Bank of Israel **Research Department**

Core Inflation Indices for Israel*

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ABSTRACT

This study examines a wide variety of core indices of the consumer price index (CPI). The quality of the indices is examined from the aspect of simplicity of calculation, and their ability to describe and assess the present inflation environment and to predict the future inflation environment. For the purpose of examining the appropriateness of monetary policy ex post, and also to help determine policy for the future, it is important to focus on core inflation, i.e., inflation excluding unexpected fluctuations that are not affected by monetary policy.

The study reviews twenty-three indices, most of which are generally accepted in the literature. In line with the findings in other countries, it was found that no single index stands out as preferable to the others. The indices that give weight to the CPI's components according to their volatility and the index that trims twenty percent of the upper and lower tails of the distribution contribute to the understanding of the current inflation environment. The index that excludes energy and food prices, the index that excludes also fruit and vegetable prices, and a more complex index based on an estimate of a VAR system provide information that improves the ability to predict the overall index.

1. Introduction

The ability to assess the course of the Consumer Price Index (CPI) is a major aspect of conducting monetary policy under an inflation-target regime. The inflation target in Israel is defined for the overall index (headline inflation), in light of which the success of the policy is measured. Because monetary policy has a delayed influence, in order to determine the required policy it is necessary to assess the future development of the overall index. In other words, the CPI is generally viewed on two levels: the first, for the purpose of assessing the development of inflation and the performance of policy in the past, and the second, for the purpose of assessing the policy required to achieve the target in the future.

The development of prices over a particular period is affected by fundamental factors and by unexpected fluctuations (noise). We can attempt to assess the basic part by examining the economic factors affecting it, for example, the level of activity in the economy, production costs and expected inflation. Alternatively, we can attempt to assess the rate of inflation arising from these factors, which is base inflation, or as it is called in this research "core inflation", by examining the development of the CPI itself, and other measures derived from it. For this purpose a core index should be chosen that can describe the basic inflation trend in the best possible manner in order to determine monetary policy.

In Israel there is no agreed or accepted definition of the "core index", as in some other countries.[1] The Bank of Israel and other bodies tend to relate to partial indices of the CPI, which exclude items characterized by significant seasonality or large fluctuations. Thus, it is common to examine the index without fruit and vegetables, or the index without fruit and vegetables, and clothing and footwear. Sometimes the housing component is excluded from the overall index, because until recently this component was correlated to a large extent with the changes in the dollar exchange rate, and was therefore highly volatile.[2] Recently, because of the significant changes in world commodity prices, and in their wake in food and energy prices in the CPI,

[1] A short discussion on indices of core inflation appears in Box 1 in Inflation Report No. 16 for the first half of 2005.

[2] Until recently, about 90 percent of rental contracts were quoted in dollars. Only in the middle of 2007 did this rate begin to fall, reaching 60 percent by the end of the year, and about 20 percent by the end of 2008.

attention is being focused also on indices that exclude these components, as is acceptable in the United States and other countries.

This article aims to examine a broad range of core indices and to assess their quality and the benefit of considering them, as part of the process of determining and analyzing monetary policy in Israel.

The article contains four sections. Following the introduction, the second section presents alternative definitions of core inflation in general terms, followed by a detailed description of the method of calculation. The third section presents tests of the quality of the core indices relative to their assessment of the past and their predictive ability. The fourth section summarizes the findings of the study.

2. Alternative definitions of core inflation

There is no single, unequivocal definition of the concept "core inflation". The accepted concept of the core index, which is referred to in many articles in the field, is that price changes of various products consist of a common component that characterizes all components of the index—this is the core inflation, and a component that reflects fluctuations in the markets of each of the products (changes in relative prices).

That is to say:

(1) $\pi^t = \pi\_core^t + \varepsilon^t$

Another formulation of core inflation presented by Bryan and Cecchetti (1994) considers it as being an index that describes the long-term, persistent part of the index, which is connected in some way to the pace of expansion of the quantity of money. The various methods for estimating core inflation reflect these descriptions. Some relate to the need to exclude temporary noise from the overall index in order to identify the joint component, and some place greater emphasis on identifying the persistent component in the rate of overall inflation. In both approaches, the temporary noise or the part that is not persistent are not part of the basic inflation environment, because they are temporary and self-correcting over time.

Several articles in the field relate to the characteristics that a "good" core index should have. Roger (1988) mentions three desirable characteristics. The first is that the index should be available. The CPI or its components meet this requirement. The second characteristic is that it should be unbiased and the third is that it should be

easily verifiable, namely, that others can also calculate it. This latter characteristic is obtained for indices based on the choice of partial components of the overall index, but is not easily obtained for indices based on econometric analysis, as we will show below. Wynne (1999) elaborates somewhat and stipulates also the need for the core index to be forward-looking, durable, with some theoretical basis, familiar and intelligible to the public, and not subject to retroactive updates. This list of characteristics can be summed up by saying that the core index has to be relatively simple, and has to be capable of reflecting well both the past and the future inflation environment. Obviously a single index will be incapable of meeting all the characteristics mentioned, some of which might even be contradictory. The choice of the preferred index will depend on the policymakers' preferences, and on the needs for which the core index is used.

In the following part we will describe various indices of core inflation that were examined in the research and that appear in the literature in this field. Furthermore, because of the special role of the exchange rate in determining the course of inflation in Israel, we will suggest an additional index that considers the effect of the exchange rate on prices.[3] Part A of this section describes the various methods in general terms, and the following parts elaborate the methods of calculation adopted for the data on the Israeli economy.

A. General description of the methods

Silver (2007) and other authors suggest dividing the different indices of core inflation into several groups. The first is the group of indices based on the exclusion of certain components from the overall index. These are usually the more volatile components that are relatively more frequently affected by supply shocks, for example, climatic changes (fruit and vegetables) or the supply of oil (energy prices). These indices are important in the context of managing monetary policy, based on the perception that the ability of policy to deal with supply shocks, especially those arising from global shocks, is limited. In any event, the reaction of policy to supply shocks that act to raise the price, in conjunction with reducing the supply, should be different from the reaction to demand shocks that act simultaneously to raise both the price and the

[3] This study will not deal with the issue of "domestic prices".

quantity. There is therefore a need to identify the effect of these shocks on the behavior of prices.

Other core indices consider the indices that relate to the central part of the distribution of price changes (limited influence). These trimmed indices exclude the tails of the distribution according to price changes of the index components each month. Thus, for example, it is possible to exclude 10 percent of the index components that increased most or decreased most in a specific month (together 20 percent), or, in an extreme version, to consider only the rate of change of the median component in the index that month. In these indices the components excluded change each month, while according to the first method, the choice of components is made once and remains fixed over time. A third type of core indices relate to the volatility of each component of the index, and builds a new index that weights the components in an inverse ratio to their variance (volatility weights). Greater weight is thus given to relatively stable components and less weight to volatile components. A version of this index weights the components with a double weighting which relates also to their original weight in the consumption basket. Another type of core indices weight the index components by their extent of persistence according to coefficients obtained in the equation that describes the serial correlation in each of the series comprising the index (persistence weights). Here too it is possible to employ double weighting, which relates to the persistence in conjunction with the original weight in the consumption basket. Another method used to create a core index in Portugal (Maria, 2004), but which is not widespread in other countries, is the analysis of principle components. By means of a linear combination of index components, this index reflects most of the variance of the overall index. Generally, all these methods give greater weight to the more stable index components, and therefore better reflect the inflation environment or its trend, while the excluded components or those that are given a smaller weight reflect fluctuations that are expected to balance out in the medium term.

All the methods presented above are based on various statistical characteristics of the prices series. A slightly different method of calculating the core index using the weights of the components was proposed by Smith (2007), and is based on estimating the equation of a time series that describes the change in the overall index by means of the change (lag) of all the items comprising it. Another method presented by Cogley (2002) uses data on only the overall index, but examines it over time. He uses exponential smoothing, that is to say, smoothing of the index over time, while giving

decreasing weight to more distant periods in the past. The approach is based on the wish to identify the continuing changes in the level of inflation. If the reaction to change in the policy tool takes several quarters, then giving decreasing weight to inflation in the more distant past is appropriate for a process of matching of this kind. This smoothing approach is preferable to other filters, because it is based only on the past and can be implemented in real time.

A different method to be examined is one that uses structural VAR analysis based on economic assumptions and whose aim is to directly identify the changes in the index arising from the supply side, as opposed to those arising from demand shocks. Quah and Vahey (1995), in a much-quoted article, estimate a system with two variables—GDP and prices, and differentiate between shocks that have a long-term effect on GDP (which are sometimes identified as supply shocks) and shocks that do not have an effect of this kind (demand shocks). They identify the shocks in the accepted manner—see, for example, Shapiro and Watson (1988). The core inflation is identified as part of the overall inflation that does not have a long-term effect on GDP. This approach is based on the assumption that in the long term all the nominal variables adapt themselves and have no effect on real sizes (vertical Phillips curve).

Another possible index of the inflation environment is quoted in the Bank of Israel's Research Department procedure for the monthly forecast of the CPI, which is based on updating the research of Suchoy and Rotberger (2006).[4] The monthly forecast uses ARIMA with seasonal adjustments. Trend estimates in subgroups of the overall index make it possible to obtain an estimate of the "inflation environment". This series of core inflation is, by definition, very smooth, and does not pay attention to the short-term changes in the CPI, as do most of the other indices that have been calculated. (See the diagrams in the Appendix.) Furthermore, because it is dependent on identifying changes and exceptional observations in the index, which is done only ex post, the calculated inflation environment is subject to retroactive updates. This estimate, which deducts seasonal factors and other noise from the inflation, is dependent on economic factors such as depreciation and import prices, as well as on other economic factors, which are indirectly reflected by means of the autoregressive component.

[4] See a detailed description of the method in the paper.

An examination of the core indices used by various central banks shows that in many countries it is acceptable to relate to indices that exclude the volatile components (in many cases, food and energy),[5] but particularly salient is the task of attempting to build alternative indices, usually more sophisticated than the method of excluding components, because of the need to improve the quality of the prediction. Several studies comparing the customary index excluding food and energy with indices obtained by other methods, show that the performance of this index is not preferable, and that its predictive ability is worse than that of alternative indices.[6] As opposed to these studies, Crone, Khettry and Mester (2008) found that the forecast of the index without energy and food is preferable to that obtained from other indices, but that the improvement relative to the overall index is not significant. Thus, for example, in Australia, Gillitzer and Simon (2006) propose an index based on smoothing of the components according to the extent of their volatility.[7] Cutler (2001) proposes an index for Britain based on persistence, Bilke and Stracca (2008) examine an index for the Eurozone based on a different calculation of persistence, while Hahn (2001) and Matilla-Garcia (2005) examine in two separate articles, an index based on SVAR analysis for the Eurozone. Martel (2008) also uses SVAR while broadening it by including energy prices in the model. Giannone and Matheson (2006) propose an index for New Zealand based on a model of dynamic factors.[8] The OECD, in a 2005 document, examines alternative indices for the United States, Europe and other countries. From all these and other studies we learn that while central banks indeed relate generally to indices that exclude certain components, there is a constant search for and examination of alternative indices that will improve the ability to identify the basic inflation trends. A further stage in analyzing the core indices is a combination of several approaches to a composite index in order to manage policy in practice. If different indices give similar results, they reinforce confidence in the correctness of the assessment of the inflation environment. If they do not point in the same direction,

[5] A description of the core indices used by central banks can be found in Suchoy and Rotberger (2006), and adjusted indices used by various banks are considered in Alvarez and Matea (1999) in the BIS book and other papers in this compilation. From a table in an unpublished paper, which was written in the Central Bank of Canada, it appears that in most of the central banks the preferred core index excludes certain components – in many cases food, energy and agricultural products.
[6] See for example Rich and Steindel (2007).
[7] We have not used this method in this paper.
[8] We have not examined this system in this paper.

we can learn from the differences between them about the nature of the inflationary process.[9]

An additional index for Israel—excluding the effect of the exchange rate: As opposed to other countries, in which the role of the exchange rate in the CPI is relatively marginal,[10] in Israel, the exchange rate (at least in the past) had a significant impact on short-term fluctuations in the CPI. This is because Israel is an open economy, but also to a great extent because of the historical linkage of housing prices to the dollar rate due to the custom of quoting them in dollars.[11] The rate of transmission from the exchange rate to the CPI estimated for Israel was about 0.3. Because of the relatively high volatility of the exchange rate, compounded by the inability to satisfactorily predict these fluctuations, there seems to be place for examining the CPI when it excludes this component, or at least when it excludes the (unexpected) fluctuations in the exchange rate. Monetary policy affects the exchange rate in the medium and even in the short term, to the extent that the rate of exchange reacts to interest-rate differentials, but in addition, unexpected factors that are not controlled by policy, including the cross exchange rate between different currencies, influence the rate to a large extent and therefore also the index. A similar index to that presented here is the domestic price index which, using different methods, excludes the influence of the exchange rate and prices abroad.[12] We will not consider these indices in the present study.

