Inflation and Policy Response - The Israeli Case: 1970-1989

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INFLATION AND POLICY RESPONSE
THE ISRAELI CASE: 1970-1989

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I. INTRODUCTION

The Israeli economy has served as a laboratory for the study of inflation and government policy response. In periods crucial in the Israel's inflationary history (such as 1977-1985), finance ministers were replaced frequently, often changing their predecessor's policy, much to the detriment of inflation.

Inflation grew from an average of less than ten percent per year in the decade preceding the first oil price shock to nearly 450 percent in 1984. In mid 1985 a comprehensive and successful stabilization program brought inflation down to about 15 to 20 percent at which level it has been stabilized since.

The inflationary process has been characterized by periods of stable inflation, followed by sudden shocks after which inflation again stabilized at a higher level. This stepwise development suggests a

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division of our observation period into several sub-periods as shown in Figure 1.

As emphasized in LIVIATAN and PITERMAN (1986), inflation often developed in an opposite direction to the budget deficit, an anomaly which has received considerable attention in theoretical work.

The variability of inflation, as measured by the yearly coefficient of the variation in monthly rates, increased with inflation and in 1984 it jumped to about twelve times its 1983 level. This positive relationship between inflation and its variance has also been observed in other economies.

Another feature of the Israeli economy is the apparently asymmetrical response of inflationary expectations to policy shocks such as discretionary devaluations and increases in governmentally administered prices (BRUNO and FISCHER, henceforth BF, 1986).

In the following section we shall present a simplified version of a model by BF (1984, 1986, 1987) and BRUNO (1989) which provides a rationale for the existence of the relatively prolonged stages in inflation.

As shown by calculations in Section 3, this model helps in explaining the major forces behind Israeli inflation in the long run. However, in the short run considerable deviations remain. These departures from the underlying rate of inflation are analyzed in Section 4. This includes the critical transitions to three digit inflation in 1979 and to run-away inflation in 1984. The rapidly growing costs of inflation both to the public and the government finally induced politicians to implement a comprehensive stabilization plan in mid 1985 (Section 5). The paper is concluded with an account of the costs and benefits of disinflation in Israel.

II. THE MODEL

BF argue that, in the long run, the inflation in Israel has been determined by the interplay of several factors:

(1) the continued budget deficit, (2) the protracted slowdown in economic growth since the first oil shock, (3) a high degree of monetary accommodation, largely due to the combination of a crawling peg regime and extensive asset indexation and (4) the public's response, which consisted of an increasingly rapid adaptation of inflationary expectations.[1]

FIGURE 1

SHORT RUN INFLATION (π_S) AND PERIOD AVERAGES (π), 1970-1989

(percent per annum)

years

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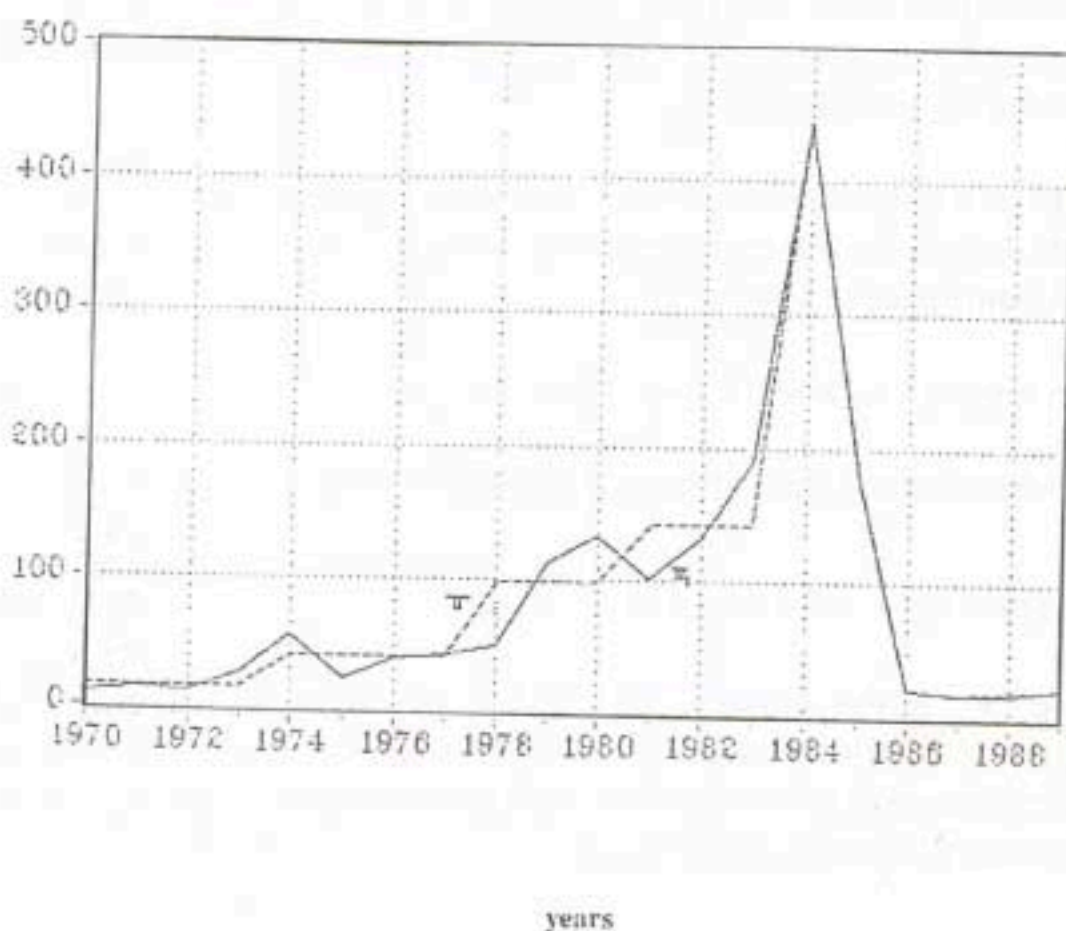
(1) The importance of some of these sources of inflation were recognized in earlier works on inflation in Israel such as in LITVIN, MERIDOR and SPIVAK (1984), SHIFFER (1982) and SOKOLER (1984).

