order to see whether the errors cancel out within the sector. Items marked with (C) have had classification change in 1994 and results cannot be fully compared.

Table 1. **Correlation coefficients (financial account)**

Chart number	Capital inflow, net	Correlation with errors and omissions	
		prel.	rev.
4A.	Private (banks + corp.)	-0.11	-0.06
	Banks total, net	0.02	0.05
	long term, net	-0.34	-0.25
4B.	liabilities, net	-0.35	-0.39*
	(C) assets, net	-0.16	0.03
4C.	short term, net	0.13	0.14
	liabilities, net	0.14	0.06
	liab. in deposits	0.17	0.14
	(C) liab. in m.m.instr. (derivatives)	-0.04	-0.21
	liab. in other	0.12	0.10
	assets, net	0.06	0.12
	assets in deposits	0.44*	0.37*
5A.	assets in other	-0.09	0.00
	Corporate sector total, net	-0.51*	-0.41*
5B.	(C) long term, net	0.21	0.05
	liabilities, net	0.26	0.18
5B.	(C) assets, net	-0.49*	-0.26
6A.	short term, net	-0.52*	-0.49*
6B.	liabilities, net	-0.26	-0.32
6C.	assets, net	-0.33	-0.26

First, it must be noted that the volume and variation in bank capital movements are much larger than in corporate capital movements. Thus the possibility for errors is significantly larger in the bank data than in the corporate data. Many corporate items are in fact smaller than the error term.

The results show that banks' short term items tend to correlate positively with error term, suggesting that something of short term inflow is missing. On the other hand, banks' long term items tend to correlate negatively with error, thus probably cancelling the errors in short term movements.

A clear negative correlation with the error is found in the corporate sector as a whole. On the long term side errors more or less may cancel out, but the results suggest that something extra may have been recorded to short term inflows (increase in liabilities or decrease in assets) and that might contribute to the error term of opposite sign.

The revisions do not markedly decrease the correlation even though a general tendency towards smaller values can be seen. The analysis here has many shortcomings; the sample period is not long enough and correlations are heavily effected by single observations. This is demonstrated as a year of new data (mid 1993 – mid 1994) is added. The correlations between various items and the error for this longer sample period are shown in the charts 5, 6 and 7 attached.

The above analysis does not say that the error is just there and that a particular item is the counterpart of the error. It only can reveal that a second look should be given to those items varying like the errors and omissions.

Numerical correlation analysis must be completed with the comparison of single peaks and scissors-movements in the errors and in the various time series. For example, corporate sector capital inflow net and error term have both in early 1992 and in early 1993 coinciding scissors-movements (negative correlation!). The respective comparison of banks does not reveal very clear similarities.

The case of corporate sector in 1994 is very interesting. It not only violates the results just received from the correlations series but also requires confirming analysis of the new data because the patterns of variations are changing.

During 1994 the errors and omissions have been more negative than positive. The negative correlation of short term items of corporate sector with the error is very clear up to 1993, but it decreases considerably with assets when the year 1994 is added. In 1994 the correlation is clearly positive! Changes in short term assets of firms have been on average negative in 1994 (capital outflow). *Ceteris paribus*, assuming the positive correlation in 1994, this could be interpreted that during 1994 we might have had a lack of short-term aggregate outflows.

The developments in 1994 may lead to a conclusion that the information system has just recently become weaker on the asset side of firm sector. This has earlier proved to be the case in other countries when comparing internationally bank data and BoP data.

Current account items are also compared with error term. The sample period is 1993.1–1994.6. Below, deficit in current account items is defined as positive as are capital imports in error term.

Table 2.

Correlation coefficients (current account)

Current account item, deficit +	correlation with error and omissions
Current account, net	-0.10
Trade account, net	-0.14
Services, net	0.12
Investment income, net	0.04
Transfers, net	-0.05

In current account, nothing significant can be found. While varying the sample period the correlation coefficients vary considerably. It can be concluded the analysis here is very weak. The result may support the original assumption that most of the errors and omissions lie in the financial items. Clearly coinciding peaks in current account and error term can be seen in June 91, Oct. 92, May 93 and Oct 93.

The correlation analysis above suggests counterparts which both correlate with errors (the one negatively, the other positively). Thus at least a part of the variation in these both items may stem from the errors. When these items are correlated against each other, negative correlations are found as expected between following financial flows:

1. Corporate long term liabilities and assets, (-0.57)
2. Corporate short term net and corporate long term net (-0.37)
3. Corporate short term assets and liabilities (-0.32)
4. Bank's long term net and short term net (-0.35)
5. Bank's short term and long term liabilities (-0.35)

The results suggest that the maturity dimension may be difficult for reporting institutions.

Fairly high negative correlations were also found between variables which were not oppositely correlated with the error term. Thus the results of the analysis above must be considered very tentative.

