

THE COST OF INTERVENTION

25.8.93

25 August 1993

THE COST OF INTERVENTION 3 AUGUST 1992 - 1 APRIL 1993

1 This note summarises our estimates of the cost to the EEA of the intervention undertaken last year to support sterling. A detailed account of the methods used to obtain these estimates, together with a discussion of the various assumptions used, is contained in the annex to this note.

2 The reserves are a store of value supporting the creditworthiness of the UK's foreign currency borrowing and, when necessary, available to purchase sterling. For this reason they must of course be held in foreign currencies and consequently their change in value should be measured on an international rather than a domestic basis. In this note we have used US\$ as our measure.

3 The calculations are based on daily figures for holdings of foreign currencies over the period 3 August 1992 to 1 April 1993. For the purposes of the calculations we have assumed that the EEA established a fund of sterling holdings at the beginning of the period which was added to as the intervention total mounted. The calculations take account of the changing currency composition of the reserves and external liabilities. For the present purpose, intervention is understood as the process of exchanging foreign currency assets for sterling assets.

4 Appropriate additions and subtractions are made for interest received on assets and interest paid on liabilities, using a standard formula for the calculation of interest, namely LIBID minus 0.125%. This represents the realistic cost of the various long and short positions we took over the period.

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5 The cost of intervention is calculated as the fall in the value of our calculated holdings (sterling plus foreign currency) between 3 August 1992 and 1 April 1993. The table attached (Annex, page 13) shows that the net value of the foreign currency reserves on 3 August 1992 was US\$ 23.63 bn. By 1 April 1993 the EEA held US\$ 26.75 bn of sterling (valued at current exchange rates) and was short US\$ 7.27 bn of foreign currency. Our net position was, therefore, US\$ 19.48 bn. This indicates that the EEA declined in value by US\$ 4.15 bn over the period.

6 Since 1 April 1993, sterling has depreciated slightly and the mark-to-market loss on the position established last year has grown accordingly. We have not done detailed calculations post 1 April but the order of magnitude of the effect on the loss can be gauged from the observation that by 23 August sterling had depreciated against the "neutral" (i.e. 40:40:20) basket of foreign currencies by just 1%.

7 As well as calculating the value of the EEA's holdings over the period, we have also modelled six counterfactual scenarios in which we explore the likely outcome of alternative intervention policies. In these scenarios we assume that interest rates and exchange rates remained as they actually were and we vary only the value of our currency holdings: this assumption is unrealistic but in practice unavoidable, and we do not think it renders the results meaningless. The main counterfactual is:

(B) "No intervention", that is, leave the ERM on 3 August.

There are two variant counterfactuals designed to investigate further the actual loss:

(C) "Neutral currency", that is, undertake the same amount of intervention as we actually did, but always maintain the "neutral" 40:40:20 currency position.

(D) "No ECU", that is, convert our ECU short position into a DM short position, by selling DM forward.

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There are three additional counterfactuals - see Annex, Paragraph 20 - which we have modelled to show their effect (rather than suggest they were realistic policy options).

8 Had we undertaken no intervention at all, but retained our net foreign currency holdings (and their currency distribution) as on 3 August 1992, by 1 April 1993 their value would have increased to US\$ 24.39 bn, largely through interest income. The difference between this and the calculated value of the EEA holdings on 1 April 1993 is US\$ 4.91 bn. This may be regarded as the opportunity cost of the intervention that we did undertake.

9 The total loss might have been higher than it was, but was ameliorated by two significant factors. First, we estimate that US\$ 2.67 bn was saved by keeping the currency composition of the reserves long of US\$ and short of DM during the autumn of 1992, and not rebalancing the currency composition of the reserves in September immediately after sterling's devaluation.

10 To summarise, we estimate that the cost of intervention over the period 3 August 1992 to 1 April 1993 can be put at US\$ 4.15 bn, which is the calculated decline in value of the reserves. In addition there is an opportunity cost of foregone earnings, which we estimate as US\$ 0.76 bn.

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11 Thus, the cost of intervention might have reached US\$ 8.19bn but, through the active management of our liabilities and of the currency composition of the reserves, the cost was limited to US\$ 4.91 bn. This is illustrated in the table below, which also converts these figures to sterling at the rate pertaining on 1 April 1993 (\$/£ 1.531).

| | <u>US\$ bn</u> | <u>£ bn</u> |
|---------------------------------------|----------------|-------------|
| Calculated fall in value or reserves: | 4.15 | 2.71 |
| Opportunity cost: | 0.76 | 0.50 |
| Total cost: | <u>4.91</u> | <u>3.21</u> |
| | | |
| Saving, due to VSTF: | 0.61 | 0.40 |
| Saving, due to currency composition: | 2.67 | 1.74 |
| Total <u>potential</u> cost: | 8.19 | 5.35 |

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ANNEX:

DETAILED ANALYSIS OF INTERVENTION COSTS AND COUNTERFACTUAL SCENARIOS

Assumptions

- 1 This annex analyses the cost of the large-scale intervention undertaken in the foreign exchange markets last autumn. In order to measure the cost it is necessary to specify what we would have done had we not intervened as we did: for this reason we analyse a number of possible courses of action - counterfactuals - and their likely cost outcomes, as well as the actual events which took place. We also illustrate that the inaccuracies of our simplifying assumptions are not material in the present context.
- 2 In these calculations we have used the widest possible definition of intervention, which is any shift between sterling and foreign currencies. We have thus used the data on stocks of assets in the reserves, net of liabilities, rather than looking at individual transactions which were considered intervention at the time they were done.
- 3 Our measure of the cost of intervention is the total return on the EEA's assets less the total return that would have accrued if we had followed some alternative policy. In calculating this amount, we need to revalue holdings of currencies. We have used actual exchange rates in the construction of our counterfactual scenarios, i.e. we have assumed implicitly that exchange rates would have been unaffected had our own operations been different. Obviously this is unrealistic, but it is the least arbitrary assumption that can be made.

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4 We also need to assume something about the interest rate return on currency positions. We have, in line with established practice, assumed that long positions earn one month Libid¹; and also that short positions are financed by borrowing at the same rate. This assumption reflects the reality of the way the reserves are managed. Interest rate returns on the reserves differ from one month Libid to the extent that we take deliberate interest rate exposures in managing the reserves. The financial results of these exposures are reported separately, since the exposures are managed in a way that makes them independent of the currency composition of the reserves. (Even when liquidity was under severe pressure in September 1992, interest rate exposures continued to be managed in accordance with the agreed strategy.) We would have continued to run essentially the same interest rate exposure even if one of the counterfactual intervention strategies had been followed. This would have been possible because we raised cash for intervention not by selling bonds, but by increasing our liabilities and by the use of repo. trades. It thus seems appropriate to use one month Libid in evaluating those strategies too.

