Foreign Exchange Rate Stabilization and the Profitability of Official Market Intervention

A Case Study for the Netherlands 1974 - 1989

By M. M. G. Fase and A. P. Huijser, Amsterdam

Official foreign exchange market intervention serves the accomplishment of foreign exchange market arrangements between countries and the stabilization of exchange rates. Affecting the position of the guilder in the EMS is the main objective of interventions by the Nederlandsche Bank. So foreign exchange interventions are mainly aimed at macroeconomic and money market targets, but have also an impact on the profits, which, however, is a microeconomic feature of minor importance. Very often, profitability of interventions is taken as a criterion for the success of foreign exchange rate stabilization. Purchasing at low and declining rates to support the exchange rate and selling in the opposite situation is the intervention behaviour that these authors have in mind. Moreover, the entry of the central bank on the foreign exchange market may turn speculation from a zero-sum game into a non-zero-sum game. If all market participants are speculators, then the profit of one agent is the loss of another. The entry of the central bank would, in this view, put an end to this situation. Depending on the intervention profits or losses of the co-operating central banks, foreign exchange speculators would make a loss or profit.

In view of this, Friedman introduced profitability as a criterion to judge the success of central banks and other monetary authorities in stabilizing foreign exchange rates through foreign exchange market interventions. In 1953 Friedman (1953, p. 188) wrote:

'In any event, it would do little harm for a government agency to speculate in the exchange market provided it held to the objective of smoothing out temporary fluctuations and not interfering with fundamental adjustments. And there should be a simple criterion of success – whether the agent makes or loses money'.

Friedman wrote this, because he viewed maintaining fixed exchange rates by means of interventions undesirable. This conviction mirrors his belief in market forces to establish market equilibrium. In spite of the apparent

appeal of this view, Friedman's profitability criterion can be criticized and actual application should be toned down for several reasons. Perhaps the main criticism is that central bank interventions do not aim at making a profit, but at the macroeconomic objectives of international exchange rate arrangements. Moreover, there is the practical problem of measurement.

This paper attempts to quantify the benefits and losses of interventions by the Netherlands central bank during the period January 1974 to June 1989. We analyse its spot market interventions in US dollars, Deutsche marks, French francs and Belgian francs, whose common purpose was mostly to affect the position of the guilder within the snake exchange rate arrangement and from 1979 onwards within the EMS. Apart from interventions on the spot market, our analysis pays attention to interventions on the forward exchange market in US dollars and Deutsche marks in which the Dutch central bank has been involved in recent years.

To place our focus on the Netherlands as a case study in an appropriate perspective, it should be emphasized that the foreign exchange market in the Netherlands is relatively small but active, with an average daily turnover of about $ 13 billion, comparible in magnitude with Canada and Sweden (Bank for International Settlements, 1990).

Table 1 shows that a small number of financial centres accounts for the bulk of foreign exchange trading. The estimated global daily turnover is $ 640 billion in which the Netherlands' foreign exchange market has a share of only 2 %. The results in table 1 are based on surveys by the central banks and monetary authorities in twenty-one countries. The estimated global turnover includes the non-reporting countries of which Germany and Luxembourg are the most notable. The surveys indicate that 77 % of the transactions were between banks or brokers. In Japan, the Unites States and the United Kingdom, the volume of local interbank dealing is equal to over half of cross-border dealings. In countries with medium sized foreign exchange markets, like the Netherlands, the local interbank operations represent only a small fraction of total interbank dealing. The cross-border dealings are far more important and amount to about 75 % of the interbank foreign exchange transactions in the Netherlands. However, it seems reasonable to view the foreign exchange market in the Netherlands as a representative case of a small open economy with a more or less fixed exchange rate within what is now the EMS framework.

To start with, the paper deals briefly with the theoretical and empirical literature on Friedman's profitability criterion for foreign exchange rate stabilization. Section 2 presents the quantitative analysis of the profitability

15*

Table 1

Total foreign exchange market activity in April 1989: average daily turnover (billions of US dollars)

Country	Turnover
United Kingdom	187
United States	129
Japan	115
Switzerland	57
Singapore	55
Hong Kong	49
Australia	30
France	26
Canada	15
The Netherlands	13
Estimated global turnover	640

Source: Bank for International Settlements (1990, p. 10).

of the interventions of the Netherlandsche Bank during the period 1974 - 1989. Following this we develop alternative criteria. In these criteria only the direction of the intervention and the exchange rate change at the moment of the intervention are assessed. In this way the concepts 'leaning against the wind' and 'success' of an intervention are given a more precise content. Section 3 contains a short discussion of the literature on the profitability criterion as a measure of success. Finally we summarize the main results and draw the conclusions.

I. Quantitative Analyses in the Literature

Before applying the Friedman criterion to the interventions in the Dutch foreign exchange market, a short discussion of comparable and previous applications for other countries would be appropriate. The findings in the literature may be helpful to judge our own results. Six studies seem especially relevant, i.e. Taylor (1982), Beenstock & Dadashi (1986), the Bank of England (1983), Leahy (1989), Mayer and Taguchi (1983), and Murray, Zelmer & Williamson (1990).

