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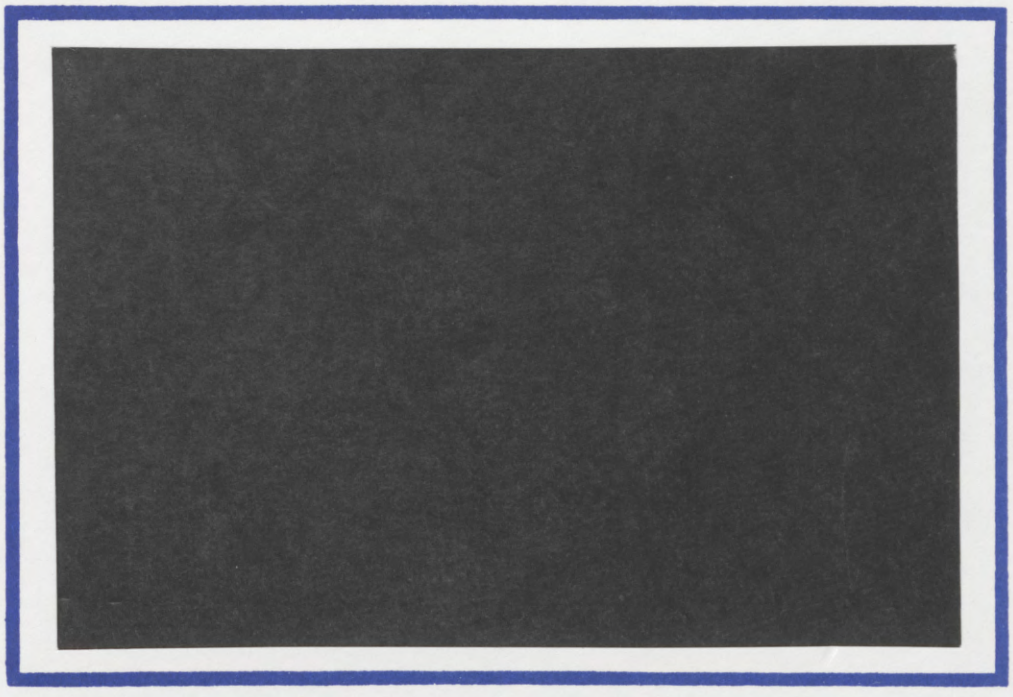

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ISRAEL'S EXCHANGE RATE BAND

by

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Working Paper No.17–92

August, 1992

* This paper is part of our project on Exchange Rate Regimes at the Israeli International Institute; see also Helpman and Leiderman (1991). We thank Michael Bruno, Assaf Razin and Zvi Sussman for insightful comments on earlier drafts, Andrew Rose and Jose de Gregorio for providing us with data for the EMS and Chile, and Gil Bufman for his very efficient research assistance. Earlier versions of this paper were presented at meetings and seminars at the Israeli International Institute, the Bank of Israel, Bank Hapoalim, the Tenth Latin American Meeting of the Econometric Society in Punta del Este, Uruguay, and the Instituto Torcuato Di Tella, Buenos Aires, Argentina. We thank participants at these meetings and seminars for their comments and suggestions. Part of the work on sections 4 and 5 was done while both authors were visiting scholars at the Research Department of the International Monetary Fund. The views expressed in the paper do not necessarily reflect those of the above mentioned institutions.

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1. INTRODUCTION

Israel's exchange rate policy followed many phases; from a fixed exchange rate in the fifties and sixties to a crawling peg in the mid seventies, a managed float from 1977 to 1982 followed by a year of a crawling peg, then again two years of a managed float. In 1985, following a major stabilization program, the exchange rate was fixed again only to be replaced by a managed float in an exchange rate band in 1989. Toward the end of 1991 a key feature of the exchange rate band was changed: A preannounced crawling central parity replaced the previous policy of a fixed central parity.

This paper is concerned with the latest phase of the country's exchange rate policy; the exchange rate bands from 1989 to 1991. Up to December 16, 1991 the Bank of Israel maintained constant central parities of bands. From then on it has adopted a pre announced adjustable central parity. Our study deals mostly with the period up to December 16, 1991 because the time period since the adoption of the new policy has been too short to enable a thorough analysis. We provide, however, some insight into the adjustable central parity regime by examining Chile that has maintained a similar policy for a number of years and by discussing the usefulness of this policy for Israel.

When the band was introduced in Israel for the first time the major argument in its favor consisted of the following: A fixed exchange rate does not enable monetary management with free capital mobility. Both were considered to be important. The former in order to cement the achievements of the stabilization program and the latter on efficiency grounds. The Bank of Israel introduced at the time a number of improvements in the functioning of the domestic financial markets and a limited liberalization of exchange controls. It intended to broaden the liberalization of exchange controls and to gradually reduce restrictions on international capital mobility. At the

same time it seeked to preserve its ability to control inflation that was reduced from over four hundred percent per annum to below twenty percent. Given Israel's history of inflation and inflationary expectations, however, it was felt that a free float may renew inflationary expectations. The exchange rate band was considered to be a good compromise between these conflicting goals.

Indeed, the introduction of the exchange rate band did not raise inflation. On the other hand neither did inflation decline under this policy. Much of the argument for a band as an anti inflationary device rests, however, on the premise that the credibility of the band limits expectations of exchange rate devaluations and thereby inflationary expectations. For this reason every assessment of the extent to which this policy curbed inflationary expectations has to examine the extent to which market participants considered the bands to be credible.

Moreover, stabilization of an exchange rate within pre specified limits shifts the burden of adjustment to the economy's underlying shocks from the exchange rate to other prices, even when a band is fully credible. Where does this induced variability show up? It is now recognized that much of it shows up in the short term interest rate. An exchange rate band that is not credible further exacerbates interest rate fluctuations and financial markets' volatility. It follows that a major cost of exchange rate stabilization when an exchange rate band is not fully credible consists of enhanced interest rate volatility. In order to assess these costs it is necessary to examine the evolution of short term interest rates.

We review the underlying theory of exchange rate bands in the next section. Our discussion is directed toward implications that can be examined using available data, and it focuses on the issues of band credibility and interest rate responses. The Israeli experience is discussed in Section 3 in view of these theoretical findings. Our main conclusion is that during the period from 1989 to 1991 market participants did not

consider the Israeli exchange rate bands to be particularly credible and that this policy introduced a strong cyclical pattern in short term interest rates. The cost of the policy in terms of volatility in financial markets seems to have been substantial. Nevertheless the policy succeeded in preventing an acceleration of inflation and a deterioration of the real exchange rate that was on the decline since 1985. In view of the fact that the exchange rate band policy was implemented in a period of a downturn in economic activity, however, it is hard to assess what part of these achievements belongs to the exchange rate policy as opposed to other measures, such as fiscal restraint.

In Section 4 we compare the performance of Israel's bands with the target zones of five exchange rates in the EMS. The reason for this comparison is that a regime of exchange rate bands has worked relatively well in Europe for more than twelve years, has facilitated economic convergence, and has not produced major strains for participating countries to switch to an alternative exchange rate system. Although we find a number of differences in the experiences of these countries, they share one major common feature with Israel: Market participants did not consider the bands to be entirely credible. Accordingly, we find that the market's anticipation of exchange rate realignments played an important role in the observed volatility of interest rates and of financial markets. In particular, periods immediately before a realignment typically exhibit a high and rising differential between domestic and foreign interest rates, and when the realignment is made it is commonly followed by a marked drop in the interest rate differential.

While the comparison with the EMS gives rise to interesting and useful insights, there still remains in the background a sizable difference between the rates of inflation in Europe and in Israel. This motivated our examination of Chile in Section 5, a country that has implemented a crawling band and has maintained the rate of inflation at levels similar to Israel's (i.e., around 20 percent per year). In contrast to the Israeli

band from 1989 to 1991, the exchange rate band in Chile featured a daily crawl of the central rate based on the estimated difference between domestic and foreign inflation. The fact that throughout the period from 1985 to 1991 this policy was associated with a marked real depreciation of the domestic currency, high GDP growth, no speculative attacks on foreign currencies, and a relatively stable rate of inflation, makes this of particular interest for Israeli policy makers, and especially in view of the fact that Israel has adopted a partly similar exchange rate policy at the end of December 1991.

In Section 6 we summarize our policy conclusions, and we provide a tentative evaluation of the new exchange rate policy that has been adopted on December 16, 1991.

2. EMPIRICAL IMPLICATIONS OF THE THEORY

The theory of exchange rate bands builds on a fundamental paper by Krugman (1991), who pointed out that the mere existence of limits on exchange rate movements that are defended by intervention in the foreign exchange market has major effects on the exchange rate even when it happens to be away from these limits. Moreover, he showed how to characterize exchange rate fluctuations under these circumstances. Since the circulation of the first draft of his paper numerous studies have refined his arguments, examined this problem in more detail, and expanded the analysis by incorporating more realistic features. At the same time the emerging new theoretical ideas have been implemented on EMS (European Monetary System) countries and countries that unilaterally defend exchange rate bands (such as Norway and Sweden). We do not review all this work. Instead we present in this section a number of empirical implications of target zone models that will guide our empirical work in the following

sections. Our presentation emphasizes *credible* exchange rate bands, because a main purpose of this study is to examine the extent to which traders had faith in the Bank of Israel's exchange rate policy.

Much of the literature on exchange rate target zones is agnostic about the sources of exchange rate fluctuations. But for our purpose it is convenient to focus on one source of random shocks, which we take to be the velocity of circulation of money. If the logarithm of velocity follows a random walk (i.e., its increments are independently distributed) and the quantity of money is constant, then a monetary model of exchange rate determination implies that a purely floating exchange rate will also follow, when expressed in logs, a random walk, which is in line with much of the evidence. Take this to be our point of departure. In particular, in a simple monetary model of this nature the relation between the log of the exchange rate, denoted by e, the log of velocity, whose negative we denote by v, and the log of the money supply, denoted by m, satisfies

$$(1) \qquad e = m + v + \gamma E[\dot{e}],$$

where E represents the expectations operator and γ a positive parameter. An increase in the expected rate of depreciation raises the nominal interest rate, bringing about a decline in the demand for money and a depreciation of the exchange rate. An increase in the supply of money raises proportionately the exchange rate, and an increase in velocity (i.e., a decline in v) reduces the exchange rate.

In a pure floating exchange rate regime with a constant stock of money, no drift in velocity and no bubbles in asset markets, the solution to this equation satisfies

$$(2) \qquad e = f,$$

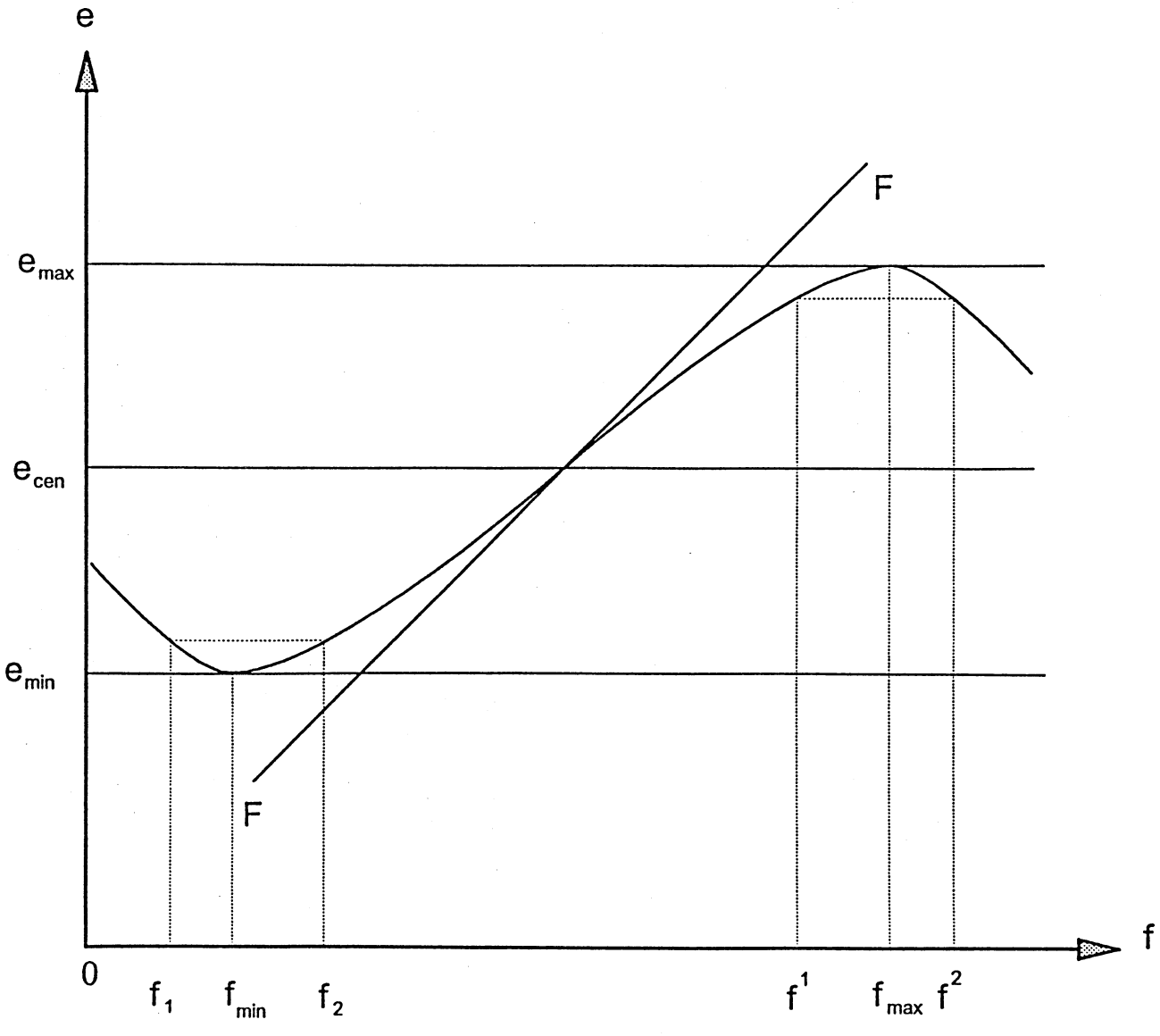
where $f = m + v$ represents the log of the *fundamentals*. This relation is depicted by line FF in Figure 1. It can be compared to the relation between the exchange rate and f under an exchange rate band.

Suppose that the central bank announces a central parity e_{cen} and fluctuation margins around it that lead to the upper limit e_{max} and the lower limit e_{min} for the exchange rate, as depicted in the figure. As pointed out by Froot and Obstfeld (1991), however, exchange rate behavior is not fully determined by this announcement; the authorities have to also explain how they intend to defend these limits.

First suppose that they defend the band by infinitesimal interventions. Whenever the exchange rate reaches a limit they target the fundamentals f to remain within predetermined bounds f_{min} and f_{max}. This policy changes the money supply via foreign exchange market interventions. Namely, at the limit points every shift in v that would have driven the exchange rate out of the band is offset by an endogenous change in m so that $m + v$ remains constant. Under these circumstances, close to the upper limit e_{max} the expected increase in the exchange rate is smaller than the expected decrease, therefore the nominal interest rate is higher than in a pure float (in a pure float the expected rate of depreciation equals zero when v follows a random walk). It follows from (1) that with the fundamentals at f_{max} the exchange rate is lower under the band regime than under a free float. A similar argument implies that with the fundamentals at f_{min} the exchange rate is higher under the band regime than under a free float. In fact, it can be shown that the relationship between the fundamentals and the exchange rate obtains the S–shape depicted in the figure, with a tangency at the band's limits (see Krugman [1991]).

A number of important implications follow from the depicted link between the exchange rate and fundamentals.

Figure 1



- First, since the long–run distribution of v is uniform, the distribution of the exchange rate in a free float is also uniform. With a band policy in place, however, the distribution of the exchange rate is bimodal, with the lowest density at the central parity and an increasing density towards the boundaries (see Svensson [1991]). This results from the fact that the policy used to defend the band enforces boundary fundamentals whenever v would lead f to exceed these bounds in the absence of intervention.
- Second, in a free float the expected exchange rate depreciation equals zero independently of the exchange rate level. With a band in place the expected rate of depreciation is highest when the exchange rate reaches the lower bound on exchange rate fluctuations and it declines monotonically as the exchange rate rises towards the band's upper limit (the expected depreciation is in fact negative in the upper part of the band).
- Third, in a free float the differential between the domestic and foreign interest rate (the latter taken to be fixed) equals zero. Under a band it is highest when the exchange rate is at its lowest limit and it declines monotonically as the exchange rate rises toward its upper limit (this property is related to the link between the location of the exchange rate in the band and its expected rate of depreciation, as we outlined above).
- Fourth, in a free float the conditional standard deviation of the rate of depreciation and the interest differential equals zero at all exchange rate levels. In the presence of a band the S–shaped curve of the exchange rate (see Figure 1) implies that both are higher at the edges of the band than around the central parity (see Svensson [1991]).

Naturally, infinitesimal interventions at the edges of a band are not the only means to maintain an exchange rate within pre specified limits. More often than not, especially in the EMS, central banks use large size interventions when the exchange rate

has not yet reached a band's limits. As pointed out by Flood and Garber (1991), a central bank can indeed defend a band's limits with a fixed prespecified level of intervention. Under these circumstances, however, it has to allow the fundamentals to exceed f_{max} and fall short of f_{min}. In particular, given rational expectations the exchange rate cannot jump in response to the finite intervention of the central bank as long as the intervention is predictable. For this reason immediately after the intervention the exchange rate should be the same as just prior to the intervention. Consequently the exchange rate follows the S–shaped curve, but this time the central bank intervenes by contracting the money supply through sales of foreign exchange whenever fundamentals equal some $f^1 > f_{max}$ and by expanding the money supply through purchases of foreign exchange whenever the fundamentals equal some $f_1 < f_{min}$ (see Figure 1). The size of the intervention is given by the difference between f^1 and f^2 at the upper limit and f_1 and f_2 at the lower limit (these intervention levels are equal in the figure). It is evident from the figure that this policy prevents anticipated jumps of the exchange rate.

Compared to the policy of infinitesimal interventions, finite interventions lead to a broader range of fundamentals. It does not change, however, the bimodal frequency distribution of the exchange rate within the band. Namely, in this case too the unconditional density of the exchange rate distribution is higher at the edges of the band than close to the central parity. Nor does it change the relationship between the expected rate of devaluation or the interest rate differential and the location of the exchange rate within the band (in the absence of drift of the fundamentals). Finally, it does not change the conditional distribution of the interest rate differential.

We have identified a number of variables that can be calculated from actual data in order to see to what extent they behave as predicted by the models of credible bands. For this purpose we may want to allow for a drift in fundamentals so as to capture

inflation differentials. Naturally, a positive drift biases the frequency distribution of the exchange rate within the band towards the upper parts of the target zone. It has little effect, however, on the relationship between the interest differential and the exchange rate or the conditional volatility of the interest rate.

Our discussion has focused on the implications of a credible exchange rate band. This choice results from our desire to examine the extent to which Israel's exchange rate band policy was perceived to be credible by market participants. The degree of credibility is important because it can determine the costs associated with the policy. Moreover, credibility is important in determining the impact of the target zones policy on inflation expectations.

There exist many ways in which exchange rate bands can be managed. For one thing, the central bank may engage in intra–marginal interventions within the band, as much of the evidence indicates.[1] Or it can engage in realignments. In the latter case traders build in this possibility into their expectations of exchange rate movements. Once this is recognized, the relationship between the exchange rate and fundamentals within a band may change dramatically, as demonstrated by Bertola and Caballero (1990). In particular, a number of the above described correlations can be reversed. These reversals are driven by a change in the shape of the relationship between the exchange rate and fundamentals, from an S–shape to a reversed S.

In the presence of a realignment risk one can decompose the expected rate of currency depreciation into a component that results from the expected change in fundamentals and a component that results from an expected realignment (see Bertola and Svensson [1991]). In this event estimation of the perceived probability of a

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[1]Lewis (1991) has argued that intra–marginal intervention with a rising probability away from the central parity raises the frequency of the exchange rate close to the central parity. But her model also implies high interest rates at the bottom of the bend and low interest rates at the top. The latter is contradicted by the data (see below).

realignment, which provides a measure of confidence in the band, requires a detailed specification of the central bank's policy with regard to the size of the realignments in case this size is deterministic, or some characteristics of its distribution in case it is stochastic. Given the small number of realignments in Israel, and the varying circumstances in which they occurred, we could not, unfortunately, follow this route in our empirical work.[2]

3. RESULTS OF ISRAEL'S POLICY

Israel's exchange rate policy followed a number of phases in the 1980s, as we have explained in the Introduction. In particular, following the stabilization program of July 1985 the NIS (New Israeli Shekel) was pegged to the US dollar. This exchange rate policy was a major building block of the stabilization program. In August 1986 the dollar peg was replaced by a peg to a basket of currencies. Following a sequence of devaluations of the NIS/Basket exchange rate in 1987, 1988 and early January 1989, the government adopted an exchange rate band on January 3, 1989. The band consisted of a NIS/Basket central parity fixed in nominal terms and a ±3 percent fluctuation zone around this parity. The band's width was enlarged to ±5 percent in March 1990. And in December 1991 the authorities relaxed the fixity of the central parity and announced an upward crawl of the central parity at the rate of 9 percent for the following twelve months.

Table 1 provides basic information about five bands that prevailed until December 16, 1991. The bands differed in terms of both their width and the level of

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[2]Rose and Svensson (1991) have applied this decomposition to the French Frank/Deutsche Mark exchange rate. In their case, however, there were more realignments than in Israel, and most importantly, exchange rate jumps were associated with realignments.

Table 1

Israel - the exchange rate of the NIS
1985 - 1991

Period	01-Jul-85	01-Aug-86	13-Jan-87	01-Dec-87	03-Jan-89	23-Jun-89	01-Mar-90	11-Sep-90	11-Mar-91
	31-Jul-86	12-Jan-87	30-Oct-87	25-Dec-88	22-Jun-89	28-Feb-90	10-Sep-90	10-Mar-91	16-Dec-91 (1)
Average exchange rate(2)	1.49	1.50	1.68	1.72	1.92	2.07	2.20	2.29	2.52
Standard deviation of the exchange rate(3)	0.6%	0.4%	0.2%	0.2%	1.1%	0.7%	2.4%	0.4%	0.3%
Mid band rate (starting from Jan. 1989)	...	...	...	...	1.95	2.07	2.19	2.41	2.55
Official band width	...	...	...	...	+/- 3%	+/- 3%	+/- 5%	+/- 5%	+/- 5%
Upper band limit	...	...	...	...	2.01	2.13	2.30	2.53	2.68
Lower band limit	...	...	...	...	1.89	2.01	2.08	2.29	2.42
Exchange rate on first day of this band	...	...	...	...	1.95	2.06	2.09	2.31	2.43
Exchange rate on last day of this band	...	...	...	...	1.98	2.10	2.31	2.29	2.56

(1) On December 17, 1991 the new "diagonal band" was announced.