5 This however misses out the short run costs of financing our heavy intervention, by lending (and in a few cases selling) securities to raise cash in a way we would not have otherwise done. These costs are we believe very small. This is because the techniques we had set up enabled us to borrow money against securities at rates very close to Libid. The extra cost of borrowing incurred through our revolving credit arrangement is of the order of \$0.01 bn over the period, and our US\$ and DM bond issues were both hedged by securities at very similar yields. Furthermore, we only sold securities where we either could raise money cheaper by outright sale, or where we wished to sell to take profits as bond prices went up in any case. The major financing cost will have been an opportunity cost, in that there were short-lived opportunities in September to invest cash on extremely advantageous terms, to exploit opportunities caused by other countries' difficulties. The cost of missing these will not have exceeded a few million dollars, however.

1 We subtract 0.125% as a rough adjustment for the lower return on sovereign assets relative to bank deposits.

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6 The time period of the analysis is a much more difficult issue. The calculations reported here run from 3 August 1992, before which net reserves were relatively constant, to 1 April 1993. By the end of March, the currency composition of net reserves was back into balance, but net reserves were still almost \$31 bn below their starting level. We had a substantial remaining "position" long sterling, and short a basket of foreign currency; the present calculations assume, by using market values, that we would be content to buy back all this remaining position at end-March exchange rates². If sterling gets stronger, our position will perform well, cutting back the estimated loss. The present calculations may thus be regarded as somewhat provisional in nature, since we cannot claim fully to have evaluated the episode until net reserves are rebuilt to their pre-September 1992 level.

The pattern of intervention

7 The events of last autumn and their aftermath require a brief description. Until July, sterling had seemed reasonably secure within the wide ERM band (Chart One: DM/£ exchange rate), strengthening in the early summer to above DM 2.90 for a period. But sterling moved below DM 2.85 in July, as it became clear that an early recovery of economic activity was not in prospect. Considerable amounts of intervention (\$6.26 bn) were undertaken in August to slow the pace of the decline. Net reserves fell from \$23.63 bn to \$17.37 bn, almost entirely in the second half of August and at rates close to DM 2.80.

8 The exchange rate seemed to have stabilised at the start of September, helped by the announcement of our ECU 10 bn borrowing arrangements. Intervention was fairly muted until Monday 14 September when sterling reached its limit rate against the lira, after the Italian realignment over the weekend. Net reserves fell by \$2.36 bn on 14 September to \$13.24 bn, by \$0.87 bn on 15 September to \$12.37 bn, and then by \$27.71 bn on 16 September

2 Or, at future rates consistent with end-March's exchange rate and the yield curves then current.

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to -\$15.34 bn, ahead of sterling's departure from the ERM after the close of business on 16 September.

9 Net reserves were gradually rebuilt in October, November and December to reach -\$10.50 bn at the end of the year. By 1 April they stood at -\$7.27 bn, still \$30.90 bn below their level of 3 August.

Currency composition

10 During the period the currency composition of net³ reserves changed considerably. In early August composition was close to the 40:40:20 in \$:DM:Yen which we regard as neutral. The actual composition was 43:37:20 so, relative to neutral, there was a \$0.75 bn dollar long matched by a corresponding DM short; the Yen position was neutral. This reflected earlier concerted intervention to slow the decline in the dollar, which had fallen from DM 1.65 in April to below DM 1.60 in June (and to a low of DM 1.40 in late August). ECU net holdings were very close to nil, with the UK's substantial marketable liabilities in ECU matched by assets denominated in ECU.

11 The \$6.73 bn of intervention in late August was principally in DM (holdings of which fell by \$4.79 bn). As a result the currency composition had become significantly different from 40:40:20 by the end August, at 60:19:21. A dollar long of \$3.54 bn was matched by an equivalent DM short; the Yen position remained in balance. Such large positions would not normally have been taken unless, as in this instance, we were under severe pressure to sell DM to support the DM/£ rate; however, we did not immediately rebalance currency reserves (by selling \$ for DM) because we felt that the dollar was likely to appreciate sharply, and because we were in a period of concerted international support for the dollar. As Chart 2 shows,

3 Net reserves are defined as gross reserves less the foreign currency debt of HMG, which is taken to include liabilities under the Exchange Cover Scheme.

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the dollar did indeed appreciate sharply. (Chart Two: DM/US\$ exchange rate).

12 The imbalance out of DM into \$ continued to grow in September, with net DM-bloc assets falling from \$3.75 bn on 1 September to -\$4.93 bn on 17 September. Net \$ holdings remained unchanged, at around \$11 bn, as did Yen holdings, at around \$3.7 bn. The last day of ERM membership saw huge intervention, still in DM-bloc currencies. This was financed by VSTF borrowings denominated in ECU⁴ and, as a consequence, net holdings of ECU fell to -\$26.66 bn. The overall effect was to produce large currency composition imbalances, illustrated by the following figures for 17 September.

Net reserves -\$16.77 bn. All figures in US\$ bn.

| <u>Currency</u> | <u>Target holdings</u> | <u>Actual holdings</u> | <u>Position</u> |
|-----------------|------------------------|------------------------|-----------------|
| \$ | -6.71 | +11.12 | long 17.83 |
| DM bloc | -6.71 | -31.61 | short 24.90 |
| of which ECU | 0.00 | -26.68 | short 26.68 |
| Yen | -3.35 | + 3.72 | long 7.07 |

The question of how quickly balance should be restored was under active consideration by the Bank and HMT during the subsequent period, with the Bank more inclined to argue that the position should not be squared-off immediately since the dollar was likely to appreciate against the DM, and particularly against the ECU.

13 The position was reduced significantly on 25 September by using mainly dollars to make the first VSTF repayment of ECU 10 bn (\$11.64 bn). The \$ long was reduced by \$7.5 bn in consequence, at a DM/\$ rate of 1.47, somewhat below the 1.52 level at which the position was acquired.

4 Intervention on 16 September totalled \$27.71 bn, of which \$24.10 bn was in ECU. The total VSTF borrowing was ECU 21.04 bn (\$28.18 bn at the relevant exchange rate on 16 September) of which ECU 2.01 bn was agreed on 14 September and ECU 19.03 bn on 16 September.

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14 The remaining dollar long was reduced again at the end of October (to \$8.11 bn) and again in mid-December (to \$5.39 bn) when further VSTF repayments were made, by using dollars for part of the repayments. By the end of March the dollar had rallied to 1.61 against the DM and the reserves were essentially back into currency balance (the \$ long was now only \$0.94 bn). We estimate that by departing from the neutral currency position at all, a profit of around \$ 0.34 bn was made and that the delay in returning to 40:40:20 immediately after 16 September was worth a total of US\$ 2.67 bn over the whole period. Subsequent departures from 40:40:20 were small and fully consistent both with the agreed strategy for currency exposures and the Bank's agreed discretion in implementing that strategy.

15 Within the DM bloc there was a large ECU short and, as a corollary, an implicit DM long. To some extent this was an involuntary consequence of VSTF financing (which is denominated in ECU); but the exposure could have been hedged by forward sales of DM for ECU. The size of the ECU position was as follows:

| | |
|---------------------------------------|-------------------|
| From 16 September until 28 September: | around -\$26.6 bn |
| From 28 September until 27 October: | around -\$14.5 bn |
| From 28 October until 10 December: | around -\$11 bn |
| From 11 December until 10 March: | around -\$4.7 bn |

16 As Chart 3 indicates (Chart Three: DM/ECU exchange rate), the ECU weakened in mid September against the DM, but was thereafter relatively steady. The rate was 2.00994 on 16 September, when the bulk of the short was established. All the repayments were at weaker levels for the ECU, thus reducing the DM cost of our repayments: 1.98250 on 28 September when ECU 10 bn was repaid; 1.96646 on 26 October when a further ECU 3.25 was repaid; 1.95845 on 11 December when ECU 4.314 bn was repaid; and 1.94103 on 11 March when the final instalment of ECU 3.48 bn was repaid.