B. Detailed description of the methods of calculation

All the methods to be presented for calculating the core indices refer to the CPI. Methods that use the components of the index are based on the division of the index into 38 components (see the table in Appendix 2). The calculations are performed on monthly data, starting from 1999, when price stability was achieved. The diagrams describing the various indices appear in the Appendix. All the indices examined are defined in Appendix Table 1.

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[9] See Silver (2007) and Mankikar and Paisley (2004).

[10] See the article by Sekine (2006) which estimates the transmission for six developed countries (the United States, Japan, Germany, Great Britain, France and Italy) from the exchange rate to import prices in the vicinity of 0.4, and the transmission from import prices to the CPI at around 0.0 to 0.1.

[11] See footnote 2.

[12] The Bank of Israel uses several methods to estimate domestic prices. Among these are the exclusion of some of the components of the index (housing, transport, and energy), deducting the influence of the exchange rate and the dollar from each of the 31 components of the index, or the use of econometric models to obtain exchange-rate coefficients of prices abroad at an aggregate level.

1. Excluding components: The index based on excluding components removed the historically most volatile components. Having divided the index into 38 components, the standard deviation of each component was examined from the beginning of 1999 to the end of 2007. The component with the greatest volatility was fresh vegetables, followed by fruit, clothing, footwear and eggs. Cigarettes, communications, housing and other housing expenses also have a relatively wide variance, but are more similar to the bulk of the index components (Appendix Table 2). In accord with this, two indices were constructed. The first—the overall index without fresh fruit and vegetables (*dlpx1*), the second without fresh fruit and vegetables and without clothing and footwear (*dlpx2*). The weight of fruit and vegetables is 23.4 points out of 1,000,[13] so that the first deducted index contains 97.7 percent of the overall index, and the second index has a weight of about 94 percent of the overall index. Macklem (2001) examined which components to exclude from the CPI in Canada, based on a similar historical analysis, and also found that food is not volatile, and he therefore does not recommend the choice of the acceptable index which excludes food.[14] At the same time, because the index in most countries does not include energy and food, and because in Israel as well this way of viewing the index is gathering momentum against the background of the recent sharp increases in energy and food prices, we will also examine indices that exclude these components and that exclude fruit and vegetables (*dlpxe, dlpxf, dlpxef, dlpxefv*).[15]

2. Center of the distribution indices: These indices deduct the extreme changes from the overall price changes in the various components of the index, from both tails, according to the condition that is chosen. This method is different from the use of exclusion-based indices, in that while in the exclusion-based indices the excluded components are chosen once and are fixed throughout the period, in this method the components excluded are chosen for each period in accord with their behavior in the particular period under examination. Bryan and Cecchetti (1994) supply the theoretical basis for the use of center-of-the-distribution indices, based on the approach that there are menu costs for changing the price in the case of a shock. They

[13] According to 2007 weights. In previous periods the weights were similar.
[14] The eight most volatile components in Canada, which are excluded from the index, are fruit, vegetables, gasoline, natural gas, other fuels, municipal public transportation, tobacco, and mortgage interest payments. The Bank of Canada regards this as the core index.
[15] The energy component includes gasoline and oil for vehicles, kerosene and diesel oil for the home, gas and service charges, and electricity.

assume that someone who comes up against a sufficiently large shock, will immediately change his price (in the same period), while someone for whom the shock as smaller, will wait until the next period. Therefore, the tails of the index reflect temporary fluctuations in the rates of change (which we would not wish to consider in determining monetary policy), while the center reflects the rate of inflation in the medium and the long term. Furthermore, in the event of skewness in the shocks occurring in the economy, the mean will not correctly reflect the continuing inflation, and the use of the median would be preferable.

In order to calculate these indices, the rates of change of the components comprising the index should be sorted according to the rate of change in that month, and the central part of the distribution (taking into account the weights) should be chosen. The most extreme version of this approach is the choice of the median of the weighted distribution (*dlpmed*). In addition, two other versions were examined. For each month, we sorted the components of the index in an increasing order and gave them a ranking. We calculated two kinds of trimmed index by excluding each month exactly 10 percent or 20 percent of each of the two tails of the distribution. In other words, we remained with an index that includes 80 or 60 percent of the components of the overall index (*dlptrnc20* and *dlptrnc40*). Because the weights of the different components does not precisely match these sizes, in this method we sometimes excluded a partial weight of a particular component.[16]

3. Weighting by volatility: We calculated the standard deviation of the rate of monthly change for the whole sample for each of the 38 components. We weighted the monthly rates of change inversely to the variance of the component. That is to say, components with high volatility obtained a low weight, while components that do not have large variance obtained a higher weight (*dlpstd*). Therefore, the weighted index according to the variance will be:

(1) $$\sum_i \frac{1}{\sigma_i^2} dlp_i \Big/ \left(\sum_i \frac{1}{\sigma_i^2} \right)$$

[16] For performing the calculation, the monthly rates of change of the index were "spread" over one thousand units, according to weights, after they were classified according to their extent of monthly change. Then, 10 or 20 percent was trimmed from each tail and the mean was calculated, which was normalized by dividing it by 0.8 or 0.6 according to the version used. Fruit and vegetables appear in an extreme rank in 78 percent of cases, and clothing and footwear in 88 percent of cases. This result is consistent with their having the highest standard deviation of the components of the index.

in which σ_i^2 is the variance of the component. A further version of this index is one with double weighting that relates to both the variance of the component and the original weighting *(w_i)*of the component in the CPI (*dlpstdw*). In this case the weighted index will be:

(2) $$\sum_i \frac{w_i}{\sigma_i^2} dlp_i \Big/ \left(\sum_i \frac{w_i}{\sigma_i^2} \right)$$

4. Weighting by persistence: In this approach, a greater weight is given to those components that are more persistent and are therefore supposed to be more capable of predicting future inflation. In order to estimate the extent of persistence, Cutler (2001) uses a simple autoregressive equation of the form:

(3) $$\pi_i^t = \alpha_i + \rho_i \pi_i^{t-12} + \varepsilon_i^t$$

where π_i^t is the monthly rate of change in prices of the component.[17] The equations were estimated from 1999 to the end of 2007. In general, the coefficients obtained are relatively low, and some are negative; in these cases the component is given a zero weight. Surprisingly, clothing and footwear, a component with a low weight in other calculations, obtained a relatively high coefficient, probably because of the high correlation between price changes in the same month each year owing to the strong seasonal aspect of this component.

In line with the weighting according to the variance, the index obtained from the use of the persistence coefficients will be (*dlpper*):

(4) $$\sum_i r_i dlp_i \Big/ \left(\sum_i r_i \right)$$

where r_i is the autoregressive coefficient when it is greater than zero, and otherwise it is zero.

Here too, we can adopt a double weighting (*dlpperw*):

(5) $$\sum_i w_i r_i dlp_i \Big/ \left(\sum_i w_i r_i \right)$$

Bilke and Stracca (2007) suggest a slightly different index for persistence. They examine the monthly rates of change of each component of the detrended index, and they examine the number of lags required for each component. Similar to their suggestion, an alternative estimate of persistence is given by the equation:

[17] We also experimented with a version of the annual rate of change, which is not reported here.

(6) $\pi\_dt_i = \alpha_i + \rho_i \pi\_dt_i^{t-12} + \varepsilon_i$,

in which π_dt_i is the monthly rate of inflation of component i, detrended using deviations from an equation to explain the rate of change with the time trend (*dlp12dt*). Here too, when a p_i of less than zero is obtained, a weight of zero is given in the weighting of the component according to persistence.

A final alternative for calculating persistence is the use of indices that exclude both trend and seasonality, making it possible to examine the persistence relative to the previous month (*dlppsdt*). The estimated equation is then:

(7) $\pi\_seasdt_i = \alpha_i + \rho_i \pi\_seasdt_i^{t-1} + \varepsilon_i$

In the three estimates, for 10 to 13 components (out of 38) negative linkage coefficients were obtained, which were converted to zero. The mean value of the persistence coefficient is 0.12 to 0.18 (including the zeroes), that is to say, a relatively low rate of persistence.

5. Principle components: This approach is based on the possibility of using of a single size which is a linear combination of the index components to express a large part of the variance of the overall index. We mentioned above that this approach is used to calculate the overall index in Portugal, but is not in widespread use elsewhere. This index is calculated for the annual rate of change of the price indices in which they are standardized by subtracting their mean and dividing it by the standard deviation of the component. Because of the method of calculation, this method does not produce an indicator of monthly change in the core index, but rather only the annual change. The accepted procedure is to use only the first principle component, which explains about 54 percent of the variance (*dlppc112*).

6. Weights according to estimation: An additional method, which is based on a combination of observation of the index components in conjunction with consideration of the time series, was proposed by Smith (2007). She suggested estimating the annual rate of change in the overall index using the annual rate of change of each in each of the components in the index, with a 12-month lag. That is to say:

(8) $\pi_{12}^t = \alpha_0 + \sum_i \alpha_i \pi_{12i}^{t-12} + \varepsilon$

This index is indicated by *dlpwreg*. By means of estimation, the weights (including negative coefficients) are obtained for each of the components of the index by this

estimation. The significant advantage of this approach is that the method of building this index makes it possible to immediately forecast the annual rate of change of the overall index for the coming 12 months (see Section 3c below).

7. Exponential smoothing: Following Cogley (2002), we calculate the core index based on the averaging out over time of the overall index (*dlpexs*), that is to say, without relating to its components. The averaging out, with decreasing weights, attributes greater importance to changes in the index that occurred in the recent past, and decreasing as time recedes. The aim of this approach is to filter short-term noise as well as to improve prospective forecasting ability. We write:

(9) $\pi\_exs^t = g_0 \sum_i (1-g_0)^i \pi_{t-i}$

Similar to Cogley's values (2002), we chose g_0 to be 0.15. Our examinations show that the sensitivity to different values in the vicinity of this value is not great.

8. Structural VAR: This method is different from all the methods reviewed above in that it is not based on statistical considerations, but rather dismantles the index according to economic considerations. This method does not have a structured economic model, but the separation between the core and the residual inflation is based on an assumption regarding the forces that determine the core inflation. Furthermore, this method is different in that instead of being based on the detailed index series and only on them, it is based on analysis of the overall index using a system of equations that include this index and an indicator of activity, for example, GDP, industrial manufacture or another index of activity (for example, the integrated index). The article of Quah and Vahey (1995) serves as a basis for later articles that adopted a similar method.[18] They define core inflation as a component of the inflation that does not have a long-term effect on the GDP, as described above. This approach is consistent with the view that monetary policy is not supposed to react, or at least not to the same extent, to supply-side shocks, but rather to deal with demand-side shocks.

According to this approach, the shocks can be identified as part of a structural VAR. We assume two types of independent shocks—one that does not influence activity in the long term, because all the nominal sizes adapt themselves over time,

[18] For example Hahn (2002), and Matilla-Garcia (2005), who derived the core inflation from VAR with three variables—inflation, GDP and the amount of money, and Martel (2008), who adds energy prices to the estimated model.

