

# From Galloping Inflation to Price Stability in Steps: Israel 1985–2013

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After the introduction of a stabilization program Israeli inflation decreased from 400% in 1985 to 2% in 2013. This paper analyzes how the remarkable transition process of Israel's disinflation took place. We reinforce the hypothesis that inflation moved in distinct steps characterized by constant levels with short-lived fluctuations around them. Multiple endogenous breakpoint tests provide strong evidence in favor of our claim. We find that the disinflation process is defined by three clear steps of high, medium and low inflation. The break dates are consistent with major economic events that constitute the end and the beginning of each disinflation step.

*Keywords:* Inflation, Disinflation Steps, Multiple Breakpoint Tests, Inflation Targeting

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# 1 Introduction

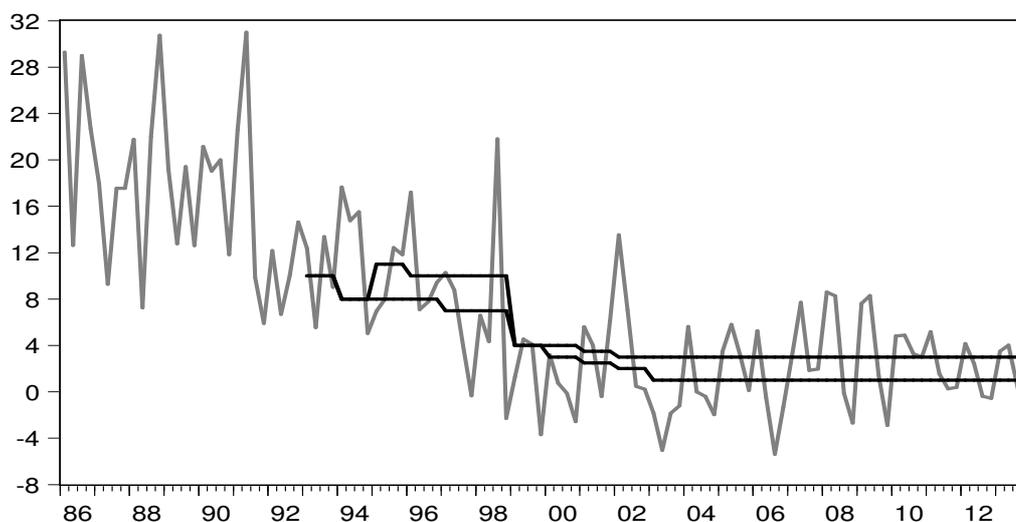
Israel's stabilization program of 1985 was clearly successful in achieving its main objective of strongly reducing inflation. While the inflation rate from January to July 1985 was close to 400%, by 1986 it was already less than 20%. The stabilization program and its dampening effect on the evolution of the price level have been extensively documented in the literature, see e.g. Bruno (1993), Bruno and Piterman (1988) and Liviatan and Melnick (1999). However, while a deterioration to full-fledged hyperinflation was prevented, the program did not fully eliminate high inflation levels when judged by Western standards. In fact, inflation remained a severe problem for at least 15 years after the program's initiation. As shown in Figure 1, right after 1985, the inflation rate got stuck at about the 20% level for approximately six years. In 1991 inflation dropped again to about 10%, staying around that level for, say, seven years.<sup>1</sup> By 1999, inflation decreased to a level of close to 2%, reflecting a long period of price stability that continues today. Hence, according to Figure 1, it appears that the process of stabilizing Israeli inflation moved in three distinct steps. In this paper, we refer to this proposition as the disinflation-in-steps hypothesis which can be attributed to Liviatan and Melnick (1999).

This paper shows that the stepwise disinflation process is not just one possible interpretation of Figure 1, but that the statistical properties of the Israeli inflation rate are actually well described by a step function. Taking the disinflation-in-steps hypothesis to the data, we thoroughly test it in the following way. Firstly, we specify a process for inflation where the mean of the series is allowed to change over time. Since our focus is to test the existence and timing of possibly several inflation steps, we have to account for multiple structural breaks in the mean. Therefore, we ana-

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<sup>1</sup>For a more detailed discussion of the first two inflation steps, see Liviatan and Melnick (1999).

Figure 1 Israeli Inflation



Notes: The figure shows the quarterly inflation rate measured in annual terms (gray line) together with the changing inflation target bands (black lines).

lyze the level of inflation using various multiple endogenous break tests developed in Bai (1997) and Bai and Perron (1998).<sup>2</sup> Secondly, we test whether the fluctuations around the inflation step levels can be considered *white noise*.

