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ANALYSIS ON THE ERRORS AND OMISSIONS IN THE FINNISH BALANCE OF PAYMENTS

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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

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 rather volatile.

Bank of Finland has a 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 large 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 caused many practical problems in recording visible and invisible current account transactions.

In view to 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 sudden weakening in the quality of statistics.

However, in these circumstances the need and scope for revisions of early indicators of current account and other items may increase. So far the error even in the first current account estimates has been moderate and the estimates have given a reliable picture of the developments in the foreign stability.

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DISCUSSION PAPER

21.12.1994

ANALYSIS ON THE ERRORS AND OMISSIONS IN THE FINNISH BALANCE OF PAYMENTS:
Restless capital movements, floating exchange rate and errors since 1991*[1]

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. The 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 rather volatile.

Bank of Finland has a 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 large 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 caused 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 phenomen. 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.

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[1] Mari Hietala has contributed to the study by making the calculations and drafting the statistical appendix.

- The paper discusses shortly 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. Is the error term stabile and random?

- Since the early preliminary data come out with only four weeks' delay, it is subject to revisions. The study discusses in section 3 also on the effects of the revisions to the error.

- As a quantitative tool, the study uses in section 4 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 has been registered by the information system. On the other hand, if the correlation is negative, some excessive inflows, net, has 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 excange rate changes to the errors are discussed in section 5.

- The quality of prelimary 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 watch the behaviour of time series. The reader is invited to familiarize to the numerous charts attached describing the variations of the errors and omissions and various balance of payments items.

The statistical methods employed and the main results are outlined in the statistical appendix. The econometric modelling system PCGIVE-version 7 was used.

2. Capital movements and exchange rate changes in 1991 - mid 1994[2]

The underlying trend in capital movements 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 1991-93 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.

Given the credibility promlem, rumors 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 rumor about the devaluation of the markka moved in international markets already in March 1991. Foreign investors reacted and hedged their markka receivables. Domestic markets were calm until May. After the Swedish crown was linked to the ECU, some pressure against the markka was felt, but, the 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, acting thus 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 and causing withdrawal from the markka after the devaluation.

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.

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[2] 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

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

Similar developments were continued during the first months of 1993. The outflow of private capitai was offsetted by the ample import of foreign finance by the central government. At the same time, the Markka depreciated markedly.

Turn occurred in March 1993 when money and exchange markets calmed down 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 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 weakening of some currencies including Swedish crown. This was accompanied by the subsequent fall of the markka. The weakening of markka coincided with outflow of capital.

During the remaining months of 1993 the markka floated upwards and capital movements were calm. However, the withdraval of the foreigners from their FIM nominated bonds continued since autumn 1993. In 1994, the rising markka interest rates have also contributed to that.

During the first half of 1994, the value of markka remained rather 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 private outflow of capital diminished markedly compared to the previous year. During autumn months a clear appreciation the markka has taken place coinciding with surpluses in the current account, capital inflows and increasing foreign exchange reserves.

3. Errors and omissions monthly

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 ans missing outflows increase 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 maximal 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 using always the first preminary estimates published, the maximum and minimum errors are considerably larger, 6.0 billion in Dec. 1993 and - 5.8 in Oct. 1993. These data were available since the beginning of 1992. The average of the errors in the first preliminaries over 30 months is 525 million and standard deviation 2423. The respective statistics of the revised errors in the 92.1 -94.6 period are: average 74 million and standard deviation 2100. In the time series in use, the historical data are always revised.

The tests of normality and stationarity were driven on the time series of the errors and omissions. According to the tests series are well behaving in both respects. About the results in detail and the statistical methods used, see the appendix.

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 April-May 94. Some of these scissors-like-movements coincide with a vigorous weakening or strengtening 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 (-0.12). 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 would be totally compensated (autocorrelation -1) that would indicate timing problems in recording transactions.

The autocorrelations up the order 4 are negative. This may mean that errors are compensated during following four months by errors of opposite sign. However, the result suggests that the errors may follow an autoregressive prosess. In fact, almost 20 per cent of the total variation of the errors can be explained by a fourth order process, though the F(4,33) statistics of this model is only nearly significant, risk level being 11 per cent.

The annual balance of payments statistics are composed of more complete information and have fewer timing problems. Thus errors and omissions can be reduced to less than one third of those quarterly. The errors less than 5 per cent of current flows on annual basis is regarded as acceptable. The long-term history of the errors and omissions is shown in charts 1B and 1C.

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 figures are revised which might reduce the error reported earlier. The surveys employed have a good coverage on the debt side but in the assets the coverage might be worse. Similarly, the notification of foreign accounts cannot be controlled and may contribute to missing data.

During autumn 1994, in the implementation of the 5th manual, the trade credits of the corporate sector were recalculated according to the more accurate survey data. This contributed to a clear decrease of the errors. The respective collection of new data and recalculation of the asset side is forthcoming. However, neither of these revisions are included in the numerical analysis of this paper. The errors and omissions as in december 1994 are shown in chart 2.

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 put to 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 helps only 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 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 when the revised data for the same period were available. Unfortunately, the reform of IMF Balance of Payments Manual caused difficulties in comparisions for some items.

Simple correlations are calculated. The correlations are statistically significant at 5 % risk measured with t-statistics in the sample period used if they exceed .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 compared.

TABLE 1 Correlation coefficients (financial account)

Chart number	Capital inflow, net	correlation with errors and omissions prel.	rev.
3.	Private (banks + corp.)	- 0.11	-0.06
4.	Banks total, net	0.02	0.05
	long term, net	- 0.34	-0.25
5.	liabilities, net	- 0.35	-0.39*
C	assets, net	- 0.16	0.03
6.	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
7.	assets in deposits	0.44*	0.37*
	assets in other	- 0.09	0.00
8.	Corporate sector total, net	- 0.51*	-0.41*
C	long term, net	0.21	0.05
	liabilities, net	0.26	0.18
9. C	assets, net	- 0.49*	-0.26
10.	short term, net	- 0.52*	-0.49*
11.	liabilities, net	- 0.26	-0.32
12.	assets, net	- 0.33	-0.26

First, it must be noted that the volume and variation in bank's capital movements are much lar-

ger than in corporate capital movements. Thus the possibilities for errors are markedly 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 cancellig 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 liabities or decrease in assets) and that might contibute to the error term of opposite sign.

The revisions do not markedly decrease the correlation eventhough 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 shown as a year of new data (mid 1993 - mid 1994) is added. The largest correlations between various items and the error for this longer sample period are shown in the charts 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 tell that you should have a second look in those items varying like the errors and omissions.

Numerical correlation analysis must be completed with the comparision 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 sciccors-movements (negative correlation!). The respective comparision in banks does not reveal very clear similarities.

The case of corporate sector in 1994 is very interesting. It does not only violate the results just received from time series but tells that the analysis of time series and must be continuous since the patterns of variations may change.

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 (see chart 12). Changes in short term as-

sets of firms have also been on average negative in 1994 (capital outflow). Ceteris paribus, this could be interpreted that during 1994 we might have had a lack of short term aggregate outfows.

The developments in 1994 may lead to a conclusion that the information system has just recently become weaker in the asset side of firm sector. This has earlier been proved to be the case also in other countries while 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 definied positive and as well as capital imports in error term.

TABLE 2 Correlation coefficients (current account)

Chart number	Current account item, deficit +	correlation with error and omissions
13.	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 like nearly 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 lay 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 suggest 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 come from the errors. When these items are correlated agaist 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 rapporters.

Rather high negative correlation were found also 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 to the errors and omissions

As said 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 rapporters to convert their foreign flows to FIM in an aggregated way. Even monitoring systems like the system of foreign settlements in the Bank of Finland use for practical reasons only second best procedures in conversion, that is, in a particular month, average exhange rates not yet known are estimated by the rates prevailed at the end of pevious month. These technical difficulties evidently cause errors.

However, in the reality of the exhange 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 examle ECU) of currencies is only the top of an iceberg.

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

In view to the facts above it is only according to the expectations that no significant quantitative relationships can be found between the errors and omissions and ECU-basket, trade weighted basket or single currencies. In singe 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 till mid 1993 (charts 14 A, B and C) . These cannot be verified econometrically.

In the new surveys, the difference between two consecutive stocks has been divided to flows coverted to FIM with relevant daily exchange rates and to valuation items which include the effects of exchange rates. This transparent way of enquiering might have helped the respondets to separate the flows really occurred and contributed to smaller errors.

The effects of exchange rates to the valuation items of the stocks of assets and liabilities of banking sector will be studied further in 1995.

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 15&16). Monthly current accout 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 the reinvested earnings has proved to be more reliable than the use of only early indicators of micro data like quarterly and semiannual statements of enterprises. (See Bank of Finland Discussion Paper 12/94, Aija Salomaa: Suorien sijoitusten uudelleen sijoitettujen voittojen seuranta ja ennustaminen, in Finnish only).

In this study, the problem of reinvested earnings was ment to be avoided by excluding it in the data. Unfortunately this could be done only partly. Thus a considerable part of the systematic error in the first preliminaries may come from the erroneous estimation of the reinvested earnings abroad in that year.

The first monthly estimate of the current account is published with only four weeks delay and it 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 18 month's delay.

According the record 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 definied a difference between the final and first preliminary estimate, in cases of underestimation of surpluses and underestimation the process of diminishing the deficit, the error is positive. Thus the average negative errors are somewhat less than -300 million FIM a month during 1989 - 1992 and positive errors 1993 - 1994 and 1987 - 1988 some 200 million FIM a month.

Large single corrections (more than +/- 500 million FIM) occur in April, July and Sep 91, in April and Oct 92, in Sept, Nov and Dec 93 and finally

Jan 94. The errors in 1993 are positive, others are negative.

The timing of errors in preliminaries do not strikingly coincide with speculative attacs or changes in the value of the markka, since a cycle dominates the estimation errors. This cycle can easily been verified: the autocorrelations up to a very high order are positive and the error can be explained with a cyclical variable like growth of exports. This cyclical variation may to a great extent come from reinvested earnings.

In addition to the cycle, some outlayers exsist in the data as the error jumps suddenly from the cyclical path to other extreme of an opposite sign. The normality of this error is rejected but not the stationarity (see appendix, points E -I).

7. Conclusions

In view to 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 sudden weakening in the quality of statistics. Since currencies are floating in many European countries, errors may rise from volatile exchange rates as well as from capital movements themselves and the work of rapporting 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 the error even in the first current account estimates has been moderate although is has proved to have a cyclical pattern.

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

This paper is a first step in the progress to analyze the errors and omissions in relation to financial account items with time series methods. More work along these lines will be done in order to maintain the quality of the Finnish balance-of-payments-statistics.

