

The Bank of Israel

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De Jure, De Facto, and Desired Independence: The Bank of Israel as a Case Study

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This chapter recounts the evolution of the de jure independence of the Bank of Israel (BOI) since it was established in 1954, provides an international comparison, and assesses year-by-year changes in the bank's de facto independence since the economic stabilization in 1985. Although no attempt is made to evaluate the year-by-year evolution of de facto 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 de facto independence in the prestabilization era was substantially lower than following it, the average level of de facto independence before 1985 provides a reasonable summary statistic for this variable during the thirty years that culminated in the 1985 stabilization. Comparison of the average levels of de facto independence before and after 1985 reveals a quantum leap in this variable between these two broad periods.

The chapter also estimates the level of de jure independence embedded in the recommendations of the 1998 Levin Commission on reform of the Bank of Israel law. A section near the end of the chapter discusses factors related to the desired future level of independence. In particular, it evaluates the pros and cons of growth targets, the closely related use of the output-gap concept as an indicator for making interest-rate policy, and the Levin Commission's recommendation to vest the legal authority for the conduct of monetary policy with a monetary-policy committee.

It is important to stress at the outset that since the concept of independence used in this chapter did not evolve until the late 1980s and, in part, in the 1990s, the estimation of independence entails the retrospective application of modern concepts of central-bank independence (CBI) to the early years of Israeli statehood. During these years, the professional consensus about the roles of a central bank (CB) and its status within government were very different from those of the present. Furthermore, the structure of the Israeli economy was substantially different from the present structure, inducing different economic-policy priorities.¹

The measurement of CBI has developed significantly during the past fifteen years. Such measurement 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 effect of CBI on the performance of developed economies normally use *de jure* independence, derived from CB charters, as a proxy for the *de facto* independence of the central bank.² Obviously there are often differences between *de facto* and *de jure* independence and such differences may be wider in developing countries than in developed ones.³

De jure independence is only one factor, albeit a weighty one, in determining the *de facto* independence of a CB. Institutional changes that are not reflected in the CB's formal charter may often have profound effects on *de facto* independence. Due to substantial cross-country variety in institutional arrangements, existing measures of *de jure* independence often overlook changes in *de facto* independence that are not reflected in *de jure* independence. One way to incorporate these additional elements into formal measurements 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. Nevertheless, it is a step toward the development of more comprehensive measures of *de facto* independence.

The BOI, which celebrated its fiftieth anniversary in 2004, is a case in point. Despite the relative immobility of the bank's charter during that half-century, substantial changes in the extent of fiscal dominance over monetary policy and the structure of the Israeli economy effected important changes in the *modus operandi* and the *de facto* independence of the bank, mostly after the 1985 stabilization.⁴ At the methodological level, then, this chapter may be considered a case study that illustrates some of the factors that one should bear in mind when attempting to complement the information contained in standard measures of *de jure* CBI.

An important general lesson taught by this chapter is that *de facto* independence may change substantially without any perceptible changes in *de jure* independence. Three additional conclusions, specific to Israel, are: (1) Although the BOI has been more independent—*de jure* and *de facto*—since 1985 than before, the gain has been more dramatic at the latter level than at the former. (2) Until the mid-1990s, *de facto* independence was generally weaker than *de jure* independence. Since the mid-1990s, *de facto* independence has been stronger than *de jure* independence. (3) Although high by domestic historical standards, the BOI's *de facto* independence since the mid-1990s has not been as high as the current *de jure* independence of the central banks in the twenty-six countries that are either current or prospective members of the European Monetary Union (EMU).⁵

The chapter is organized as follows: after a brief description of standard measures of *de jure* independence, the next section presents data on the evolution of *de jure* independence of the BOI over the past fifty years and compares it with that in other developed and developing countries over the past two decades. It also examines the level of *de jure* independence that would have prevailed had the recommendations of the Levin Commission on reform of the BOI charter been accepted.⁶ The following section sets forth a methodology for the measurement of *de facto* CBI and establishes comparability by using the

same metric that is used to measure de jure independence. This section also discusses factors unrelated to law that have affected the BOI's de facto independence over time and the assumptions made in transforming these factors into numerical codes.

The next section presents and discusses the historical evolution of the BOI's de facto independence and evaluates the factors that have combined to enhance it. This is followed by a section that reflects on the desirable level of BOI independence in view of current empirical and theoretical knowledge about the effects of CBI and CB conservatism, and debates the pros and cons of growth and output-gap targeting. The final section offers concluding remarks.

EVOLUTION OF THE DE JURE INDEPENDENCE OF THE BANK OF ISRAEL

The Concept and Measurement of De Jure Central-Bank Independence

A layperson or an economist raised in the tradition of twenty or more years ago may question the need for central-bank independence in the first place. Why should a public policymaking institution be independent in its decisions from the democratically elected government?⁷ The current consensual answer is that governments, since they try to attain several other objectives such as high employment and easy financing of their own expenditure, create a socially costly inflation bias. Thus, the delegation of authority to a relatively conservative institution that is more concerned than the government about price stability—that is, the central bank—is beneficial for society (Rogoff, 1985).

In keeping with this view, indices of de jure CBI focus on the extent to which the CB is directed by law to focus monetary policy on price stability as the only, or the main, purpose of such policy, even if this results in the de-emphasis of other goals such as growth and the financing of budget deficits. To be effective, this CB focus should be backed by sufficient independence in the choice of monetary instruments. Most importantly, the CB's decision-making auspices should not receive explicit or implicit instructions from government officials and should have enough personal and financial independence to be able to resist political pressures. Furthermore, there should be sufficiently effective constraints on government's ability to resort to inflationary finance. Thus, CBI does not mean *carte blanche*; instead, it means that the CB has a sufficiently clear mandate to focus mainly on price stability and has enough instrument independence to implement this mandate.

The recent literature contains several alternative indices of de jure CBI.⁸ The index proposed here is based on a coding of sixteen different characteristics of CB charters that pertain to the distribution of authority over monetary policy, procedures for the resolution of conflicts between CB and government, the relative importance of price stability in CB objectives as stated in the law, the seriousness of limits on CB lending to government, and procedures for the appointment and dismissal of the CB governor. Cukierman, Webb, and Neyapti (1992) present a weighted index of these sixteen characteristics that they term LVAW. The scale of

this aggregate index, as well as of individual de jure indices, ranges from 0 (the least possible independence) to 1 (maximum independence). The conventions used to code individual components of de jure independence and the aggregation procedure used to obtain the aggregate index are described in table A1.1 of the appendix. One advantage of the LVAW index is its availability for many countries during the second half of the twentieth century, thereby allowing us to compare the de jure independence of the BOI with that of other countries' CBs at different times.

De Jure Independence of the Bank of Israel over Time and in Comparison with Other Countries

Although the original Bank of Israel charter (1954) has been amended more than once during the past fifty years, only the 1985 amendment is relevant for our CBI index. This amendment, popularly nicknamed the “No-Printing Law,” substantially limits government’s legal ability to obtain advances from the BOI and stipulates that securitized borrowing from the central bank should be at market rates.⁹ Table 1.1 describes the aggregate de jure independence of the BOI under the original 1954 law and under the law after the 1985 amendment against the background of the de jure independence of CBs in developed economies during the 1980s.¹⁰ The table shows that under the original 1954 law the BOI had less de jure independence than the CBs of Germany, Switzerland, the United States, Canada, and the Netherlands, but more de jure independence than the CBs of Sweden, New Zealand, the United Kingdom, France, and Italy. Under the original statute, the de jure independence of the Bank of Israel ranked in the 41st percentile from the top. After the 1985 amendment, the BOI gained de jure independence, its LVAW index rising from 0.39 to 0.46. This elevated its ranking among the central banks of developed countries in the 1980s to the 27th percentile from the top. A similar qualitative picture emerges when the comparison

Table 1.1. De Jure Independence of the BOI before and after the “No-Printing” Amendment—Comparison with Developed Countries during the 1980s

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—1998/99 (Levin Commission proposal)	0.61	Australia	0.36	Spain	0.23
W. Germany	0.69	Iceland	0.34	Japan	0.18
Switzerland	0.64	Luxembourg	0.33	Norway	0.17
Austria	0.61	Sweden	0.29	Belgium	0.17
Denmark	0.50	Finland	0.28		
United States	0.48	U.K.	0.27		
Canada	0.45	Italy	0.25		

Source: Table 2 in Cukierman, Webb, and Neyapti, 1992 and table A1.1 in appendix.

is made with the central banks of developing countries during the 1980s. Further details appear in table 2 of Cukierman, Webb, and Neyapti (1992).

The picture shown in table 1.1 changed quite a bit in the 1990s. During that decade, the *de jure* independence of many central banks—those of all countries that joined the euro zone in 1999; nearly all former socialist economies (FSEs), which established new central banks with very high levels of *de jure* independence; practically all Latin American economies; New Zealand; the United Kingdom; Sweden; and Japan—was substantially upgraded. The countries that joined the euro zone had to upgrade the *de jure* 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. However, the flood of central-bank reforms in other FSEs, as well as in other parts of the world—always in the direction of more independence—reflects a growing professional consensus among policymakers and academics that high CBI is desirable.¹¹

As a consequence of this global trend, the BOI has much less *de jure* independence, relative to other countries, at the beginning of the twenty-first century than it had after the 1985 “No-Printing Law” was passed. The discussion that follows documents some of the numerical dimensions of this process. As table 1.1 shows, the LVAW index of aggregate *de jure* independence for the BOI has been constant at 0.46 since 1985. In contrast, the average *de jure* independence embodied in the charters of twenty-six FSEs was 0.56 in the second half of the 1990s.¹² Even after the “No-Printing Law” passed, the Bank of Israel remained well below the median in this group of central banks. Only eight banks (those of Azerbaijan, Croatia, Kazakhstan, Macedonia, Romania, Tajikistan, Turkmenistan, and Ukraine) scored lower. Although the exact numerical value of the LVAW of the European Central Bank (ECB) as prescribed by the Maastricht treaty is not available, calculations by Sadeh (2003) suggest that a score of 0.76 would be overly restrictive as a lower bound.¹³ Interestingly, the United Kingdom, Sweden, and Denmark, which chose not to join the EMU, also gave their CBs much more *de jure* independence during the 1990s. In the estimation of Sadeh (2003), the LVAW indices for these countries as of 2001 were 0.89, 0.92, and 0.70, respectively. In relative terms, then, the *de jure* independence of the BOI is substantially lower today than it was in the 1980s.

