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The Valuation Items of Portfolio Investments in Finnish Balance of Payments

ABSTRACT

The valuation items between the flows and stocks of portfolio investment account consist of asset price change and other changes, often reporting inconsistencies. It is worth while to investigate how well the two first mentioned parts can be identified and do these items generally response to changes in the market. Thus valuation items can be considered as a sign of validity in balance of payments data. In this paper portfolio investments are examined in liabilities side i.e. how the market fluctuations effect to our foreign debt and how well these changes explain the changes in different valuation items. Under consideration are foreign-owned shares, bonds and money market instruments between time period 1/1991 - 6/1996. Main results are that there are no systematic omissions of market changes in our balance of payments data which could lead to erroneous information or conclusions. However there are deviations and problems in data but increased knowledge of these shortages has helped to improve the accuracy of portfolio investment information. This paper shows that the valuation changes in shares, foreign currency denominated bonds and money market instruments are most easily identified to changes in various market prices (price and yield indexes, foreign exchange rates). The valuation items of Finnish markka denominated bonds and money market instruments are more complicated to explain.

CONTENTS

ABSTRACT

1 INTRODUCTION

This paper focuses on the portfolio investments' valuation items in Finnish Balance of Payments by comparing BOP data with general market development. Liabilities side of the portfolio investments is examined and the focus is especially on shares, Finnish Markka (FIM) denominated bonds, foreign currency denominated bonds, FIM denominated money market (MM) instruments and foreign currency denominated MM instruments. The data is derived from Finland's monthly BOP information from the beginning of 1991 to June 1996 and it is been collected by employing monthly surveys to financial institutions (banks, brokers, insurance companies) and to major enterprises.
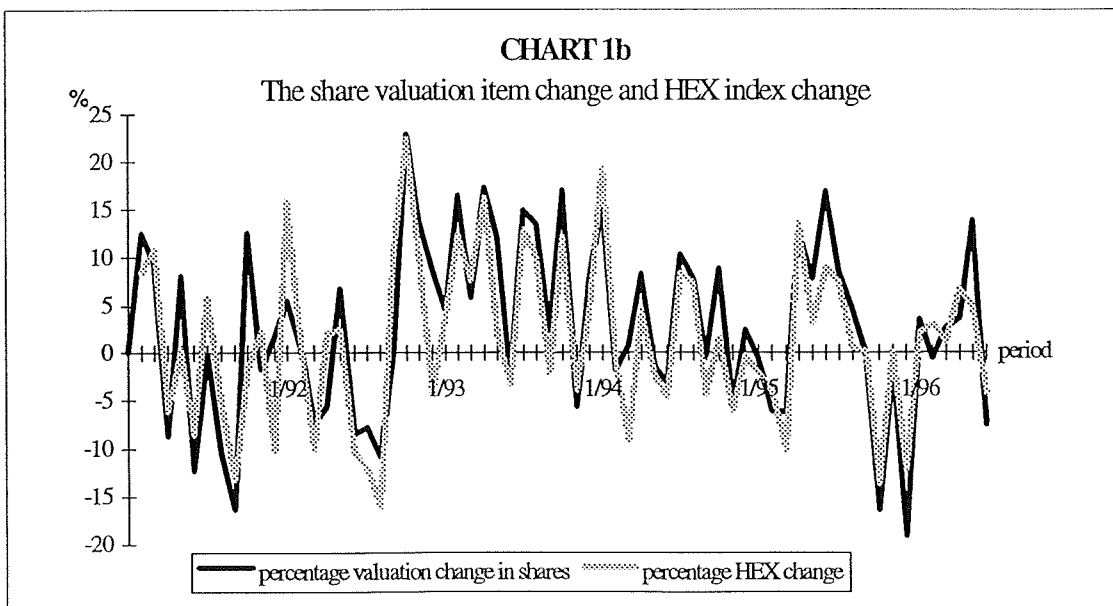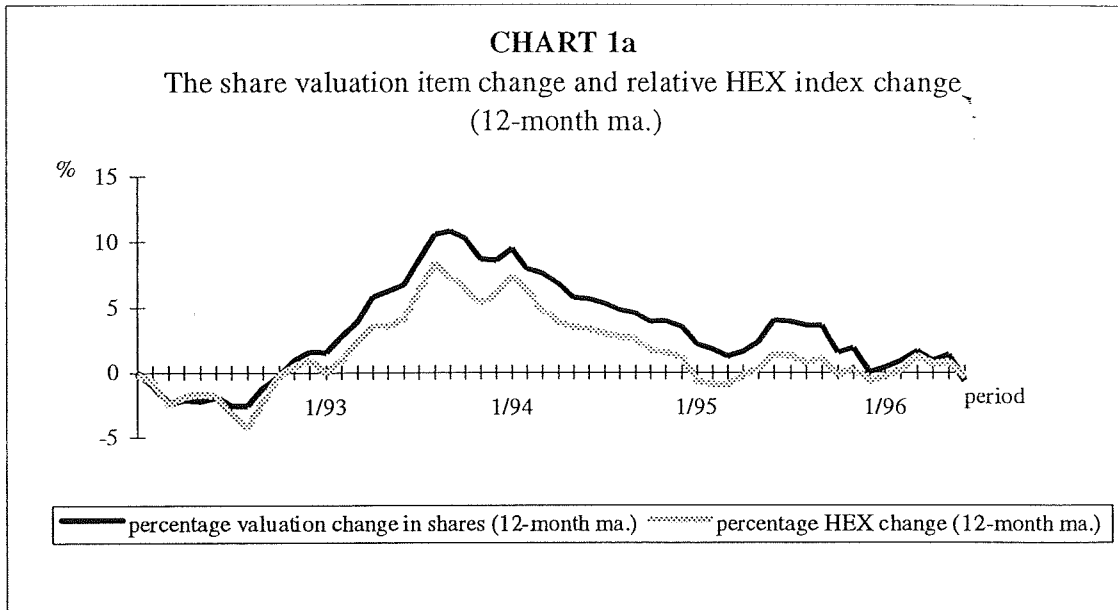
Valuation item is the difference between net change and total change in the stock of asset. Net change denotes purchases of the asset subtracted from the sales of the asset in the liabilities side. So valuation item consists of those factors that affect to the value of the asset stock other than purchases, sales, issues or redemptions. The technical part of this paper is to examine how large part of the valuation item can be quantitatively explained by using market data. The purpose of this paper is to check that the valuation changes are correctly orientated in view to market information. Valuations can include factors such as simple reporting failures, changes in the estimation methods used in compiling the data, frame or sampling problems. Inaccuracies can also be caused by changes in the fundaments of the economy like devaluation of the currency, radical changes in the level of interest rates or exceptional price changes in the stock exchange.