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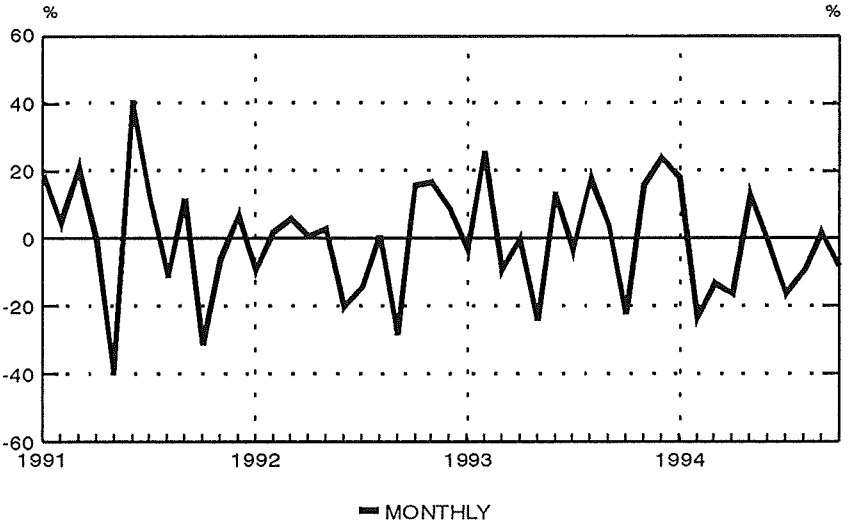
1.

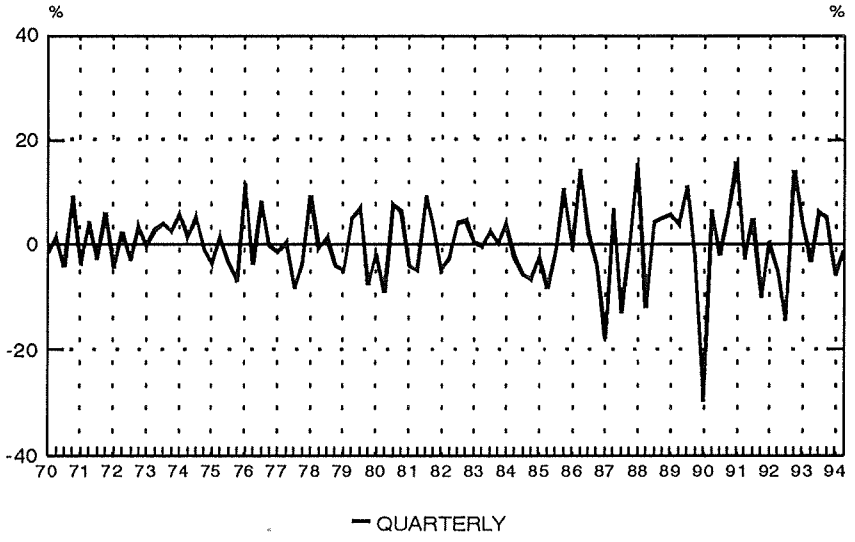
ERRORS AND OMISSIONS IN BOP 1991M1 - 1994M10
PER CENT OF CURRENT ACCOUNT RECEIPTS

A



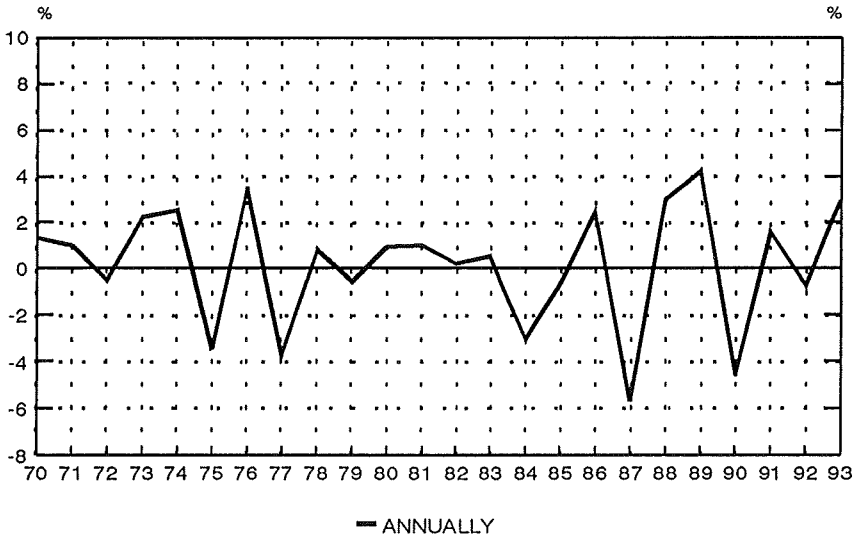
ERRORS AND OMISSIONS IN BOP 1970Q1 - 1994Q2
PER CENT OF CURRENT ACCOUNT RECEIPTS

B



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

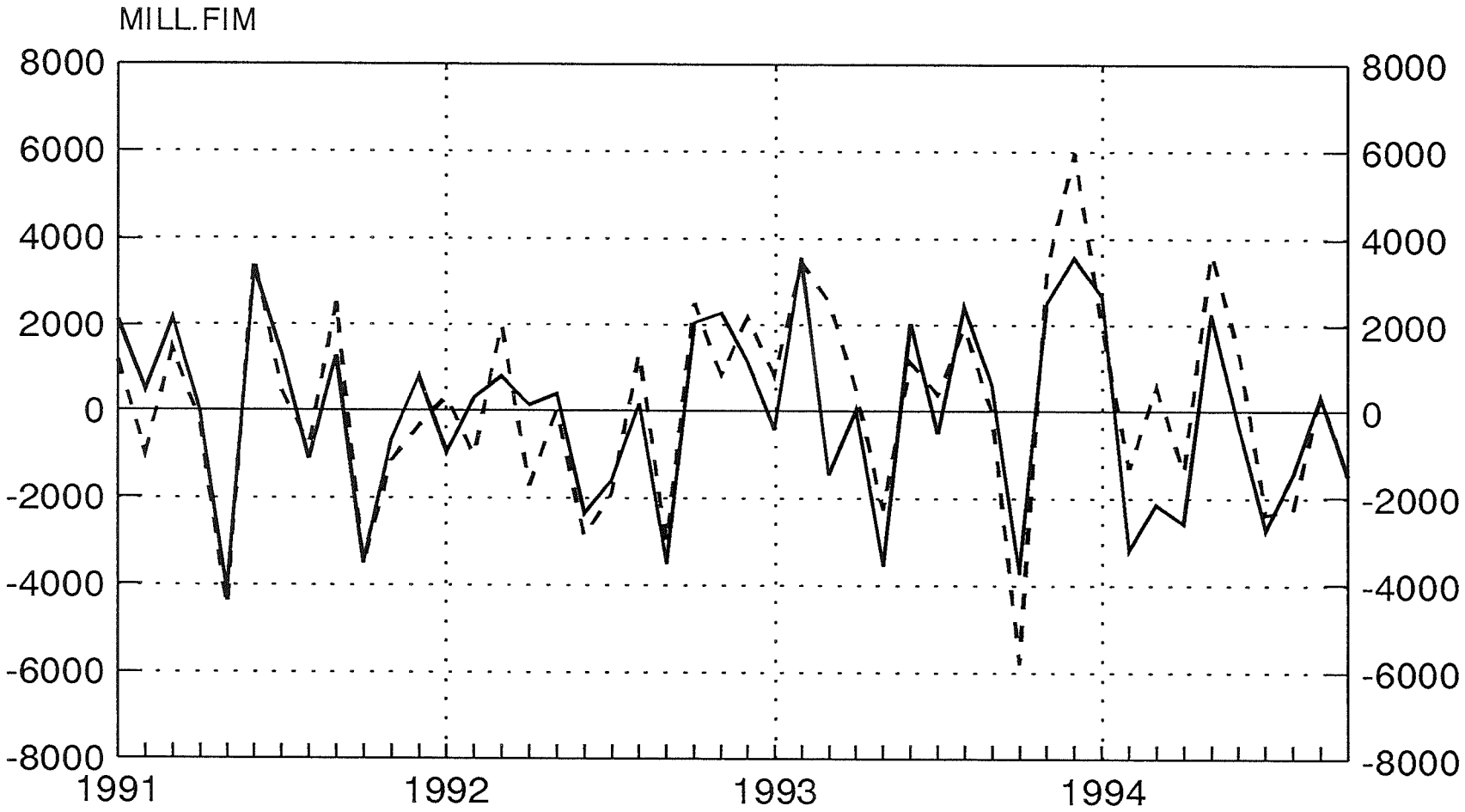
C.



2.

ERRORS AND OMISSIONS IN BOP

1991M1 - 1994M10



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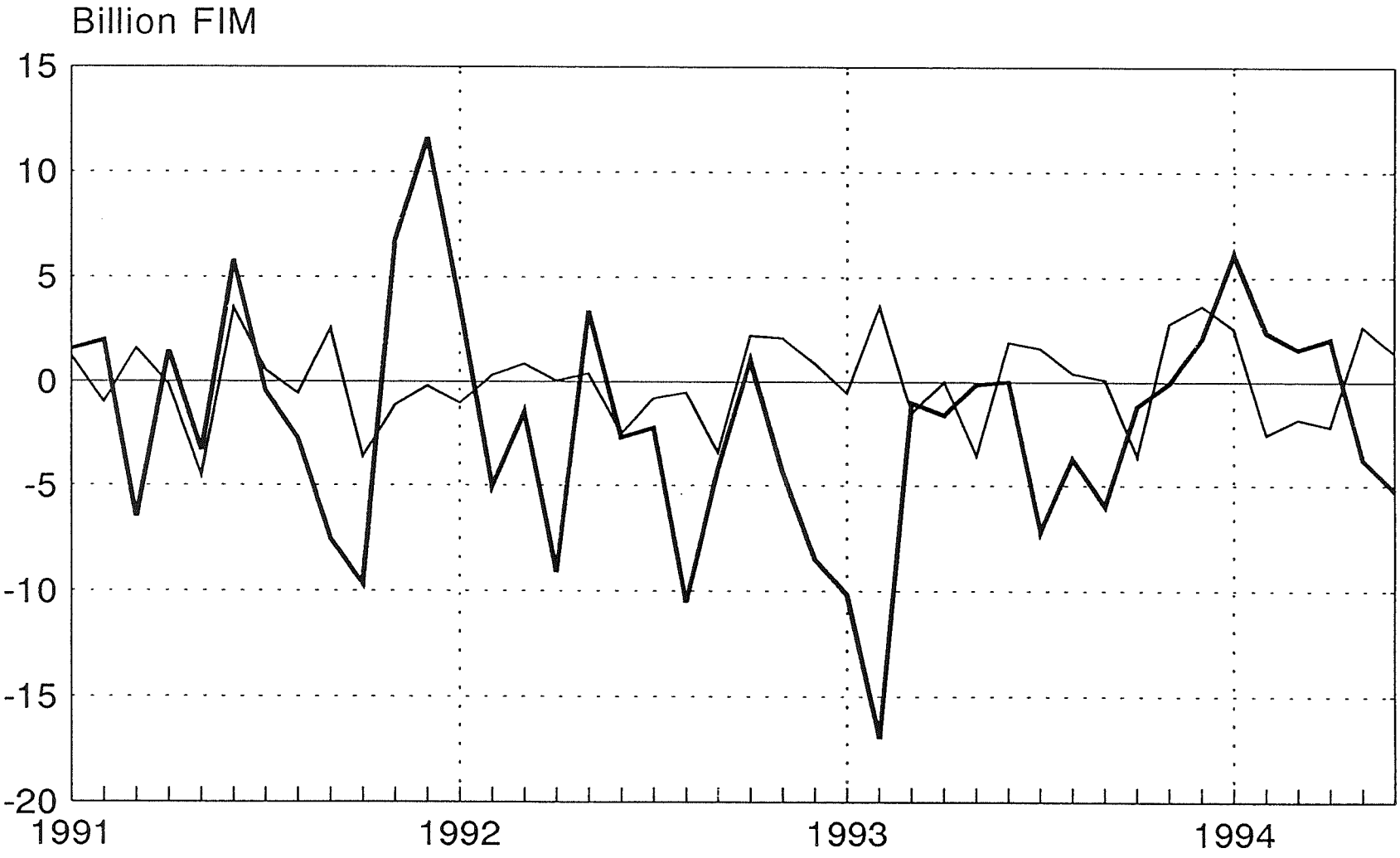
3.