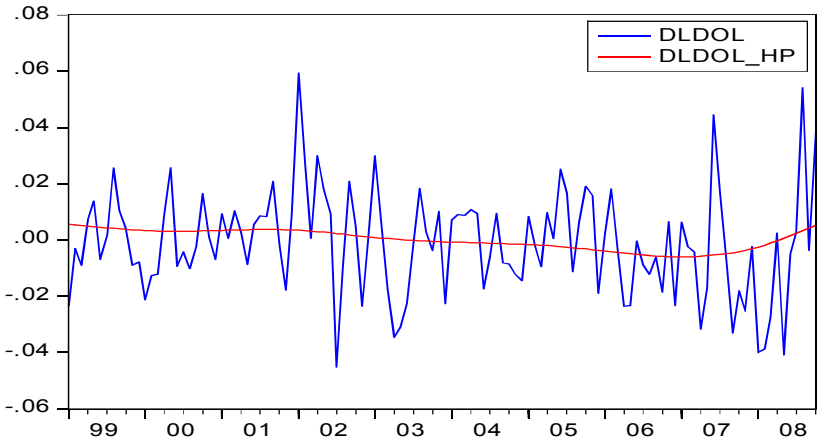
and the other that has an unlimited effect on prices and activity, but does not affect the core inflation. Because the system includes two variables (and shocks), one restriction is sufficient for identification. The restriction used for identification is that the effect of the shocks that create the core inflation (that includes the demand shocks) on the GDP sum to zero in the long term. The system we estimated uses monthly data, and therefore the indicator of activity is, alternately, the change in industrial manufacturing (*dlpvari*), or the change in the Bank of Israel's composite index (*dlpvarm*). Because of the seasonality in the CPI index data, we included in the system also monthly dummy variables. The estimate included eight lags. This lag matches the statistical tests for the composite index, but is longer than the number of lags required for the industrial manufacture (only two). Because it is economically reasonable for the effect of shocks to the industrial manufacturing on prices to last longer than two months, we chose to estimate the system also for industrial manufacture with eight delays. For shocks defined as those that create the core part of the inflation, we added also the constant and the monthly dummy variables, which reflect fluctuations in demand, with their coefficients, to the core part of the inflation.

9. The inflation environment according to the monthly model for forecasting the CPI index (*dlparima*): The calculation is quoted from the monthly model used by the Research Department for forecasting the short-term CPI index. It is based on Suchoy and Rotberger (2006), with the addition of updates to the model from time to time. The estimate of the inflation environment is obtained through automatically identifying the trend and the seasonality in the sub-components of the index. The parameters are estimated using X12-ARIMA and are updated together with the database.

10. Excluding the effect of the exchange rate: In order to exclude the effect of the exchange rate, we estimated a simple equation of the relation between the monthly change in the exchange rate of the sheqel against the dollar, and the change in the CPI for the whole period, starting in 1999. The estimate was made for two definitions. First—the overall change in the exchange rate, and second—for the volatile component of the change, calculated as the gap between the actual change and the trend according to the HP filter (see Figure 1). The residual from this equation with the addition of the constant, that is to say, the gap between the change in the overall index and the change explained by the exchange rate, was defined as being the index

excluding the exchange rate. In examinations that we undertook, we obtained a significant effect of the change in the exchange rate (in the two formulations) in the present period and with a lag of an additional month to six months (some of the delays were not significant, but remained in the equation). The results of the regression are presented in Appendix 3. The disadvantage of this formulation of the core index is that it is based on the HP filter and that it is a result of statistical estimation. This analysis is not intended to differentiate between local effects on the index and effects from abroad, which include, in addition to the effect of the exchange rate, also the effect of the change in prices of imports from abroad.[19] The intention behind the deduction that was made here is to identify a major source of fluctuations in the CPI arising from large fluctuations in the exchange rate, and in the not-negligible transmission from the exchange rate to the CPI, at least in the past. Deducting the noise in the exchange rate beyond the trend, facilitates this examination. At the same time, one could think that monetary policy should react to price changes arising from the exchange rate, in contradistinction to exogenous shocks to supply, for example, and that monetary policy could, to a certain extent, effect changes in the exchange rate by setting the interest rate.

Figure 1: The Monthly Change in the Exchange Rate and the Trend



3. Testing the quality of the core indices

The concept of the core index is not defined in a singular and unequivocal manner. In the above analysis a large number of indicators that are based on different approaches and that could serve as a core index, were presented. In order to choose between the

[19] Reference to the analysis of domestic prices can be found in the box in Inflation Report No. 20 for the first half of 2007, and in Chapter 3 of the Bank of Israel Report for 2006.

core indices or at least to assess the weaknesses and the advantages of each of them, we need to define what the desirable characteristics of a core index are, and to examine it relative to these characteristics. As mentioned above, there are two types of uses for indices of this type. The first, to analyze and assess what the inflation environment was in the recent past and is at present; the second, is for assessing (basic) inflation or the expected inflation environment in the future, and according to this to decide on the monetary policy necessary to achieve the inflation target. Each of these uses requires different characteristics of the core index. In the following sections we will present various examinations of core indices that were undertaken with respect to these two uses.

As mentioned above, the quality of the indices has been examined since 1999, after stability was achieved in the inflation environment. The drawback of this choice is the brief period at our disposal; the advantage, however, lies in the fact that it reflects a relatively stable inflation environment, as currently prevails. The development of the various core indices in conjunction with the change in the overall index over the past 12 months is presented in the diagrams in the appendix.

a. A Core index for assessing the past and the present

To correctly assess the inflation environment, the core index has to be unbiased relative to the overall index. For it to have an advantage over the overall index, it has to have smaller volatility. Table 1 gives a simple statistical description of the different core indices. We see that the index that gives the index components an inverse weight to their volatility, has, by definition, a lower standard deviation than that of the overall index. The indices that exclude volatile components or concentrate on the center of the distribution, have a similar standard deviation to that of the overall index. The index that is an exponential smoothing of the overall index succeeds in significantly reducing the volatility. Also the indices that exclude the influence of the exchange rate, which, by nature, is highly volatile, have a relatively low variance. An examination of inflation in the past 12 months (Table 2) shows similar results. There we also see that the index which describes the inflation trend according to X12-ARIMA has a relatively small standard deviation, because of its definition as a trend.

An examination of the average deviation from the overall index and its variance, and the average absolute value of the deviation, shows that the indices which exclude components, most of the center-of-the-distribution indices and the weighted index

according to the standard deviation and the original weights, have relatively small deviations. In other words, their course shows no significant difference from that of the overall index (Tables 3 and 4).

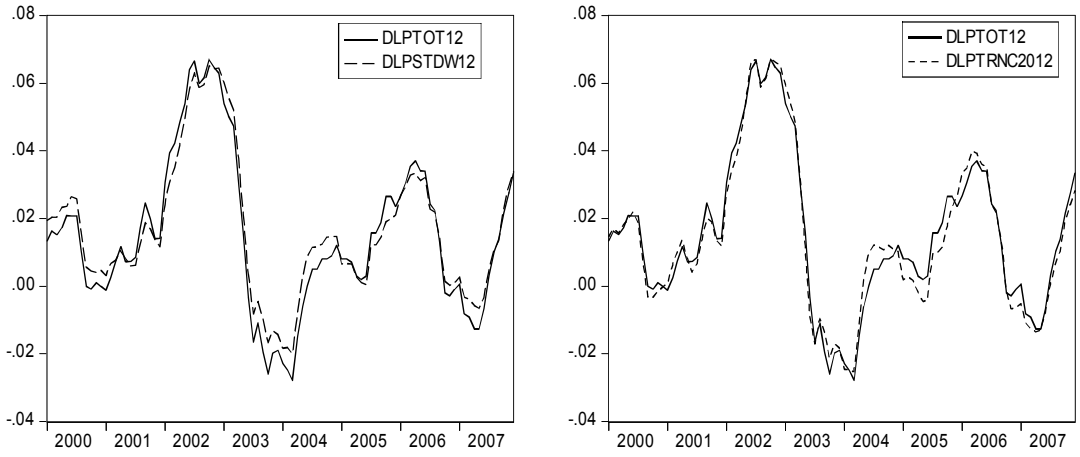
The examination whether the core index is unbiased was done for the monthly and the yearly rate of change by means of estimating an equation that links the core index and the overall index. For the index to be unbiased it is required that the intercept is significantly not different from zero and that the slope is not significantly different from one. For the monthly rates of change, we found that the center-of-the-distribution index *dlptrnc40*, those weighed according to volatility, one of the indices that weights according to persistence, the index that deducts the exchange-rate trend, and the exponential smoothing, are unbiased. A more significant examination is for the rate of change in the past 12 months. Excluding fruit and vegetables, the center-of-the-distribution indices and the weighting according to standard deviation and according to estimation, maintains the lack of bias. Also, eliminating the exchange-rate trend, principle components, exponential smoothing and the ARIMA maintains the lack of bias in intercept and in slope, but with relatively high standard deviations (Tables 3 and 4).

An additional examination looks at the deviation of the core indices from the HP trend. In other words, to what extent is the suggested index close to some smooth course of the CPI? Observation of the monthly data (Table 3) shows that if we exclude energy, then most of the center-of-the-distribution indices, one of the indices based on persistence, the indices according to principle components, exponential smoothing and ARIMA are relatively closer to the trend of prices.[20]

In summary, it would appear that the index excluding fruit and vegetables is not of significant benefit, because it is very similar to the overall index. Of the center-of-the-distribution indices, the index that trims 10 or 20 percent from each tail (*dlptrnc20, dlptrnc40*) has a relatively low volatility of deviation, and is unbiased. Also the weighted index by volatility in conjunction with the weight in the basket (*dlpstdw*) has low volatility. The calculation of these two indices is relatively simple, easy to explain, and does not require estimation.

[20] The HP trend can of itself serve as a core index. It is therefore not clear whether there is room to compare the core indices calculated to another calculation of the "inflation environment".

Figure 2: dlptrnc20 and dlpstdw indices as opposed to the overall index in the past 12 months



The core index based on deducting deviations from the exchange-rate trend produces a different course from the overall index and from the other core indices, and has a different meaning to that of the other indices. It is unbiased, but because it does not follow the course of the overall index, it deviates rather widely from it. The core index based on exponential smoothing, follows the course of the overall index and is unbiased, but, by virtue of the way it is built, it is characterized by relatively large deviations from the course of the overall index. Its disadvantage is in being dependent on the smoothing parameter, which, to a certain extent is chosen arbitrarily, even though its sensitivity to the different parameter sizes that were chosen is not large.

b. A Core index for forecasting purposes

b.1. Forecasting ability of the core index

The second major use of the core index is for forecasting inflation and assessing the future inflation environment for the purpose of managing monetary policy. If the core index removes noise, then (in expectation) it should be capable of forecasting the future inflation environment (in the absence of significant structural changes). It could be claimed that it is not possible to expect to forecast future inflation by means of any index of current inflation, because given the current inflation environment, monetary policy will react in order to change the inflation. Therefore, there appear to be grounds for examining the forecasting ability only for the short term in which the effect of monetary policy is not yet fully apparent.

The first examination of the quality of the forecast looks at the gap between the core index and the overall index 6 or 12 months ahead. (See a similar examination in

Cutler (2001)). A smaller deviation implies a better ability to forecast the rate of inflation in the near future. In particular, a smaller deviation than that obtained by the use of the overall index is preferable. Table 5 presents the average gap and its standard deviation.

It is noteworthy that the standard deviation of the gaps is very large; in other words, there are large deviations of the actual CPI index from the forecast given 6 or 12 months previously. The extent of the fluctuations is similar for all the indices, including the overall index. According to the sample, these errors are partly offset, and the average gap is approximately half a percentage point in the forecast for six months ahead (and includes a period that overlaps that used for the forecast) in some of the indices, and approximately one percent for the forecast a year ahead, with a standard deviation of about 4 percent. The high volatility of the CPI limits the use of the development of prices in the recent past for better forecasting the expected course. In any event, for six months ahead, clearly the future inflation deviations from the indices that exclude energy or food, and the index that excludes the deviation in the exchange rate from the trend, is smaller than that obtained by the use of the overall index. A similar picture is obtained for the forecast 12 months ahead, with the addition of a good forecast of indices that exclude energy and food, or energy, food, fruits and vegetables and the index based on persistence.