(2) NIS/US$ for the first period and NIS per basket unit for all other periods.

(3) Based on daily data.

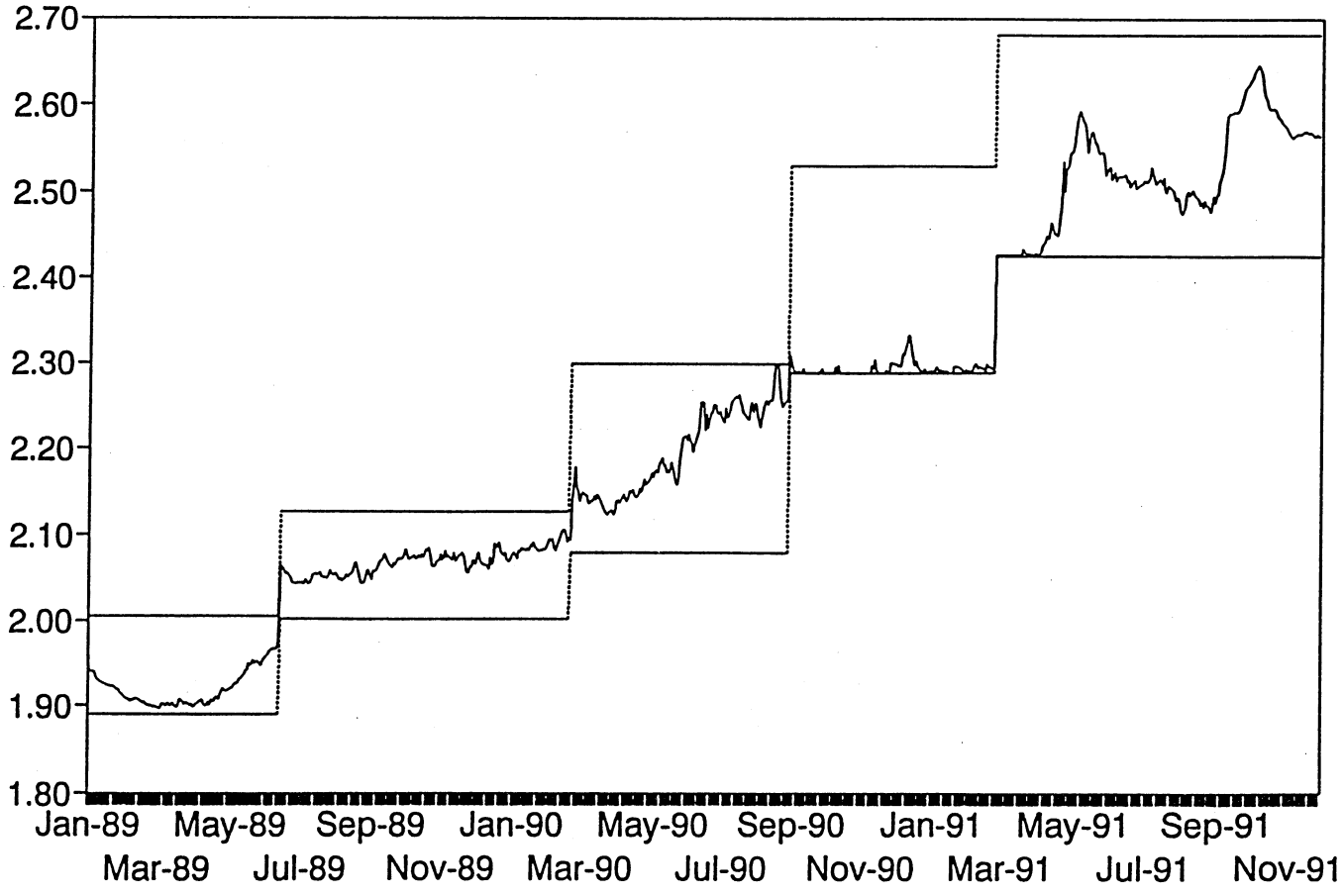
their central parity exchange rates. The first band was in effect from January 3, 1989 to June 22, 1989. The central parity was 1.95 (NIS per unit of the currency basket) and the band's width was ±3%. The second band started on June 23, 1989, and remained in effect until February 28, 1990. Its central parity was 2.07 and its width remained the same as in the previous band (i.e., ±3%). The third band lasted from March 1, 1990 to September 10, 1990, with a central parity of 2.19 and a fluctuation range of ±5%. The fourth band was implemented on September 11, 1990, after the exchange rate had reached the upper limit of the third band. Following a 10% devaluation the central parity was established at 2.41. The width remained ±5%. The fifth band was formed on March 11, 1991 and lasted until December 16, 1991. It had a central parity of 2.55 and a width of ±5%. Following a devaluation of the central parity of 3 percent on December 17, 1991 (i.e., the central parity became 2.629 instead of 2.552), the authorities shifted to a system that allows for the central parity to depreciate daily at the preannounced annual rate of 9 percent.

We present in Figure 2 a plot of the daily NIS/Basket exchange rate from early 1989 to the end of 1991. Each exchange rate band is identified by three horizontal lines: its central parity and its upper and lower limits. The figure exhibits a number of features:

- First, the exchange rate followed an average upward trend throughout that period. The trend prevailed within bands and was supported by upward adjustments of the central parity.
- Second, there existed frequent realignments of the central parity: there were five devaluations in less than three years.
- Third, some upward adjustments of the central parity took place when the exchange rate was not close to the upper limit of a band. The realignment of March 1990 provides a case in point, while the realignment of March 1991 provides a

Figure 2

New Israeli Shekels per Basket Unit
January 1, 1989 - December 16, 1991



particularly striking example; at that time *the exchange rate was close to the lower limit of the band.*

- Fourth, the exchange rate remained quite often well below the central parity and even close to the bottom of a band, especially so during the first, fourth and fifth bands. This feature is particularly puzzling in view of the fact that there existed an overall upward trend in the exchange rate. During the fourth band the exchange rate remained *most* of the time close to its lower limit, resembling a fixed exchange rate regime.

The theory of credible exchange rate bands suggests that the proportion of time an exchange rate spends in different parts of the band should exhibit the following pattern: If there is no upward or downward trend in fundamentals, the frequency distribution should be symmetric around the central parity with lower frequencies closer to the central parity. This prediction applies independently of whether interventions are infinitesimal at the bounds or take on finite fixed values. In the presence of an upward trend in fundamentals, however, that brings about an upward trend in the exchange rate, more weight is shifted towards the upper parts of the band (see the discussion in Section 2).

In order to see how well this prediction fares in the Israeli case, we have plotted the frequency distribution of the exchange rate within the five bands in Figure 3. The figure builds on a division of a band into four equal slices on each side of the central parity. Evidently, the theoretical predictions are not in line with the data. The exchange rate spent too much time in the middle of the bands and too little time at their upper parts relative to the theoretical predictions. Our earlier observation that the exchange rate appears to have spent much time close to the bottom of some bands is supported by this distribution. This finding is confirmed by the occupancy rates in Table 2, which describe which fraction of the observations under a given band were positioned in the lower quarter, mid half, or upper quarter of the band. These facts

Figure 3

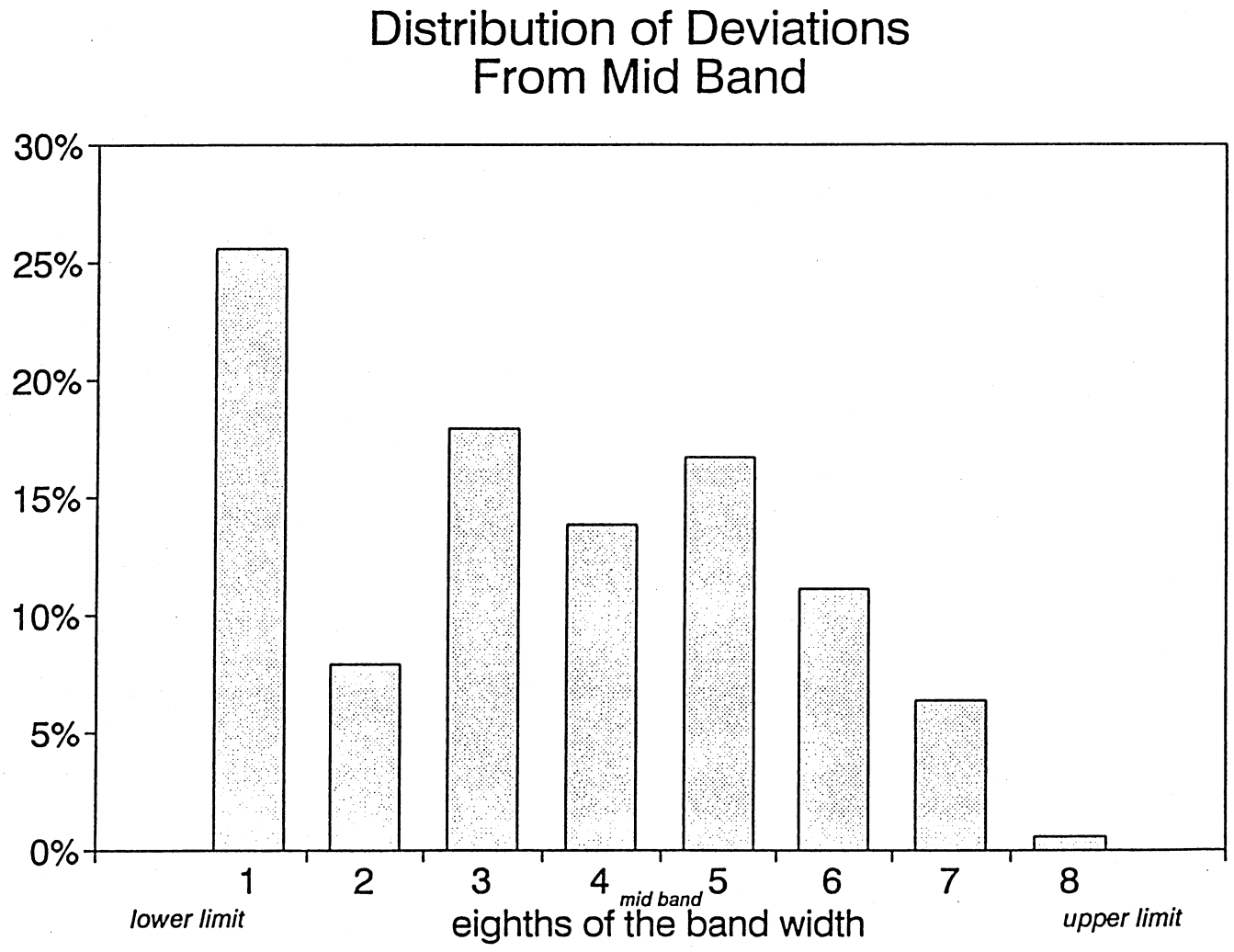

Distribution of Deviations
From Mid Band
30%
25%
20%
15%
10%
5%
0%
1
2
3
4
5
6
7
8
mid band
lower limit
eighths of the band width
upper limit

Table 2

Exchange rate flucuations within various regions of the band.
The New Israeli Shekel against the Currency Basket

	(1) Lower quarter	(2) Mid half	(3) Upper quarter	H0: Avg(2)=Avg(1) and Avg(2)=Avg(3) t ratio Significance level (rejection of H0 when lower than 5%)
Band1 3-Jan-89 to 22-Jun-89				
Number of observations	63	50	1	1.335
Occupancy rate	55.3%	43.9%	0.9%	18.5%
Average daily depreciation	-0.004%	0.11%	NA	
Standard deviation	1.43%	0.63%	NA	
Band2 23-Jun-89 to 28-Feb-90				
Number of observations	0	168	5	-0.987
Occupancy rate	0.0%	97.1%	2.9%	32.5%
Average daily depreciation	NA	0.0001%	0.12%	
Standard deviation	NA	0.24%	0.27%	
Band3 1-Mar-90 to 9-Sep-90				
Number of observations	9	87	35	-0.995
Occupancy rate	6.9%	66.4%	26.7%	32.1%
Average daily depreciation	-0.06%	0.03%	0.16%	
Standard deviation	0.16%	0.51%	0.45%	
Band4 10-Sep-90 to 10-Mar-91				
Number of observations	123	0	0	NA
Occupancy rate	100.0%	0.0%	0.0%	NA
Average daily depreciation	0.01%	NA	NA	
Standard deviation	0.29%	NA	NA	
Band5 11-Mar-91+				
Number of observations	54	91	0	-0.922
Occupancy rate	37.2%	62.8%	0.0%	35.7%
Average daily depreciation	0.13%	0.07%	NA	
Standard deviation	0.82%	0.43%	NA	

suggest that the bands were not particularly credible. The lack of credibility is corroborated by the frequent realignments. We conclude:

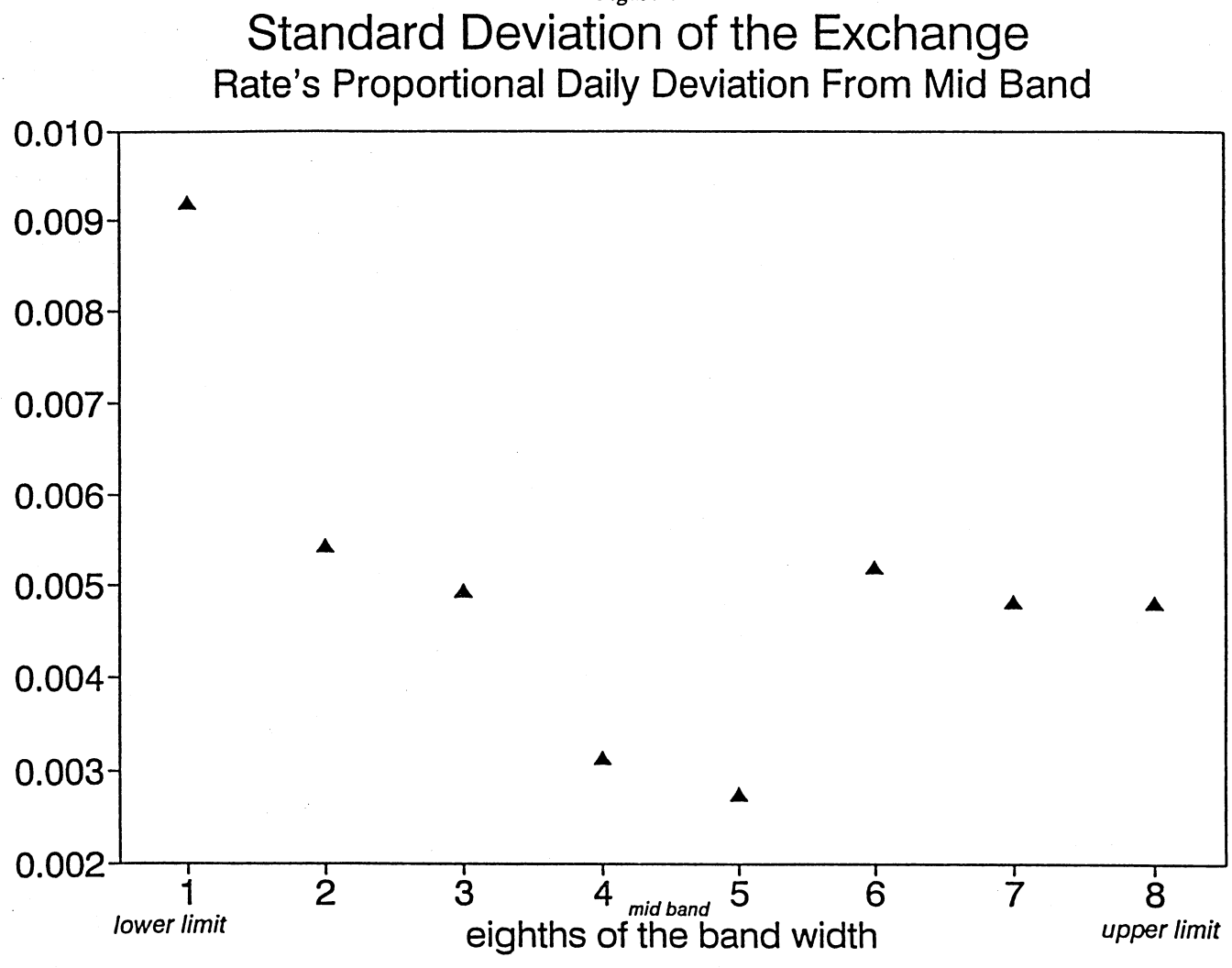
- Fifth, the time frequency distribution of the exchange rate within bands did not follow a pattern suggested by credible bands.

The theory of credible bands suggests that the average rate of change of the exchange rate should be smaller when the exchange rate is close to the bounds of a band than when it is close to its central parity. This prediction results from the fact that close to the boundaries the elasticity of the exchange rate with respect to fundamentals is lower than in the middle range. In the event the exchange rate should be more volatile in the middle of a band than at its edges (see Section 2).

In Table 2, we report t–ratios aimed at testing the null hypothesis that the average rate of change of the exchange rate does not depend on whether the level of the exchange rate is at the lower quarter, mid half, or upper quarter of the band. In order for the data to support the credible bands model, this null hypothesis would have to be statistically rejected in favor of sizable positive and significant t–ratios. That would indicate that the rate of depreciation around the midpoint of the band is greater than the rates of change of the exchange rate at the boundaries. None of the reported t–ratios is statistically significant at the 5 percent level. Thus, there is no evidence in support of the hypothesis that the drift of the exchange rate is greater at the middle of the band than elsewhere.

We examine exchange rate volatility in Figure 4. The figure exhibits standard deviations of $(e/e_{cen}) - 1$; i.e., proportional deviations of the exchange rate from the middle of the band, for eight regions of a typical band, four on each side of the central parity (the division corresponds to Figure 3). The major deviation from the theoretical prediction is that there appears to be larger exchange rate volatility near the band's

Figure 4


Standard Deviation of the Exchange
Rate's Proportional Daily Deviation From Mid Band
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
1
2
3
4
5
6
7
8
lower limit
mid band
upper limit
eighths of the band width

boundaries than in the middle.[3] This pattern may also indicate a lack of credibility.

- Sixth, the exchange rate was on average more volatile near the limits of the band than near the central parity rate. In addition, no significant differences were found in the average rate of change of the exchange rate across the various regions of the band.

Our six points summarize evidence on the behavior of the exchange rate within bands. The facts do not conform with the patterns predicted by credible bands. Instead, lack of credibility that reflects expectations of realignments can explain the observed patterns of exchange rate movements (see Bertola and Caballero [1990]).

Expectations of future exchange rates affect interest rates. For this reason we can extract useful information about the public's expectations of the evolution of the exchange rate from data on short term interest rates. Thus, for example, a high short term NIS interest rate reflects expectations of a sharp rise in the exchange rate (i.e., an expected depreciation) while a low NIS interest rate reflects expectations of a slow rise in the exchange rate (as long as the domestic interest rate is higher than the foreign interest rate).

The shortest reliable free market interest rate available in Israel is determined in monetary auctions. There the Bank of Israel auctions off credit funds to financial institutions. The auctions take place once a week. For this reason we now work with weekly observations. Figure 5 presents a plot of this interest rate over the time interval in which the five bands prevailed. The figure exhibits two important features:

- First, the interest rate follows a cyclical pattern.

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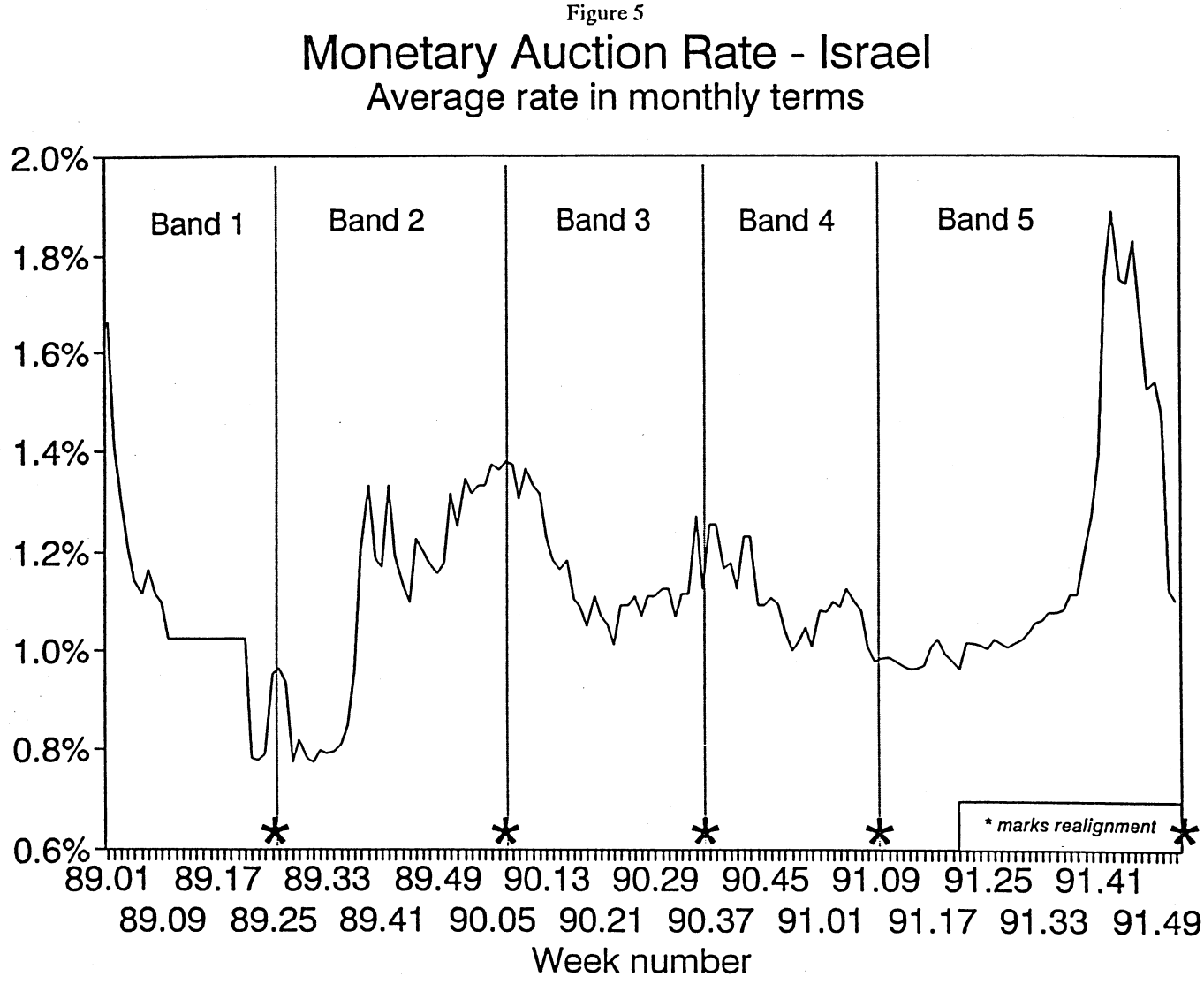
[3]The high volatility at the bottom is dominated by the episodes in which the exchange rate was maintained for long time periods close to a band's lower limit, and in particular during the existence of the fourth band.