Taylor's analysis concerns the empirical application of Friedman's profitability criterion as a measure of success in exchange rate stabilization policy by means of exchange market interventions. Due to a lack of data, he

confines himself to the spot market. He considers the intervention policy of the central banks of Canada, France, Germany, Italy, Japan, Spain, Switzerland, Great Britain and the United States of America during the seventies after the collapse of the Bretton-Woods system.

Taylor applies a simple rule to measure the profits and losses on dollar-intervention during the period 1973 - 1980. He states that the profit during a certain period equals the sum of the dollars purchased less the sum of the dollar value of domestic currency sold. As during the seventies most of the central banks in the countries studied purchased as much as they sold, the result is not affected by the actual value of the dollar at the end of the 1970s. Exceptions are Germany which accumulated dollars, and France which sold dollars during that decade. Taylor concludes that together the nine countries have lost about $ 12 billion.

The calculated losses shown in the above mentioned paper differ widely among countries. Canada e.g. incurred a very minor loss. Germany, Italy and England lost $ 3.4, $ 3.7 and $ 2.1 billion respectively. However, these results should not be taken at face value. For instance, an analysis of the sub-periods shows that the results depend strongly on the observation period chosen. Moreover, the result of the sub-periods will not sum up the overall result as a consequence of the calculation method used. Despite these interpretation problems, the sub-periods confirm the overall results. Taylor refrains from reporting the interest proceeds connected with the investment in different currencies, only remarking that these results are in fact unimportant. This inattention to the interest calculation is especially remarkable, because his approach implicitly assumes an equilibrium exchange rate. As the exchange rates were not stationary in the observed period (see figure 1), the given definition of the equilibrium exchange rate lacks meaning. However, assuming interest rate parity, this difficulty can be obviated by introducing the interest differential on assets of various currencies. The interest differential relates to investments in domestic and foreign currency and reflects the money market effect of foreign exchange market interventions on the central banks' operating results.

With respect to the reported loss of $ 12 billion for the US, Taylor notes that these losses result from most central banks' policy of leaning against the wind. The general feeling is that inevitable exchange rate adjustments are only temporarily delayed by interventions and the ultimate exchange rate change make the interventions by the central bank a costly affair. Hence, Taylor states that interventions are sensible only if they help to attain the equilibrium exchange rate as soon as possible. It is notably the central banks of Italy, Spain and England which tried to arrest the gradual

change in their fundamental exchange rate for some time during the observation period. When they finally gave up their support operations, the exchange rate dropped suddenly and they lost money on their interventions. In a more recent theoretical study Taylor (1989) shows that 'leaning against the wind' will not inevitably lead to losses if the exchange rate follows a random walk, since the mathematical expectation in this model is zero.

Another interesting example from the literature is the intervention study made by the Bank of England. This study stresses the limited relevance of Friedman's profitability criterion as an assessment of the actual exchange market policy. Nevertheless, the results illustrate the profitability of the Bank of England's dollar interventions in the sample period 1977 - 1982. Unlike other studies, the Bank of England's analysis also examines the interest profits and losses implied by exchange rate market intervention. The conclusion is that the interventions were profitable in the sample period. However, in 1976 for example, there was a considerable loss, which was of the same order of magnitude as the profit in the period 1977 - 1982. Apart from that, the study lists several arguments against the use of profitability as a measure for the success of intervention policy, especially by stressing the relevance of the macroeconomic context and the difficulty of specifying exchange rate equilibrium in the calculations.

Leahy (1989) calculates the profitability of US interventions in D-mark and Yen over the period 1973 - 1988. Over the period 1977 - 1981 and from 1985 onwards, the only periods in which the United States intervened to any significant amount, the interventions generated a profit of $ 5.5 billion. However, the experience with interventions by the United States is quite limited and Leahy does not rule out pure chance as an explanation for this profitability. Alternative explanations consider a liquidity premium on dollar investment, the existence of information asymmetries and market inefficiency.

Finally, we mention the results obtained by Mayer & Taguchi. They show that in the period 1974 - 1982 Germany, Japan and England made a profit on their dollar interventions of about $ 2 billion, $ 4.9 billion and $ 0.5 billion respectively. More important is that this study rejects the profitability criterion as a useful benchmark, because of practical and theoretical arguments. As to the first, they point at the important question of the evaluation of the sold or purchased currency at the end of the observation period to make up the bill. If the market rate at the end of the period is chosen, the profit on interventions depends heavily on it and it is therefore somewhat arbitrary. This becomes even more important when the exchange rates are non-stationary. However, if interest parity holds, non-stationarity can be

compensated by the calculated interest profits or losses due to the interventions.

As to the second argument, Mayer & Taguchi point at phenomena such as 'overshooting' and 'vicious circles', and the psychological effects of for instance policy intentions and expectations, casting doubt on the simple connection between profit and the stabilizing influence of interventions. From a theoretical point of view, the question about the stabilizing influence of profitability interventions is therefore difficult to answer and leaves no scope for firm convictions.

II. Interventions by the Nederlandsche Bank

Foreign exchange market interventions by the Nederlandsche Bank take place on the spot and the forward exchange markets with the first quantitatively the most important. The main currencies involved are the US dollar and the German mark. The objective of the interventions is not to make a profit but to meet an exchange rate agreement among countries, which requires to influence the position of the guilder within the EMS. Of course, the interventions also affect the money market.