Estimating the Level of De Jure Independence Implicit in the Levin Commission Recommendations

In December 1997, Prime Minister Benjamin Netanyahu appointed a committee of experts to recommend an update of the BOI charter. The committee, headed by Supreme Court Justice (ret.) Dov Levin, was comprised of a former governor of the BOI, a former chair of the Knesset Finance Committee, two academic economists, one accountant, and one lawyer. In December 1998, after a year of deliberations, the committee presented the prime minister with its recommendations for reform of the Bank of Israel charter (Levin Commission, 1998). Although the legislature did not pursue the recommendations, it is interesting to examine the level of *de jure* independence that the committee envisaged.

A quick glance at the first column of table 1.1 suggests that the Levin Commission recommendations, if implemented, would raise the index of de jure independence of the BOI from 0.46 to 0.61. Three main factors would account for the increase: (1) Price stability takes precedence over other goals. (2) Instrument independence is asserted more strongly than in the existing law. (3) The set of circumstances under which a governor may be dismissed is narrowed. The adoption of the Levin Commission recommendations would boost the de jure independence of the BOI appreciably—to slightly above the median of the group of twenty-six FSEs, but still substantially below the indices of the Bank of England, the Bank of Sweden, and the ECB.¹⁴

The committee also recommended that authority over the conduct of monetary policy, currently vested solely with the governor of the Bank of Israel, be delegated to a five-member committee. The effect of this recommendation on independence is not immediately obvious and the LVAW index, as constructed, does not reflect it. A discussion of the likely effect of this recommendation on de facto independence under alternative scenarios appears later in a subsection on the “Internal Division of Powers over Monetary Policy at the BOI and the Levin Commission Recommendation” subsection.

EVALUATION OF THE DE FACTO INDEPENDENCE OF THE BANK OF ISRAEL—METHODOLOGICAL ISSUES AND ASSUMPTIONS

De facto independence need not coincide with de jure independence, of course. A disparity may occur for a variety of reasons: (1) Laws are strongly susceptible to lacunae, leaving implementation open to interpretation and interference by other institutions within general government. (2) Even when the law is clear and lacuna-free, imperfect compliance may cause slippage between the letter of the law and actual practice. (3) The economic and institutional structures within which the CB operates affect the CB's de facto independence even where de jure independence is strongly honored.

In the case of the Bank of Israel, such factors cannot be overemphasized. Until the 1985 stabilization, one of the BOI's main tasks was to channel and extend credit to various sectors of the economy. This was accomplished through an elaborate system of directed credit (DC). The BOI had relatively little influence on the size, composition, and terms of this credit. Furthermore, due to other institutional restrictions the bank did not have sufficient authority to operate effectively in the open market. In addition the capital market was highly segmented and dominated by noncompetitive elements. The combination of these factors seriously impeded the bank's practical ability to focus on the price-stability goal. Since the 1985 stabilization, however, this state of affairs has been changing gradually due to desegmentation, deregulation, and changes in the operating procedures of monetary policy. Some of these changes had profound effects on the de facto independence of the BOI even though, as shown in the previous section, the changes in de jure independence were relatively modest.

Here we describe the methods and assumptions that we used to measure the changes in the BOI's de facto independence before and after 1985 as well as within the post-1985 period. To make the findings as comparable as possible with de jure independence, we used the same codification system for both actual and de jure independence. In coding de facto independence, however, account was taken not only of the letter of the law but also of what happened in practice. Consequently, the effects of changes in institutional and related arrangements—such as the size of DC, the BOI's de facto freedom to conduct open-market operations, the magnitude of the budget deficit, the efficacy of limits on government's ability to borrow from the CB, the extent of deregulation of financial markets, the type of exchange-rate regime, and the existence or nonexistence of inflation targets—may be factored into the index. Although this methodology is inevitably judgmental in that it entails the evaluation and location of the effects of the aforementioned factors across the components of the index, it has two advantages. First, it imposes a minimum of discipline on the inevitably judgmental measurement of de facto CBI. Second, by committing itself to specific numerical values for the components of the index, it paves the way to a systematic and more precise future evaluation of the de facto independence of the bank.

Codification of De Facto Independence in the Pre-1985 Era

During much of the period before the 1985 stabilization, monetary policy was severely restricted by a combination of factors. The BOI was forced to act, to a large extent, like a development bank that grants cheap credit in volumes and under terms largely determined by outside players. Financial markets were strongly segmented and the bank had little practical latitude to conduct the open-market operations that were needed to absorb liquidity injections that government and the private sector created (Cukierman and Sokoler, 1993; Barkai and Liviatan, 2007a, d). Although the impact of those constraints on the ability and determination of the bank's management to keep inflation low varied somewhat, the variations were minor in comparison to the changes that followed the 1985 stabilization.

Therefore, as an initial approximation, we assume that the de facto independence of the BOI in the pre-1985 period was constant but allow for variations in the post-1985 period. To measure the actual values of the components of independence in the pre-1985 period, we use the codings of the corresponding de jure components in the 1954 law as a benchmark and adjust the codings, where necessary, to reflect the levels of de facto independence on these components. During this period, the existence of large-scale directed credit in magnitudes and under terms that were determined outside the CB, coupled with severe limitations on the bank's ability to conduct open-market operations, meant that despite its de jure authority the BOI's ability to control monetary policy was quite limited. In fact, the currently accepted goals of monetary policy were largely subjugated to the BOI's role as a development bank.¹⁵ Under these conditions, the actual weight of price stability in the conduct of monetary

policy and compliance with de jure lending restrictions were substantially lower than their legally mandated counterparts.¹⁶

Codification of De Facto Independence in the Post-1985 Era

The post-1985 period is characterized by sustained gradual processes of institutional change that, in many cases, have had appreciable consequences for the de facto independence of the BOI. The most important of them are the reduction of DC (mostly through attrition), periodic increases in ceilings on the total stock of short-term Treasury bills (MAKAM) culminating in their total abolition at the end of 2001, desegmentation of credit markets, deregulation of capital flows, and flexibilization of the exchange rate. The introduction of inflation targets in December 1991 falls into this category as well. Additionally, a substantial increase in the short-term key rate, starting in the mid-1990s, points to an increase in the relative emphasis on price stability.¹⁷

Despite the 1985 “no-printing” amendment, the law leaves some latitude for the monetization of budget deficits, for several reasons. First, the government is free to convert its substantial foreign exchange receipts at the BOI without passing them through the foreign-exchange market and spending the proceeds domestically. Second, although the BOI may mop up the consequent increase in liquidity by issuing short-term Treasury bills, the amount of liquidity that the bank could absorb by means of this instrument was capped until the end of 2001.¹⁸ The ceiling was often effective, forcing the bank to rely on auctioned deposits to mop up liquidity. For reasons elaborated in the next subsection, these auctioned or time deposits (PAZAK) may not allow the bank to absorb liquidity as effectively as it could by issuing Treasury bills (MAKAM). Third, even in the absence of institutional constraints, the maintenance of low inflation in the face of large deficits entails unpopularly high interest rates and makes it more difficult for the BOI to focus on the objective of price stability, thereby limiting its de facto independence. The introduction of inflation targets in 1991 marked the beginning of a process in which these targets replaced the exchange rate as a nominal anchor. Initially, the target was treated like a prediction rather than a commitment to deliver a certain rate of inflation. However, the stringency and effectiveness of inflation targets gradually increased during the 1990s as both government and the BOI increasingly construed the target as a commitment and also gradually lowered it (figure 1.1). Table A1.3 in the appendix builds a judgmental coding of these and other effects into the index. The third part of the appendix lists the conventions followed to code the components of de facto independence using the same classification as that used to code de jure independence. The groups of variables affected are those related to the authority over monetary policy, lending restrictions, and CB goals. The general conventions for the coding of the last-mentioned variable between 1986 and 1994 are straightforward and are relegated to the appendix. Since the considerations involved in coding this variable from 1995 onward rely on broader economic considerations, they are treated in the discussion that follows.

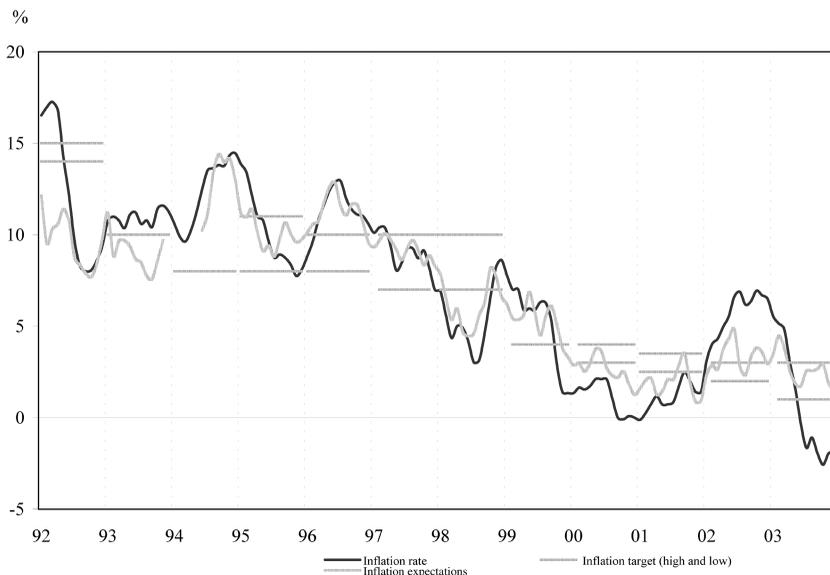


Figure 1.1. Inflation Target, Actual Inflation, and Inflation Expectations.

Source: BOI.

Sometime in the early to mid-1990s, the short-term interest rate became an important and highly visible instrument of monetary policy. After resting at rather low levels until 1994, the real short-term rate (as measured by the real rate on short-term Treasury bills) rose markedly in 1995, leveled off at 4%–5% until 1997, climbed to 6% in 1998, remained at or above this level until 2000, and fell back to 4% or less from 2001 and on.¹⁹ Thus, real short-term real rates were uncharacteristically high during the six years from 1995 to 2000. From the eve of this high-interest era (1994) to its termination (2000), actual annual inflation plummeted from over 12% to slightly over 1%.

The onset of this high-interest period may be thought of as the beginning of a process of reduction in the BOI's implicit output target. Until then, the bank probably had, at least implicitly, an output target that exceeded the potential level of output. Under such circumstances, as has been well known since the early 1980s, discretionary monetary policy is susceptible to an inefficient inflation bias (Kydland and Prescott, 1997; Barro and Gordon, 1983). Some time during the early 1990s, central bankers and international institutions such as the IMF internalized this fact, leading to a worldwide uptrend in CB independence and an accompanying decrease in CB implicit output targets. The high-interest period in 1995 may well have been set in motion by the adoption of a similar point of view by decision makers at the BOI.