The results are presented with charts where the relations between different factors can easily be seen. Most of the time series are transformed by using moving averages (ma.) which even out the most radical changes and leave the most important trends visible. In chapter 2.1 the valuation item of shares is compared with the stock exchange general price index, in 2.2 FIM denominated bonds are presented with bond yield index, in 2.3 foreign currency denominated bonds are compared to trade weighted currency index and German 5-year interest rates and chapters 2.4 and 2.5 deal with the FIM and foreign currency denominated money market instruments with Finnish 1-month interest rate and USD exchange rate. The charts of the original data (without moving averages) are also shown in every chapter.

2 THE VALUATION ITEMS OF PORTFOLIO INVESTMENTS

2.1 Shares

Development in Helsinki stock exchange can be characterised as quite bearish in the year 1991 and in the beginning of the year 1992. The trend changed at the end of 1992. From October 1992 to October 1995 general price index (HEX) increased about 280 %. **Chart 1a** depicts HEX general index monthly changes and monthly valuation change of shares in BOP with 12-month moving averages.

CHART 1a

The share valuation item change and relative HEX index change
(12-month ma.)

percentage valuation change in shares (12-month ma.) ·········· percentage HEX change (12-month ma.)

CHART 1b

The share valuation item change and HEX index change

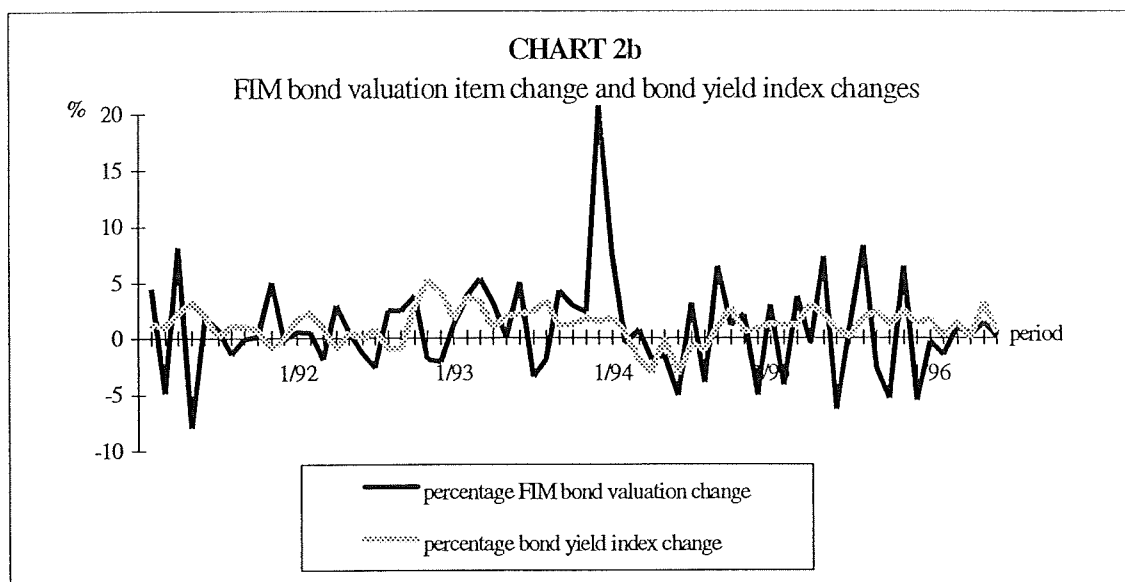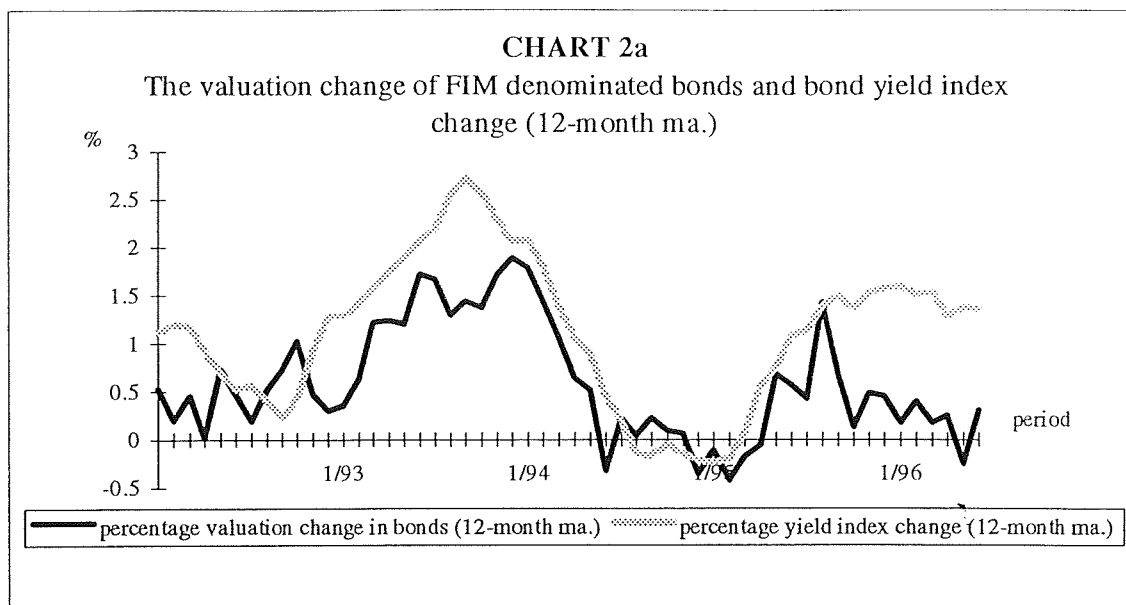percentage valuation change in shares ·········· percentage HEX change