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17 The exchange rate gains noted above were to some extent offset by ECU interest rates being higher than DM rates. As Chart 3A indicates (Chart Four: DM Libor/ECU Libor), ECU rates rose briefly to over 4 percentage points p.a. above DM rates, and averaged about 1.5 points p.a. higher over the period. This increase in interest costs will have offset only a small proportion of the exchange rate gains since the loans were only open for a few months, and the exchange rate gains on the whole borrowing averaged rather over 2%.

18 In practice, the interest charged on the VSTF loan was lower than the open market rate for ECU borrowing over the period, by a margin ranging from 30 to 140 basis points. (The VSTF interest rate is a fixed monthly rate, based on a lagged average of interest rates as notified by the Central Banks of European Community members, weighted according to the strength of the various currencies in the ECU.) This saving could have been "locked-in" by selling DM forward for ECU, thus translating the debt into DM at a below-market interest rate; we would have given up the prospect of gain from ECU weakness in exchange for still lower borrowing costs.

Counterfactuals

19 As the above discussion has made clear, there are a number of factors which influenced the size and the value of our foreign currency holdings and of our acquired sterling holding. The aim of the counterfactual scenarios that we have developed is to quantify, as far as is possible, the impact of each of these factors; for example, the timing of our intervention or the currency composition of the foreign holdings. Each counterfactual seeks to measure the likely outcome of an intervention strategy different from the one which we actually followed.

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20 The counterfactuals are, in brief:

- (B) Our main counterfactual, the "No Intervention" scenario, equates with a policy of leaving the ERM in early August. In this case we maintain the composition and size of our foreign currency holdings at their levels of 3 August 1992, by assuming no intervention.
- (C) Our first variant counterfactual, the "Neutral Currency" scenario, equates with a policy of preserving the neutral 40:40:20 currency mix at all times throughout the period. Intervention is assumed to have occurred on the same days and in the same amounts as it actually did, but in different currencies, so as to preserve our neutral position.
- (D) Our second variant counterfactual, the "No ECU" scenario, equates with a policy of preferring a DM short to an ECU short. In this case the ECU liability (*i.e.* the VSTF loan) is hedged by forward sales of DM, while the US\$ and Yen holdings are maintained in the same proportions as was actually the case.
- (E) Of the other counterfactuals, the "Massive Intervention" scenario equates with a policy of large scale intervention early in August to show the seriousness of our intention to defend the value of sterling. In this case all the sterling that was actually purchased between 3 August and 17 September is assumed to have been purchased on 3 August.
- (F) Another counterfactual, the "Italian Option" scenario, equates with a policy of leaving the ERM on 11 September, when the Italians devalued. In this case we maintain the reserves at their level and composition of 11 September, after significant intervention but prior to the major intervention of 16 September.
- (G) Finally, the "No Reserves" scenario equates with a policy of not holding foreign reserves at all and choosing not to intervene in the foreign exchanges. In this case we convert

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all our foreign reserves to sterling on 3 August and simply accrue interest to this sterling holding over the period.

Method

21 The method adopted here is simplified to avoid having to analyse the large number of transactions done each day. The starting point for our analyses are the net holdings of each of the 3 major currencies, plus ECU.

22 Net holdings of minor currencies are allocated to the closest relevant major currency: thus Canadian Dollars are treated as US Dollars, and European currencies other than ECU are treated as DM. So, for example, our Canadian holdings were converted each day to US\$, at the current exchange rate, and added to the US\$ holding. Positions in such minor currencies were generally rather small; consequently we are satisfied that any inaccuracies, due to differential interest rates, are immaterial.

23 It is worth noting that the value of our currency positions are measured on an historic cost basis for holdings of bonds and other instruments. This means that holdings of securities are probably somewhat undervalued, since world markets have been on an upward trend in the recent period. Thus the currency reserves will have been larger at market value than the accounting numbers suggest. (In particular, the market value of the DM holding will have been affected by the sharp rally in DM bonds in September). However, these effects are relatively small: the effect on currency positions will have been of the order of tens of million of dollars, so the knock-on effect on estimates of currency losses will be of the order of a few million dollars. (We are working towards the introduction of market-value measurement techniques for our currency holdings in the near future.)

24 We start by calculating the change in net holdings of each of the four currencies for each day, starting at close of business on 3 August 1992. Each change is converted into a sterling amount at

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an average exchange rate. For example, the change in value of the US\$ holdings from close of business on 3 August until close of business on 4 August is converted to sterling using the average of the exchange rate at close of business on 3 August and the exchange rate at close of business on 4 August.⁵

25 We also calculate the interest that we would earn (for long positions) or pay (for short positions) on each of the four holdings, at the rate of LIBID minus 0.125%. (See paragraph 4). These four interest amounts are converted to sterling and then summed. The sum of the changes in these four holdings plus interest is taken as the total net intervention for that day. The calculation is repeated day by day, to give a cumulated estimate of the stock of sterling acquired by running down the reserves. (We assume the stock was zero at close of business on 3 August). This sterling stock itself earns interest each night on the same LIBID less 0.125% basis as for foreign currency stocks.

26 Our estimate of the total value of the reserves on subsequent days is thus:

the cumulative sum of estimated sterling intervention
plus interest earnings on this amount
plus the remaining net foreign currency reserves.

27 The cost of intervention over any given period has two components. First, the difference between the value of the reserves at the start of the period and the value of the reserves, including the sterling purchased, at the end of the period. This calculation tells us the change in value of the calculated reserves over the period, but it ignores any opportunity costs. The second component can be measured by comparing the value of the reserves at the end of the period with an estimate of what the value of the

5 There are a number of exceptions to this general rule. On days when major intervention took place, such as the 16 September, we have used the average exchange rate for the trades done on that date. When VSTF repayments are made, we have used the actual rates, as agreed according to the VSTF rules.

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reserves would have been at the end of the period if an alternative course of action had been taken. The main counterfactual scenario we have developed (see Paragraph 20) suggests a different, full answer to the question, "What was the cost of intervention?", over and above the first component which tells us by how much the value of the reserves actually declined over the period.

28 We have made a number of simplifying assumptions in following this procedure. Of these, the two most important are:

(1) The present estimates of foreign exchange positions allow for interest on our net foreign currency assets on a cash, rather than an accruals basis. Thus, whereas our calculations assume a reasonable daily estimate of accrued interest for each net currency holding, in reality the actual holdings receive (and pay) interest in an irregular fashion. This should not create any systematic bias, but will lead to some small, random errors in the timing with which we estimate intervention to have taken place. The alternative - identifying each specific interest flow - would be extremely laborious and would not make much difference.