Since this point of view was novel at the time, the public may not have noticed it for a while. Consequently, inflation expectations did not fully internalize this change for some time. Measurements of inflation expectations as derived from the capital market support this statement by showing that,

during the first three years of the high-interest era, average annual inflation expectations ranged from 9% to 11% (Liviatan, 2007, table 17.3).²⁰

A relatively simple way to conceptualize the change in BOI policy and the initial lack of public response to it is to posit that, at the outset, the bank had an implicit output target that was above the potential. Then, at some point during the mid-1990s, the implicit output target declined and became equal to potential output. For several years following the change in policy, however, the public continued to believe that the CB had an above-potential output target. Under such circumstances, it may be shown that the real interest rate is higher, on average, than its natural level as long as the lower output target is not fully credible. The fourth part of the appendix demonstrates this within a New Keynesian framework formulated by Clarida, Gali, and Gertler (1999). Importantly, initially imperfect credibility of the lower output target is necessary for the attainment of above-natural-average real rates. Had the public become aware of the lower output target immediately, real rates would have remained at their natural level on average (see appendix).

Liviatan (2007) shows that monetary expansion was slower during the high-interest era than in the early 1990s, confirming that monetary policy became more restrictive in terms of both interest rates and growth rates of money supply. Liviatan argues that, since prices and wages are stickier than the nominal exchange rate, this led to an incipient appreciation of the real exchange rate that was followed later on by a partial reversal of this tendency.²¹

Importantly, the mechanism outlined here and the one stressed by Liviatan are complements rather than substitutes. In fact, both are needed for a full understanding of the reason for the change in BOI policy in the mid-1990s and of its economic consequences. Be that as it may, there is little doubt that the era of high real rates is associated with the de-emphasis of output objectives by the BOI. To reflect these considerations, we raised the actual value of the “objectives” code from 0.4 in 1994 to 0.6 for the 1995–97 period.

During the next three years, the importance attributed to price stability appears to have increased again, for several reasons: (1) After an upturn in inflation in 1998, the inflation target was reduced in 1999 to its lowest level ever (to that time) and the real rate was raised further. (2) Regressions of actual inflation on lagged values of the inflation target show that, while the target had no significant impact on inflation in the first half of the 1990s, it had a sizable and significant impact on inflation from 1996 on.²² (3) Taylor rules and exchange-rate-based interest-rate-reaction functions estimated for the July 1993–December 2001 period generally underestimate the interest rate set by the BOI from 1997–98 on (Melnick, 2002). To reflect these factors, the code was raised from 0.6 in 1997 to 0.9 in 1998 and was held at this level until 2001.²³

Following a “deal” between the BOI and the Ministry of Finance in late 2001, the key rate was lowered by 200 basis points in December of that year. The resulting substantial reduction in the real rate was reversed during the second half of 2002 and in 2003. To reflect the dip, we reduced the code to 0.8 for 2002 and returned it to 0.9 for 2003.

Treasury Bills, Time Deposits, Swaps, Government Foreign-Exchange Transactions, and Instrument Independence

Until it was abolished at the end of 2001, the ceiling on the value of short-term Treasury bills that the BOI could issue on behalf of the government prompted the bank to apply a restrictive monetary policy by accepting time deposits (PAZAK) or offering swaps to the banking system. This tendency was particularly evident in the second half of the 1990s. Since they are offered only to the banking system, the two last-mentioned instruments have a more limited scope than Treasury bills, which are offered to the public and are also more liquid because they are traded on the secondary market. Accordingly, the bank can mop up a given amount of liquidity at lower cost by means of Treasury bills than by means of time-deposit accounts or swaps negotiated through the banking system.

Thus, the source of authority over the size of Treasury bill balances has implications for the efficiency of the monetary-policy instruments available to the bank. Hence, the lifting of the ceiling on Treasury bill balances in the mid-1990s and the elimination of the ceiling in 2001 enhanced the bank's de facto instrument independence, as explained in the appendix. The bank did not wait long to exercise its control over the superior instrument. Indeed, from the end of 2001 to the end of 2002 the Treasury bill balance increased by about 25% (from NIS 35 billion to slightly under NIS 44 billion) whereas the balance in time-deposit accounts decreased by more than NIS10 billion.²⁴

In its capacity as the government's banker, however, the BOI converts any amount of foreign exchange that the government desires into domestic currency and vice versa.²⁵ An important implication of this arrangement is that, by converting its dollar balances into NIS to finance current expenditure, the government may circumvent the spirit of the 1985 "No-Printing" Law. As long as legal ceilings on the issuance of Treasury bills existed, the BOI did not have enough instrument independence to sterilize the effect of such conversions on the money supply. Since the ceilings were removed in December 2001, the bank has been able to utilize its ability to issue Treasury bills to absorb the impact of such transactions on the monetary base, thereby maintaining the spirit of the No-Printing Law. But government's ability to use its considerable foreign-exchange balances to finance excesses of expenditures over tax revenues may induce a bias toward excessive use of this source of finance.

The loan guarantees extended to the government of Israel by the United States following the second Gulf War may have a similar effect. The government may invoke the guarantees to borrow abroad without necessarily spending the proceeds at the time. Such an action normally bolsters foreign exchange reserves in the first phase and expands the money supply when the government decides to spend all or some of these additional reserves domestically. Such events underscore the need to equip the BOI with enough instrument independence to mop up the excess liquidity that is created in the second phase.

EVOLUTION AND ROOTS OF THE DE FACTO INDEPENDENCE OF THE BANK OF ISRAEL

Table 1.2 shows the aggregate de facto independence level of the BOI as characterized by the weights of the LVAW index. For comparison purposes, the aggregate de jure value of the same index is presented as well. The detailed codings underlying the de facto aggregate index appear in table A1.3 of the appendix; the detailed conventions used to generate those codes are set forth in the second and third parts of the Appendix. The aggregate level of de facto independence, based on these weights and codes, is denoted by AVAW.

Table 1.2 supports several general conclusions: (1) the BOI has had much more de facto independence, on average, in the post-1985 period than before. (2) Its average de jure independence has also increased since 1985, but by a substantially lower factor than its de facto independence. (3) Whereas de facto independence was substantially lower than de jure independence in the pre-1985 period, it was slightly higher than de jure independence, on average, in the post-1985 period.²⁶ (4) Despite constant de jure independence, de facto independence in the post-1985 era has varied considerably (see table 1.2).

For all these reasons, the 1985 stabilization marks a watershed in the periodization of CBI in Israel. Although this statement applies to both de jure and de facto CBI, it is much more dramatic in regard to the latter type. Taking a look at the progression of de facto independence after stabilization, we see that an initial dramatic jump in 1986 was followed by a decline that resulted in a local trough in 1989, succeeded by a return to approximately the 1986 level in 1994.²⁷ The period immediately following (1995–98) was characterized by additional and considerable increases in de facto CBI.

Since the mid-1990s, generally speaking, de facto independence has been uniformly higher than in previous years and also substantially higher than de jure independence. In fact, the de facto independence of the BOI since the mid-1990s has been in the upper range of de jure independence of developed

Table 1.2. Evolution of the De Facto Independence of the Bank of Israel

Year	AVAW (de facto)	Memo: LVAW (de jure)	Year	AVAW (de facto)	Memo: LVAW (de jure)
Pre-1985	0.13	0.46	1994	0.51	0.46
Post-1985 (avg.)	0.53	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

countries' CBs in the 1980s, with only Germany, Switzerland, and, sometimes, Austria having higher scores (table 1.1). It also is in the same range as the average de jure independence of transition economies in the 1990s. This level, however, is much lower than the current levels of de jure independence of the ECB, the Bank of England, and the Bank of Sweden. These findings suggest that various nonlegislative changes that modify the CB's institutional framework may affect de facto independence quite dramatically even without any changes in the law or in law abidance.²⁸ A more general lesson from the case of the BOI is that legal indices of CBI should be supplemented by additional institutional evidence.

Sensitivity Analysis

Eijffinger and Schaling (1993) and Eijffinger and van Keulen (1995) claim that, at least for developed economies, the importance of de jure characteristics related to the assignment of authority over monetary policy, the procedures for conflict resolution, and the relative importance prescribed by law to price stability far outweigh the importance of other parameters. In some versions of their study, they go as far as to assign positive weights *only* to these three de jure variables. In contrast, the total weight that the LVAW index assigns to these three variables is merely 0.3.

To examine the sensitivity of the qualitative results of our study to these weighting assumptions, two alternative versions of the aggregate indices were calculated. One, whose de jure value is labeled LVES, assigns respective weights of 0.4, 0.4, and 0.2 to the allocation of authority for monetary policy, the procedures for resolution of conflicts between government and the CB, and the extent of focus on price stability as prescribed by law. All other variables are assigned zero weights. This weighting scheme, however, appears extreme in that it totally ignores the seriousness of the restrictions on lending to government. To account for this factor while continuing to focus strongly on the variables stressed by Eijffinger and Schaling, a second index, whose de jure value is labeled LVESX, was calculated. LVESX is a weighted average of the narrow LVES index and the subaggregate of all restrictions on CB lending to government,²⁹ which were weighted at 0.6 and 0.4, respectively. Essentially, this index assigns total weights of 0.48 to the "policy formulations" group, 0.12 to "objectives," and 0.4 to the "lending restrictions" group, and neglects the "CEO" group.

The evolution of the de facto (denoted AVESX) and the de jure (LVESX) values of the aggregate index, based on this weighting scheme, is shown in the second column of table A1.3 in the appendix. The data suggest that practically all the qualitative results attained by use of the wider LVAW index carry over to the narrower index. A similar conclusion is obtained when the calculations are performed again with the even narrower LVES index (not shown).

Interestingly, the post-1985 value of the LVESX index, 0.38, is substantially lower than the average value of the same index for the central banks of transition economies in the 1990s. The average de facto value of this index (AVESX) in the post-1985 period, however, falls into the same range as the average value of the de jure index (LVESX) in transition economies.³⁰

Domestic and Global Factors behind the Changing Independence of the Bank of Israel

The developments reviewed above raise an interesting question about the growing independence of the BOI: what factors triggered and sustained the process? This subsection discusses possible factors and attempts to evaluate their relative importance. There is little doubt that the most important trigger for the increase in the independence of the BOI was the bitter experience with triple-digit inflation in 1977–85, particularly several failed stabilization attempts and the substantial amount of energy that the senior political leadership of the country had to invest in order to make the 1985 stabilization a success.³¹

Following the success of the 1985 stabilization, a public and political consensus lined up behind the need for strong measures to prevent the recurrence of episodes such as those that had made the stabilization necessary. Since until 1985 monetary policy had effectively been conducted by politicians through the Ministry of Finance, the blame for the high inflation was laid squarely on the political establishment. Given this view, it was natural to seek policymaking institutional reform in ways that would limit the influence of the political establishment on monetary policy. The 1985 “No-Printing” amendment to the BOI charter was one consequence of this trend. Another was the appointment, in 1986, of a politically unaffiliated academic, Michael Bruno, as governor of the BOI. Bruno, who was rather independent personally as well as politically, was allowed to start and sustain a long-term process of structural reforms of the financial sector that probably would not have been tolerated before the hyperinflation period. More generally, following the debacle of the high-inflation period, the political establishment became more receptive to professional advice. At the time these processes unfolded, the idea that CBI was a desired feature was still a novelty among professional economists. Therefore, it makes sense to trace the increases in BOI independence during the second part of the 1980s mainly to domestic forces.