1. Spot Market Interventions

Figures 1 and 2 depict the dollar and D-mark exchange rates in the period 1974 - 1989 and the spot interventions by the Nederlandsche Bank in these currencies on a quarterly basis. Table 2 gives the cumulated interventions. This table shows that until 1987 purchases and sales of dollars were more or less in equilibrium, but it conceals most of the details because of its aggregated character.

Figure 1, however, shows that relatively huge interventions in dollars were usually followed by a number of small and compensatory transactions during the next quarters. The strong rise of the cumulated dollar interventions at the end of the observation period is connected with the support given in October 1986 by the Nederlandsche Bank, together with other European central banks. In the whole periode January 1974 - June 1989 about D-mark 3.0 billion is cumulated by means of interventions, of which 2 billion in 1987 and 1988. During the eighties French francs have been decumulated and Belgian francs have been accumulated.

Our calculation of intervention profits and losses of the Nederlandsche Bank are based on monthly data. For the sake of simplicity we make the heroic but necessary assumption that the interventions are uniformly dis-
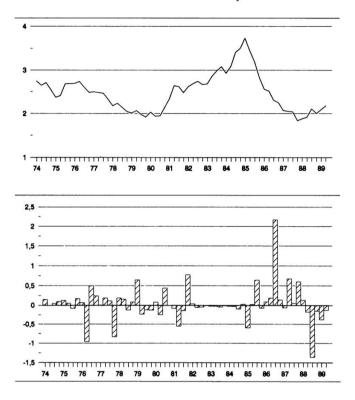
Figure 1: Dollar exchange rate and dollar interventions

tributed within each month and take place using the average exchange rate
in the relevant month. For that matter we distinguish between the result of
purchases and sales, on the one hand, and net interest proceeds, on the other.
The results of purchases and sales are defined as the difference between the
cost of net purchases of foreign currency and the profit of the accumulated
foreign currency at the end of the observation periods i.e.

$$P = -\sum_{t=t_o}^{t_n} A_t \cdot e_t + \left(\sum_{t=t_o}^{t_n} A_t\right) \cdot e_{t_n}$$

with

P the profit of purchases and sales of foreign currency measured in guilders at the
        end of the observation period;

A_t purchases of currency, measured in foreign currency, in period t;

e_t exchange rate of foreign currency in guilders, in period t;

e_{t_n} exchange rate of foreign currency in guilders at the end of the observation period.
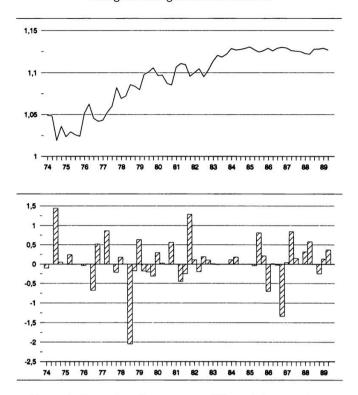
Figure 2: D-mark exchange rate and D-mark interventions

The first term represents the costs of net purchases of foreign currency in the observation period. The second term represents the proceeds of net sales of cumulated foreign currency at the end of the observation period, using the relevant exchange rate at the end of the period. This method of calculation is equivalent to that used by Taylor. The interest benefit is related to the interest differential of investments in domestic and foreign currencies. We assume that the accumulated foreign currencies earn the 3-month Euro-currency interest rate, while the 3-month Euro-guilder interest rate serves as the alternative interest rate. Furthermore, we assume that each month the interest on foreign investments is exchanged into guilders. The interest proceeds, R, of spot interventions, are:

$$R = \left[\sum_{t'=t_o}^{t_n} \left(\sum_{t=t_o}^{t'} A_t \right) \cdot e_{t'} \cdot (r_v - r)/1200 \right], \quad \text{if} \quad \sum_{t=t_o}^{t'} A_t \geq o$$

$$R_{t',t''} = \left[\sum_{t''=t'}^{t''} \left(\sum_{t=t'}^{t''} A_t \cdot e_t \right) \cdot (r_v - r)/1200 \right], \quad \text{if} \quad \sum_{t=t'}^{t'}, A < o$$

Table 2

Cumulated interventions (billion foreign currency)

	Dollar	D-mark	French franc	Belgian franc
1974	0.3	1.4	0.6	1.4
1975	0.6	1.6	0.6	1.4
1976	0.4	1.4	0.7	12.8
1977	− 0.1	2.1	0.7	12.8
1978	0.2	0	0.7	12.8
1979	0.3	0	0.7	12.8
1980	0.6	0.8	0.7	15.1
1981	0.6	1.4	− 0.8	18.5
1982	0.5	1.6	1.9	43.0
1983	0.4	1.6	− 0.8	55.2
1984	0.3	1.9	− 0.8	55.2
1985	0.3	2.9	− 0.8	55.2
1986	3.9	0.8	− 9.5	55.8
1987	4.1	1.9	− 9.5	55.8
1988	2.6	2.5	− 9.5	55.8
1989*	2.1	3.0	− 9.5	55.8

* January - June.

with

r_v three month Euro-currency interest rate;

r three month Euro-guilder interest rate;

t_o beginning of the period in which the cumulated interventions are positive;

t_n end of this period.