PRIVATE NET CAPITAL INFLOW

& errors and omissions in BOP



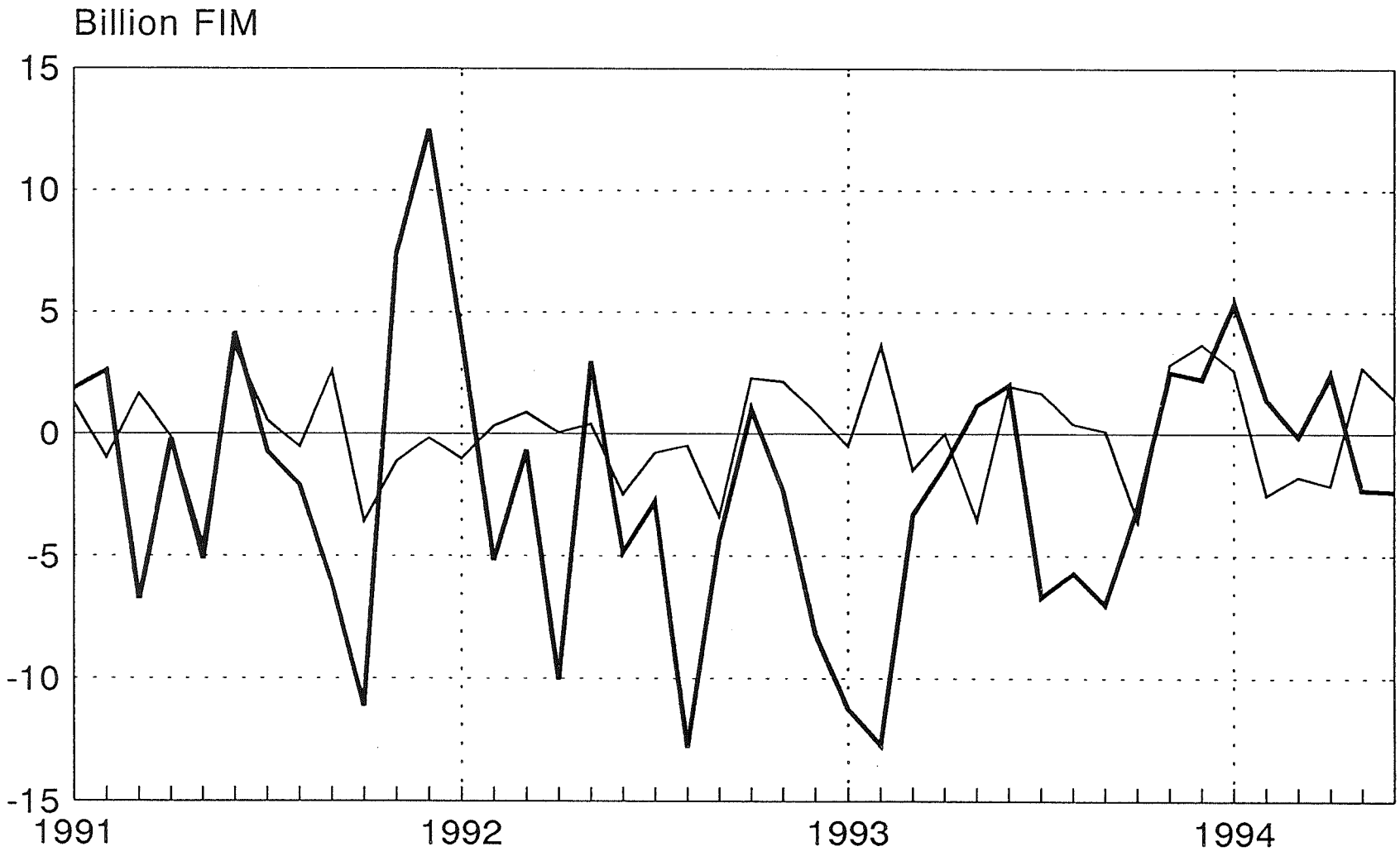
+ = capital inflow to Finland

correlation -0.06

4.

BANKS NET CAPITAL INFLOW

& errors and omissions in BOP



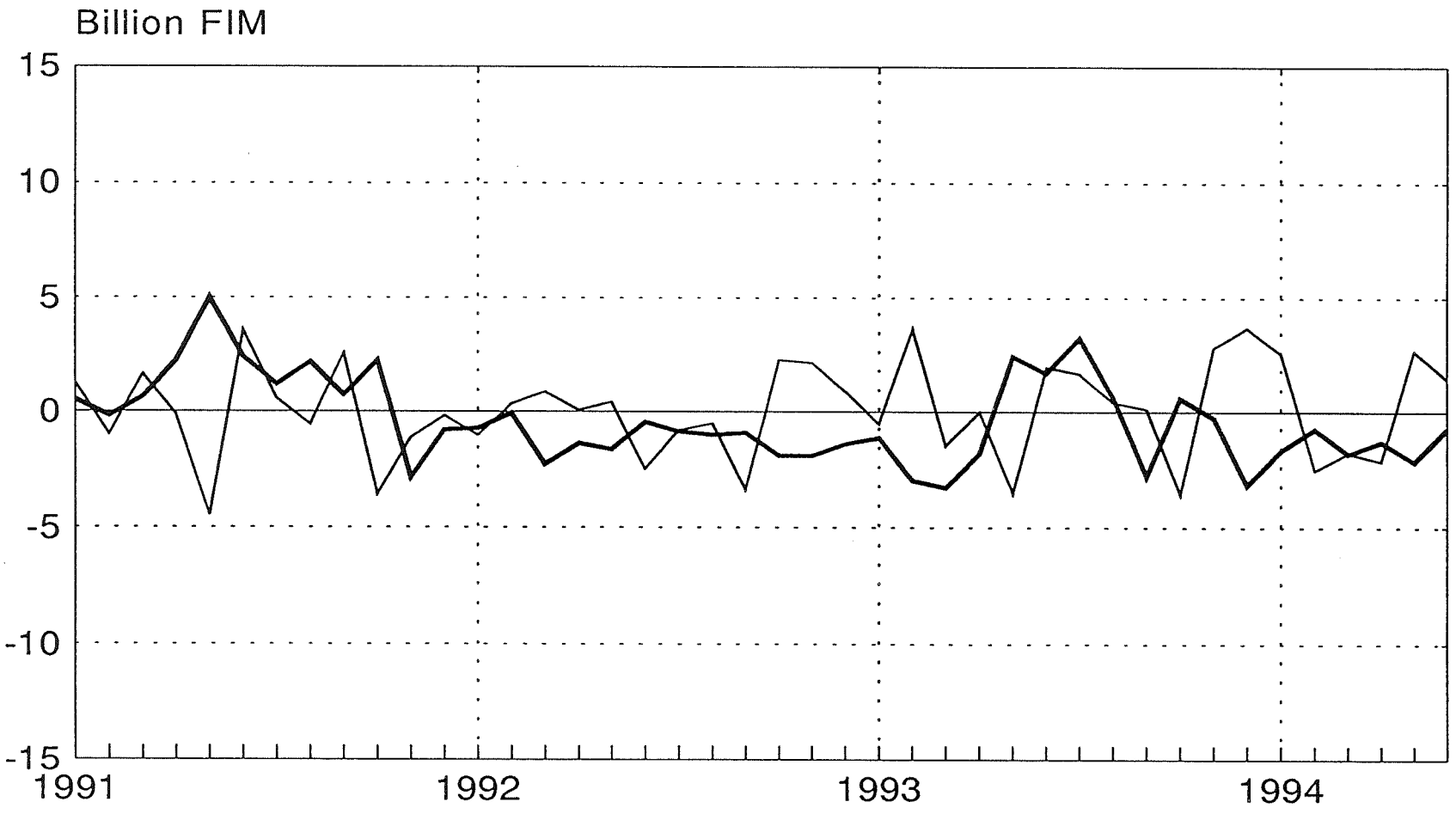
+ = capital inflow to Finland

correlation 0.08

5.