The share valuation item seems to coincide with the changes in the stock exchange prices. However BOP data has clearly larger percentage changes than HEX index. The diagrams above imply that the portfolio of shares in the ownership of foreign investors is quite similar to the "HEX index portfolio" in the stock exchange.

Chart 1a shows some overestimation for the BOP valuation item from the beginning of the year 1993 to the end of 1995. At the moment the changes seem to be equal. During the time 1993-1995 stock exchange was extremely bullish due to the strong trading and increase in the value of Nokia's share. Nokia's part of the trading in Helsinki stock exchange was more than 30% in some of these days and a great deal of trades were executed by foreign investors. This may explain the fact that during this time the "foreign portfolio" of Finnish shares was a similar to HEX index overweighted with Nokia's share and that may be why the BOP estimation has higher but alike formed values than HEX index most of the time. The similar facts can be noticed from the original data, **chart 1b,** where the estimate of valuation item is usually higher in the bullish situations and lower in the bearish situations. During 1992 and in the end of 1995 and in the beginning of 1996 the valuation item estimate performs quite well without any systematic error.
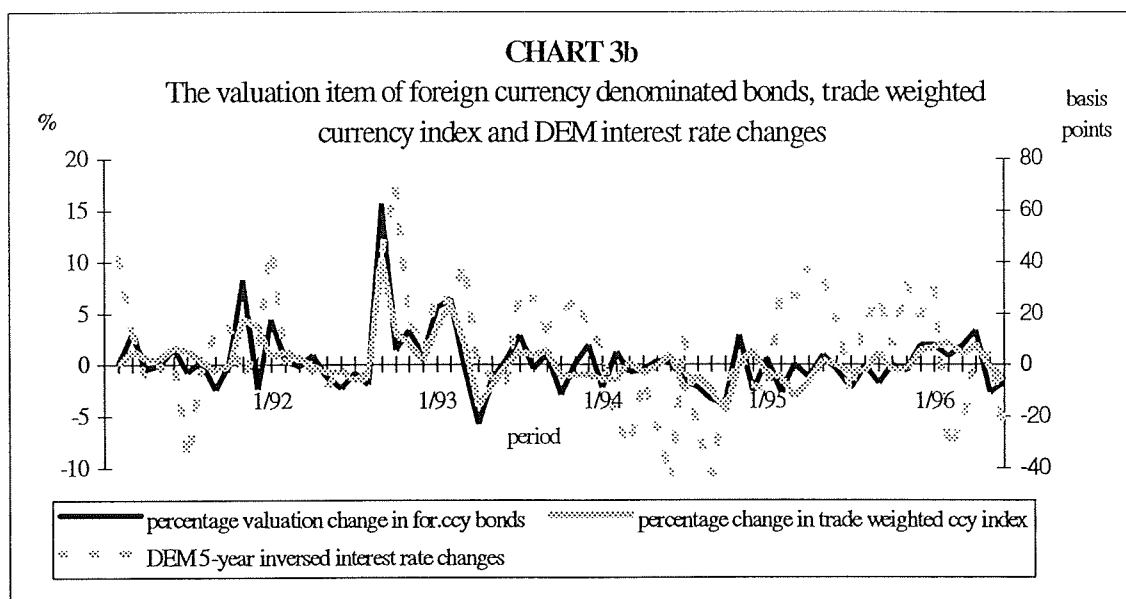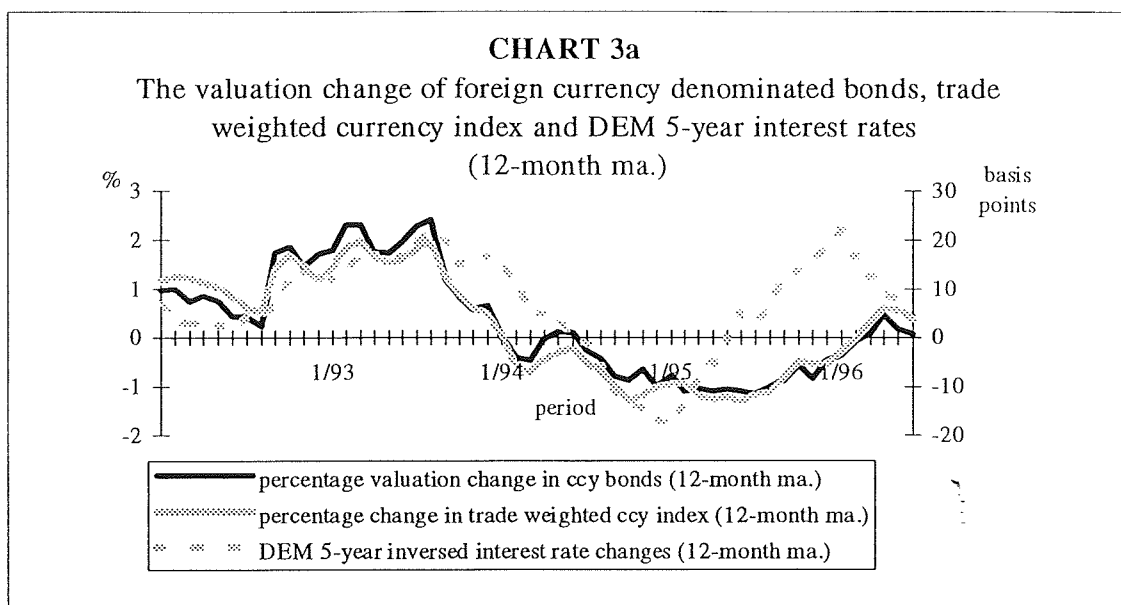
2.2 FIM denominated bonds