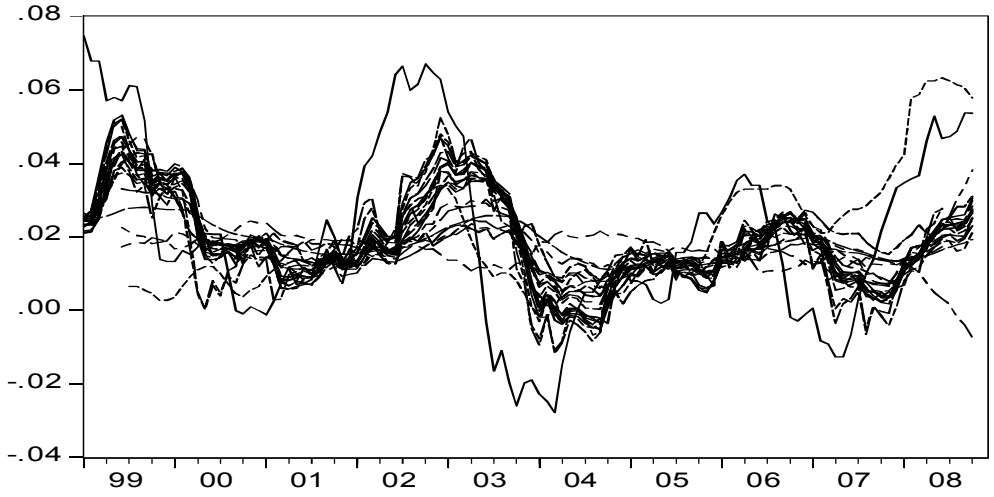
In a further examination, we estimated an equation that allows for a coefficient different from zero for the intercept, and a slope different from one, with the aim of examining whether a different relation exists between the indices that would enable a better forecast. And particularly, whether there is a core index that is capable of forecasting the CPI better than the overall index six months ahead. The estimated equation is:

(10) $\pi_{12} = \alpha_i + \beta_i \, \pi\_core_{12}^{t-6} + \varepsilon_i$

The results are presented in Table 6. The results of the estimation show that the intercept is different from zero and the slope is significantly different from one in most cases. It further emerges that the overall index enables forecasting of the expected inflation with a relatively low explanation rate (R^2) of around 24 percent. The indices that exclude energy and food, and also with the addition of excluding fruit and vegetables produce an explanation rate of more than 30 percent. The core index

based on structural VAR explains around 40 percent of the overall index after 6 months.

Figure 3: The overall index and the forecast (6 months ahead) according to different core indices



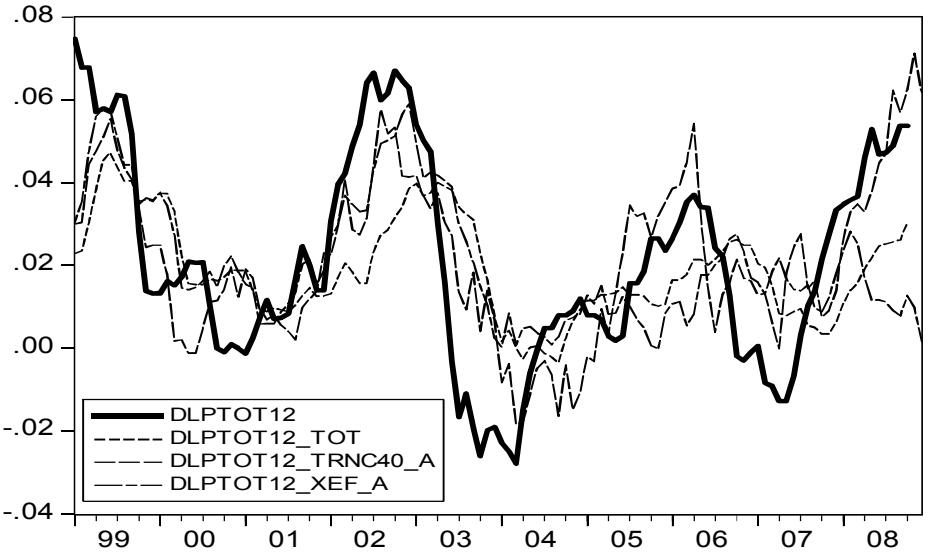
If indeed the VAR index manages to eliminate the supply shocks, which are expected to be transient, we can expect that it will be better able to forecast the development of inflation in the near future, relative to the index as a whole, including also the supply shocks.

All in all, the volatility of the overall index, and particularly the significant effect of unexpected fluctuations in the exchange rate on the index, does not enable significant use of existing knowledge in order to assess the expected inflation in the near future. It therefore seems that it is difficult to rely on these indices in order to assess the expected rate of inflation in the near term. This is demonstrated in Figure 3, which presents the overall index for each period (the unbroken line, with relatively conspicuous fluctuations) and the forecast obtained from the estimated equation. A forecast is presented also within the sample (up to August 2007), and also half a year outside it. Very noticeable is that most of the core indices follow the large fluctuations in the overall index, and therefore do not give a good prospective forecast. The index based on the ARIMA is the only one that forecasts the rising trend in the overall index during 2008 (indicted by a broken line above the course of the overall index).

A further examination presented in Table 7 examines whether the core index contains additional information beyond that inherent in the overall index for forecasting inflation six months ahead. The existence of multicolinearity between the

variables makes it difficult to interpret the coefficients that are obtained, while, at the same time, in some cases both the overall index and the core index are significant, and the explanation rate (R^2) of the equation as a whole is greater than that of the equation that includes only the core index. In particular, estimation that includes the core index according to the center of the distribution (*dlptrnc40*) improves the explanation rate up to more than 50 percent, and produces a forecast that is close to the development of the index in practice, both inside and outside the sample. The index that excludes food and energy also contributes to improving the forecast of the CPI relative to the equation without this index, but the forecast derived from it does not succeed in following the development of the index outside the sample. The index based on VAR analysis, according to the examinations we conducted, also improves the forecast of the overall index (Figure 4).

Figure 4: The overall index and the forecast based on the index itself and with the addition of various core indices



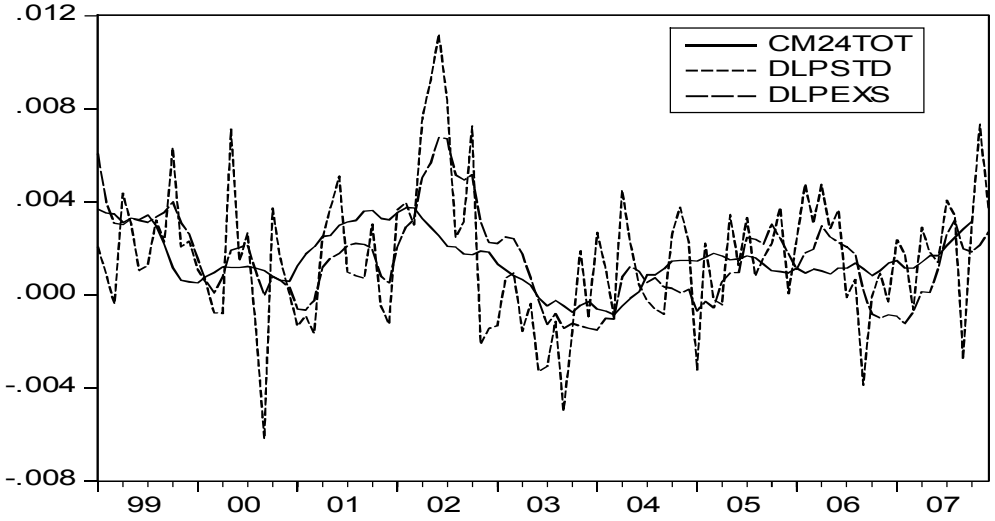
b. 2. Examining the core index as an indicator of the inflation environment

The deviation from the inflation environment: In line with Clark (2001) and others, we can assess the inflation environment by a moving average around the period we are considering. For this purpose, we calculated the moving average for 12, 18 and 24 months around the month in question.[21] We would expect the gap between the core index that follows the inflation environment and the average we calculated to be

[21] For example, for a moving average of 12 months, we calculated the average from 5 months prior to the present month to 6 months after it.

relatively small. Table 8 presents the standard deviation of the difference between the moving average for 12, 18 and 24 months, and each of the core indices (that exist in monthly terms). From these it emerges that the standard deviation of most of the core indices is similar to that characterizing the overall index, and is similar for the different horizons. The gap between the core index calculated by weighting the volatility (*dlpstd*), the index calculated according to the persistence (*dlppsdt*) and the index based on the exponential smoothing (*dlpexs*), and the inflation environment that was calculated, is significantly smaller than that obtained by the use of the other indices (Figure 5).

Figure 5: Twenty-four months moving average of the overall index (thick continuous line), core index according to volatility weighting (short broken line) and the core index according to exponential smoothing (long broken line)



The extent of convergence to the inflation environment: If the core index reflects the inflation environment, then a deviation of the present rate of inflation from the environment is expected to be conveyed in a return to the trend in the forthcoming periods.[22] That is to say, in the following equation

(11) $\pi_{12}^{t+12} - \pi_{12}^{t} = \alpha + \beta(\pi_{12}^{t} - \pi\_core_{12}^{t}) + \varepsilon_i$

we expect to obtain a negative and significant β.[23] Table 9 shows that only some of the core indices maintain the required characteristic, and in any event, the explanation rate of the equations is relatively low in most cases. The index based on the VAR method obtains the expected negative sign, and the explanatory rate of the equation is

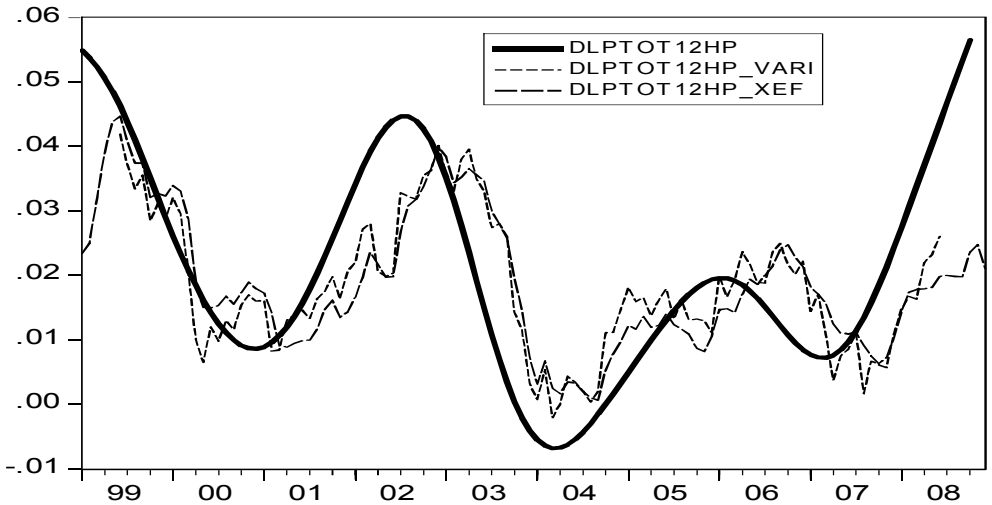
[22] Here again there might be reservations about this examination, because of the possible influence of the monetary policy adopted.
[23] The examination is accepted in many papers. See Cogley (1998) and OECD (2005).

also a relatively high 65-70 percent. Here too, if this index indeed manages to exclude the supply shocks from the CPI, one would expect its convergence to the inflation environment. The index that eliminates the deviation from the exchange-rate trend also shows a characteristic of " error correction", with a high explanatory rate of 50 percent. Here too, because the fluctuations in the exchange rate are responsible for a large part of the variance in the CPI, the removal of these fluctuations facilitates a better forecast of the index. The index based on the ARIMA also meets the condition required here for an index that represents the inflation environment.

The connection with the inflation trend: The previous section showed the difficulty of forecasting the rate of inflation six months ahead. If the actual inflation course is characterized by relatively large and frequent shocks, it is reasonable to assume that we will not be able to correctly assess the expected overall rate of inflation for every period, and, more important, to be capable of assessing the development of the inflation environment or the inflation trend. It is therefore necessary to examine whether it is possible by means of the core index to assess the expected inflation trend—in other words, the expected changes in the environment. Table 10 presents the ability to forecast the inflation trend in 6 months time, as it is calculated by the HP procedure for each of the core indices and the overall inflation.