Figure 5


Monetary Auction Rate - Israel
Average rate in monthly terms
2.0%
1.8%
1.6%
1.4%
1.2%
1.0%
0.8%
0.6%
Band 1
Band 2
Band 3
Band 4
Band 5
* marks realignment
89.01 89.17 89.33 89.49 90.13 90.29 90.45 91.09 91.25 91.41
89.09 89.25 89.41 90.05 90.21 90.37 91.01 91.17 91.33 91.49
Week number

- Second, each cycle is associated with an exchange rate band; the interest rate generally rises before a realignment and declines after a realignment.

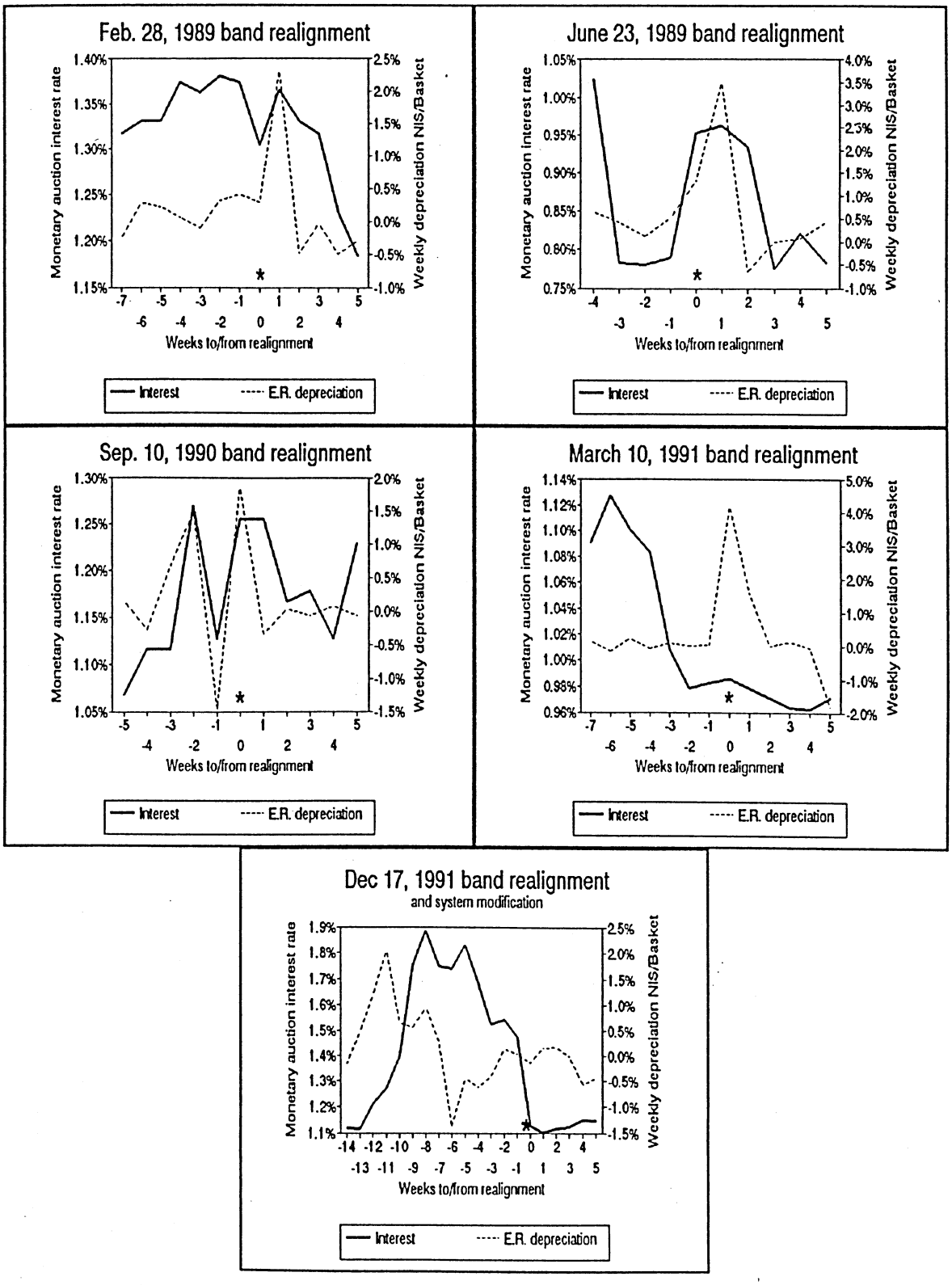
Thus, the market's anticipation of devaluations played an important role in the observed volatility of interest rates, and these anticipations typically preceded actual realignments.

In order to examine more closely the relation between interest rate fluctuations and the occurrence of realignments we present in Figure 6 enlarged plots of the rate of change of the exchange rate and the interest rate, a few weeks before and a few weeks after each realignment. The plots are consistent with the notion that devaluation expectations developed before realignments. The expectations were reflected in both a rising interest rate and higher rates of depreciation. They also suggest that the realignment of March 1991 was the least expected, which is plausible in view of the fact that it took place at a time when the exchange rate was at the bottom of its band. Moreover, these figures show that:

- Third, in most cases the interest rate declined slowly following realignments.

Our last finding is puzzling. If the interest rate increased sharply prior to realignments as a result of expectations of an exchange rate depreciation, it should have dropped down sharply following a realignment, unless of course a realignment did not eliminate expectations of further devaluations. Since it is hard to believe that traders continued to expect substantial devaluations immediately following realignments, the sluggish decline of the interest rate is difficult to understand. In search of an explanation we examined some institutional features, such as the high concentration of the banking sector, but have so far failed to come up with convincing evidence on this point. In the next section we will examine whether this finding is unique to Israel or applies to European currencies as well.

Figure 6
New Israeli Shekel/Currency Basket Depreciation and 1 week Monetary Auction Rate.
Interest rate in monthly terms, depreciation in daily terms.



When a credible exchange rate band is protected by infinitesimal interventions at the boundaries, the interest rate should be high when the exchange rate is low and low when the exchange rate is high. This negative relation between the interest rate and the exchange rate results from the fact that with an exchange rate at the bottom of a band traders expect average exchange rate devaluations while with an exchange rate at the top they expect average exchange rate appreciations (see Section 2). The same applies when interventions are not infinitesimal but are at a known finite value (see Section 2).

We examine further the relation between the interest rate and the exchange rate in Figure 7. The first five panels describe deviations of the interest rate from its average as a function of the deviation of the exchange rate from the central parity. Every panel represents an exchange rate band. Evidently no clear pattern emerges from these plots; in some bands these deviations appear to be positively correlated while in others they appear to be negatively correlated (we report correlation coefficients at the bottom of each panel). Moreover, the lack of a clear cut relationship is not limited to the edges of the bands only but also applies close to the central parity. These observations are corroborated by the last panel, which pools all bands together. We therefore conclude:

- Fourth, the relation between the interest rate and the location of the exchange rate within a band does not conform to the pattern of credible bands.

As the method of intervention in the foreign exchange market appears to be important for the functioning of a band, one would hope to be able to extract some useful information from data on the authorities' net sales of foreign currency. These data are available on a monthly basis. Figure 8 provides a plot of the monthly net sales of foreign currency and the monthly rate of devaluation of the NIS/Basket exchange rate. The evidence is mixed, in that four out of the five realignments were preceded by high and generally rising net sales of foreign currency by the authorities. It is, however,

Figure 7

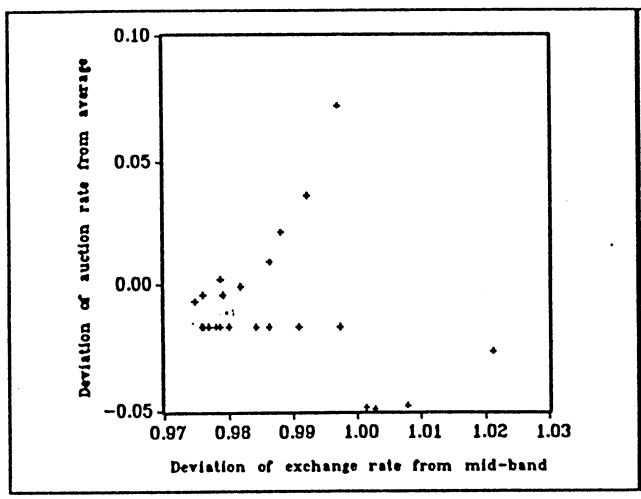


Figure 1 - BAND 1. Correlation coefficient = -0.171

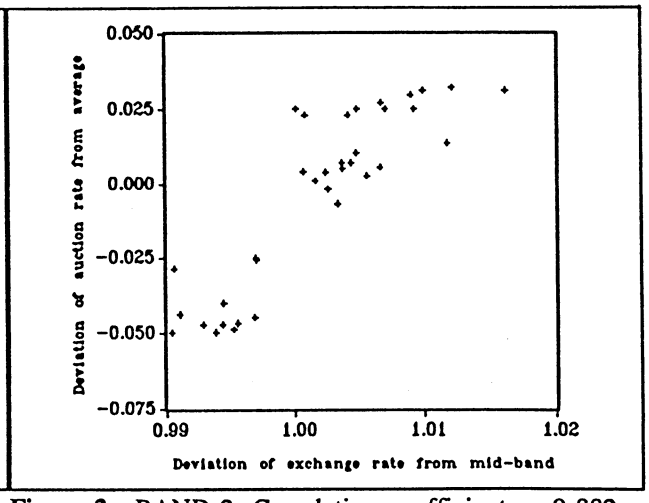


Figure 2 - BAND 2. Correlation coefficient = 0.882

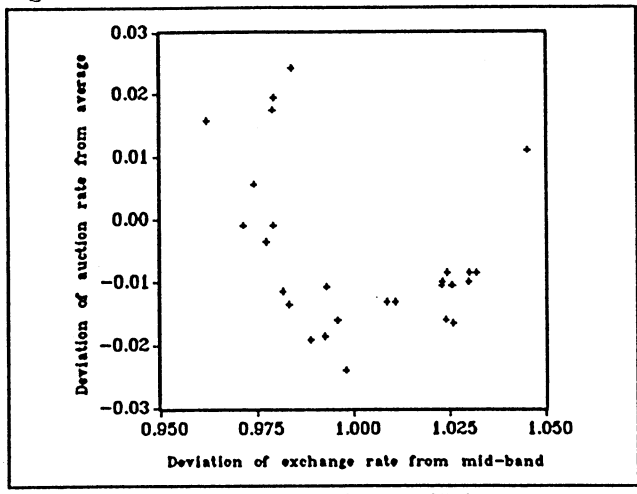


Figure 3 - BAND 3. Correlation coefficient = -0.374

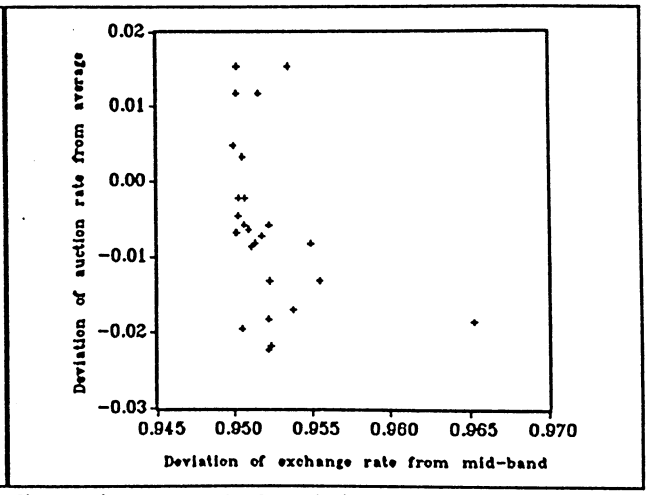


Figure 4 - BAND 4. Correlation coefficient = -0.355

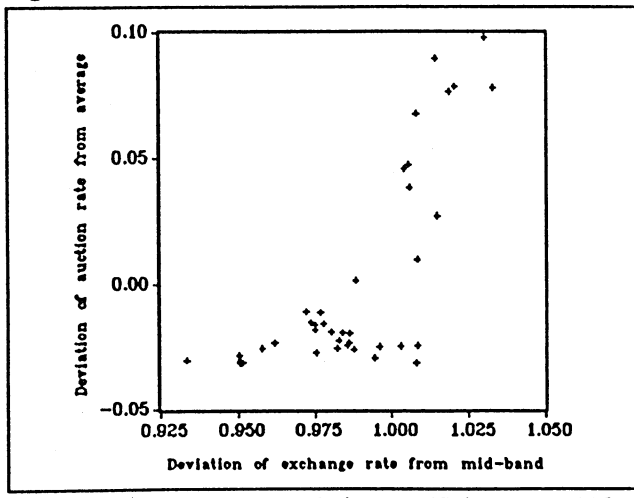


Figure 5 - BAND 5. Correlation coefficient = 0.745

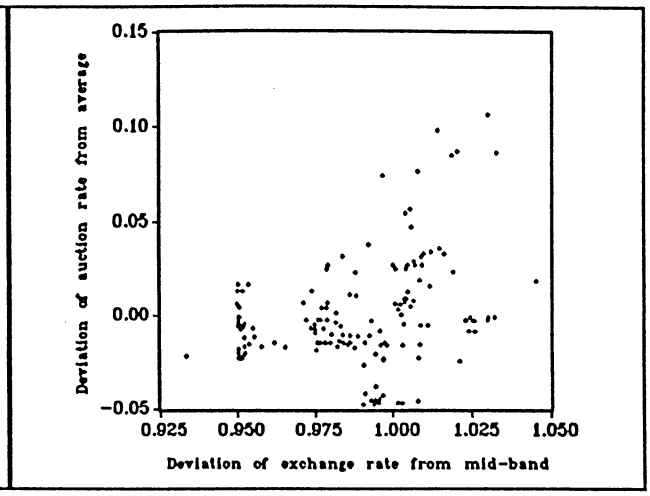
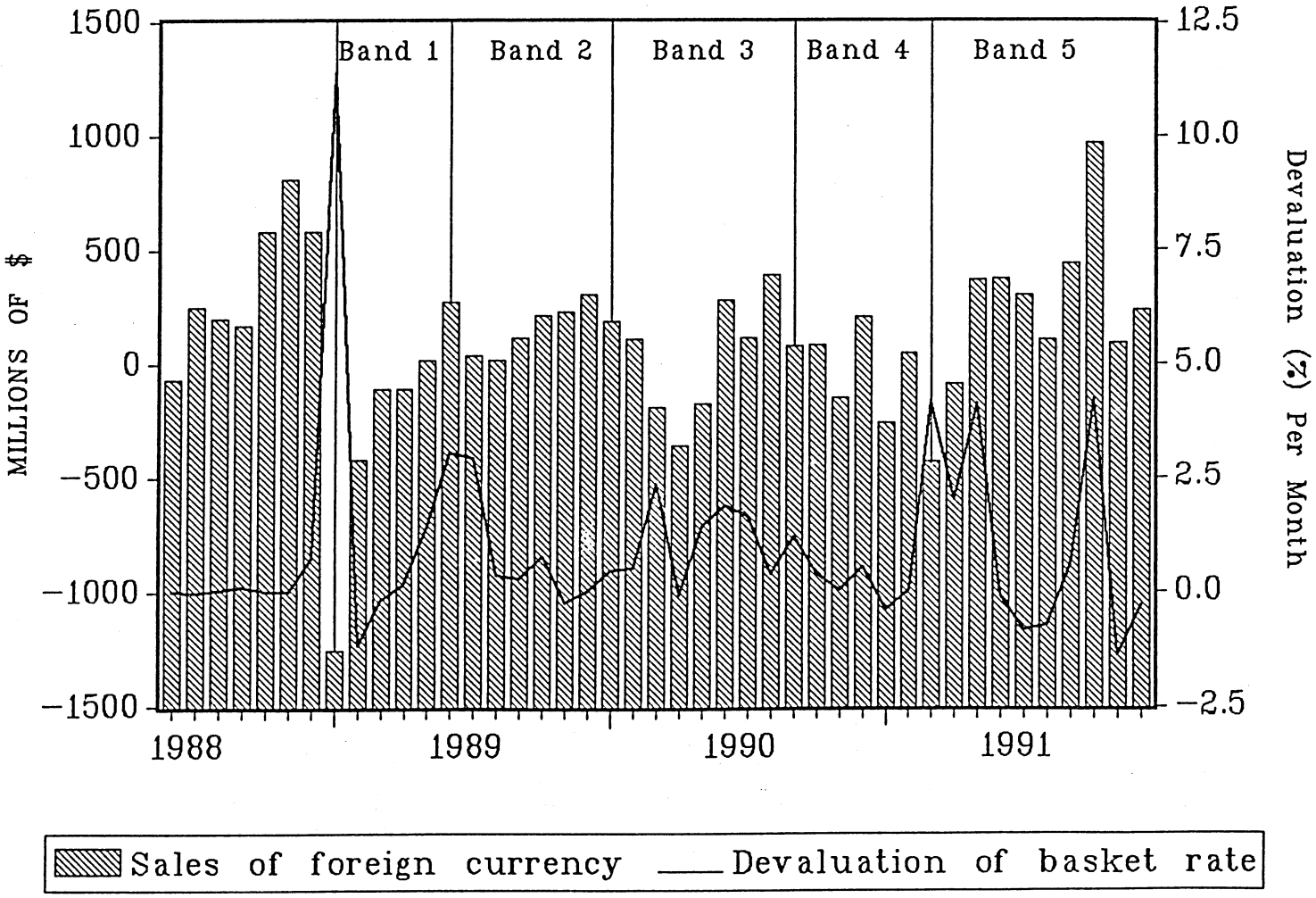


Figure 6 - Entire band period.
Correlation coefficient = 0.335

Deviation of the exchange rate from the mid-band rate, versus the deviation of the monetary auction interest rate from the average auction rate, over each of the corresponding periods.

Figure 8

Sales of Foreign Currency to the Israeli Public



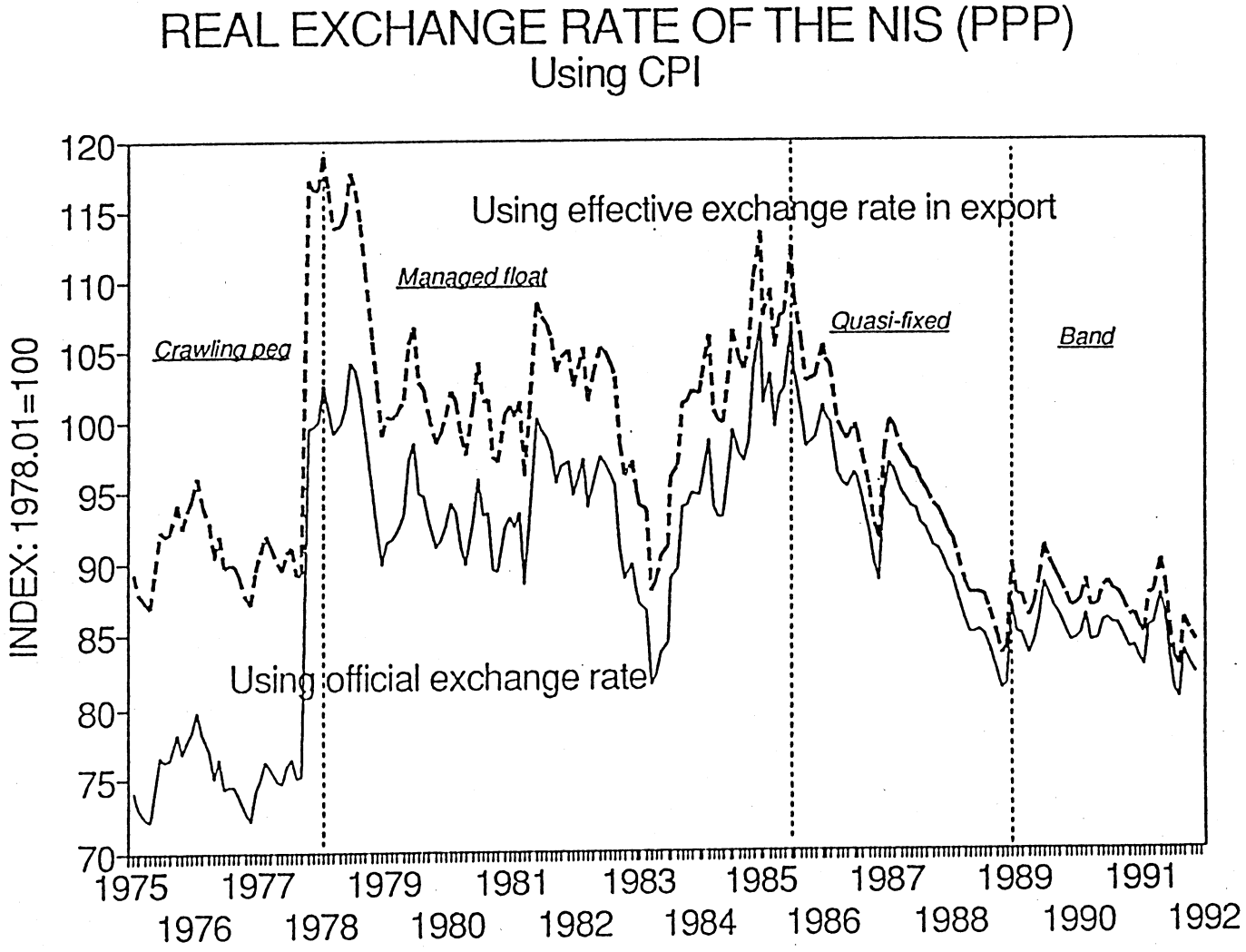
not possible to identify a clear and systematic pattern from these plots. In particular:

- Net sales of foreign currency were not always strongly and positively related to currency depreciations.