To assess the quality of valuation item for markka denominated bonds percentage valuation item changes have been compared to bond yield index changes by using 12 month moving averages. Yield index as well as valuation item can be characterised being positive during the observation time except short period in the end of 1994, in the beginning of 1995 and 5/96. The data includes two exceptional observations which can be seen in the original data, **chart 2b,** in December 1993 and January 1994. These approximately 20 % and 7 % positive changes would dominate the estimation figures with moving averages so that BOP data would be significantly exaggerated between the period 12/93 and 12/94.The valuation changes in 12/93 and 1/94 take place because of the change in our reporting system. The coverage of portfolio reporting was then markedly increased and because all of the effects of the change could not been estimated in the historical stocks, there is a break in series. In **chart 2a** we have removed these outliers to examine the real effects of the used factors. During the whole observation period slight underestimation in valuation items can be detected and it becomes stronger in 1996. This can be caused by repo-transactions in which financial institutions have difficulties to report. Also the secondary market transactions with bonds part of the repo transactions are almost impossible to find out. Due to these problems estimation methods have to be used to explain the difference between BOP data bond valuation item and bond yield index. Because of the missing repo-positions the stock of bonds may be too small and then if we assume net change to be correct the result is too small (negative) valuation change.

CHART 2a

The valuation change of FIM denominated bonds and bond yield index change (12-month m.a.)

percentage valuation change in bonds (12-month ma.) ········· percentage yield index change (12-month ma.)

CHART 2b

FIM bond valuation item change and bond yield index changes

percentage FIM bond valuation change

········· percentage bond yield index change

2.3 Foreign currency denominated bonds

The development in foreign currency denominated bond valuation item can be evaluated with foreign exchange rate and foreign interest rate changes. Finnish Markka was devaluated in 11/91 and started to float in 9/92. In and between these periods FIM weakened strongly which is easily visible in the original data **chart 3b**. Here positive relative change in the value of foreign currency means weakening domestic currency. The trend of bond valuation items was clearly positive until the end of 1993 in **chart 3a** (with 12-month moving averages).

CHART 3a

The valuation change of foreign currency denominated bonds, trade
weighted currency index and DEM 5-year interest rates
(12-month ma.)

percentage valuation change in ccy bonds (12-month ma.)

percentage change in trade weighted ccy index (12-month ma.)

DEM 5-year inversed interest rate changes (12-month ma.)

CHART 3b

The valuation item of foreign currency denominated bonds, trade weighted
currency index and DEM interest rate changes

percentage valuation change in for.ccy bonds   percentage change in trade weighted ccy index

