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**LEGAL, ACTUAL AND DESIRABLE
INDEPENDENCE: A CASE STUDY OF
THE BANK OF ISRAEL**

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***INTERNATIONAL MACROECONOMICS
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ABSTRACT

Legal, Actual and Desirable Independence: A Case Study of the Bank of Israel*

This paper documents the evolution of the legal independence of the Bank of Israel since its creation in 1954 to present times, provides an international comparison, and assesses the changes in the actual independence of the Bank on a yearly basis following the 1985 stabilization of inflation. The data developed in the paper makes it possible to compare the evolution of actual and of legal independence after the 1985 stabilization and to compare the legal independence of the bank with that of other countries at different points in time. The paper also evaluates the level of legal independence embedded in the Levin's committee recommendations for reform of the Bank of Israel law. The paper shows that various institutional changes have induced, since 1985, substantial changes in the actual independence of the bank without any legislative change. The paper also identifies domestic and international factors that stimulated those changes and evaluates the desirable level of independence for the future. In particular the paper evaluates the pros and the cons of assigning to the bank growth targets, in addition to inflation targets.

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1 Introduction

This paper documents the evolution of the **legal** independence of the Bank of Israel (BI) since its creation in 1954 to present times, provides an international comparison, and assesses the changes in the **actual** independence of the Bank on a yearly basis following the 1985 stabilization of inflation. Although no attempt is made to evaluate the year by year evolution of actual independence in the pre 1985 period an estimate of its **average** level is provided as a benchmark for the latter period. Since the variability of actual independence in the pre stabilization era is substantially lower than following it, the average level of actual independence in the pre 1985 period provides a reasonable summary statistic for this variable during the thirty years culminating in the 1985 stabilization. Comparison of the average levels of actual independence in the pre and post 1985 eras reveals that there has been a quantum jump in this variable between those two broad periods.

The paper also evaluates the level of legal independence embedded in the recommendations of the 1998 Levin Committee for reform of the Bank of Israel law. A section in the latter part of the paper discusses factors related to the desirable future level of independence. In particular, it evaluates the pros and the cons of growth targets, of the closely related use of the output gap concept as an indicator for interest rate policy and of the Levin's Committee recommendation to vest the legal authority for the conduct of monetary policy with a monetary policy committee.

It is important to stress already at the outset that, since the concept of independence utilized in the paper evolved only during the late eighties and part of the nineties, evaluation of independence involves a retrospective application of modern concepts of central bank independence (CBI) **also** to early years of statehood. During those years professional consensus about the roles of the central bank (CB) and about its status within government differed widely from the present. In addition, the structure of the Israeli economy substantially differed from the present structure, inducing different economic policy priorities.¹

Substantial advances have been made during the last fifteen years in the measurement

¹Utilization of a modern metric to evaluate the independence of the BI might appear out of context to policymakers operating during the early years of statehood. The concluding section contains additional remarks on this tension.

of CBI. The existence of such measures makes it possible to study the impact of independence on the performance of the economy in areas such as inflation, growth, real rates and investment. Studies of the impact of CBI on the performance of the economy in developed economies normally use legal independence derived from CB charters as a proxy for the actual independence of the central bank.² It is well known that there often are divergences between actual and legal independence and that such differences are likely to be larger in developing than in developed economies.³

Legal independence is only one, albeit non negligible, factor that determines the actual independence of a CB. There often are institutional changes that are not reflected in the formal charter of the CB but which have, nonetheless, profound effects on the actual independence of the Bank. Due to substantial variety in institutional arrangements across countries, existing measures of legal independence often miss changes in actual independence that are not reflected in legal independence. One way to incorporate those additional elements into formal measures of CBI is to consider the entire institutional and economic structure within which the CB operates. Such an effort requires a closer look at additional features of the economies under consideration and, inevitably, involves judgmental elements. It is, nonetheless, a step on the way to the development of more comprehensive measures of actual independence.

The BI, that is expected to celebrate its fiftieth anniversary in 2004, is a case in point. In spite of relative immobility of the Bank's charter since inception, substantial changes in the degree of fiscal dominance over monetary policy and in the structure of the Israeli economy, brought about important changes in the modus operandi and in the actual independence of the bank mainly after the 1985 inflation stabilization.⁴ At the methodological level, the paper can be viewed as a case study that illustrates some of the factors to consider when attempting to

²Early contributions includes Grilli, Masciandaro and Tabellini (1991), Cukierman, Webb and Neyapti (1992), Alesina and Summers (1993), Cukierman, Kalaitzidakis, Summers and Webb (1993) and Eijffinger and Schaling (1993). A survey appears in Cukierman (1998). In all those studies, including the present one, CBI is taken to represent the mandate and the ability of the CB to focus mainly or mostly on achieving price stability, even at the cost of relative neglect for other objectives like stabilization of output and financing of budgetary deficits. Thus, CBI as used here can also be thought of as the degree of effective conservativeness of the Bank.

³Details appear in chapter 19 of Cukierman (1992).

⁴Extensive surveys of the monetary history of Israel prior to the 1985 stabilization, including the pre statehood and pre Bank of Israel eras appear in Barkai (2002b,c,d,e). The period immediately preceding the stabilization is surveyed in Barkai and Liviatan (2003) and the post 1985 period in Liviatan (2003). A colourful documentation of the dominance of fiscal over monetary policy in the pre 1985 era appears in Barkai (2002a).

complement the information contained in standard measures of legal CBI.

An important general lesson from the paper is that there can be substantial changes in actual independence without any noticeable changes in legal independence. Three more, Israeli specific, conclusions are that: 1. Although both the actual and the legal independence of the BI were higher in the post 1985 era than prior to it, the increase in the former was much more dramatic than that of the latter, 2. Till roughly the mid nineties actual independence has generally been lower than legal independence. Since the mid nineties actual independence is found to be higher than legal independence. 3. Though high by domestic historical standards, the actual independence of the BI after the mid nineties is not as high as the current legal independence of the central banks of the twenty six countries that are either current or prospective members of the Economic and Monetary Union (EMU).⁵

The paper is organized as follows. After a brief description of standard measures of legal independence the first section following the introduction (section 2) presents data on the evolution of the legal independence of the BI during the last fifty years and compares it to that of other developed and developing economies during the last two decades. It also examines the level of legal independence of the Bank, had the recommendations of the Levin Committee for reform of the charter of the BI been accepted.⁶ Section 3 lays down a methodology for measuring actual CBI using, for comparability purposes, the same metric that was used to measure legal independence. The section discusses the additional, non legal, factors that affected the actual independence of the BI through time and the assumptions made in transforming those factors into numerical codes.

The historical evolution of actual independence is presented and discussed in section 4. The latter part of the section evaluates the factors that combined to raise the actual independence of the BI. Section 5 reflects on the desirable level of independence for the BI in view of current empirical and theoretical knowledge about the effects of CBI and CB conservativeness.

⁵Since they are all bound by the Treaty of Maastricht those countries are ultimately expected to have a legal level of independence equal to that of the European Central Bank. Thus (except for a few countries (like the UK, Sweden, Denmark and Switzerland), following enlargement, monetary policy for the European area is conducted by a highly independent CB.

⁶The Levin Committee was nominated in December 1997 by then Prime Minister Netanyahu . The Committee submitted a report with recommendations for reform of the charter of the Bank of Israel in December of 1998 (Levin (1998)) but the report's recommendation were not pursued by the legislature.

The section also discusses the pros and the cons of growth and of output gap targeting. This is followed by concluding remarks.

2 Evolution of the Legal Independence of the Bank of Israel

2.1 The concept and measurement of legal central bank independence

A layman, or an economist raised in the tradition of twenty or more years ago, may question why central bank independence is needed in the first place. Why should a public policy making institution be independent in its decisions from the democratically elected government?⁷ The current consensual answer is that, since they try to achieve several other objectives like high employment and easy financing of government expenditures, governments create a socially costly inflation bias. Hence delegation of authority to a relatively conservative central banker that is more concerned about price stability than government is beneficial for society (Rogoff (1985)).

In line with this view legal indices of CBI focus on the extent to which the CB is directed by law to focus monetary policy on price stability as the only or main objective of monetary policy, even at the cost of deemphasizing other objectives like growth and the financing of budget deficits. To be effective this focus of the bank should be backed by sufficient independence in the choice of monetary instruments. Most importantly, the bank's decision making bodies should not receive explicit or implicit instructions from governmental officials, should enjoy sufficient personal and financial independence to be able to resist political pressures and there should be sufficiently effective constraints on government's ability to resort to inflationary finance. Thus, CBI does not mean that the bank is free to do anything it pleases. It means, instead, that it has a sufficiently clear mandate to focus mostly on price stability in conjunction with enough instrument independence to implement this mandate.

The recent literature contains several alternative indices of legal CBI. The most com-

⁷Such questions are occasionally raised by academic economists as well (Stiglitz (1998)).

prehensive of those is the index in Cukierman, Webb and Neyapti (1992) or in chapter 19 of Cukierman (1992). This index is based on a coding of sixteen different characteristics of CB charters that pertain to the allocation of authority over monetary policy, procedures for resolution of conflicts between the CB and government, the relative importance of price stability in CB objectives as stated in the law, the seriousness of limitations on lending by the CB to government, and procedures for the appointment and dismissal of the governor of the CB. Cukierman, Webb and Neyapti (1992) present a weighted index of those sixteen characteristics (LVAW). The scale of this aggregate index, as well as of individual, legal indices, ranges between zero (for the minimal possible independence) and one (for the maximum level of independence). The conventions used to code individual components of legal independence and the aggregation procedure used to obtain the aggregate index are described in table A1 of the appendix. One advantage of the LVAW index is that it is available for a good number of countries during the second half of the twentieth century, making it possible to compare the legal independence of the BI to that of other countries at different times.

2.2 The legal independence of the Bank of Israel over time and in comparison to other countries

Although the Bank of Israel charter has been amended more than once during the last fifty years only the 1985 amendment to the original 1954 charter is relevant for our index of CBI. This amendment popularly nicknamed as the "no printing law" substantially limits the legal ability of government to obtain advances from the BI and stipulates that securitized borrowing from the BI should be at market rates.⁸ Table 1 presents the aggregate legal independence of the original 1954 law and that of the law after the 1985 amendment against the background of the legal independence in developed economies during the eighties.⁹ The table reveals that, in terms of the original 1954 law the BI enjoyed a level of legal independence below countries such

Table 1: The legal independence of the Bank of Israel before and after the "no

⁸This amendment replaces paragraph 45 of the original 1954 BI law and is classified as amendment number 15.

⁹Table A2 in the appendix presents the individual codings underlying the aggregate indices of CBI for the original (1954) and the amended (1985) Israeli laws.

printing” amendment - A comparison to developed economies during the eighties

Country	LVAW	Country	LVAW	Country	LVAW
Israel - 1954	0.39	Ireland	0.44	New Zealand	0.24
Israel - 1985	0.46	Netherlands	0.42	France	0.24
Israel - 1998/9 (Levin C.)	0.61	Australia	0.36	Spain	0.23
W. Germany	0.69	Iceland	0.34	Japan	0.18
Switzerland	0.64	Luxemburg	0.33	Norway	0.17
Austria	0.61	Sweden	0.29	Belgium	0.17
Denmark	0.50	Finland	0.28		
US	0.48	UK	0.27		
Canada	0.45	Italy	0.25		

Sources: Table A1 in appendix and Table 2 of Cukieman, Webb and Neyapti (1992).

as Germany, Switzerland, the US, Canada and the Netherlands, but above Sweden, New-Zealand, the UK, France and Italy. In terms of this law the legal independence of the Bank of Israel ranked at the 41st percentile from the top. Following the 1985 amendment the legal independence of the bank rose, as measured by the LVAW index, from 0.39 to 0.46. This raised its legal ranking among the central banks of developed economies in the eighties to the 27th percentile from the top. A qualitatively similar picture emerges when the comparison is made with the central banks of developing countries during the eighties. Further details appear in table 2 of Cukieman, Webb and Neyapti (1992).