CHANGE IN BANKS LONG-TERM LIABILITIES

& errors and omissions in BOP



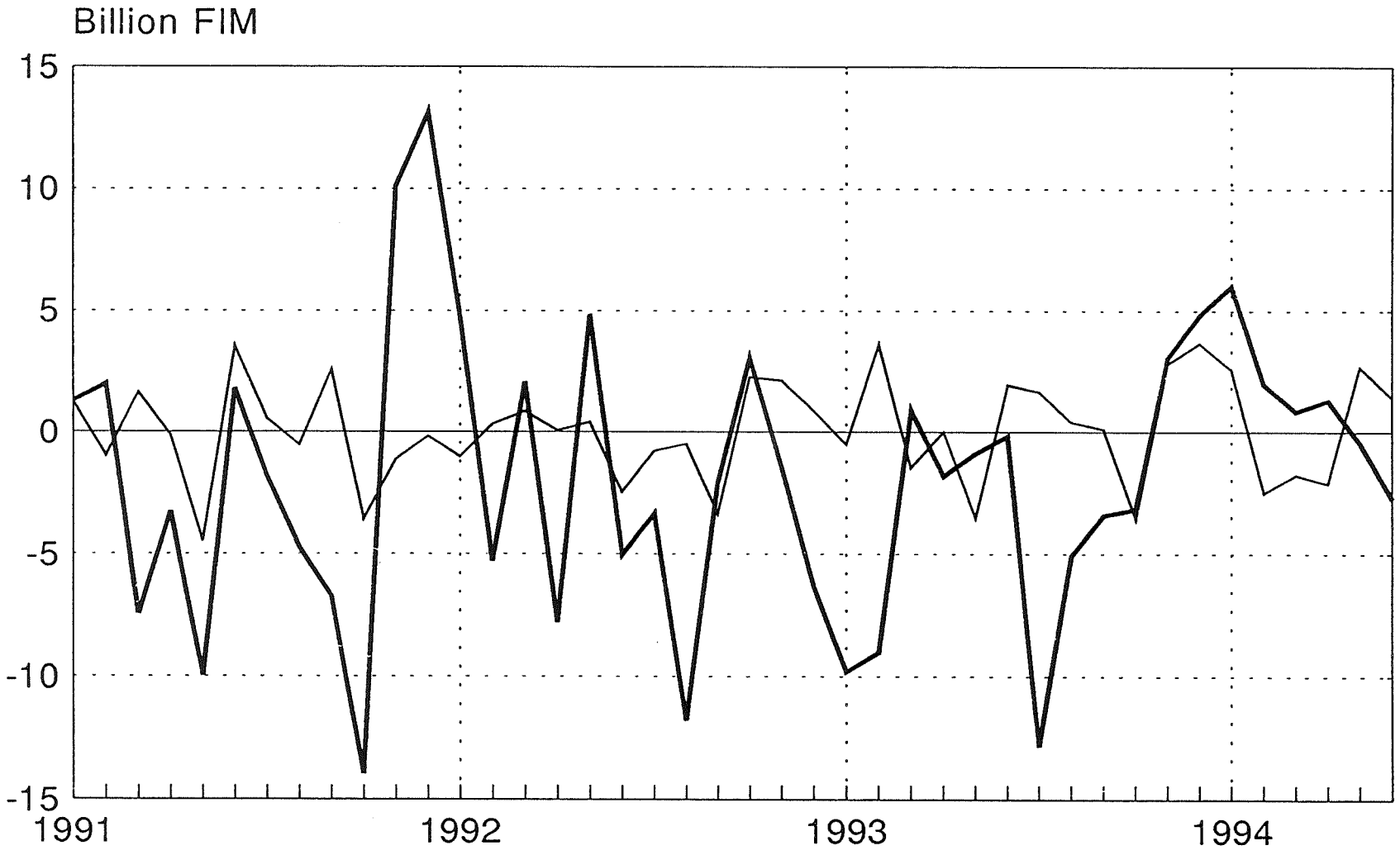
\+ = capital inflow to Finland

(Correlation = -0.26)

6.

BANKS SHORT-TERM NET CAPITAL INFLOW

& errors and omissions in BOP



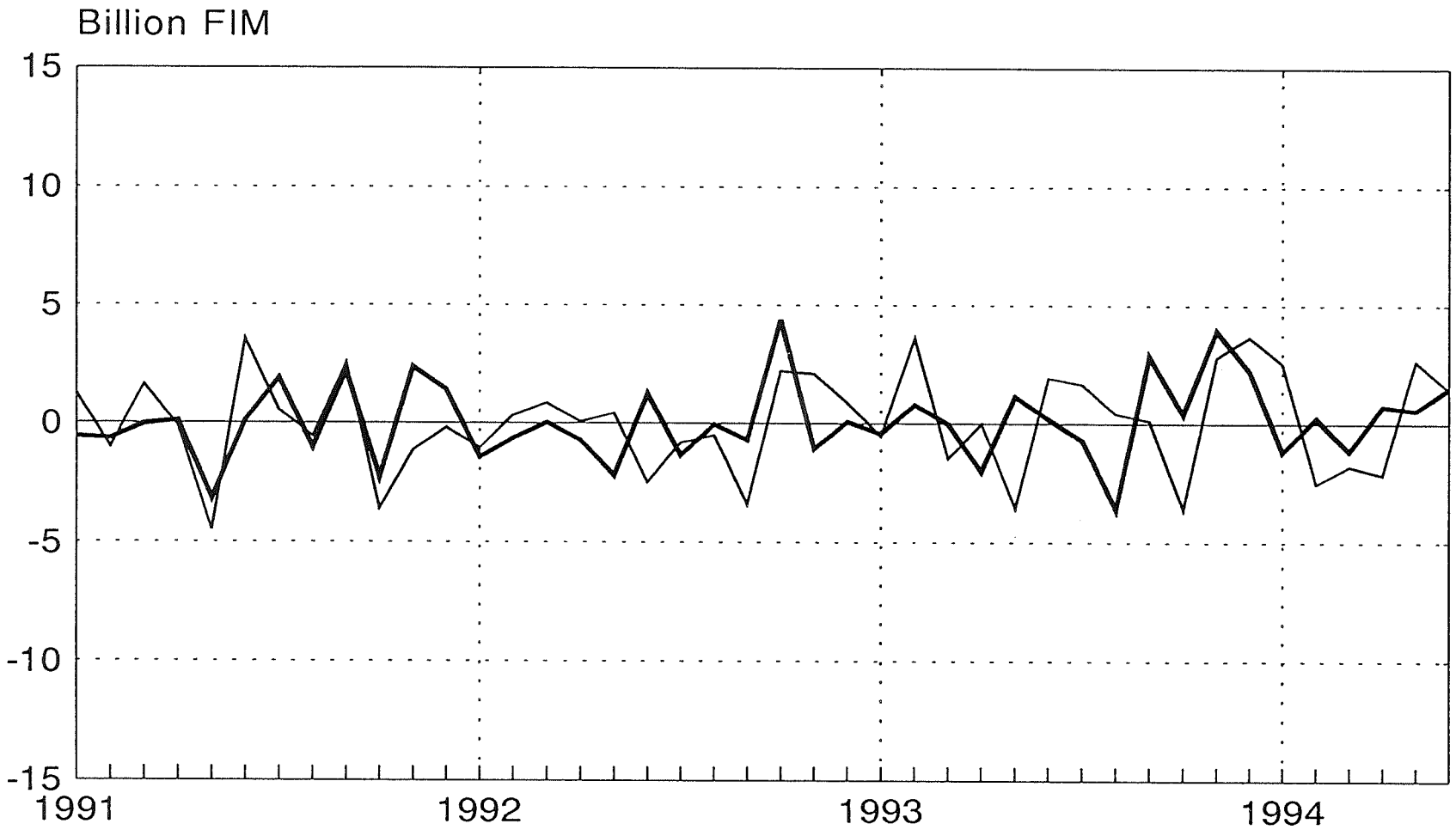
+ = capital inflow to Finland

correlation 0.15

7.

CHANGE IN BANKS SHORT-TERM ASSETS IN DEPOSITS

& errors and omissions in BOP



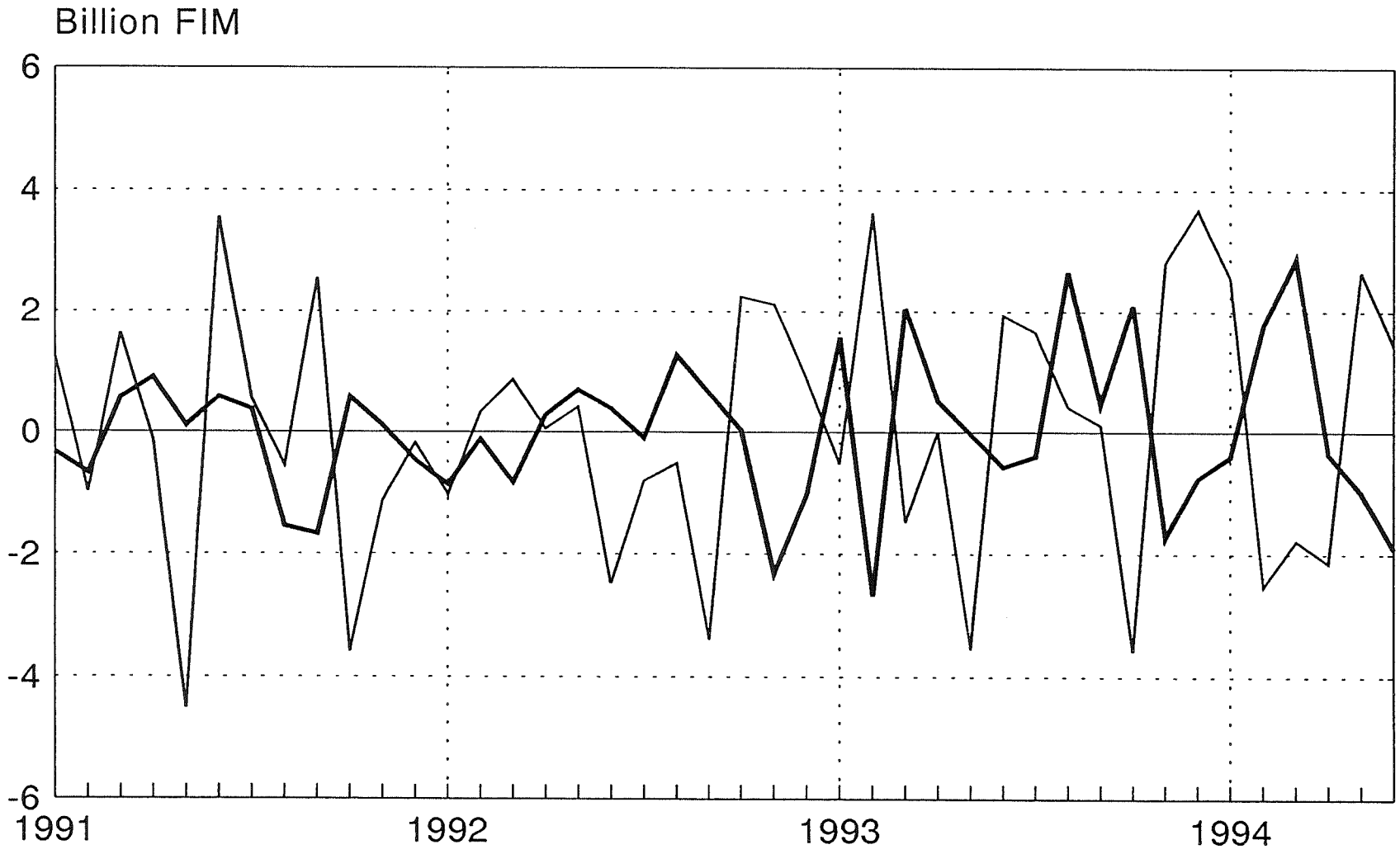
\+ = capital inflow to Finland

(Correlation = +0.34)

8.