These features are brought together in the following model, to explain the underlying inflation and to provide a rationale for the prolonged existence of a high inflation equilibrium, when a similar budget deficit and monetary policy could also be consistent with a lower inflation rate. The budget deficit (G-T) in an open economy is financed from three sources, namely the printing of high powered money (H), the issuance of (indexed) domestic government bonds (B) and official external finance (F):

$$G - T = \dot{H}/P + \dot{B} + \dot{F}E/P \tag{1}$$

Government outlays (G), taxes and unilateral transfers (T), and B are in real terms, H and F are nominal variables, the latter in foreign currency. E denotes the exchange rate and P the price level. The dotted variables are time derivatives.

In a steady state the output ratios of high powered money (h), bonds (b) and the external debt (f) are constant, i.e. the real assets grow at the same pace as output (Y).

$$h = H/PY = h_0, \quad b = B/Y = b_0, \quad f = FE/PY = f_0 \tag{2}$$

or after taking logs and differentiating by time we get:

$$\dot{H}/H = \theta = \pi + n, \quad \dot{B}/B = \dot{F}/F = n, \tag{3}$$

where π is the inflation rate and n is output growth. Dividing equation (1) by output, substituting for equation (3) and deducting foreign finance of the deficit from both sides of equation (1) we get the domestically financed deficit ratio:

$$d_1 = d - (\dot{F}/F)f = \pi h + n(h+b) \tag{4}$$

Solving for π and denoting (h+b) as v, we may write steady state (S.S) inflation as:

$$\pi = [d_1 - nv]/h. \tag{5}$$

Equation (1) is an identity whereas equation (4) is a long run equilibrium condition. The partial derivatives of equation (5) are:

$\pi_h = -(1/h^2)(d-n(b+f)) < 0$ for any positive steady-state inflation and $\pi_d > 0$, $\pi_n < 0$.

The High Inflation Trap (HIT)

For expositional purposes we assume that the deficit is financed only by base money (though the main conclusions hold also for the more general case of equation (4) as can be seen in BF (1987)). The deficit can be written as:

$$d = \Theta h \tag{1'}$$

The demand for money is assumed to be of the Cagan type,

$$h = \exp(-\alpha \pi^e). \tag{6}$$

and inflationary expectations are assumed to be formed adaptively;[2]