During the 1990s, additional domestic and global developments reinforced the trend. First, financial stability became more important due to a gradual increase in the importance of the Israeli financial markets. Since financial stability and price stability correlate positively in the long run, this led to further support for an independent BOI. Second, the globalization of financial markets, in which Israel took part by phasing out its restrictions on capital and currency flows, made an independent CB more necessary. In a world of unrestricted capital mobility, the benefits of stable monetary policies in terms of access to international financial markets and capital inflows are greater 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 of unrestricted capital mobility. Both factors add to the desirability of CBI. This trend was reinforced by the fact that, by the beginning of the 1990s, most developed economies had slashed their inflation rates to levels far below 5% while Israeli inflation still chugged ahead in double digits. This systematic inflation differential established a premium for domestic-currency-denominated financial assets and complicated the management of

monetary policy, making it desirable to try to eliminate the premium by aligning Israeli inflation with the OECD levels for good.

Finally, during the 1990s an international professional consensus formed around the belief that CBI is a “free lunch” because it reduces inflation without hurting growth.³² This consensus, as it evolved, permeated international institutions such as the IMF and led to a broad-based global process of upgrading de jure CBI.³³ In Israel, it may well have contributed to the introduction of inflation targets at the beginning of the 1990s and facilitated the buildup of the public consensus needed to implement the conservative policies that the BOI applied in the second half of the 1990s.

HOW INDEPENDENT SHOULD THE BANK OF ISRAEL BE? A VIEW FROM ACADEMIA

During the past two decades, theory and evidence have converged to create a consensus that CBs should have a high level of effective conservatism, that is, independence. Empirical work has demonstrated that CBI reduces long-term inflation without affecting average output in developed economies and that it reduces long-term inflation and *raises* average long-term growth in developing economies.³⁴ At the theoretical level, the case for CBI is supported by the argument that due to various motives like employment, seignorage, and balance-of-payments considerations, political authorities are susceptible to an inefficient inflation bias that may be alleviated by the delegation of authority over monetary policy to a sufficiently conservative CB.³⁵ However, as Rogoff (1985) points out, this does not necessarily imply that the CB should be a strict inflation targeter if society *also* puts some positive weight on the stabilization of output,³⁶ since a strict inflation targeter (or an ultraconservative CB) underemphasizes output stabilization relative to price stability. Rogoff’s work in particular suggests that a CB should have instrument independence and should be more conservative than society but should not be ultraconservative.

This leaves quite a bit of latitude for the choice of CB conservatism (CBC). Woodford (2003) demonstrates that in the presence of price and wage stickiness, maximization of the welfare of the representative individual implies that the CB should base its policy on a variant of the well-known Taylor (1993) rule, an interest-rate rule that assigns positive weights to deviations of inflation from 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 these distortions. Depending on the structure of the economy, this may imply that the interest rate should respond positively to the output gap as well. Woodford’s concept of the output gap refers to the difference between the level of output in the presence of sticky prices and the level of output in their absence.³⁷ The behavior of Woodford’s output gap, however, 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 amplifies the importance of CBI as a credible guardian, and a signal of, nominal stability. This need, however, is partly attenuated by the fact that open capital markets also exert more discipline on the ministry of finance and, through it, on the political establishment.

Should the Bank of Israel Have a Growth Target?

One way to make sure that a relatively independent CB also pays attention to the stabilization of output is to establish *de jure* growth targets. Arguments in favor of growth targets for the BOI are often made in Israel, particularly during recessions. Indeed, the Levin Commission report on reform of the BOI Law recommends that the bank be required to take growth into consideration in its policymaking criteria.

What does this imply for the desired level of conservatism of the BOI? An important insight is that the optimal level of conservatism, or effective independence, should depend on the structure of the economy. In particular, if a decrease in the short-term interest rate has a strong and sufficiently sustained effect on economic activity and a relatively small and distant effect on inflation, a relatively low level of conservatism in the conduct of monetary policy is indicated. If the converse is true, a high level of conservatism in targeting inflation—perhaps even strict inflation targeting—is warranted. These considerations have a direct bearing on whether the BOI should or should not be assigned growth targets. In particular, if due to Israel's inflationary history a rate cut would have a powerful and rapid effect on inflation, 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 its impact on inflation is small, it may be best, even for a relatively liberal society, to refrain from instructing the CB to attain growth targets.³⁸

However, even if econometric methods demonstrate that the recent Israeli tradeoff coefficient is large, several additional considerations should be kept in mind. First, requiring the BOI, through legislation or in other institutional ways, to attain growth targets may open the door for political pressure on the bank to conduct a policy of permanently low real interest rates. Given Israel's inflationary history and its legacy of formal and informal indexation arrangements, such a policy may have a swift upward effect on inflation expectations, the speed of their adjustment, and in turn, actual inflation.

Finally, there is a widespread consensus within the economic profession and the community of policymakers that monetary policy cannot affect potential output and, therefore, should not be used to try to influence its path. By implication, reasonable "growth targeting" should be directed at offsetting cyclical fluctuations in output rather than 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. To apply this principle in practice, the growth rate of actual output must be separated into two components: “potential output” and “cyclical output.” The following subsection discusses the monetary-policy perils associated with such a separation.

The Perils of Output-Gap Stabilization

Nobody knows the time path of potential output for sure. Although hindsight clears up some of the uncertainty, normally there is much uncertainty about the level of this variable (current and expected in the near future) 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 also infiltrates the output gap. A major implication of this observation for the choice of monetary-policy measures is that, due to poor real-time knowledge about the output gap, flexible inflation (or growth) targeters condition their policies on a variable that is measured with a substantial amount of error.

In an important article, Orphanides (2001) shows that during the second half of the 1970s and in some of the 1980s, the Fed systematically overestimated potential output, leading to substantial overestimation of the magnitude of the recession during those years. Since the Fed behaved as a flexible inflation targeter, these forecasting errors induced a monetary-policy stance that was eventually considered, with the benefit of hindsight, excessively expansionary—thus contributing to the U.S. inflationary bulge of the second half of the 1970s. The fact that output slumped badly during the second half of the 1970s is well known and undisputed. At issue here is how much of the decrease traces to cyclical elements over which monetary policy has some temporary impact, as against how much was due to changes in potential output, over which monetary policy has little impact, if any.

Since forecasting errors are positive sometimes, negative at other times, 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 (2005) show that errors in forecasting potential output and the output gap are generally serially correlated and that the average magnitude of the serial correlation depends on the fundamentals of the economy. The intuitive reason is that, unlike forecasts of many variables in which the true values become known at a one-period lag, the true values of potential output and the output gap are not revealed with certainty even after the fact. Consequently, monetary-policy errors that are made by flexible inflation (or growth) targeters become serially correlated as well. At times when potential output approximates the trend, the measured persistence in policy is small and may not constitute a serious problem for growth targeting. At times when potential output deviates severely from the trend, however, policy errors may prove quite persistent over time. Thus, when growth targeting is applied, the inherent unobservability of the output gap is particularly dangerous for nominal stability around and after turning points in the path of potential output.³⁹

Since inflation depends on the output gap, this problem may arise under strict inflation targeting as well. However, since in 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 (2005), who show, using a retrospective New Keynesian model of the economy, that the more conservative the CB is, the smaller the difference between the interest rates chosen in the presence and in the absence of uncertainty about potential output and the output gap.

Internal Division of Powers over Monetary Policy at the BOI and the Levin Commission Recommendation

From the *de jure* standpoint, the final authority over monetary policy within the BOI is vested with the governor of the bank. This legal status strongly resembles that of the governor of the Reserve Bank of New Zealand since the 1989 reform. However, it differs from most other central banks—for example, the Bank of England, the Fed, and the ECB—in which the ultimate internal authority over monetary policy resides with a monetary policy committee (MPC). One of the main recommendations of the Levin Commission on reform of the BOI law was to vest authority for monetary policy with a five-person MPC: the governor, two deputy governors, and two outside independent experts who do not hold positions in other branches of government, industry, or the private banking system. To date, the committee's recommendations have not been implemented.

Since the issue concerns the redistribution of authority *within* the bank (counting the independent outside experts as part of the bank), ostensibly the proposed reshuffling would not affect the independence of the bank *vis-à-vis* the government and various interest groups. Whether this would be the case in practice depends on two factors: (1) the degree of internal cohesion in the MPC and its members' ability to implement a policy that a majority of members approves despite the existence of prior dissenting views, and (2) 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 economic interest groups. If these two conditions—inner cohesion and outer independence—are met, the formation of an MPC may actually enhance the BOI's *de facto* independence by strengthening its ability to resist outside pressures. The experience of the Bundesbank and the more recent experience of the ECB suggest that, when these conditions are satisfied, the MPC can withstand outside pressures more easily due to its collective responsibility. If one or more of the conditions is not satisfied, however, the switch to a MPC may lessen *de facto* independence.

The BOI Governor as the Economic Advisor to the Government

The original 1954 charter ordains the governor of the Bank of Israel as the government's official economic advisor. In this capacity, BOI governors are

expected to attend and address meetings of the ministerial committee for economic affairs and of the Knesset (parliament) and may express their views and recommendations on economic policy issues that lie outside the BOI's purview, such as fiscal policy and the size of the budget deficit. Although governors cannot vote on these matters, the informal influence of this additional role of theirs has been important in some cases. Despite doubts expressed by some former governors about the desirability of this unique feature of the governorship, the function has managed to survive to the present day.

The governor's economic-advisor function is a two-edged sword. On the one hand, it establishes a legal basis for attempts by the governor to shape the economic environment in which monetary policy operates. It also facilitates the sharing of professional economic information between the bank and the government. During the early years of Israeli statehood, the latter characteristic was particularly important. On the other hand, it has been argued that the economic-advisor function prevents the governor from publicly criticizing the government's economic policies when the bank, in its professional opinion, considers them misguided.⁴⁰

How does the governor's role as economic advisor to the government affect the independence of the BOI? There are two opposing effects, both related to the foregoing discussion. In his/her advisory capacity, the governor may acquire some influence on other areas of public policy that determine the constraints with which monetary policy has to cope; fiscal policy is a prominent example. However, the advisory function may make it more difficult for the bank to focus on the price-stability objective.