(2) We assume that the sterling holding yielded Libid less 0.125%. In practice, most of the sterling was lent back into money markets via the foreign exchange swap markets, in exchange for borrowed foreign currency. However, the Bank's stock of sterling money market assistance rose. A portion of this, between £2.6 bn and £4.4 bn, was provided through the "gilt repo" route, on which we earned LIMEAN; and between £1 bn and £3 bn was placed on deposit with BIS at rates close to LIBID. The remainder was used to increase our portfolio of bill purchases, whose yields would have been related to our stop rates (which are consistent with base rates). Overall, therefore, LIBID minus 0.125% represents a reasonable approximation for the sterling holding over the period.

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Results

29 The value of the EEA's sterling holding acquired since 3 August 1992 provides our measure of intervention. Charts 4 and 5 (Chart Five: Sterling holdings in £ and Chart Six: Sterling holdings in US\$) show that we undertook around \$7 bn of intervention in August 1992 and around \$29 bn in September. At its peak our sterling holding reached \$38 bn on 17 September. It was gradually reduced to \$30 bn by the end of 1992, and to \$26.75 by 1 April 1993 (the end of our period of measurement). The chief counterpart to the growth of our sterling holding was a fall in our foreign currency holdings, from \$23.63 bn on 3 August to -\$7.27 bn on 1 April. The nadir (-\$16.93 bn) was on 21 September.

30 Adding net foreign reserves to our sterling holdings gives the value of our total calculated holdings. These fell from \$23.63 bn on 3 August to \$19.48 bn on 1 April. Over this period, therefore, we can say that the effect of intervention was to reduce the value of our total calculated holdings by \$4.15 bn. (This figure has itself been reduced by sterling's recovery; it was at its highest - \$7.01 bn - on 11 February 1993).

31 These numbers are comprised of two elements: first, the realised loss on the portion of sterling purchased in August and September and reversed at a lower exchange rate; and, second, our estimate of the unrealised loss on the sterling purchased in August and September and, as yet, not sold for foreign reserves. This calculation assumes our willingness to sell sterling for foreign currencies at exchange rates current on 1 April 1993 (see Paragraph 6). This assumption is debateable, but must be made if we are to put a provisional figure on the cost of intervention.

32 A summary of the estimated values of our calculated holdings, together with the values of our holdings under the various counterfactual scenarios, is given on the following page.

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NB: All figures are in US\$ bn.

| | Aug.03 | Sep.01 | Oct.01 | Nov.02 | Dec.01 | Jan.04 | Feb.01 | Mar.01 | Apr.01 |
|------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| (A) CALCULATED HOLDINGS: | | | | | | | | | |
| Total value of currency holdings | 23.63 | 24.48 | 20.53 | 18.35 | 18.89 | 18.84 | 17.76 | 17.93 | 19.48 |
| Of which: | | | | | | | | | |
| Foreign | 23.63 | 16.90 | -16.10 | -13.00 | -12.28 | -10.50 | -7.83 | -7.85 | -7.27 |
| Sterling | | 7.58 | 36.63 | 31.35 | 31.17 | 29.34 | 25.59 | 25.78 | 26.75 |
| Change from Aug.03 | | 0.85 | -3.10 | -5.28 | -4.74 | -4.79 | -5.87 | -5.70 | -4.15 |
| (B) MAIN COUNTERFACTUAL: | | | | | | | | | |
| "No Intervention" | | | | | | | | | |
| Value of holdings | 23.63 | 24.47 | 24.52 | 23.56 | 23.60 | 23.38 | 23.55 | 23.94 | 24.39 |
| (A) less (B) | | 0.01 | -3.99 | -5.21 | -4.71 | -4.54 | -5.79 | -6.01 | -4.91 |
| (C) Variant Counterfactual: | | | | | | | | | |
| "Neutral Currency" | | | | | | | | | |
| Value of holdings | 23.63 | 23.88 | 22.86 | 18.62 | 18.85 | 18.37 | 17.37 | 17.47 | 19.14 |
| (A) less (C) | | 0.60 | -2.33 | -0.27 | 0.04 | 0.47 | 0.39 | 0.46 | 0.34 |
| (D) Variant Counterfactual: | | | | | | | | | |
| "No ECU" | | | | | | | | | |
| Value of holdings | 23.63 | 24.48 | 20.05 | 17.99 | 18.22 | 18.19 | 17.20 | 17.35 | 18.87 |
| (A) less (D) | | 0.00 | 0.48 | 0.36 | 0.67 | 0.65 | 0.56 | 0.58 | 0.61 |
| (E) Other Counterfactual: | | | | | | | | | |
| "Massive Intervention" | | | | | | | | | |
| Value of holdings | 23.63 | 25.16 | 19.73 | 15.99 | 16.23 | 15.91 | 14.44 | 14.30 | 16.15 |
| (A) less (E) | | -0.68 | 0.80 | 2.36 | 2.66 | 2.93 | 3.32 | 3.63 | 3.33 |
| (F) Other Counterfactual: | | | | | | | | | |
| "Italian Option" | | | | | | | | | |
| Value of holdings | 23.63 | 24.48 | 23.55 | 22.43 | 22.51 | 22.39 | 22.19 | 22.51 | 23.10 |
| (A) less (F) | | 0.00 | -3.02 | -4.08 | -3.62 | -3.55 | -4.43 | -4.58 | -3.62 |
| (G) Other Counterfactual: | | | | | | | | | |
| "No Reserves" | | | | | | | | | |
| Value of holdings | 23.63 | 24.87 | 21.89 | 19.35 | 19.55 | 19.26 | 18.53 | 18.61 | 19.85 |
| (A) less (G) | | -0.39 | -1.36 | -1.00 | -0.66 | -0.42 | -0.77 | -0.68 | -0.37 |

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33 Our main counterfactual, Counterfactual B ("No Intervention"), suggests that if we had maintained our foreign currency holdings as at 3 August, their value would have increased slightly over the period from \$23.63 bn to \$24.39 bn as a result of the accumulation of interest on the holdings and the effects of fluctuations in exchange rates. This would have outperformed our calculated holdings by \$4.91 bn over the whole period. Since in this counterfactual scenario we neither buy nor sell sterling, sterling's devaluation has no impact upon the value of the holdings.

34 Our first variant counterfactual, Counterfactual C ("Neutral Currency"), explores the results if we had intervened in the size, and with the timing, that we did, but had continually rebalanced holdings so as to maintain the 40:40:20 neutral position. By the end of September the value of our holding would have been US\$ 2.33 bn higher than it was in fact. However, by 1 April this strategy produces holdings lower in value by US\$ 0.34 bn than those held in fact. This demonstrates the impact of the dollar's rise against the DM with a very large DM/\$ position. In practice it would not have been sensible to sell dollars and yen to buy sterling in September 1992, since we intended to increase the value of sterling against the DM and this would most likely have occurred by selling DM to buy sterling. Given the impossibility of following the 40:40:20 formula when it was advantageous so to do (i.e. in late August and September) the actual strategy of gradually selling dollars and yen to reduce our DM short has increased the value of the total holdings by US\$ 2.67 bn since the start of October. (This is the difference between the end September and end March values for this strategy). That is, we are US\$ 2.67 bn better off than if we had attempted to re-establish a 40:40:20 book by selling \$ for DM when the latter was over-priced at 1.40/\$.