DEM 5-year inversed interest rate changes

Depreciated FIM meant positive valuation effects to the stock of bonds. The value of currency is depicted as the value of trade weighted currency index in **chart 3a**. The changes in trade weighted index and bond valuation item are quite similar. Same kind of results are also achieved (although not so clear) if DEM, ECU or USD rates are used instead of trade weighted currency index. From the beginning of the year 1994 till 1996 FIM appreciated which is visible in the form of negative valuation changes. In the beginning of 1996 FIM has weakened slightly because of the international environment (tightened USD interest rates, the uncertainty of economic performance in Germany, ERM speculation) which has increased positive foreign currency bond valuation item changes. During the last few years the largest part of government's foreign debt has been DEM denominated (about 30%) which makes the comparing at valuation item changes to DEM interest rates relevant. Government bonds
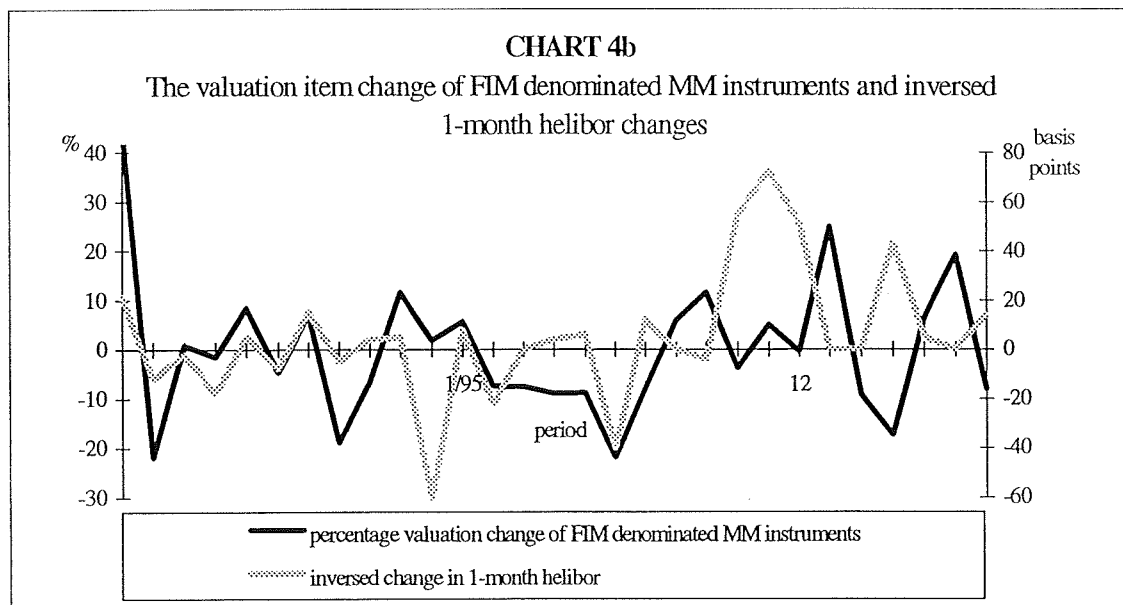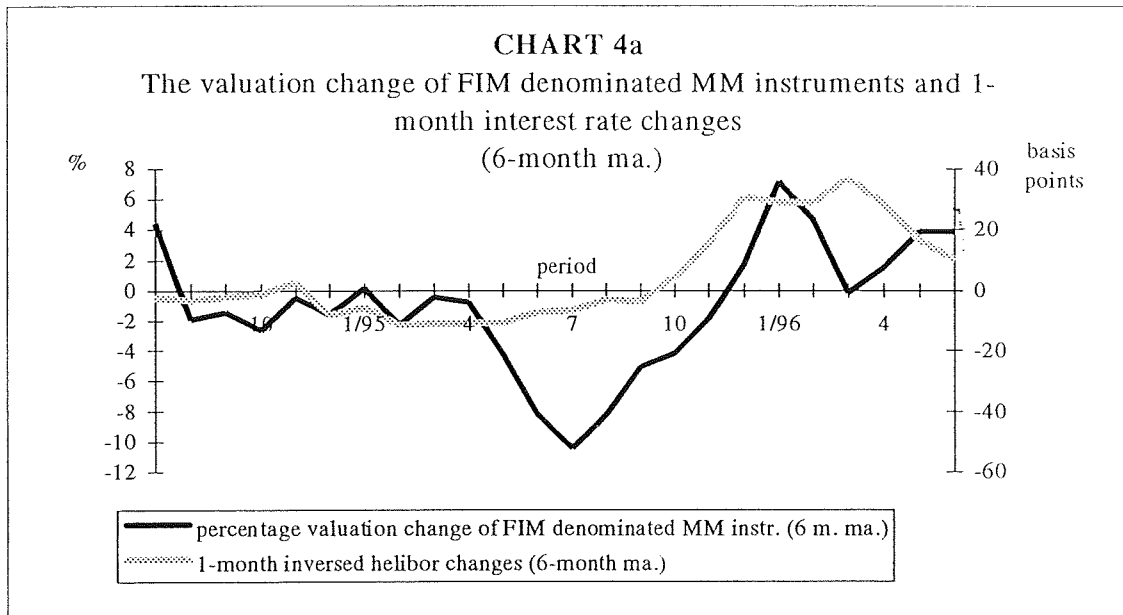
represent major part of our foreign currency bond debt and the average maturity of these papers has recently been between 5 and 6 years.

In **chart 3a** the bond valuation item is also compared with the changes in DEM interest rate levels. Left hand axis represents percentage changes of the valuation item and the right hand side basis point changes in 5-year DEM interest rates. The scale of the interest rate has been reversed so that if the interest rate lowers the curve in the chart moves upward which in turn indicates that both axis changes should move approximately "hand in hand." According to **chart 3a** both changes match quite well until 9/93. This is the first month when moving average does not include the effect of FIM devaluation (floating) and then downward movement by valuation item is steeper than DEM interest rate change. After 9/93 bond valuation item changes are quite underestimated which is also the case after the beginning of the year 1995. The only period when changes are markedly different is the end of 1995 and the first quarter of this year. The explanation of bond valuation item changes can only partially be explained by interest rate changes. In the beginning of 1996 FIM has devaluated quite strongly and this seems to have more powerful effect than DEM interest rates to the stock of currency denominated bonds. Simple regression analysis has been used to define the valuation changes by foreign exchange rates and by foreign interest rates. Results are given in the **appendix**.

2.4 FIM denominated money market instruments

MM instruments are separated from bonds by maturity which is usually less than a year. FIM denominated bonds' valuation item has been compared to the 1-month interest rate (helibor). In BOP data FIM and foreign currencies are separated from 1/94. Changes of data collection system explain some of the differences in **chart 4a**.

CHART 4a

The valuation change of FIM denominated MM instruments and 1-month interest rate changes
(6-month ma.)

——— percentage valuation change of FIM denominated MM instr. (6 m. ma.)
············ 1-month inversed helibor changes (6-month ma.)