CONCLUDING REMARKS

The case of the Bank of Israel suggests that, due to various institutional developments unrelated to laws, such as the introduction of inflation targets; the discontinuation of directed credit; and changes in the degree of integration of capital markets, in the type of exchange-rate regime, and in fiscal discipline, de facto independence may change quite dramatically even under an unchanged CB charter.

The stabilization of inflation in 1985 was a watershed for the independence of the BOI in both the de jure and the de facto senses. Since the stabilization, de jure independence has increased moderately and de facto independence has gained dramatically. Before the stabilization, de facto independence was substantially lower than de jure independence. Since the stabilization, average de facto independence has been somewhat stronger than de jure independence, even though the "no-printing" amendment raised the level of de jure independence. Before the amendment, in the early 1980s, the 1970s, and before, the de jure independence of the BOI rested at the 40th percentile or so among developed countries. Despite the amendment, the BOI's relative de jure independence was substantially lower in 2001 than in the 1980s, since the de jure independence of many central banks was strongly upgraded during the 1990s.

The arguments in this chapter are based on a modern notion of CBI that considers a central bank more independent the more intensively it focuses on price stability, the more tightly it controls the instruments of monetary policy, the more effective the limitations on lending to government are, and the more emphatic the personal independence of the CB governor is. The advantage of this index is that, in addition to covering a wide range of issues, it is available for many countries in different periods of time, thereby allowing us to compare the *de jure* independence of the BOI with that of other countries' CBs in different periods.

However, the index excludes a feature that may have had some impact on the independence of the bank, particularly during the early statehood years: the quality of the BOI Research Department in comparison with that of other economic-research entities in Israel. The first Governor of the BOI, David Horowitz, gave the first director of the Research Department, David Kochav, and his successors *carte blanche* to recruit individuals solely on the basis of professional considerations. This strategy paid off in that, to this day, the Bank of Israel Research Department is the country's finest macroeconomic research entity, adding the weight of "professionalism" to the bank's policy positions.

This characteristic probably places the *de facto* independence of the Bank on a higher level than that captured by the indices in this chapter. This factor may have mattered during the BOI's first thirty years, when the general conception was that the bank and the Finance Ministry should formulate macroeconomic policy by consensus. Due to the powerful position of the ministry and of government at large, however, one doubts whether the inclusion of this additional factor would substantially affect the broad conclusions expressed here. To reinforce this view, we note that during the bank's first three decades, one of the main policy goals was to encourage investment in order to stimulate real growth. This was done by largely subjugating currently conventional CB objectives to the role of the BOI as a development bank through the mechanism of directed credit. David Horowitz publicly endorsed this policy. In an exchange with Don Patinkin in the early 1970s about the BOI's role in controlling the money supply, Horowitz argued that the bank should adapt its policies to those of government. During these three decades, the BOI was effectively characterized by a multiplicity of goals, of which price stability ranked low in priority. This was very much in the spirit of the Keynesian consensus that dominated professional economic thinking at the time.

In view of the narrowness of Israel's capital markets during those decades, this general approach might have made some sense at the time. It is much less likely to do so today, as current Israeli policymakers confront a totally different level of development of the economy and of domestic and international capital markets. Even if there were some merit to the low level of independence and the related multiplicity of goals imposed on the Bank of Israel during its first three decades, this is no longer the case. Although the *de facto* independence of the BOI is much higher today than it was in those distant years, government's ability to induce large increases in the monetary base by converting foreign exchange in order to finance potential deficits may handicap the bank's ability

to deliver long-term price stability. But, since it fully controls the issue of Treasury bills today, the BOI is better equipped than in the past to deal with this problem, if it arises.

This raises an important and difficult question: what level of conservatism (independence) would be appropriate for the BOI in the future? The preceding section reviews some of the considerations involved in designing a socially optimal framework of operation for a CB. In particular, it takes up the thorny question of whether a CB should also be assigned a growth target. Instead of rehashing the arguments in that section, I will conclude with several observations that reflect a broad current intellectual consensus: (1) Since monetary policy cannot affect real variables in the long run, it has a comparative advantage in assuring price stability in the long term. (2) Insofar as real objectives such as “growth” are assigned to a CB, they should be limited to short-term countercyclical policies and administered in doses of magnitudes that should preferably be left to the CB. (3) Casual evidence suggests that, in the long run, a higher level of CB conservatism is associated with lower real rates.

A notable conclusion of this chapter is that the BOI's de facto independence has been consistently higher than its de jure independence since the mid-1990s.⁴¹ This discrepancy invites various political pressures on the CB. Thus, during the second half of the 1990s, the head of the Manufacturers Association of Israel asked the attorney general to declare particular monetary-policy measures taken by the bank to be in violation of the BOI Law and several Members of Knesset proposed bills that would restrict the bank in various ways to make it more dependent on the Knesset Finance Committee. In 2002, then-Finance Minister Silvan Shalom proposed the delegation of authority over monetary policy to a seven-member committee that, apart from three members affiliated with the BOI, would be recruited from other branches of government and of the economy. Thus, the external members could outvote those from the bank. These episodes suggest that the current relatively high level of de facto independence may not endure for long without some upgrading of de jure independence.

Finally, the structure of the economy and the response of inflation and inflation expectations depend on the monetary-policy rule. This is the so-called “Lucas critique.” After a change in the monetary-policy rule, the public gradually adjusts its expectation-formation process. In Israel, it made such an adjustment to the new policy regime that followed the 1985 stabilization. A similar if less dramatic shift, reinforcing the trend toward price stability, probably occurred after the BOI moved toward a more conservative policy in the mid-1990s. One of the considerations often neglected by scholars in the choice of central-bank conservatism is that a policy-rule change associated with a decrease in conservatism leads to changes in the expectation-formation process, which makes price stability costlier to maintain.⁴² In view of the rather grim inflation memories of the Israeli public, the public's expectation-formation process may take a sudden change for the worse. The exchange-rate bulge and the inflation spike that occurred after the BOI

abruptly cut the key interest rate in late 2001 supports the view that this risk should not be taken lightly.

APPENDIX

Coding and Aggregation of Legal Variables

Table A1.1 of the appendix translates CB charters into numerical codes on the basis of the sixteen basic underlying variables of the LVAW aggregate index. Each variable is coded on a scale of 0–1, where 0 stands for the minimal level of independence and 1 for the maximal level. The LVAW index is obtained by a two-round judgmental aggregation procedure. In the first round, sixteen features of de jure independence are aggregated into eight subgroups. These eight subgroups are then further aggregated to obtain the LVAW index.⁴³ The weights used in the second and last round of aggregation are appointment and dismissal procedures and term of governorship—0.20; source of authority over monetary policy, CB targets, and severity of limitations on advances to government—0.15 each; limitations on securitized lending, source of decision about CB lending, and other miscellaneous features of lending limitations—0.10 each; and the width of the circle of potential borrowers from the CB—0.05.⁴⁴ The implementation of those principles to calculate aggregate legal independence is summarized in Table A1.2.

Conventions for Coding of Individual Components of De Facto Independence in the Pre-1985 Era

To reflect the features discussed in the “Codification of De Facto Independence in the Pre-1985 Era” section and in accordance with the definitions in table A1.1, the components of “who formulates” and “final authority” are adjusted downward from de jure codings of 0.67 and 0.2 to de facto codings of 0.2 and 0, respectively. This is summarized in the row labeled “De facto CBI—before 1985” in table A1.3. The same conjunction of institutional factors also means that the de facto weight given to price stability was even lower than the modest de jure code for this variable. In reflection of this judgment, the 0.4 code for the “objectives” variable in the 1954 charter is replaced with a value of 0.1. Additionally, the de facto value of the variable “Who appoints the CEO?” (i.e., the governor) is scaled down from the de facto code of 0.5 to 0.25 to reflect the fact that, although CEOs are formally appointed by the president of Israel, they are actually appointed by a decision of the prime minister and the minister of finance that is ratified by the government.

Last but not least, since at the time the CB was obligated, either directly or indirectly, to lend to the government and to governmental and private companies designated by the government, at terms that were also designated by various governmental agencies, most codings of the lending limitation (LL) variables have been scaled downward. (Details appear in the last eight figures in the first row of table A1.3.) To fully appreciate the meaning of the coding decisions made in this subsection and the next, the reader is advised to use table A1.1 as a reference.

Table A1.1. De Jure Variables and Their Codings

Group	Definition of Variable	Variable	Levels of Independence and Their Meanings	Numerical Codings
Governor	Governor's term of office (years)	<i>too</i>	1. $too \geq 8$	1
			2. $8 > too \geq 6$	0.75
			3. $too = 5$	0.50
			4. $too = 4$	0.25
			5. $too < 4$	0
	Who appoints the Governor?	<i>app</i>	1. Governor appointed by CB board	1
			2. Governor appointed by council composed of members from executive and legislative branches as well as from CB board	0.75
			3. Governor appointed by legislative branch (Congress, king)	0.50
			4. Governor appointed by executive branch (council of ministers)	0.25
			5. Governor appointed by decision of one or two members of executive branch (e.g., prime minister or minister of finance)	0
	Provisions for dismissal of Governor	<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 executive branch's discretion			0.17	
7. Unconditional dismissal possible at executive branch's discretion			0	
Is Governor	<i>off</i>	1. Governor prohibited by law from holding any other office in government	1	

Continued

Table A1.1. Continued

Group	Definition of Variable	Variable	Levels of Independence and Their Meanings	Numerical Codings
	allowed to hold another office?		2. Governor not allowed to hold any other office in government unless authorized by executive branch	0.5
			3. Law does not prohibit Governor from holding another office	0
Polycymaking	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 not clearly defined as CB goals or in case of conflict within CB	0.8
			3. In case of conflict, final decision made by 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 formulating the government budget?	<i>adv</i>	1. Yes	1
			2. No	0
CB goals		<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 pursue policies aimed at 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 set any objectives for CB	0.2
			6. Some goals appear in the charter but price stability is not one of them	0
Lending limitations	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 may exceed 15% of government revenues or are specified as fractions of government expenditure)	0.33
			4. No legal limits on advances; their quantity is 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 on 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. The law leaves 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 may borrow from CB	1
			2. Central and state governments as well as all political subdivisions may borrow from CB	0.66
			3. In addition to the institutions mentioned under 2, public enterprises may borrow from CB	0.33
			4. CB can lend to all of the above as well as to the private sector	0

Continued

Table A1.1. Continued

Group	Definition of Variable	Variable	Levels of Independence and Their Meanings	Numerical Codings
	Type of limit, where such a limit exists	<i>ltype</i>	1. Limit specified as an absolute cash amount 2. Limit specified as a percentage of CB capital or other liabilities 3. Limit specified as a percentage of government revenues 4. Limit specified as a percentage of government expenditures	1 0.66 0.33 0
	Maturity of loans	<i>Lmat</i>	1. Maturity of CB loans limited to a maximum of 6 months 2. Maturity of CB loans limited to a maximum of one year 3. Maturity of CB loans limited to a maximum of more than one year 4. No de jure upper bounds on the maturity of CB loans	1 0.66 0.33 0
	Restrictions on interest rates ^b	<i>lint</i>	1. Interest rate on CB loans must be at market rate 2. Interest rate on CB loans to government cannot be lower than a certain floor 3. Interest rate on CB loans cannot exceed a certain ceiling 4. No explicit legal provisions regarding the interest rate on CB loans 5. Law stipulates no interest-rate charge on government's borrowing from the CB	1 0.75 0.50 0.25 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: Cukierman, 1992, table 19.1.