35 Our second variant counterfactual, Counterfactual D ("No ECU"), shows that it was advantageous for us to borrow ECU to finance intervention rather than DM. By the end of September, had we followed this counterfactual scenario we would already have been \$0.48 bn worse off than we actually were. This figure varies over the period, reflecting fluctuations in the DM/ECU exchange rate,

THE COST OF INTERVENTION 25 August 1993

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but at 1 April the value of the holdings in this counterfactual scenario is still \$0.61 bn lower than the calculated value of the holdings. The main explanation for this is that the value of the ECU is in part determined by the value of sterling and when sterling devalues so too does the ECU. (As of the end of March 1993 sterling accounts for about 11% of the value of the ECU).

36 Of the other counterfactuals, Counterfactual E ("Massive Intervention") illustrates the effects of massive early intervention. If this had succeeded in preventing the devaluation of sterling, our holdings would have been worth more than in any of the other counterfactuals (for example, \$24.94 bn on 1 April, assuming sterling exchange rates identical to those on 14 September). However, if the intervention had failed to affect the longer term course of exchange rates, this option would have showed a significant diminution in value, reaching US\$ 19.73 bn by 1 October, some \$ 0.8 bn less than the calculated out-turn. This is because actual intervention on 16 September took place at the cheapest pre-devaluation level of sterling (DM 2.778) rather than its early August levels (DM 2.84).

37 Our next counterfactual, Counterfactual F ("Italian Option"), suggests that if we had ceased intervention on 11 September and if sterling had devalued by the same degree as it actually did, then over the period 3 August to 1 April the value of our holdings would have diminished by \$0.53 bn. The value of our sterling holding on 11 September was \$8.22 bn; however, by 1 April, despite the accrual of interest, this had declined to \$6.97 due to sterling's fall against the dollar. Nevertheless, the value of our holdings in this scenario would have been \$3.62 bn higher than the value of our calculated holdings on 1 April.

38 Our final counterfactual, Counterfactual G ("No Reserves"), suggests that had we converted all our net foreign holdings to sterling in early August their value would have declined from \$23.63 bn to \$19.85 bn by 1 April, a fall of 16%. This represents

THE COST OF INTERVENTION

25 August 1993

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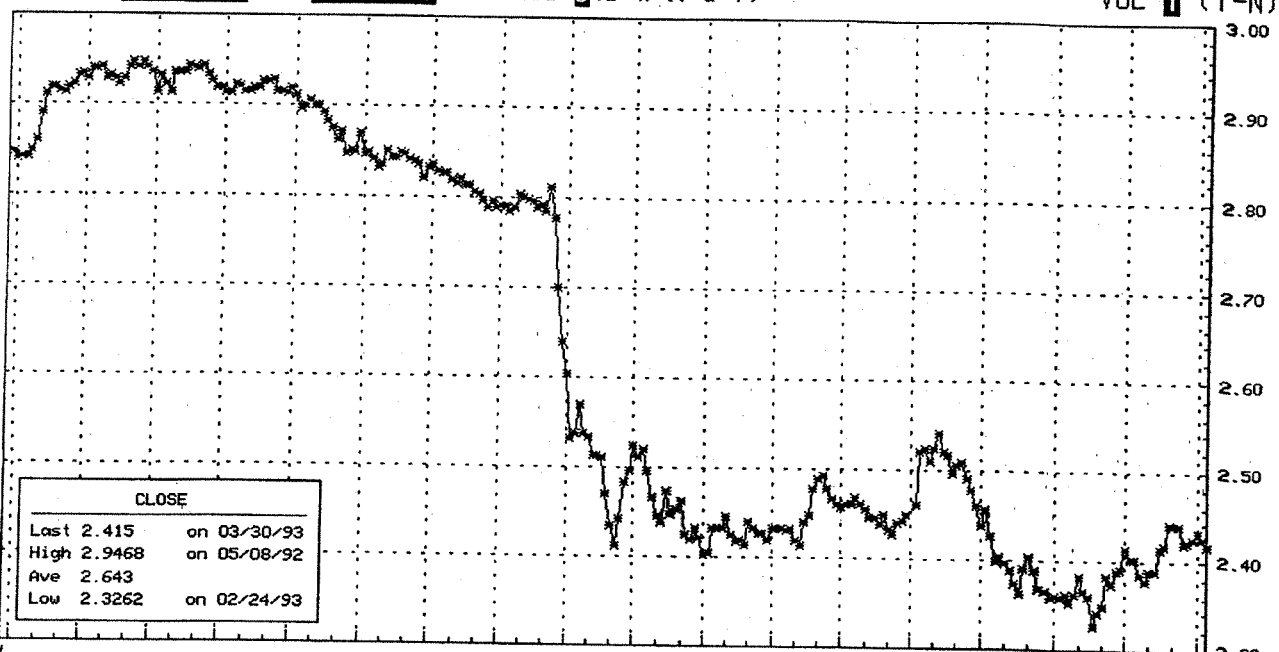
the fall in the value of sterling against foreign currencies (for example, 21% against the dollar) over the period (Chart Seven: £/US\$ exchange rate), offset by the accrual of interest to the sterling holding. This scenario would have outperformed our actual strategy by just a small margin: in Counterfactual G we buy less sterling than we actually did, but we buy it at early August prices, which were higher than those prevailing on 16 September.

Bank of England
25 August 1993

GP
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Currency GP

PRICE GRAPH for DMBP -- D-MARK X-RATE STERLING
 RANGE 4/1/92 TO 3/30/93 PERIOD D(D-W-M-Q-Y) VOL 1 (Y-N)



1 April 24 15MAY 5JUN 26 17JUL 7AUG 28 18SEP 9OCT 30 20NOV 11DEC 1JAN93 22 12FEB 5MAR 26
 Bloomberg-all rights protected. London:21-330-7500 New York:212-318-2000 Princeton:609-497-3500 Singapore:226-3000
 Sydney:2-241-1133 Tokyo:3-3578-1625 Washington DC:202-393-1024 LN10-191-5 25-Aug-93 13:34:08