The first formula applies to periods in which, on average, foreign currency is accumulated. Every month interest proceeds are exchanged into guilders. The second formula applies to periods in which, on average, foreign currency is sold. In that case exchange into guilders takes place at the moment of intervention[1]. Table 3 shows the results of our calculations for the period as a whole and for two sub-periods.

---

[1] To enhance the comparability with the literature, the definition of the interest-proceeds is independent of the domestic money market situation at the moment of intervention. Another simplification is the neglect of the credit mechanism of the FECOM connected with obligatory interventions in the EMS. As a result of these

Table 3

The profits of spot interventions (millions of guilders)

	Proceeds of purchases and sales	Interest proceeds	Total proceeds
Period January 1974 - June 1989			
Dollar	403	774	1,177
D-mark	250	− 200	49
French franc	64	− 173	− 109
Belgian franc	− 347	923	576
Total	370	1,324	1,693
Sub-period January 1974 - December 1982			
Dollar	592	218	810
D-mark	198	− 99	99
French franc	− 150	165	15
Belgian franc	− 213	287	74
Total	427	571	998
Sub-period January 1983 - June 1989			
Dollar	41	298	339
D-mark	14	− 18	− 4
French franc	322	− 572	− 250
Belgian franc	− 29	137	108
Total	348	− 155	193

The main conclusion is that the spot interventions made by the Nederlandsche Bank since 1974 have yielded a profit of FL. 1.7 billion, of which FL. 1.3 billion was the calculated interest result. The results differ notably between currencies and periods. Further – and this contrasts e.g. Taylor's view – the interest costs and benefits are, at least in the Netherlands' case, not negligible and of greater importance than the benefits of purchases and sales. The Bank of England (1983), Leahy (1989) and Murray et al. (1990) report similar results with respect to the importance of interest proceeds, in their assessment of the intervention profits made by the central banks of the United Kingdom, the United States and Canada respectively.

---

simplifications the calculated profits differ from the actual profits and losses reported by the Nederlandsche Bank. However, the profit calculation is consistent with the theory underlying Friedman's profit criterion.

As the interest parity theory suggests, the interest profit of the EMS currencies has the opposite sign to the profits of purchases and sales. The valuation of the cumulated currency at the end of the sample period introduces an arbitrary element into our calculations. Therefore, it is sensible to give the results for every year separately. Table 4 presents the yearly results.

Again, according to this set up the spot exchange market interventions have been profitable most of the time. A remarkable exception are the dollar interventions in 1986 and 1987. Our results indicate a loss of about Fl 600 million in these two years.

More information about the significance of the valuation issue is given by the calculation of the profits of purchases and sales in a certain year, supplemented by the results attained if the cumulated foreign exchange would be successively evaluated using the exchange rate at the end of each following year. The results for the dollar are given in table 5.

In eight out of sixteen cases the calculated profit in a certain year changes signs in a subsequent year, if the net accumulated currency is valuated using the end-of-period exchange rate of the following years. There are eleven changes of sign if we do not split the period into sub-periods.[2]

Table 6 gives the corresponding results for the intervention in Deutsche marks. The sign changes in five out of sixteen cases within the two sub-periods and in six cases within the period as a whole. Compared with the dollar this result is more stable. Interesting and instructive is the relationship between table 3 on the one hand and tables 5 and 6 on the other, confining ourselves to the dollar and the D-mark. The profits of purchases and sales of these currencies in the sub-periods given in table 3 are the result of cumulation of the figures for the relevant currencies and sub-period in the last row from tables 5 and 6 respectively. This exercise clarifies the special character of the calculated benefits, which would be completely different if they were based on the diagonal summation, thereby using a different valuation. (The corresponding results are the profits given in table 4.) The main conclusion is that giving too much weight to the calculations shown here would be erroneous.[3]

---

[2] For the sake of brievety the accompanying table is not shown here.

[3] An additional reason is provided by the test of the hypothesis that the variation of the benefits of purchases and sales can be described as a random proces. This hypothesis is not rejected for the dollar interventions and the French franc interventions; for the D-mark and the Belgian franc however, the hypothesis is rejected. See the appendix for the statistical elaboration of this approach.

Table 4: **The profit of spot interventions per year (millions of guilders)**

	Dollar		D-mark		French franc		Belgian franc	
	purchases and sales	interest proceeds	purchases and sales	interest proceeds	purchases and sales	interest proceeds	purchases and sales	interest proceeds
1974	– 37.7	6.8	23.4	– 1.7	– 15.3	29.9	0.9	1.4
1975	49.2	7.5	0.6	– 0.6	0	0	0	0
1976	144.3	25.6	13.4	17.6	– 2.2	0.3	1.4	35.4
1977	27.3	6.9	35.5	– 3.3	0	0	0	0
1978	– 50.9	13.0	6.8	38.2	0	0	0	0
1979	4.4	24.8	15.9	– 11.5	0	0	0	0
1980	96.2	9.6	– 4.3	– 4.8	0	0	0	0.6
1981	73.4	– 56.5	7.9	0.6	13.7	– 10.1	– 3.7	6.7
1982	8.5	– 2.5	5.0	0.3	– 98.0	112.0	– 1.7	12.4
1983	– 27.5	– 7.1	0.3	0.0	21.4	– 62.5	– 12.0	31.5
1984	– 30.2	– 11.8	0.8	– 1.1	0	0	0	0
1985	278.6	– 16.4	1.3	– 3.7	0	0	0	0
1986	– 430.2	20.0	– 0.6	9.2	98.3	– 54.0	– 0.5	0.7
1987	– 194.4	25.6	– 1.3	– 8.6	0	0	0	0
1988	186.4	– 37.1	6.4	– 3.3	0	0	0	0
1989*	– 64.6	– 11.6	– 0.5	– 0.5	0	0	0	0

* January – June.