(12) $\pi_{12}\_hp = \alpha_i + \beta_i\, \pi\_core_{12}^{t-6} + \varepsilon_i$

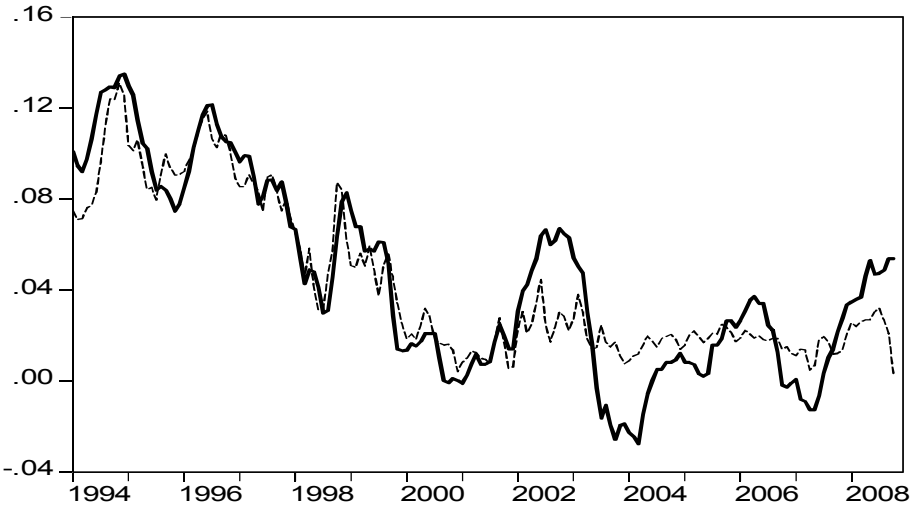
Figure 6: The HP trend of the inflation and the forecast of it according to the overall index (thick continuous line), the index according to VAR (short broken line) and the index without food and energy (long broken line)



According to this examination as well, the index that excludes energy and food (and also the one that furthermore excludes fruit and vegetables), and the index based on the VAR, show the highest rate of explanation—around 50 percent, and higher than the rate of explanation obtained by the use of the overall index. The two core indices—without food and energy and that based on VAR, forecast the trend changes in the index, but with a lag of several quarters (Figure 6).

The correlation with inflation expectations: Inflation expectations reflect individuals' assessments about the expected inflation environment in the coming year. We can differentiate two different periods in the context of the behavior of expectations derived from the capital market (Table 11). From 1994 to the end of 2000 there is a very high correlation between actual inflation during the past 12 months and the expectations of inflation in the coming 12 months. From the beginning of 2002 this connection weakened considerably and inflation expectations remained relatively stable around 2 percent (the center of the range of the inflation target), as opposed to the relatively high volatility of the actual inflation (Figure 7).

Figure 7: Actual overall inflation (unbroken line) and inflation expectations (broken line)



The core indices are supposed to better reflect the inflation environment, and therefore we would expect that the expectations of inflation would be better matched to them. And indeed, in the period in which there was correlation, and the correlation between expectations of the overall index was above 90 percent for the core indices based on excluding components and on the center of the distribution, the correlation was similar to that of the expectations of the overall index, and lower for the other core

indices. In the second period, in which the correlation was lower (0.68 with the overall index), the correlation with the core indices mentioned above was similar. The correlation with the index that excludes the exchange-rate trend was particularly weak—that is to say, future expectations are affected to a considerable extent by fluctuations in the exchange rate. Based on these results, we cannot conclude that the inflation expectations better reflect some core index, but rather that they are based to a large extent on the behavior of the overall index.

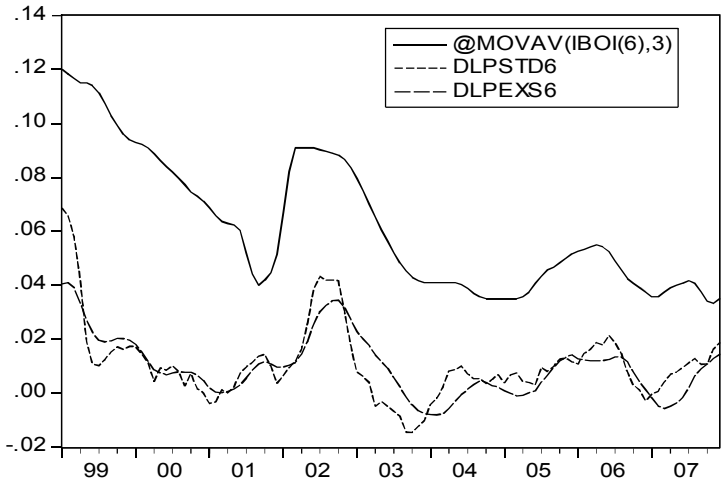
b. 3. The core index and the Bank of Israel's interest rate

The major importance of a core index is that it enables us to identify the inflation environment and changes in it, for the purpose of setting monetary policy. In this context we wish to examine the connection between Bank of Israel interest, which serves as the major tool of monetary policy, and the core indices in two directions. The first—which index affects changes in the Bank of Israel interest? And second—which index is most affected by changes in the interest rate?

The effect of prices on interest: The Bank of Israel examines, using many indicators, the ongoing development of the CPI, and the inflation expectations for various time horizons, when it decides the interest rate each month. Because the decision makers did not have at their disposal most of the core indices presented in this study, they clearly did not examine these indices directly. Nevertheless, it is possible to examine which index is better matched to the interest-rate decisions, and which therefore better describes and represents the indices and the weights that the Bank gives to the development of prices. For this purpose we examined the correlation between the development of each of the indices in the past six months, and the 3-month or 6-month average interest three months later. The results are presented in the two left-hand columns of Table 12. Preliminary observation shows that the correlation with some of the deducted indices is higher than with the overall index.

In particular, the connection between the interest and the indices based on the center of the distribution, or weighting according to volatility is greater—about 40-50 percent relative to the interest rate set six months later. Interestingly, relative to the index based on exponential smoothing (*dlpexs*), the correlation is very high, probably because of the persistence that also exists in the interest and the generally slow changes in the interest rate.

Figure 8: Bank of Israel interest after half a year (unbroken line), weighted index according to volatility (short broken line), and the index according to exponential smoothing (long broken line)



The effect of interest on prices: In determining monetary policy, the Bank of Israel may well examine the development of the index as a whole, but the ability of monetary policy to have an influence does not necessarily refer to the development of the overall index which also has noises and fluctuations that are independent of monetary policy. The two right columns of Table 12 present the effect of Bank of Israel interest (three-month average) that was determined 3 or 6 months previously, on the development of the various indices. Firstly, the connection between most of the indices and the lagged interest rate is negative, as we would expect—raising interest is corresponds with lower rates of inflation after a certain period. Here it seems that the correlation with most of the deducted indices is similar to that with the index as a whole, even though it includes unexpected noise. An exception is the correlation with the index based on the structural VAR, which is meant to eliminate supply shocks. Because monetary policy is unable to affect supply shocks, which can also originate outside the Israeli economy, it is reasonable that the effect on inflation that excludes these components, will be greater. A further result is that the index excluding changes in the exchange rate (*dlpxdol*) is related to a large extent to policy in the past. Here too, despite the exchange rate being affected by the interest rate, removing the large fluctuations in the index arising from significant fluctuations in the exchange rate,

some of which are also due to to external shocks, makes is possible to expose the connection between monetary policy and the development of prices.[24]

4. Conclusion

The study presents and examines a wide range of indices known as "core indices" and examines their quality in two major areas—their ability to describe and assess the present inflation environment, and their ability to assess the expected inflation environment in the near term and to predict its development. As part of the study, we built various types of indices, as is customary in the professional literature on the subject, and in line with what other central banks are doing. Accepted and simple-to-build indices are those that exclude fixed components from the index, based on the extent of their volatility or because of other considerations. In this study we examined six different indices of this kind. Other indices, also relatively simple, are indices of the center of the distribution, which exclude each period (month) the most volatile components. Indices of a third kind weight anew all the components of the index on the basis of various considerations—volatility, persistence or contribution to the development of the overall index. We also examined core indices obtained from VAR analysis, using principle components, and from exponential smoothing. We also presented and examined a trend index calculated as part of the model of the Research Department for monthly forecasting of the index.

The examination of the quality of the indices included an examination of their statistical characteristics relative to the overall index, relative to various definitions of the inflation environment, and analysis of the connection between them and the future development of the overall index, such as forecasting ability and the convergence of the overall index to the environment described by the core index. A qualitative summary of the results of the examination for all the indices examined appears in Table 13a and 13b.

The tables show that in line with results from other research studies, no single core index is clearly preferable to other indices in all respects. Furthermore, in general, the ability of core indices to forecast future inflation is not high. Nevertheless, we can characterize the advantages and the disadvantages of various

[24] Starting from the end of 2007, there is a marked decrease in the extent of transmission between the exchange rate and the CPI, and therefore also in the volatility of the index arising from changes in the rate of exchange. It is still too early to examine the change in the correlation between the Bank of Israel interest and the overall index or the various core indices.

indices. The indices that exclude the volatile components—fruit and vegetables, clothing and footwear, energy or food, do not contribute information to understanding the present environment or to assessing the future. On the other hand, the indices that exclude food and energy, as well as fruit and vegetables (*dlpxef, dlpxefv*), while not unbiased in relation to the overall index, do have information that improves the ability to forecast the development of future inflation. Adding the index without food and energy to the overall index in the equation for forecasting the index six months ahead, does improve predictive ability (Table 7). Of the center-of-the-distribution indices, the index that trims 20 percent from the exceptional observations on each side (*dlptrnc40*) is unbiased relative to the overall index and does have additional information that improves the forecast. The indices based on weights according to volatility are less volatile than the overall index, and are unbiased relative to it.

An interesting result is obtained for indices based on VAR analysis (*dlpvarm, dlpvari*). They are different from the indices mentioned above in that they are based on the overall index, without dismantling it into components, and with the addition of an economic variable that describes the activity. The disadvantage of these indices is that they are based on estimation, and therefore they are more complex to built and more open to judgment and changes. At the same time, their definition has an economic base that defines the core inflation as a component of the inflation that does not have a long-term impact on GDP, and they facilitate differentiation between fluctuations arising from the demand side as opposed to those arising from the supply side—a differentiation that is necessary for managing monetary policy. These indices give a better forecast of the overall index and its trend (HP) than those obtained from the overall index, and they are also affected to a larger extent than the overall index by Bank of Israel interest.

Additional indices worthy of mention are those that exclude the influence of the exchange rate on the index, with or without excluding the exchange rate trend (*dlpxdol, dlpxdolhp*). These indices were examined in order to obtain an assessment of the extent to which fluctuations in the exchange rate affect the development of the CPI. The results, as expected, show that they are significantly less volatile than the overall index, and the overall inflation converges towards them (Table 8). Furthermore, the effect of the Bank of Israel interest on this deducted index is significantly higher than the effects of the overall index and other core indices.

In conclusion, the examinations that were undertaken show that the indices that weight the components according to their volatility (*dlpstdw, dlpstd*) and the indices without the tails of the distribution (*dlptrnc40*) contribute to understanding the present environment. The index without food and energy, or without food, energy and fruit and vegetables (*dlpxef, dlpxefv*) and the index based on VAR (*dlpvari, dlpvarm*) contribute to assessing the expected inflation environment and are likely to help in conducting monetary policy.

Table 1: Simple statistics of the various indices
Monthly rate of change January 1999-December 2007 (percentages)

		Median	Mean	Standard Deviation	Minimum	Maximum
dlptot	Overall index	0.10	0.13	0.49	-0.87	1.53
dlpx1	Excluding components	0.11	0.13	0.50	-0.89	1.49
dlpx2		0.11	0.14	0.51	-0.89	1.39
dlpxe		0.10	0.10	0.47	-0.81	1.41
dlpxf		0.09	0.11	0.56	-1.04	1.70
dlpxef		0.05	0.07	0.54	-1.06	1.58
dlpxefv		0.04	0.06	0.56	-1.00	1.49
dlpmed	Center of the distribution	0.10	0.13	0.45	-1.03	1.52
dlptrnc20		0.07	0.12	0.50	-0.93	1.37
dlptrnc40		0.07	0.13	0.45	-0.95	1.37
dlpstd	Weighting by volatility	0.14	0.16	0.29	-0.62	1.12
dlpstdw		0.12	0.15	0.43	-0.77	1.28
dlpper	Weighting by persistence	-0.39	0.02	1.34	-2.97	3.16
dlpperw		-0.08	0.07	0.84	-2.00	2.37
dlpp12dt		-0.38	0.02	1.31	-2.91	3.11
dlppsdt		0.12	0.17	0.41	-0.83	1.33
dlpvari	Structural VAR	-0.01	0.03	0.45	-1.08	1.22
dlpvarm		-0.03	0.03	0.45	-1.07	1.23
dlpxdol	Deducting the exchange rate	0.13	0.14	0.38	-0.87	0.87
dlpxdolhp		0.13	0.14	0.37	-0.88	0.83
dlpexs	Exp. smoothing	0.18	0.15	0.19	-0.15	0.68

* The core indices according to principle components and based on weighting by estimation (*dlpwreg*) are calculated only for the annual rates of change. The monthly figure for the core index according to X12-ARIMA (Suchoy and Rotberger, 2006) reflects a trend, and therefore we examine it only in annual terms (not the rate of change in the past 12 months). See the tables describing annual changes.