CHART 4b

The valuation item change of FIM denominated MM instruments and inversed
1-month helibor changes

——— percentage valuation change of FIM denominated MM instruments
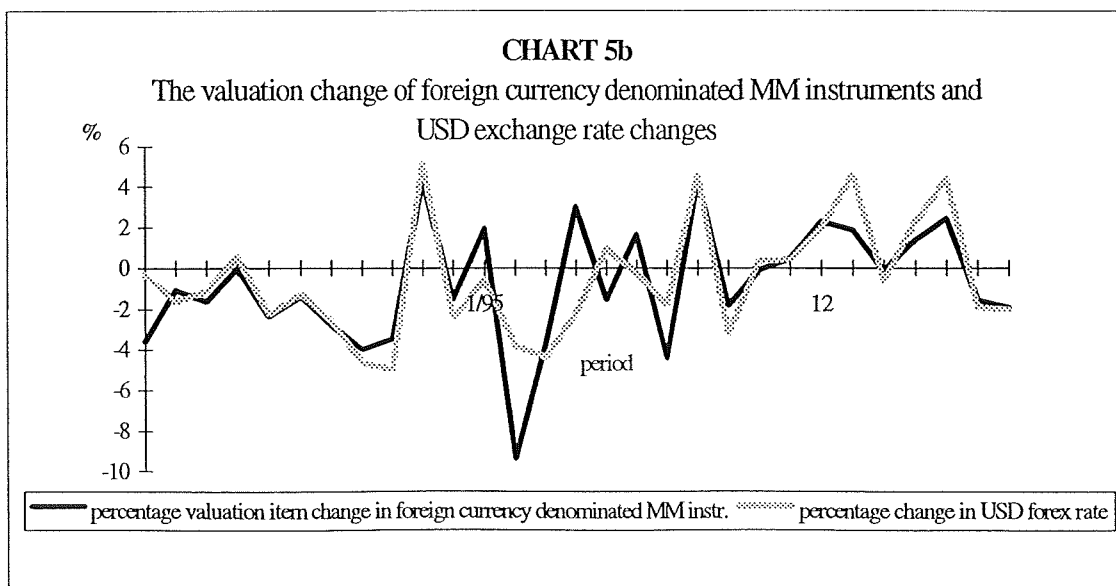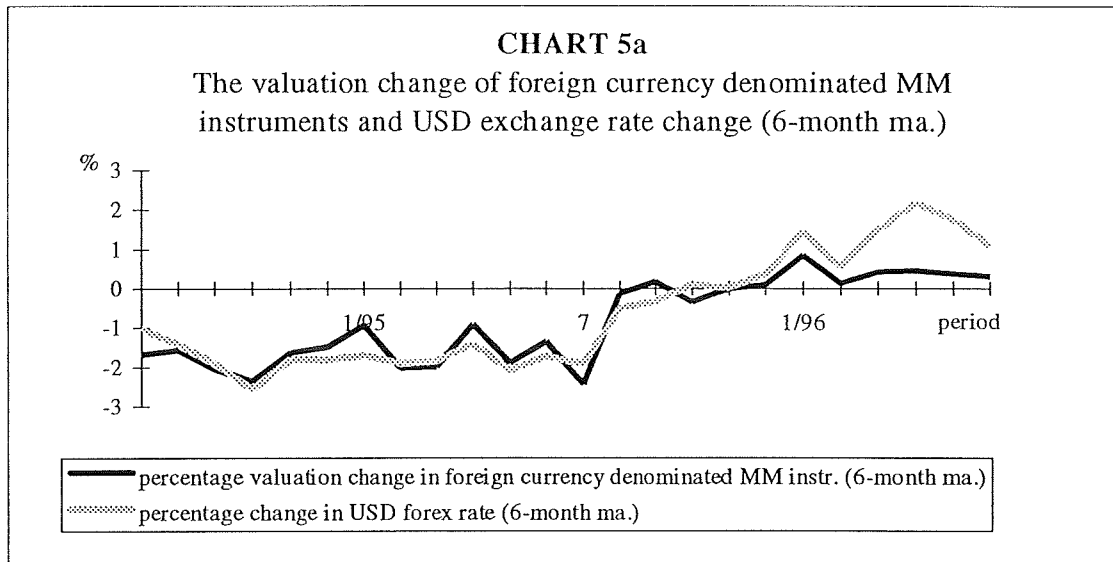············ inversed change in 1-month helibor

The valuation item changes are large during the whole observation period which is also visible in the original data **chart 4b**. Due to the reporting problems many observations in money market instruments' time series are subject to large inaccuracies. As depicted in **chart 4a** valuation item changes seem to move quite close with 1-month interest rate. The interest rate curve is inversed in a similar manner as in chapter 2.2. Other interest rates (3-month, 6-month

or 12-month) do not give as good results as the 1-month rate. Thus these instruments may be more sensitive to very short term interest rate changes. The valuation item changes and interest rate changes are mostly of equal sign but BOP data contains quite strong negative changes between 5/95 and 11/95 according to **chart 4a**. In the original data, **chart 4b**, the valuation item observations are negative between 2/95 and 7/95 (from -7.3% to -22%) which might be a reporting error in net change data.

2.5 Foreign currency denominated money market instruments

The data of foreign currency denominated MM instruments is available only from 2/94. The development of this valuation item has been negative until in the beginning of this year largely because of the strengthening FIM, **chart 5a**.

CHART 5a

The valuation change of foreign currency denominated MM instruments and USD exchange rate change (6-month ma.)

— percentage valuation change in foreign currency denominated MM instr. (6-month ma.)
········ percentage change in USD forex rate (6-month ma.)

CHART 5b

The valuation change of foreign currency denominated MM instruments and USD exchange rate changes

— percentage valuation item change in foreign currency denominated MM instr. ········ percentage change in USD forex rate

During this year, excluding 5 and 6/96, the weakening of FIM has brought about positive valuation items. Compared to the USD exchange rate the valuation item changes are quite similar. This result is not achieved if other foreign currencies such as DEM, ECU or currency indexes are used. The issues and trading of foreign currency denominated MM instruments in the Finnish market are generally USD-based.