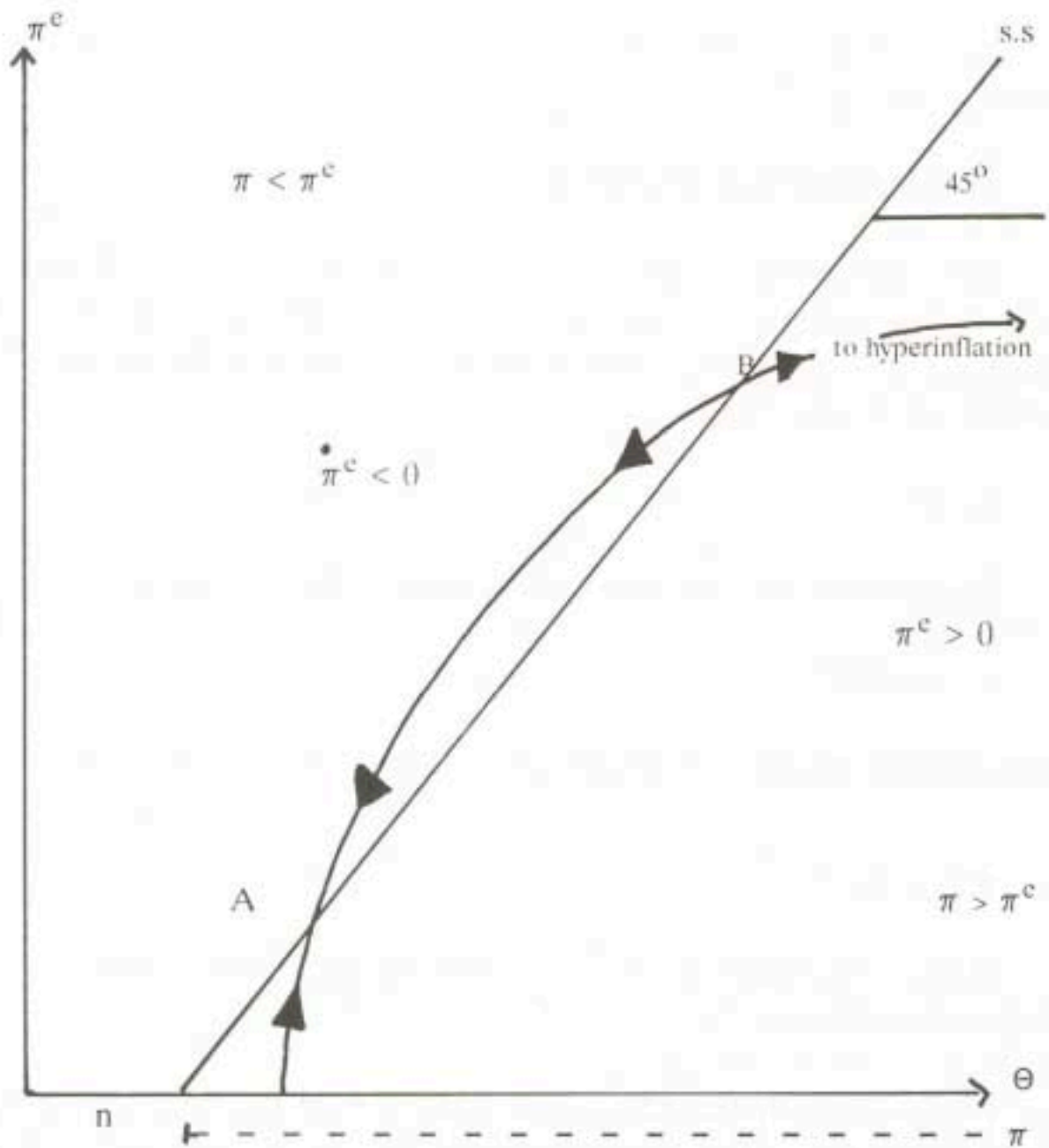$$\dot{\pi}^e = \beta(\pi - \pi^e). \tag{7}$$

We note that since in S.S. $\dot{\pi}^e = 0$ this implies $\pi(\text{S.S.}) = \pi^e(\text{S.S.})$ (45 degree line in Figure 2).

From differentiating the output ratio of high powered money we know that $\pi = \Theta - n$. Therefore, any point below the S.S. line implies $\pi > \pi^e$ and above the line $\pi < \pi^e$.

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(2) BF (1987) also discuss the model's implications for rational expectations.

FIGURE 2

low ß. (ß < 1/α)

Differentiating money demand (6) with respect to time and solving for π we get:

$$\pi = \Theta - n + \alpha \dot{\pi}^e \tag{8}$$

Substituting equation (8) into equation (7) and collecting terms, we get:

$$\dot{\pi}^e = (1-\alpha B)^{-1} B (\Theta - n - \pi^e).\qquad(9)$$

The budget line (d) is obtained from substituting equation (6) into equation (1') and solving for π^e.

$$\pi^e = -1/\alpha \log d + 1/\alpha \log \Theta \qquad(10)$$

The model yields a dual equilibrium, at low (A) and high inflation (B). Equation (9) implies that the low inflation equilibrium is stable for low levels of B (i.e. when $B < 1/\alpha$) while a sudden shift to the right of B leads to hyperinflation. By the same line of argument, a high B (namely $B > 1/\alpha$) yields stability at point B. This may be called a trap, since a given deficit could be financed with low inflation (point A), but nevertheless the stable equilibrium is at point B, the Pareto inferiority outcome. Furthermore, a restrictive fiscal policy will worsen inflation. This counterintuitive result stems from the economy being on the "wrong" side of the Laffer-curve, where the relative increase in the inflation-tax rate π is smaller than the relative decline in the tax base (h). The combined effect thus reduces seigniorage.[3] In other words, the "short-run" relationship of deficits and the rate of inflation need not be positive. This phenomenon was observed for Israel in LIVIATAN and PITERMAN (1986). This Laffer-effect can be seen from Figure 3. An increase in inflation at point A raises h above d. A similar increase in π at B forces the government to reduce d.

An interesting extension to this model is given in BRUNO (1989). In order to sustain rapid inflation, the Central Bank has to accommodate money demand continuously; for example, through recurrent devaluations of the exchange rate. A common exchange rate rule may be to peg unit labor costs in order to maintain producers' competitiveness.