5 Effects of exchange rate movements on the errors and omissions

As stated above it is intuitively clear that the volatility of exchange rate movements from month to month or even from day to day make it extremely difficult for reporting institutions to convert their foreign flows to FIM in an aggregated way. Even monitoring systems, such as the system of foreign settlements in the Bank of Finland, use for practical reasons second best procedures in conversion, that is, in a particular month, average exchange rates not yet known are estimated by the rates prevailing at the end of previous month. These technical difficulties evidently cause errors.

However, in the reality of the exchange markets, the various currencies go up and down in relation to each other and thus what is seen as a change of the

value of markka against the basket (for example ECU) of currencies is only the tip of the iceberg.

It is also very difficult to say what might be direction of the effect of exchange rate changes for the errors. It might be different in assets and in liabilities as it might if the domestic currency or the rates between various foreign currencies are going up or down. Similarly, the effects of changes of foreign currencies against each other may cancel out.

In view to the facts above it is only according to expectations that no significant quantitative relationships can be found between the errors and omissions and ECU basket, trade-weighted basket or single currencies. In single currencies like the dollar and the German mark the variations against the markka are largest. Similarities with the error of the BoP statistics and the changes of the markka rates of the above mentioned currencies can be seen during the first months of the floating of the markka til mid 1993 (charts 7A, B and C). These cannot be verified econometrically.

In the new surveys, the difference between two consecutive stocks has been divided into flows covered to FIM with relevant daily exchange rates and into valuation items which include the effects of exchange rates. This transparent way of enquiring might have helped the respondents to separate the flows actually occurring and to contributing to a smaller error term.

The effects of exchange rates on the stocks of assets and liabilities and on their valuation items of are discussed in the forthcoming study by Jarmo Kariluoto.⁵

6 Preliminary versus final estimates of current account

The other 'error-terms' related to the balance of payment statistics are the differences between revised and preliminary key variable estimates. The most important variable is the current account (charts 8A&B). Monthly current account preliminaries have been available since 1987.

One major problem in compiling current account preliminaries is the estimation of the reinvested earnings of the current year. A more general approach which also links the overall economic development of Europe and reinvested earnings has proved to be more reliable than merely the use of early indicators of micro data like quarterly and semiannual statements of enterprises.⁶

In this study, the reinvested earnings are included in the data of the econometric analysis, but their effect on the errors in the preliminaries is shown separately in the chart 8B. A considerable part of the systematic error in the first preliminaries has come from uncomplete data and erroneous estimation of the reinvested earnings abroad.

⁵ See Kariluoto, The Finnish Balance of Payments 1975-1994, in Finnish, forthcoming.

⁶ See Salomaa 1994.

The first monthly estimate of the current account is published with only four weeks delay and is based on uncomplete data. The estimates are revised quarterly and also in accordance with national accounts revisions. Final statistics of current account is available with an 18 month delay.

According records since 1987, the preliminary estimates of current account are conservative in the sense that they underestimate both the widening and the diminishing of the deficit as well as the growth of the surplus. On average, the errors are some -100 million FIM a month. However, as defined as the difference between the final and first preliminary estimate, the error term is positive in cases of underestimation of surpluses and underestimation of diminishing the deficit, the error is positive. Thus, the average negative errors are some -300 million FIM a month during 1989-1992 and positive errors for 1993-1994 and for 1987-1988 some 200 million FIM a month. However, in 1991 reinvested earnings contributed -250 million FIM a month to the error. During the most of 1992 their contribution was even larger, some -400 million FIM a month, which is practically the whole of the estimation error.

Large single corrections (more than +/- 500 million FIM) occur in April, July and Sep 1991, in April and Oct 1992, in Sept, Nov and Dec 1993 and finally in Jan and especially in June 1994. The corrections have been clearly more than five per cent in relation to current receipts in April and July 1991, in April 1992 and in June 1994.

The timing of errors in preliminaries do not strikingly coincide with speculative attacks or changes in the value of the markka, since a cycle dominates the estimation errors (both excluding and including reinvested earnings). This cycle can easily be verified: the error can be explained with a cyclical variable describing international economic developments (especially in Europe). In the appendix below, the error is explained with Finnish exports which also follows the international cycle. This systematic error in preliminary current account information asks for further studies and also for changes in the system to produce the preliminary statistics. The experience shows that the decision to include the reinvested earnings to such an important early warning statistics like current account should probably be reconsidered.

In addition to the cycle, some outliers exist in the data as the error jumps suddenly from the cyclical path to the other extreme of the opposite sign. These do not support the assumption on the normality of the time series.

7 Conclusions

In view of quality of the BoP-statistics measured with the errors and omissions, the last four years of exchange rate turbulence did not cause outstanding errors and a weakening in the quality of statistics. Since currencies are floating in many European countries, errors may arise from volatile exchange rates as well as from capital movements themselves and the work of reporting institutions has become more difficult.