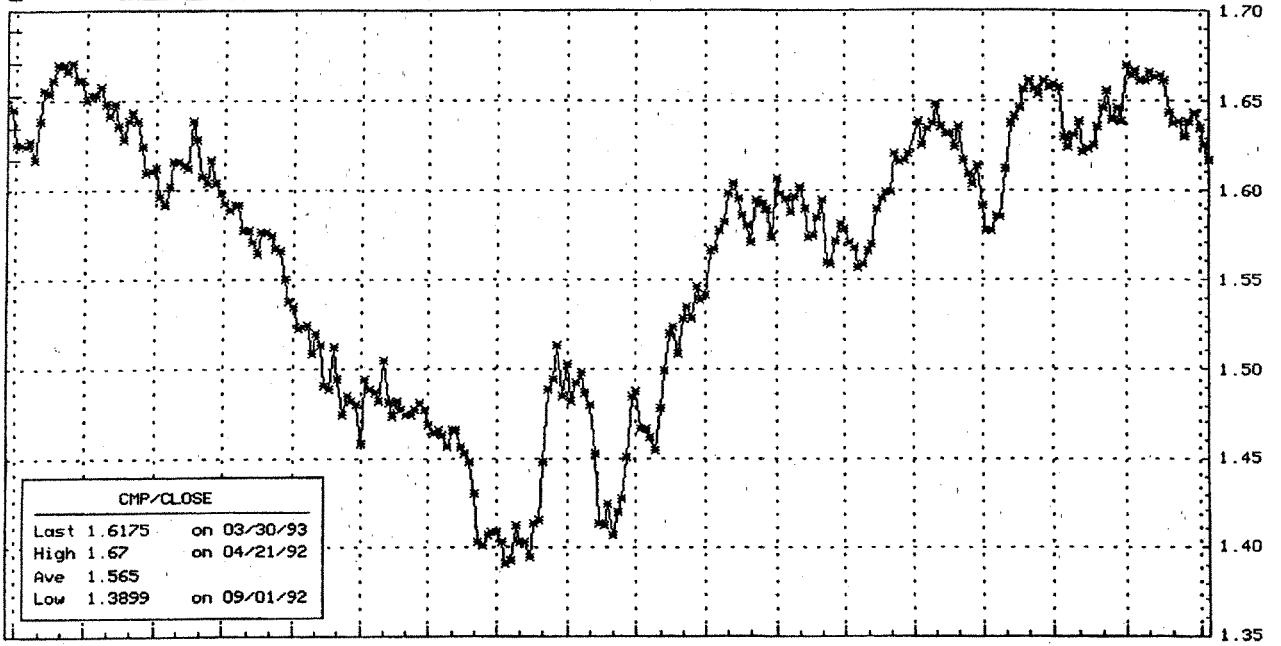
DM/E Exchange Rate

1 April 1992 - 30 March 1993

DMS. Curncy GP
Screen printed.

Curncy GP

PRICE GRAPH for DMS DEUTSCHE MARK SPOT
RANGE **4/1/92** TO **3/30/93** PERIOD **D**(D-W-M-Q-Y)



| CMP/CLOSE | |
|-----------|--------------------|
| Last | 1.6175 on 03/30/93 |
| High | 1.67 on 04/21/92 |
| Ave | 1.565 |
| Low | 1.3899 on 09/01/92 |

1 April 24 15MAY 5JUN 26 17JUL 7AUG 28 18SEP 9OCT 30 20NOV 11DEC 1JAN93 22 12FEB 5MAR 26
Bloomberg-all rights protected. London:71-330-7500 New York:212-318-2000 Princeton:609-497-3500 Singapore:226-3000
Sydney:2-241-1133 Tokyo:3-3578-1625 Washington DC:202-393-1024 LN10-191-5 25-Aug-93 13:35:30

DMS/US\$ Exchange Rate

1 April 1992 - 30 March 1993

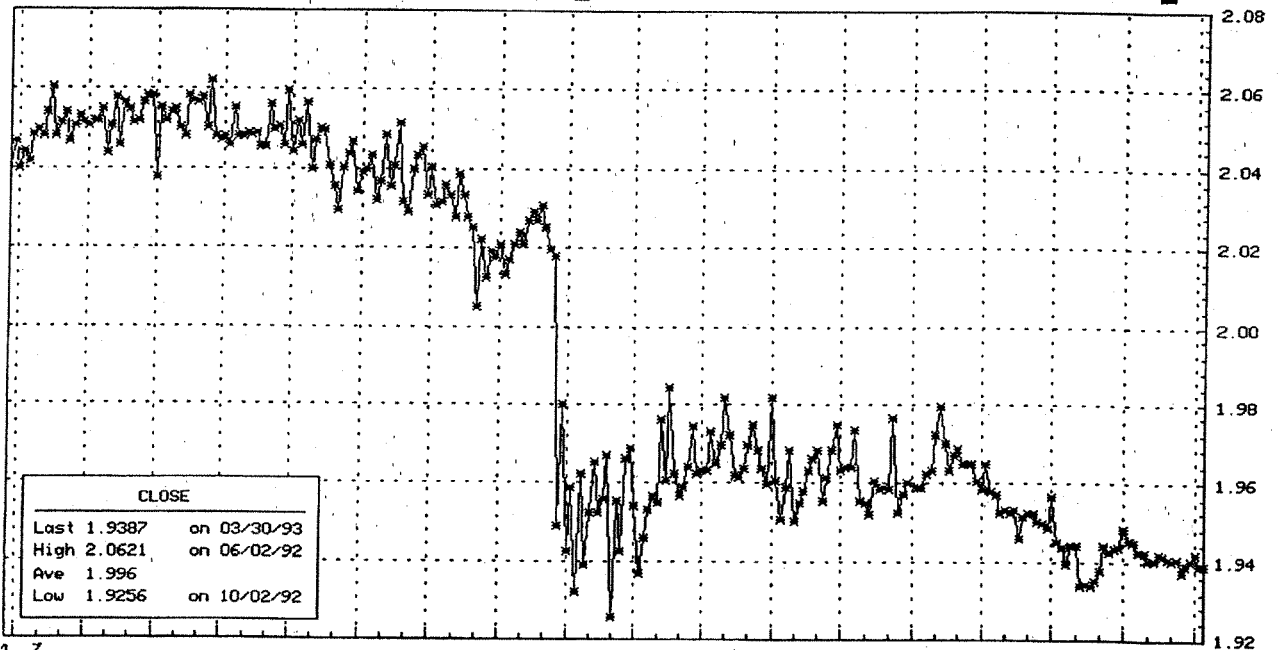
ECDM Curncy GP

Curncy GP

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PRICE GRAPH for ECDM -- ECU CROSS RATE D-MARK

RANGE **4/1/92** TO **3/30/93** PERIOD **D** (D=W-M-Q-Y) VOL **Y** (Y-N)



1 April 24 15MAY 5JUN 26 17JUL 7AUG 28 18SEP 9OCT 30 20NOV 11DEC 1JAN93 22 12FEB 5MAR 26
 Bloomberg-all rights protected. London:71-330-7500 New York:212-318-2000 Princeton:609-497-3500 Singapore:226-3000
 Sydney:2-241-1133 Tokyo:3-3578-1625 Washington DC:202-393-1024 LN10-191-5 25-Aug-93 13:36:34