Table 5: **The profit of purchases and sales of dollars (millions of guilders)**

Sub-period 1974 - 1982

year of valuation \ year of intervention	1974	1975	1976	1977	1978	1979	1980	1981	1982
1974	− 37.7								
1975	2.9	49.2							
1976	− 55.5	− 4.0	144.3						
1977	− 100.0	− 44.7	168.6	27.3					
1978	− 183.4	− 120.7	213.9	181.0	− 50.9				
1979	− 218.8	− 153.1	233.1	246.4	− 88.1	4.4			
1980	− 154.7	− 94.6	198.3	128.1	− 20.7	40.4	96.2		
1981	− 58.4	− 6.7	145.9	− 49.5	80.7	94.6	187.9	73.4	
1982	− 2.8	44.0	115.7	− 151.9	139.1	125.9	240.7	72.8	8.5

Sub-period 1983 - 1989*

year of valuation \ year of intervention	1983	1984	1985	1986	1987	1988	1989
1983	− 27.5						
1984	− 71.6	− 30.2					
1985	− 1.0	52.6	278.6				
1986	60.2	124.2	280.4	− 430.2			
1987	103.2	174.6	281.6	− 1,486.6	− 194.4		
1988	88.4	157.3	281.1	− 1,122.1	− 14.6	186.4	
1989*	62.1	126.5	280.4	− 478.1	303.0	− 188.8	− 64.6

* January - June.

Table 6: **The profit of purchases and sales of D-marks (millions of guilders)**

Sub-period 1974 – 1982

year of valuation \ year of intervention	1974	1975	1976	1977	1978	1979	1980	1981	1982
1974	23.4								
1975	7.1	9.6							
1976	31.4	4.9	13.4						
1977	87.7	14.7	5.3	35.5					
1978	90.0	15.1	4.9	36.5	6.8				
1979	120.0	20.4	0.6	50.6	– 37.6	15.9			
1980	92.0	15.5	4.7	37.5	3.8	17.2	– 4.3		
1981	106.5	18.0	2.6	44.3	– 17.7	16.5	4.9	7.9	
1982	116.6	19.8	1.1	49.0	– 32.6	16.1	11.3	12.2	5.0

Sub-period 1983 – 1989*

year of valuation \ year of intervention	1983	1984	1985	1986	1987	1988	1989
1983	0.3						
1984	0.2	0.8					
1985	0.2	0	1.3				
1986	0.2	1.2	5.3	– 0.6			
1987	0.2	– 0.3	0.4	9.8	– 1.3		
1988	0.2	0.8	3.8	2.5	2.2	6.4	
1989*	0.2	0.1	1.6	7.1	0.0	5.0	– 0.5

* January – June.

2. Some Alternative Criteria

A practical objection against the profitability criterion of foreign exchange market stabilization, is the arbitrary choice of the moment of the evaluation. Therefore, four alternative criteria are considered here.

These criteria only assess the direction of the intervention and the exchange rate change at the moment of intervention. The first criterion indicates whether the interventions were in the right direction by supporting the exchange rate when it is declining and by purchasing foreign exchange when the exchange rate is climbing. This 'direction'-criterion measures the percentage of months in which the interventions were in the right direction in relation to the total number of months in which there were interventions. The second criterion is the 'effectiveness'-criterion and indicates whether the exchange rate moved in the desired direction after the intervention. The third criterion combines the two former criteria. An intervention is successful according to this 'success'-criterion if, in case of a supporting intervention, the centered three-month-average exchange rate is above the intervention exchange rate. Of course, these four criteria do overlap. Therefore, they do not add to 100 percent pairwise or otherwise.

Table 7 presents the results of this assessment. As shown, over 70 percent of the interventions were 'successful' according to the third criterion. The last sub-period, however, shows a lower score than the first sub-period. The interventions were 'effective' in not more than half of the cases, while in about 75 percent of the months the interventions were in the expected direction given the actual exchange rate change.

The low score on the 'effectiveness'-criterion points at 'against the wind' interventions. That applies to situations in which the direction of the inter-

Table 7

Scores of the interventions in dollars and D-marks

Criterion	1974 - 1989*		1974 - 1982		1983 - 1989*	
	$	DM	$	DM	$	DM
1: 'direction'	74	77	70	77	81	76
2: 'effectiveness'	43	47	48	44	35	52
3: 'success'	70	71	74	72	63	68
4: 'against the wind'	62	56	56	61	69	50

* January - June.

vention was expected, but the effect was not strong enough to change the direction of movement of the exchange rate. Therefore, the fourth criterion in table 7 measures the percentage of cases in which the intervention was correctly directed but is not followed by a desired exchange rate. In about 60 percent of the months in which is intervented according to criterion 1 the fourth criterion indicates an 'against-the-wind' intervention.