In these circumstances the need and scope for revisions of early indicators of current account and other items may increase. So far our error even in the first current account estimates has been moderate in relation to the current flows, although it has proved to have a cyclical pattern. The inclusion of the

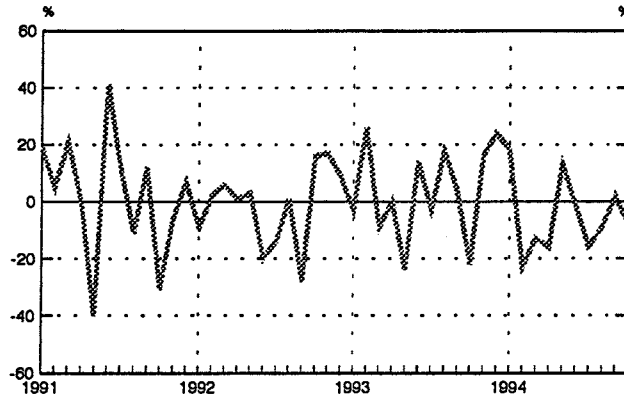
reinvested earnings to the current account causes severe problems for the estimation of preliminary statistics.

In quality control, new analytical methods for the search for errors must be adopted both in working with the time series of ready statistics as well as in filling in the gaps of missing data in the basic information.

This paper is a first step in the process to analyse the errors and omissions in relation to financial account items with time series methods. More work along these lines is called for in order to maintain the quality of Finnish balance-of-payments statistics.

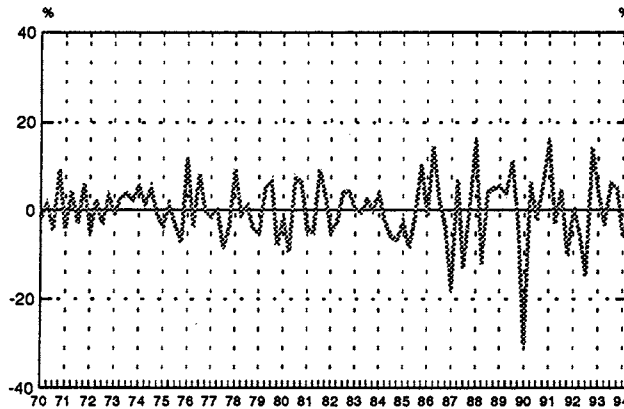
Chart 1.

1A. ERRORS AND OMISSIONS IN BOP 1991M1 - 1994M10
PER CENT OF CURRENT ACCOUNT RECEIPTS



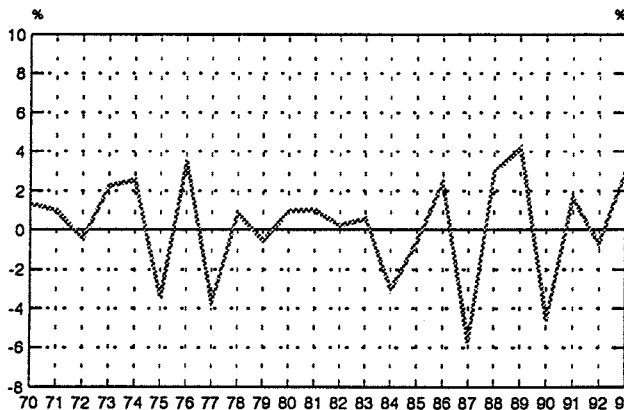
*** MONTHLY

1B. ERRORS AND OMISSIONS IN BOP 1970Q1 - 1994Q2
PER CENT OF CURRENT ACCOUNT RECEIPTS



*** QUARTERLY

1C. ERRORS AND OMISSIONS IN BOP 1970 - 1993
PER CENT OF CURRENT ACCOUNT RECEIPTS



*** ANNUALLY

Chart 2.