DM/ECU Exchange Rate

1 April 1992 - 30 March 1993

CHART FOUR

SGY2

Index SGY2

YIELD SPREAD MOVING AVERAGE

SELL LIBOR/BID ECU 1 MONTH

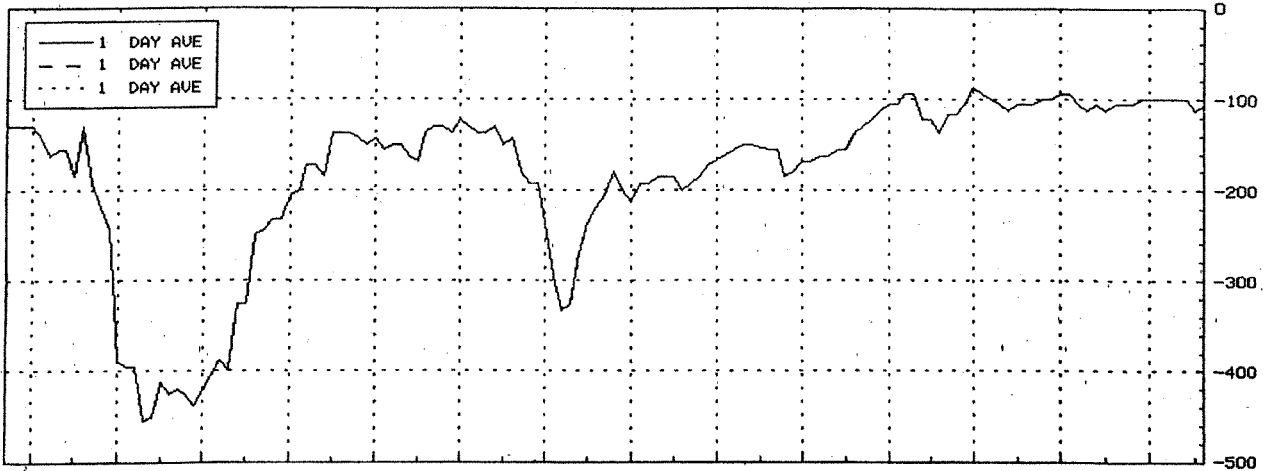
MID (7.938)

BUY LIBOR/BID DM 1 MONTH

MID (6.750)

MTY, CALL, PUT

| | | | | | |
|--------|----------------------|------------|-----|---------------------------------------|-------|
| RANGE | 9/1/92 TO 3/15/93 | SELL | BUY | # PERIODS | 1 1 1 |
| PERIOD | D (D-W-M-Q-Y) | TIME FRAME | N | N (N=NY, F=NY 9-3, L=LONDON, T=TOKYO) | |
| SPREAD | Y P=PRICE OR Y=YIELD | VALUE | C | C (O=OPEN, H=HIGH, L=LOW, C=CLOSE) | |
| YIELD | C CONV/SEMI-ANN/ANN | MARKET | M | M (B=BID, A=ASK, M=MID) | |

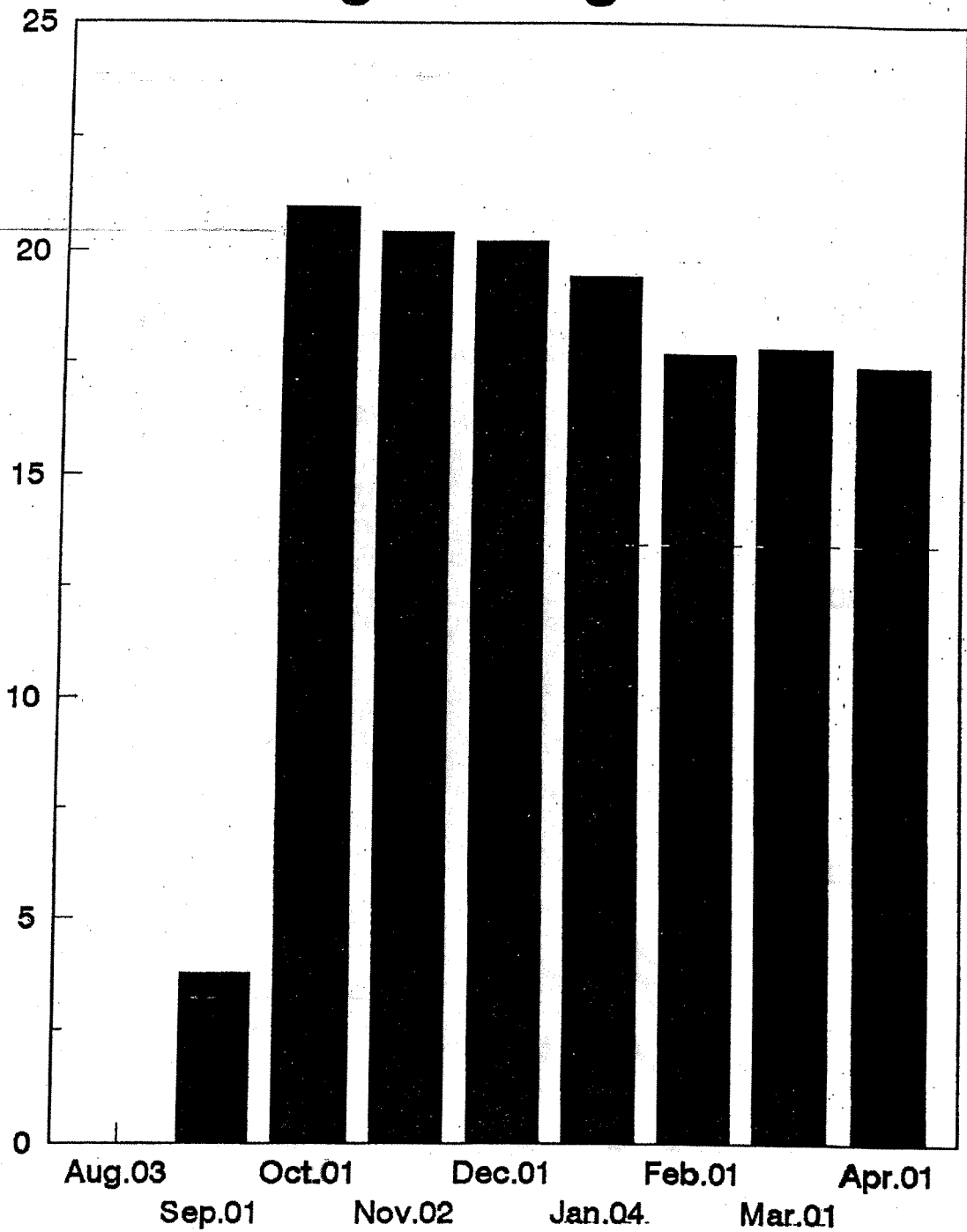


1 Sept. 18 20OCT 16 30 13NOV 27 11DEC 25 8JAN93 22 5FEB 19 5MAR
 Bloomberg-all rights protected. London:21-330-7500 New York:212-318-2000 Princeton:609-497-3500 Singapore:226-3000
 Sydney:2-241-1133 Tokyo:3-3578-1625 Washington DC:202-393-1024 LN10-191-5 25-Aug-93 13:42:09