CORPORATE SECTOR NET CAPITAL INFLOW

& errors and omissions in BOP

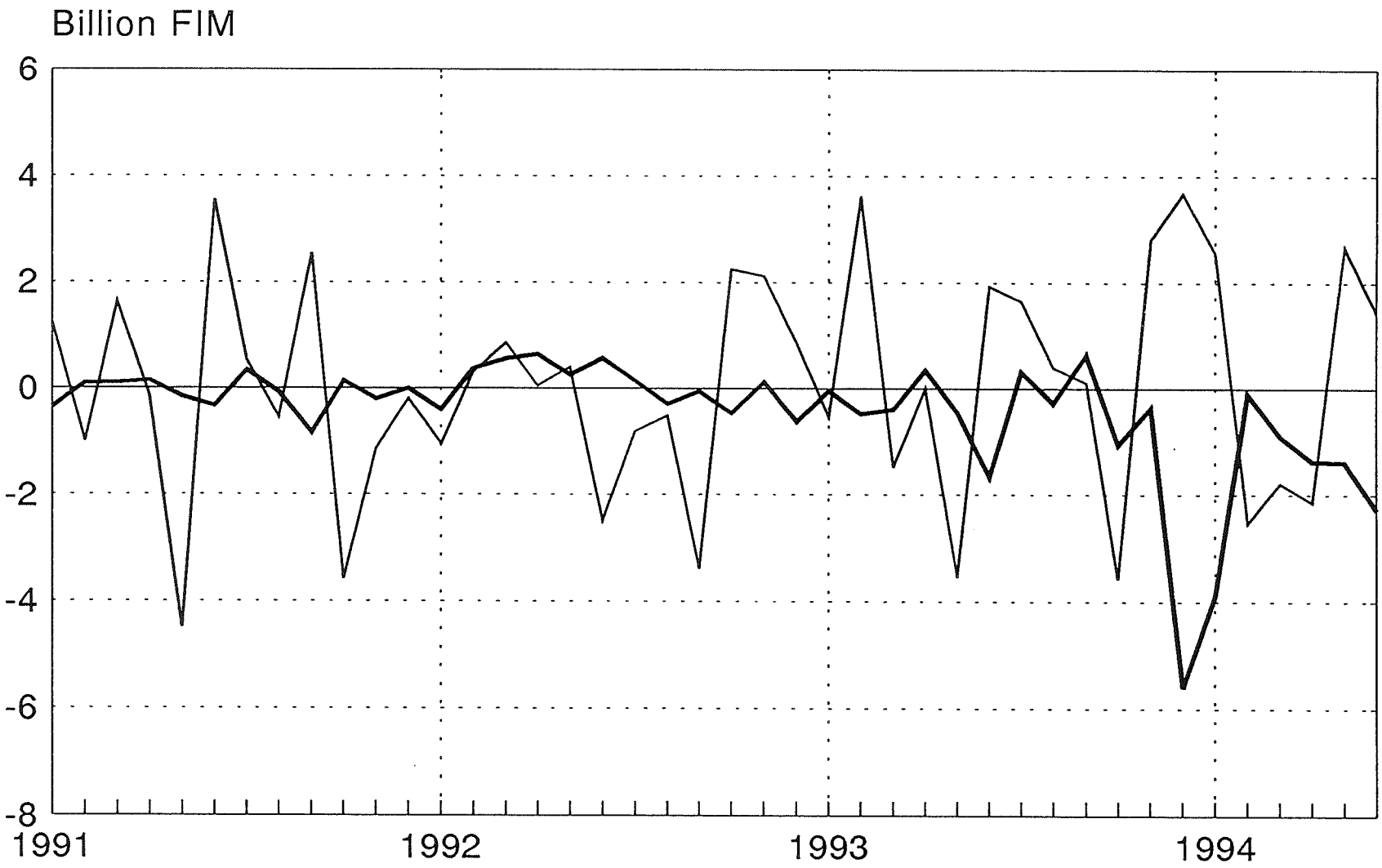


\+ = capital inflow to Finland

(Correlation = -0.51)

CHANGE IN CORPORATE SECTOR LONG-TERM ASSETS

& errors and omissions in BOP

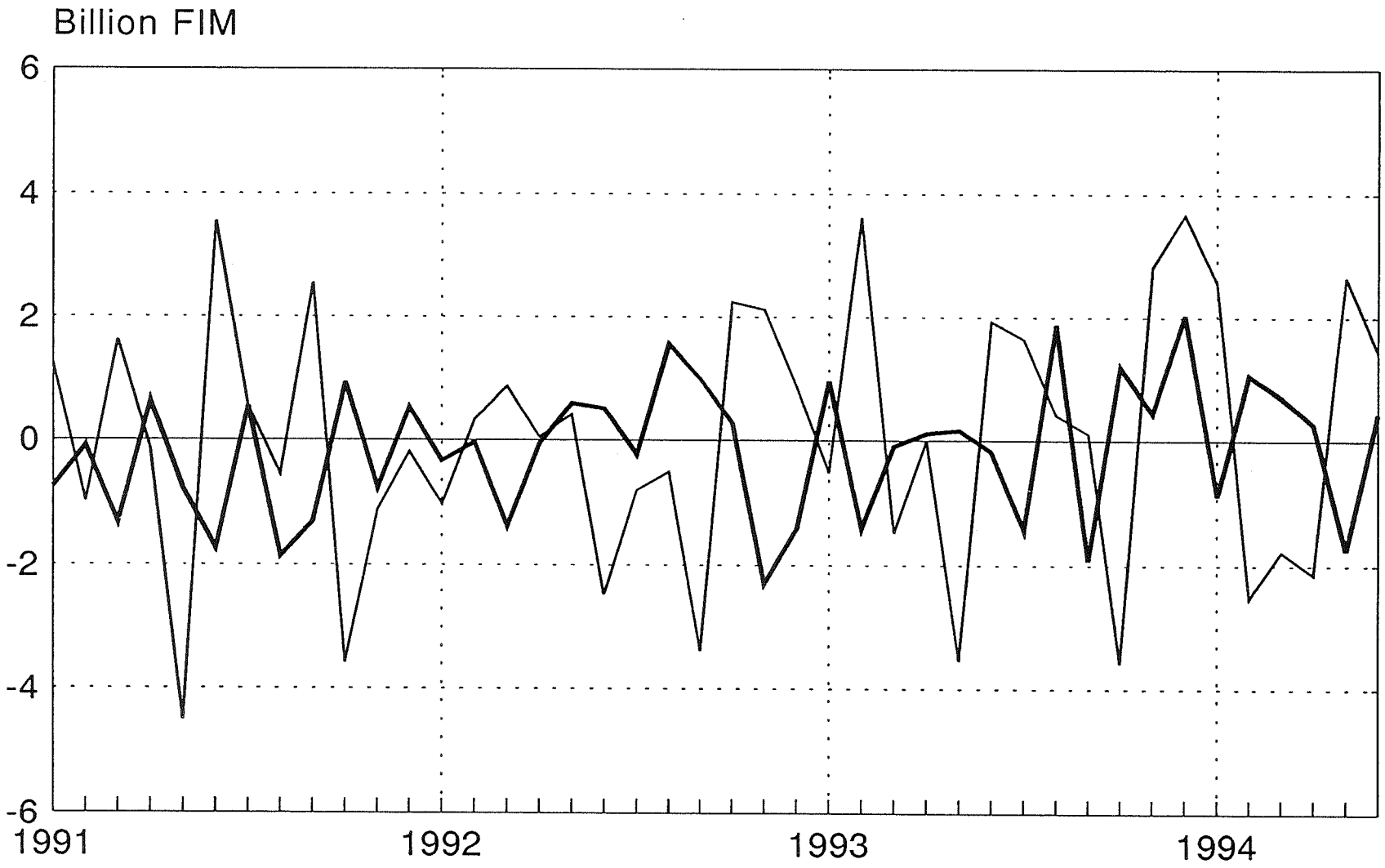


\+ = capital inflow to Finland

(Correlation = -0.34)