**Errors and omissions in BoP
1991M1-1994M10**

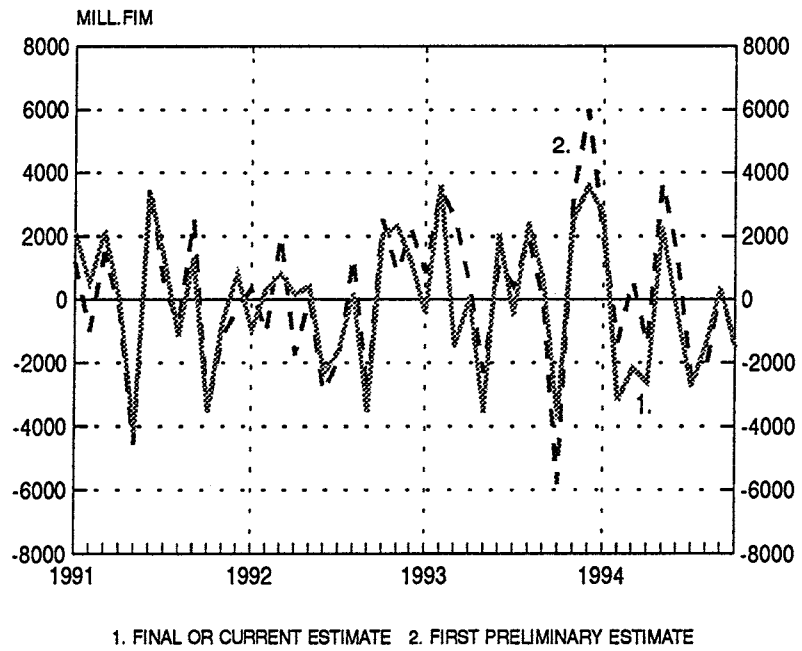


Chart 3A.

Autocorrelation function for monthly series

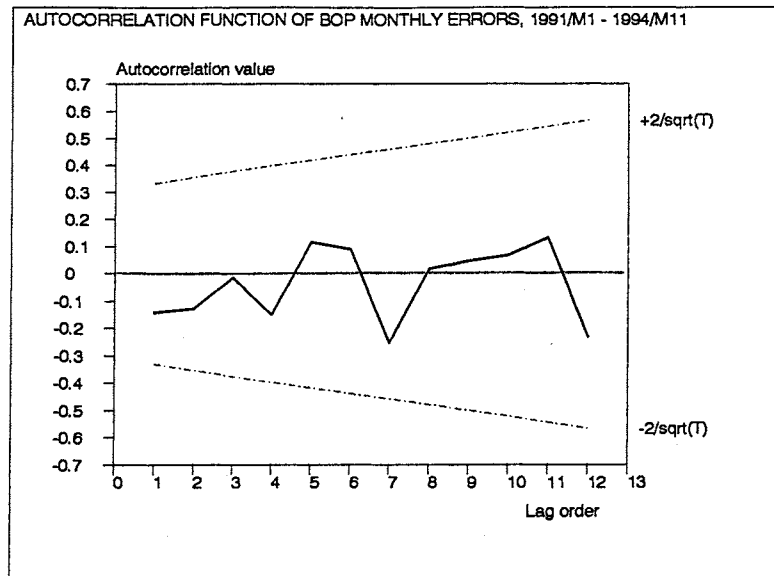


Chart 3B.

Autocorrelation function for quarterly series

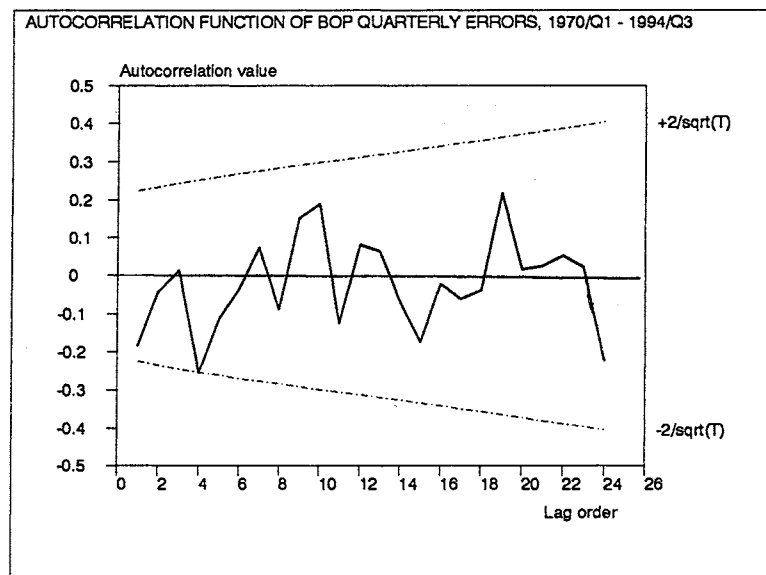
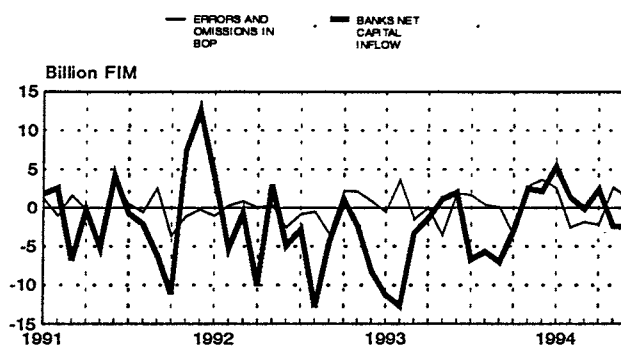


Chart 4.