DM LIBOR / ECU LIBOR

1 September 1992 - 15 March 1993

Sterling holding in £ bn



Sterling holding in US\$ bn

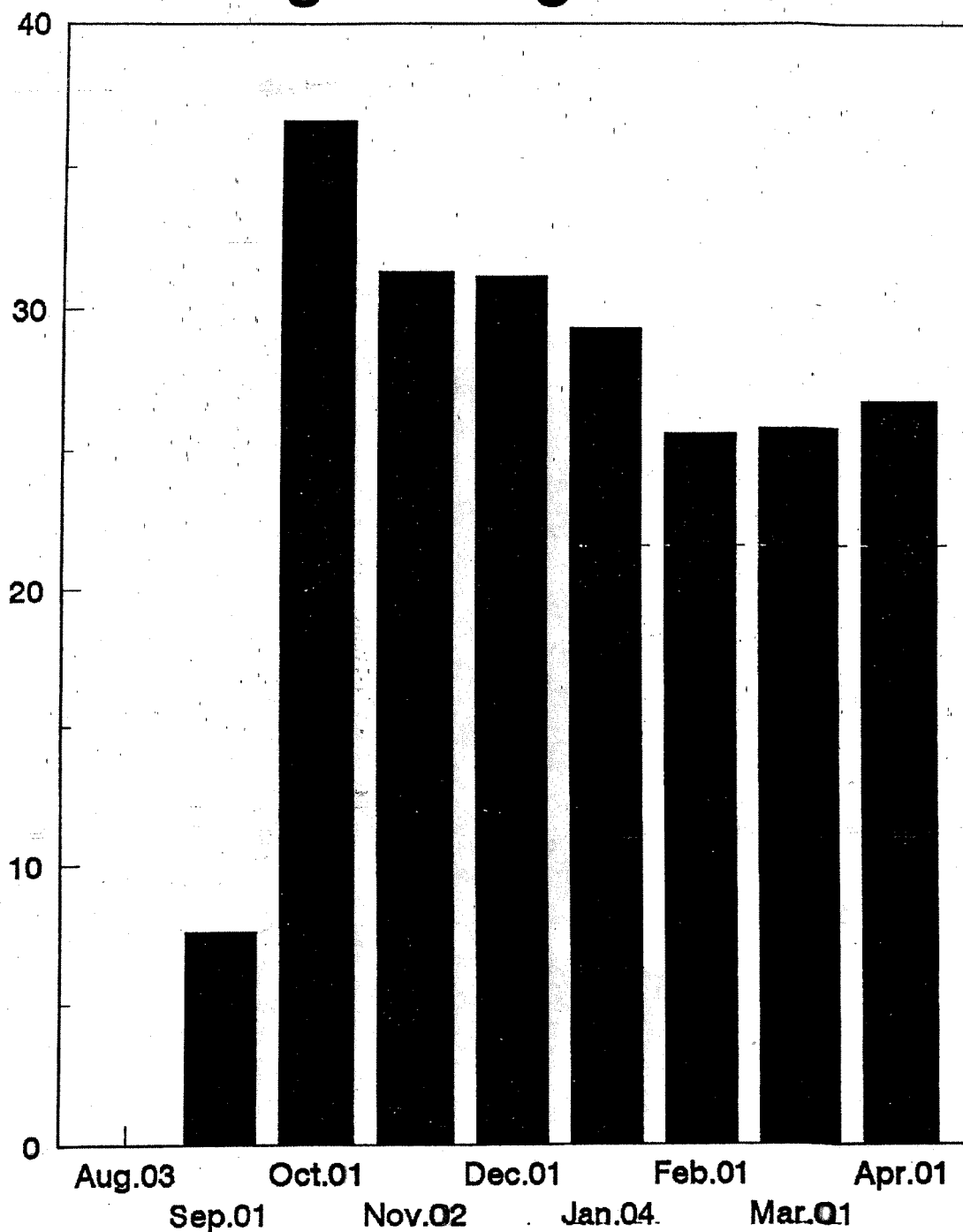


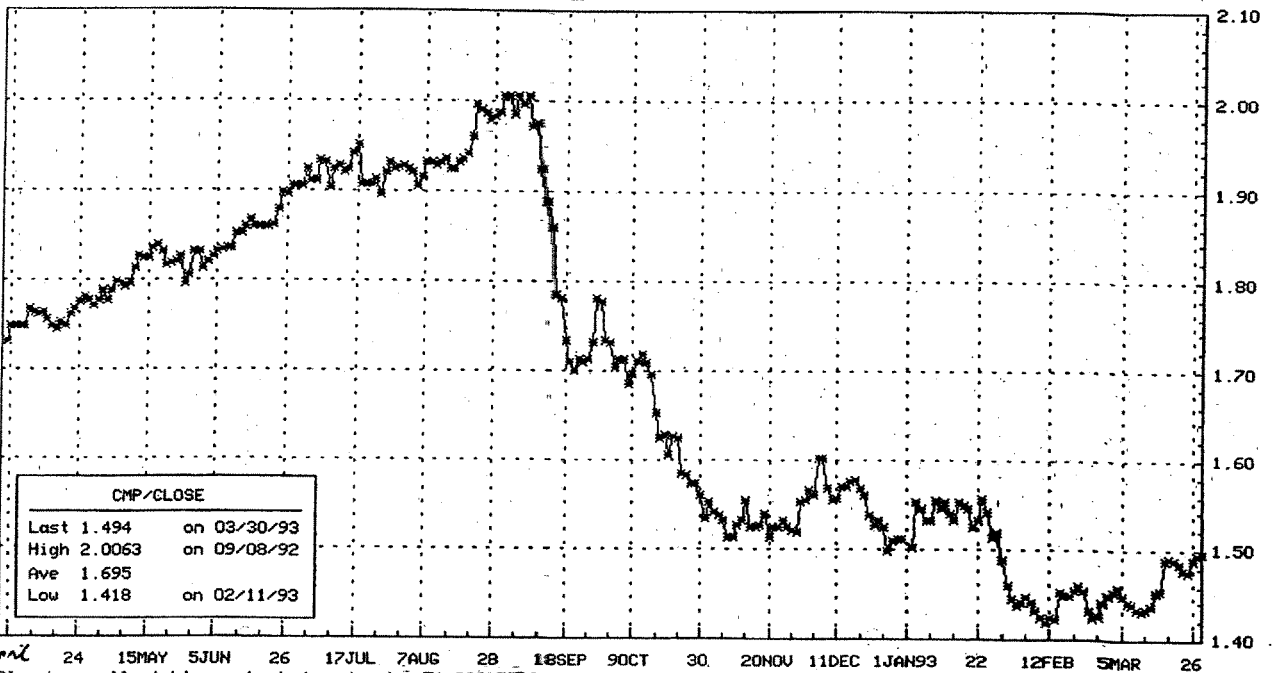
CHART SEVEN

BPS. Curncy GP
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Curncy GP

PRICE GRAPH for BPS STERLING SPOT

RANGE **4/1/92** TO **3/30/93** PERIOD **D**(D-W-M-Q-Y)



1 April 24 15MAY 5JUN 26 17JUL 7AUG 28 18SEP 9OCT 30 20NOV 11DEC 1JAN93 22 12FEB 5MAR 26
 Bloomberg-all rights protected. London:71-330-7500 New York:212-318-2000 Princeton:609-497-3500 Singapore:226-3000
 Sydney:2-241-1133 Tokyo:3-3578-1625 Washington DC:202-393-1024 LN10-191-5 25-Aug-93 13:43:01

£ / US \$ Exchange Rate
1 April 1992 - 30 March 1993