There exists a difficulty in interpreting this finding. The government of Israel obtains substantial resources in foreign currency, especially in the form of foreign aid. This income significantly exceeds the government's expenditure in foreign currency. As a result, it ends up selling on average foreign exchange. Our figures on intervention in the foreign exchange market reflect this reality. The time pattern of disbursements of foreign exchange is, however, a policy variable and could be used primarily to affect the exchange rate. To what extent it was used in that way and to what extent it was guided by other policy considerations is hard to determine. In any case, we could not reach firm conclusions from an examination of these data.

Our final piece of evidence concerns the evolution of the real exchange rate. A major problem of the Israeli economy during the 1980s resulted from the lack of a stable competitive real exchange rate. This is evident from Figure 9, which exhibits the time pattern of two measures of the real exchange rate from 1975 to 1991. These plots have been constructed from quarterly data. Changes in the real exchange rate were calculated as the difference between the rate of currency depreciation against the basket plus a weighted average of the inflation rates of Israel's major trading partners minus the rate of inflation in Israel (using the consumer price index). The difference between the plots results from the fact that in one case we used the official exchange rate and in the other the effective exchange rate in the calculation of the rate of currency depreciation. Evidently both exhibit a very similar pattern, as does a plot based on wholesale price inflation (not shown here).

Figure 9


REAL EXCHANGE RATE OF THE NIS (PPP)
Using CPI
INDEX: 1978.01=100
120
115
110
105
100
95
90
85
80
75
70
Using effective exchange rate in export
Using official exchange rate
Crawling peg
Managed float
Quasi-fixed
Band
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992

The figure covers a time span during which Israel was under four different exchange rate regimes: (i) a crawling peg; (ii) a managed float; (iii) a quasi–fixed exchange rate; and (iv) an exchange rate band. The time interval of each exchange rate regime is identified by vertical lines. All five exchange rate bands form the last regime.

We present a measure of export profitability in Figure 10 . This measure is based on the ratio of output to input prices in the sector producing exports (disaggregated by industry measures are not available). A comparison of this measure with the real exchange rate shows that they are closely related. We have also examined real wages per unit output in industry (not shown) and found that it followed the same pattern as the real exchange rate. We therefore conclude that our measure of the real exchange rate provides a reliable index of competitiveness, and this is how we interpret it in the following discussion.

The data show clearly that the economy's competitiveness improved substantially following the adoption of a managed float in October 1977. This high degree of competitiveness was achieved, however, at a cost; the rate of inflation accelerated to unprecedented levels in the first part of the eighties, as shown in Figure 11. In fact, the methods of exchange rate management used to maintain competitiveness in the early eighties contributed directly to the acceleration of inflation. Those methods were, however, not able to prevent a real appreciation until 1983, and only in July 1985, as a result of a major stabilization program, did the real exchange rate return close to its previous peak of 1978. Unfortunately, the stabilization program and the policies that followed its implementation were not able to prevent a severe real appreciation, which stopped only with the devaluations of December 1988–January 1989 and the adoption of a currency band.

It appears that the exchange rate policy based on currency bands was able to stabilize the real exchange rate, albeit at a low level, without an acceleration of the rate

Figure 10

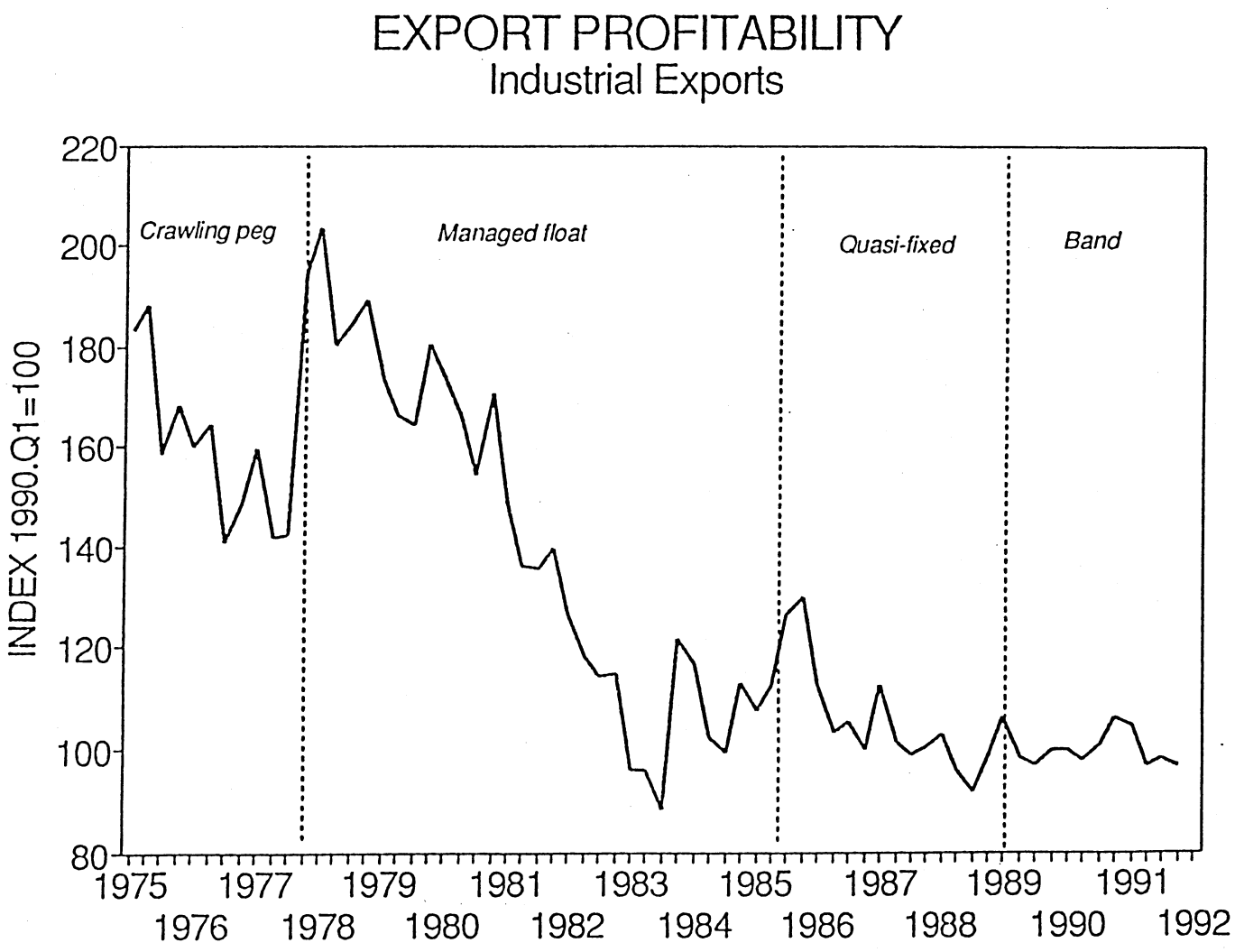
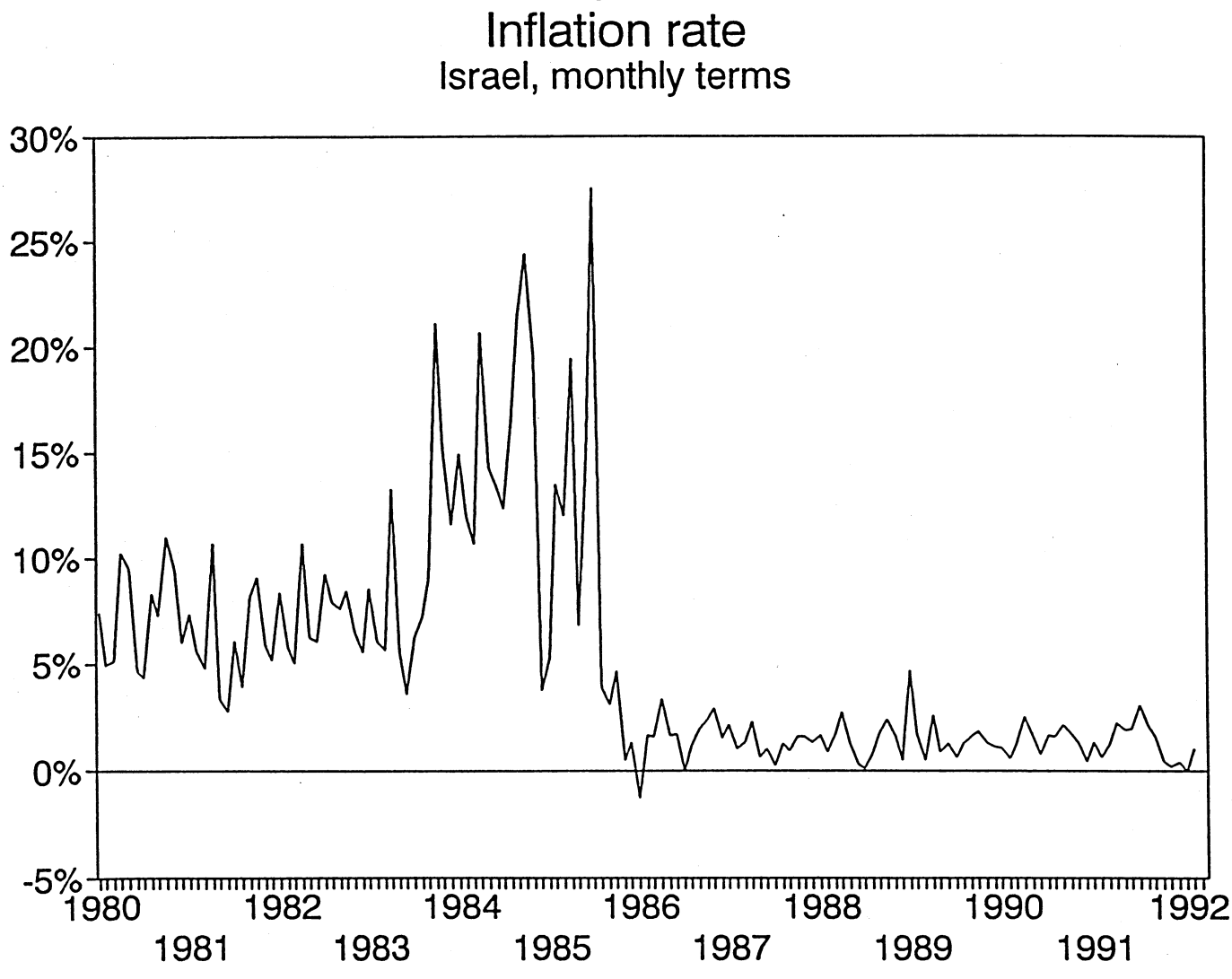

EXPORT PROFITABILITY
Industrial Exports
INDEX 1990.Q1=100
220
200
180
160
140
120
100
80
Crawling peg
Managed float
Quasi-fixed
Band
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992

Figure 11


Inflation rate
Israel, monthly terms
30%
25%
20%
15%
10%
5%
0%
-5%
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992

of inflation (see Figures 9 and 11). At the end of 1990 the real exchange rate was about 15% lower than in the early eighties. It would be most interesting to identify the contribution of the band policy to the economy's competitiveness. On this important question, however, we can only speculate. The data suggest that the band policy played a role in the stabilization of the real exchange rate. Yet the time interval over which the real exchange rate was stabilized was also a time interval with relatively high unemployment and a general slack in the economy. The low level of activity prevented cost increases, and in particular labor costs, and thereby contributed to a stable real exchange rate. Were it not for this downturn in economic activity the exchange rate policy per se may have not been able to prevent further real appreciations. For these reasons we find it difficult to form a judgment on the contribution of the band policy to competitiveness.

Our evidence indicates that the band policy was not able to prevent significant nominal exchange rate depreciations, but that these depreciations did not raise the rate of inflation. Whether this policy helped significantly to combat wage increases as intended by the Bank of Israel is hard to judge. It achieved, however, relative stability of the real exchange rate during a period of high unemployment. The band policy was not particularly credible.[4] This important finding has been corroborated by a number of indicators. Its lack of credibility led to excessive fluctuations. Particularly severe were fluctuations of the short term interest rate that followed a cyclical pattern, with high interest rates preceding realignments and low interest rates following realignments. Moreover, the interest rate exhibited a high degree of sluggishness during its declines

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[4]Pessach and Razin (1992) have examined a model with a one–sided ceiling on Israel's exchange rate. Assuming that the ceiling is an implicit policy target they examined whether the data (which differ from ours) supports a non–linearity of the type implied by a credible ceiling (the upper part of our Figure 1). Their conclusion was that the implicit ceiling was credible. Their finding is, however, not comparable to ours.

following realignments. All this suggests that whatever achievements the band policy may have had, it was quite costly in terms of volatility in financial markets. These considerations played an important role in the decision to shift in December 1991 to a regime of a crawling central parity at a pre–announced rate.

4. A COMPARISON WITH THE EMS

In order to obtain a better understanding of the workings of Israel's exchange rate band it is useful to compare it to similar policies in other countries. Accordingly, in this section we present evidence about six currencies in the European Monetary System (EMS) and about five exchange rates relative to the Deutchemark: the French Franc, the Italian Lira, the Belgian Franc, the Danish Krone, and the Dutch Guilder. Since the EMS has typically been regarded as a "Deutchemark system," we express all interest differentials and exchange rates in relation to the DM.

The EMS was founded on March 13, 1979. At the present time there are 12 currencies that participate in the EMS. In addition to the six currencies listed above they include: the Greek Drachma, the Irish Pound, the Luxembourg Franc, the Portuguese Escudo, the Spanish Peseta, and the Pound Sterling. The main feature of the ERM (Exchange Rate Mechanism) is that it consists of a system of target zones specified as narrow bands around a set of agreed multilateral central parities. For most currencies the ERM allows fluctuation limits of ±2.25% around central parities defined in terms of ECU (European Currency Unit). These limits are jointly protected by the relevant central banks. Realignments of central parities take place following unanimous agreement of the member states. There have been twelve realignments since the inception of the EMS, the last one on January 5, 1990. Institutional details of the system are clearly explained in Folkerts–Landau and Mathieson (1989) and Giavazzi

and Giovannini (1989).

For each one of the five exchange rates considered here, we provide three main pieces of evidence. First, we present figures depicting the behavior of the pertinent exchange rate and interest rate differential for the entire sample from April 1979 to May 1990. Second, we concentrate on the relation between the exchange rate and the interest rate differential in the periods before and after each realignment. Virtually every realignment in the EMS is preceded by a period of strain on the system, which gets reflected in financial markets. Our main objective is to determine whether prior to realignments there is generally a seizable increase in the interest differential and to examine the extent to which the interest differential drops after realignments. Third, we report statistical tests of the hypothesis that the rate of change of the exchange rate decreases as the exchange rate approaches the limits of the band — a central hypothesis of the model with credible bands.

4.1 The French Franc

Our first and most detailed discussion relies on data for the French Franc. This choice is based on the observation that France experienced a high rate of inflation relative to other countries participating in the EMS (see Table 3) and consequently engaged in a relatively large number of realignments. These two features, high inflation and frequent realignments, make it especially comparable to Israel. Figure 12a depicts the evolution of the FF/DM (French Frank/Deutchemark) exchange rate during France's tenure in the EMS. We identify each exchange rate band by a central parity and lower and upper bounds on currency fluctuations of ±2.25%. The figure, which is comparable to Figure 2 for Israel, yields the following main conclusions:

- First, like in Israel, the FF/DM exchange rate followed a marked upward trend over that time interval. This trend was supported by currency realignments. Unlike the

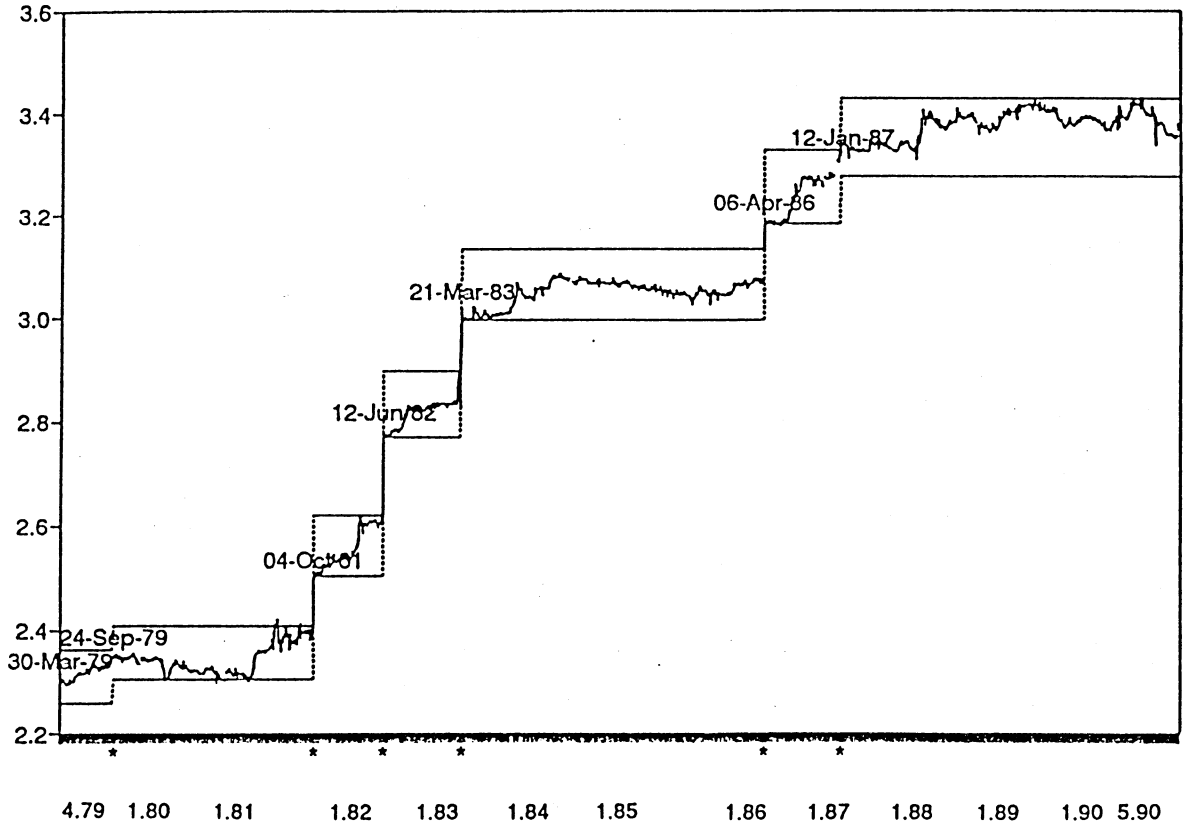
Table 3 - Rates of Inflation
(Annual percent change in CPI)

	Country								
Year	GER	FRA	ITA	BEL	DEN	NET	ISR	CHI	USA
1979	4.1	10.8	14.8	4.5	9.6	4.2	78.3	33.4	11.3
1980	5.4	13.3	21.3	6.7	12.3	6.5	131.0	35.1	13.5
1981	6.3	13.4	19.5	7.6	11.7	6.7	116.8	19.7	10.3
1982	5.3	11.8	16.5	8.7	10.1	5.9	120.4	9.9	6.2
1983	3.3	9.6	14.6	7.7	6.9	2.8	145.6	27.3	3.2
1984	2.4	7.4	10.8	6.3	6.3	3.3	373.8	19.9	4.3
1985	2.2	5.8	9.2	4.9	4.7	2.2	304.6	30.7	3.6
1986	-0.1	2.5	5.9	1.3	3.7	0.1	48.1	19.5	1.9
1987	0.2	3.3	4.7	1.6	4.0	-0.7	19.8	19.9	3.7
1988	1.3	2.7	5.1	1.2	4.6	0.7	16.3	14.7	4.0
1989	2.8	3.5	6.3	3.1	4.8	1.1	20.2	17.0	4.8
1990	2.7	3.4	6.5	3.4	2.6	2.5	17.2	26.0	5.4

NOTE: The countries are (from left to right): Germany, France, Italy, Belgium, Denmark, Netherlands, Israel, Chile, and United States of America.
The data are from: International Financial Statistics, Yearbook 1991, pp. 117-119

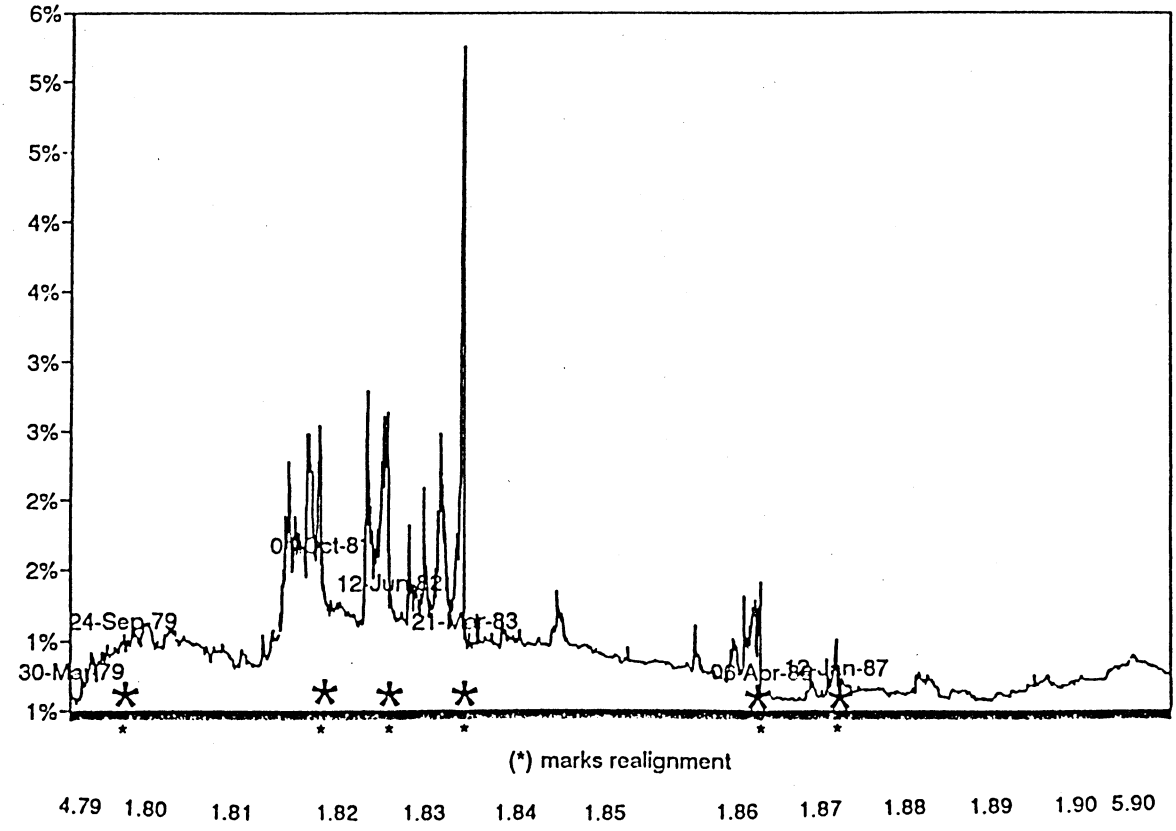
12a:

The French Franc in the EMS
Francs per Deutche Mark



12b:

FFR/DM Interest Rate Differential
30 day rate - monthly terms



Israeli case, however, the upward trend was dominated by realignments. The common reason for currency depreciations was undoubtedly high inflation rates in both countries, that significantly exceeded the rates of inflation of their trade partners.