The above picture changes quite a bit in the nineties. During that decade the legal independence of many central banks, the world over, has been substantially upgraded. This includes, *inter alia*, all the countries that joined the Euro area in 1999, practically all the former socialist economies (FSE) that created new central banks with very high levels of legal independence, practically all the Latin American economies, New-Zealand, the UK, Sweden and Japan. The countries that joined the Euro area had to upgrade the legal independence of their central banks to comply with the requirements of the Maastricht Treaty. Partly for the same reason prospective entrants to the European Monetary Union (EMU) in central and Eastern

Europe followed the same track. But the flood of central bank reforms in other FSE, as well as in other parts of the world - - always in the direction of more independence reflects a growing professional consensus among both policymakers and academics that high CBI is desirable.¹⁰

As a consequence of this world wide trend, relatively to other countries, the level of legal independence of the BI is substantially lower at the beginning of the twenty first century than it was following the 1985 "no printing law". The following discussion documents some of the numerical dimensions of this process. As suggested by table 1, since 1985 the LVAW index of aggregate legal independence for the BI has been constant at 0.46. By contrast, the average level of legal independence embodied in the charters of 26 former socialist economies as of the second half of the nineties is 0.56 (calculated from table 1 of Cukierman, Miller and Neyapti (2002) using the latest charters available). Even after the "no printing" amendment the Bank of Israel is now well below the median within this group of central banks with only eight banks (Azerbaijan, Croatia, Kazakhstan, Macedonia, Romania, Tajikistan, Turkmenistan and Ukraine) possessing lower indices. Although the precise numerical value of LVAW for the European Central Bank (ECB) as prescribed by the Treaty of Maastricht is not available calculations made by Sadeh (2003) suggest that, an overly restrictive lower bound is 0.76.¹¹ Interestingly, the UK, Sweden and Denmark that chose not to join EMU also substantially upgraded the levels of independence in their charters during the nineties. Sadeh (Op. Cit.) estimates that, as of 2001, the LVAW indices for those countries were 0.89, 0.92 and 0.70 respectively. Clearly, in relative terms, the legal independence of the BI is currently substantially lower than in the eighties.

2.3 Evaluation of the legal independence embedded in the Levin's committee recommendations

In December of 1997 Prime Minister Netanyahu appointed a committee of experts whose task was to recommend an updating of the BI charter. The Committee, headed by former judge

¹⁰This world trend is described in Cukierman (1998). A detailed documentation of central bank reforms in the FSE and their effect on inflation in the FSE appears in Cukierman, Miller and Neyapti (2002).

¹¹This number is the average of the LVAW index for twenty three current and prospective members of EMU in 2001. The Treaty of Maastricht requires all the national central banks to eventually upgrade their national charters to the level prescribed by the Treaty. Since not all current and prospective members have completed this process in 2001 the figure in the text constitutes a lower bound for the legal independence of the ECB.

Dov Levin, also included a former governor of the Bank, a former chair of the Knesset Finance committee, two academic economists, one accountant and one lawyer. In December of 1998, after a year of deliberations the Committee, submitted its recommendations for reform of the Bank of Israel's charter to the Prime Minister (Levin (1998)). But the report's recommendations were not pursued by the legislature. It is, nonetheless, of some interest to examine the level of legal independence embedded in the committee's report.

A quick glance at the first column of table 1 suggests that, if implemented, the Levin Committee recommendations would have raised the index of legal independence of the BI from 0.46 to 0.61. The main factors responsible for this increase are: 1. The price stability objective takes precedence over other objectives, 2. Instrument independence is asserted more strongly than in the existing law, 3. The set of circumstances under which a governor can be dismissed is narrowed down. Adoption of the Levin's committee recommendations would have caused a non negligible increase in the legal independence of the BI. If legislated, those recommendations would have raised the legal independence of the BI a bit above the median within the group of twenty six former socialist economies. But this level would still be substantially below those of the UK, Sweden and the ECB.¹²

The Committee also recommended that the authority over the conduct of monetary policy which is currently vested only with the governor of the Bank should be delegated to a five members' committee. The effect of this recommendation on independence is not immediately obvious and, by construction, the LVAW index does not reflect this feature. A discussion of the likely effect of this recommendation on actual independence under alternative scenarios appears in subsection 5.3.

3 Evaluation of the Actual Independence of the Bank of Israel - Metodological Issues and Assumptions

It is well known that actual independence need not coincide with legal independence. This may occur for a variety of reasons. First, laws are normally highly incomplete leaving actual

¹²The UK got a dispensation from adjusting the Bank of England charter to the independence levels required by the Treaty of Maastricht but chose to implement most of those adjustments nonetheless.

implementation open to interpretation and interference by other institutions within the public sector. Second, even when the law is clear and complete there may be slippages between the letter of the law and actual practice due to imperfect compliance with the law. Third, the economic and institutional structures within which the CB operates affect the actual independence of the CB, even for a given level of tightly respected legal independence.

In the case of the Bank of Israel such factors cannot be overemphasized. Till the 1985 inflation stabilization one of the main tasks of the BI was to channel and extend credits to various sectors of the economy. This was done through an elaborate system of directed credits (DC) to various sectors of the economy. The BI had relatively little influence on the size, the composition and the terms of those credits. On top of that, due to other institutional restrictions the Bank did not have sufficient authority to conduct effective open market operations. In addition the capital market was highly segmented and dominated by non competitive elements. The combination of those factors seriously impeded the actual ability of the Bank to focus on the price stability objective. Due to desegmentation, deregulation, and changes in the operating procedures of monetary policy this state of affairs gradually changed following the 1985 stabilization and is still changing to this day. Some of those changes had profound effects on the actual independence of the BI in spite of the fact that, as shown in the previous section, the changes in legal independence were relatively modest.

This section describes the methods and assumptions used to measure the consequent changing actual independence of the BI between the pre 1985 and the post 1985 period, as well as within the second period. To preserve as much comparability as possible with legal independence the same codification system is used for actual as for legal independence. However in coding actual independence account is taken not only of the letter of the law but also of what happened in practice. As a consequence the effects of changes in institutions and related arrangements such as the size of DC, the actual freedom of the BI to conduct open market operations, the size of the governmental budget deficit, the extent to which limitations on government's ability to borrow from the CB are effective, the extent of deregulation of financial markets, the type of exchange rate regime and the existence, or non existence, of inflation targets can be factored into the index. Although this methodology is inevitably judgmental in that it necessitates the evaluation and location of the effects of the above factors across the

components of the index, it has two advantages. First it imposes some minimal discipline on the inevitably judgemental measurement of actual CBI. Second, by committing to particular numerical values for the components of the index it paves the way to a systematic and more precise future evaluation of the actual independence of the bank.

3.1 Codification of actual independence in the pre 1985 era

During much of the period prior to the 1985 stabilization of inflation monetary policy was severely restricted by the following combination of factors. The Bank of Israel was forced to act to a large extent as a development bank that granted cheap credits whose volume and terms were largely determined outside the Bank. Financial markets were strongly segmented and the Bank did not have much de facto possibility to conduct the open market operations necessary to absorb liquidity injections created by Government and the private sector (Cukierman and Sokoler (1993), Barkai (2002a, 2002e)). Although there have been some variations in the impact of those constraints on the ability and determination of the Bank's management to maintain low inflation they were of second order in comparison to the changes that occurred after the 1985 stabilization.

I assume therefore, as a first approximation, that the actual independence of the BI in the pre 85 period has been constant but allow for over time variations in it, in the post 85 period. To obtain a measure of the actual values of the components of independence in the pre 1985 period I take the codings of the respective legal components in the 1954 law as a benchmark and adjust the codings, when needed, so as to reflect the actual levels of independence on those components. During this period the existence of extensive directed credits whose magnitude and terms were determined outside the CB in conjunction with severe limitations on the bank's ability to conduct open market operations meant that, in spite of the legal authority bestowed on it, the BI had rather limited ability to control monetary policy. In fact, to a large extent the (currently conventional) objectives of monetary policy were subjugated to the bank's functioning as a development bank.¹³ Clearly, under those conditions the actual weight given

¹³This subjugation was amplified, until 1970, by the existence of a 9 percent legal ceiling on nominal interest rates. Since, during this period, inflation was frequently above this figure, the legal ceiling often prevented the BI from maintaining positive real short term interest rates.

to price stability in the conduct of monetary policy and the actual adherence to legal limitations on lending were substantially lower than their legally mandated counterparts. A description of the precise mapping of those facts into numerical codings for the individual components of actual independence appears in the second part of the appendix.

3.2 Codification of actual independence in the post 1985 era

The post 1985 period is characterized by sustained processes of institutional change many of which had non negligible consequences for the actual independence of the BI. The most important of those are a gradual reduction, mostly through attrition, of DC; a gradual increase in ceilings on the total stock of short term treasury bills (Makam) until their complete elimination at the end of 2001; a gradual process of desegmentation of credit markets; a gradual process of lifting of various controls on capital flows; a gradual flexibilization of the exchange rate and the introduction of inflation targets in December 1991. In addition a substantial increase in the short term interest rate set by the Bank, starting in the mid nineties, points to an increase in the relative emphasis on price stability. This subsection provides a broad discussion of the issues while the more specific coding details are relegated to the third part of the appendix.

However, in spite of the 1985 "no printing" amendment the law leaves some latitude for the monetization of budgetary deficits for several reasons. First, the government is free to convert its substantial foreign exchange receipts at the BI without passing through the foreign exchange market and spending them domestically. Second, although the BI can issue Makam to mop up the consequent increase in liquidity, there was, until the end of 2001, a ceiling on the amount of liquidity that the Bank could absorb by means of this instrument.¹⁴ The ceiling was often effective forcing the Bank to rely on auctioned deposits to mop up liquidity. For reasons that are elaborated in the next subsection those auctioned or time deposits (Pazak) may limit the ability of the Bank to absorb liquidity in comparison to Makam. Third, even in the absence of institutional constraints, maintenance of low inflation in the face of large deficits requires unpopular high rates of interest and makes it more difficult for the BI to focus on the objective

¹⁴Unlike the Fed, the BI does not have a stock of seasoned governmental securities. To absorb liquidity it partially relies on the issuance of Makam, which is formally considered an obligation of Government. Up to the ceiling the quantity of Makam is largely determined by the BI.

of price stability thus limiting its de facto independence.

The introduction of inflation targets in 1991 marks the beginning of a process in which those targets replaced the exchange rate as a nominal anchor. Initially the target was taken as a prediction rather than a commitment to deliver a certain rate of inflation. But the stringency and effectiveness of inflation targets gradually increased over the nineties as both government and the BI took the target more as a commitment and also gradually reduced it (see Figure 1). Table A3 in the appendix incorporates a judgmental coding of those and other effects. Part three of the appendix outlines the conventions followed to code the components of actual independence using the same classification as the one used to code legal independence. The groups of variables affected are those dealing with the authority over monetary policy, limitations on lending and CB objectives. The broad conventions for coding the last variable between 1986 and 1994 are straightforward and are relegated to the appendix. Since the considerations involved in coding this variable from 1995 and on rely on broader economic considerations they are discussed in what follows.

Sometime during the first half to mid nineties the short term interest rate became an important and highly visible instrument of monetary policy. After being rather low till 1994, the short term real rate (as measured by the real rate on Makam) increased markedly in 1995, remained in a range between 4 and 5 percent till 1997, increased again in 1998 and remained around the 6 percent level and beyond till 2000 before decreasing back to the 4 percent level and below during 2001-2003 (further details appear in table 2.18A of Liviatan (2003)).¹⁵ Thus, during the six years between 1995 and 2000 short term real rates were uncharacteristically high. From the eve of this high real interest rates era, in 1994, to its termination in 2000 actual yearly inflation decreased from over 12 percent to a bit over one percent.

The advent of this high interest rate period can be thought of as marking the beginning of a process of reduction in the BI implicit output target. Prior to that time the Bank probably possessed, at least implicitly, an output target that was above the potential level of output. It has been well known since the early eighties that under such circumstances discretionary monetary policy is subject to an inefficient inflationary bias (Kydlan and Prescott (1997) and

¹⁵A similar qualitative picture emerges from table A4 of the appendix that provides data on the real rate paid by the BI to private banks on funds deposited in it.