We obtain the following main results. Our empirical findings do not depend on the choice of the breakpoint test. All tests find two significant structural breaks at break dates that are in line with major economic events in Israel. No serial correlation is found in the first two steps, and some moderate serial correlation develops in the last step of price stability. Apart from these properties, the three inflation steps are characterized by a decreasing mean, today being at 2% and hence 10 times smaller than in 1986, and a variance that was reduced by almost 40% over the last 30 years.

In view of our results, natural question remains: Why did inflation get stuck at

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<sup>2</sup>For a comprehensive survey of multiple break tests, see Perron (2006).

each successive step for a prolonged period of time? We provide a detailed explanation of that phenomenon consistent with the break dates from the statistical analysis and the macroeconomic condition of Israel during each step. In brief, we interpret the step-like behavior of inflation as a temporary equilibrium convenient to and supported by the government and the Central Bank. We also argue that inflation targeting played a crucial role for Israel to eventually create a regime of price stability.

Our paper is structured as follows. Section 2 briefly describes the stabilization program of 1985 which precedes our analyzed sample period. Section 3 includes the multiple break point methodology as well as a presentation of the results obtained from the break tests. In Section 4 we provide an explanation for why Israeli inflation got stuck at each of the steps found in the statistical analysis. Conclusions and policy implications are discussed in Section 5.

## **2 Israel's 1985 Stabilization Program**

The stabilization program in Israel was the heterodox vintage type developed in the 1980s to deal with inflation not only in Israel, but also in Latin America, cf. Bruno et al. (1988). The orthodox component of the program included traditional fiscal and monetary contractionary policies. On the fiscal side, the main component was cutting government spending, primarily security spending and subsidies, which reduced the government deficit to a sustainable long-run level.<sup>3</sup> Restraint primary credit ceilings were also introduced, resulting in exceptionally high interest rates. On the monetary policy side, a crucial legislation passed, banning the

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<sup>3</sup>In the pre-stabilization era the fiscal deficit and thus the trend growth in the public debt were unsustainable in the long-run, as defined in Drazen and Helpman (1990).

government from borrowing from the Central Bank. The law gave the Central Bank the necessary de facto independence to carry out independent monetary policy.<sup>4</sup>

It was believed at that time, however, that to stop inflation rapidly and to cut the strong dynamic inertial forces, a non-orthodox component had to be included in the program. That component created temporary price controls (after the elimination of almost all subsidies) thus imposing a strong positive price shock at the program's initiation.<sup>5</sup> To avoid wage compensation for the initial price shock, a wage agreement was reached that temporarily stopped the cost of living allowance and provided for restoring real wages to the pre-stabilization level only after a lag of 6 months. Another central ingredient of the program was the introduction of a fixed exchange rate vis-à-vis a basket of currencies that was designed to be the nominal anchor of the system.

In order to enhance the credibility of the stabilization program, two further components, involving the US government, were added. The first component was a one-time grant of \$ 1.5 billion which was designated to serve as a cushion for a possible deterioration of the balance of payments.<sup>6</sup> The second, a change in the form of US economic aid to Israel from lending to a grant of \$ 3 billion per year to finance Israel's purchase of military equipment.<sup>7</sup> Israel was allowed to convert a small component of this second grant to domestic uses. Finally, a joint committee of US and Israeli government officials and economists was formed to follow up the progress of the program.

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<sup>4</sup>In the pre-stabilization era money financing was freely used by the government.

<sup>5</sup>In the month of July 1985, when the program started, the CPI rose by more than 27%.

<sup>6</sup>This was a key component since in the pre-stabilization era the acceleration of inflation was related to balance of payments crises, see Bruno and Fischer (1986), Liviatan and Piterman (1986).

<sup>7</sup>The borrowing from the US, before 1985, increased the external debt of Israel and aggravated the unsustainable rise in the public debt.

The disinflation-in-steps hypothesis postulates that the stabilization program was followed by a stepwise declining inflation rate. In order to test the hypothesis, we now turn to the structural break point methodology that we use to determine the timing of the disinflation steps.

### 3 Statistical Assessment of the Disinflation Steps

Prior to our empirical analysis, we started with an AR(1) process with coefficients allowed to break  $l + 1$  times as the most general model for inflation, i.e.,  $\pi_t = c_i + \alpha_i \pi_{t-1} + \varepsilon_t$ ,  $i = 1, \dots, l + 1$ . Strong evidence against any autocorrelation is found as the  $\alpha_i$ 's are clearly insignificant for all  $i$ . Therefore, we concluded that the proper specification for the inflation process is indeed a pure step function which we now discuss in detail.

#### 3.1 Multiple Break Point Test Methodology

We investigate Israeli inflation regimes using the following mean-plus-noise model with multiple breaks,

$$\pi_t = c_i + \varepsilon_t, \quad i = 1, \dots, l + 1. \quad (1)$$

where  $\pi_t$  denotes quarterly observations from 1986Q1 until 2013Q4 on the quarter-to-quarter inflation rate expressed in annual terms. The error term  $\varepsilon_t$  may be autocorrelated and heteroskedastic. The level parameter  $c_i$  is allowed to break up to  $l$  times which gives us  $l + 1$  inflation steps.