- Second, like in Israel there were frequent realignments, but unlike Israel the French realignments generally took place only when the exchange rate was close to the band's upper limit.
- Third, typical realignments involved large depreciations of the currency. Moreover, in four out of the six episodes the new and old target zones did not overlap.
- Fourth, it appears from the figure that the exchange rate spent too much time close to the central parity to be consistent with a credible band protected by marginal interventions at the edges or large constant interventions. This observation is corroborated by the histogram in Bertola and Caballero (1990) and by the evidence on occupancy rates provided in Table 4. The distribution of the exchange rate appears to be unimodal with most of the weight in the middle rather than bimodal with little weight in the middle as suggested by the theory. This pattern resembles Israel (see Figure 3), except that in France the exchange rate did not spend much time at the bottom of bands.
- Fifth, a credible band implies rates of depreciation that decrease as the exchange rate approaches the upper limit of the band. Table 4 reports average daily depreciation rates of the FF/DM exchange rate at the upper quarter of the band, the mid half, and the bottom quarter. Also reported in the table are t–ratios for testing the null hypothesis that the average daily rates of depreciation in the upper and lower region of the band are equal to the daily mean exchange rate change in the middle of the band. A large negative value of the test statistic indicates that one can reject the null hypothesis in favor of an alternative that the drift in the middle of the band is smaller than in the

Table 4

Exchange rate fluctuations within various regions of the band.
The French Franc against the Deutche Mark

	(1) Lower quarter	(2) Mid half	(3) Upper quarter	H0: Avg(2)=Avg(1) and Avg(2)=Avg(3) t ratio Significance level (rejection of H0 when lower than 5%)
Band1 13-Mar-79 to 23-Sep-79				
Number of observations	0	125	7	-0.944
Occupancy rate	0.0%	94.7%	5.3%	34.7%
Average daily depreciation	NA	0.01%	0.05%	
Standard deviation	NA	0.12%	0.18%	
Band2 24-Sep-79 to 3-Oct-81				
Number of observations	208	228	67	0.140
Occupancy rate	41.4%	45.3%	13.3%	88.8%
Average daily depreciation	-0.02%	0.00%	-0.02%	
Standard deviation	0.19%	0.19%	0.19%	
Band3 4-Oct-81 to 11-Jun-82				
Number of observations	54	60	56	-0.478
Occupancy rate	31.8%	35.3%	32.9%	63.4%
Average daily depreciation	0.09%	0.04%	0.05%	
Standard deviation	0.65%	0.18%	0.24%	
Band4 12-Jun-82 to 20-Mar-83				
Number of observations	6	136	49	-2.526
Occupancy rate	3.1%	71.2%	25.7%	1.2%
Average daily depreciation	0.71%	-0.00%	0.15%	
Standard deviation	0.92%	0.23%	0.91%	
Band5 21-Mar-83 to 5-Apr-86				
Number of observations	130	605	0	-0.922
Occupancy rate	17.7%	82.3%	0.0%	35.7%
Average daily depreciation	0.02%	0.01%	NA	
Standard deviation	0.40%	0.14%	NA	
Band6 6-Jun-86 to 11-Jan-87				
Number of observations	63	110	8	-0.826
Occupancy rate	34.8%	60.8%	4.4%	41.0%
Average daily depreciation	0.02%	0.01%	0.12%	
Standard deviation	0.11%	0.17%	0.27%	
Band7 12-Jan-87+				
Number of observations	2	529	291	-2.103
Occupancy rate	0.2%	64.4%	35.4%	3.6%
Average daily depreciation	-0.55%	-0.01%	0.02%	
Standard deviation	0.02%	0.17%	0.20%	

See note to table 2.

region near the boundary. As indicated earlier, the credible target zone model implies that these statistics ought to be positive and significant, thus indicating a stronger drift in the middle region of the band than in the limits. The results indicate that contrary to what one would expect from credible bands, none of the t–ratios in the French case are positive and significant. In fact, the null hypothesis is not rejected in five out of the seven bands considered, and it is rejected with sizable negative t–ratios in the remaining two cases.

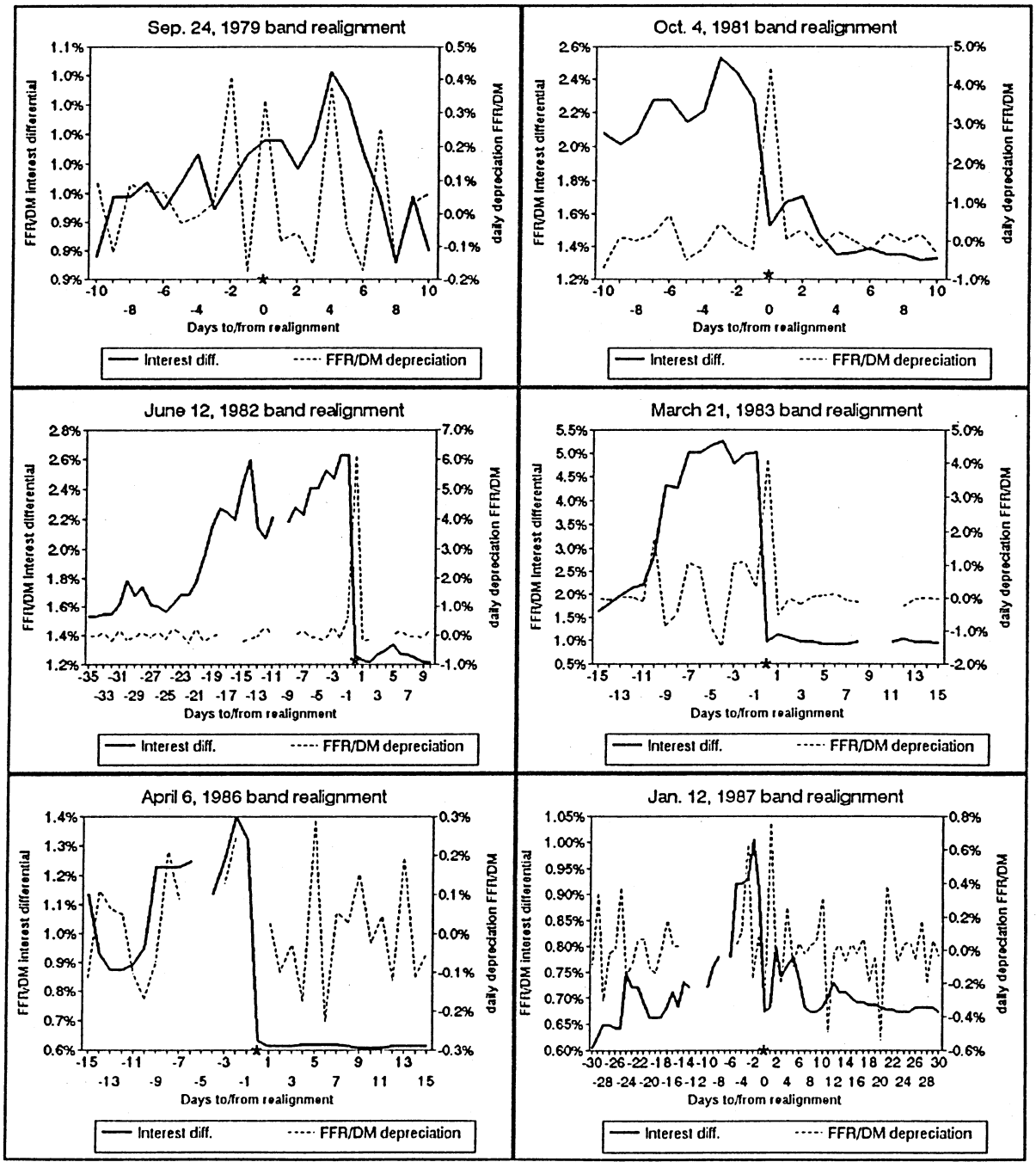
The evidence on exchange rate movements suggests that the approach of the upper limit of the band triggered expectations of a large exchange rate increase, presumably via a realignment, and that these expectations in turn accelerated the rate of depreciation. If this conjecture is correct these expectations should also be reflected in higher interest rate differentials. This issue can be examined with Figure 12b which provides a plot of the French–German short term interest rate differential. Band periods correspond to time intervals between two asterisks in the figure. While there are no marked trends in the interest differential, the evidence indicates that the interest differential increased noticeably prior to realignments and dropped sharply following realignments.

This is confirmed in Figure 13, which provides enlarged plots of interest differentials and depreciations for the six realignments between the French Franc and the DM. As far as interest rates are concerned we conclude from Figure 13:

- Like in Israel, the domestic–foreign interest rate differential increased prior to realignments, as did the rate of currency depreciation. Unlike the Israeli case, however, in France the interest rate dropped sharply following a realignment.

The lack of confidence in the bands appears also from other pieces of evidence. Giovannini (1990) found, for example, that the French–German interest rate differential was consistently above the upper bound implied by credible target zone models. In

Figure 13
French Franc/DM Depreciation and 30 Day Interest Rate Differential
Interest rate in monthly terms, depreciation in daily terms



similar vein Bodnar (1991) found that the relation between the interest differential and the location of the exchange rate within a band did not follow the patterns suggested by credible target zone models (there existed, for example, a significant negative correlation between the interest rate differential and the distance of the exchange rate from the upper limit of the band).

The available evidence about the French exchange rate bands points to the fact that like in Israel market participants did not have much confidence in the bands. In particular, there is a clear relation between interest rate differentials and the occurrence of realignments, and as in Israel expectations of realignments played an important role in generating interest rate volatility. Nevertheless, there do exist interesting differences that we have pointed out, such as the speed with which the interest rate responded to realignments and the time frequency with which the exchange rate visited different parts of the band.

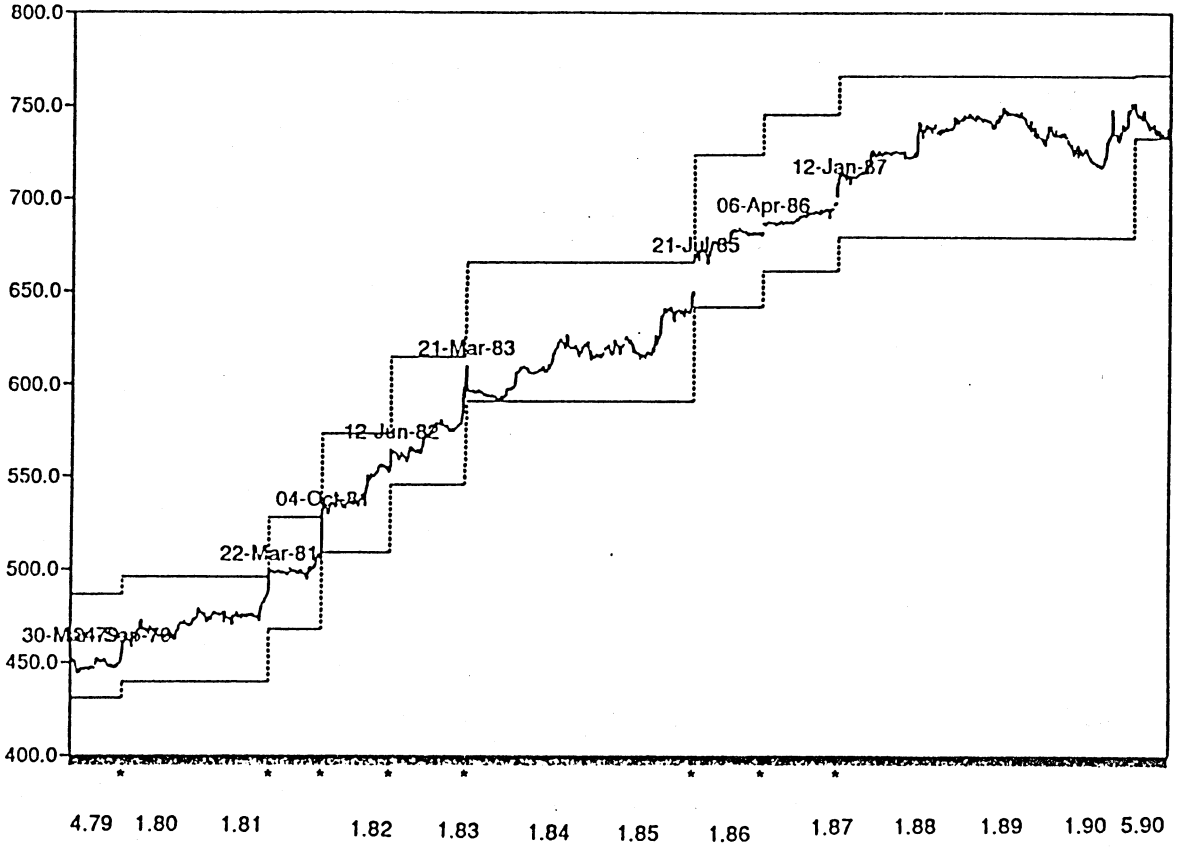
4.2 The Italian Lira

In the following discussion we follow the pattern developed for the French Frank and for this reason choose to be rather brief. For every currency we provide diagrams similar to Figures 12 and 13 and a table similar to Table 4. These summarize the relevant information for each currency in our sample.

The official fluctuation limits for the Italian Lira were ±6 percent from the inception of the EMS until January 5, 1990, at which time they were reduced to ±2.25 percent. Figure 14 describes the evolution of the exchange rate and the interest rate. Overall, they exhibit similar patterns to the French Franc. In particular, we observe a marked trend of exchange rate depreciation over the years, and the fact that in between realignments the exchange rate was generally positioned near the center of the existing band. The latter feature is confirmed by the occupancy ratios reported in Table 5.

14a:

The Italian Lira in EMS
Liras per Deutche Mark



14b:

LIT/DM Interest Rate Differential
30 day rate - monthly terms

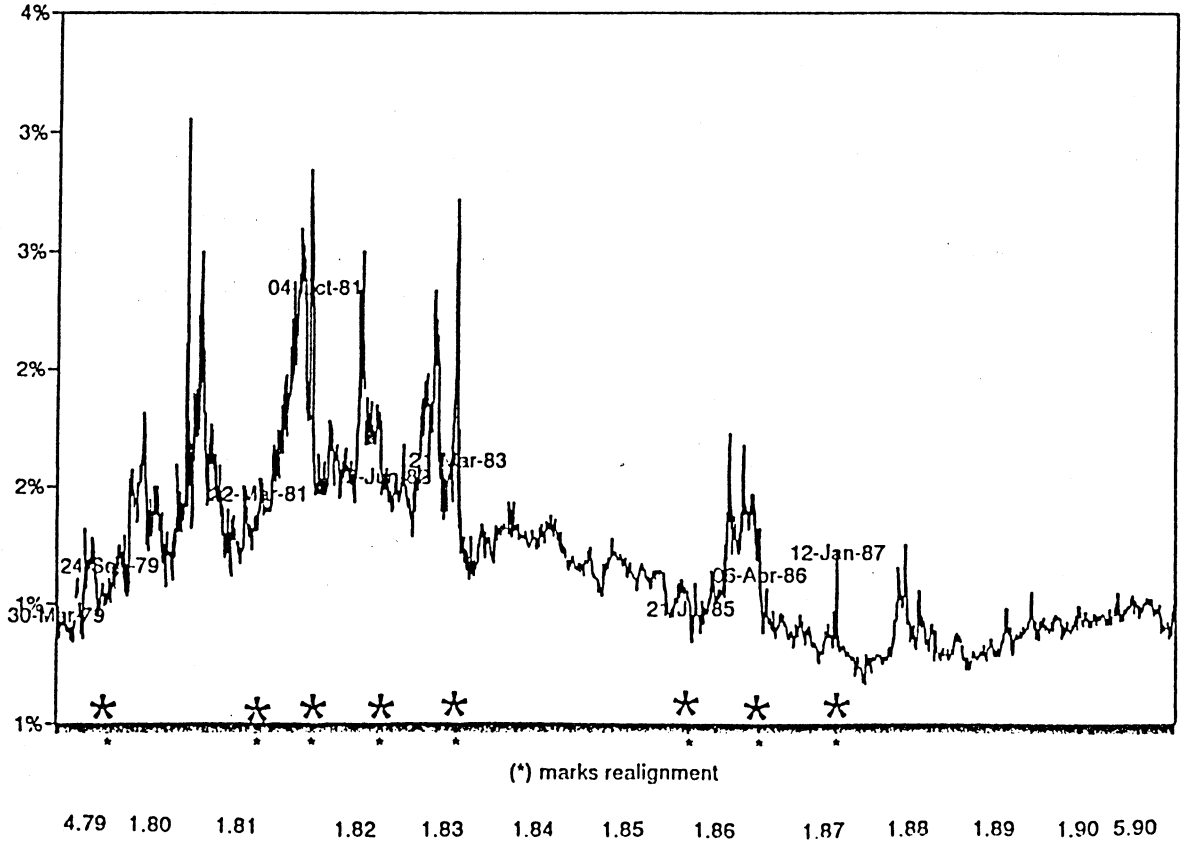


Table 5

Exchange rate fluctuations within various regions of the band.
The Italian Lira against the Deutche Mark

	(1) Lower quarter	(2) Mid half	(3) Upper quarter	H0: Avg(2)=Avg(1) and Avg(2)=Avg(3) t ratio Significance level (rejection of H0 when lower than 5%)
Band1 13-Mar-79 to 23-Sep-79				
Number of observations	6	124	0	0.355
Occupancy rate	4.6%	95.4%	0.0%	72.3%
Average daily depreciation	-0.03%	-0.01%	NA	
Standard deviation	0.32%	0.16%	NA	
Band2 24-Sep-79 to 21-Mar-81				
Number of observations	0	355	18	-1.940
Occupancy rate	0.0%	95.2%	4.8%	5.3%
Average daily depreciation	NA	0.15%	0.10%	
Standard deviation	NA	0.19%	0.14%	
Band3 22-Mar-81 to 3-Oct-81				
Number of observations	0	228	0	NA
Occupancy rate	0.0%	100.0%	0.0%	NA
Average daily depreciation	NA	0.03%	NA	
Standard deviation	NA	0.23%	NA	
Band4 4-Oct-81 to 11-Jun-82				
Number of observations	0	60	0	NA
Occupancy rate	0.0%	100.0%	0.0%	NA
Average daily depreciation	NA	0.05%	NA	
Standard deviation	NA	0.31%	NA	
Band5 12-Jun-82 to 20-Mar-83				
Number of observations	54	138	3	1.665
Occupancy rate	27.7%	70.8%	1.5%	9.8%
Average daily depreciation	-0.02%	0.06%	0.33%	
Standard deviation	0.13%	0.25%	0.28%	
Band6 21-Mar-83 to 20-Jul-85				
Number of observations	209	364	5	1.085
Occupancy rate	36.2%	63.0%	0.9%	27.9%
Average daily depreciation	-0.00%	0.02%	0.18%	
Standard deviation	0.15%	0.21%	0.42%	
Band7 21-Jul-85 to 5-Apr-86				
Number of observations	0	185	0	NA
Occupancy rate	0.0%	100.0%	0.0%	NA
Average daily depreciation	NA	0.01%	NA	
Standard deviation	NA	0.16%	NA	
Band8 6-Apr-86 to 11-Jan-87				
Number of observations	0	200	0	NA
Occupancy rate	0.0%	100.0%	0.0%	NA
Average daily depreciation	NA	0.02%	NA	
Standard deviation	NA	0.12%	NA	
Band9 12-Jan-87+				
Number of observations	56	695	77	-1.557
Occupancy rate	6.8%	83.9%	9.3%	12.0%
Average daily depreciation	-0.01%	0.00%	0.06%	
Standard deviation	0.15%	0.18%	0.23%	

See note to table 2.

The t–ratios in the last column of Table 5 reject the null hypothesis that average depreciations were invariant with respect to the position of the exchange rate within the band. At variance with the Israeli and French cases, however, all realignments of the Italian Lira produced a large overlap between the exchange rate bands before and after realignments. The enlarged graphs for individual realignments in Figure 15 indicate that in six out of the eight plotted realignments the Lira–DM interest rate differential was either high or increasing prior to a realignment and that this differential dropped sharply immediately after each realignment. From Figure 14b it is also clear that there was substantial volatility in the interest rate differential around realignments.