Barro and Gordon (1983)). Some time during the early nineties this fact was internalized by central bankers and international institutions like the IMF, leading to a worldwide process of increase in the independence of central banks and to an accompanying decrease in their implicit output targets. It is likely that the advent of the high interest rate period in 1995 was triggered by the adoption of a similar point of view by decision makers at the BI.

Since, this point of view was novel at the time it is likely to have gone largely unnoticed by the public for some time. As a consequence inflationary expectations did not fully internalize this change for a while. This point of view is supported by measures of inflationary expectations derived from the capital market.¹⁶ Those measures show that, during the first three years of the high interest rate era, average yearly inflationary expectations fluctuated in the 9 to 11 percent range backing up the view that it took some time for the Israeli public to realize the change in regime (table 2.18A of Liviatan (2003)).

A relatively simple way to conceptualize the change in the policy stance of the BI and the initial (lack of) public response to it is to posit that, at the outset, the Bank possessed an implicit output target that was above potential. Then, at some point during the mid nineties, the implicit output target went down and became equal to potential output. But the public continued to believe that the CB possesses an output target that is above potential for several years following the change in policy stance. It can be shown that, under such circumstances, the real rate of interest is higher, on average, than its natural level as long as the lower output target is not fully credible. This is demonstrated within a New Keynesian framework due to Clarida, Gali and Gertler (1999) in the fourth part of the appendix. It is important to stress that an initially imperfect credibility of the lower output target is necessary for above natural average real rates. For, as explained in the appendix, had the public become aware of the lower output target immediately real rates would have remained at their natural level on average.

Table 2.18A of Liviatan (2003) shows that the rates of monetary expansion during the high interest era were lower than in the early nineties confirming that monetary policy became more restrictive both in terms of interest rates as well as in terms of rates of growth of the money

¹⁶The widespread availability of both indexed and non indexed government bonds in the Israeli financial markets makes it possible to estimate expected inflation from the difference between nominal and real rates of interest of similar maturity and financial quality.

supply. Liviatan argues that (due to the higher stickiness of prices and wages in comparison to the nominal exchange rate) this led to an incipient appreciation of the real exchange rate followed, later on, by a partial reversal of this tendency, and produces evidence supporting this view.¹⁷

It is important to note that the mechanism outlined here and the one stressed by Liviatan are complements rather than substitutes. As a matter of fact both are required to get a full understanding of the reason for the change in the BI policy stance in the mid nineties as well as of its economic consequences. Be that as it may, there is little doubt that the era of high real rates is associated with a deemphasis of output objectives by the BI. To reflect those considerations the actual value of the "objectives" code is raised from 0.4 in 1994 and to 0.6 for the 1995 - 1997 period.

During the subsequent three years there appears to have been an additional increase in the actual importance attributed to price stability for a number of reasons. First, following an increase in actual inflation in 1998 the inflation target was **reduced** in 1999 to the **lowest** level it had ever been at up to that time, and the real rate increased further. Second, regressions of actual inflation on lagged values of the inflation target show that, while the target had no significant impact on inflation during the first half of the nineties, it had a sizable and significant impact on inflation from 1996 and on.¹⁸ Third, Taylor rules and exchange rate based interest rate reaction functions estimated for the period between July 1993 and December 2001 generally underestimate the rate of interest set by the Bank from 1997-98 and on (Melnick (2002)). To reflect those factors the code was raised from 0.6 in 1997, to 0.9 in 1998, and maintained at this level till 2001.¹⁹

Following a "deal" between the Bank and the Treasury at the end of 2001 the BI rate was reduced by two hundred basis points in December 2001. This led to a substantial reduction in the real rate which was reversed during the second half of 2002 and 2003. To reflect this

¹⁷This pattern is consistent with Dornbusch (1976) overshooting hypothesis. See also Liviatan (1984).

¹⁸A monthly regression of yearly moving averages of inflation rates on a lagged value of the inflation target measured in a conformable way did not yield a significant coefficient between 93 and 95 (12 observations). A similar regression over the 1996 to mid 2003 period produced a significant positive coefficient in the vicinity of one (30 observations) and a substantially higher adjusted R-squared. Although the first sample is rather small these regressions are consistent with the view that the target has been taken more as a commitment since 1996.

¹⁹Melnick's (Op. Cit.) estimated reaction functions imply that, during this period, the BI behaved as a strict inflation targeter.

temporary reduction in the real rate the code was reduced to 0.8 for 2002 and raised back to 0.9 in 2003.

3.3 Makam, Pazak, Swaps, Government's foreign exchange transactions and instrument independence

Until its abolition at the end of 2001 the ceiling on the amount of Makam treasury bills that the BI could issue for Government led the Bank to conduct restrictive monetary policy by accepting time deposits (Pazak) or offering swaps to the banking system. This tendency was particularly in evidence during the second half of the nineties. Since they are offered **only** to the Banking system, the latter two instruments have a more limited scope than the Makam which is offered to the public at large and is also more liquid since it is traded on the secondary market. Hence the Bank can mop up a given amount of liquidity at a lower cost by means of Makam than by means of Pazak accounts or swaps negotiated through the banking system.

Thus, the location of authority over the amount of Makam balances has implications for the efficiency of the monetary policy instruments available to the Bank. Because of those considerations the relaxation of the ceiling on the Makam balances in the mid nineties and its ultimate removal in 2001 were taken to raise the actual instrument independence of the Bank as explained in part three of the appendix. The Bank did not wait long to utilize its control over the better instrument as evidenced by the fact that between the end of 2001 and the end of 2002 the Makam balance increased by about twenty five percent (from about 35 billion IS to a bit less than 44 billions) whereas the balance of the Pazak accounts decreased by over 10 billions IS (Bank of Israel - Report on Operations for 2002, Appendix table on the Bank's balance sheet, 1985-2002).

On the other hand, in its capacity as the Banker of Government, the BI converts any amount of foreign exchange that Government desires into domestic currency and vice versa.²⁰ An important implication of this arrangement is that, by converting its \$ balances into Shekels to finance current expenditures, Government can circumvent the spirit of the 1985 "no printing"

²⁰This amounts to full sterilization of the impact of Government's foreign exchange transactions on the market's rate of exchange.

law. Due to the existence of legal ceilings on the issuance of Makam, the BI did not have in the past enough instrument independence to sterilize the effect of such conversions on the money supply. But those ceilings were removed in December 2001 and since then the Bank can utilize its ability to issue Makam to mop up the impact of such transactions on the monetary base thus maintaining the spirit of the "no printing law". But the fact that Government can use its non negligible foreign exchange balances to finance excesses of expenditures over tax revenues may induce a bias towards excessive use of this source of finance.

The loan guarantees recently extended to the Israeli government by the US may have a similar effect. Government can utilize those guarantees to raise funds abroad without necessarily spending them at the time, and then utilize them later. Such an action normally raises the foreign exchange reserves of the BI in the first stage, and creates an expansion of the money supply when Government decides to spend part or all of those additional reserves domestically. Such events underscore the need for sufficient instrument independence to the BI to enable it to mop up the excess liquidity that is created in the second stage.

4 Evolution of the Actual Independence of the Bank of Israel and its Roots

Table 2 shows the aggregate actual independence level of the BI as characterized by the weights of the LVAW index. For comparison purposes the aggregate legal value of the same index is presented as well. The detailed codings underlying the actual aggregate index appear in table A3 of the appendix and the detailed conventions used to produce those codes are laid out in parts 2 and 3 of the appendix. The aggregate **actual** level of independence based on those weights and codes is denoted by AVAW.

Several general conclusions emerge from Table 2. First, the average level of actual independence of the BI is substantially higher in the post 1985 period than prior to it. Second, the average level of legal independence is also higher after 1985 than prior to it, but by a substantially lower factor than is the case for actual independence.

Third, whereas actual independence is substantially lower than its legal counterpart in

the pre 1985 period, the post 1985 actual independence is, on average, slightly higher than legal independence in that period.²¹ Fourth, the table shows that, in spite of a constant legal independence, the variability of actual independence in the post 1985 era was substantial.

For all these reasons the 1985 stabilization of inflation constitutes a watershed for the time path of CBI in Israel. Although this statement applies to both legal and actual CBI it is much more dramatic for the second type of independence. Taking a look at the time path of actual independence after stabilization shows that, following an initial dramatic jump in 1986, actual independence went down reaching a local minimum in 1989 and climbing back to roughly the 1986 level in 1994.²² The immediately following period (1995 through 1998) is characterized by further, non negligible, increases in actual CBI.

Generally, actual independence after the mid nineties is uniformly higher than prior to that and also substantially higher than legal independence. As a matter of fact the actual independence of the BI from the mid nineties and on is in the upper range of legal independence

Table 2: Over time evolution of the actual independence of the Bank of Israel

Year	AVAW (actual)	Memo: LVAW (legal)	Year	AVAW-Actual	Memo: LVAW (legal)
Pre 1985	0.13	0.39	1994	0.51	0.46
Post 1985 -Average	0.52	0.46	1995	0.55	0.46
1986	0.50	0.46	1996	0.52	0.46
1987	0.44	0.46	1997	0.57	0.46
1988	0.39	0.46	1998	0.64	0.46
1989	0.32	0.46	1999	0.64	0.46
1990	0.39	0.46	2000	0.69	0.46
1991	0.44	0.46	2001	0.66	0.46
1992	0.43	0.46	2002	0.66	0.46
1993	0.46	0.46	2003	0.64	0.46

²¹The extremely low level of actual independence obtained for the pre 1985 period is consistent with the description of Barkai (2002a, 2002e) for the sixties and the seventies.

²²The years around 1989 are the only years in the post 1985 period in which actual independence is lower than its legal counterpart.

of developed economies in the eighties with only Germany, Switzerland and, sometimes Austria, having higher scores (Table 1). It also is in the same range as the average legal independence of the transition economies during the nineties. Yet, this level is still substantially lower than the current levels of legal independence of the ECB, the UK and Sweden. The results above suggest that various non legal changes that alter the institutional framework facing the CB may affect actual independence quite dramatically even without any changes in the law or in law abidance.²³ A more general lesson from the case of the BI is that legal indices of CBI should be supplemented by additional institutional evidence.

4.1 Sensitivity analysis

Eijffinger and Schaling (1993) and Eijffinger and van Keulen (1995) have claimed that, at least for developed economies, the importance of the legal characteristics dealing with the assignement of authority over monetary policy, the procedures for conflict resolution and the relative importance prescribed by law to price stability far outweigh that of other characteristics. In some versions of their work they even go as far as assigning positive weights **only** to those three legal variables. By contrast the total sum of weights assigned by the LVAW index to those three variables is merely 0.3.

To examine the sensitivity of the qualitative results of the paper to those weighting assumptions two alternative versions of the aggregate indices have been calculated. One, whose legal value is labelled LVES, assigns weights of 0.4, 0.4 and 0.2 respectively to the allocation of authority for monetary policy, to the procedures for resolution of conflicts between government and the CB, and to the degree of relative focus on price stability as prescribed by law. All other variables are assigned zero weights. However this weighting scheme appears extreme in that it totally ignores the seriousness of limitations on lending to government. To account for that while still maintaining stronger focus on the variables stressed by Eijffinger and Schaling

²³Cukierman, Miller and Neyapti (2002) find that legal independence in the transition economies has a negative impact on inflation only after the process of liberalization has gone far enough. They argue that this is may be due to the fact that compliance with the law and the degree of liberalization are positively related so that the latter is a proxy for the former. See also Eijffinger and Stadhouser (2003). However, I am not aware of any evidence suggesting that there have been noticeable changes in complianced with the law in Israel. The assumption that law abidance in Israel has been constant over time, at least since the sixties, appears to be reasonable.

a second index, whose legal value is labelled LVESX, is calculated. This index is a weighted average of the narrow LVES index and of the subaggregate of all limitations on lending by the CB to government from Cukierman, Webb and Neyapti (1992) with weights of 0.6 and 0.4 respectively. Essentially, this index assigns a total weight of 0.48 to the group of "policy formulations" a weight of 0.12 to "objectives", a total weight of 0.4 to the group of "limitations on lending" and neglects the "CEO" group

The evolution of the **actual** (denoted AVESX) and of the **legal** (LVESX) values of the aggregate index based on this weighting scheme is shown in the second column of Table A3 of the appendix. Examination of this data suggests that practically all the qualitative results reached with the wider LVAW index carry over to the narrower index. A similar conclusion holds when calculations are replicated with the, even narrower, LVES index (not shown).