The testing theory for multiple endogenous breaks was developed by Bai (1997),

Bai and Perron (1998), Bai and Perron (2003a), Bai and Perron (2003b). For the sake of robustness, we consider several variants of multiple break tests. Each variant builds on the sum of squared residuals

$$\sum_{i=1}^{l+1} \sum_{t=T_{i-1}+1}^{T_i} (\pi_t - \hat{c}_i)^2 \quad (2)$$

( $T_0 = 0$  and  $T_{l+1} = T$ ) and is based on the corresponding F-statistic

$$F(T_1, \dots, T_l) = \frac{1}{T} \left( \frac{T - (l + 1)}{l} \right) \hat{c}' R' (R \hat{V}(\hat{c}) R')^{-1} R \hat{c} \quad (3)$$

where  $V(\hat{c})$  is a heteroskedasticity and autocorrelation consistent estimator of the variance of the breaking regression coefficient. Moreover, we also allow the error term  $\varepsilon_t$  to follow a different distribution in each of the  $l + 1$  steps, implying that the estimator  $V(\hat{c})$  varies across the disinflation steps.  $R$  is defined such that  $R\hat{c} = (\hat{c}'_1 - \hat{c}'_2, \dots, \hat{c}'_l - \hat{c}'_{l+1})$ . Apparently, the F-statistic increases and an additional break date becomes more likely, if differences between estimated coefficients of adjacent regimes are large. Bai and Perron (2003b) provide simulated critical values for the following variants of the tests.

In the first step of the *sequential* test, the F-statistic is used to test for a single break over the full sample. The natural breakpoint candidate is the date when the sum of squared residuals is most reduced. Provided that the break is found to be significant, the procedure is repeated for both subsamples to identify a possible second break date. The sequential testing procedure stops when the null of no break cannot be rejected anymore. In the *global* test, optimization is performed along both dimensions, the number of breakpoints and the break dates. Bai and Perron (2003a) propose an efficient algorithm to reduce the computational burden of the global test

considerably.<sup>8</sup> Finally, we use the *combined* break test proposed by Bai and Perron (1998). In this variant,  $l$  is determined globally and sequential tests for additional breaks are conducted in each of the  $l + 1$  regimes.

In our empirical application, we allow for up to  $l^* = 5$  structural breaks implying up to 6 different disinflation steps. Note that this choice covers the case of 3 steps, referring to periods of high, medium and low inflation. We trim 7.5% of the observations at the boundaries of each disinflation step.

### 3.2 Number and Timing of the Disinflation Steps

The multiple break point test results are summarized in Table 1. The columns include the number of breaks  $l$  under the alternative hypothesis, followed by the robust test statistic, the relevant critical value and the estimated break dates.

Table 1 Inflation Steps in Israel: Results from Endogenous Break Tests

<i>multiple break test variant</i>	breaks ( $l$ ) under $H_1$	test statistic	5% crit. value	first break date	breaks ( $l$ ) under $H_1$	test statistic	5% crit. value	second break date	breaks ( $l$ ) under $H_1$	test statistic	10% crit. value
global (UD <sub>max</sub> )	1	76.68	8.88	1991Q4	2	106.65	8.88	1999Q1	3	72.50	7.46
global (WD <sub>max</sub> )	1	76.68	9.91	1991Q4	2	126.74	9.91	1999Q1	3	104.37	8.20
sequential	1	76.68	8.58	1991Q4	2	29.90	10.13	1999Q1	3	5.09	9.41
combined	1	76.68	8.58	1991Q4	2	29.90	10.13	1999Q1	3	2.75	9.41

Notes: Results of multiple structural break tests for the regression (1). Critical values are taken from Bai and Perron (2003b). *global* (UD<sub>max</sub>) and *global* (WD<sub>max</sub>) refer to the global testing procedures described in Bai and Perron (1998). The *sequential* test is introduced by Bai (1997). For the *combined* testing approach, see Bai and Perron (1998). We trim 7.5% of the observations at the boundaries of each disinflation regime and allow for a maximum number of  $l^* = 5$  structural breaks. In each panel, the columns provide the number of breaks ( $l$ ) under  $H_1$ , followed by the robust test statistic, the relevant critical value, and – in case of significance (until  $l = 2$ ) – the estimated break dates. The global tests exhibit their maxima at  $l = 2$  where they both clearly reject the null of a single break. In line with the global tests, the sequential and combined tests reject the null of a single break as well. They also show, however, that – even at the 10% level – 2 breaks are not rejected in favor of 3. All tests find the breaks at 1991Q4 and 1999Q1.