^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 variable is that minimum rates are likely to have been devised in order to discourage borrowing from the CB while maximum rates are probably meant to facilitate borrowing from the CB. However, the requirement of a minimum rate is classified below "market rates" because minimum rates, when they exist, are usually lower than market rates.

Table A1.2. Individual and Aggregate Codings of De Jure Independence of the Bank of Israel—1954 Law, 1985 Amendment, and Levin Commission Proposal

	Year of Enactment or Revision of Bank of Israel Law	LVAW	CEO				Policy Formulation				Limitations on Lending								
			Term of Office	Who Appoints	Dis-missal	Other Offices	Who Formulates	Final Authority	Role in Budget	Objectives	Advances	Securitized Lending	Terms of Lending	Potential Borrowers	Type of Limit	Maturity of Loans	Interest Rates	Primary Market	Sum of Weights
Original law	1954	0.39	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” amendment	1985	0.46	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 Comm. proposal	1998/9	0.61	0.50	0.50	0.83	1.00	1.00	0.60	0.00	1.00	0.66	0.00	0.66	1.00	0.00	0.66	1.00	0.00	
Weights-LVAW			0.0500	0.0500	0.0500	0.0500	0.0375	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 A1.3. Individual and Aggregate Codings of the Components of de Facto Independence of

Year	Actual Aggregate Independence		Memo Item		CEO				Policy Formulation		
			Legal	Average	Term of	Who	Dis-	Other	Average	Who	Final
	AVAW	AVESX	LVAW	CEO	Office	Appoints	missal	Offices	Monpol + conf	Formu- lates	Authority
Prior to 1985	0.13	0.05	0.42	0.44	0.50	0.25	0.50	0.50	0.0500	0.20	0.00
1986	0.50	0.36	0.48	0.44	0.50	0.25	0.50	0.50	0.1000		
1987	0.44	0.33	0.48	0.44	0.50	0.25	0.50	0.50	0.1250		
1988	0.39	0.30	0.48	0.44	0.50	0.25	0.50	0.50	0.1500		
1989	0.32	0.28	0.48	0.44	0.50	0.25	0.50	0.50	0.1750		
1990	0.39	0.31	0.48	0.44	0.50	0.25	0.50	0.50	0.2000		
1991	0.44	0.35	0.48	0.44	0.50	0.25	0.50	0.50	0.2000		
1992	0.43	0.35	0.48	0.44	0.50	0.25	0.50	0.50	0.2000		
1993	0.46	0.37	0.48	0.44	0.50	0.25	0.50	0.50	0.2000		
1994	0.51	0.45	0.48	0.44	0.50	0.25	0.50	0.50	0.3000		
1995	0.55	0.50	0.48	0.44	0.50	0.25	0.50	0.50	0.3714		
1996	0.52	0.51	0.48	0.44	0.50	0.25	0.50	0.50	0.4428		
1997	0.57	0.57	0.48	0.44	0.50	0.25	0.50	0.50	0.5142		
1998	0.64	0.65	0.48	0.44	0.50	0.25	0.50	0.50	0.5856		
1999	0.64	0.68	0.48	0.44	0.50	0.25	0.50	0.50	0.6570		
2000	0.69	0.75	0.48	0.44	0.50	0.25	0.50	0.50	0.7284		
2001	0.66	0.75	0.48	0.44	0.50	0.25	0.50	0.50	0.7998		
2002	0.66	0.78	0.48	0.44	0.50	0.25	0.50	0.50	0.8998		
2003	0.64	0.76	0.48	0.44	0.50	0.25	0.50	0.50	0.8998		
Mean: 86-03	0.52	0.50	0.48								
Memo items											
		Legal									
		LVESX									
De jure-1954		0.33		0.50	0.50	0.50	0.50	0.50	0.2675	0.67	0.20
De jure-1985		0.38		0.50	0.50	0.50	0.50	0.50	0.2675	0.67	0.20
Weights-LVAW				0.2000	0.0500	0.0500	0.0500	0.0500	0.1500	0.0375	0.0750
Weights-LVESX									0.4800		

Conventions for Coding of Individual Components of De Facto Independence in the Post-1985 Era

Authority over monetary policy (total weight: 0.15). The original Bank of Israel Law (1954) vested the BOI with considerable de jure instrument independence. In the pre-1985 era, however, as explained above, much of this power remained on the books only. After the 1985 stabilization, the legal provisions that empowered the BOI to conduct monetary policy gradually became operational and more meaningful with the phaseout of DC and the flexibilization of the exchange rate. The flexibilization of the Treasury bill ceiling in August 1994 and the indexation of this ceiling to the CPI from then on enhanced the bank's instrument independence somewhat. The authority-over-policy factor gained further importance in December 2001 when the Treasury bill ceiling was abolished altogether.⁴⁵ The desegmentation process, the deregulation of capital movements, and further flexibilization of the exchange rate gave the bank additional operational freedom. (Figure 1.2 shows the progression of the exchange-rate band.)

The combination of these elements is reflected in a combined coding of the "who formulates" and "final authority" variables (total weight: 0.113). Before 1985, the de facto value of the code for this combination of variables was 0.05. Presumably it increased by a factor of 4 but did so only gradually, after the phaseout 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 Treasury bill 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 global professional revolution associated with the introduction of inflation targets in many countries, it is assumed that this process elevated the index to 80% of its maximal value (0.8) in 2001. To reflect the graduality of its progression, it is assumed that the process began in 1994 and proceeded linearly until 2001. The code was raised again by 0.1 from 2002 on to reflect the total elimination of ceilings on balances of Treasury bills at the end of 2001.

Lending limitations (total weight: 0.5). The value of this group of variables is based on a judgmental coding of the sum of the lending-limitation variables. The post-1985 coding of the de jure value of this total is 0.513 (table A1.3). It is assumed that, starting in 1986, this figure also reflects the de facto value of the total, provided that the total government budget deficit is zero but that each percentage point increase in the deficit/GDP ratio, as conventionally measured, lowers the code by 0.04. The de facto level of stringency of limitations on lending to government is determined as a negative function of the budget deficit for two reasons. First, as discussed above, government can raise the level of liquidity despite the 1985 "no-printing" amendment by selling its foreign reserves to the BOI. The larger the budget deficits, the more likely government is to do this. Second, higher deficits raise real interest rates and increase public pressure on the BOI to "ease" the burden of high rates by injecting liquidity.

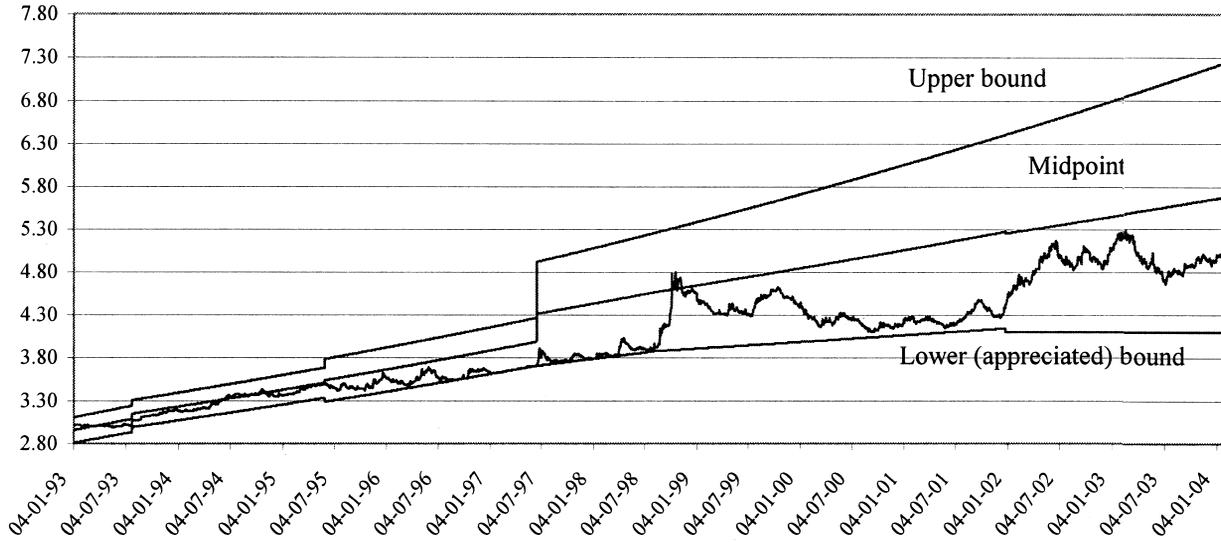


Figure 1.2. NIS Exchange Rate against Currency Basket.

Source: BOI.

Finally, to reflect the gradual impact of reductions in various types of DC (as well as the gradual increase of interest rates on such credit) on the effectiveness of the lending limitations, it was assumed that this process was implemented gradually between 1986 and 1995 and that it raised the index to 80% of its maximal possible value (0.8) by the latter year. During this period, the contribution of this factor to the index is assumed to rise linearly.

Targets or objectives (weight: 0.15). It is assumed that after the trauma of hyperinflation and the political efforts expended to stabilize it, the focus on price stability as the main policy goal became much stronger in 1986 than it had been before. To reflect this, the value of this variable was raised fourfold, from 0.1 to 0.4, and held at this level through 1987. It was then reduced to 0.3 in 1988 to reflect the relaxation of the exchange-rate anchor and kept at this value until 1991. To reflect the initial introduction of inflation targets in late 1991, the code was returned to 0.4 in 1992 and held there until 1994.

Negative Correlation between the Real Rate and the Central Bank's Output Target under Conditions of Imperfect Credibility

One result of an increase in the CB's emphasis on price stability is recognition of the fact that it does not pay to systematically aim at a level of output that surpasses potential output. When the output target goes down and becomes equal to potential output for the first time, the public does not sense the change for a while, creating a situation in which the bank's true (normally implicit) output target is equal to potential output but the public still believes that it exceeds the potential. The early stages of stabilization of low inflation may conform to such a pattern. Using a New Keynesian framework surveyed by Clarida, Gali, and Gertler (1999) (CGG), this appendix shows that, under such circumstances, the bank will set a real rate that exceeds the Wicksellian natural rate of interest.