Interestingly the, post 1985, value of the LVESX index of 0.38 is substantially lower than the average value of the same index for the central banks of transition economies during the nineties. But the average **actual** value of this index (AVESX) in the post 1985 period is in the same range as the average value of the legal index (LVESX) in the transition economies (details on this index in the transition economies appear in Table 1 of Cukierman, Miller and Netapti (2002)).

4.2 Domestic and Global factors behind the changing independence of the Bank of Israel

The developments reviewed above raise an interesting question about the factors that have triggered and sustained the process of increase in the independence of the BI. This subsection discusses possible factors and attempts to broadly evaluate their relative importance. There is little doubt that the most important trigger for the increase in the independence of the BI is the bitter experience with the triple digit inflation during the 1977 to 1985 period, including in particular several failed stabilization attempts, as well as the substantial amount of energy that the top political leaders of the country had to invest in order to ultimately make the 1985

stabilization a success.²⁴

Following the success of the 1985 stabilization there developed a consensus in the public, as well as in political circles, that strong measures should be taken to prevent the recurrence of such episodes. Since, prior to 1985, monetary policy was effectively conducted by politicians through the MOF, the blame for the high inflation was squarely put on the political establishment. Given this view, it was natural to look for reform of policymaking institution in ways that would limit the influence of the political establishment on monetary policy. The 1985 "no printing" amendment to the BI charter was one consequence of this trend. Another was the appointment, in 1986, of an academic with no party affiliation - Michael Bruno - as Governor of the BI. Bruno, who was personally rather independent, was allowed to start and sustain a long term process of structural reforms of the financial sector that, most likely, would not have been tolerated prior to the Israeli "great inflation". More generally, following the debacle of the great inflation period, the political establishment became more open to professional advice. When the processes above were taking place the idea that CBI is a desirable feature was still in its infancy among professional economists. It is, therefore, sensible to consider the increases in the independence of the Bank during the second part of the eighties as being driven mainly by domestic forces. This trend was reinforced, during the nineties, by additional domestic and global developments.

First, due to a gradual increase in the importance of the Israeli financial markets, financial stability became more important. Since in the long run financial stability and price stability are positively associated this led to further support for an independent BI. Second, the globalization of financial markets in which Israel took part by gradually abolishing restrictions on capital and currency flows increased the need for an independent CB. In a world of free capital mobility, the benefits of stable monetary policies in terms of access to international financial markets and of capital imports are higher than in a world with capital account restrictions. By the same token the cost of unstable monetary policies in terms of capital flight and related disruptions is substantially higher in a world with free capital mobility. Both factors make CBI a more desirable feature. This trend was reinforced by the fact that, by the beginning of the nineties,

²⁴A comprehensive description of the high inflation era and of the period leading to the stabilization and its aftermath appears in Bruno (1993).

most developed economies had reduced their inflation rates to levels substantially below five percent while Israeli inflation still fluctuated in the ten percent range. This systematic inflation differential created a premium on domestic currency denominated financial assets and complicated the conduct of monetary policy, making it desirable to try to eliminate the premium by permanently reducing Israeli inflation to the rates of OECD countries.

Finally, during the nineties an international professional consensus evolved according to which CBI is a free lunch since it reduces inflation without hurting growth.²⁵ This consensus permeated international institutions like the IMF and led to a wide scale process of upgrading of legal CBI the world over (details appear in Cukierman (1998)). It is quite likely that this evolving consensus contributed to the introduction of inflation targets at the beginning of the nineties and facilitated the buildup of the public consensus needed to implement the conservative policies followed by the BI during the second half of the nineties.

5 How Independent Should the Bank of Israel Be? - A View from Academia

During the last two decades both theory and evidence contributed to create a consensus that a high level of effective conservativeness, or independence, for the CB is desirable. Empirical work has demonstrated that CBI reduces long run inflation without affecting average output in the developed economies, and that it reduces long run inflation and **raises** average long term growth in the developing economies.²⁶ At the theoretical level the case for CBI has been supported by the argument that due to various motives like employment, seignorage and balance of payments considerations, political authorities are subject to an inefficient inflation bias that can be alleviated by delegation of authority over monetary policy to a sufficiently conservative CB.²⁷ However, as pointed out by Rogoff (1985), this does not necessarily imply that the CB

²⁵Grilli, Masciandaro and Tabellini (1991) who coined this expression base it on a finding, for the developed economies, that legal CBI has a negative impact on inflation and no impact on growth. For developing countries Cukierman et. al.(1993) find a similar negative impact of (proxies for actual) CBI on inflation and a positive impact on growth.

²⁶A non exhaustive list of references includes Grilli, Masciandaro and Tabellini (1991), Cukierman, Webb and Neyapti (1992), chapter 20 of Cukierman (1992), Alesina and Summers (1993) and Cukierman et. al. (1993).

²⁷Summaries of those arguments appear in Cukierman and Liviatan (1990) and in Part I of Cukierman (1992).

should be a strict inflation targeter if society puts some positive weight **also** on the stabilization of output.²⁸ The reason is that a strict inflation targeter (or ultra conservative CB) puts too little emphasis on output stabilization in comparison to price stability. In particular the work of Rogoff implies that the CB should have instrument independence, that it should be more conservative than society but that it should not be ultra conservative.

Obviously, this still leaves quite a bit of latitude for the choice of CB conservativeness (CBC). In a recent book Woodford (2003) demonstrates that, in the presence of price and wage stickiness, maximization of welfare of the representative individual implies that the CB should conduct policy using a variant of the, well known, Taylor (1993) rule. This is an interest rate rule that assigns positive weights to the deviations of inflation from its target and to the output gap. The weights should depend on the structure of the economy. The basic intuition underlying the response of the interest rate to inflation is that, in the presence of price and wage stickiness, inflation distorts relative prices and leads to inefficient production and consumption decisions. Hence, a policy that stabilizes inflation around a low target, and reduces unexpected inflation, contributes to welfare by reducing those distortions. Depending on the structure of the economy, this may imply that there should be a positive response of the interest rate to the output gap as well. Woodford conceives of the output gap as the difference between the level of output in the presence and in the absence of sticky prices.²⁹ But the behaviour of Woodford's output gap may be quite volatile making the correspondence between his concept and the smooth measures of the output gap utilized by central banks in practice rather tenuous.

A more recent argument in favor of CBI is related to its impact on capital flows. The globalization of financial markets and the associated increase in the sensitivity of capital flows to unstable domestic policies increases the importance of CBI as a credible guardian of, and a signal of, nominal stability. However this need is partially attenuated by the fact that open capital markets also exert more discipline on the Ministry of Finance and through it on the political establishment.

²⁸A strict inflation targeter is a CB that cares only about inflation and its stabilization. This terminology is due to Svensson (1997).

²⁹Woodford's argument relies on a quadratic approximation of the utility of the representative consumer. For New Keynesian models and parameter values that are considered as reasonable for the US economy Woodford concludes that the weight on the inflation deviation should be large in comparison to the weight on the output gap.

5.1 Should the Bank of Israel have a growth target?

One way to assure that a relatively independent CB will also pay attention to stabilization of output is to legally mandate growth targets for the CB. Arguments in favor of growth targets for the BI are often made in Israel, particularly during recessions. The Levin Committee Report on reform of the BI law contains a statement requiring the Bank to also take growth into consideration when setting policy.

What are the implications of the above for the desirable level of conservativeness of the BI? An important insight is that the optimal level of conservativeness, or effective independence, should depend on the structure of the economy. In particular, if a decrease in the short term rate of interest has a strong and sufficiently sustained effect on economic activity and a relatively small and distant effect on inflation, a relatively low level of conservativeness in the conduct of monetary policy is indicated. But if the converse is true a high level of conservativeness in targeting inflation - - perhaps even strict inflation targeting - - is indicated. Those considerations have a direct bearing on whether the BI should or should not be assigned growth targets. In particular, if due to Israel's inflationary history, the effect of a decrease in the interest rate on inflation is large and swift, the introduction of legally mandated growth targets may not be a good idea. In other words, if the tradeoff between the impact of monetary policy on economic activity and on inflation is small, it may be optimal, even for a relatively liberal society, to abstain from instructing the CB to achieve growth targets.³⁰

But even if it is found econometrically that the recent Israeli tradeoff coefficient is large there are several additional considerations to keep in mind. First, requiring the BI, through legislation or other institutional devices, to attain growth targets may open the door for political pressures on the Bank to conduct a policy of permanently low real interest rates. Given the inflationary history of Israel with its legacy of formal and informal indexation arrangements such a policy may have a swift upward impact on inflationary expectations, on the speed of their adjustment and therefore on actual inflation.

Finally, there is a widespread consensus that monetary policy cannot affect potential output and should not, therefore, be used to try to influence its path. This implies that rea-

³⁰A more detailed discussion of the pros and cons of growth targets for the BI appears in Cukierman (2003).

sonable "growth targeting" should be directed at offsetting cyclical fluctuations in output rather than at trying to change the path of potential output over which it has no influence. In other words growth targets should be applied to the cyclical components of output rather than to total output. The practical implementation of this principle requires a decomposition of the growth rate of actual output into a "potential output" component and into a "cyclical output" components. The monetary policy perils associated with such a decomposition are discussed in the following subsection.

5.2 The perils of output gap stabilization

Nobody knows with certainty what is the time path of potential output. Although part of this uncertainty is resolved with the benefit of hindsight there is normally substantial uncertainty about the current and near future expected level of this variable at the time monetary policy choices have to be made. Since the output gap is defined as the difference between actual and potential output this uncertainty is also injected into the output gap. A major implication of this observation for the choice of monetary policy procedures is that, due to poor real time knowledge about the output gap, flexible inflation (or growth) targeters condition their policy on a variable that is measured with a substantial amount of error.

In an important paper Orphanides (2001) shows that during the second part of the seventies and part of the eighties the Fed systematically overestimated potential output leading to substantial overestimation of the magnitude of the recession at that times. Since the Fed behaved as a flexible inflation targeter those forecast errors induced a monetary policy stance which came to be considered, with the benefit of hindsight, as excessively loose thus contributing to the inflationary bulge of the second half of the seventies in the US. The fact that there was a substantial decrease in output during the second half of the seventies is well known and is not under dispute. What is at issue here is how much of this decrease was due to cyclical elements over which monetary policy has some temporary impact versus how much was due to changes in potential output over which monetary policy has little or no impact.

Since errors of forecast are sometimes positive, at other times negative, and normally not persistent, one may think at first blush that policy errors induced by poor measurement

of the output gap should not inject persistent errors into the choice of monetary policy. Unfortunately, this is not the case with the output gap. Cukierman and Lippi (2004) show that errors in forecasting potential output and the output gap are generally serially correlated and that the average magnitude of this serial correlation depends on the underlying parameters of the economy. The intuitive reason is that, unlike forecasts of many variables whose true values become known with a lag of one period, the true values of potential output and of the output gap are not revealed with certainty, even after the fact. As a consequence monetary policy errors of flexible inflation (or growth) targeters become serially correlated as well. In periods in which potential output does not deviate much from its trend the measured persistence in policy is small and may not constitute a serious problem for growth targeting. But in periods with large deviations of potential output from its trend policy errors may be quite persistent over time. Thus, in the presence of growth targeting, the inherent unobservability of the output gap is particularly dangerous for nominal stability around and following turning points in the path of potential output.³¹

Since inflation depends on the output gap this problem may arise under strict inflation targeting as well. However since, under this targeting method, the poorly measured output gap variable does not enter into the objective function of the CB, the policy errors are likely to be smaller. This intuition is backed by the discussion in section 5.1 of Cukierman and Lippi (2004). Using a backward looking Neo Keynesian model of the economy they show that the higher the degree of conservativeness of the CB, the lower the difference between the choice of interest rate in the presence and in the absence of uncertainty about potential output and the output gap.