Table 2: Simple statistics of the various indices
Annual rate of change January 1999-December 2007 (percentages)

		Median	Mean	Standard Deviation	Minimum	Maximum
dlptot	Overall index	1.41	1.89	2.51	-2.78	7.47
dlpx1	Excluding components	1.34	1.87	2.55	-2.67	7.27
dlpx2		1.57	2.04	2.62	-2.64	7.27
dlpxe		1.18	1.58	2.48	-2.65	7.59
dlpxf		1.26	1.70	2.72	-3.43	7.37
dlpxef		0.79	1.30	2.69	-3.32	7.48
dlpxefv		0.70	1.24	2.75	-3.43	7.57
dlpmed	Center of the distribution	1.23	1.91	2.58	-1.38	7.64
dlptrnc20		1.35	1.86	2.55	-2.53	6.95
dlptrnc40		1.36	1.96	2.48	-2.00	7.13
dlpstd	Weighting by volatility	1.70	2.33	2.39	-1.94	8.71
dlpstdw		1.47	2.11	2.41	-2.00	7.66
dlpper	Weighting by persistence	0.42	0.54	2.46	-4.96	8.68
dlpperw		0.59	1.23	2.26	-2.40	8.72
dlpp12dt		0.42	0.57	2.46	-4.87	8.67
dlppsdt		1.80	2.50	2.90	-1.77	9.01
dlpwreg	Weighting by estimate	1.54	1.89	2.44	-2.77	8.03
dlpvari	Structural VAR	0.30	0.52	1.43	-2.33	3.66
dlpvarm		0.34	0.37	1.47	-2.62	4.30
dlpxdol	Excl. exchange rate	1.60	1.69	1.22	-0.74	3.91
dlpxdolhp		1.89	1.34	2.18	-2.12	7.85
dlppc1	Principle comp.	1.34	1.34	2.18	-2.10	7.85
dlpexs	Exp. Smoothing	1.52	1.52	2.01	-1.00	6.29
dlparima	X12-ARIMA	1.22	0.70	1.54	6.10	1.54

Table 3: Indices of the quality of the core index
Monthly rate of change January 1999-December 2007 (percentages)

		Average absolute value of the deviation from the overall index	Average deviation from the overall index	Standard deviation of the deviation	Quality of matching to the overall index					Square of the deviation from the HP trend (mult. by 100)
					Inter-cept	Std. Dev	Slope	Std. Dev.	R^2	
dlpx1	Excluding components	0.10	0.00	0.12	0.00	0.01	0.95	0.02	0.94	0.22
dlpx2		0.18	-0.01	0.21	0.00	0.02	0.88	0.04	0.83	0.22
dlpxe		0.11	0.03	0.14	0.03	0.01	1.01	0.03	0.92	0.20
dlpxf		0.08	0.02	0.09	0.03	0.00	0.87	0.01	0.99	0.29
dlpxef		0.14	0.06	0.17	0.07	0.02	0.87	0.03	0.90	0.27
dlpexfv		0.20	0.06	0.24	0.08	0.02	0.80	0.04	0.82	0.29
dlpmed	Center of the distribution	0.22	0.00	0.28	0.01	0.03	0.90	0.06	0.68	0.18
dlptrnc20		0.15	0.00	0.19	0.02	0.02	0.91	0.04	0.85	0.22
dlptrnc40		0.17	-0.00	0.22	-0.00	0.02	0.98	0.05	0.81	0.18
dlpstd	Weighting by volatility	0.28	-0.03	0.35	-0.06	0.04	1.22	0.12	0.51	0.06
dlpstdw		0.14	-0.02	0.17	-0.03	0.02	1.06	0.04	0.88	0.16
dlpper	Weighting by persistence	1.09	0.11	1.25	0.13	0.04	0.14	0.03	0.14	1.79
dlpperw		0.50	0.06	0.59	0.10	0.03	0.43	0.04	0.52	0.68
dlpp12dt		1.06	0.11	1.22	0.13	0.04	0.14	0.03	0.14	1.72
dlppsdt		0.22	-0.04	0.29	-0.04	0.03	0.98	0.07	0.66	0.13
dlpvari	Structural VAR	0.25	0.10	0.29	0.10	0.03	0.88	0.06	0.66	0.21
dlpvarm		0.25	0.10	0.30	0.11	0.03	0.88	0.06	0.64	0.24
dlpxdol	Excluding the exchange rate	0.24	-0.00	0.31	-0.00	0.03	1.00	0.08	0.60	0.14
dlpxdolhp		0.25	-0.01	0.32	-0.01	0.03	1.00	0.08	0.57	0.13
dlpexs	Exp. smoothing	0.33	-0.02	0.44	-0.05	0.06	1.20	0.23	0.20	0.02

* The core indices according to principle components and based on weighting by estimation (*dlpwreg*) are calculated only for the annual rates of change. dlparima is presented only in annual terms. See footnote to Table 1.

Table 4: Indices of the quality of the core index
Annual rate of change, January 1999-December 2007 (in percentages)

		Average absolute value of the deviation from the overall index	Average deviation from the overall index	Standard deviation of the deviation	Quality of matching to the overall index					Square of the deviation from the HP trend (mult. by 100)
					Inter-cept	Std. Dev.	Slope	Std. Dev.	R^2	
dlpx1	Excluding components	0.19	0.02	0.23	0.06	0.04	0.98	0.02	0.99	1.87
dlpx2		0.25	-0.15	0.30	-0.05	0.05	0.95	0.02	0.99	2.06
dlpxe		0.43	0.32	0.43	0.32	0.10	1.00	0.03	0.97	1.49
dlpxf		0.33	0.20	0.34	0.34	0.04	0.92	0.02	0.99	2.27
dlpxef		0.72	0.59	0.55	0.70	0.09	0.91	0.03	0.96	2.28
dlpxefv		0.76	0.65	0.61	0.79	0.09	0.89	0.03	0.95	2.65
dlpmed	Center of the distribution	0.70	-0.01	0.84	0.14	0.23	0.92	0.05	0.90	2.21
dlptrnc20		0.33	0.04	0.40	0.08	0.08	0.97	0.02	0.98	1.94
dlptrnc40		0.46	-0.07	0.54	-0.05	0.14	0.99	0.04	0.95	1.84
dlpstd	Weighting by volatility	0.99	-0.44	1.14	-0.30	0.25	0.94	0.10	0.80	1.81
dlpstdw		0.45	-0.22	0.48	-0.26	0.11	1.02	0.04	0.96	1.56
dlpper	Weighting by persistence	1.92	1.35	1.97	1.51	0.36	0.70	0.09	0.47	4.51
dlpperw		0.97	0.66	1.00	0.64	0.20	1.02	0.13	0.84	1.89
dlpp12dt		1.90	1.32	1.95	1.49	0.36	0.71	0.09	0.48	4.39
dlppsdt		0.73	-0.61	0.72	-0.22	0.16	0.85	0.04	0.95	2.97
dlpwreg	Weighting by estimation	0.46	0.00	0.58	0.00	0.06	1.00	0.02	0.95	1.48
dlpvari	Structural VAR	1.48	1.38	1.34	1.07	0.19	1.60	0.11	0.83	2.77
dlpvarm		1.64	1.52	1.39	1.33	0.22	1.51	0.12	0.78	3.42
dlpxdol	Excluding the exchange rate	1.85	0.52	2.40	0.89	0.76	0.73	0.40	0.10	3.21
dlpxdolhp		1.71	0.29	2.10	0.07	0.64	1.14	0.35	0.31	1.67
dlppc1	Principle comp.	1.03	-0.00	1.27	0.00	0.27	1.00	0.11	0.75	1.37
dlpexs	Exp. Smoothing	1.28	-0.19	1.59	-0.12	0.36	0.97	0.12	0.60	1.23
dlparima	X12-ARIMA	2.09	0.67	2.81	0.02	0.69	0.17	0.28	0.01	4.87

Table 5: Quality of the core-index forecast—the gap between the core index and inflation several months ahead*
Annual rate of change, July 1999-December 2007 (percentages)

		6 months ahead		12 months ahead	
		Mean	Std. Deviation	Mean	Std. Deviation
dlptot		-0.26	2.60	-0.57	3.88
dlpx1	Excluding components	-0.26	2.66	-0.58	3.94
dlpx2		-0.43	2.71	-0.76	4.00
dlpxe		0.05	2.50	-0.22	3.76
dlpxf		-0.08	2.65	-0.41	4.04
dlpxef		0.32	2.51	0.03	3.90
dlpxefv		0.37	2.56	0.06	3.98
dlpmed	Center of the distribution	-0.35	2.96	-0.69	4.11
dlptrnc20		-0.25	2.75	-0.57	3.98
dlptrnc40		-0.38	2.85	-0.70	4.00
dlpstd	Weighting by volatility	-0.74	2.92	-0.95	3.88
dlpstdw		-0.50	2.77	-0.79	3.91
dlpper	Weighting by persistence	1.14	3.04	1.00	3.71
dlpperw		0.40	2.78	0.13	3.76
dlpp12dt		1.12	3.04	0.96	3.71
dlppsdt		-0.90	3.04	-1.20	4.38
dlpwreg	Weighting by estimation	-0.27	2.50	-0.58	3.77
dlpvari	Structural VAR	1.13	1.82	0.89	2.76
dlpvarm		1.26	1.90	1.01	2.81
dlpxdol	Excl. exchange rate	0.41	2.58	0.34	2.81
dlpxdolhp		0.05	2.45	-0.17	2.70
dlppc1	Principle comp.	-0.29	2.82	-0.48	3.68
dlpexs	Exp. Smoothing	-0.54	3.00	-0.79	3.66
dlparima	X12-ARIMA	0.66	2.07	0.63	2.49

* We examine the mean and the standard deviation of the expression dlptot12-dlp x12(-h), where dlptot12 is the annual rate of change in the CPI, h periods ahead, and dlpx12 the core index in question.

Table 6: Indices of the quality of the core index—forecasting ability 6 months ahead*
Annual rate of change, January 1999-December 2007 (percentages)

		Characteristics of the equation				
		Intercept	Std. Deviation**	Slope	Std. Deviation**	R^2
dlptot		0.93	0.39	0.46	0.14	0.24
dlpx1	Excluding components	0.98	0.40	0.44	0.14	0.22
dlpx2		0.92	0.40	0.43	0.14	0.22
dlpxe		1.00	0.38	0.50	0.12	0.29
dlpxf		1.02	0.37	0.45	0.13	0.27
dlpxef		1.12	0.36	0.49	0.11	0.33
dlpxefv		1.17	0.36	0.48	0.11	0.32
dlpmed	Center of the distribution	1.18	0.48	0.33	0.16	0.12
dlptrnc20		1.06	0.42	0.41	0.15	0.19
dlptrnc40		1.11	0.46	0.36	0.16	0.14
dlpstd	Weighting by volatility	1.02	0.53	0.34	0.15	0.12
dlpstdw		0.96	0.45	0.40	0.15	0.17
dlpper	Weighting by persistence	1.67	0.46	0.30	0.12	0.10
dlpperw		1.33	0.45	0.39	0.14	0.14
dlpp12dt		1.67	0.46	0.30	0.12	0.10
dlppsdt		0.95	0.44	0.34	0.12	0.18
dlpwreg	Weighting by estimation	0.81	0.39	0.43	0.14	0.22
dlpvari	Structural VAR	1.14	0.32	0.99	0.22	0.40
dlpvarm		1.30	0.34	0.91	0.22	0.35
dlpxdol	Excl. exchange rate	2.03	0.74	-0.30	0.46	0.01
dlpxdolhp		1.13	0.51	0.33	0.34	0.03
dlppc1	Principle comp.	1.13	0.54	0.27	0.15	0.07
dlpexs	Exp. Smoothing	1.34	0.51	0.23	0.20	0.04
dlparima	X12-ARIMA	0.74	0.49	0.92	0.37	0.21

* The estimated equation is: dlptot12 = c0 + c1*dlpX12(-6), where dlpX12(-6) is the annual rate of change in the core index with a six-monthly lag, and dlptot is the annual rate of change in the overall index.
** Corrected to serial correlation according to Newey-West.