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(3) This result is also obtained in other models, such as BARRO and GORDON (1983), DRAZEN and HELPMAN (1989) and SARGENT and WALLACE (1981).

$$\dot{e} = \beta_1 (w-e) \tag{7'}$$

where e is the rate of devaluation, $\dot{e}$ its acceleration and w denotes wage inflation. The coefficient β_1 reflects the authorities' speed of accommodation and may itself rise with inflation. Of course with a rapidly accelerating inflation where inflation is reported once a month, the rate of devaluation (available on a daily basis) and $\dot{e}$, its adjustment tend to be used in the formation of inflationary expectations. Wage *inflation can be written as a function of inflation, reflecting indexation* (backward looking) or inflationary inertia and inflationary expectations (e, forward looking).[4]

$$w = \Phi \pi + (1-\Phi)e \tag{11}$$

Rewriting equation (11) as:

$$w - e = \Phi (\pi - e) \tag{11'}$$

and substituting into equation (7') we get:

$$\dot{e} = \beta_1 . \Phi (\pi - e) \tag{12}$$

where $\beta(e) = \beta_1 (e).\Phi$ can be interpreted as the public's adaptive expectations coefficient, in the same spirit as β in the above HIT analysis.

The Israeli experience in 1981 to 1983 (see below) illustrates the difficulty faced by the authorities in reducing a high β coefficient. For example, an administrative decision to slow down the rate of devaluation (i.e. a reduction in β_1) without a complementary correction of fundamental imbalances in the economy will fail to gain credibility. In such a case the public's inflationary expectations will tend to exhibit strong inertia (a high value of Φ) based on the public's belief that high inflation will persist and that the temporarily low rate of devaluation e is inconsistent with wage demands. In view of the rapidly deteriorating

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(4) The role of unemployment is neglected here.

competitiveness, the authorities will eventually have to give in and return β_1 to its high level.

FIGURE 3
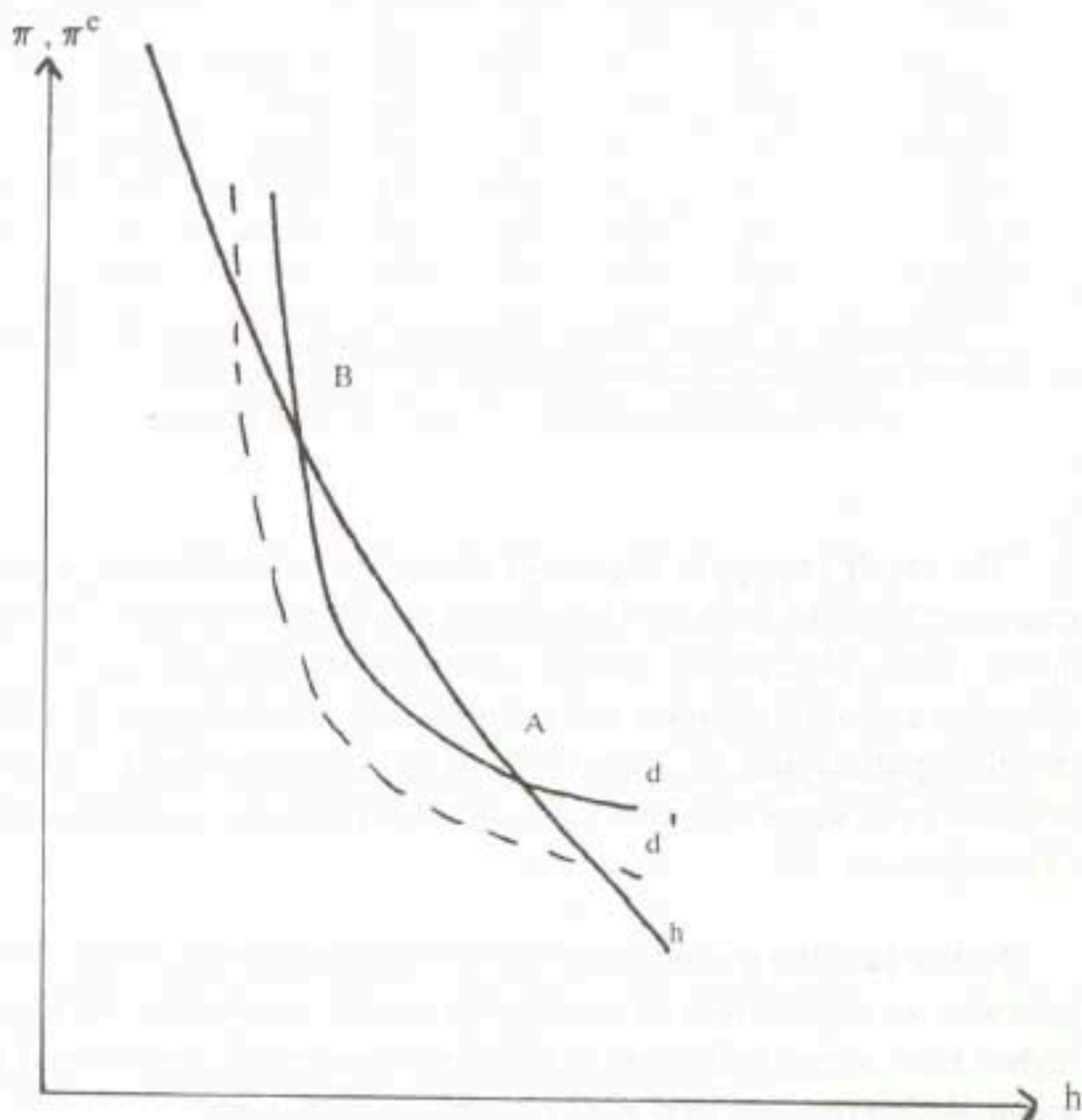
III. CALCULATION OF UNDERLYING INFLATION

Similarly to BRUNO and FISHER (1986, 1987) and BRUNO (1989), we calculated the underlying rate of inflation (Table 1) as implied by equation (5).[5]

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[5] The limitations of the data are severe. The deficit is frequently updated, sometimes for a number of years and by sizeable amounts. We use the data of MERIDOR (1988). Since there is no data for the 1989 deficit according to the old SNA, we used the new definition from 1980 onward. The domestic debt is based on an indirect estimate rather than on actual stocks of bonds (YARIV, 1986).