4A

**BANKS NET CAPITAL INFLOW
& ERRORS AND OMISSIONS IN BOP**

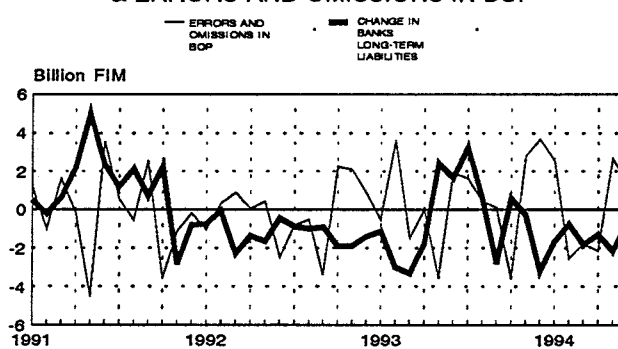


+ = capital inflow to Finland

Correlation 0.08

4B

**CHANGE IN BANKS LONG-TERM LIABILITIES
& ERRORS AND OMISSIONS IN BOP**

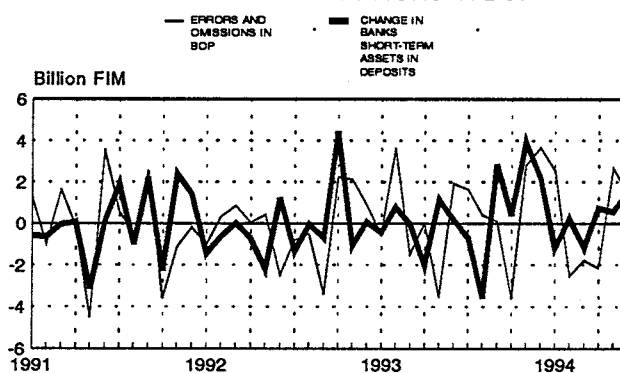


+ = capital inflow to Finland

Correlation = -0.26

4C

**CHANGE IN BANKS SHORT-TERM ASSETS IN DEPOSIT
& ERRORS AND OMISSIONS IN BOP**

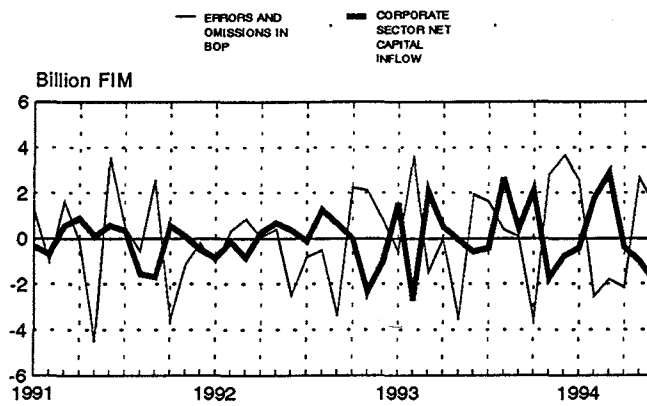


+ = capital inflow to Finland

Correlation = 0.34

Chart 5.

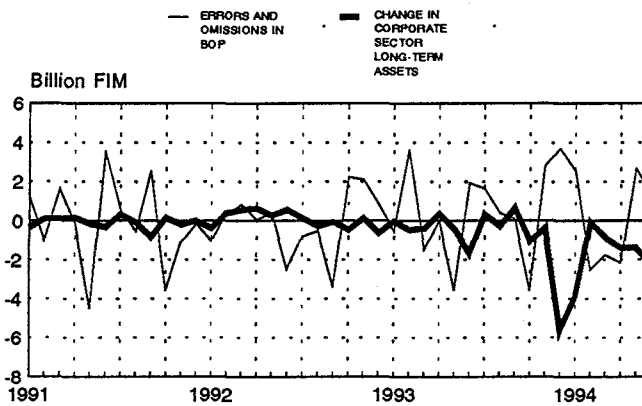
5A CORPORATE SECTOR NET CAPITAL INFLOW
& ERRORS AND OMISSIONS IN BOP



+ = capital inflow to Finland

Correlation -0.51

5B CHANGE IN CORPORATE SECTOR LONG-TERM ASSETS
& ERRORS AND OMISSIONS IN BOP

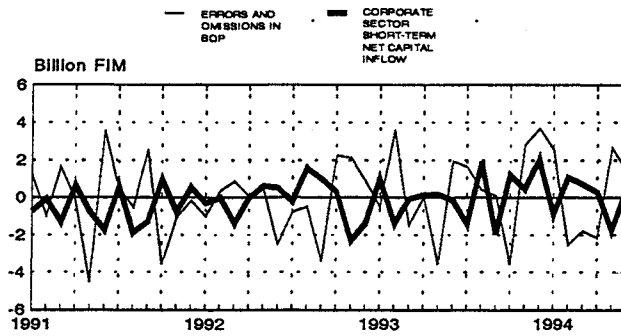


+ = capital inflow to Finland

Correlation -0.34

Chart 6.