³¹This statement is consistent with recent empirical findings in Orphanides and Williams (2003). They utilize real time data on the perceptions of policymakers about potential output during the 1970's and compares those perceptions with current estimates (as of October 1999) of the historical data. Taking the "current" rendition of estimates of potential output as a proxy for the true values of potential output during the seventies they find highly persistent deviations between the current and the real time estimates of the output gap (see their Figure 3 in particular).

5.3 Allocation of authority over monetary policy within the Bank and the Levin's Committee recommendation

From a legal point of view the final authority over monetary policy within the BI is vested with the Governor of the Bank. This is similar to the legal status of the Governor of the Reserve Bank of New-Zealand since the 1989 reform. But it differs from most other central banks like the Bank of England, the Fed and the European Central Bank (ECB) in which the ultimate authority over monetary policy within the Bank rests with a monetary policy committee (MPC). One of the main recommendations of the Levin Committee for reform of the BI law was to vest the authority over monetary policy in a MPC composed of five individuals including the Governor, two Deputy Governors and two outside independent experts that do not hold positions in other branches of Government or in industry and the private banking system. To date the Committee's recommendations have not been implemented.

At first blush it would seem that, since it is concerned with the reallocation of authority **within** the Bank (counting the independent outside experts as part of the Bank), the proposed reshuffling of authority can be done without affecting the Bank's independence vis a vis Government and various interest groups. Whether this is likely to be the case in practice or not depends on several factors. First is the degree of cohesion within the MPC and the ability of its members to implement a policy approved by a majority of its members even if prior to this approval there were dissenting views. Second, is the extent to which the outside members of the Committee are truly independent of both the executive and legislative branches of Government and of various interest groups in the economy. Provided those two conditions are satisfied the formation of an MPC may actually raise the actual independence of the BI by raising its ability to resist outside pressures. The past experience of the Bundesbank and the more recent experience of the ECB suggest that, when those conditions are satisfied, the collective responsibility of the Committee makes it easier to stand up to outside pressures. But if one or more of those conditions is not satisfied the switch to a MPC may reduce actual independence.

5.4 The governor as economic advisor to government

The original 1954 charter ordains the governor of the Bank of Israel as the official economic advisor to government. Within that framework Israeli governors are expected to attend and address meetings of the economic cabinet and of parliament and are entitled to air their views and to make recommendations on other issues of economic policy such as fiscal policy and the size of the budget deficit. Although they cannot vote on those matters the informal influence of this additional task was important in some instances. In spite of doubts expressed by some former governors about the desirability of this, rather unique, feature it managed to survive till the present.

The economic advisor function of the governor is a double edged sword. On one hand, it provides a legal basis which enables the governor to try to shape the economic environment within which monetary policy operates. It also facilitates the sharing of professional economic information between the Bank and Government. During the early years of statehood the second function was particularly important. It has been argued, on the other hand, that the economic advisor function prevents the governor from publicly criticizing the economic policies of government when those policies are misguided in the professional opinion of the Bank.³²

How does the economic advisor function of the governor affect the independence of the BI? There are two opposing effects that are related to the discussion above. In his advisory capacity the governor may obtain some influence on other areas of public policy that determine the constraints faced by monetary policy. Fiscal policy is a prominent example. On the other hand the economic advisor function is likely to make it more difficult for the Bank to focus mainly on the price stability objective.

³²In a daily newspaper article former governor Zanbar (1977) argues that the advisor to government function impairs the ability of the Bank to act as (in David Horowitz's words) the "compass and the conscience" of the economy. Interestingly, the trigger for writing this article was a reprimand of governor Gafni by prime minister Begin for publicly criticizing the budget proposal submitted by the Minister of Finance to Parliament. Begin argued that since, in his capacity as advisor to government, the governor can air his views within government, he should refrain from publicly criticizing government's economic policies.

6 Concluding Remarks

The case of the BI suggests that, due to various (non legal) institutional developments, such as the introduction of inflation targets, discontinuation of directed credits, changes in the degree of integration of capital markets, in the type of exchange rate regime and in fiscal discipline, actual independence may change quite dramatically even without any change in the CB charter.

The stabilization of inflation in 1985 is a watershed for both the legal and the actual independence of the Bank. Following the stabilization there has been a moderate increase in legal independence and a dramatic increase in the actual level of independence. Prior to the stabilization actual independence was substantially lower than legal independence. After it, the average level of actual independence became somewhat higher than legal independence. This occurred in spite of the fact that, due to the "no printing" amendment the level of legal independence rose as well. Prior to this amendment, during the first part of the eighties, the seventies and before, the legal independence of the BI ranked around the fourthieth percentile within developed economies. In spite of the amendment, the relative position of the legal independence of the Bank is substantially lower in 2001 than it was in the eighties. This is due to a process of very substantial upgrading in the legal independence of many central banks in the world during the nineties.

The statements above are based on a modern notion of CBI that considers a Bank to be more independent the stronger its focus on price stability, the higher its control over the instruments of monetary policy, the more effective are limitations on lending to government and the higher the personal independence of the governor of the CB. The advantage of this index is that, in addition to covering a wide range of issues, it is available for many countries in different time periods making it possible to compare the legal independence of the BI to that of other countries in different periods.

Nonetheless the index abstracts from a feature that might have had some impact on the independence of the Bank, particularly during the early years of statehood. It is the relative quality of the research department of the Bank in comparison to other economic research units in Israel. From the Bank's inception the first governor of the Bank, David Horowitz, gave a free hand to the first director of the research department of the Bank, David Kochav, and to his

successors to recruit individuals only on the basis of professional considerations. This strategy payed off in that, to this day, the Bank of Israel research department is the best macroeconomic research unit in the country adding the weight of "professionalism" to the policy positions taken by the Bank.

This feature probably raises the actual independence of the Bank above the levels captured by the indices in the paper. It is likely that this factor was relatively more important during the first thirty years after the foundation of the Bank when the general conception was that the Bank and the Treasury should formulate macroeconomic policy by consensus. However, due to the powerful position of the Treasury and of government, I doubt that the inclusion of this additional factor would have substantially affected the broad conclusions of the paper. This view is reenforced by the fact that during the first three decades of the Bank's existence one of the main objectives of policy was to encourage investments in order to envigor real growth. This was done by largely subjugating currently conventional CB objectives to its functioning as a development bank via directed credits. David Horowitz, the first governor of the BI is on public record for suscribing to this view. In an exchange from the early seventies with Don Patinkin about the role of the Bank in controlling the money supply Horowitz argued that the Bank has to adapt its policies to those of government. During those three decades the BI was effectively characterized by a multiplicity of goals. Although price stability was one of those, it effectively had low priority. This was very much in the spirit of the Keynesian consensus that dominated professional economic thinking at the time.

In view of the narrow capital markets faced by the Israeli economy during those decades this general approach might have made some sense at the time. This is much less likely to be the case today when Israeli policymakers face a totally different level of development of the economy and of domestic and international capital markets. Thus, even if there was some merit to the low level of independence and to the associated multiplicity of objectives imposed on the Bank during its first three decades of operation, this is no longer the case. Although the actual independence of the Bank is substantially higher today than in those distant years there still are some remnants of past institutional arrangements that handicap the Bank's ability to deliver long run price stability. One is government's ability to force large increases in the monetary base by means of foreign exchange conversions designed to finance potential deficits and the other is

the existence of a lower bound on the exchange rate band. Since it currently fully controls the issuance of Makam the Bank is better equipped than in the past to deal with the first problem, if it arises. Although the lower limit on the exchange rate becomes effective only during periods of substantial capital inflows and a rate of inflation that is above target the existence of such a limit is a handicap on the Bank's ability to deliver price stability under some circumstances.

This raises an important and difficult question about the appropriate level of effective conservativeness or independence for the BI in the future. Section 5 of the paper reviews some of the considerations involved in designing a socially optimal framework of operation for the CB. In particular it addresses the thorny question of whether a CB should also be assigned a "growth target". Rather than summarize the arguments of that section I will conclude with several observations that reflect a broad current intellectual consensus. First, since in the long run monetary policy cannot affect real variables it has, in that run, a comparative advantage in assuring price stability. Second to the extent that the CB is assigned real objectives like "growth", they should be limited to short term anticyclical policy whose magnitude should preferably be left to the Bank. Third, casual evidence suggests that, in the long run, higher central bank conservativeness is associated with lower real rates.

A notable conclusion of the paper is that, since the mid nineties, actual independence is consistently higher than its legal counterpart.³³ This discrepancy invites various political pressures on the CB. Thus, the head of the industrialists association during the second half of the nineties asked the attorney general to rule out that monetary policy violates the BI charter and a number of private bills, introduced by members of Parliament, proposed the imposition of various restrictions that would make the Bank more dependent on the Finance Committee of the Knesset. In 2002, then Finance Minister, Silvan Shalom proposed that authority over monetary policy be delegated to a seven members committee whose members could be recruited from other branches of government and of the economy. According to Shalom's proposal only three members would be affiliated with the BI. The remaining four members would be recruited from other branches of government and of the economy, implying that the external members

³³Although this conclusion is partly based on judgement it was shown to be robust to an alternative way of codifying independence. Further experimentation with even more codification systems is always desirable. But, in view of the further increase in the discrepancy between actual and legal independence since 1998, the conclusion in the text is highly likely to reflect reality, at least, from that time and on.

could outvote those from the Bank. Those episodes suggest, that without some upgrading of legal independence, the current comparatively high level of actual independence may not long endure.

Finally, the structure of the economy and the response of inflation and of inflationary expectations depend on the policy rule. This is the so called "Lucas critique". Following a change in the monetary policy rule the public gradually adjusts its expectation formation process. Thus after the 1985 stabilization the public gradually adjusted its expectation formation process to the new policy regime. A similar, but less dramatic, shift probably occurred following the increase in the conservativeness of policy since the mid nineties reinforcing the trend towards price stability. One of the, often neglected, considerations in the choice of central bank conservativeness is that a change in the policy rule associated with a decrease in conservativeness leads to changes in the process of expectation formation that make it more costly to maintain price stability.³⁴ In view of the non negligible inflationary memories of the Israeli public an adverse change in the public's expectation formation process may occur quite rapidly. The bulge in the exchange rate and in the rate of inflation following the abrupt reduction in the BI interest rate at the end of 2001 supports the view that this risk should not be taken lightly.

7 Appendix

7.1 Coding and aggregation of legal variables

The translation of CB charters into the sixteen basic variables underlying the aggregate index LVAW into numerical codes appear in table A1 of the Appendix. Each variable is coded on a scale between 0 and 1 where 0 stands for the minimal level of independence and 1 for the maximal level. The index LVAW is obtained via a two rounds judgmental aggregation procedure in the first of which sixteen various features of legal independence are aggregated into eight subgroups. Those eight subgroups are then further aggregated to obtain the index LVAW.³⁵ The weights

³⁴A recent empirical documentation of such a process for the US appears in Orphanides and Williams (2003). The work of Woodford (2003) implies that an appropriately chosen commitment raises the ability of the CB to stabilize the real economy while attaining the inflation target on average.

³⁵Cukierman (1992) presents an unweighted version of the same characteristics (LVAU). Other indices, as those used by Bade and Parkin (1988), Alesina (1988, 1989), Grilli, Masciandaro and Tabellini (1991) and Eijffinger

used in the second and last round of aggregation are; appointment and dismissal procedures and term of office of the governor – 0.20; location of authority over monetary policy, CB objectives and severity of limitations on advances to government –0.15 each; limitations on securitized lending, location of decision about CB lending and other miscellaneous feature of limitations on lending – 0.10 each; and the width of the circle of potential borrowers from the CB – 0.05. Further detail appears in section 19.3 of Cukierman (1992).

7.2 Conventions for coding of individual components of actual independence in the pre 1985 era

To reflect the features discussed in section 3.1 of the text, and in line with the definitions in Table A1, the components "who formulates" and "final authority" are adjusted downward from legal codings of 0.67 and 0.2 to "actual" codings of 0.2 and 0 respectively. This is summarized in the row labelled "actual CBI - prior to 1985" in Table A3. The same conjunction of institutional factors also means that the actual weight given to price stability was even lower than the modest legal code for this variable. This judgment is reflected by a replacement of the 0.4 code for the "objectives" variable in the 1954 charter by a code of 0.1. In addition, the "actual" value of the variable "who appoints the CEO?" is scaled down from the legal code of 0.5 to 0.25 to reflect the fact that, although the CEO is formally appointed by the Israeli President, he is **actually** appointed through a decision of the Prime Minister and the Finance Minister that is confirmed by Cabinet.