TABLE 1
CALCULATION OF UNDERLYING INFLATION, BASED ON EQUATION (5)

Period	d	n	n*v	d-nv	h	underlying inflation	actual rate
1970-73	5.9	9.1	6.9	-1.0	0.139	(0)	16
1974-77	6.6	3.0	3.0	3.6	0.094	38	40
1978-80	13.5	3.9	4.6	8.9	0.051	173	97
1981-83	9.8	2.6	3.1	6.7	0.025	271	141
1984	8.4	2.3	3.0	5.4	0.017	323	445
1985	5.9	3.9	5.2	0.7	0.034	21	185
1986-87	0.8	4.4	6.0	-5.2	0.047	(0)	102
1988-89	3.0	1.4	1.6	1.4	0.052	26	19

Sources: Budget data up to 1986 from MERIDOR (1988), all other data from the data bank of the Research Department, Bank of Israel.

The result ($\pi_{(S.S.)}$ in Figure 4) shows that all inflation stages are consistent with the formula's prediction though their levels are quite far apart. The calculations exceed inflation significantly in the late seventies and early eighties, and fall short of actual inflation in 1984. In the first period and in 1986-1987, the calculations yield a negative inflation rate, suggesting that some or all explanatory variables are out of steady state.

Notice that the period since the stabilization plan (at least 1988/9) indicates an equilibrium at a relatively low level, though considerably higher than actual inflation. A different assumption on external debt accumulation resulted in $\pi = 14$ percent for 1988-1989.[6]

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(6) It seems that BF used actual $\dot{F}/F$ in equation (4) and so did we in Table 1. However, a more consistent assumption is $\dot{F}/F = n$, implying that v in equation (5) includes not only h and b, but also net official external debt (f). Then the deficit d_1 needs to be substituted for the total deficit (d). The results are:

1970-1973	1974-1977	1978-1980	1981-1984	1988-1989
0	129	190	548	14

FIGURE 4
STEADY-STATE INFLATION (π_{ss}) VERSUS ACTUAL INFLATION (π), 1970-1989

(percent per annum)