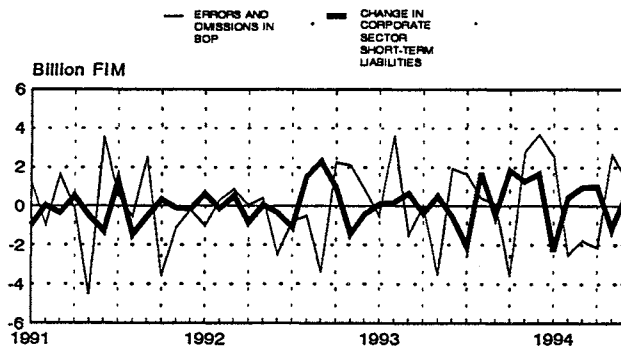
6A CORPORATE SECTOR SHORT-TERM NET CAPITAL INFLOW
& ERRORS AND OMISSIONS IN BOP



+ = capital inflow to Finland

Correlation -0.37

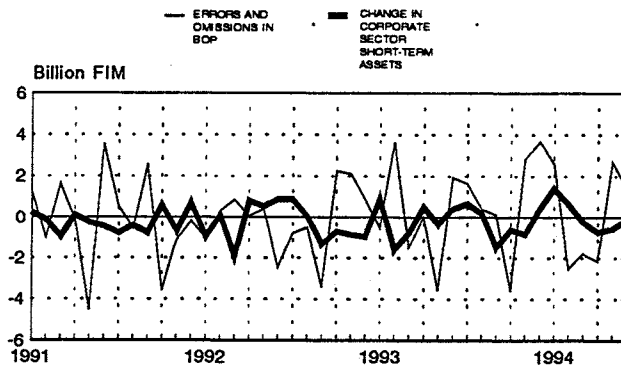
6B CHANGE IN CORPORATE SECTOR SHORT-TERM LIABILITIES
& ERRORS AND OMISSIONS IN BOP



+ = capital inflow to Finland

Correlation -0.32

6C CHANGE IN CORPORATE SECTOR SHORT-TERM ASSETS
& ERRORS AND OMISSIONS IN BOP

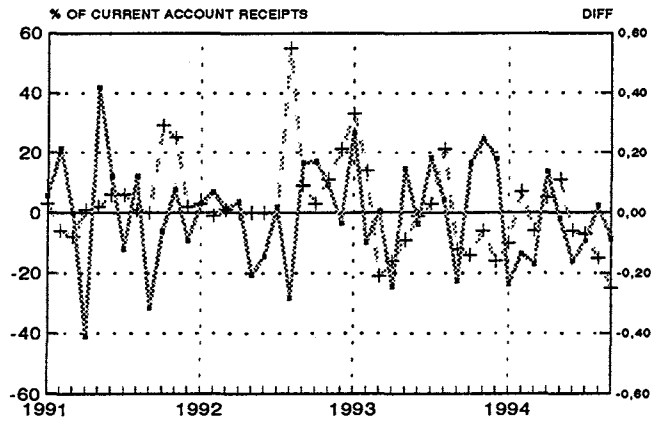


+ = capital inflow to Finland

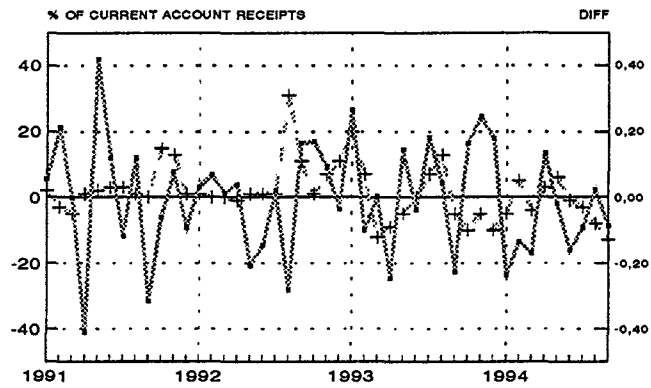
Correlation -0.10

Chart 7.