4.3 The Belgian Franc

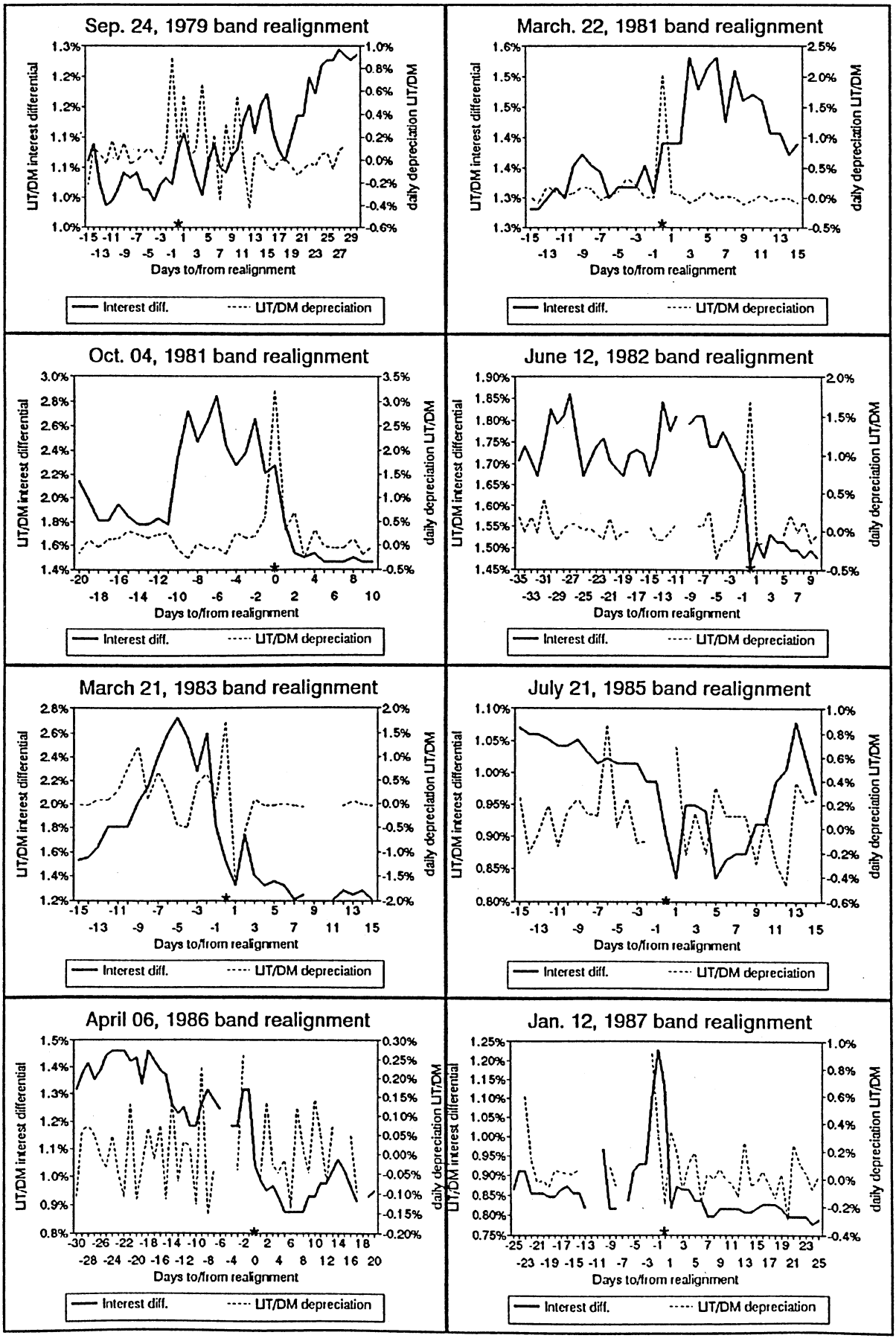
We present in Figure 16 data on the Belgian Franc. Several interesting features emerge from Figure 16a. First, throughout the target zone regime there were both periods with a relatively trendless exchange rate and periods with a strong upward trend (such as in 1982–83). Second, in each one of the seven realignments the adjustment was made when the exchange rate was located at the upper part of the target zone. Third, in three out of the seven realignments the old and new bands had a large region of overlap. Fourth, the exchange rate spent a considerable amount of time within the upper quarter of the band, as can also be seen from the occupancy ratios in Table 6. Most of the t–ratios in Table 6 are negative, indicating that on average there was a larger depreciation when the exchange rate was near the boundaries than at the center of the band. Yet, these differences are not statistically significant and the hypothesis that average depreciations were not different across the three regions of the band can not be rejected at the 5 percent level.

Turning to Figure 17, we observe that in five out of the seven realignments the domestic–foreign interest differential was either high or increasing before the

Figure 15

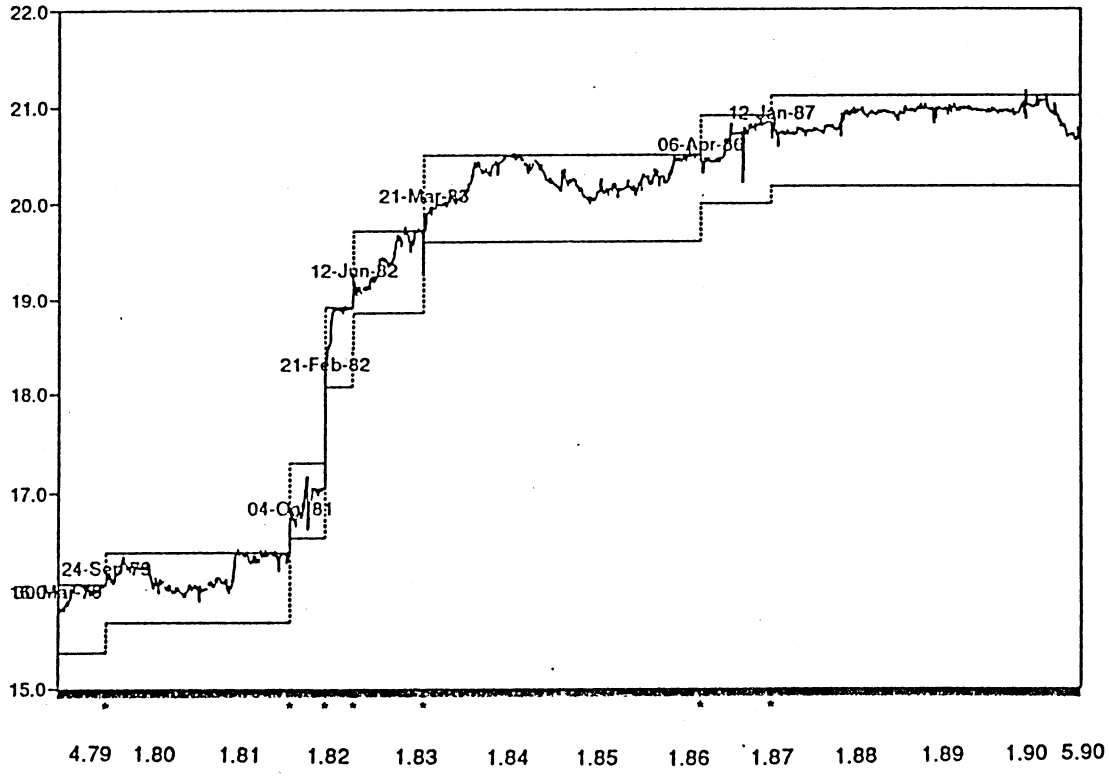
Italian Lira/DM Depreciation and 30 Day Interest Rate Differential

Interest rate in monthly terms, depreciation in daily terms



16a:

The Belgian Franc in the EMS
Belgian Francs per Deutche Mark



16b:

BF/DM Interest Rate Differential
30 day rate - monthly terms

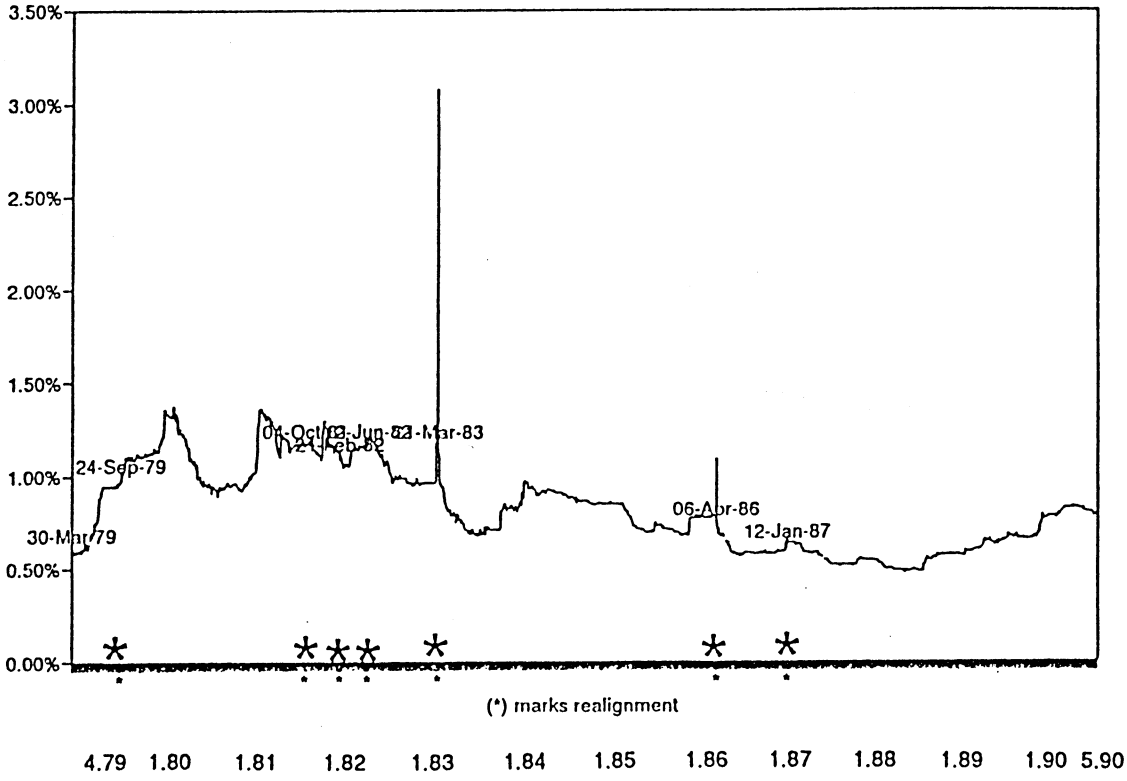


Table 6

Exchange rate flucuations within various regions of the band.
The Belgian Franc against the Deutche Mark

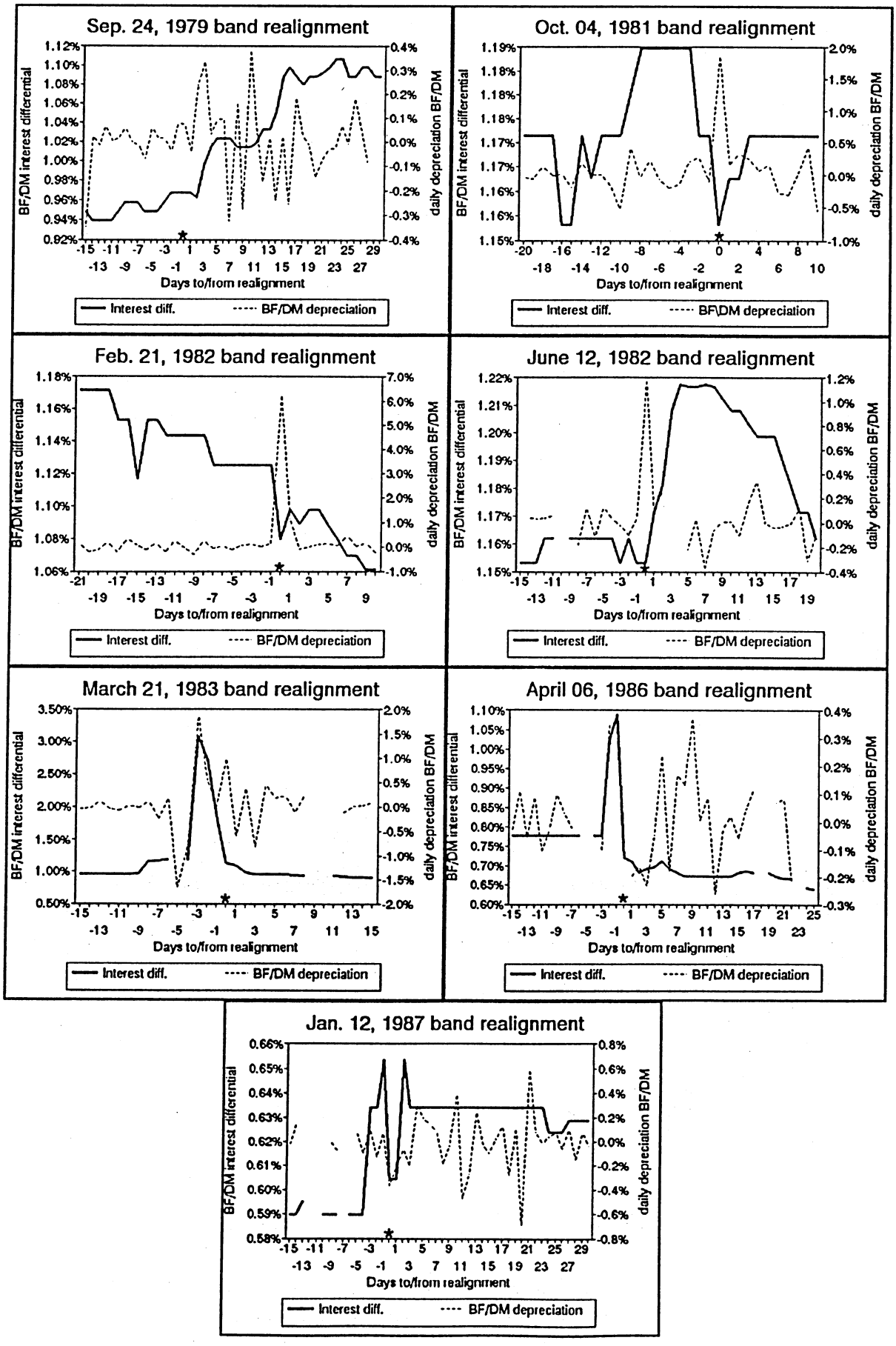
	(1) Lower quarter	(2) Mid half	(3) Upper quarter	H0: Avg(2)=Avg(1) and Avg(2)=Avg(3) t ratio Significance level (rejection of H0 when lower than 5%)
Band1 13-Mar-79 to 23-Sep-79				
Number of observations	0	30	99	-0.319
Occupancy rate	0.0%	23.3%	76.7%	75.03%
Average daily depreciation	NA	0.01%	0.01%	
Standard deviation	NA	0.12%	0.01%	
Band2 24-Sep-79 to 3-Oct-81				
Number of observations	0	270	230	-0.991
Occupancy rate	0.0%	54.0%	46.0%	32.19%
Average daily depreciation	NA	-0.00%	0.01%	
Standard deviation	NA	0.17%	0.02%	
Band3 4-Oct-81 to 20-Feb-82				
Number of observations	14	78	2	0.771
Occupancy rate	14.9%	83.0%	2.1%	44.3%
Average daily depreciation	-0.11%	0.06%	0.48%	
Standard deviation	0.94%	0.26%	0.24%	
Band4 21-Feb-82 to 11-Jun-82				
Number of observations	1	17	56	0.038
Occupancy rate	1.4%	23.0%	75.7%	97.0%
Average daily depreciation	NA	0.16%	0.38%	
Standard deviation	NA	0.32%	0.16%	
Band5 12-Jun-82 to 20-Mar-83				
Number of observations	11	101	80	-0.613
Occupancy rate	5.7%	52.6%	41.7%	54.1%
Average daily depreciation	-0.05%	0.01%	0.04%	
Standard deviation	0.13%	0.27%	0.26%	
Band6 21-Mar-83 to 3-Jun-86				
Number of observations	3	422	323	-0.561
Occupancy rate	0.4%	56.4%	43.2%	57.5%
Average daily depreciation	-0.3%	0.00%	0.0%	
Standard deviation	0.7%	0.14%	0.1%	
Band7 6-Jun-86 to 11-Jan-87				
Number of observations	1	75	109	0.324
Occupancy rate	0.5%	40.5%	58.9%	74.0%
Average daily depreciation	NA	0.23%	0.0%	
Standard deviation	NA	0.12%	0.3%	
Band8 12-Jan-87+				
Number of observations	0	260	565	-1.557
Occupancy rate	0.0%	31.5%	68.5%	12.0%
Average daily depreciation	NA	-0.01%	0.00%	
Standard deviation	NA	0.15%	0.14%	

See note to table 2.

Figure 17

Belgian Franc/DM Depreciation and 30 Day Interest Rate Differential

Interest rate in monthly terms, depreciation in daily terms



realignment and sharply dropped after realignments. In some cases, the initial drop in the interest differential immediately after a realignment was followed by a substantial rise. In line with the evidence for other countries, Figure 16b indicates that there was a marked volatility of interest rates around realignments.

4.4 The Danish Krone

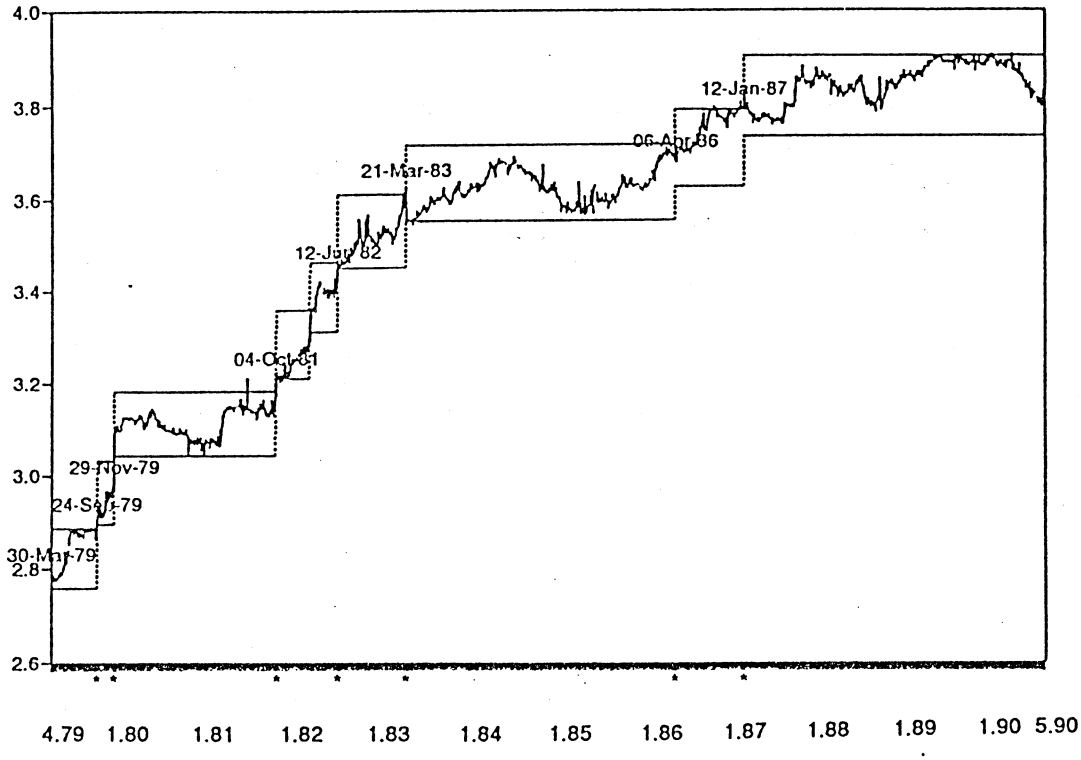
The behavior of the Danish Krone/DM exchange rate and interest differential, plotted in Figure 18, points to two main sub periods. The first one, up until mid 1983, is characterized by frequent realignments, a marked depreciation of the domestic currency, and a high degree of volatility in the interest differential. After mid 1983, however, realignments were more infrequent, the exchange rate was more stable and so was the interest rate differential. The occupancy rates in Table 7 indicate that in contrast to the predictions of the credible target zone model, the exchange rate spent most of the time around the center of the band. The evidence on t–ratios indicates that only in two out of the eight bands the rate of depreciation near the boundaries was smaller than in the area near the central parity. In most cases shown in Figure 19 the interest rate differential was either high or increasing before a realignment and then dropped after the realignment. There were, however, some episodes, such as the June 12 1982 realignment, in which the interest rate declined rather slowly after a realignment, much as in the case of Israel.