The tests provide a clear picture of the disinflation steps. The global tests exhibit their maximum at  $l = 2$  where they both clearly reject the null of a single break. In line with the global tests, the sequential and combined tests also reject the null of

<sup>8</sup>For the global test, Bai and Perron (1998) propose two versions of the test statistic, UD<sub>max</sub> and WD<sub>max</sub>. UD<sub>max</sub> assigns equal weights implying that each number of breaks is considered equally likely. WD<sub>max</sub> uses weights which improve the power of the test when the true number of breaks is higher than the number of breaks under the null.

a single break. Besides, they show that – even at the 10% level – 2 breaks are not rejected in favor of 3. All tests consistently find the breaks at 1991Q4 and 1999Q1.

### 3.3 Level, Persistence and Variability During the Steps

Table 2 contains the estimation results for the three steps of disinflation which we just found by means of the structural break tests. The steps reflect periods of high (1986Q1 to 1991Q3), medium (1991Q4 to 1998Q4) and low (1999Q1 to 2013Q4) inflation. Mean inflation  $\hat{c}_i$  in the second column equals the estimation results from regression (1) with heteroskedasticity and autocorrelation consistent standard errors in brackets. We see that inflation moved literally in big steps from almost 20% to 10% and then finally to 2%. The last column documents that the strong decrease in levels was accompanied by a substantially declining standard deviation of inflation along the steps.

Table 2 Characterizing the Disinflation Steps: Average, Persistence and Variability of Israeli Inflation

<i>period</i>	mean inflation	persistence					variability
	$\hat{c}_i$	Q(1)	Q(2)	Q(4)	Q(8)	Q(12)	$\hat{\sigma}$
<i>high inflation</i> 1986Q1 – 1991Q3	18.03 [1.04]	0.38 (0.54)	1.36 (0.51)	2.90 (0.57)	5.85 (0.66)	8.99 (0.70)	5.86
<i>medium inflation</i> 1991Q4 – 1998Q4	9.54 [0.87]	0.45 (0.50)	0.76 (0.68)	4.58 (0.33)	7.80 (0.45)	15.39 (0.22)	4.45
<i>low inflation</i> 1999Q1 – 2013Q4	2.04 [0.50]	4.65 (0.03)	9.54 (0.01)	14.33 (0.01)	31.61 (0.00)	44.52 (0.00)	3.66

Notes: This table contains estimation results for the three steps of disinflation, the high (1986Q1 to 1991Q3), medium (1991Q4 to 1998Q4) and low (1999Q1 to 2013Q4) inflation periods. Mean inflation equals the estimation results from regression (1) with heteroskedasticity and autocorrelation consistent standard errors in brackets.  $Q(k)$  statistics (to test for autocorrelation up to order  $k$ ) with corresponding  $p$ -values in parentheses indicate that Israeli inflation shows no persistence at all in the first two steps, whereas autocorrelation is present in the third step, i.e., during the period of price stability. The last column documents a substantially declining standard deviation of inflation along the steps.

Another remarkable finding is shown by the  $Q(k)$  statistics for autocorrelation up to order  $k$  in the residuals from (1). As indicated by the  $p$ -values in parentheses,

Israeli inflation shows no persistence at all in the first two steps, whereas moderate autocorrelation is present in the third step, i.e., during the period of price stability.<sup>9</sup>

## 4 Discussion: Why Did Inflation Get Stuck at Each of the Three Steps?

### 4.1 The Formation of the First Step: 1986Q1 to 1991Q3

As emphasized in Section 2, the stabilization program corrected the fundamental fiscal and balance of payments imbalances and provided the Central Bank a basic law to carry out independent monetary policy. However, although inflation fell sharply, high levels were not completely eliminated. Our breakpoint estimation results show that inflation got stuck at about 20% over an extended period from 1986Q1 until 1991Q3. What is a plausible explanation of this phenomenon?

To begin with, the stabilization program had to deal with the crucial absence of credibility. The non-orthodox components of the program were similar to measures taken before the program's initiation, when a series of "package deals"<sup>10</sup> failed to solve the problem. To further complicate matters, the fundamental correction of the fiscal and balance of payments deficits was not well understood and was received with skepticism.<sup>11</sup>

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<sup>9</sup>To get an intuition of the degree of autocorrelation, we note that the the first order autocorrelation coefficients and corresponding standard errors during the steps of high, medium and low inflation are  $\hat{\rho}^{\text{high}} = -0.12 [0.21]$ ,  $\hat{\rho}^{\text{medium}} = 0.12 [0.19]$  and  $\hat{\rho}^{\text{low}} = 0.27 [0.13]$ . That is,  $\hat{\rho}^{\text{high}}$  and  $\hat{\rho}^{\text{medium}}$  are low and clearly insignificant, while  $\hat{\rho}^{\text{low}}$  implies some moderate and significant first order autocorrelation.