CORPORATE SECTOR SHORT-TERM NET CAPITAL INFLOW

& errors and omissions in BOP

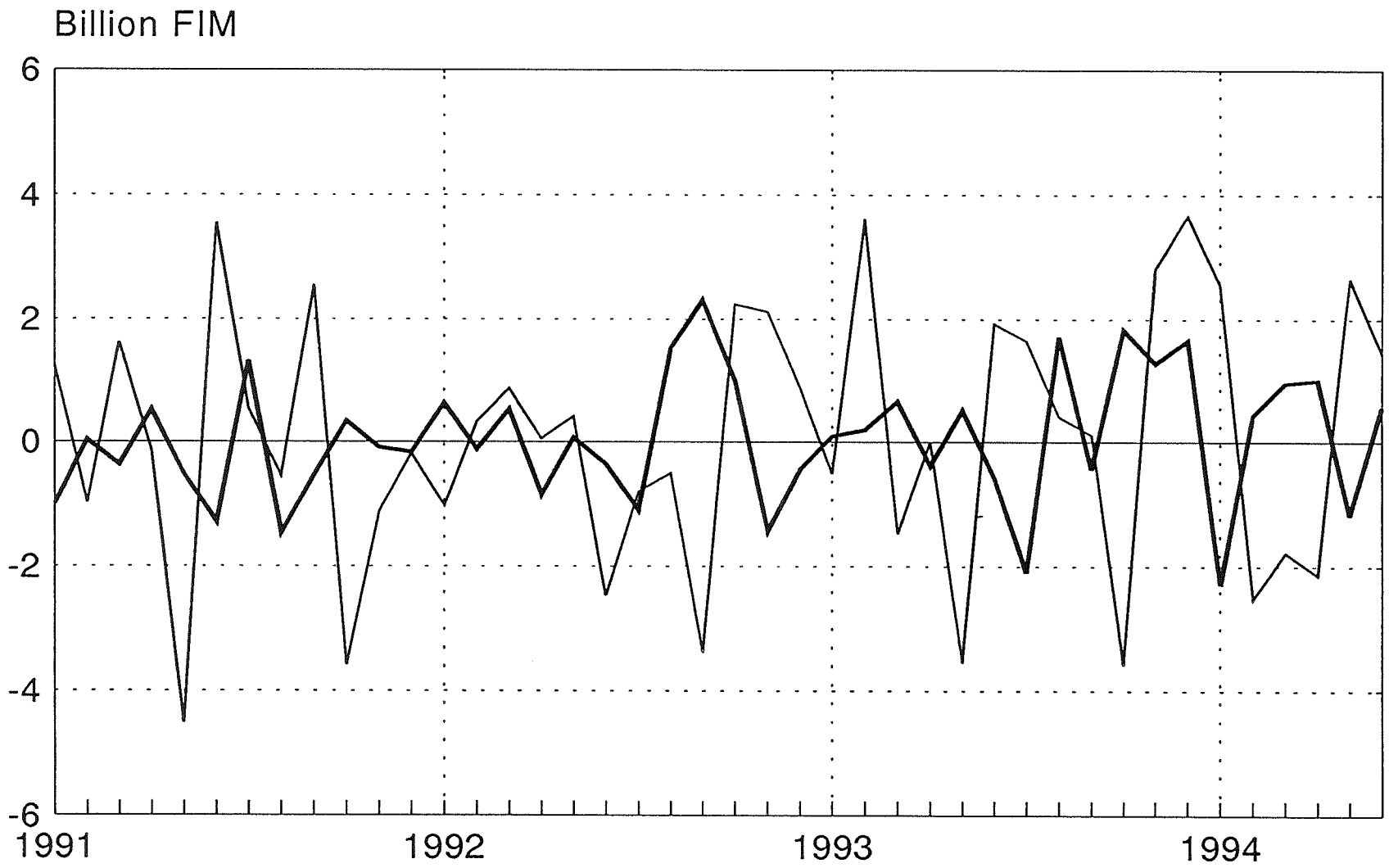


\+ = capital inflow to Finland

(Correlation = -0.37)

CHANGE IN CORPORATE SECTOR SHORT-TERM LIABILITIES

& errors and omissions in BOP

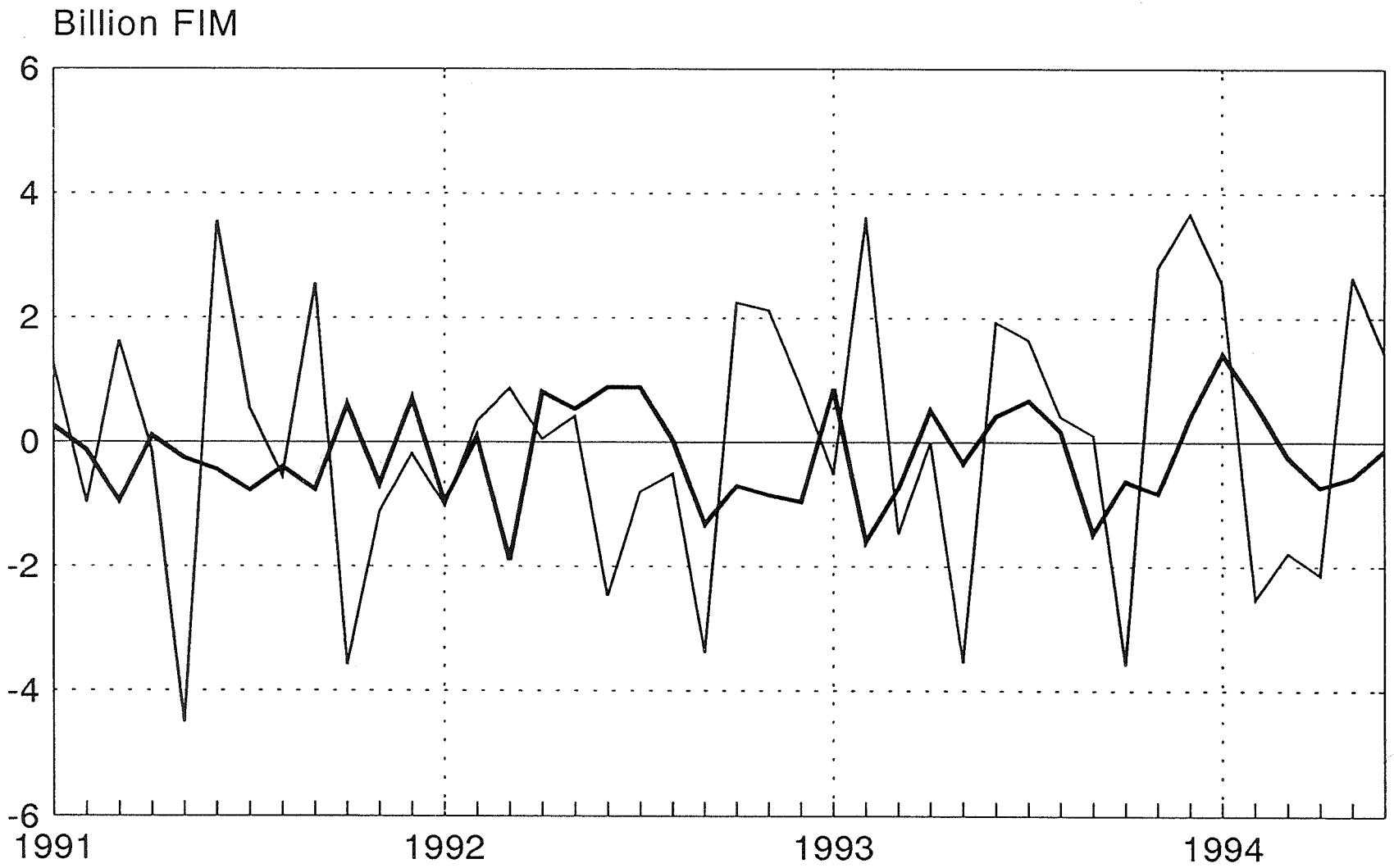


\+ = capital inflow to Finland

(Correlation = -0.32)

CHANGE IN CORPORATE SECTOR SHORT-TERM ASSETS

& errors and omissions in BOP

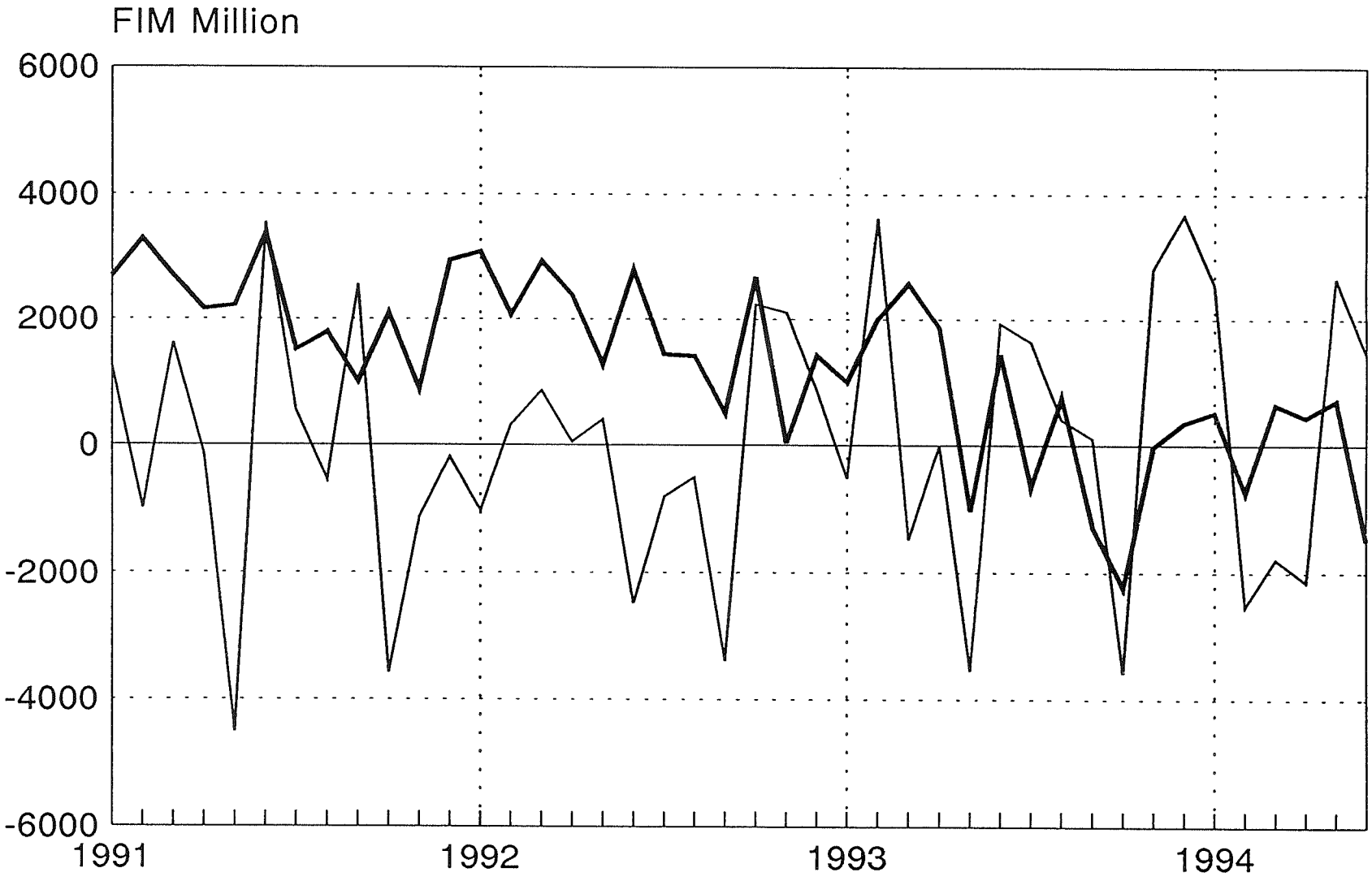


+ = capital inflow to Finland

correlation −0.10

CURRENT ACCOUNT (deficit +)

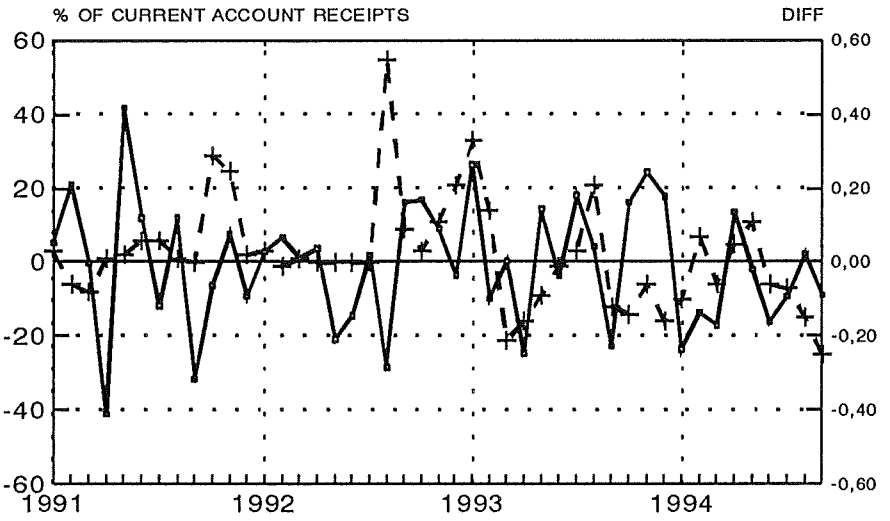
& errors and omissions in BOP (capital inflow +)