3 CONCLUSIONS

The study shows clear relationships between share valuation item and stock exchange index (HEX) and between trade weighted currency index and foreign currency denominated bonds valuation item. The relationship between USD exchange rate and foreign currency denominated money market instruments is also notable. The most problematic valuation items are in FIM denominated bonds and in FIM denominated money market instruments. It must be also stressed that all the figures in the BOP data from 1994 are still preliminary figures and therefore subject to possible changes and they may include considerable reporting errors.

During the observation period trading in Helsinki Stock Exchange was dominated by few of the biggest companies in Finland which are mostly owned by non-residents. Thus the changes in the value of stock exchange are largely the same as the valuation changes in "foreign portfolio". In addition there have not been any major difficulties in the reporting and share data can be considered fairly reliable.

FIM denominated bonds are problematic because the reporting institutions do not very well know the volume of their repo-deals (open repo-positions in the end of the month) and estimation has to be used. In addition, changes in the reporting system and secondary market transactions with bonds related to repo-deals are also one potential origin of errors. However the directions of the changes have mainly been according to expectation which may indicate that no fundamental errors in FIM bond data exist.

The valuation items in foreign currency denominated bonds have followed the changes of foreign exchange rates quite well. Because government bonds are the largest part of this item plenty of information is available in this area. Foreign interest rates (DEM 5-year) haven't had any especially meaningful effects to the valuation of these items although relation between these variables exists.

The valuation item of FIM denominated money market instruments is difficult to rationalize. No proper benchmark index for these papers exists and so the results are presented with 1-month interest rate. Difficulties are caused by the lack of information of these papers and the reporting errors. Measures to improve instructions for intermediaries are going to be taken in the near future.

Foreign currency denominated money market instruments are clearly dollar based which gives straightforward results when comparing the valuation item to USD exchange rate.

APPENDIX

REGRESSION ANALYSIS FOR FOREIGN CURRENCY DENOMINATED BONDS

The valuation change of currency denominated bonds has been examined with simple regression analysis by explaining the change with changes in trade weighted currency index and changes in 5 year DEM interest rates. The results are evaluated in 95% confidence level. Using the moving average data it seems that the valuation change is very dependent of the currency index. We have a strong prior belief that there is a positive relationship between these variables which leads to test null hypothesis "variables not dependent (regression coefficient = 0)" against "regression coefficient >0". According to this t-value (one-sided) is 22,3 which confirms our prior belief very clearly. In this case there is in practise no possibility at all to get a wrong conclusion (P(conclusion error)= $5,9*10^{-28}$). Coefficient estimate is 0,984 which means that there is approximately a similar relative change in trade weighted currency index and in the valuation item of foreign currency denominated bonds in the moving average sense. Strong positive relation is also visible the line fit plot in **chart 1a** which is almost an upward sloping straight line. From the residual plot in **chart 1b** it can be seen that there is no indication of an systematic error, residuals have random locations. Diagrams and statistics regarding these tests are given in the **SUMMARY OUTPUT 1** (next page).

Relationship between valuation item and DEM 5 year interest rates is weak. One could conclude that there is a negative dependency between these variables (higher interest rates lower the value of bonds) and do the testing with null hypothesis "no dependency" against "negative dependency". According to this coefficient estimate is -0,01 with t-value (one-sided) -0,02. This indicates that null hypothesis should not be rejected i.e. to conclude "there are no dependency between DEM interest rates and currency bond valuation items". However the largest part of the bonds are government's and during the last few years they have been mainly DEM denominated (28-29 % in 1994-1996). According to this the variable could be kept in the model especially because the sign of the coefficient is correct and thus gives more accurate information. In line fit **chart 1c** it can be seen that the first (positive) quarter of the axis is empty which indicates that there are no changes in which DEM interest rate rises and currency denominated bond valuation item is positive simultaneously. In third (negative) quarter there are several observations regarding periods 2-4/94, 6/95-2/96. During this time DEM 5-year interest rates have been lowering and our BOP data valuation item has also been negative. It seems that during this period the revaluation of FIM has offset the effects that interest rates have to the valuation item. Similar results are achieved if we use the original data (without moving averages) in analysing these changes. Then t-values are somewhat weaker than previously but conclusions remain the same.

In both cases the interception values (i.e. the values which indicate the interest rate or foreign exchange rate change when the valuation item doesn't change) are near zero also according to the t-tests. So there are no essential other factors that could affect to the valuation item. According to this testing it can be concluded that the most important factor to affect to the valuation item is foreign exchange rate (especially in this case trade weighted currency index) where the depreciation of domestic currency makes valuation items higher i.e. increases the stock of foreign currency denominated bonds (other factors being equal) and the other way round. Foreign interest rates haven't had strong impact but it can be seen that lowering foreign interest rates are related to higher valuation changes and the other way round. The effects of interest rates to the valuation item are minor ones because of the strong impact of currency