<sup>10</sup>The package deals were tripartite price-wage agreements between the government, the Histadrut (The National Trade Union), and the employers organization. Those were signed typically after a price shock due to subsidy cuts and a devaluation of the currency to deal with balance of payments crises.

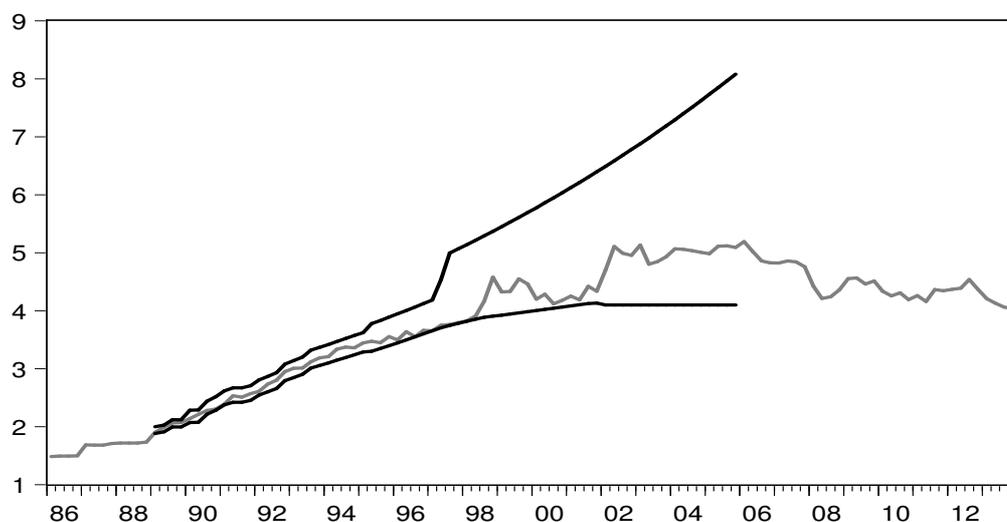
<sup>11</sup>Support for this view is the critical approach of leading professors of economics at the Tel Aviv University to the stabilization program.

However, despite difficult starting conditions, the program succeeded in reducing inflation from levels of several hundred percent to about 20% in 1986. Because this large decrease of inflation was achieved at relatively low costs in terms of output loss and unemployment, there was a big political gain. The initial success of the program was followed by an increase in acceptance and a regain of at least some credibility.

After the program's initiation, the dominant policy goal was to stabilize inflation and prevent its acceleration or a return to pre-stabilization dynamics. The policy challenges were related to three main issues. The first issue was to prevent a rise in real wages. The nominal compensation agreed upon in the program instituted at the beginning of 1986, was larger than the necessary compensation to restore the pre-stabilization real wage level. This fact is an indication that inflation declined more than expected. The rise in real wages was avoided by further agreements with the Histadrut and the employers' organization. The second issue was the decline in the real exchange rate in a fixed exchange rate regime caused by the continuation of inflation. This was dealt by small devaluations followed by establishing an exchange rate band (an horizontal band first and then a diagonal band) that allowed for a trend rise in the nominal exchange rate (see Figure 2). The third issue was related to the elimination of price controls. The solution was to implement a gradual elimination of controls, allowing prices to rise at the inflation step level without re-introducing subsidization.

As the first inflation step stabilized, and the fiscal and balance of payments situation became better known and understood, the program gained more credibility validating the new level of inflation. It is fair to say that the government and the Central Bank did not try to further decrease inflation. Their main goal was to exploit the initial success by stabilizing the rate of inflation at 20% and focus on avoiding

Figure 2 Exchange Rate



Notes: The figure shows the NIS exchange rate with respect to a basket of currencies (gray line) together with the changing exchange rate bands (black lines).

an adverse shock that might move the rate of inflation to a higher and accelerating level. As Liviatan and Melnick (1999) proposed “this can be understood in view of the lack of consensus about the cost-benefits-balance of further reducing inflation from its relatively low level”.

## 4.2 The Transition to the Second Step: 1991Q4 to 1998Q4

The transition to the second step of 10% was not the result of a new anti-inflationary policy. Rather, it occurred as the result of a natural supply shock caused by the massive wave of immigration from the former Soviet Union that started in 1990. Israel absorbed 1 million immigrants during a period of only 5 years, half of them between 1990 and 1992. The break date of 1991Q4 from the statistical analysis is therefore perfectly in line with this extraordinary event.<sup>12</sup>

<sup>12</sup>The conditions for disinflation in Israel were favorably affected by a decline in the rate of inflation in Israel’s principal trading partners’ countries.