The behavior of the economy is described by:

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

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

where 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 these variables conditioned on the information available to the public in period t , i_t is the short-term nominal interest rate, 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 formulated as

$$g_t = \mu g_{t-1} + \hat{g}_t \quad 0 < \mu < 1 \quad (3)$$

$$u_t = \rho u_{t-1} + \hat{u}_t \quad 0 < \rho < 1$$

Here \hat{g}_t and \hat{u}_t are innovations to the cyclical components of demand and costs, respectively, and μ and ρ characterize the persistence of these shocks. The first equation in (3) 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 in order to reflect the notion that, since individuals smooth their consumption, expectations of higher consumption in the period to come (associated with higher expected output) lead them to demand more current consumption, which raises current output. Within this construct, the CB influences the output gap and inflation by its choice of the short-term nominal interest rate—which, given inflation expectations, determines the real short-term rate. Note that the CB affects inflation through the mediation of the output gap.

Here, as in the stylized models of sticky staggered prices pioneered by Calvo (1983), current inflation depends on inflation expectations. In this type of model, only a fraction of firms have the opportunity to adjust their price each period and, due to the costs of price adjustment, each firm exercises this opportunity at discrete intervals. Hence, when a firm is given an opportunity to adjust its price, the higher the inflation expectations, the larger the adjustment it will make. 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 looking, as well as backward looking, models of an economy in which output is determined by demand.

One dimension of an increase in the effective conservatism or independence of the CB is that the initially positive discrepancy between desired and potential output dwindles to zero. It is convenient to model this by considering two types of central bankers, one who incurs losses whenever the output gap swerves from a target that is $k\%$ above potential and another whose output target is equal to potential output. Until it internalized the inefficiency associated with output targets that are above potential, the BOI belonged to the first type. After it internalized the inefficiency, it became a CB of the second type. Below I refer to the first type as a relatively “level conservative” CB, to distinguish it from Rogoff’s (1985) conception of conservatism, which refers to the relative importance that the CB attributes to the stabilization of inflation and output. Whenever the term “conservatism” appears here, it should be construed as referring to the first type of conservatism.

Both types of CBs dislike deviations of inflation and of output from their respective targets and disagree only about their output targets. The goal 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 of CBs to the stabilization of output. Here $k > 0$ for the more liberal (more dependent) CB and $k = 0$ for the more conservative (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 of CB.

Under conditions of discretion, a “type k ” CB chooses in each period the nominal interest rate, i_t , and a contingent path for future interest rates in order 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 an internal minimum 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 equal to the marginal cost of deviating from the inflation target (i.e., zero). Note that this condition depends on the effective level of CB independence (or conservatism), 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 of 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 work out the current value of k from the interest rate, thereby eliminating imperfect credibility. To focus on imperfect-credibility situations, I assume that, except for the interest rate, the public observes all variables and shocks at a one-period lag while the CB observes them contemporaneously. This represents a minimal deviation from the original framework and prevents the public from immediately inferring the CB's output target by observing the current interest rate. It also makes the CGG framework more realistic. Suppose now that, after a sustained period during which it had an output target above potential ($k > 0$), the CB lowers its target to the level of potential output ($k = 0$) but the public's perception of the target, k^e , remains positive. Since the actual value of k is 0, the CB behaves in a way that will satisfy condition (5) above at $k = 0$.

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

The public, however, believes that the CB is behaving in a way that will 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 these circumstances, the actual values of inflation, the output gap, and the real interest rate are expressed 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 interest rate 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 is targeting an above-potential output level, a CB that has recently begun to target potential output is led to choose an interest rate that exceeds the Wicksellian natural rate (in this version of the model the Wicksellian natural rate is zero). Note, in view of equations (8) and (9), that imperfect credibility also leads to a positive average rate of inflation and to a below-potential average level of output. Indeed, such has been the case during stabilizations of inflation in OECD countries.

Cukierman (2004) also shows that where perfect credibility is present (i.e., $k^e = 0$) the average real rate rests at its natural level, average inflation is zero, and output is equal to its potential level on average. Thus, a *fully credible* reduction of the CB output target to the potential level neither causes the real rate to deviate systematically from its natural level nor induces inflation and output to swerve systematically from their targets.

The difference between this case and a state of imperfect credibility ($k^e > 0$) may be understood intuitively as follows: a positive value of k^e under imperfect credibility leads to systematically positive inflation expectations, which via equation (2) raise actual inflation. To spread the costs of the output and inflation gaps efficiently, the CB raises the real rate beyond its natural level, thereby depressing average output to a below-potential level. Under perfect credibility, in contrast, average inflation expectations are zero. Thus, the CB does not need to *systematically* hold the real rate above its natural level in order to spread the costs of the output and inflation gaps efficiently.

One may argue that the public may use the contemporaneous observation of the interest rate in equation (10) 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 of the interest rate amounts to an observation of a linear combination of k and of the innovations \hat{u}_t and \hat{g}_t to costs and aggregate demand. Within such an extended framework, k^e will be equal to the expected value of k , assuming that the combination of k and of these innovations is linear. Cukierman (2004) argues that although such an extension changes some of the details of the model, it does not alter the basic conclusion, i.e., a decrease in k from a positive value to zero will be followed by a period during which average real interest rates surpass the natural rate.

Table A1.4. The Behavior of the Ex Ante Real Rate of the Bank of Israel since Mid-1989

Date	Bank of Israel	Inflation	Bank of	Bank of			Bank of			Bank of			Bank of		
	Nominal Rate of Interest	Expectations (for the next 12 months)	Israel Real Rate of Interest	Date	Nominal Rate of Interest	Inflation Expectations (for the Next 12 Months)	Bank of Israel Real Rate of Interest	Date	Nominal Rate of Interest	Inflation Expectations (to 12 Months Ahead)	Bank of Israel Real Rate of Interest	Date	Nominal Rate of Interest	Inflation Expectations (to 12 months ahead)	Bank of Israel Real Rate of Interest
06/1989	10.92	12.14	-1.09	06/1993	12.76	8.68	3.75	06/1997	14.47	8.62	5.39	06/2001	7.25	2.08	5.07
07/1989	11.2	13.86	-2.34	07/1993	11.85	8.47	3.12	07/1997	13.66	9.23	4.06	07/2001	6.78	2.08	4.61
08/1989	10.29	14.31	-3.52	08/1993	10.16	7.75	2.24	08/1997	13.78	9.70	3.72	08/2001	6.61	2.86	3.65
09/1989	13.3	13.82	-0.46	09/1993	9.45	7.59	1.73	09/1997	14.49	9.15	4.89	09/2001	6.61	3.52	2.98
10/1989	16.85	17.43	-0.49	10/1993	9.48	8.63	0.78	10/1997	14.55	8.34	5.73	10/2001	6.61	1.97	4.55
11/1989	15.86	15.45	0.36	11/1993	9.75	9.70	0.05	11/1997	14.57	8.86	5.24	11/2001	6.38	0.87	5.46
12/1989	16.51	18.23	-1.45	12/1993	10.24	-		12/1997	14.61	8.29	5.84	12/2001	5.63	0.93	4.65
01/1990	18.2	21.62	-2.81	01/1994	11.04	-		01/1998	14.56	7.82	6.25	01/2002	3.98	2.33	1.62
02/1990	18.98	20.92	-1.60	02/1994	11.1	-		02/1998	13.89	6.52	6.92	02/2002	4.04	2.86	1.15
03/1990	18.16	17.39	0.66	03/1994	11.1	-		03/1998	13.43	5.35	7.67	03/2002	4.60	2.64	1.91
04/1990	15.87	13.13	2.42	04/1994	11.1	-		04/1998	13.07	5.96	6.71	04/2002	4.65	3.74	0.88
05/1990	14.5	15.10	-0.52	05/1994	11.54	-		05/1998	12.71	4.68	7.67	05/2002	4.89	4.32	0.55
06/1990	14.38	17.99	-3.06	06/1994	12.19	10.23	1.78	06/1998	12.34	4.46	7.54	06/2002	7.26	4.82	2.32
07/1990	15.19	17.42	-1.90	07/1994	12.81	11.14	1.50	07/1998	12.05	4.55	7.17	07/2002	9.66	2.78	6.69
08/1990	15.02	20.10	-4.23	08/1994	13.32	13.32	0.00	08/1998	10.50	5.60	4.64	08/2002	9.65	2.32	7.17
09/1990	16.54	21.97	-4.45	09/1994	15.07	14.39	0.59	09/1998	10.07	6.36	3.49	09/2002	9.64	3.30	6.14
10/1990	15.89	20.45	-3.79	10/1994	16.73	13.96	2.43	10/1998	10.28	8.15	1.97	10/2002	9.69	3.82	5.65
11/1990	15.11	19.24	-3.46	11/1994	16.78	14.15	2.30	11/1998	13.51	7.72	5.38	11/2002	9.64	3.57	5.86
12/1990	14.41	17.51	-2.64	12/1994	18.47	12.99	4.85	12/1998	14.56	6.63	7.43	12/2002	9.61	2.94	6.48
01/1991	15.2	17.37	-1.85	01/1995	18.51	11.17	6.60	01/1999	14.56	6.18	7.90	01/2003	9.43	3.48	5.75
02/1991	14.85	15.15	-0.26	02/1995	18.31	10.95	6.63	02/1999	14.48	5.44	8.58	02/2003	9.43	4.23	4.99
03/1991	14	15.72	-1.49	03/1995	17.23	11.39	5.24	03/1999	13.99	5.35	8.20	03/2003	9.39	3.31	5.88
04/1991	13.19	13.88	-0.61	04/1995	15.82	10.10	5.19	04/1999	13.41	5.60	7.40	04/2003	9.21	1.99	7.08
05/1991	13.65	14.63	-0.85	05/1995	15.02	9.11	5.42	05/1999	12.86	6.86	5.61	05/2003	8.87	1.37	7.40
06/1991	13.73	14.69	-0.84	06/1995	14.49	9.40	4.65	06/1999	12.86	5.79	6.68				
07/1991	13.88	15.95	-1.79	07/1995	14.44	8.81	5.18	07/1999	12.81	4.50	7.95				