Last but not least, in view of the fact that the CB was obligated to, either directly or indirectly, lend to government and governmental and private companies that were designated by government at terms that were also designated by various governmental agencies, most of the codings of the limitations on lending (LL) variables are scaled downward (details appear in the last eight figures in the first row of Table A3). To get a full appreciation of the meaning of the coding decisions made in this and in the next subsection the reader is advised to consult Table A1.

and Schaling (1993) can, for the most part, be approximated by subsets of the components of the LVAW (or of the LVAU) index.

7.3 Conventions for coding of individual components of actual independence in the post 1985 era

Authority over monetary policy: (total weight 0.15) The BI was vested with a non negligible degree of **legal** instrument independence already at inception (1954 original law). But as explained in the text this authority largely remained on the books in the pre 1985 era. After the 1985 stabilization the items delegating authority to conduct monetary policy to the bank gradually became operational and more meaningful with the phasing out of DC and the flexibilization of the exchange rate. Flexibilization of the Makam ceiling in August 1994 and the indexation of this ceiling to the CPI from that point and on raised somewhat the instrument independence of the bank at the time. This factor increased again in December 2001 when the ceiling was totally abolished.³⁶ In addition the processes of desegmentation, removal of capital controls and further flexibilization of the exchange rate contributed additional operational freedom to the bank (Figure 2 shows the evolution of the exchange rate band).

The combination of those elements is reflected in a combined coding of the variables "who formulates" and "final authority" (with total weight of 0.113). Prior to 1985 the "actual" value of the code for the combination of those variables was 0.05. I assume that it went up by a factor of 4 but only gradually, after the phasing out of DC became sufficiently important and the exchange rate band sufficiently flexible. More specifically, the code was doubled to 0.1 in 1986 and then raised linearly to 0.2 between 1987 and 1990. To reflect the flexibilization of the Makam ceiling and its indexation in 1994 the code from that year and on was increased by 0.1 bringing its value to 0.3.

To reflect the additional gradual increase in independence due to the combined effect of desegmentation, the further widening of the exchange rate band, and the influence of the international professional revolution associated with the introduction of inflation targets in a good number of countries I assume that this process brought the index to eighty percent of its maximal value (0.8) in 2001. To reflect its gradual nature it is assumed that the process started in 1994 and proceeded linearly till 2001. The code was raised again by 0.1 from 2002 and on to

³⁶The wider meaning of Makam as an instrument of monetary policy and of its flexibilization is discussed in subsection 3.3 of the text. .

reflect the total elimination of ceilings on Makam at the end of 2001.

Limitations on lending: (total weight of 0.5) The value of this group of variables is based on a judgmental coding of the total of the limitation on lending variables. The post 1985 coding of the legal value of this total amounts, from table A2, to 0.513. I assume that, starting in 1986, this figure also reflects the actual value of this total provided the total governmental budget deficit is zero, but that each percentage point increase in the deficit/GDP ratio as conventionally measured reduces this code by 0.04. Making the actual level of stringency of limitations on lending to Government a negative function of the budget deficit is motivated by the following considerations. First, as discussed above, Government can by selling its foreign exchange reserves to the BI raise the level of liquidity in spite of the 1985 "no printing" amendment. The likelihood that Government will engage in such activity is higher when budget deficits are higher. Second, higher deficits raise real interest rates and increase public pressures on the BI to "alleviate" the burden of high rates by liquidity injections.

Finally, to reflect the gradual impact of reductions in various types of DC (as well as the gradual increase of interest rates on those credits) on the effectiveness of limitations on lending I assume that this process was gradually phased in between 1986 and 1995, and that it raised the index to eighty percent of its maximal possible value (0.8) by that year. Over this period the contribution of this factor to the index is assumed to increase linearly.

Objectives: (weight 0.15) It is assumed that following the trauma of the big inflation and the political efforts expanded to stabilize it, the focus on price stability as a main objective of policy substantially increased in 1986. To reflect this, the figure on this variable is raised fourfolds, from 0.1 to 0.4, and maintained at this level through 1987. It is then reduced to 0.3 in 1988 to reflect a relaxation of the exchange rate anchor and kept at this value until 1991. To reflect the initial introduction of inflation targets at the end of 1991 the code is raised back to 0.4 in 1992 and maintained at this level till 1994..

7.4 The negative relation between the real rate and the central bank's output target under imperfect credibility

One aspect of an increase in the CB emphasis on price stability is recognition of the fact that it does not pay to systematically maintain the level of output above potential output. When this occurs for the first time the public does not perceive the change for some time creating a situation in which the true (normally implicit) output target of the Bank is equal to potential, but the public still believes that it is higher than potential. The early stages of stabilization of low inflation are likely to conform to such a pattern. Using a New Keynesian framework due to Clarida, Gali and Gertler (1999) (CGG) this appendix shows that, under such circumstances, the Bank will set a real rate that is higher than the Wicksellian natural rate of interest.

The behavior of the economy is described by

$$x_t = -\varphi(i_t - E_t\pi_{t+1}) + E_t x_{t+1} + g_t \quad (1)$$

$$\pi_t = \lambda x_t + \beta E_t \pi_{t+1} + u_t \quad (2)$$

Here x_t and π_t are the output gap and inflation, $E_t x_{t+1}$ and $E_t \pi_{t+1}$ are the expected values of those variables conditioned on the information available to the public in period t , i_t is the short term nominal rate of interest, g_t is a demand shock, u_t is a cost shock and φ , λ and β are positive coefficients. The stochastic behavior of the two shocks is stationary but persistent, and is given by

$$\begin{aligned} g_t &= \mu g_{t-1} + \hat{g}_t & 0 < \mu < 1 \\ u_t &= \rho u_{t-1} + \hat{u}_t & 0 < \rho < 1. \end{aligned} \quad (3)$$

Here \hat{g}_t and \hat{u}_t are the innovations to the cyclical components of demand and of costs respectively, and μ and ρ characterize the persistence of those shocks. The first equation states that the output gap is negatively related to the ex ante real rate of interest and positively related to the expected

future output gap. The latter appears in the output gap equation to reflect the notion that, since individuals smooth consumption, expectations of higher consumption next period (associated with higher expected output) leads them to demand more current consumption, which raises current output. In this framework the CB affects the output gap and inflation through the choice of the short term nominal rate of interest which, given expected inflation, determines the short term real rate. Note that the CB affects inflation through the output gap.

As in stylized models of sticky staggered prices pioneered by Calvo (1983), current inflation depends on future expected inflation. In this type of model only a fraction of firms has the opportunity to adjust its price each period and, due to costs of price adjustment, each firm adjusts its price at discrete intervals. Hence when it is given the chance to adjust its price the firm adjusts it by more the higher is expected future inflation. The positive dependence of inflation on the output gap is based on the view that this gap is a measure of excess demand and is shared by both forward, as well as backward, looking models of the economy in which output is demand determined.

One of the dimensions of an increase in the effective conservativeness or independence of the CB is that the (initially positive) discrepancy between desired and potential goes down to zero. It is convenient to model that by considering two types of central bankers. One that incurs losses whenever the output gap deviates from a target that is k percent above potential and another type whose output target is equal to potential output. The first type characterizes the Bank before it has internalized the inefficiency associated with output targets that are above potential and the second type represents it after it has internalized the inefficiency. I will refer to the first type as being a relatively "level conservative" CB to distinguish it from Rogoff's (1985) conception of conservativeness that refers to the relative importance attributed by the Bank to the stabilization of inflation and of output. Whenever the term "conservativeness" appears here it should be understood as referring to the first type of conservativeness.

Both CB types dislike deviations of inflation and of output from their respective targets and differ from each other only in their output targets. The objective of either type is to minimize

$$\frac{1}{2}E_0 \sum_{t=0}^{\infty} \delta^t [\alpha(x_t - k)^2 + \pi_t^2] \quad (4)$$

where δ is a discount factor and α is the relative importance attributed by both types to the stabilization of output. Here $k > 0$ for the more liberal (or more dependent) CB and $k = 0$ for the more conservative (or more independent) CB. I shall proceed by solving this problem for any k and then compare the levels of the real rate chosen by each type.

Under discretion a CB of "type k " chooses in each period the nominal interest rate, i_t , and a contingent path for future interest rates so as to minimize the expression in equation (4) subject to the structure of the economy in equations (1), (2) and (3) and taking expectations as given. The Euler equations necessary for minimization of this problem are given by

$$x_t - k = -\frac{\lambda}{\alpha}\pi_t, \quad t = 0, 1, 2, \dots \quad (5)$$

This condition states that, in each period the marginal cost of deviating from the output target is equated to the marginal cost of deviating from the inflation target (which is zero). Note that this condition depends on the effective level of independence (or conservativeness) of the CB as characterized by the size of k . In particular a positive k implies that the CB is willing to tolerate a positive deviation of inflation from its target even when output is at its potential level.

Consistent modeling of imperfect credibility requires some adjustment in the informational assumptions made in CGG. In particular, if the public has full current information about all economic variables and shocks (as CGG assume) it can immediately back up the current value of k from the interest rate, thus eliminating imperfect credibility. To focus on situations of imperfect credibility I assume that, except for the interest rate, the public observes all variables and shocks with a one period lag while the CB still observes them contemporaneously. This represents a minimal deviation from the original framework and prevents the public from immediately inferring the output target of the CB from the observation on the current interest rate. It also moves the CGG framework a bit towards realism.

Suppose now that, after a sustained period during which it had an output target above potential ($k > 0$) the output target of the CB is reduced to the level of potential output ($k = 0$). However the public's perception of the target, denoted k^e , remains positive. Since the actual

value of k is 0, the CB behaves so as to satisfy condition (5) above with $k = 0$.

$$x_t = -\frac{\lambda}{\alpha}\pi_t, \quad t = 0, 1, 2, \dots \quad (6)$$

But the public believes that the CB behaves so as to satisfy the condition

$$x_t^e - k^e = -\frac{\lambda}{\alpha}\pi_t^e, \quad t = 0, 1, 2, \dots \quad (7)$$

where $k^e > 0$ is the discrepancy between desired and actual output as perceived by the public, and x_t^e and π_t^e denote the corresponding perceptions of the output gap and inflation. Cukierman (2004) shows that, under those circumstances the actual values of inflation, the output gap and the real interest rate are given respectively by

$$\pi_t = \alpha q \rho u_{t-1} + \frac{\alpha}{\alpha + \lambda^2} \hat{u}_t + \frac{\alpha^2 \beta}{\lambda(\alpha + \lambda^2)} k^e. \quad (8)$$

$$x_t = -\lambda q \rho u_{t-1} - \frac{\lambda}{\alpha + \lambda^2} \hat{u}_t - \frac{\alpha \beta}{\alpha + \lambda^2} k^e. \quad (9)$$

$$r_t = \frac{1}{\varphi} \left[\lambda q \rho (1 - \rho) u_{t-1} + \frac{\lambda}{\alpha + \lambda^2} \hat{u}_t + g_t + \frac{\alpha \beta}{\alpha + \lambda^2} k^e \right]. \quad (10)$$

Equation (10) implies that the expected value of the real rate of interest is given by

$$Er_t = \frac{\alpha \beta}{\varphi(\alpha + \lambda^2)} k^e \quad (11)$$

which is positive as long as k^e is positive. Thus, as long as the public believes that the CB targets an output level that is above potential, a CB that has recently started to target potential output is led to choose an interest rate that is above the Wicksellian natural rate. Note, from equations (8) and (9), that imperfect credibility also leads to a positive average rate of inflation and to a level of output that is below potential on average as has been observed to be the case during the stabilization of inflation in the OECD countries.

Cukierman (2004) also shows that in the presence of perfect credibility (i.e. $k^e = 0$) the average real rate is at its natural level, average inflation is zero and output is equal to its potential level on average. Thus, a **fully believed**, reduction of the CB output target to the

potential level does not lead to systematic deviations of the real rate from its natural level. Nor does it lead to systematic deviations of inflation and of output from their targets.