Despite the acceleration of economic growth and the large creation of employment, associated with it, the supply of labor was even larger and unemployment increased, putting downward pressure on wages, see Table 3. The decline in real wages supported a deceleration of price increases. Although these were favorable factors for the decline in the rate of inflation, the more substantial impact was the effect the massive increase in the labor force had on the flexibility of the labor market. The immigrants from the former Soviet Union were reluctant to join the labor union in Israel. Thereby, they reduced the power of the almighty Histadrut which made possible a major reform of the labor market.

Table 3 The Transition to the Second Step

	GDP	Inflation	Unemployment	Real Wages	Immigration
1989	1.4	20.7	8.9	100.0	0.5
1990	6.6	17.6	9.6	99.1	4.4
1991	6.1	18.0	10.6	95.9	3.8
1992	7.2	9.4	11.2	97.1	1.6

Notes: The data refer to real GDP growth, Inflation as the average percentage CPI change during the year, unemployment in percent, real wages index with 1989 = 100 and immigration in percent of the population.

During that time, monetary policy was opportunistic in taking advantage of the labor supply shock and focused on stabilizing the rate of inflation at the new lower level.

On the fiscal front, an important development was the passage of the balanced budget law. This allowed a *temporary* rise in the fiscal deficit related to the necessary rise in spending associated with the absorption of immigration without impairing government credibility. On the balance of payments front, it was again the US who granted loan guarantees to finance an anticipated rise in the current account deficit associated with the absorption of the new immigrants.

In 1993 a first inflation target was announced (see Figure 1). It was not a transition to an inflation targeting regime, but rather an attempt to stabilize the new lower

level of inflation caused by the immigration shock. Moreover, the rate of inflation needed to be coordinated with the diagonal exchange rate band at a rate consistent with the difference between domestic and foreign inflation, see Ben-Bassat (1995).

The first move toward an inflation targeting regime was done in 1995. While there was no attempt to further reduce inflation, this signals the beginning of a new monetary regime in Israel. Inflation targeting could not be fully realized because it was in conflict with the diagonal exchange rate band, see Sokoler (2000). In 1997, the interest rate differential between the domestic and the foreign rates produced large foreign exchange capital inflow. The exchange rate hit the lower limit of the exchange rate band forcing the Bank of Israel to buy foreign exchange and sterilize the purchases. Hence, the ability of the Bank to pursue the necessary restrictive policy to reduce inflation was limited. From the 1997 experience it became clear that the exchange rate band was incompatible with traditional disinflation monetary policy. Setting the required higher interest rates contradicted the lower exchange rate limit and so abandoning the exchange rate band was indispensable to apply the required monetary policy for further disinflation.<sup>13</sup>

### **4.3 The Present Step of Price Stability: 1999Q1 to 2013Q4**

The transition to the final and still prevailing step occurred at the beginning of 1999. The break date of 1999Q1, which was found in the econometric analysis, is again fully consistent with the economic developments in Israel. The transition to the step of low inflation can be attributed to the monetary policy implemented to achieve price stability under an inflation targeting regime. This was possible after eliminating the conflict between the inflation targeting and the exchange rate band. First, by

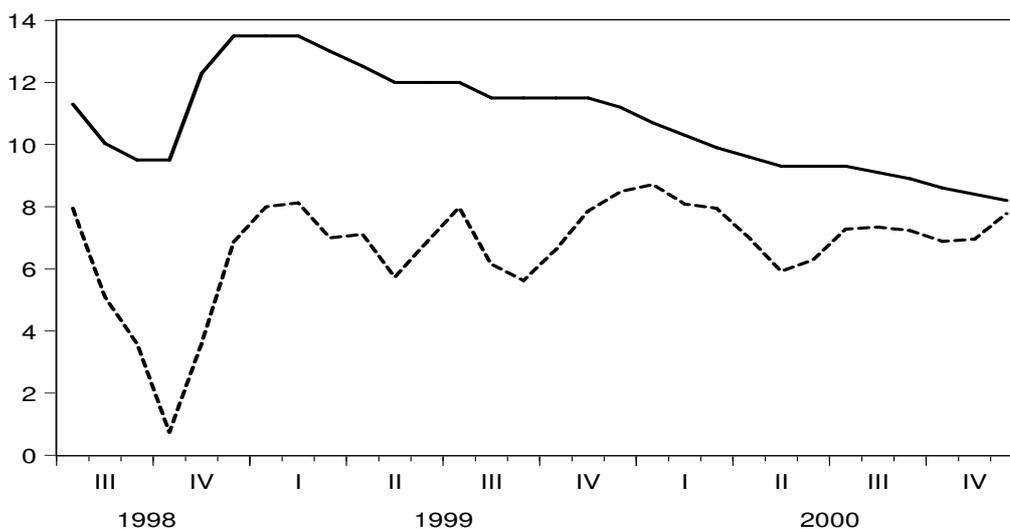
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<sup>13</sup>It seems that abandoning the exchange rate anchor was delayed due to lack of experience with traditional monetary policy in Israel.

widening the band, and then by eliminating it all together. Monetary policy gained credibility through two distinct episodes, thus changing inflationary expectations towards price stability.