years
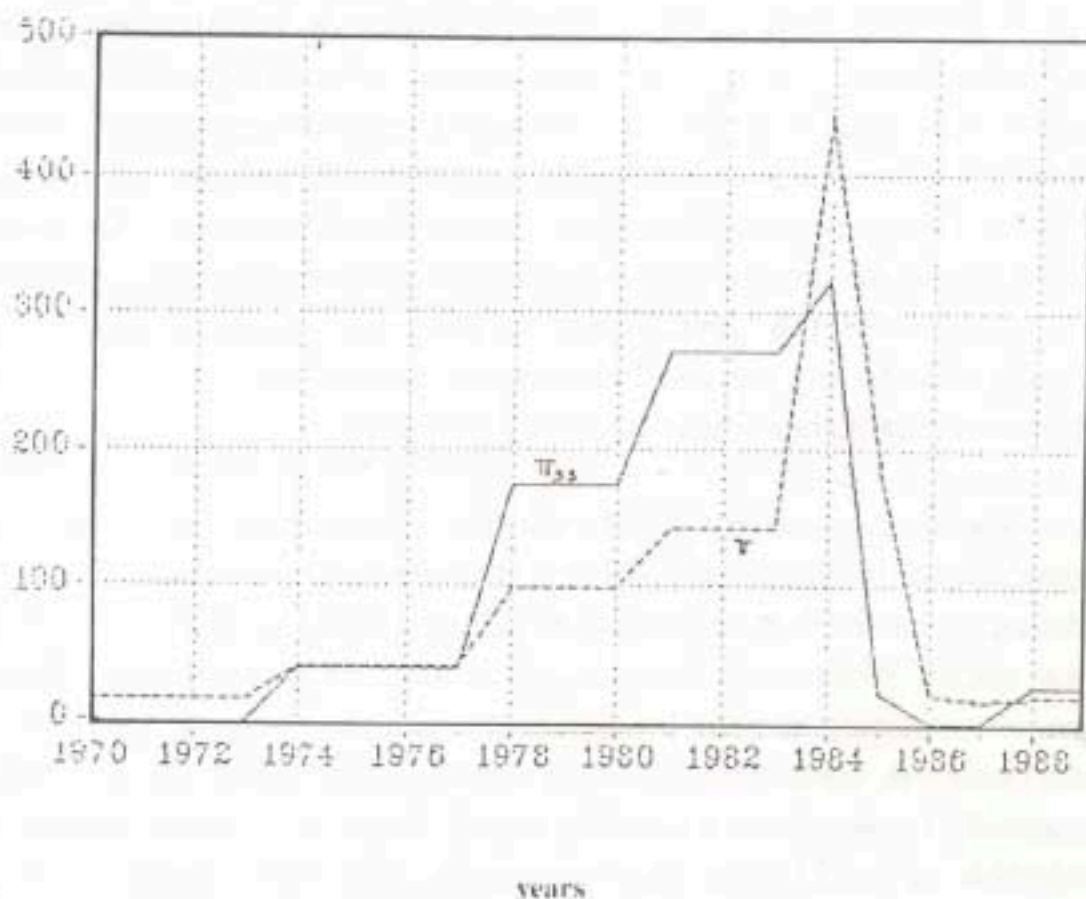
IV. INFLATION IN THE SHORT RUN

While steady state considerations provide some understanding for the shifts of inflation rates in the medium and long run, the short run inflation differed sometimes significantly from the respective period average. Relying on "eye-econometrics," one might have included 1978 in the second period, 1979 to 1982 in the third and 1983 and 1984 in the fourth. However, this way of splitting the sample period into subperiods is technical, whereas the present division is more policy-oriented.[7]

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(7) The division in LIVIATAN-PITERMAN (1986) does not differ much from ours.

According to LIVIATAN and PITERMAN (1986), the change in stage in 1974 reflected a typical problem of the Israeli inflation.[8] The budget deficit doubled in 1974, reaching 18 percent of GDP. With the pegged exchange rate, this deficit spilled over into the current account, whose deficit grew by about 4 percent of GDP. The government reacted to these growing deficits by a sharp price shock initiated by a cut in subsidies and a 40 percent devaluation. Interestingly, this one-time shock was not immediately translated into a new higher level of inflation. Figure 1 shows that inflation declined again in 1975. Monthly figures even show that the November/December 40 percent devaluation was not caught up to by inflation for at least three quarters of 1975, when the government decided to accelerate devaluations, finally abandoning the fixed rate system for a crawling peg. This event certainly established inflation at a higher level.

The next significant event was the abolition of foreign exchange regulations in October 1977 by the newly elected government, in disregard of the fundamental disequilibrium in the economy. Inflation was above 30 percent, the budget deficit had grown and reached 15 percent of GNP, and the rate of devaluation had been accelerated. The deregulation was accompanied by a sharp price shock. Governmentally controlled prices were raised by nearly 70 percent within the last five months of 1977 and the exchange rate was devalued by an unprecedented 46 percent as part of the liberalization package. It took a few months for inflation to step up, but by 1978 inflation had reached about 50 percent, up from an average of about 30 percent on the eve of the liberalization.

Another crucial feature of the liberalization was the creation of foreign exchange linked deposits, including demand deposit (PATAM) accounts. Although this helped preserve the foreign exchange reserves from speculative attacks better than before, it became clear (with the benefit of hindsight) that this had two important shortcomings: the public's wealth now became indexed to a much higher degree than

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(8) They explain inflation by the combined effect of frequent and sudden shifts from the balance of payments objective to the inflation objective and back, with each price shock being translated into ongoing inflation due to monetary accommodation and expectations. However, LEFDERMAN and RAZIN (1988) reject this hypothesis.

before. This caused a shift out of the demand for high powered money, thus raising long run inflation. Furthermore, any devaluation now had a much stronger wealth effect, since unlike international reserves, these PATAM accounts were domestically created and could grow beyond the level of foreign reserves in periods of increased devaluation expectations.

In other words, the typical real balance effect, which should reduce domestic demand following a price shock, was strongly diminished with increased wealth indexation. Such price shocks tended thus to be translated more easily than before into increased inflationary expectations.

During 1979 the budget deficit continued at a very high level (about 20 percent), and the price shock from the second oil crisis was even larger than the previous one. The public continued to substitute domestic currency for foreign currency linked deposits (h fell from a low 7.5 GNP percent to an even lower 4.5 percent). By the end of 1979, with inflation remaining at three digits, the finance minister Orgad was replaced by Hurwitz, whose aim was to follow a conventional anti-inflationary financial policy. However, as in the past, the policy was again introduced by an initial price shock. As a result, the deficits in the budget and the balance of payments improved significantly, though at the cost of increased unemployment. This contradicted the preferences of Israeli society concerning the inflation/unemployment trade-off. Corrective policies were abandoned due to adjustment fatigue and Hurwitz resigned.