The difference between this case and that of imperfect credibility ($k^e > 0$) can be understood intuitively as follows. The positive value of k^e under imperfect credibility leads to a systematically positive expected inflation, which raises actual inflation, via equation (2). To spread the costs of the output gap and of the inflation gap in an efficient manner the CB raises the real rate above its natural level and this depresses average output below potential. By contrast, under perfect credibility, expected inflation is zero on average so that the CB does not need to **systematically** maintain the real rate above its natural level in order to spread the costs of the output gap and of the inflation gap in an efficient manner.

One could argue that the contemporaneous observation of the interest rate from equation (10) can be used by the public to sharpen its perception of the value of k . One way to extend the model in order to account for such a possibility is to reformulate k as a stochastic variable and to recognize that, from equation (10), an observation on the interest rate amounts to an observation on a linear combination of k and of the innovations, \hat{u}_t and \hat{g}_t to costs and aggregate demand. In such an extended framework k^e will be equal to the expected value of k conditional on a linear combination of k and of those innovations. Cukierman (2004) argues that, although such an extension changes some of the model's details, it does not alter the basic conclusion that, a decrease in k from a positive value to zero, will be followed by a period over which real rates are, on average, above the natural rate of interest.

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Table A1: Legal Variables and their Codings

Group	Definition of variable	Variable	Levels of independence and their meanings	Numerical codings
CEO	Term of office of CEO in years	<i>too</i>	1. <i>too</i> ≥ 8	1
			2. $8 > too \geq 6$	0.75
			3. <i>too</i> = 5	0.50
			4. <i>too</i> = 4	0.25
			5. <i>too</i> < 4	0
Who appoints the CEO?	<i>app</i>	1. CEO appointed by CB board	1	
		2. CEO appointed by council composed of members from executive and legislative branches as well as from CB board	0.75	
		3. CEO appointed by legislative branch (Congress, king)	0.50	
		4. CEO appointed by executive branch (council of ministers)	0.25	
		5. CEO appointed through decision of one or two members of executive branch (e.g., prime minister or minister of finance)	0	
Provisions for dismissal of CEO	<i>diss</i>	1. No provision for dismissal	1	
		2. Dismissal possible only for nonpolicy reasons (e.g., incapability or violation of law)	0.83	
		3. Dismissal possible and at discretion of CB board	0.67	
		4. Dismissal for policy reasons at legislative branch's discretion	0.50	
		5. Unconditional dismissal possible at legislative branch's discretion	0.33	
		6. Dismissal for policy reasons at branch's discretion	0.17	
		7. Unconditional dismissal possible at executive branch's discretion	0	
Is CEO allowed to hold another office?	<i>off</i>	1. CEO prohibited by law from holding any other office in government	1	
		2. CEO not allowed to hold any other office in government unless authorized by executive branch	0.5	
		3. Law does not prohibit CEO from holding another office	0	
Policy formulations	Who formulates monetary policy?	<i>monpol</i>	1. CB alone has authority to formulate monetary policy	1
			2. CB participates in formulation of monetary policy together with government	0.66
			3. CB participates in formulation of monetary policy in an advisory capacity	0.33
			4. Government alone formulates monetary policy	0
	Government directives and resolution of conflicts	<i>conf</i>	1. CB given final authority over issues clearly defined in the law as CB objectives	1
			2. Government has final authority only over policy issues that have not been clearly defined as CB goals or in case of conflict within CB	0.8
			3. In case of conflict final decision up to a council whose members are from CB, legislative branch, and executive branch	0.6
			4. Legislative branch has final authority on policy issues	0.4
			5. Executive branch has final authority on policy issues, but subject to due process and possible protest by CB	0.2
			6. Executive branch has unconditional authority over policy	0
Is CB given an active role in the formulation of government's budget?	<i>adv</i>	1. Yes	1	
		2. No	0	
CB objectives	<i>obj</i>	1. Price stability mentioned as the only or major goal, and in case of conflict with government CB has final authority to purchase policies aimed achieving this goal	1	
		2. Price stability mentioned as the only goal	0.8	
		3. Price stability mentioned along with other objectives that do not seem to conflict with price stability (e.g., stable banking)	0.6	
		4. Price stability mentioned with a number of potentially conflicting goals (e.g., full employment)	0.4	
		5. CB charter does not contain any objectives from CB	0.2	
		6. Some goals appear in the charter, but price stability not one of them	0	

Group	Definition of variable	Variable	Levels of independence and their meanings	Numerical codings
Limitations on lending	Limitations on advances	<i>lla</i>	1. Advances to government prohibited	1
			2. Advances permitted but subject to limits in terms of absolute cash amounts or to other types of relatively strict limits (e.g., up to 15% of government revenues)	0.66
			3. Advances subject to relatively accommodative limits (e.g., advances can exceed 15% of government revenues or are specified as fractions of government expenditures)	0.33
			4. No legal limits on advances; their quantity subject to periodic negotiations between government and CB	0
	Limitations on securitized lending	<i>lls</i>	Specification of levels identical to those for advances	
	Who decides control of terms of lending? ^a	<i>ldec</i>	1. CB controls terms and conditions of government borrowing from it	1
			2. Terms of CB lending specified in the law, or CB given legal authority to set these terms	0.66
			3. Law leaves the decisions about the terms of CB lending to government to negotiations between CB and executive branch	0.33
			4. Executive branch alone decides the terms of CB lending to government and imposes them on CB	0
	How wide is the circle of potential borrowers from CB?	<i>lwidth</i>	1. Only central government can borrow from CB	1
2. Central and state governments as well as all political subdivisions can borrow from CB			0.66	
3. In addition to the institutions mentioned under 2 public enterprises can borrow from CB			0.33	
4. CB can lend to all of the above as well as to the private sector			0	
Type of limit when such limit exists	<i>ltype</i>	1. Limit specified as an absolute cash amount	1	
		2. Limit specified as a percentage of CB capital or other liabilities	0.66	
		3. Limit specified as a percentage of government revenues	0.33	
		4. Limit specified as a percentage of government expenditures	0	
Maturity of loans	<i>lmat</i>	1. Maturity of CB loans limited to a maximum of 6 months	1	
		2. Maturity of CB loans limited to a maximum of one year	0.66	
		3. Maturity of CB loans limited to a maximum of more than one year	0.33	
		4. No legal upper bounds on the maturity of CB loans	0	
Restrictions on interest rates ^b	<i>lint</i>	1. Interest rate on CB loans must be at market rate	1	
		2. Interest rate on CB loans to government cannot be lower than a certain floor	0.75	
		3. Interest rate on CB loans cannot exceed a certain ceiling	0.50	
		4. No explicit legal provisions regarding the interest rate on CB loans	0.25	
		5. Law stipulates no interest rate charge on government's borrowing from the CB	0	
Prohibition on lending in primary market	<i>lprm</i>	1. CB prohibited from buying government securities in primary market 2. CB not prohibited from buying government securities in primary market	1 0	

Source: Table 19.1 in Cukierman (1992).

- a. Terms of lending concern maturity, interest, and amount of loans subject to the relevant legal limits.
- b. The rationale for the classification of this variables is that minimum rates are likely to have been devised in order to discourage borrowing at the CB while maximum rates are probably meant to facilitate borrowing at the CB. But the requirement of a minimum rate is classified below "market rates", since minimum rates, when they exist, are usually lower than market rates.

Table A2: Individual and aggregate codings of the legal independence of the Bank of Israel - 1954 charter, 1985 amendment and Levin's committee proposal

	Year of Enactment or Revision of Bank of Israel Law	LVAW		CEO		Policy Formulation		Objectives		Limitations on lending						Sum of market weights		
		Term of office	Who appoints	Dis-missal	Other offices	Who formulates	Final authority	Role in budget	Advances	Securitized lending	Terms of lending	Potential borrowers	Type of limit	Maturity of loans	Interest rates		Primary market	
Original charter	1954	0.50	0.50	0.50	0.50	0.67	0.20	0.00	0.40	0.33	0.00	0.66	1.00	0.00	0.66	0.25	0.00	
After no printing am.	1985	0.50	0.50	0.50	0.50	0.67	0.20	0.00	0.40	0.66	0.00	0.66	1.00	0.00	0.66	1.00	0.00	
Levin's C. proposal	1998/9	0.50	0.50	0.83	1.00	1.00	0.60	0.00	1.00	0.66	0.00	0.56	1.00	0.00	0.66	1.00	0.00	
Weights-LVAW		0.0500	0.0500	0.0500	0.0500	0.6375	0.0750	0.0375	0.1500	0.1500	0.1000	0.1000	0.0500	0.0250	0.0250	0.0250	0.0250	1.0000

Table A4: The behavior of the ex ante real rate of the Bank of Israel since mid 1989