The first episode is related to the Bank of Israel's reaction to the LTCM<sup>14</sup> crisis of 1998 and the related Russian and South East Asian financial crises. The contagion effect of those crises had a strong impact on Israeli financial markets. The main effect was that large capital outflows produced a sharp devaluation creating price shock because domestic prices were indexed to the US dollar, a pathological inheritance of Israel's history of inflation, see Shiffer (2001). In the past, a rise in inflation was usually associated with exchange rate shocks combined with a balance of payments crisis, see Liviatan and Piterman (1986).

Figure 3 Nominal and Real Interest Rates 1998 – 2000



Notes: The figure shows the Bank of Israel's nominal short-term policy rate (solid line) together with the real short-term interest rate (dashed line).

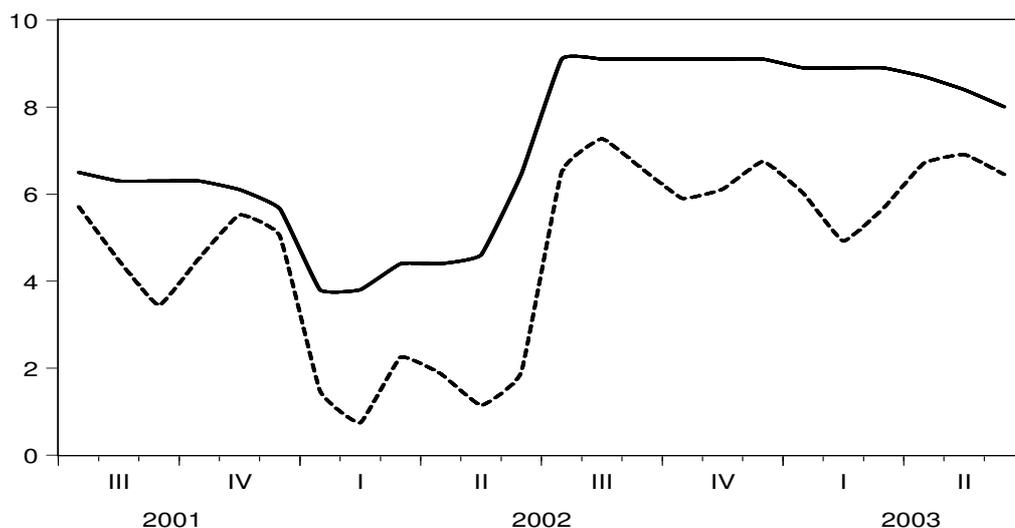
<sup>14</sup>Long-Term Capital Management (LTCM) was an American hedge fund management firm. The firm's most important hedge fund, Long-Term Capital Portfolio L.P., collapsed in the late 1990s.

At that time, Israel was not in a balance of payments crisis and the Bank of Israel, for the first time, dealt with the price shock by a sharp rise of 400 basis points in the rate of interest (see Figure 3). This monetary policy shock had an immediate impact on the movement of capital, and the previous outflows reversed, returning the exchange rate to pre-crisis levels, undoing to a large extent the previous price shock. Although the exchange rate changed its course and inflation did not accelerate, the Bank of Israel persisted with a high interest rate policy for a very long time. The interest rate returned to the pre-LTCM crisis level in 2000, even though the rate of inflation was very low. In fact, the rate of inflation in 2000 was zero. It seems that this determined action by the Bank of Israel had a positive credibility effect on inflation expectations, convincing the public of its serious goal to eliminate the final residual inflation and achieve price stability.

The second episode, while not fueled by external crises, had a similar effect on inflation expectations, and reflects the commitment of the Bank of Israel to achieve price stability. In December of 2001, in the context of a policy deal with the government, the Bank of Israel reduced its interest rate by 200 basis points to 3.8%. This produced large capital outflows causing a depreciation of the currency, and a corresponding price shock similar to the shock of 1998. Again there was concern that inflation would accelerate, wasting the previous disinflation achievements. The Bank took corrective action by raising the interest rate to 9.1% reversing the outflow of capital and minimizing the exchange and the price shock (see Figure 4). The Bank of Israel maintained these high interest rates even though the economy was suffering from a serious recession.