3. Forward Exchange Market Interventions in Dollars and D-marks

Besides the spot interventions there have been in recent years forward exchange market interventions. Generally speaking the supposed objective is the same as pursued by spot interventions. As known, forward interventions have no immediate money market effect and therefore should be considered as a separate instrument.

The profit T of forward exchange market intervention, is calculated as:

$$T = \sum_{t=t_o}^{t_n} \left[\sum_{m=1}^{M} {}_mA_{t-m} \left(e_s - {}_mF_{t-m}\right) \right]$$

with

${}_mA_{t-m}$ the forward purchase at $(t-m)$ of currency m months ahead;

${}_mF_{t-m}$ the forward rate at $(t-m)$ of currency m months ahead in guilders;

e_t the exchange rate of foreign currency at t in guilders.

Of course, interest proceeds are not relevant here.

Table 8 gives the amount of the forward interventions and the related profitability. Qualitatively the result coincides with the results for the spot interventions. The dollar interventions on the forward exchange market in 1986 and 1987, however, caused a loss of Fl 230 million, in addition to the loss mentioned before, of Fl 600 million, on the spot interventions during these years.

III. Profitability and Stability

According to Friedman's criterion profitable interventions are stabilizing. Friedman (1953, p. 269) formulated his proposition as follows:

'People who argue that speculation is generally destabilizing seldom realize that this is largely equivalent to saying that speculators lose money, since speculation can be destabilizing in general only if speculators on average sell when the currency is low in price and buy when it is high.'

Table 8

Volume and profits of forward interventions

	Dollar		Deutsche mark	
	volume in millions of dollars	profit in millions of guilders	volume in millions of D-marks	profit in millions of guilders
1984	− 45.0	− 8.9		
1985	− 31.0	12.6		
1986	729.0	− 201.0		
1987	845.5	− 29.5	900	− 3.0
1988	132.5	18.5		
1989	0	0		
Total	1,631.0	− 208.3	900	− 3.0

Various authors have critically examined the generality of Friedman's proposition but very few studied the subtle problem of measuring profitability.[4] As to the critics Baumol (1957) was the first to criticize Friedman's view by constructing counterexamples. He defined base situations without speculators, and demonstrated that speculators could profitably increase the frequency and amplitude of price movements. In these counterexamples the excess demand of non-speculators is not only a function of contemporaneous prices, but (indirectly) also of prices in previous periods. Kemp (1963) also provided a counterexample based on a different principle: the base situation has three equilibrium prices. Speculators can move the market towards the higher equilibrium by purchasing, and by subsequently selling, return to the original lower price. Based on work by Telser (1959), Kemp (1963) and Farrell (1966), Schimmler (1973) demonstrated that (provided prices are uniquely determined by excess demand functions) positive profits necessarily imply price stabilization if and only if the non-speculative excess demand is a constant linear downward sloping function of contemporaneous prices. As Schimmler, Orosel (1984) demonstrated a similar equivalence using different concept of stability and profitability, emphasizing again that Friedman's proposition is not necessarily true.

To examine the plausibility of Schimmler's condition, we need to interpret the non-speculative class of agents. Friedman suggests that we should

---

[4] Ibid, p. 175.

define anyone whose decisions are influenced by prices other than the current prices as a speculator. This would make Schimmler's condition more plausible, especially since Farell (1966) demonstrated earlier that the linearity condition can be weakened in the presence of transaction costs. Baumol in his reply to Telser (1959, pp. 301 - 302), objects that such a definition makes the issue less interesting, as policy makers are primarily interested in the effect of professional speculators entering into a market which in any case contains amateur speculators. In this interpretation Baumol's counterexample gains strength. In a footnote Orosel (1984) excludes futures markets. This implicitly represents another criticism to Friedman's definition which therefore loses some of its appeal in the presence of futures markets. Johnson (1976) argues against Baumol's counterexample. He does not find the concept of one speculator profiting at the cost of others a substantial criticism of Friedman's proposition. He also notes that if 'speculators' purchase commodities to sell them later, 'non-speculators' must on the whole sell commodities to buy them later. This effectively makes both parties speculators. From this perspective, it would appear that Schimmler's condition would become less plausible.

This discussion illustrates the high level of abstraction and the necessity to sharpen the problem before more definitive conclusions can be reached. Friedman's (1969, pp. 285 - 291) own contribution to the further discussion, is especially worth mentioning. Here he gives a more balanced appraisal and differentiates the valuation function of speculation from its insurance function.

The BIS study by Mayer & Taguchi mentioned earlier, seems more relevant to the implications of our own calculations with respect to the Netherlands. Their main conclusion is that the profitability criterion falls short as a means of measuring the stabilizing role of official interventions, because the criterion can be applied only in the context of simple and unrealistic notions of the exchange rate theory. Moreover, according to these authors, the profitability criterion is not always relevant, because at best it only gives information about the direction of the intervention effect. This means that a profitable intervention is not necessarily effective, and that is, according to these authors, what matters from a macro-economic point of view.