The new finance minister, Aridor, argued that inflation reflected largely a bubble of self-fulfilling expectations and that all that was needed was to break the vicious circle of devaluations and expectations by slowing down devaluations, even if the budget was in deficit. Meanwhile inflation had reached about 130 percent. With elections nearing (1981), import tariffs were slashed, government controlled prices were kept down and the real exchange rate appreciated strongly, with the immediate result of a deterioration in the government's and the balance of payment's deficits. Inflation did decline from about 135 percent at the time Aridor had taken office, to some 110 percent in late

1981 and early 1982.[9] By August/September 1982 it became evident that inflation was back at about 130 percent with an overvalued exchange rate, implying considerable suppressed inflation. The finance minister nevertheless continued in the same spirit; in October he announced a policy of forcing down inflationary expectations by sticking to a rule of monthly 5 percent changes in governmentally controlled prices and the exchange rate. Monetary policy remained expansionary since real bond yields were more or less pegged. Real wages continued to grow.[10] As a result the current account deficit deteriorated. The adjustment of the rapidly appreciating real exchange rate was delayed until October 1983. Subsidies had also grown automatically with inflation, thus forcing large increases in government controlled prices. All these price shocks were immediately translated into inflation by the interplay of increasingly rapid adjustments in inflationary expectations (see GOTTLIEB et al., 1985) and the automatic monetary accommodation largely due to the indexation of financial assets. Elections were announced for July 1984. Inflation had more than doubled within about half a year (from September 1983 to April 1984) and was running at an annual rate of 263 percent.

By then the government's tax revenues had begun to dwindle due to the private sector's dragging tax payments as much as possible. The costs of inflation became increasingly visible both to the government, with its revenue source threatened (the Olivera-Tanzi effect), and to the public who had to allocate more and more resources to the maintenance of real income despite widespread indexation (see also SHIFFER, 1982 and 1986). MAROM (1986) had estimated that the inflation induced expansion of the financial sector cost the economy (in the early eighties) about 2 percent of GNP per year. KLEIMAN's estimate (1984) of 3-4 percent of GNP also included other elements. A further cost to a borrowing country, such as Israel, is the increased risk premium on foreign loans GOTTLIEB (1989), raising the cost of external finance.

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(9) Of course, part of this decline may have been the lagged effect of the predecessor's contractionary fiscal and monetary policies.

(10) This may be due to high inertia Φ in equation (11), though HELPMAN and LEIDERMAN (1987) dismiss this explanation.

The growing concern about inflation led the government to seek ways to reduce inflation by cooperating with the labor union (HISTADRUT) and with the Employers' organization. A package deal was proposed, in which the government promised to refrain from raising taxes or government controlled prices and the union and employers agreed on freezing real wages and the COLA agreement. Three such consecutive deals were attempted - without success. They failed because the government kept evaluating the exchange rate rapidly; and the fundamental policy variables such as the government deficit and monetary accommodation remained inflationary.

The failures of the various package deals paved the way for a comprehensive stabilization program. It had become widely understood that a successful plan should be two pronged, namely attacking the balance of payments and inflation simultaneously, and also being quick and radical rather than gradual (see SOKOLER et al., 1984).

V. THE STABILIZATION PLAN[11]

The stabilization plan included the following major measures:

(1) Orthodox measures

A planned cut in the budget deficit of about 10 percent of GDP was forecast in the 1984/5 budget. It was recommended to achieve this goal through expenditure cuts rather than tax increases. The political choice was a cut of 6 percent of GDP, mostly through taxation and a reduction of subsidies.

Monetary policy was tightened in order to slow down domestic demand pressure and also to attract foreign capital and thus strengthen foreign exchange reserves.

The barring of PATAM demand deposits for new funds. Discussions were stepped up to reduce monetary accommodation by a new law intended to limit the government's automatic overdraft facility

(11) A detailed analysis is found in BRUNO and PITERMAN (1988).

at the Central Bank (up to 20 percent of the deficit). Since 1986 the government has to balance the account for the year as a whole, but can use the overdraft facility in the short run.

(2) Heterodox measures

The exchange rate was devalued by 19 percent. Free goods and services were allowed a one time price adjustment of about 17 percent on average. Thereafter prices were frozen for three months.

The COLA agreement was temporarily suspended in exchange for a one-time compensation and an agreed upon path of future wage increases. The so called heterodox measures aimed at strengthening the government's credibility (especially in terms of the exchange rate and governmentally controlled prices) and at appeasing the labor union (price controls). However, they also helped to break the automatic monetary accommodation. In terms of the high inflation trap analyzed in Section 2, the measures can be rationalized as is done in Figure 5.

Credibility was also strengthened by political factors such as the establishment of the National Unity government, and the special US grant of US$ 1.5 billion (which was made conditional upon the implementation of an agreed upon program approved by a joint US-Israeli committee of professional economists).

The result was a sharp and rapid fall of inflation-from an average of 477 percent monthly inflation (in annual terms) in the twelve months preceding the stabilization plan to a rate of 58 percent p.a. in the three months following it (excluding the month of implementation). From then on inflation stabilized at about 15-20 percent and has not changed much since.

The stabilization plan has been successful in slashing inflation and in keeping it relatively low. Moreover, business GDP started to boom (5.8 percent real growth in 1986 and 7.0 in 1987) led by private consumption, exports, and, in 1986 also, investment. Many observers held the combination of orthodox and heterodox policies, supported by foreign aid, responsible for this seemingly costless adjustment program.

However, by mid 1987, though it had yet to be discerned, growth began to slow down and eventually turned into a recession by 1988.

BRUNO and MERIDOR (1990) analyzed the extent to which the recession was caused by the stabilization plan. To answer this question they first estimated the output loss due to the supply shocks of the Intifada and the election year.[12] They then subtracted the sum of these effects from the difference between potential and actual business GDP growth and arrived at a total cost of disinflation of about 3.5 to 4 percent over two years. They explain the initial, strong consumption boom, which delayed the recession, by an excessively optimistic outlook due to the swift success of the stabilization plan.[13] When the adjustment difficulties became apparent, consumption adjusted rapidly.