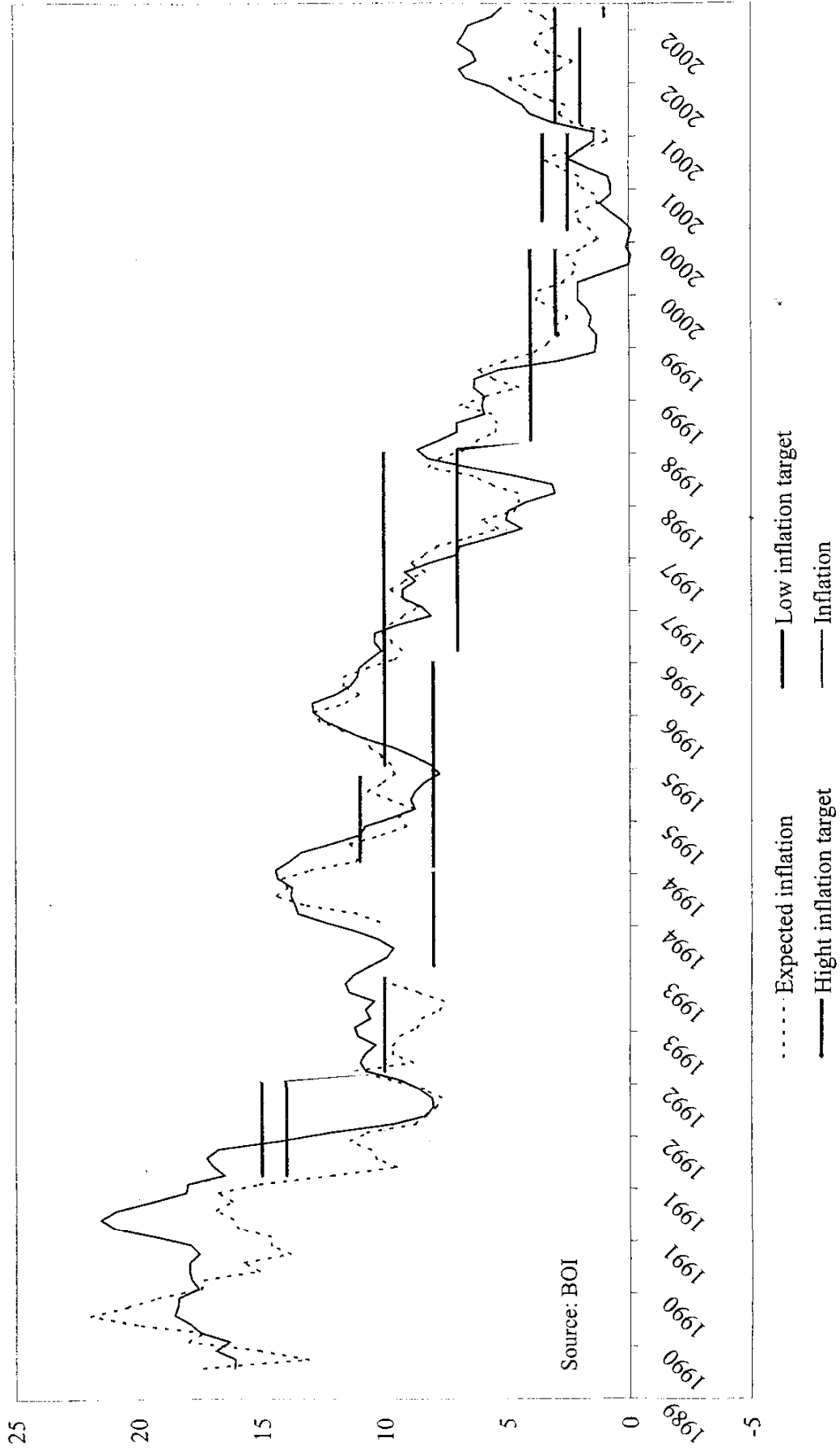
Date	Bank of Israel nominal rate of interest	Inflation expectations (for the next 12 months)	Bank of Israel real rate of interest	Date	Bank of Israel nominal rate of interest	Inflation expectations (for the next 12 months)	Bank of Israel real rate of interest
06/1989	10.92	12.14	-1.09	06/1993	12.76	8.68	3.75
07/1989	11.2	13.86	-2.34	07/1993	11.85	8.47	3.12
08/1989	10.29	14.31	-3.52	08/1993	10.16	7.75	2.24
09/1989	13.3	13.82	-0.46	09/1993	9.45	7.59	1.73
10/1989	16.85	17.43	-0.49	10/1993	9.48	8.63	0.78
11/1989	15.86	15.45	0.36	11/1993	9.75	9.70	0.05
12/1989	16.51	18.23	-1.45	12/1993	10.24	.	.
01/1990	18.2	21.62	-2.81	01/1994	11.04	.	.
02/1990	18.98	20.92	-1.60	02/1994	11.1	.	.
03/1990	18.16	17.39	0.66	03/1994	11.1	.	.
04/1990	15.87	13.13	2.42	04/1994	11.1	.	.
05/1990	14.5	15.10	-0.52	05/1994	11.54	.	.
06/1990	14.38	17.99	-3.06	06/1994	12.19	10.23	1.78
07/1990	15.19	17.42	-1.90	07/1994	12.81	11.14	1.50
08/1990	15.02	20.10	-4.23	08/1994	13.32	13.32	0.00
09/1990	16.54	21.97	-4.45	09/1994	15.07	14.39	0.59
10/1990	15.89	20.45	-3.79	10/1994	16.73	13.96	2.43
11/1990	15.11	19.24	-3.46	11/1994	16.78	14.15	2.30
12/1990	14.41	17.51	-2.64	12/1994	18.47	12.99	4.85
01/1991	15.2	17.37	-1.85	01/1995	18.51	11.17	6.60
02/1991	14.85	15.15	-0.26	02/1995	18.31	10.95	6.63
03/1991	14	15.72	-1.49	03/1995	17.23	11.39	5.24
04/1991	13.19	13.88	-0.61	04/1995	15.82	10.10	5.19
05/1991	13.65	14.63	-0.85	05/1995	15.02	9.11	5.42
06/1991	13.73	14.69	-0.84	06/1995	14.49	9.40	4.65
07/1991	13.88	15.95	-1.79	07/1995	14.44	8.81	5.18
08/1991	14.53	16.20	-1.44	08/1995	14.21	9.76	4.05
09/1991	15.08	16.85	-1.51	09/1995	14.18	10.67	3.17
10/1991	21.55	16.23	4.58	10/1995	14.80	10.03	4.33
11/1991	24.15	16.76	6.33	11/1995	15.26	9.59	5.18
12/1991	19.43	15.10	3.76	12/1995	15.19	9.75	4.96
01/1992	15.85	12.14	3.31	01/1996	14.70	10.13	4.15
02/1992	13.75	9.54	3.84	02/1996	15.04	10.58	4.03
03/1992	11.74	10.31	1.30	03/1996	15.05	10.75	3.88
04/1992	11.79	10.59	1.09	04/1996	15.24	11.78	3.10
05/1992	11.76	11.40	0.32	05/1996	16.01	12.62	3.01
06/1992	11.5	10.73	0.70	06/1996	17.01	12.84	3.69
07/1992	11.69	8.73	2.72	07/1996	18.58	11.55	6.30
08/1992	11.73	8.34	3.13	08/1996	17.69	11.06	5.97
09/1992	11.63	7.89	3.47	09/1996	17.11	11.66	4.88
10/1992	11.7	7.69	3.72	10/1996	16.81	11.62	4.65
11/1992	10.94	8.40	2.34	11/1996	16.44	10.70	5.18
12/1992	10.84	9.76	0.98	12/1996	16.36	9.58	6.19
01/1993	11.51	11.20	0.28	01/1997	15.82	9.30	5.97
02/1993	12.79	8.85	3.62	02/1997	15.22	9.69	5.05
03/1993	12.69	9.66	2.76	03/1997	14.96	10.06	4.46
04/1993	12.69	9.68	2.74	04/1997	14.96	9.72	4.77
05/1993	12.99	9.35	3.33	05/1997	14.99	9.20	5.30

The behavior of the ex ante real rate of the Bank of Israel since mid 1989 - Cont.

Date	Bank of Israel nominal rate of interest	Inflation expectations (for the next 12 months)	Bank of Israel real rate of interest	Date	Bank of Israel nominal rate of interest	Inflation expectations (for the next 12 months)	Bank of Israel real rate of interest
06/1997	14.47	8.62	5.39	06/2001	7.25	2.08	5.07
07/1997	13.66	9.23	4.06	07/2001	6.78	2.08	4.61
08/1997	13.78	9.70	3.72	08/2001	6.61	2.86	3.65
09/1997	14.49	9.15	4.89	09/2001	6.61	3.52	2.98
10/1997	14.55	8.34	5.73	10/2001	6.61	1.97	4.55
11/1997	14.57	8.86	5.24	11/2001	6.38	0.87	5.46
12/1997	14.61	8.29	5.84	12/2001	5.63	0.93	4.65
01/1998	14.56	7.82	6.25	01/2002	3.98	2.33	1.62
02/1998	13.89	6.52	6.92	02/2002	4.04	2.86	1.15
03/1998	13.43	5.35	7.67	03/2002	4.60	2.64	1.91
04/1998	13.07	5.96	6.71	04/2002	4.65	3.74	0.88
05/1998	12.71	4.68	7.67	05/2002	4.89	4.32	0.55
06/1998	12.34	4.46	7.54	06/2002	7.26	4.82	2.32
07/1998	12.05	4.55	7.17	07/2002	9.66	2.78	6.69
08/1998	10.50	5.60	4.64	08/2002	9.65	2.32	7.17
09/1998	10.07	6.36	3.49	09/2002	9.64	3.30	6.14
10/1998	10.28	8.15	1.97	10/2002	9.69	3.82	5.65
11/1998	13.51	7.72	5.38	11/2002	9.64	3.57	5.86
12/1998	14.56	6.63	7.43	12/2002	9.61	2.94	6.48
01/1999	14.56	6.18	7.90	01/2003	9.43	3.48	5.75
02/1999	14.48	5.44	8.58	02/2003	9.43	4.23	4.99
03/1999	13.99	5.35	8.20	03/2003	9.39	3.31	5.88
04/1999	13.41	5.60	7.40	04/2003	9.21	1.99	7.08
05/1999	12.86	6.86	5.61	05/2003	8.87	1.37	7.40
06/1999	12.86	5.79	6.68				
07/1999	12.81	4.50	7.95				
08/1999	12.31	5.55	6.40				
09/1999	12.30	6.10	5.84				
10/1999	12.30	5.07	6.88				
11/1999	12.23	3.80	8.12				
12/1999	11.93	3.31	8.34				
01/2000	11.39	2.86	8.29				
02/2000	10.87	2.98	7.67				
03/2000	10.50	2.52	7.79				
04/2000	10.14	3.00	6.93				
05/2000	9.85	3.76	5.87				
06/2000	9.86	3.65	5.99				
07/2000	9.82	2.68	6.95				
08/2000	9.64	2.31	7.17				
09/2000	9.39	2.19	7.05				
10/2000	9.06	2.53	6.37				
11/2000	8.87	1.82	6.93				
12/2000	8.63	1.25	7.29				
01/2001	8.45	1.60	6.75				
02/2001	8.12	2.03	5.97				
03/2001	7.87	2.15	5.60				
04/2001	7.57	1.26	6.23				
05/2001	7.56	1.43	6.04				

Source: Bank of Israel

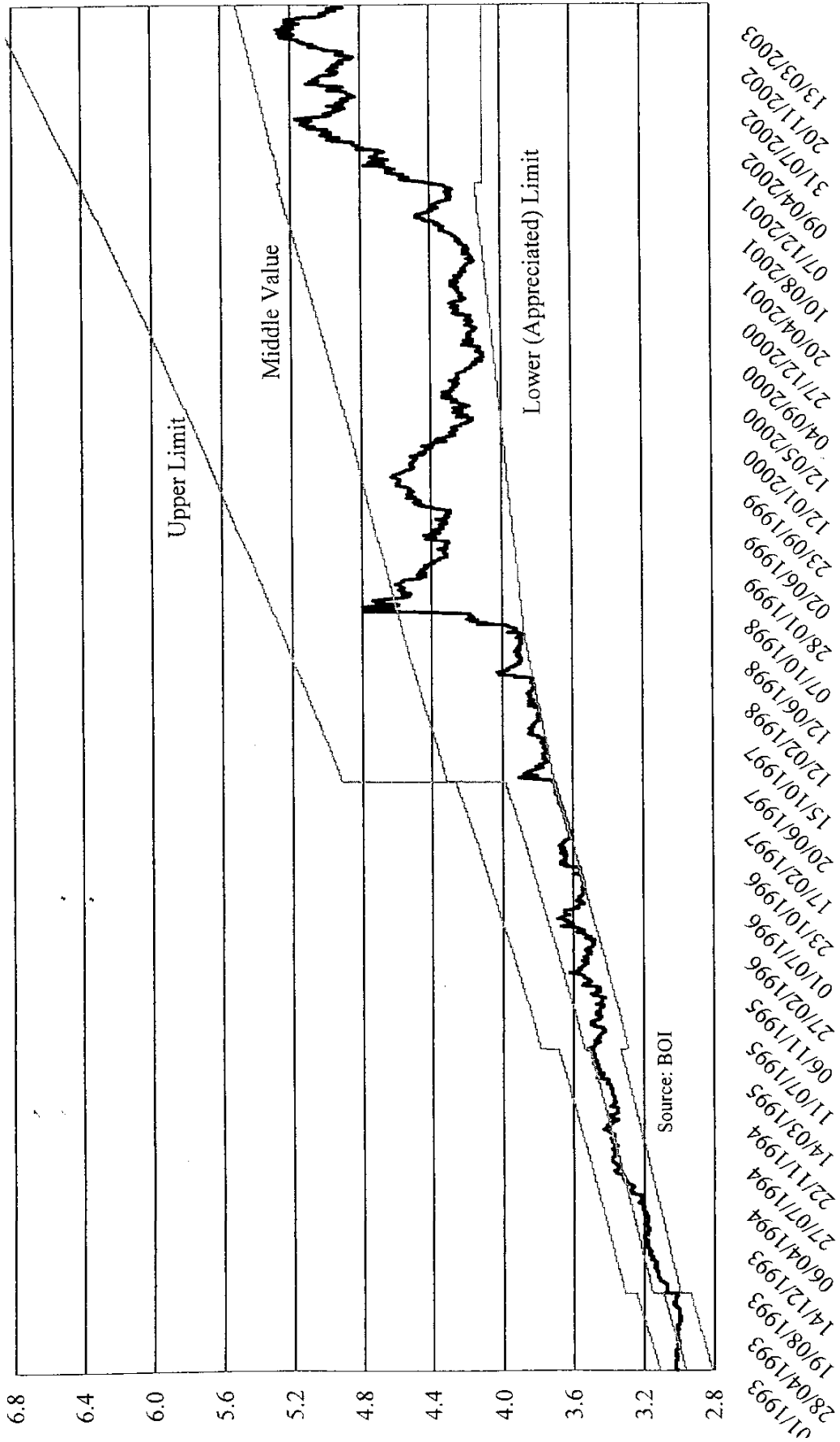
Figure 1: The inflation target, actual inflation and expected inflation



Source: BOI

Source: Bank of Israel

Figure 2: NIS exchange rate against the currency basket



Source: Bank of Israel