IV. Conclusions

According to Friedman the profitability criterion of foreign exchange market interventions is a measure for the stabilizing effect of interventions. In this view, interventions are successful if they are profitable. In this paper

16*

we have demonstrated that measuring the profitability of foreign exchange interventions unambiguously is difficult in practice.

Taylor applies the profitability principle to the interventions of a number of central banks during the period 1973 - 1980 and finds that the central banks suffered huge losses. The Netherlands is not represented in Taylor's analysis. Our analysis, using data of the Netherlandsche Bank's interventions, shows that Taylor's finding is not relevant for the Netherlands. Including interest profits, interventions on the spot exchange market in the period January 1974 - June 1989 earned a profit of Fl 1.7 billion. However, forward exchange market interventions caused a loss of about Fl 200 million. It should be kept in mind that these calculations heavily depend on the valuation method and the choice of the observation period. Therefore, differences with the results in the literature do not necessarily imply a different intervention behaviour of the Dutch central bank.

Support of the dollar in 1986 and 1987 gave rise to substantial losses, but the dollar interventions in the period as a whole turn out to be profitable. The general conclusion is therefore that exchange market interventions in dollars in the period 1974 - 1989 did not lead to the huge losses that are reported in the literature for other countries and periods. As a result, the spot exchange market intervention in dollars earned a profit of about Fl 1.2 billion, of which 66 % is to be attributed to interest earnings. Interventions in other currencies – with the exception of the French franc – were profitable, too. The overall profit of the spot and forward interventions in the observation period is Fl 1.5 billion. Neglecting interest earnings, which would not be justified in our opinion, there would be a relatively small profit on exchange market interventions. The notion that profitability is an appropriate measure of the success of foreign exchange intervention, is controversial in the relevant literature. A closer look at the literature shows that profitable interventions are often stabilizing, although unprofitable interventions need not necessarily be destabilizing. However, more important than the micro-economic profitability criterion is the question about the effectiveness of exchange market interventions as an instrument of macroeconomic policy. Our qualitative assessment, using four alternative yardsticks, supports the view that the Dutch foreign exchange intervention policy has been successfull.

Appendix

From a statistical point of view it is of importance to know whether the calculated results should be attributed to random factors. Suppose the

interventions are independent drawings from a distribution with zero mean and a constant variance σ^2, then the variance of the profit equals:

$$\sigma^2 \sum_{t=t_o}^{t_n} (e_{t_n} - e_t)^2$$

This variance is calculated using the observed variance of the intervention in the observation period. The root of the variance is divided by the calculated profit or loss. Assuming normality, the one-tailed t-test is a measure of the profitability that the profit or loss is a result of random interventions.[5] We apply this test to the results of purchases and sales in table 3. The results, shown in table 9 under the heading t_1, indicate that the dollar intervention cannot be distinguished from a random proces. The same applies to the French franc. The probability that the results of interventions in the D-mark and the Belgian franc should be attributed to random factors is, however, relatively small. Our findings for the sub-periods seem to confirm this result. For instance, the profit on dollar interventions in the first sub-period is considerable, even in a statistical sense. The same applies to the Belgian franc in the last sub-period. Spencer (1985) criticizes Taylor's application of the t-test and proposes two alternative t-tests. The first, t_2 in table 9, is asymptotically equivalent to the t-value of the regression coefficient, β, from the regression of the intervention on the profit:

$$A_t = \beta(e_{t_n} - e_t) + u_t.$$

It tells whether random intervention, with the same mean and variance as actual intervention, are likely to have resulted in benefits as great as those that actually occurred. The differences between t_1 and t_2 in table 9 are small. The second alternative, t_3, in table 9, considers the deviations of intervention flows about the mean and indicates whether it is likely that the difference between the profit due to intervention and that implied by a policy of constant intervention (with the same mean) could have been generated by a policy of random intervention (with the same variance).[6] As is clear from table 9, the differences between the results are small and indicate that the calculated statistics are not very sensitive to changes in the average level of the interventions and the exchange rate used to close the books.

---

[5] See *Taylor*, op. cit., p. 361.
[6] See *Spencer*, op. cit., p. 1021.

Table 9

The benefit of intervention from purchases and sales with *t*-statistics

	Benefit of purchases and sales	*t*-values		
		t_1	t_2	t_3
Period 1974 - 1989*				
Dollar	404	0.30	0.30	0.30
D-mark	250	1.48	1.48	1.48
French franc	64	0.06	0.06	0.06
Belgian franc	− 347	− 1.32	− 1.31	− 1.31
Sub-period 1974 - 1982				
Dollar	592	0.92	0.92	0.71
D-mark	198	1.53	1.55	1.14
French franc	− 150	− 0.39	− 0.39	0.15
Belgian franc	− 213	− 0.77	− 0.77	0.97
Sub-period 1983 - 1989*				
Dollar	41	− 0.03	0.03	0.45
D-mark	14	1.38	1.40	1.29
French franc	322	1.48	1.49	0.36
Belgian franc	− 29	− 3.02	− 3.13	− 1.54

* January - June. The critical value of the *t*-test at a 10 percent confidence limit is 1.282.