index. In this model the partial explanation ratio for currency index becomes very dominant and the role of DEM interest rates is insignificant. If DEM interest rates are tested alone the factor becomes much more significant.
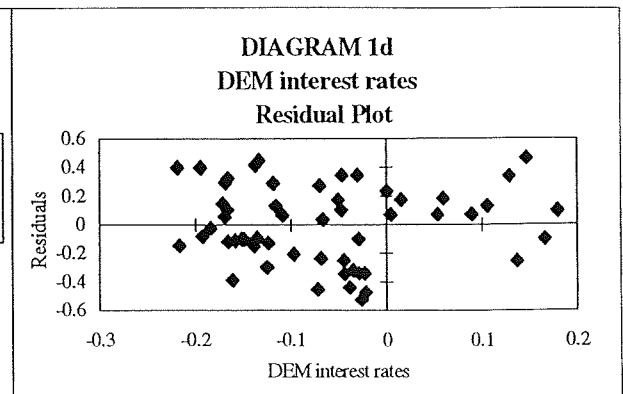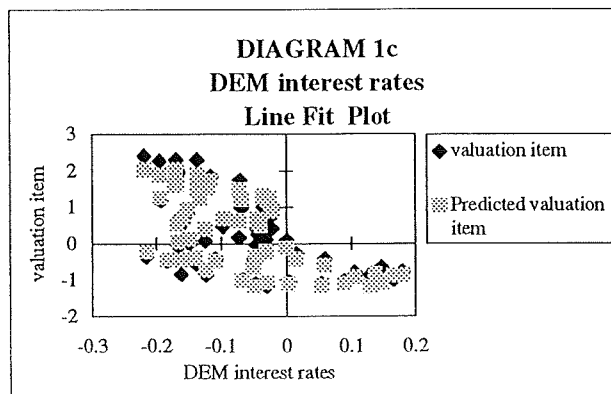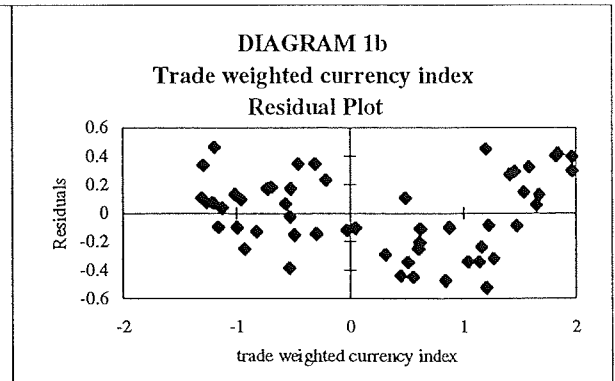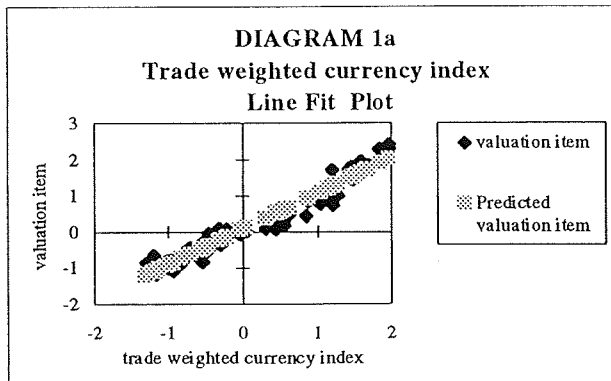
SUMMARY OUTPUT 1
REGRESSION ANALYSIS FOR FOREIGN CURRENCY DENOMINATED BONDS:
Valuation item, trade weighted currency index and DEM 5-year interest rates

Regression Statistics	
Multiple R	0.9691368
R Square	0.939226138
Adjusted R Square	0.936842849
Standard Error	0.273656946
Observations	54

ANOVA

	df	SS	MS	F	Significance F
Regression	2	59.02506304	29.51253152	394.0882743	9.6556E-32
Residual	51	3.819294319	0.074888124		
Total	53	62.84435736			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.075764258	0.04467832	1.695772313	0.096026319	-0.01393114	0.16545966
trade weighted currency index	0.984342877	0.044161801	22.28946426	5.94535E-28	0.895684431	1.073001323
DEM interest rates	-0.010794873	0.455501984	-0.02369885	0.981185308	-0.92525256	0.903662813

DIAGRAM 1a
Trade weighted currency index
Line Fit Plot

DIAGRAM 1b
Trade weighted currency index
Residual Plot

DIAGRAM 1c
DEM interest rates
Line Fit Plot

DIAGRAM 1d
DEM interest rates
Residual Plot

According to the previous testing the relationship between DEM interest rates and valuation item can't be examined very clearly due to the strong impact of trade weighted currency index. Testing can be clarified if the two factors are separated from the model. If trade weighted currency index is tested alone against valuation item the results are alike with the previous section. 6% of the fluctuations of the valuation item remains unexplained. Next step is to explain this residual with DEM 5-year interest rates. The valuation item time series with removed exchange rate effect are available from 1/94. Testing results are shown in the **SUMMARY OUTPUT 2**.

DEM interest rates explain 56% of the changes in residual and the coefficient estimate is -0,06 which is clearly significant according to the t-value. So it can be concluded that although the change in currency index is the most important influencing factor to the valuation item interest rates can't be ignored. DEM 5-year interest rate explains more than a half of the changes that currency index doesn't. The rest can be classified as minor reporting failures.

SUMMARY OUTPUT 2
REGRESSION ANALYSIS FOR FOREIGN CURRENCY DENOMINATED BONDS:
Valuation item and DEM 5-year interest rates

Regression Statistics	
Multiple R	0.746575248
R Square	0.5573746
Adjusted R Square	0.537255264
Standard Error	0.009673053
Observations	24

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.002592153	0.002592153	27.70342871	2.79064E-05
Residual	22	0.002058495	9.3568E-05		
Total	23	0.004650648			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-0.002355145	0.001997358	-1.17913021	0.25094163	-0.006497415	0.001787126
DEM 5-year intr.	-0.064787282	0.012309006	-5.263404669	2.79064E-05	-0.090314627	-0.039259938

DIAGRAM 2a
DEM 5-year interest rates
Line Fit Plot

DIAGRAM 2b
DEM 5-year intrerest rates
Residual Plot