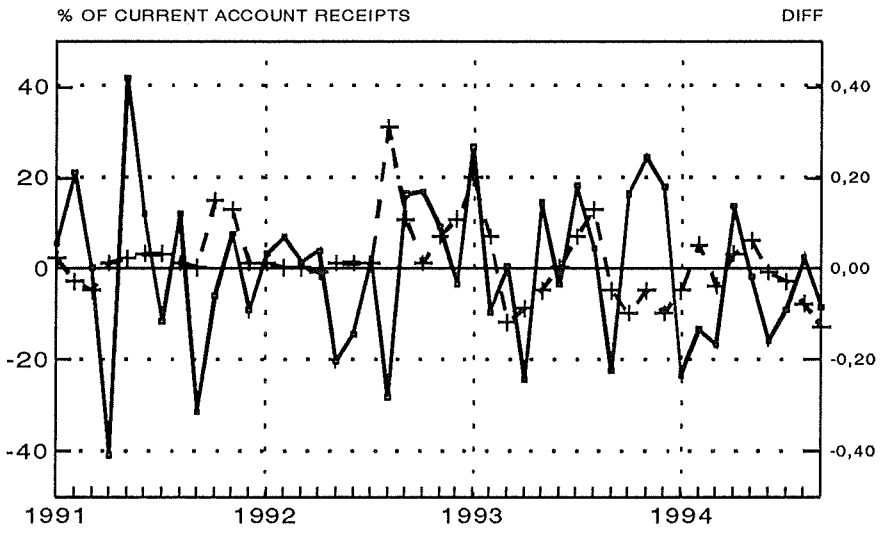
14.

ERRORS AND OMISSIONS IN BOP AND EXCHANGE RATE MOVEMENTS
1991M2 -1994M10

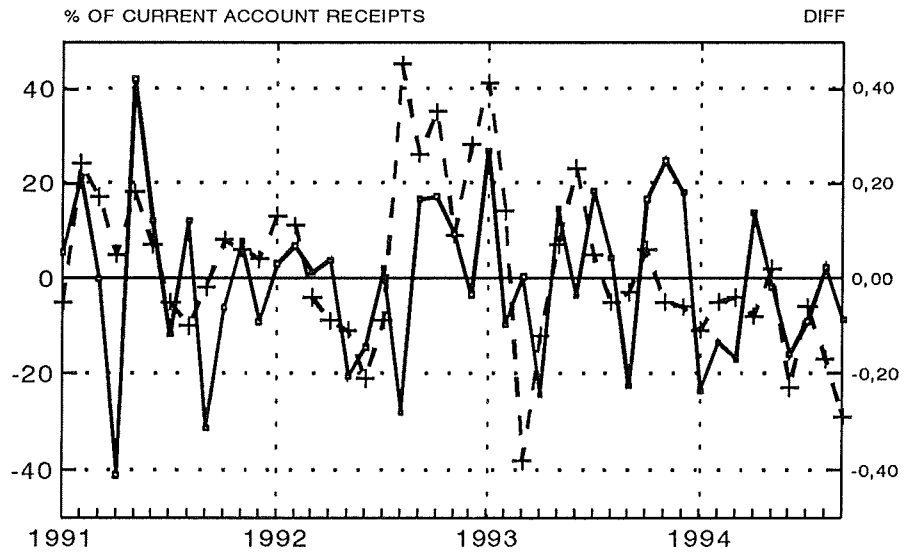
A. ERRORS AND OMISSIONS + CHANGE IN ECU BASKET



B. ERRORS AND OMISSIONS + CHANGE IN FIM / DEM

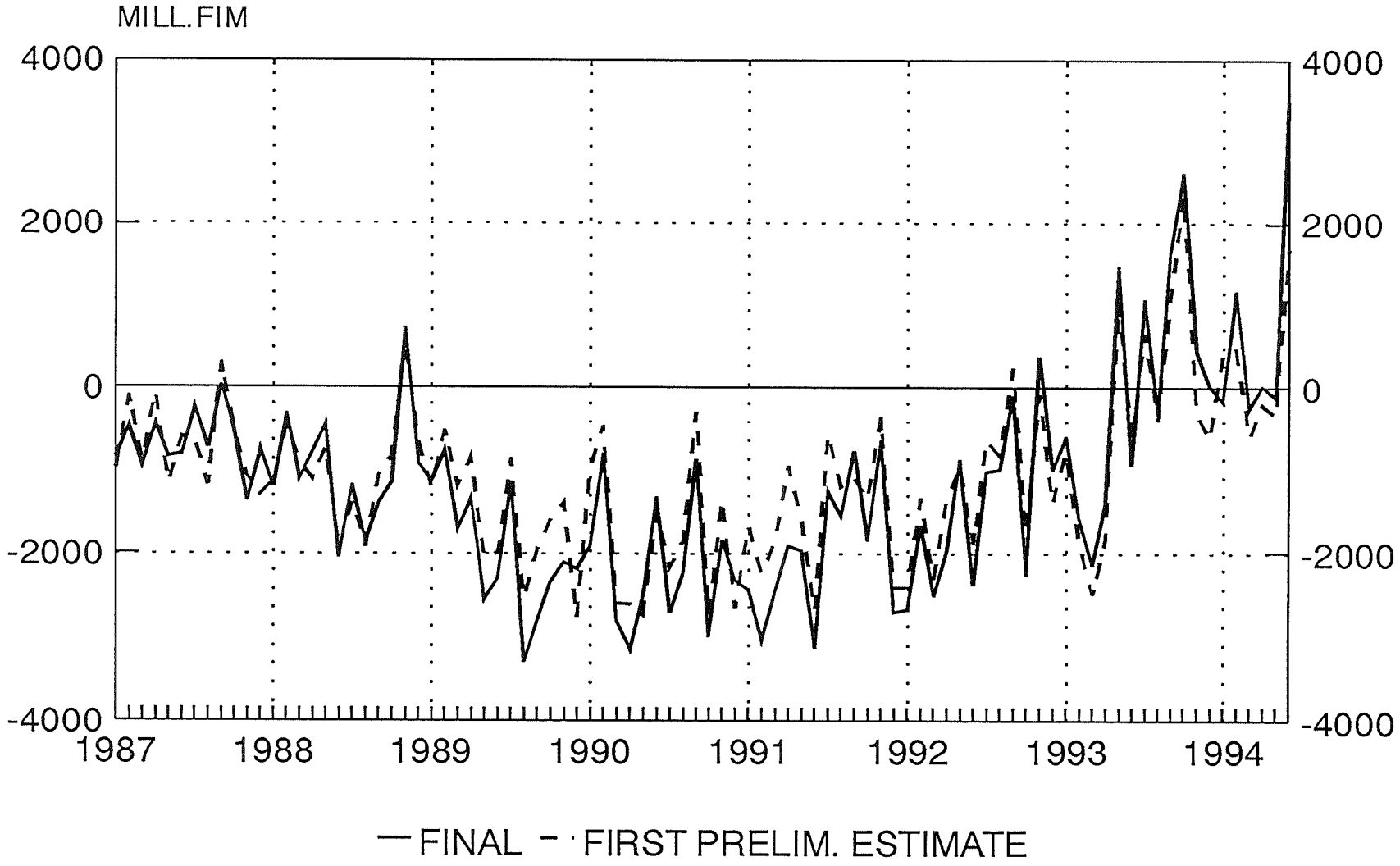


C. ERRORS AND OMISSIONS + CHANGE IN FIM / USD



CURRENT ACCOUNT 1987M1 - 1994M6

Final and first preliminary estimate



Information Services
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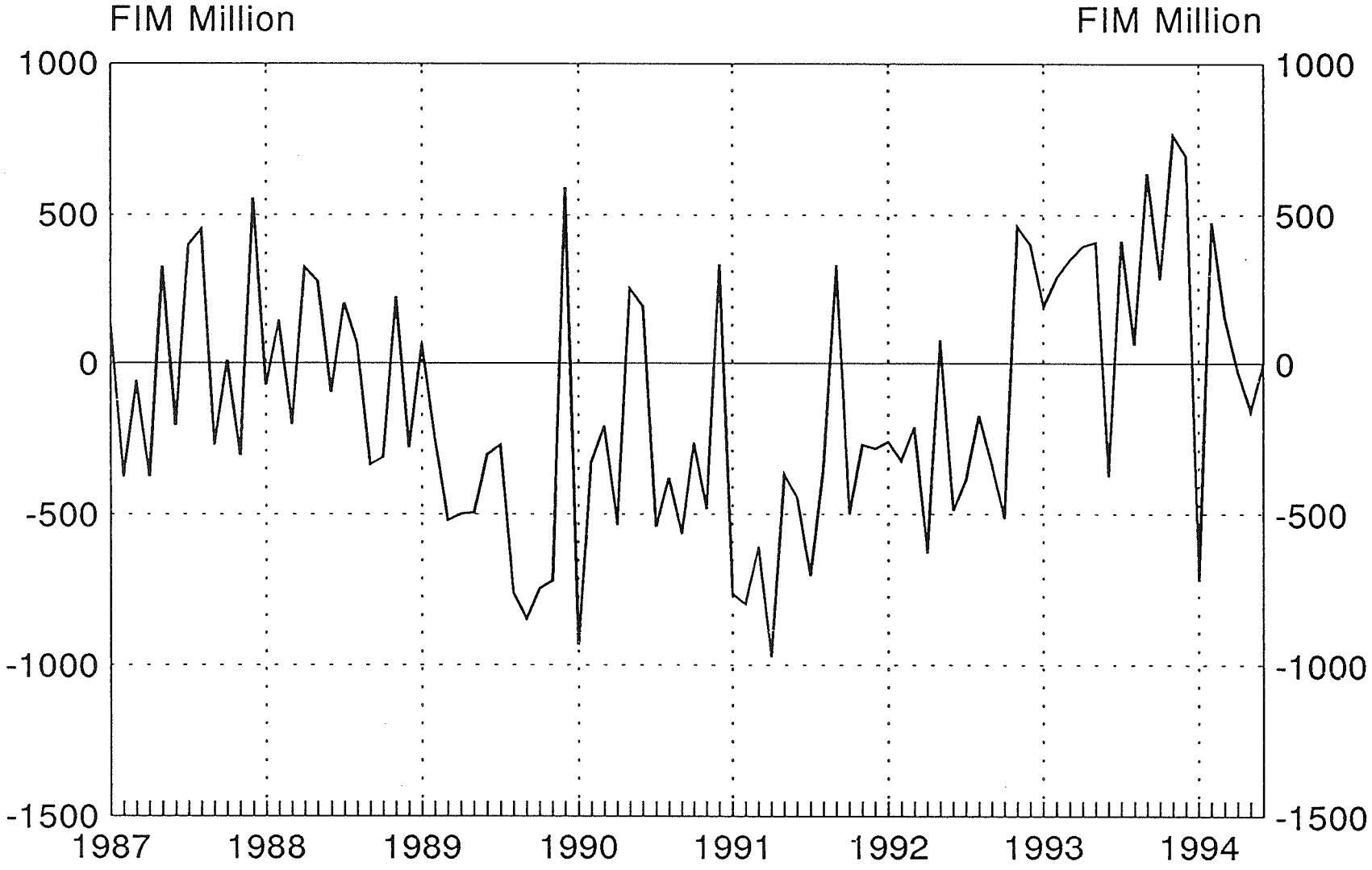
CURRENT ACCOUNT