Table 7: Indices of the quality of the core index—forecasting ability 6 months ahead—added information from the core index*
Annual rate of change, July 1999-December 2007 (percentages)

		Intercept	Lagged Core Index	Lagged Overall Index	R^2
dlptot		0.93		0.46	0.24
dlpx1	Excluding components	0.88	-1.72	2.20	0.27
dlpx2		1.05	-1.27	1.77	0.26
dlpxe		1.45	1.87	-1.40	0.34
dlpxf		2.00	3.19	-2.98	0.37
dlpxef		2.65	2.45	-2.18	0.51
dlpxefv		2.48	2.00	-1.71	0.44
dlpmed	Center of the distribution	1.11	-1.29	1.70	0.40
dlptrnc20		0.88	-2.15	2.59	0.36
dlptrnc40		1.39	-2.59	2.93	0.53
dlpstd	Weighting by volatility	1.34	-0.55	0.94	0.30
dlpstdw		1.67	-2.14	2.48	0.40
dlpper	Weighting by persistence	0.86	-0.08	0.52	0.24
dlpperw		0.74	-0.55	0.93	0.28
dlpp12dt		0.86	-0.09	0.52	0.24
dlppsdt		1.37	-1.10	1.69	0.32
dlpwreg	Weighting by estimation	0.80	0.68	-0.24	0.22
dlpvari	Structural VAR	1.89	2.11	-0.69	0.50
dlpvarm		1.71	1.37	-0.30	0.38
dlpxdol	Excl. exchange rate	1.71	-0.87	0.52	0.31
dlpxdolhp		1.13	-0.24	0.47	0.22
dlppc1	Principle comp.	1.15	-0.57	0.85	0.29
dlpexs	Exp. Smoothing	1.60	-0.65	0.87	0.35
dlparima	X12-ARIMA	0.19	0.81	0.34	0.35

* The estimated equation is: dlptot12 = c0 + c1*dlpX12(-6)+c2*dlptot12(-6), where dlpX12(-6) is the annual rate of change in the core index with a six-monthly lag, and dlptot12 is the annual rate of change in the overall index. Cells with a grey background are significant at the 10% level. Corrected to serial correlation according to Newey-West.

Table 8: Indices of the quality of the core index—the ability of the core index to forecast the trend (HP) of the overall index 6 months ahead*
Annual rate of change, January 1999-December 2007 (percentages)

		Intercept	Lagged core index	R^2
dlptot	Overall index	1.13	0.36	0.38
dlpx1	Excluding components	1.17	0.34	0.36
dlpx2		1.13	0.33	0.35
dlpxe		1.18	0.39	0.46
dlpxf		1.23	0.34	0.40
dlpxef		1.30	0.37	0.49
dlpxefv		1.34	0.36	0.47
dlpmed	Center of the distribution	1.29	0.27	0.22
dlptrnc20		1.22	0.32	0.31
dlptrnc40		1.22	0.30	0.26
dlpstd	Weighting by volatility	1.07	0.32	0.27
dlpstdw		1.11	0.33	0.31
dlpper	Weighting by persistence	1.68	0.29	0.25
dlpperw		1.41	0.33	0.28
dlpp12dt		1.67	0.29	0.25
dlppsdt		1.12	0.28	0.30
dlpwreg	Weighting by estimation	1.06	0.34	0.37
dlpvari	Structural VAR	1.35	0.69	0.55
dlpvarm		1.47	0.63	0.47
dlpxdol	Excl. exchange rate	1.77	-0.04	0.00
dlpxdolhp		1.10	0.39	0.11
dlppc1	Principle comp.	1.15	0.29	0.22
dlpexs	Exp. Smoothing	1.22	0.28	0.15
dlparima	X12-ARIMA	1.27	0.44	0.13

* The estimated equation is: dlptot12 = c0 + c1*dlpX12(-6), where dlpX12(-6) is the annual rate of change in the core index with a six-monthly lag, and dlptot is the annual rate of change in the overall index. All the coefficients are significant at the 5% level, except for one cell indicted in grey. Corrected to serial correlation according to Newey-West.

Table 9: Indices of the quality of the core index—deviation of future inflation relative to the deviation of the inflation from the core*, annual rate of change, January 1999-October 2007 (percentages)

		Characteristics of the equation		
		Intercept	Slope	R^2
dlpx1	Excluding components	-0.17	5.52	0.11
dlpx2		0.79	5.74	0.19
dlpxe		1.11	-3.90	0.17
dlpxf		-1.12	5.36	0.21
dlpxef		0.27	-0.63	0.01
dlpxefv		-0.37	0.44	0.00
dlpmed	Center of the distribution	-0.00	1.25	0.07
dlptrnc20		-0.16	2.54	0.06
dlptrnc40		0.00	1.56	0.04
dlpstd	Weighting by volatility	-0.44	-0.78	0.05
dlpstdw		-0.15	-0.29	0.00
dlpper	Weighting by persistence	1.05	-0.84	0.18
dlpperw		0.64	-1.11	0.08
dlpp12dt		1.04	-0.85	0.17
dlppsdt		1.84	3.14	0.32
dlpwreg	Weighting by estimation	-0.09	-1.58	0.05
dlpvari	Structural VAR	3.45	-2.59	0.76
dlpvarm		3.41	-2.30	0.65
dlpxdol	Excluding the exchange rate	0.64	-1.25	0.56
dlpxdolhp		0.33	-1.38	0.54
dlppc1	Principle comp.	-0.12	-1.22	0.15
dlpexs	Exp. Smoothing	-0.28	-0.83	0.11
dlparima	X12-ARIMA	0.77	-1.16	0.66

* The estimated equation is: dlptot12(+12)-dlptot12 = c0 + c1*(dlptot-dlpX12), where dlpX12 is the annual rate of change in the core index, and dlptot12 is the annual rate of change in the overall index. If the core index is a good indicator of the inflation environment, the coefficient c1 is expected to be negative and significant. Cells with a grey background are significant at the 5% level. Corrected to serial correlation according to Newey-West.

Table 10: Standard deviation of the core index from the moving average (centered) of the overall index, January 1999-December 2007 (percentages)*

		12-month average	18-month average	24-month average
dlptot	The overall index	0.46	0.48	0.48
dlpx1	Excluding components	0.47	0.49	0.49
dlpx2		0.47	0.50	0.49
dlpxe		0.44	0.46	0.45
dlpxf		0.53	0.55	0.55
dlpxef		0.51	0.53	0.52
dlpxefv		0.53	0.55	0.55
dlpmed	Center of the distribution	0.41	0.44	0.44
dlptrnc20		0.47	0.49	0.48
dlptrnc40		0.42	0.44	0.44
dlpstd	Weighting by volatility	0.25	0.27	0.27
dlpstdw		0.40	0.42	0.42
dlpper	Weighting by persistence	1.34	1.34	1.34
dlpperw		0.83	0.84	0.83
dlpp12dt		1.32	1.32	1.31
dlppsdt		0.35	0.37	0.38
dlpvari	Structural VAR	0.45	0.46	0.45
dlpvarm		0.44	0.45	0.44
dlpxdol	Excl. exchange rate	0.41	0.41	0.38
dlpxdolhp		0.40	0.40	0.36
dlpexs	Exp. Smoothing	0.17	0.16	0.15

* Relates only to the core indices calculated for the monthly index (in addition to the annual). The centered average for 12 periods for time t averages out the rate of change of the overall index from period t-5 to t+6. Similarly, the moving averages are calculated for 18 and 24 months.

Table 11: Indices of the quality of the core index—the correlation between inflation expectations and the indices for 12 months, different periods*

The index for the past 12 months		January 1997-December 2007	January 1997-December 2000	January 2001-December 2007
dlptot	The overall index	0.84	0.93	0.68
dlpx1	Excluding components	0.84	0.93	0.69
dlpx2		0.84	0.93	0.69
dlpxe		0.85	0.93	0.63
dlpxf		0.82	0.94	0.70
dlpxef		0.84	0.94	0.65
dlpxefv		0.83	0.94	0.66
dlpmed	Center of the distribution	0.83	0.90	0.68
dlptrnc20		0.82	0.92	0.67
dlptrnc40		0.82	0.91	0.67
dlpstd	Weighting by volatility	0.86	0.84	0.59
dlpstdw		0.86	0.92	0.67
dlpper	Weighting by persistence	0.78	0.77	0.24
dlpperw		0.85	0.83	0.65
dlpp12dt		0.78	0.78	0.25
dlppsdt		0.83	0.89	0.68
dlpwreg	Weighting by estimation	0.70	0.90	0.64
dlpvari	Structural VAR	0.59	0.79	0.62
dlpvarm		0.52	0.63	0.63
dlpxdol	Excl. exchange rate	-0.04	-0.39	0.27
dlpxdolhp		0.41	-0.21	0.37
dlppc1	Principle comp.	0.84	0.94	0.56
dlpexs	Exp. smoothing	0.88	0.90	0.53
dlparima*	X12-ARIMA	-0.23	-0.48	0.04

* Starting in 1999.

Table 12: Indices of the quality of the core index—the correlation between the index over the past 6 months and the Bank of Israel interest rate (three-month average), January 1999-December 2007 (percentages)*

		Bank of Israel interest 3 months later	Bank of Israel interest 6 months later	Bank of Israel interest 3 months earlier	Bank of Israel interest 6 months earlier
dlptot		0.28	0.36	-0.18	-0.13
dlpx1	Excluding components	0.29	0.38	-0.16	-0.11
dlpx2		0.30	0.38	-0.15	-0.11
dlpxe		0.29	0.38	-0.15	-0.10
dlpxf		0.23	0.32	-0.20	-0.14
dlpxef		0.24	0.33	-0.18	-0.10
dlpexfv		0.25	0.35	-0.16	-0.08
dlpmed	Center of the distribution	0.43	0.50	-0.05	-0.03
dlptrnc20		0.31	0.40	-0.13	-0.09
dlptrnc40		0.38	0.45	-0.08	-0.06
dlpstd	Weighting by volatility	0.52	0.58	0.09	0.00
dlpstdw		0.38	0.45	-0.07	-0.05
dlpper	Weighting by persistence	0.30	0.30	0.00	-0.06
dlpperw		0.31	0.33	-0.09	-0.06
dlpp12dt		0.30	0.30	-0.00	-0.06
dlppsdt		0.38	0.49	-0.09	-0.12
dlpvari	Structural VAR	0.08	0.18	-0.29	-0.17
dlpvarm		0.10	0.20	-0.25	-0.13
dlpxdol	Excl. exchange rate	-0.08	-0.13	-0.36	-0.33
dlpxdolhp		0.37	0.30	0.16	0.21
dlpexs	Exp. smoothing	0.74	0.77	0.38	0.20

* Calculated only for indices considered for monthly inflation. Therefore we did not examine *dlpwreg, dlppc1* and *dlparima*

Table 13a: Summary of the examinations of the core indices—simplicity of the calculation and assessment of the present environment

The index	Simplicity of calculation	Assessment of the present environment			
		Less volatile than the overall index (Tables 1,2)	Smaller deviation from the overall index (Tables 3,4)	Lack of bias from the overall index (Tables 3,4)	Square of the deviation from the HP trend (Tables 3,4)
dlpx1	√		√	√	√
dlpx2	√		√		√
dlpxe	√		√		√
dlpxf	√		√		
dlpxef	√		√		
dlpxefv	√		√		
dlpmed	√				√
dlptrnc20	√		√	√	√
dlptrnc40	√		√	√	√
dlpstd	√	√		√	√
dlpstdw	√	√	√	√	√
dlpper					
dlpperw					
dlpp12dt					
dlppsdt				√	√
dlpwreg				√	
dlpvari		√			√
dlpvarm		√			√
dlpxdol		√		√	√
dlpxdolhp		√		√	√
dlppc1				√	
dlpexs		√		√	√
dlparima		√		√	

Table 13b: Summary of the examinations for the core indices—assessment of future inflation

The index	Assessment of development of future inflation							
	Gap between the core index and future inflation (Table 5)		Quality of the forecast (Table 6)	Added information to the forecast (Table 7)	Std. Dev. of the gap from moving average (Table 8)	Convergence to core index (Table 9)	Ability to forecast HP trend (Table 10)	Effect of Bank of Israel interest (Table 12)
	6 months	12 months						
dlpx1								
dlpx2								
dlpxe	√	√						
dlpxf	√	√						√
dlpxef		√	√	√			√	
dlpxefv		√	√				√	
dlpmed								
dlptrnc20								
dlptrnc40				√				
dlpstd					√			
dlpstdw								
dlpper		√						
dlpperw								
dlpp12dt								
dlppsdt					√			
dlpwreg								
dlpvari			√	√		√	√	√
dlpvarm			√			√	√	√
dlpxdol		√				√		√
dlpxdolhp	√	√				√		
dlppc1								
dlpexs					√			
dlparima								