7A. → ERRORS AND OMISSIONS + CHANGE IN ECU BASKET



7B. → ERRORS AND OMISSIONS + CHANGE IN FIM / DEM



7C. → ERRORS AND OMISSIONS + CHANGE IN FIM / USD

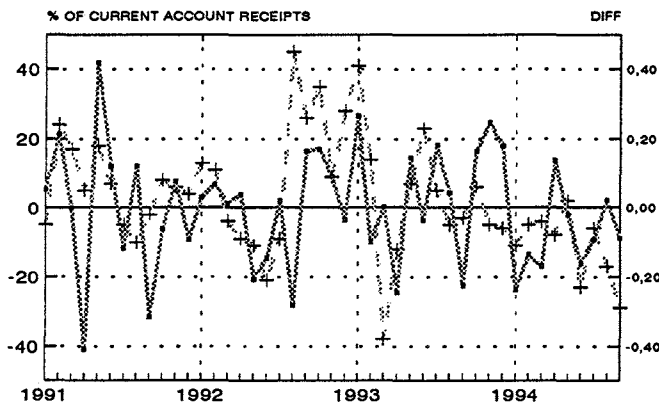
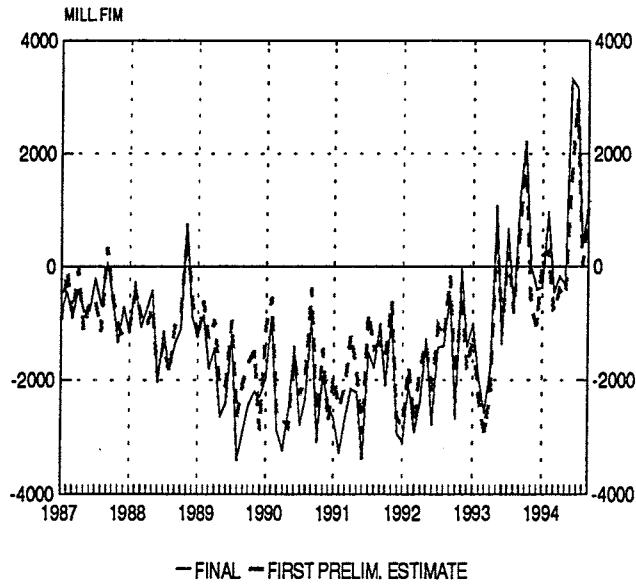
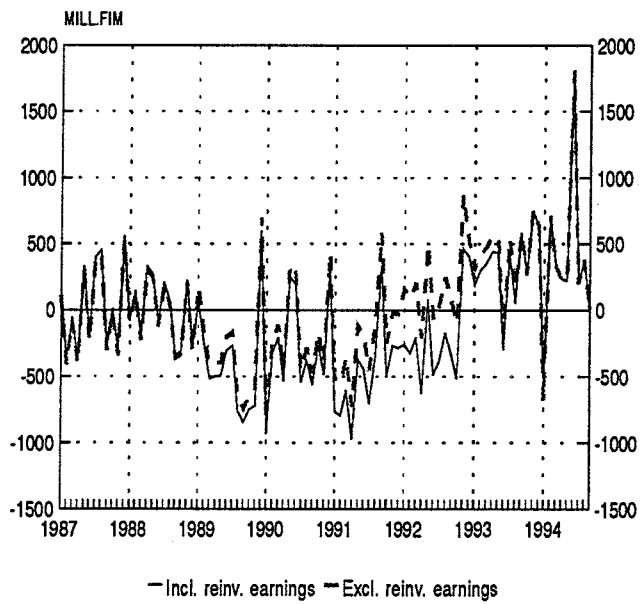


Chart 8.

8A. CURRENT ACCOUNT 1987M1 - 1994M9
Final and first preliminary estimate



8B. DIFFERENCE BETWEEN FINAL AND FIRST PRELIMINARY ESTIMATE
OF CURRENT ACCOUNT



References

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Appendix

This appendix describes basic statistical results.

1 Descriptive statistics of the monthly time series of errors and omissions (KS81N.M)

The present sample is: 1991 (1) to 1994 (6)

Sample Size	42
Mean	54.9585
Std.Devn.	2150.2274
Skewness	-0.2304
Excess Kurtosis	-0.7494
Minimum	-4512.2800
Maximum	3672.7300
Normality Chi ² (2)	1.3223

2 Monthly time series of errors and omissions in relation to current account receipts

Frequency Domain Estimation

Dependent variable is RKS81NM

Sample period 91M1 to 94M11, 47 observations

Estimate	Parameter	Standard Error	t-ratio
.00004	σ^2 (Level)	.00005	.7087
.00018	σ^2 (Seasonal)	.00012	1.5299
.0224	σ^2 (Irregular)	.00917	2.4419*

3 Monthly time series of errors and omissions in relation current account receipts

Autocorrelation function and Ljung-Box tests

ESRC Centre in Economic Computing System for Time Series
Sample 91M1 to 94M11, 47 observations, 47 used

Variable	RKS81
Minimum	-.4097
Mean	.00251
Maximum	.4187
Standard Deviation	.1710

ESRC Centre in Economic Computing System for Time Series

Order	Auto-correlation	Standard Error	Ljung-Box Statistic
1	-.1426	.1459	1.0185
2	-.1280	.1488	1.8572
3	-.0157	.1511	1.8701
4	-.1506	.1512	3.0846
5	.1160	.1543	3.8223
6	.0901	.1562	4.2782
7	-.2551	.1573	8.0255
8	.0171	.1658	8.0428
9	.0457	.1659	8.1693
10	.0678	.1661	8.4553
11	.1321	.1667	9.5716
12	-.2313	.1689	13.0907**