Difference between final and first preliminary estimate



Statistical **Appendix**

This apendix describes basic statistical operations used above. First it discusses some of the descriptive statistics produced by PCGIVE including means, standard deviation, skewness, excess kurtosis, maximum and minimum of the series. Next the autocorrelations and the autorregressive process of the series are computed and finally the formal time series tests for stationarity are provided. [3]

A. Descriptive statistics of the errors and omissions (KS81N.M)

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

Sample Size	42
Mean	54.958571
Std.Devn.	2150.227402
Skewness	-0.230406
Excess Kurtosis	-0.749470
Minimum	-4512.280000
Maximum	3672.730000
Normality $Chi^2(2)$	1.3223

The last line displays the statistic proposed by Jarque and Berra, for testing whether a series is normally distributed. The statistic is given by

$$\chi^2(2) = \frac{(T-k)}{6}\left(SK^2 + \frac{1}{4}EK^2\right)$$

where T is the number of observations, k is one for an ordinary series, SK is skewness and EK is kurtosis. Under the null hypothesis of normality, the Jarque-Bera statistic is distributed chi-squared with 2 degrees of freedom. If a test-statistic of more than 5.99 is observed, the null hypothesis will be rejected at the 5% level.

B. Correlogram of the errors and omissions, its autocorrelation propereties (=how current values of the series are correlated with past values)

Data correlogram plots the series $\{r_j\}$ where each one is the correlation coefficient of the current value of the series with the series lagged a certain number of periods.

Graph 1. **Q = 42*(Sum of 4 squared mtv Autocorrelations) = 4.849**

	-1	0	1
lag			
1	.....**	.....	-0.11966
2	.....***	.....	-0.17037
3	.....***	.....	-0.16916
4	.....****	.....	-0.20854

PCGIVE also computes the Box-Pierce Q-statistic, which is given by

$$Q_{BP} = n\sum_{j=1}^{p} r_j^2$$

where r_j is the j-th correlation and n is the number of observations. Q can be used to test the hypothesis that all of the correlations are zero; that is, that the series is white noise. Under the null hypothesis, Q is distributed as chi-squared, with degrees of freedom equal to the number of correlations, p.

The critical values of χ^2 for 4 degrees of freedom at five and one percent risk are 9.49 and 13.28 respectively. Since the computed Q lies below these limits, the data support the null hypothesis and it may be accepted. However, the test have rather poor power properties. (The crude limits of $\pm 2/\sqrt{N}$ can also be used to see if any values of r_j are significantly different from zero. In this case computed values lie between these limits and this gives more support to the null hypotheses.)

C. Autoregressive process:

a regression of y_t on a constant and its own lagged values, estimated by OLS.

Table 1. **Autoregression for the errors and omissions (KS81N): 4 lags from 1 to 4**

The present sample is: 1991 (5) to 1994 (6)

	Constant	Lag 1	Lag 2	Lag 3	Lag 4
Coeff	4,941	-0,2451	-0,2975	-0,2965	-0,337
Std.Err	344	0,1649	0,1646	0,1677	0,1687

RSS = 148209323.1 $\tilde{O}$ = 2119.24 R^2 = 0.196506
F(4, 33) = 2.01765 [0.1148]

F-statistic is a test of the hypothesis that all of the coefficients in a regression are zero except the constant. If the F-statistic exceeds a critical level, at least one of the coefficients is probably non-zero. The number in [] following F-test is its probability value.

D. Unit root tests

Unit root tests are used in examining the stationarity of time series. Stationarity of variables is assumed in the derivation of standard inference procedures for various models - nonstationary of variables and errors invalidate many standard results and require special treatment. Since statistical BoP systems can be regarded as a model it is important to study the stationarity of the model.

PCGIVE runs an Augmented Dickey-Fuller (ADF) test for unit root. The ADF test consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms, and optionally, a constant and a time trend. User can specify the number of lagged differences to be included. If there is no lagged first differences on the right hand side, test is called the Dickey-Fuller test (DF).

To illustrate the ADF test consider an simple process

$$x_t = \alpha + \beta x_{t-1} + \epsilon_t .$$

The process is stationary if $-1<\beta<1$. If $\beta=1$ the process generates a random walk with drift and x is then nonstationary (autoregressive coefficient is unity and hence stationarity is violated). Thus the crucial null hypothesis for testing nonstationarity is that the absolute value of β should equal one and the test of this hypothesis is a unit root test.

To test the null hypothesis the process is usually respecified as

$$\Delta x = \alpha + \gamma x_{t-1} + \epsilon_t , \quad (\gamma = \beta - 1) .$$

The null hypohesis is now H_0: $\gamma=0$. Running the unit root test produces a t-statistic and a large negative t-statistic allows rejection of the hypothesis of a unit root and suggests that the series is stationary. Under the null hypothesis of a unit root, the reported t-statistic does not have the standard t-distribution. Convenient critical values are counted by MacKinnon and these are provided in PCGIVE. (In PCGIVE 5% significant is marked by *and 1% by **.)

Unit root tests for the errors and omissions (KS81N.M)

Unit root tests for KS81N The present sample is: 1991 (3) to 1994 (6)

Table 2. **Dickey-Fuller test for KS81N; ∆KS81N on**

Variable	Coefficient	Std.Error	t-value
Constant	-430.58	771.56	-0.558
Trend	21.381	30.534	0.700
KS81N_1	-1.1248	0.16341	-6.883

Õ = 2219.16 DW = 2.01 DW(KS81N) = 2.185 DF(KS81N) = -6.883**
RSS = 182212264.4 for 3 variables and 40 observations

Table 3. **Augmented Dickey-Fuller test for KS81N; ∆KS81N on**

Variable	Coefficient	Std.Error	t-value
Constant	-463.67	767.75	-0.604
Trend	22.447	30.377	0.739
KS81N_1	-1.3509	0.25000	-5.404
∆KS81N_1	0.19766	0.16606	1.190

Õ = 2206.76 DW = 2.05 ADF(KS81N) = -5.404**
RSS = 175313182.4 for 4 variables and 40 observations

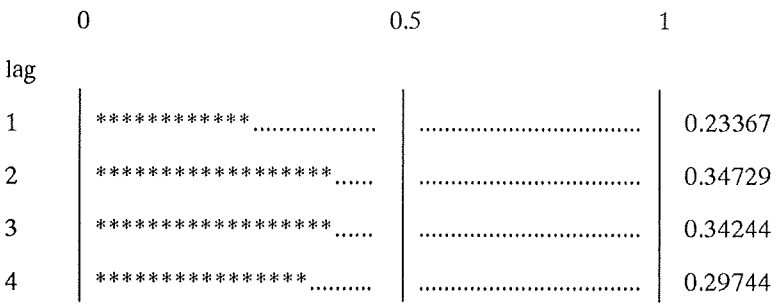
E. Descriptive statistics of the difference between the final and the first preliminary estimate of the current account (diff)

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

Sample Size	90
Mean	-117.981444
Std.Devn.	460.190962
Skewness	0.679030
Excess Kurtosis	1.016012
Minimum	-973.610000
Maximum	1674.340000
Normality $Chi^2(2)$	10.667**

F. Data correlogram of the diff

Graph 2. **90*(Sum of 4 squared diff Autocorrelations) = 34.28**



G. Autoregression for the diff: 4 lags from 1 to 4

The present sample is: 1987 (5) to 1994 (6)
Table 4.

	Constant	Lag 1	Lag 2	Lag 3	Lag 4
Coeff.	-16.47	0.05379	0.2388	0.2592	0.1522
Std.Err	50.93	0.1221	0.1196	0.1191	0.1218

RSS = 14721221.85 σ = 426.314 R^2 = 0.210433
F(4, 81) = 5.39697 [0.0007] **

H. Modelling diff with cyclical variables by OLS

Table 5. **(EQ 1) Value of exports**
The present sample is: 1987 (1) to 1994 (6)

Variable	Coefficient	Std.Error	t-value	HCSE	PartR²	Instab
Constant	-935.39	232.21	-4.028	282.04	0.1557	0.59*
XV	0.093385	0.026014	3.590	0.033130	0.1277	0.40

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

Table 6. **(EQ 2) Log diff (12) of value of exports**
The present sample is: 1988 (1) to 1994 (6)

Variable	Coefficient	Std.Error	t-value	HCSE	PartR²	Instab
Constant	-232.53	56.706	-4.101	49.929	0.1812	0.74*
⌂12LXV	1170.0	334.64	3.496	381.37	0.1385	0.40

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

I. Unit root tests for the diff

Table 7. **Dickey-Fuller test for diff; ⌂diff on**
The present sample is: 1987 (3) to 1994 (6)

Variable	Coefficient	Std.Error	t-value
Constant	-218.88	103.86	-2.107
Trend	2.8969	1.9040	1.521
diff_1	-0.76132	0.11515	-6.612

σ = 449.585 DW = 1.96 DW(diff) = 1.391 DF(diff) = -6.612**
RSS = 17180740.66 for 3 variables and 88 observations

Table 8. **Augmented Dickey-Fuller test for diff; ∆diff on**

Variable	Coefficient	Std.Error	t-value
Constant	-163.81	101.73	-1.610
diff_1	-0.51973	0.13990	-3.715
Trend	2.4229	1.8380	1.318
∆diff_1	-0.32137	0.11379	-2.824

σ = 432.198 DW = 1.96 ADF(diff) = -3.715*
RSS = 15690775.9 for 4 variables and 88 observations