It seems that this episode convinced the public of the Central Bank's commitment to maintain price stability. Expected inflation stabilized around the center of the inflation target rate at 2%. Since then, Israel has experienced price stability and thus

Figure 4 Nominal and Real Interest Rates 2001 – 2003



Notes: The figure shows the Bank of Israel's nominal short-term policy rate (solid line) together with the real short-term interest rate (dashed line).

eventually completing the stabilization of inflation that began with the stabilization program of 1985.

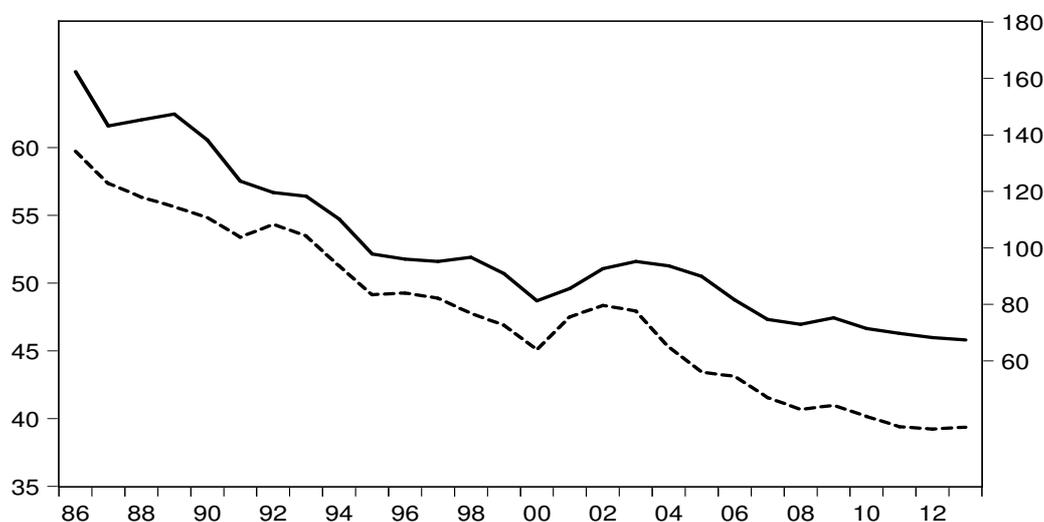
## 5 Conclusion

The success of the 1985 stabilization program in Israel clearly illustrates that the elimination of inflation was not achieved through a single act. Even when the fundamental fiscal and monetary policies were adequate and other heterodox components were used, the disinflation process was long, and a long-term commitment to disinflation was required. Therefore, a high degree of perseverance of the government and the Central Bank was needed to finally achieve price stability.

A key factor in the stabilization process was the government's determination and resolve to reduce the public debt and government expenditure thus creating a basic

disinflation predisposition (see Figure 5).<sup>15</sup>

Figure 5 Public Debt and Public Expenditure 1985 to 2013



Notes: The figure shows public debt (solid line, right *y*-axis) and general government expenditure (dashed line, left *y*-axis) both in percent of GDP.

Credibility was achieved gradually. First, by stabilizing the inflation rate after its initial drop following the implementation of the stabilization program. This generated the first 20% inflation step. Then, working opportunistically to stabilize the rate of inflation at a lower rate, following the labor supply shock of the massive immigration wave. This generated the second 10% inflation step. The process was finalized by moving to the third and current price stability step. This was accomplished by successfully implementing monetary policy in the framework of an inflation targeting regime that was challenged and put to tests by two strong price shocks in 1998Q4 and in 2002Q1. A firm determination of the Bank of Israel to deal with those shocks became visible. Monetary policy was highly restrictive with exceptionally high real interest rates, especially in 2002, when the economy was suffering from a deep recession. This seems to have finally persuaded the public of the determina-

<sup>15</sup>This had also a positive effect on the balance of payments.

tion of the Bank to achieve price stability thus having a strong dampening effect on inflationary expectations.

In the empirical analysis, we find that the use of the terminology *inflation steps* is clearly justified. In the first two steps of high (20%) and medium (10%) inflation, we observe that within the steps inflation is a constant plus a white noise error. It is remarkable that no serial correlation is found in those steps. In the last step, the low inflation or price stability step, inflation fluctuates around a constant of 2%, i.e., around the center of the inflation target range. However, in this step the deviations of inflation from the target range center show some moderate serial correlation. Since it is a very usual characteristic of an inflation process to be serially correlated, our interpretation of this finding is that Israeli inflation has become a more normal process, similar to inflation processes in other countries that have not suffered from the Israeli inflationary experience. Another possible interpretation is that the successful implementation of inflation targeting induced a mean reversal to the 2% center and hence generated the serial correlation.

We conclude that the use of a forward looking inflation targeting regime with an independent Central Bank that is free to use monetary instruments to stabilize the inflation rate was crucial to the elimination of the last 10% inflation step and thus to achieve long-run price stability.

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