4 Descriptive statistics of the errors and omissions in relation to current account receipts (RKS81), quarterly time series

The present sample is: 1970 (1) to 1994 (3)

Sample Size	99	
Mean	-0.0003	
Std.Devn.	0.0724	
Skewness	-0.7307	
Excess Kurtosis	2.8693	
Minimum	-0.3167	
Maximum	0.1673	
Normality Chi ² (2) =	18.595	[0.0001]**

The present sample is: 1985 (1) to 1994 (3)

Sample Size	39	
Mean	-0.0046	
Std.Devn.	0.0975	
Skewness	-0.7036	
Excess Kurtosis	1.1548	
Minimum	-0.3167	
Maximum	0.1673	
Normality Chi ² (2) =	4.884	[0.0870]

The present sample is: 1970 (1) to 1984 (4)

Sample Size	60	
Mean	0.0025	
Std.Devn.	0.0495	
Skewness	0.2097	
Excess Kurtosis	-0.7026	
Minimum	-0.0937	
Maximum	0.1190	
Normality Chi ² (2) =	1.7816	[0.4103]

The present sample is: 1991 (1) to 1994 (3)

Sample Size	15	
Mean	-0.0008	
Std.Devn.	0.0824	
Skewness	0.2951	
Excess Kurtosis	-0.5404	
Minimum	-0.1466	
Maximum	0.1581	
Normality Chi ² (2) =	0.4387	[0.8030]

5 Quarterly time series of errors and omissions in relation to current account receipts

Frequency Domain Estimation

Dependent variable is RKS81NQ

Sample period 70Q1 to 94Q3, 99 Observations

Estimate	Parameter	Standard Error	t-ratio
.000007	σ^2 (Level)	.00001	.7541
.000030	σ^2 (Seasonal)	.00002	1.4464
.005078	σ^2 (Irregular)	.00083	6.0986**

6 Quarterly time series of errors and omissions in relation to current account receipts

Autocorrelation function and Ljung-Box tests

ESRC Centre in Economic Computing System for Time Series
Sample 70Q1 to 94Q3, 99 observations, 99 used

Variable	RKS81NQ
Minimum	-.3168
Mean	-.0003040
Maximum	.1674
Standard Deviation	.0728

ESRC Centre in Economic Computing System for Time Series

Order Statistic	Auto-correlation	Standard Error	Ljung-Box Statistic
1	-.1823	.1005	3.3893
2	-.0421	.1038	3.5721
3	.0141	.1040	3.5928
4	-.2549	.1040	10.4298*
5	-.1126	.1101	11.7778
6	-.0355	.1113	11.9130
7	.0748	.1114	12.5205
8	-.0889	.1119	13.3887

7 Quarterly time series of errors omissions, tests on autoregressive conditional heteroscedasticity

$$\text{ARCH } 1F(1,94) = 0.67362 \quad [0.4139]$$

$$\text{ARCH } 4 F(4,85) = 0.52985 \quad [0.7141]$$

Testing for ARCH from lags 1 to 4

$$\text{Chi}^2(4) = 5.1699 [0.2703] \text{ and } F\text{-Form } (4,88) = 1.2804 [0.2838]$$

ARCH (1 to 4) Coefficients:

	Constant	Lag 1	Lag 2	Lag 3	Lag 4
Coeff.	0.0042	-0.0782	0.0394	0.0074	0.2132*
Std.Err	0.0016	0.1041	0.1045	0.1045	0.104

$$\text{RSS} = 0.0128169, \sigma = 0.0120684$$

8 Descriptive statistics of the difference between the final and the first preliminary estimate of the current account (diff)

Analysis of diff

The present sample is: 1987 (1) to 1994 (6)

Sample Size	90
Mean	-117.9814
Std.Devn.	460.1909
Skewness	0.6790
Excess Kurtosis	1.0160
Minimum	-973.6100
Maximum	1674.3400
Normality Chi ² (2) =	10.667**

9 Modelling diff with cyclical variables by OLS

(EQ 1) Value of exports

The present sample is: 1987 (1) to 1994 (6)

Variable	Coefficient	Std.Error	t-value
Constant	-935.39	232.21	-4.028
XV	0.0933	0.0260	3.590

$R^2 = 0.127736$, $F(1,88) = 12.887$ [0.0005], $\sigma = 432.231$, $DW = 1.70$
 RSS = 16440457.32 for 2 variables and 90 observations

(EQ 2) Log diff (12) of value of exports

The present sample is: 1988 (1) to 1994 (6)

Variable	Coefficient	Std.Error	t-value
Constant	-232.53	56.706	-4.101
$\Delta_{12}LXV$	1170.0	334.64	3.496

$R^2 = 0.138549$, $F(1,76) = 12.223$ [0.0008], $\sigma = 442.502$, $DW = 1.70$
 RSS = 14881387.34 for 2 variables and 78 observations

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