They further argue that the inverse Olivera-Tanzi effect and extremely high real interest rates reduced business profitability and thus investment demand. The consumption boom probably also delayed necessary structural adjustments shifting the attention back from financial to real activity.

We may thus conclude that disinflation has been achieved at a relatively low and delayed cost. The delay makes such a program a politically attractive alternative to a plan which extracts the price immediately.

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(12) The latter caused a postponement of the devaluation, which affected exports negatively.

(13) KIGUEL and LIVIATAN (1988) argue that the consumption boom reflects low credibility due to inevitable real exchange rate appreciation in stabilization programs hinging on the exchange rate anchor. As a result, consumption is precipitated.

FIGURE 5
THE EFFECTS OF THE STABILIZATION PROGRAM (1989)
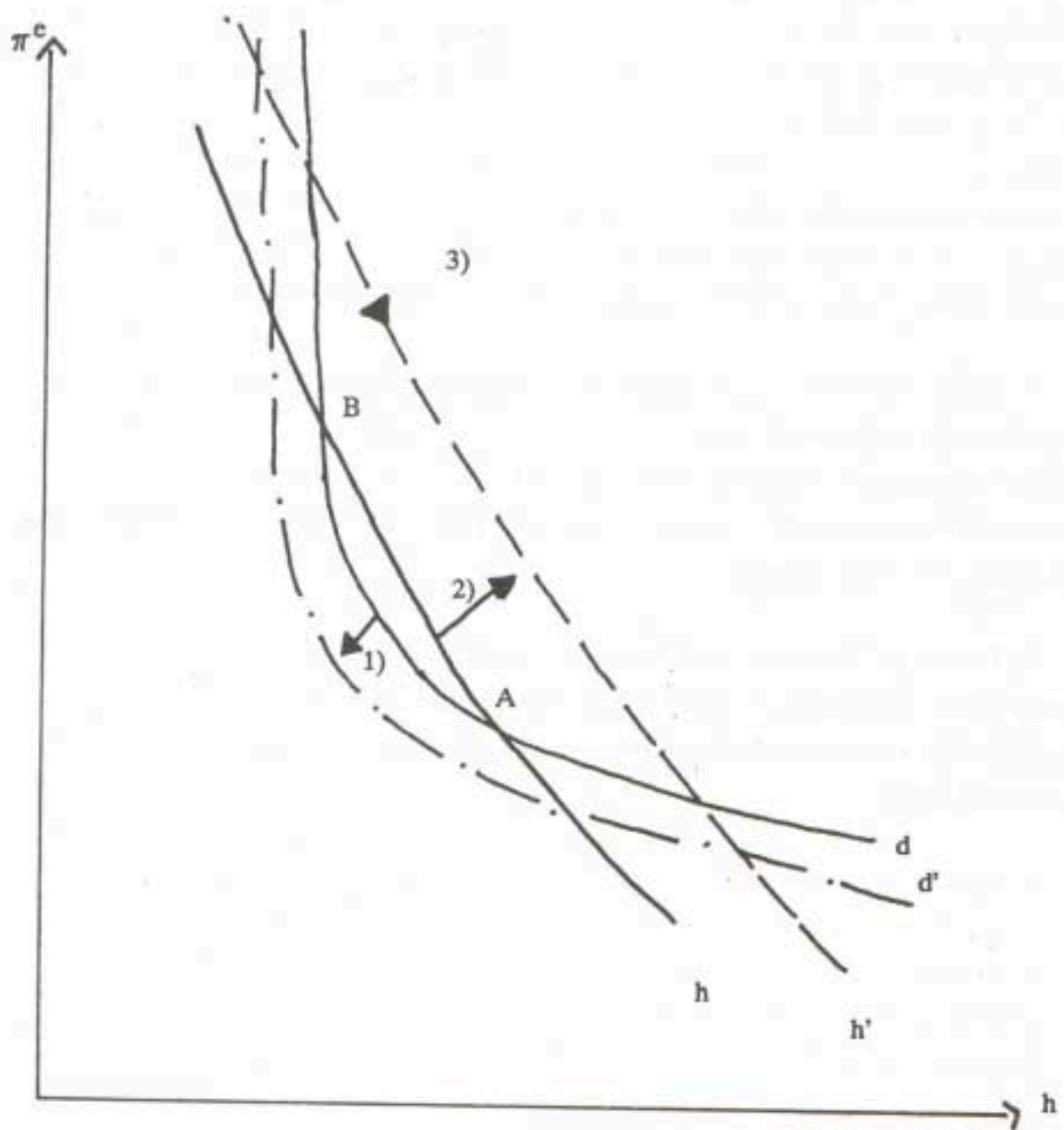
From HIT (B) to low inflation equilibrium (A)

1) Cut the budget deficit
2) Reversal of Currency Substitution
3) Heterodox measures, reducing expectations inertia and establishment of nominal anchors, reducing monetary accomodation.

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