4.5 The Dutch Guilder

The Dutch Guilder differs in several dimensions from the other currencies, as one can see from Figure 20. In particular, there were only two realignments of the central parity and there was a relatively weak trend of depreciation against the DM. The

18a:

The Danish Krone in the EMS
Danish Krone per Deutche Mark



18b:

D. Krone/DM Interest Rate Differential
30 day rate - monthly terms

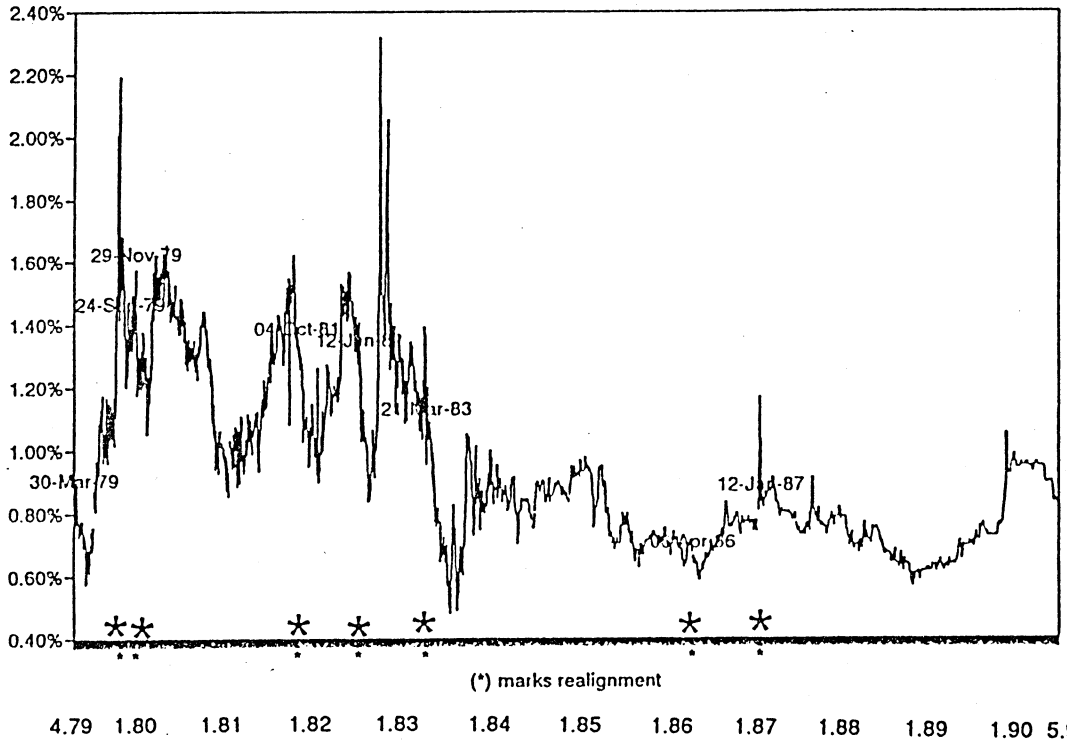


Table 7

Exchange rate fluctuations within various regions of the band.
The Danish Krone against the Deutche Mark

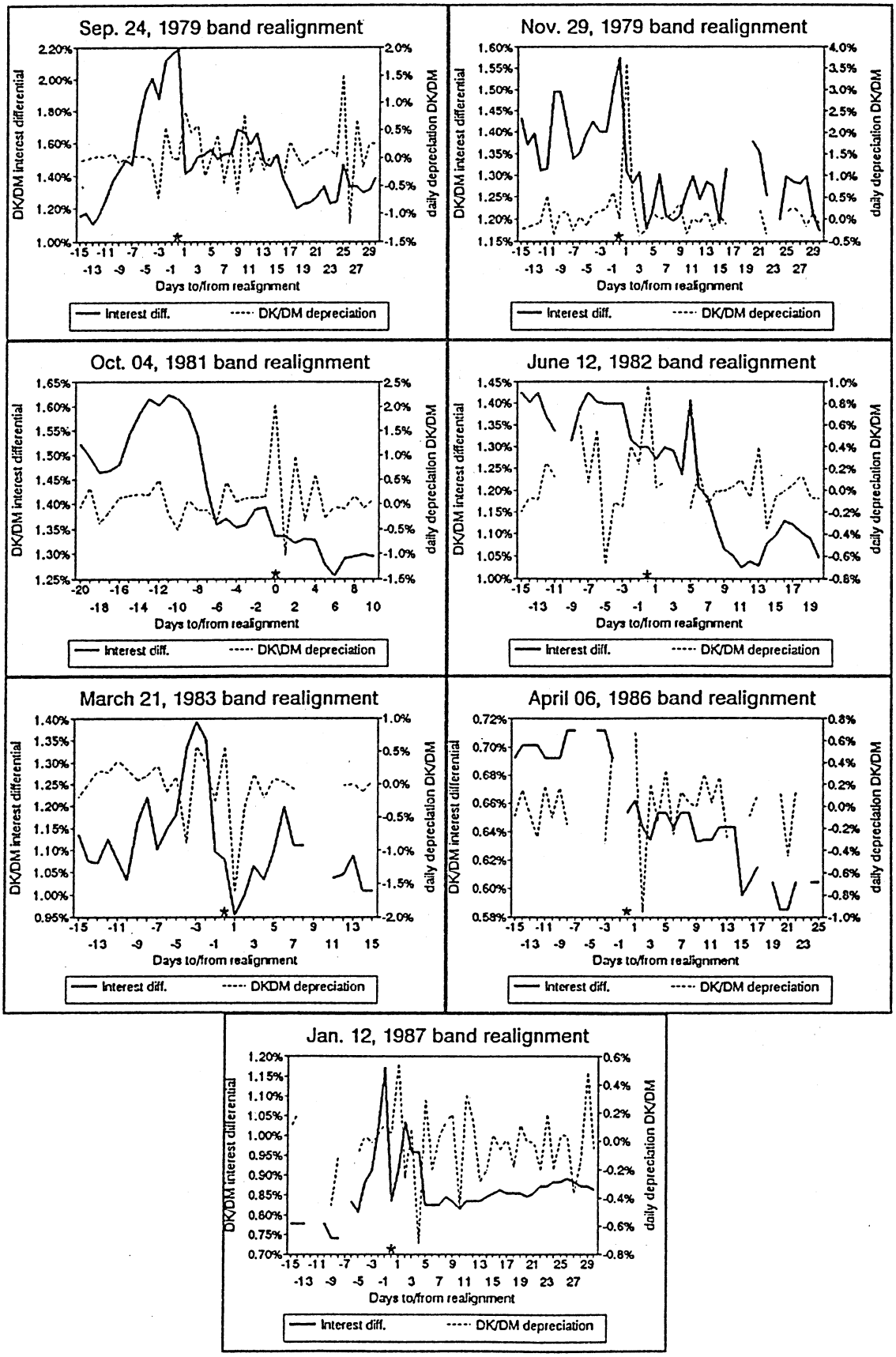
	(1) Lower quarter	(2) Mid half	(3) Upper quarter	H0: Avg(2)=Avg(1) and Avg(2)=Avg(3) t ratio Significance level (rejection of H0 when lower than 5%)
Band1 13-Mar-79 to 23-Sep-79				
Number of observations	29	19	82	2.889
Occupancy rate	22.3%	14.6%	63.1%	0.5%
Average daily depreciation	-0.02%	0.15%	0.01%	
Standard deviation	0.17%	0.18%	0.19%	
Band2 24-Sep-79 to 28-Nov-79				
Number of observations	23	25	0	1.647
Occupancy rate	47.9%	52.1%	0.0%	10.1%
Average daily depreciation	-0.03%	0.18%	NA	
Standard deviation	0.44%	0.43%	NA	
Band3 29-Nov-79 to 3-Oct-81				
Number of observations	70	346	40	0.715
Occupancy rate	15.4%	75.9%	8.8%	47.8%
Average daily depreciation	-0.08%	0.01%	0.13%	
Standard deviation	0.27%	0.32%	0.19%	
Band4 4-Oct-81 to 11-Jun-82				
Number of observations	56	113	0	-0.810
Occupancy rate	33.1%	66.9%	0.0%	41.9%
Average daily depreciation	0.07%	0.04%	NA	
Standard deviation	0.48%	0.22%	NA	
Band5 12-Jun-82 to 20-Mar-83				
Number of observations	50	135	12	-0.393
Occupancy rate	25.4%	68.5%	6.1%	69.5%
Average daily depreciation	0.03%	0.02%	0.09%	
Standard deviation	0.26%	0.30%	0.38%	
Band6 21-Mar-83 to 5-Apr-86				
Number of observations	192	495	68	2.453
Occupancy rate	25.4%	65.6%	9.0%	1.4%
Average daily depreciation	-0.05%	0.02%	0.30%	
Standard deviation	0.25%	0.23%	0.21%	
Band7 6-Jun-86 to 11-Jan-87				
Number of observations	0	69	119	-0.420
Occupancy rate	0.0%	36.7%	63.3%	67.5%
Average daily depreciation	NA	0.00%	0.02%	
Standard deviation	NA	0.27%	0.16%	
Band8 12-Jan-87+				
Number of observations	73	427	330	-0.709
Occupancy rate	8.8%	51.4%	39.8%	47.8%
Average daily depreciation	-0.02%	-0.00%	0.01%	
Standard deviation	0.15%	0.21%	0.18%	

See note to table 2.

Figure 19

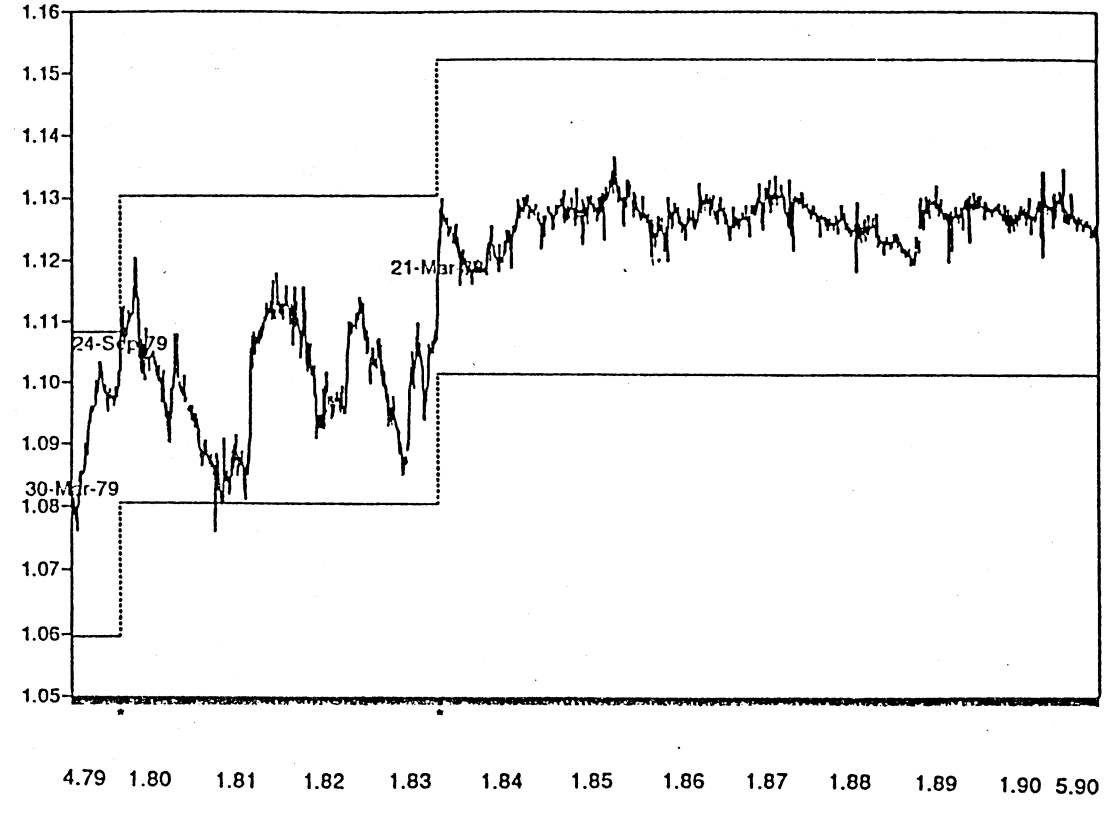
Danish Krone/DM Depreciation and 30 Day Interest Rate Differential

Interest rate in monthly terms, depreciation in daily terms



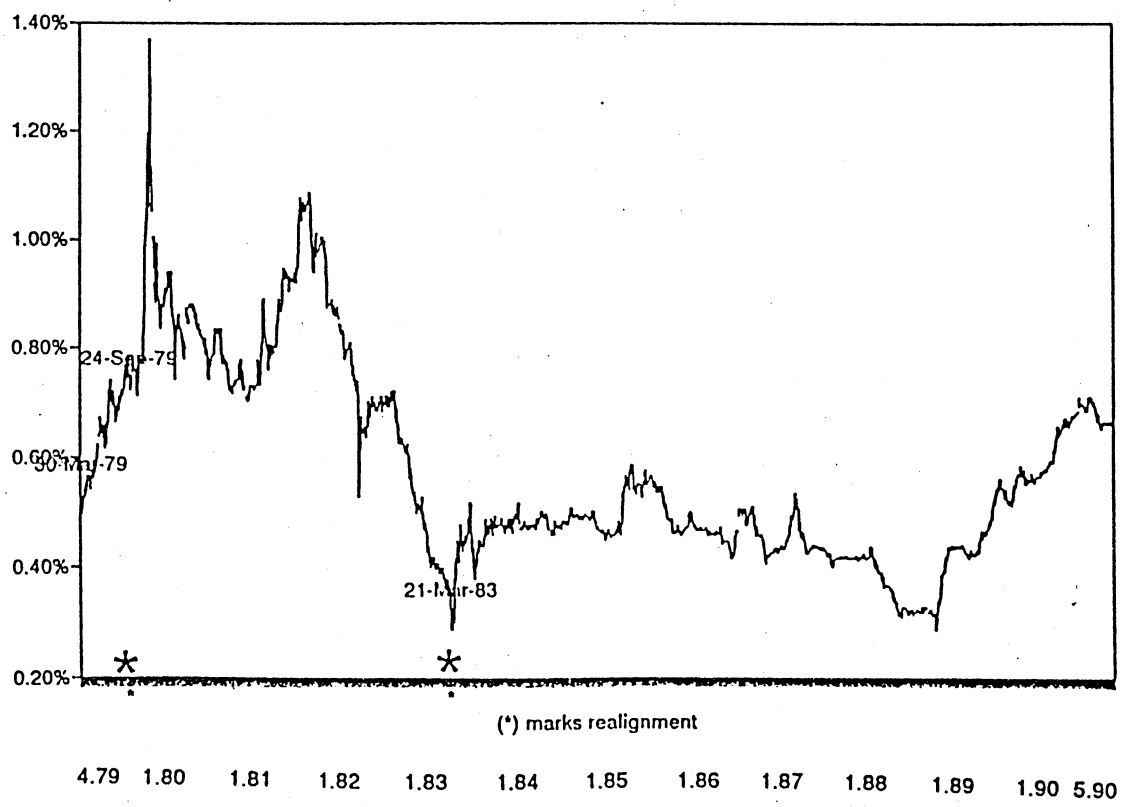
20a:

The Dutch Guilder in the EMS
Guilders per Deutche Mark



20b:

Guilder/DM Interest Rate Differential
30 day rate - monthly terms



period before April 1983 exhibited a sizable volatility of both the exchange rate and the interest differential. After that, both variables showed a marked degree of stability, with the exchange rate fluctuating mainly around the central parity. The latter can be seen from the occupancy rates reported in Table 8. Lastly, as shown in Figure 21, each one of the two realignments was followed by an almost immediate drop in the interest rate differential.

Some broad conclusions emerge from a comparison of the Israeli Shekel with the five European currencies that we have discussed in this section. First, the bands for all six currencies appear to have lacked credibility. Second, countries with high rates of inflation, such as Israel, France and Italy, were lead to realign rather frequently. Third, interest rates exhibited a high degree of volatility around realignments. Fourth, interest rates tended to be high prior to realignments and drop afterwards. A major difference between Israel and the European countries is, however, that in Israel the decline of the interest rate following a realignment was rather slow while in Europe interest rates decline rapidly, with Denmark being somewhat of an exception.

5. A COMPARISON WITH CHILE

While the evidence about the EMS countries proves useful for an evaluation of Israel's exchange rate band, we can obtain additional insights by examining Chile's band with a crawling central parity. Chile has implemented this policy since 1985. Several features of Chile's experience make it especially interesting for Israel. First, like Israel, Chile is a highly open economy with moderate inflation (15 to 30 percent in recent years; see Table 3). Second, in contrast to the EMS countries' multilateral target zones

Table 8

Exchange rate fluctuations within various regions of the band.
The Dutch Guilder against the Deutche Mark

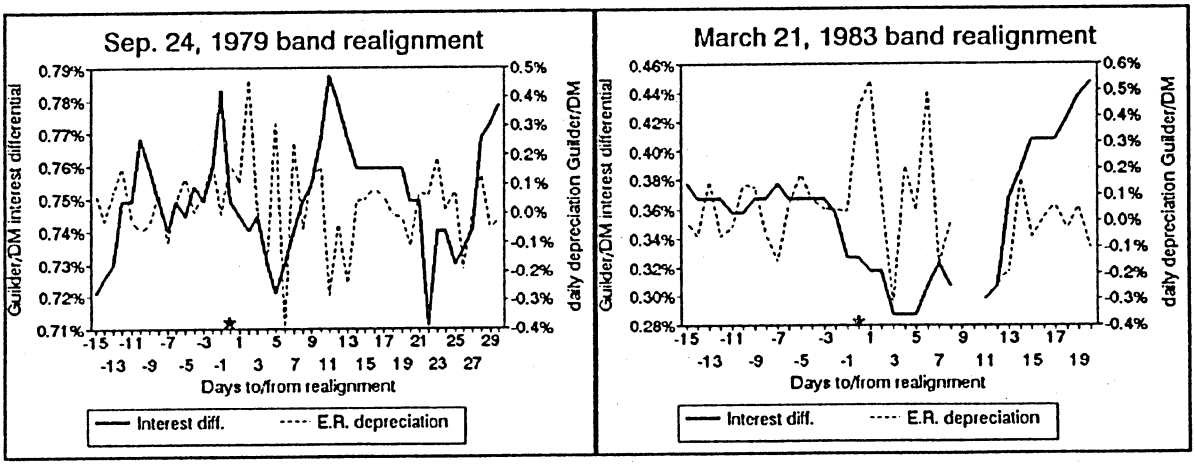
	(1) Lower quarter	(2) Mid half	(3) Upper quarter	H0: Avg(2)=Avg(1) and Avg(2)=Avg(3) t ratio Significance level (rejection of H0 when lower than 5%)
Band1 13-Mar-79 to 23-Sep-79				
Number of observations	0	60	72	0.301
Occupancy rate	0.0%	45.5%	54.5%	76.4%
Average daily depreciation	NA	0.03%	0.01%	
Standard deviation	NA	0.11%	0.10%	
Band2 24-Sep-79 to 20-Mar-83				
Number of observations	202	668	5	1.065
Occupancy rate	23.1%	76.3%	0.6%	28.7%
Average daily depreciation	-0.01%	0.00%	0.08%	
Standard deviation	0.18%	0.16%	0.26%	
Band3 21-Mar-83+				
Number of observations	0	1790	0	NA
Occupancy rate	0.0%	100.0%	0.0%	NA
Average daily depreciation	NA	0.00%	NA	
Standard deviation	NA	0.13%	NA	

See note to table 2.

Figure 21

Dutch Guilder/DM Depreciation and 30 Day Interest Rate Differential

Interest rate in monthly terms, depreciation in daily terms



Chile defends its band unilaterally (like Israel). Third, in designing this exchange rate policy Chile's authorities have stressed the existence of a tradeoff between a domestic inflation target and a real exchange rate (or current account) target. Their aim has been to simultaneously ensure competitiveness and a controlled rate of inflation. The same aims play a major role in Israel's policy objectives.

Chile's exchange rate is determined in an intra–bank market. It is allowed to fluctuate within a band around a reference rate set by the Banco Central [see Banco Central de Chile (1991) and Ffrench–Davis and Vial (1990) for details and additional references]. Following two steep devaluations in 1985, the authorities adopted a policy of daily adjustments in the Peso/US Dollar reference exchange rate. The size of the daily adjustments has been chosen on the basis of the estimated difference between domestic and foreign inflation. The width of the band was ±2% around the central parity in the initial phase, it increased to ±3% in January 1988, and further widened to ±5% in June 1989. On January 23, 1992 the band was increased to ±10% around the reference rate.

Chile has had a long experience with crawling–peg exchange rate policies. There appears to be in that country broad agreement that policies of this type allow to preserve real exchange rate parity and the profitability of exports in the face of persistently higher domestic rates of inflation. The role of the band is to add flexibility to the crawling peg— flexibility that is called for given the wide swings in the international price of copper and in capital flows. Thus, when the price of copper is high or there is a capital inflow the exchange rate moves toward the bottom of the band, and at the same time the central parity continues to crawl upwards at a rate that is based on the inflation differential between Chile and its trade partners.

Figure 22 depicts monthly observations of the Peso/U.S. Dollar exchange rate from the inception of the crawling band. In addition to the actual exchange rate the

Figure 22

NOMINAL EXCHANGE RATE - CHILE

85.07-91.01

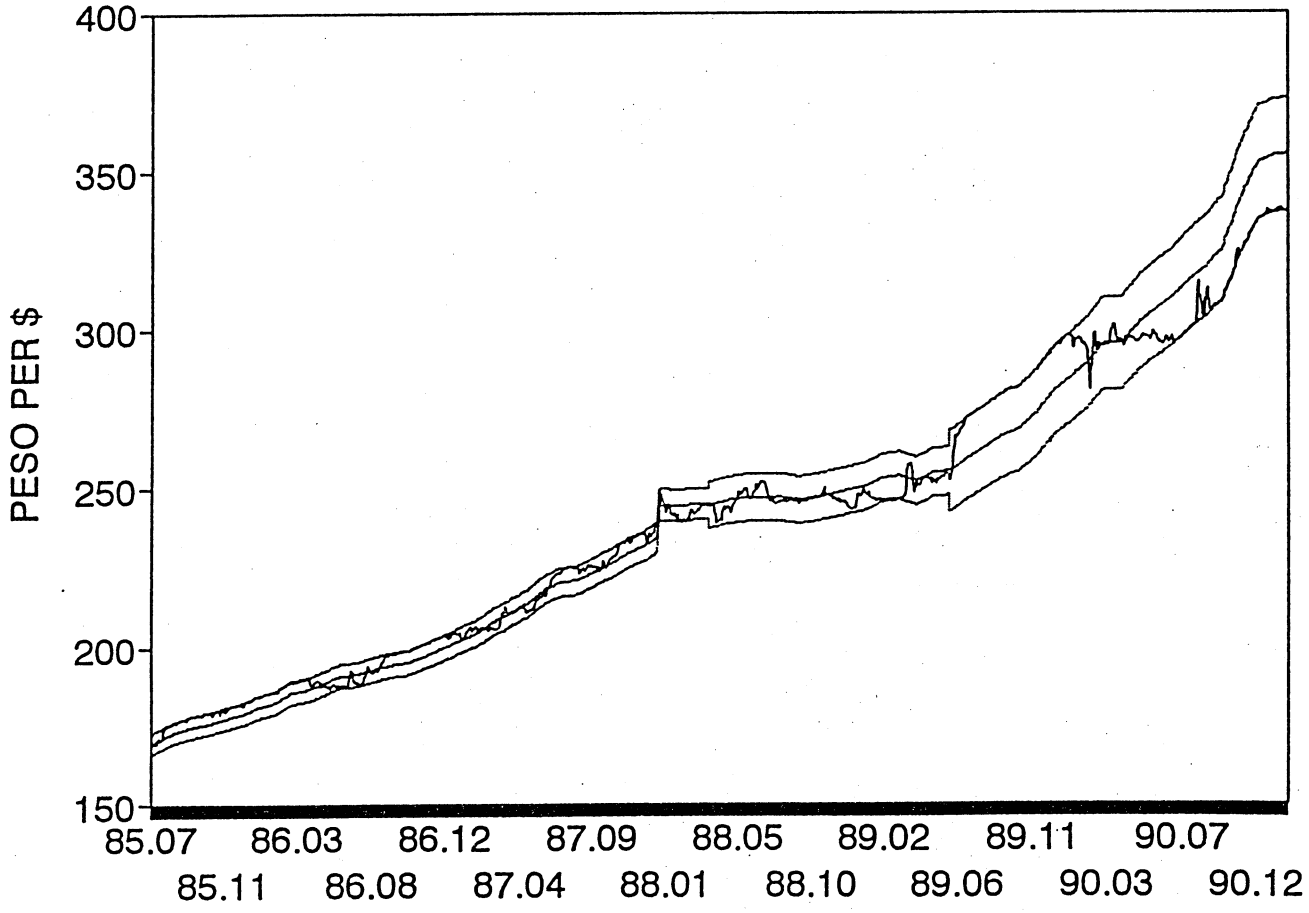


figure exhibits the central parity and the band's upper and lower limits. The enlargements of the band's width are clearly depicted in this figure. Figure 23 provides an enlargement for the period from December 1989 to September 1991. According to reports from the Banco Central, starting in June 1989 the authorities intervened in the foreign exchange market in order to raise the exchange rate and thereby reduce the demand for imports and preserve external competitiveness that had declined in previous months. Accordingly, between May and the end of 1989 the Peso depreciated by about 9 percent in real terms. These developments were, however, reversed after the first quarter of 1990, as high domestic real interest rates along with other factors attracted about $1 billion of short term capital inflows in the first half of 1990. The persistent capital inflow and an improved current account resulted in strong trends towards a nominal appreciation of the Peso. These trends were met by active intervention in the foreign exchange market. The central bank, Banco Central, purchased about $4.5 billion in 1990 and 1991 for that purpose. The outcome was that for about a year and a half, from June 1990 to January 1992, the level of the exchange rate was at the lower limit of the band, yet it depreciated along with the crawling depreciation of the central parity. Finally, the persistent pressures toward appreciation contributed toward the decision by the Banco Central to revalue the reference rate by 5 percent and to expand the band's width to ±10% on January 23, 1992. The authorities justified these measures by indicating that intervention had been costly and that the revaluation essentially validated underlying trends in fundamentals of a structural (long term) nature. In addition, it was argued that the enlargement of the band's width would allow market forces to have a more dominant role in the determination of actual exchange rates.