08/1991	14.53	16.20	-1.44	08/1995	14.21	9.76	4.05	08/1999	12.31	5.55	6.40
09/1991	15.08	16.85	-1.51	09/1995	14.18	10.67	3.17	09/1999	12.30	6.10	5.84
10/1991	21.55	16.23	4.58	10/1995	14.80	10.03	4.33	10/1999	12.30	5.07	6.88
11/1991	24.15	16.76	6.33	11/1995	15.26	9.59	5.18	11/1999	12.23	3.80	8.12
12/1991	19.43	15.10	3.76	12/1995	15.19	9.75	4.96	12/1999	11.93	3.31	8.34
01/1992	15.85	12.14	3.31	01/1996	14.70	10.13	4.15	01/2000	11.39	2.86	8.29
02/1992	13.75	9.54	3.84	02/1996	15.04	10.58	4.03	02/2000	10.87	2.98	7.67
03/1992	11.74	10.31	1.30	03/1996	15.05	10.75	3.88	03/2000	10.50	2.52	7.79
04/1992	11.79	10.59	1.09	04/1996	15.24	11.78	3.10	04/2000	10.14	3.00	6.93
05/1992	11.76	11.40	0.32	05/1996	16.01	12.62	3.01	05/2000	9.85	3.76	5.87
06/1992	11.5	10.73	0.70	06/1996	17.01	12.84	3.69	06/2000	9.86	3.65	5.99
07/1992	11.69	8.73	2.72	07/1996	18.58	11.55	6.30	07/2000	9.82	2.68	6.95
08/1992	11.73	8.34	3.13	08/1996	17.69	11.06	5.97	08/2000	9.64	2.31	7.17
09/1992	11.63	7.89	3.47	09/1996	17.11	11.66	4.88	09/2000	9.39	2.19	7.05
10/1992	11.7	7.69	3.72	10/1996	16.81	11.62	4.65	10/2000	9.06	2.53	6.37
11/1992	10.94	8.40	2.34	11/1996	16.44	10.70	5.18	11/2000	8.87	1.82	6.93
12/1992	10.84	9.76	0.98	12/1996	16.36	9.58	6.19	12/2000	8.63	1.25	7.29
01/1993	11.51	11.20	0.28	01/1997	15.82	9.30	5.97	01/2001	8.45	1.60	6.75
02/1993	12.79	8.85	3.62	02/1997	15.22	9.69	5.05	02/2001	8.12	2.03	5.97
03/1993	12.69	9.66	2.76	03/1997	14.96	10.06	4.46	03/2001	7.87	2.15	5.60
04/1993	12.69	9.68	2.74	04/1997	14.96	9.72	4.77	04/2001	7.57	1.26	6.23
05/1993	12.99	9.35	3.33	05/1997	14.99	9.20	5.30	05/2001	7.56	1.43	6.04

Source: Bank of Israel.

Notes

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1. The use of modern metrics to evaluate BOI independence may appear out of context to policymakers who operated during the early statehood years. The concluding section offers additional remarks about this tension.
2. Early contributions to the literature on this matter include 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 these 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 relative neglect of other goals such as stabilization of output and financing of budget deficits. Thus, the concept of CBI as used here may also be thought of as the degree of effective conservatism of the CB.
3. For details, see chap. 19 of Cukierman (1992).
4. For extensive surveys of Israel's monetary history before the 1985 stabilization, including the pre-statehood and pre-BOI eras, see Barkai and Liviatan (2007a) and Barkai and Liviatan (2007b, c). The period immediately preceding the stabilization is surveyed in Barkai and Liviatan (2007d) and the post-1985 period in Liviatan (2007). A colorful account of the dominance of fiscal policy over monetary policy in the pre-1985 era appears in Barkai (2002).
5. Since all are bound by the Maastricht treaty, these countries are ultimately expected to establish a level of *de jure* independence equal to that of the European Central Bank. Thus, except for a few countries (e.g., the United Kingdom, Sweden, Denmark, and Switzerland), monetary policy in the post-enlargement euro zone will be managed by a highly independent CB.
6. The Levin Commission, established in December 1997 by then Prime Minister Benjamin Netanyahu, submitted a report with recommendations for reform of the Bank of Israel charter in December 1998 (Levin Commission, 1998). The legislature, however, did not pursue the recommendation.
7. Such questions are occasionally raised by academic economists as well (Stiglitz, 1998).
8. For the most comprehensive of them, see Cukierman, Webb, and Neyapti (1992) and chap. 19 of Cukierman (1992).
9. The amendment replaced Section 45 of the original 1954 BOI Law and is classified as Amendment 15.
10. Table A1.2 in the appendix presents the individual codings that underlie the aggregate CBI indices for the original (1954) and the amended (1985) laws.
11. This global trend is described in Cukierman (1998). Detailed documentation of central-bank reforms in FSE and their effect on inflation in FSE appears in Cukierman, Miller, and Neyapti (2002).
12. Calculated from table 1 in Cukierman, Miller, and Neyapti (2002), on the basis of the most recent charters available.
13. This 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 de jure independence of the European System of Central Banks.

14. The United Kingdom was absolved from having to align the Bank of England charter with the independence levels required by the Maastricht treaty but chose to make most of the adjustments anyway.
15. Until 1970, this subjugation was amplified by the existence of a 9% de jure ceiling on nominal interest rates. Since inflation was frequently higher than 9% during this period, the ceiling often prevented the BOI from maintaining positive real short-term interest rates.
16. A description of the precise mapping of these facts into numerical codings for the individual components of de facto independence appears in the second part of the appendix.
17. This subsection discusses the issues broadly. The specific coding details are presented in the third part of the appendix.
18. The BOI, unlike the Fed, does not keep a stock of seasoned government securities on hand. To absorb liquidity, it relies partly on the issue of short-term Treasury bills, which are formally considered a government liability. Up to the ceiling, the quantity of Treasury bills is determined largely by the BOI.
19. A similar qualitative picture emerges from table A1.4 of the appendix, which provides data on the real rate that the BOI paid private banks for funds deposited with it.
20. The widespread availability of both indexed and nonindexed government bonds in the Israeli financial markets makes it possible to estimate expected inflation by calculating the difference between nominal and real rates of interest on instruments of similar maturity and financial quality.
21. Liviatan produces evidence supporting this view. This pattern is consistent with Dornbusch's overshooting hypothesis (Dornbusch, 1976). See also Liviatan (1984).
22. A monthly regression of annual moving averages of inflation rates on a lagged value of the inflation target, measured conformably, did not yield a significant coefficient between 93 and 95 (twelve observations). A similar regression for the 1996 to mid-2003 period produced a significant positive coefficient in the vicinity of 1 (thirty 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 more strongly construed as a commitment since 1996.
23. Melnick's estimated reaction functions imply that the BOI behaved as a strict inflation targeter during this period (Melnick, 2002).
24. Bank of Israel, *Annual Report*, 2002, appendix table to the balance sheet, 1985–2002.
25. Amounting to full sterilization of the impact of the government's foreign-exchange transactions on the market exchange rate.
26. The extremely low level of de facto independence obtained for the pre-1985 period is consistent with Barkai's account of matters in the 1960s and the 1970s (Barkai and Liviatan, 2007a, c).
27. During the post-1985 period, only in the years around 1989 did the BOI have less de facto independence than de jure independence.
28. Cukierman, Miller, and Neyapti (2002) found that de jure independence in transition economies has a negative impact on inflation only after the liberalization process has gone far enough. To explain this, they argue that law abidance and the degree of liberalization may be positively related, making the latter a proxy for the former. See also Eijffinger and Stadhouer (2003). However, I am not aware of any evidence of perceptible changes in law abidance in Israel. The assumption that law abidance in Israel has been constant over time, at least since the 1960s, appears to be reasonable.

29. Culled from Cukierman, Webb, and Neyapti (1992).
30. For details about this index in transition economies, see table 1 of Cukierman, Miller, and Neyapti (2002).
31. For a comprehensive description of the high-inflation era and the periods shortly preceding and following stabilization, see Bruno (1993).
32. Grilli, Masciandaro, and Tabellini (1991) applied the expression to this context after having found, for developed economies, that *de jure* CBI has a negative impact on inflation and no impact on growth. For developing countries, Cukierman et al. (1993) found that proxies for *de facto* CBI have a similar negative impact on inflation and a positive impact on growth.
33. For details, see Cukierman (1998).
34. A nonexhaustive list of references includes Grilli, Masciandaro, and Tabellini (1991), Cukierman, Webb, and Neyapti (1992), chap. 20 of Cukierman (1992), Alesina and Summers (1993), and Cukierman et al. (1993).
35. For summaries of these arguments, see Cukierman and Liviatan (1990) and part I of Cukierman (1992).
36. A strict inflation targeter is a CB that cares only about inflation and its stabilization. The term traces to Svensson (1997).
37. Woodford's argument relies on a quadratic approximation of the utility of the representative consumer. For New Keynesian models and parameter values that are considered reasonable for the U.S. economy, Woodford concludes that the inflation deviation should be assigned a greater weight than the output gap.
38. For a more detailed discussion of the pros and cons of growth targets for the BOI, see Cukierman (2003).
39. This statement is consistent with recent empirical findings in Orphanides and Williams (2005), who used real-time data about policymakers' perceptions of potential output during the 1970s and compared these perceptions with current estimates (as of October 1999) of the historical data. Using the "current" version of potential-output estimates as a proxy for the actual values of potential output during the 1970s, they found highly persistent deviations between the current and the real-time estimates of the output gap. (See their figure 3 in particular.)
40. Former governor Moshe Sanbar argued (1977) that the advisory function impairs the bank's ability to act as the "compass and the conscience" of the economy (in the words of David Horowitz, the first governor of the BOI). Interestingly, the newspaper article in which Sanbar expressed this opinion was written after Prime Minister Menachem Begin reprimanded BOI Governor Arnon Gafny for publicly criticizing a budget proposal that the minister of finance had submitted to the Knesset. Begin claimed that since the governor can air his views within the government in his capacity as the government's economic advisor, he should refrain from publicly criticizing the government's economic policies.
41. Although this conclusion is partly based on judgment, an alternative way of codifying independence shows it to be robust. Further experimentation with additional codification systems is always desirable. In view of the added widening of the discrepancy between *de facto* and *de jure* independence since 1998, however, it is very likely that the conclusion in the text reflects reality, at least from that time on.
42. An empirical documentation of such a process in the United States appears in Orphanides and Williams (2005). Woodford (2003) suggests that an appropriately chosen commitment enhances the CB's ability to stabilize the real economy while attaining the inflation target on average.

43. Cukierman (1992) presents an unweighted version of the same characteristics (LVAU). Other indices, such as those used by Bade and Parkin (1988), Alesina (1988, 1989), Grilli, Masciandaro, and Tabellini (1991), and Eijffinger and Schaling (1993), may for the most part be approximated by subsets of the components of the LVAU (or of the LVAU) index.
44. For further details, see section 19.3 of Cukierman (1992).
45. The broader meaning of Treasury bills as a monetary-policy instrument and its flexibilization are discussed in the subsection of the text entitled "Treasury Bills, Time Deposits, Swaps, Government Foreign-Exchange."

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