References

Baumol, W. J., 1957: Speculation, profitability, and stability, Review of Economics and Statistics 39, pp. 263 - 271. − *Bank for International Settlements,* 1990: Survey of foreign exchange market activity, Monetary and Economic Department, February, Basle. − *Bank of England,* 1983: Intervention, stabilization and profits, Quarterly Bulletin 23, 3, pp. 284 - 291. − *Beenstock,* M., and *Dadashi,* S., 1986: The profitability of forward currency speculation by central banks, European Economic Review 30, pp. 449 - 456. − *Farrell,* M. J., 1966: Profitable speculation, Economica 33, pp. 183 - 193. − *Friedman,* M., 1953: The case for flexible exchange rates, in: *Friedman,* M., Essays in Positive Economics, University of Chicago Press, Chicago, pp. 157 - 203. − *Johnson,* H. G., 1976: Destabilizing speculation: a general equilibrium approach, Journal of Political Economy 84, pp. 101 - 108. − *Kemp,* M. C., 1963: Speculation, profitability, and price stability, Review of Economics and Statistics 45, pp. 185 - 189. − *Leahy,* M. P., 1989: The profitability of U.S. intervention, International Finance Discussion Papers, No. 343, Board of Governors of the Federal Reserve System. − *Longworth,* D., 1989: The profitability of forward currency speculation by central banks, a comment, European Economic Review 33, pp. 839 - 843. − *Mayer,* H., and *Taguchi,* J., 1983: Official intervention in the exchange markets: stabilizing or

destabilizing?, BIS Economic Papers, No. 6. – *Murray*, J., *Zelmer,* M., and *Williamson,* S., 1990: Measuring the profitability and effectiveness of foreign exchange market intervention: some Canadian evidence, Bank of Canada, Technical Report, No. 53. – *Orosel*, G., 1984: Profitable speculation and price stability, Jahrbücher für National-ökonomie und Statistik 199, pp. 485 - 501. – *Schimmler*, J., 1973: Speculation, profitability, and price stability: a formal approach, Review of Economics and Statistics 55, pp. 110 - 114. – *Spencer*, P. D., 1985: Official intervention in the foreign exchange market, Journal of Political Economy 93, pp. 1019 - 1024. – *Taylor*, D., 1982: Official intervention in the foreign exchange market, or, bet against the central bank, Journal of Political Economy 90, pp. 356 - 368. – *Taylor,* D., 1989: How to make the central bank look good, Journal of Political Economy 97, pp. 226 - 232. – *Telser*, L. G., 1959: A theory of speculation relating profitability and stability, Journal of Economics and Statistics 41, pp. 295 - 301.

Zusammenfassung

Die Stabilisierung der Wechselkurse und Rentabilität
amtlicher Marktinterventionen: eine Fallstudie für die Niederlande
für den Zeitraum 1974 - 1989

Dieser Beitrag enthält eine auf der Grundlage von Monatskursen auf dem Kassa- und Terminmarkt erstellte empirische Analyse der amtlichen Interventionen der Zentralbank der Niederlande auf dem Devisenmarkt im Zeitraum 1974 bis 1989.

Die wichtigste Botschaft dieser Analyse ist die, daß Interventionen auf dem niederländischen Devisenmarkt eine stabilisierende Wirkung haben. Die Latte, an der diese stabilisierende Wirkung gemessen wird, ist die Rentabilität. Es wird jedoch aufgezeigt, daß eine zweifelsfreie Rentabilitätsmessung von Zentralbankinterventionen schwierig ist. Ferner wird eine statistische Prüfmethode entwickelt, mit der die Ergebnisse darauf untersucht werden sollten, ob sie auf Zufallsfaktoren zurückzuführen sind.

(Das Friedman-Kriterium, amtliche Devisenmarktinterventionen, Zentralbank)

Summary

Foreign Exchange Rate Stabilization and the Profitability
of Official Market Intervention: A Case Study for the Netherlands
1974 - 1989

This paper presents an empirical analysis of the official foreign exchange interventions by the Netherlands' central bank during the period 1974 - 1989, using monthly data of spot and forward exchange market.

The main message of this analysis is that foreign exchange market interventions in the Netherlands have a stabilising impact. The yardstick of the stabilising effect is profitability. However, it is shown that it is difficult to assess the profitability of cen-

tral bank intervention unambiguously. In addition a statistical test is developed to examine whether the results should be attributed to random factors.

(Friedman criterion, official exchange market intervention, central banking.)

Résumé

La stabilisation des cours de change et la rentabilité des interventions officielles sur le marché: une étude de cas des Pays-Bas pour la période de 1974 à 1989

Cet article contient une analyse empirique des interventions officielles de la Banque centrale des Pays-Bas sur le marché des changes pour la période s'étendant de 1974 à 1989. L'analyse se base sur les cours mensuels sur les marchés au comptant et à terme.

La principale conclusion de cette analyse est que les interventions sur le marché des changes néérlandais ont un effet stabilisant qui est mesuré par leur rentabilité. On y montre cependant qu'il est difficile de mesurer d'une manière tout-à-fait certaine la rentabilité des interventions de la Banque centrale. De plus, une méthode de contrôle statistique est développée pour vérifier si les résultats obtenus sont dus à des facteurs aléatoires.

(Le critère de Friedman, interventions officielles sur le marché des changes, banque centrale).