The real effective exchange rate of the Peso against the U.S. Dollar is plotted in Figure 24. It can be seen that the crawling band regime resulted in a considerable real

Figure 23 - Peso/US Dollar Nominal Exchange Rate in Recent Months

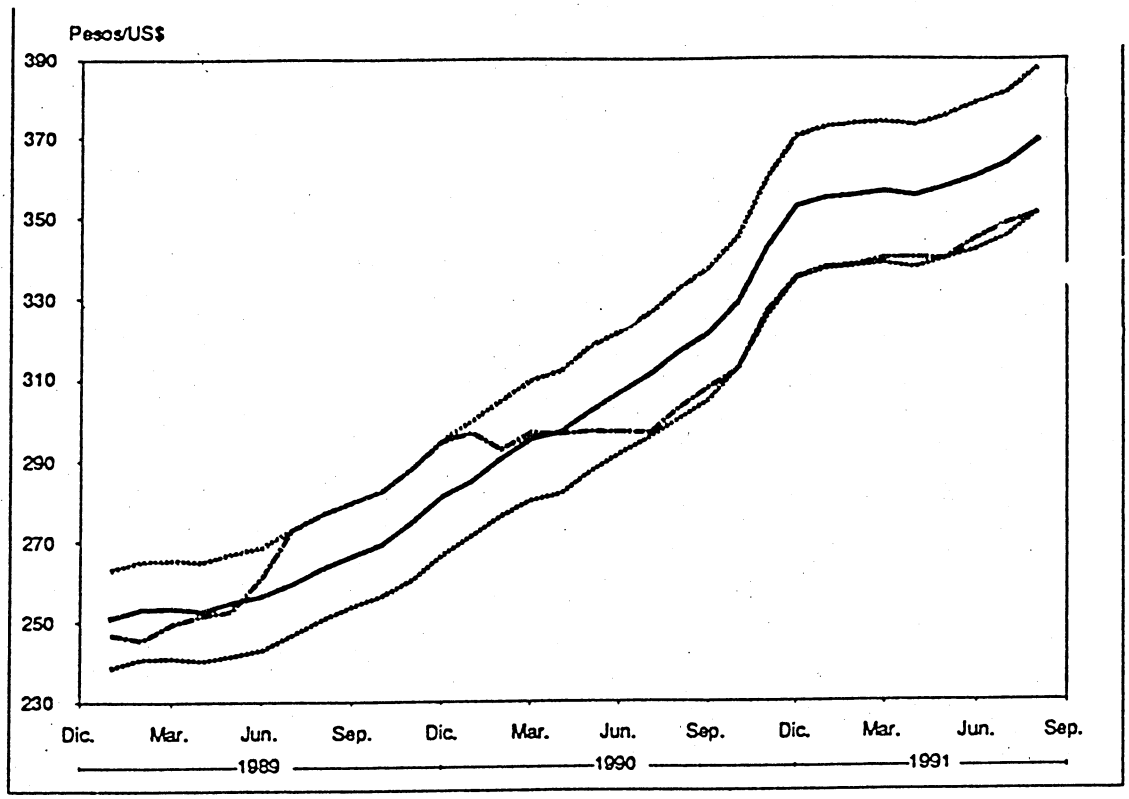
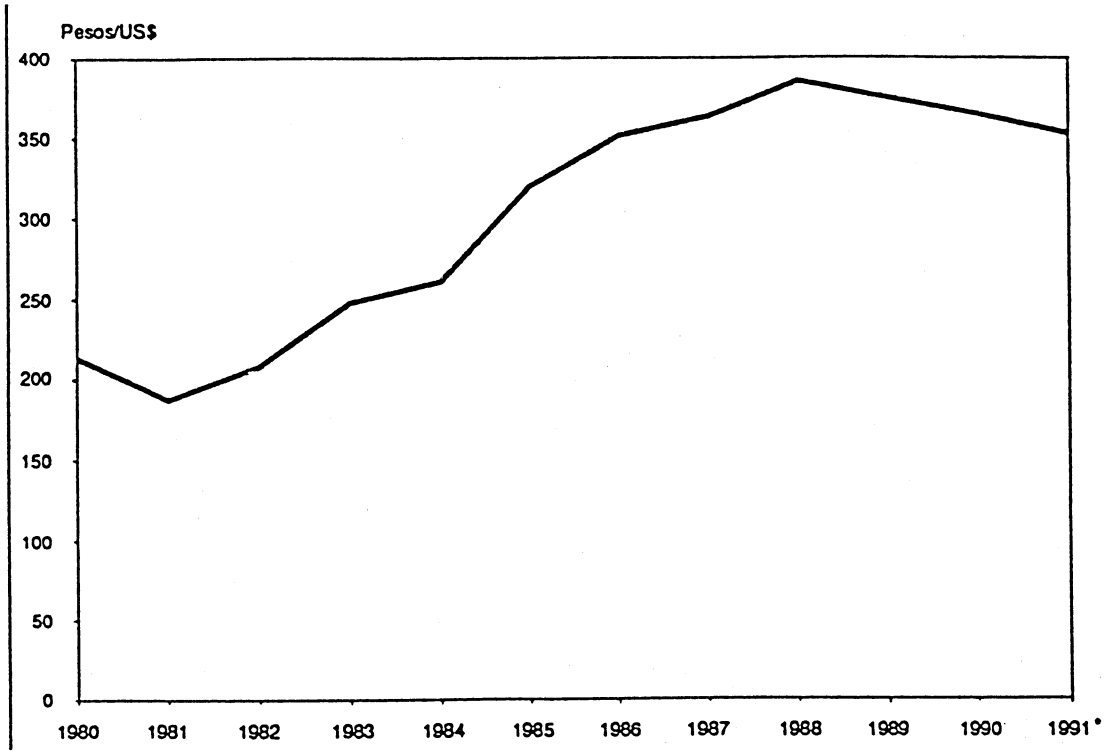


Figure 24 - Chile's Real Effective Exchange Rate



effective depreciation (about 20 percent) between the end of 1985 and the end of 1991. Although in the last three years there has been a weak trend of real appreciation of the Peso, in part due to large capital inflows, Figure 24 highlights the fact that the crawling exchange rate policies throughout the 1980s, along with other important policy measures, resulted in a marked trend of real depreciation. The economy's performance during that period was impressive. During the five years 1986–1990 GDP grew at 6% per year, inflation averaged 19% per year (see Table 3), unemployment fell from 12% of the labor force in late 1985 to less than 6% in 1990, non–copper exports rose by 14% per year in volume, and there was a sharp reduction in the ratio of external debt to exports. Underlying these developments was a supportive budget with near fiscal balance; the budget deficit was only about one percent of GDP between 1985 and 1990.

The nominal interest rate on bank loans is plotted in Figure 25. Up until late 1989 there were monthly fluctuations in the nominal interest rate, yet within a relatively narrow range of between 1.5 and 2.5 percent per month. During 1990 and 1991 there was a marked rise in the nominal interest rate which most probably reflected the impact of Banco Central's attempted sterilization of capital inflows. In other words, it happened precisely during the period in which the authorities heavily intervened by purchasing foreign currencies to support the exchange rate and at the same time sold domestic bonds in order to sterilize part of the increased liquidity. These sales of bonds were associated with high and rising domestic nominal interest rates.

It is difficult to relate in Chile interest rate fluctuations to realignments, because of the continuous process of the latter. Unlike in Israel and the EMS countries in Chile a realignment is not a special event. Under the Chilean exchange rate band, there were no speculative attacks on foreign currencies and no interest rate spikes of the nature observed in Israel and the EMS countries before realignments. At each point in time

Figure 25


Chile: Nominal Interest Rate
(Monthly Rate on 30 to 89 day loans)
(Percent)
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
1986.01
1987.01
1988.01
1989.01
1990.01
1991.0

nominal interest rates incorporate expectations of realignments over the relevant horizon. Thus, as long as market participants regard the system as credible and the size of actual realignments does not differ much from expected realignments, realignments per se provide no reason for interest rate volatility.

Although a complete discussion of economic conditions in Chile during the exchange rate band era is beyond the scope of this paper, it is important to point out that throughout this period there were several reforms that affected the external sector. For example, on April 19, 1990 the authorities removed controls on foreign exchange transactions and allowed every agent to freely exchange foreign currency. Similarly, a 120–day minimum finance requirement for imports was eliminated on January 5, 1990 (Chile maintains an open trading system with a uniform import tariff of 15 percent). And to avoid excessive borrowing abroad, the Banco Central imposed on June 15, 1991 a capital import tax that raises the cost of borrowing abroad for loans with maturity of less than one year. This capital import tax has the same objective as the capital import tax that was imposed in Israel in 1978.

A comparison of the experience of Israel and Chile (see Figures 2 and 22) suggests the following conclusions:

- First, in both countries there was a strong trend of nominal depreciations. The countries differed, however, in the methods employed to effect these depreciations. While in Chile the central parity was raised smoothly every day, Israeli realignments were discrete and surrounded by considerable uncertainty regarding the specific time and size of the change in the central parity.
- Second, in both countries there were episodes in which the exchange rate spent considerable time at the bottom of the band. Some of these episodes reflect a policy choice by the authorities aimed at achieving specific goals.

- Third, while domestic nominal interest rates exhibited in Israel a cyclical pattern that was closely associated with the expected timing of realignments, the continuous crawl of the central parity prevented in Chile realignment–related interest rate volatility.
- Fourth, Chile experienced a marked depreciation of the real exchange rate during the years of its exchange rate band while Israel's policy was associated with a relatively stable real exchange rate (albeit at an historically low level). Chile's emphasis on real depreciation and export promotion was not accompanied by an acceleration of inflation. The rate of inflation was also stable in Israel.

6. POLICY IMPLICATIONS

The choice of a suitable exchange rate regime is a difficult matter for every country, and the more so for countries with complex economic problems. In each case it is necessary to identify objectives of the exchange rate policy that fit in together with other objectives of the broader policy design and with other instruments available for policy making. Countries with built in inflationary pressures that cannot be dealt with efficiently by means of monetary and fiscal policy will, for example, adopt different exchange rate regimes than countries that do not face these type of difficulties with inflation. And countries that face severe balance of payments constraints typically adopt different exchange rate policies from countries that face no problems of external financing. For these reasons it is necessary to evaluate Israel's exchange rate policy from the point of view of the constraints that the economy was facing and other available options.

Let us therefore recall that in 1985 Israel implemented a major stabilization program that was designed to curb the rate of inflation from over 400% per annum to acceptable low levels (a one digit inflation rate was the objective at the time). A central tenet of the program was that an elimination of the budget deficit and tight monetary policy would not be sufficient to achieve the inflation objective at acceptable levels of unemployment. This view was based on two major arguments [see Helpman and Leiderman (1988)]: (i) that the country's long experience with inflation and the system of indexation that emerged from it resulted in a structure of inflation expectations that would not be eliminated by orthodox policy measures; and (ii) that there was a weak control of nominal aggregates up to the point that conventional monetary policy could not be used to stabilize the rate of inflation at a desired level, and especially so in the face of expected major structural changes. This twin objection to a conventional policy mix led to the adoption of the exchange rate as the main nominal anchor (it was also supplemented by temporary wage and price controls). Given broad agreement on the need to balance the budget, it remained to choose an exchange rate policy that will fulfill the task of price stabilization.

The stabilization program adopted a fixed exchange rate vis a vis the US dollar. This was replaced with a fixed exchange rate vis a vis a currency basket in the summer of 1986 (see Table 1). Given that inflation remained in the range of 15–20 percent per annum, however, it was difficult to maintain a fixed exchange rate and the central bank performed four devaluations before it changed the regime to an exchange rate band at the beginning of 1989. As we have explained in the Introduction, the purpose of the band was to better accommodate the inflationary pressures and at the same time to allow conventional monetary policy to play a greater role without destabilizing the capital account in the face of attempts to reduce foreign exchange controls. The latter point builds on the argument that a fixed exchange rate and relatively free capital

mobility significantly reduce the potency of open market operations.

Was Israel's post–stabilization exchange rate policy wise? In order to answer this question it is necessary to review options that were not chosen. One option is a crawling peg, with which the country experimented in the mid seventies. Another is a managed float. Recall that this was the country's policy in the late seventies and early eighties. This time the degree of intervention could be adjusted to current circumstances. Both policy options were rejected at the beginning of the stabilization program as well as during the shift to a currency band. The main reason for this rejection was the perceived effect of these policies on inflationary expectations. It was argued that contrary to the need to curb inflationary expectations these policies help preserve existing inflationary expectations. The same arguments were used to reject more gradual realignments of the central parity during the 1989–1991 exchange rate band regime.

The counter argument in favor of gradual upward adjustments of the exchange rate rests on the uncertainty introduced by infrequent adjustments and the resulting real appreciation that weakens international competitiveness. Israel suffered from both, as we have documented in this paper. And indeed these are the arguments that brought about a shift to a crawling band at the end of 1991. The timing of the policy changes is important. We believe that the adoption of a fixed exchange rate at the beginning of the stabilization program played a major role in its success. But we also feel that beginning with 1988 there was room for a more flexible exchange rate policy, designed to improve competitiveness by preventing real appreciations and some of the increase in unemployment.

We believe that a target zone regime is an appealing exchange rate system for the Israeli economy. This regime can enable the country to preserve the advantages of a nominal exchange rate anchor that curbs inflationary expectations and at the same time

provide room for limited short run flexibility. A target zone, or an exchange rate band, allows for some degree of adjustment of the nominal exchange rate in response to external and internal shocks that do not represent a reneging on medium– and long–term nominal policy targets. Furthermore, movements of the exchange rate within the band provide the policy maker with information about the nature and degree of persistence of the shocks, and about the need to adjust the central parity.

Adopting an exchange rate band forces the authorities to take a stand on key operational issues. First, the central parity can be fixed or it can crawl. In countries with rates of inflation significantly above the rates of inflation of their trade partners a permanently fixed central parity is not feasible. Therefore for such countries the real choice is between infrequent realignments and a crawl. Infrequent realignments generate substantial uncertainty about the timing and size of adjustments, produce interest rate volatility, and damage the credibility of the band, as we have documented in this paper. This feeds undoubtedly into inflationary expectations, although we do not have estimates of this effect. Second, when adopting a crawling central parity the authorities have to choose the crawl's pace on explicit criteria. It can be based on a nominal target (e.g., inflation objectives) or on a real target (e.g., the real exchange rate). Third, it is necessary to choose a widths for the exchange rate band. Bands of ±2.25 percent around the central parity have been used in Europe, of ±5 percent in Chile and Israel, and of ±10 percent in Chile at the present time. The choice of the band's width involves an assessment of the variance of the shocks impinging the economy and its foreign exchange market, as well as the degree to which the authorities can commit to narrow limits of exchange rate flexibility. The size of a band determines interest rate volatility even in the absence of realignments, but there exists no monotonic link between the band's width and the degree of interest rate volatility [see Svensson (1991)]. Fifth, there remains the issue of whether intra marginal interventions will be used and

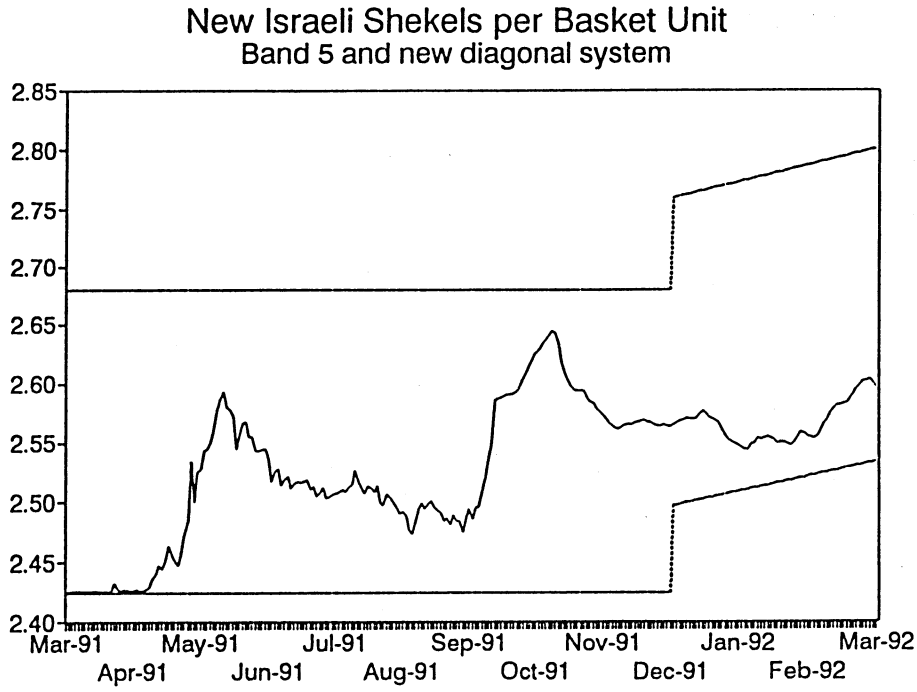
under what circumstances. The authorities may, for example, choose to react to a decrease in the profitability of exports by accelerating the rate of depreciation within the band.

Our work points out important difficulties with Israel's exchange rate band from 1989 to 1991, and in particular with the choice of a fixed central parity followed by infrequent realignments. Given the behavior of fundamentals and the institutional constraints this choice implied that sporadic realignments were necessary in order to restore competitiveness by compensating foreign currency holders and exporters for the accumulated difference between the domestic and foreign inflation. It turned out that realignments of this sort occurred five times in less than three years. In each case, there was a large degree of uncertainty and speculation about the time, size, and nature of realignments. These factors, in turn, were reflected in costly foreign exchange interventions and in enhanced volatility of interest rates and returns on other assets.

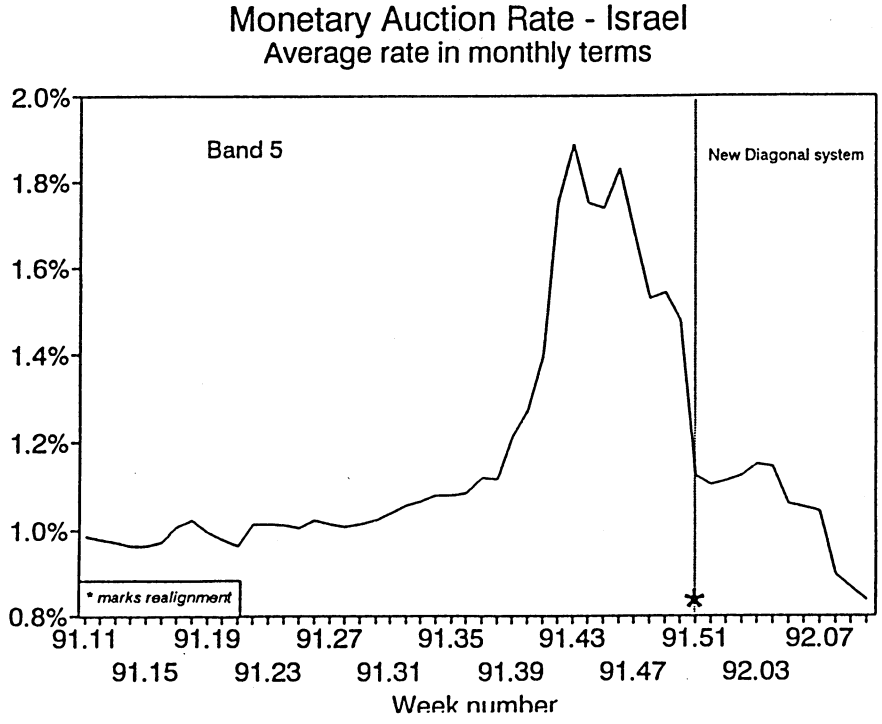
We believe that some of these difficulties have been removed by the adoption of the crawling band in December 16, 1991. The pre announced gradual increase in the central parity has become a key anchor for nominal variables and for inflationary expectations. From the standpoint of inflation discipline and of stabilizing inflation expectations, the new Israeli system has much to offer. There are good reasons to expect the policy of small daily depreciations of the central parity to be perceived as credible by dealers in foreign exchange, and therefore to attenuate, if not eliminate, the volatility of nominal interest rates that prevailed in the previous regime. Figures 26a and 26b provide evidence on exchange rate and interest rate behavior during the first three months of the crawling band. Most notable is the sharp drop in the nominal interest rate that occurred during this period.

Figure 26

26a:



26b:



Having said this, however, many issues remain open. First, it is not yet clear how and when the authorities will announce their central parity targets for the period beyond the first twelve months of the new band. Second, lack of credibility remains a painful problem, as exemplified by the speculative attack in early July, 1992. Large internal or external shocks may still bring about the need to depart from the prevailing commitments. Important in this context are the degrees of alignment and consistency between exchange rate policy and the underlying fiscal and monetary policies. A shift toward sharply expansionary fiscal and monetary policies could impose severe strains on the present exchange rate policy and could lead to substantial deviations from the adopted band. Third, there is the "morning after" Europe's convergence to a single currency and its implications for the exchange rate policy in Israel. One key question is whether in that event Israel should adopt the ECU as the reference currency. All these issues need to be discussed in detail.

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