Appendix Table 1: Definitions of the Core Indices

Name	Group	Definition
dlpx1	Excluding components	Without fresh fruit and vegetables
dlpx2		Without fresh fruit and vegetables, and clothing and footwear
dlpxe		Without energy
dlpxf		Without food
dlpxef		Without energy and food
dlpxefv		Without energy, food, fruit and vegetables
dlpmed	Center of the distribution	The median
dlptrnc20		Trimming the upper and lower 10 percent of the distribution
dlptrnc40		Trimming the upper and lower 20 percent of the distribution
dlpstd	Weighting by volatility	Inverse weight to the variance of the component
dlpstdw		Inverse weight to the variance of the component multiplied by the weight of the component in the index
dlpper	Weighting by persistence	Weighting according to the persistence coefficient relative to the monthly inflation a year previously
dlpperw		Like dlpper multiplied by the weight of the component in the index
dlpp12dt		Like dlpper for the detrended rate of inflation
dlppsdt		Like dlpper for the detrended and seasonally adjusted rate of inflation
dlpwreg	Weighting by estimation	Weights according to the estimate of overall inflation using the components of the index
dlpvari	Structural VAR	Based on estimating VAR equations for prices and for industrial manufacture
dlpvarm		Based on estimating VAR equations for prices and for the Bank of Israel composite index
dlpxdol	Excl. exchange rate	Using an equation linking between the index and the rate of exchange
dlpxdolhp		using an equation linking between the CPI and the cyclical component in the exchange rate
dlppc1	Principle comp.	Use of the first component from the analysis of principle components
dlpexs	Exp. Smoothing	Exponential smoothing
dlparima	X12-ARIMA	Inflation environment according to the monthly model of the Research Department

Appendix Table 2: Components of the index, their weights and basic statistics of the monthly rate of change in prices, in percentages, January 1999- December 2007 (108 observations)

		Component	Weight in 2007 (from 1,000)	Mean	Standard Deviation	Minimum	Maximum
1	cp01	Fruit and vegetables – fresh vegetables	13.3	0.23	7.56	-18.1	26.01
2	cp02	Fruit and vegetables – fresh fruit	10.1	0.25	6.80	-15.0	25.56
3	cp03	Fruit and vegetables – frozen, pickled and preserved vegetables	6.2	0.16	1.21	-3.06	3.11
4	cp04	Fruit and vegetables – preserved and dried fruit	4.1	0.17	1.12	-2.90	2.66
5	cp11	Food – grain bread and dough products	25.2	0.34	0.68	-0.87	3.33
6	cp12	Food – meat, poultry, fish and their products	34.6	0.19	1.23	-2.59	5.12
7	cp13	Food – oil and margarine	3.4	0.26	1.36	-3.98	3.70
8	cp14	Food – milk and dairy products	22.6	0.27	0.69	-1.02	5.30
9	cp15	Food - eggs	2.7	0.24	0.74	-2.72	3.62
10	cp16	Food – sugar, jam and candy	4.4	0.25	1.02	-2.42	3.33
11	cp17	Food - beverages	10.5	0.08	1.02	-2.52	2.74
12	cp18	Food – miscellaneous food products	9.0	0.10	0.77	-1.82	1.93
13	cp19	Food – meals outside the home	24.7	0.28	0.25	-0.29	1.21
14	cp21	Housing – housing services owned by the residents	163.2	0.02	1.43	-3.42	4.25
15	cp22	Housing - rent	39.7	-0.01	1.16	-2.74	3.43
16	cp23	Housing – other housing expenses	7.4	-0.12	1.47	-6.52	6.16
17	Cp31	Household maintenance – electricity, fuel and water for household consumption	44.4	0.44	1.42	-3.77	8.95
18	cp32	Household maintenance – maintaining and improving the home and the grounds	13.5	0.26	0.54	-1.20	2.39
19	cp33	Household maintenance – miscellaneous household needs	8.2	0.08	0.99	-2.65	2.70
20	cp34	Household maintenance – municipal taxes	23.6	0.19	0.85	-3.10	3.65
21	cp35	Household maintenance – household assistance	15.5	0.23	0.27	-0.57	1.05
22	cp41	Household furniture and equipment - furniture	14.3	-0.03	0.82	-2.96	1.86
23	cp42	Household furniture and equipment – household electrical equipment	13.7	-0.22	0.80	-5.86	1.22
24	cp43	Household furniture and equipment – non-electrical household equipment	3.7	-0.00	1.04	-2.55	5.85

		Component	Weight in 2007 (from 1,000)	Mean	Standard Deviation	Minimum	Maximum
25	cp44	Household furniture and equipment – bedding and home decorations	6.6	-0.11	1.15	-3.48	3.89
26	cp51	Clothing and footwear - clothing	26.6	-0.21	5.72	-10.01	15.47
27	cp52	Clothing and footwear - footwear	7.6	-0.47	4.06	-13.46	9.06
28	cp61	Education, culture and entertainment - education	53.3	0.21	0.56	-1.65	3.46
29	cp62	Education, culture and entertainment – culture and entertainment	76.1	-0.02	1.06	-3.74	2.66
30	cp71	Health – health services	20.0	0.26	0.36	-0.58	1.77
31	cp72	Health – dental treatment	15.1	0.28	0.44	-0.66	3.76
32	cp73	Health – medication and medical aids (medical equipment)	16.7	0.24	1.46	-1.67	13.71
33	cp81	Transport and communications - transport	170.9	0.23	1.13	-3.29	3.29
34	cp82	Transport and communications – communications services	40.1	-0.09	1.32	-8.76	3.17
35	cp91	Miscellaneous – cigarettes, tobacco and smoking products	10.5	0.43	1.08	-0.54	8.09
36	cp92	Miscellaneous – personal services and cosmetics	30.0	0.09	0.86	-1.98	2.11
37	cp93	Miscellaneous – jewelry, watches	4.4	0.43	1.31	-2.07	6.69
38	cp94	Miscellaneous – bags, satchels, etc.	4.1	-0.03	1.12	-3.69	3.31
	cptot	**The overall index**	**1000**	**0.13**	**0.49**	**-0.87**	**1.53**

Appendix Table 3: Results of the equation explaining price changes with the exchange rate

A: Rate of change in the exchange rate

Included observations: 108
Sample: 1999M01 2007M12

	Coefficient	Std. Error	t-Statistic	
C	0.001369	0.000382	3.584599	0.0005
DLDOL	0.123249	0.024605	5.009129	0.0000
DLDOL(-1)	0.098412	0.026140	3.764779	0.0003
DLDOL(-2)	0.021320	0.027087	0.787118	0.4331
DLDOL(-3)	0.034705	0.024342	1.425693	0.1571
DLDOL(-4)	-0.014526	0.024704	-0.588002	0.5579
DLDOL(-5)	0.033336	0.024028	1.387388	0.1684
DLDOL(-6)	0.022223	0.022438	0.990410	0.3244

R-squared	0.400416	Mean dependent var.	0.001289
Adjusted R-squared	0.358445	S.D. dependent var.	0.004921
S.E. of regression	0.003942	Akaike info criterion	-8.163110
Sum squared resid.	0.001554	Schwarz criterion	-7.964434
Log likelihood	448.8079	Hannan-Quinn criterion	-8.082554
F-statistic	9.540313		

B: Rate of change in the exchange rate excluding the trend

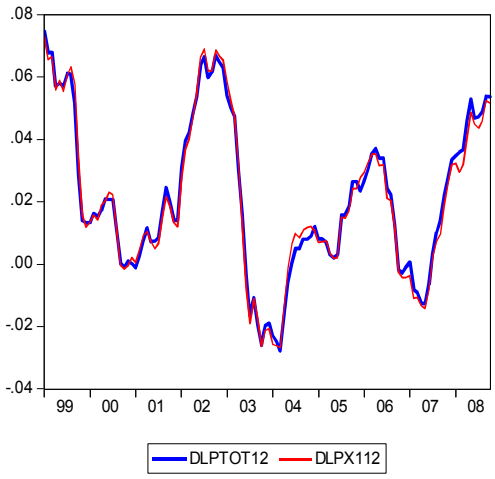
Included observations: 108
Sample: 1999M01 2007M12

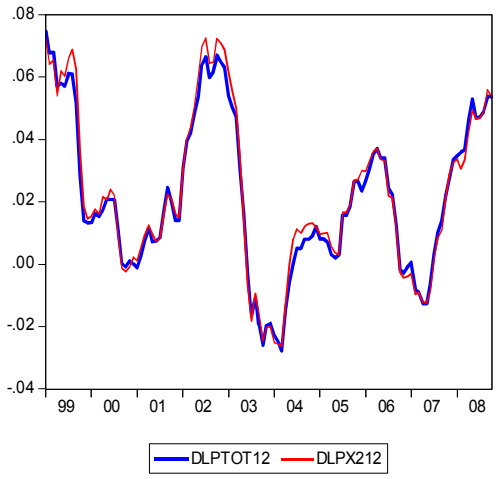
	Coefficient	Std. Error	t-Statistic	Probability
C	0.001394	0.000371	3.756108	0.0003
DLDOL_CYC	0.134997	0.024525	5.504453	0.0000
DLDOL_CYC(-1)	0.105343	0.025652	4.106613	0.0001
DLDOL_CYC(-2)	0.028764	0.026604	1.081202	0.2822
DLDOL_CYC(-3)	0.047310	0.024219	1.953402	0.0536
DLDOL_CYC(-4)	-0.004624	0.024386	-0.189633	0.8500
DLDOL_CYC(-5)	0.040972	0.023599	1.736189	0.0856
DLDOL_CYC(-6)	0.036682	0.022539	1.627483	0.1068

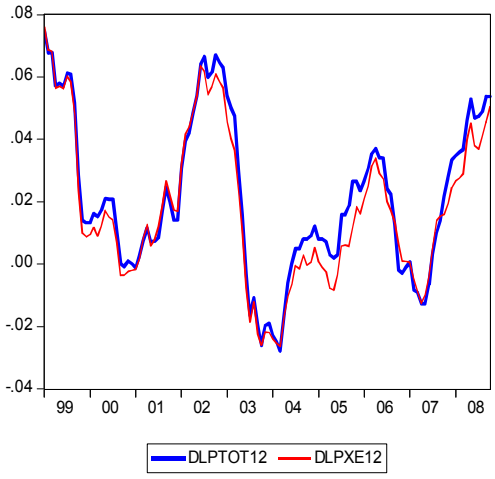
R-squared	0.430203	Mean dependent var.	0.001289
Adjusted R-squared	0.390317	S.D. dependent var.	0.004921
S.E. of regression	0.003843	Akaike info criterion	-8.214066
Sum squared resid.	0.001477	Schwarz criterion	-8.015389
Log likelihood	451.5596	Hannan-Quinn criter.	-8.133510
F-statistic	10.78585		

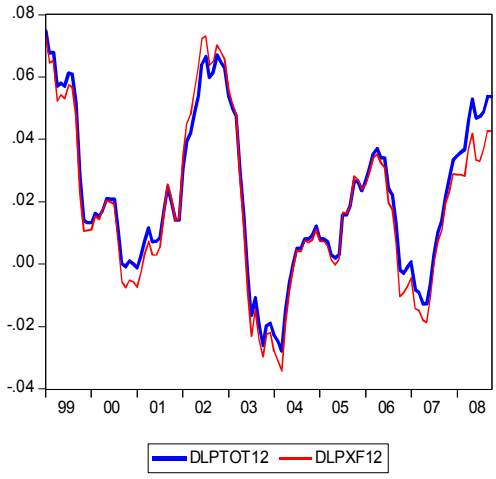
Appendix Diagram: The core indices versus the overall index, rate of change in the past 12 months

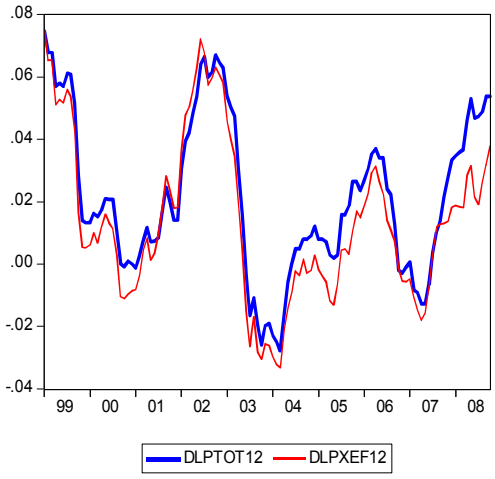
A: Indices excluding components

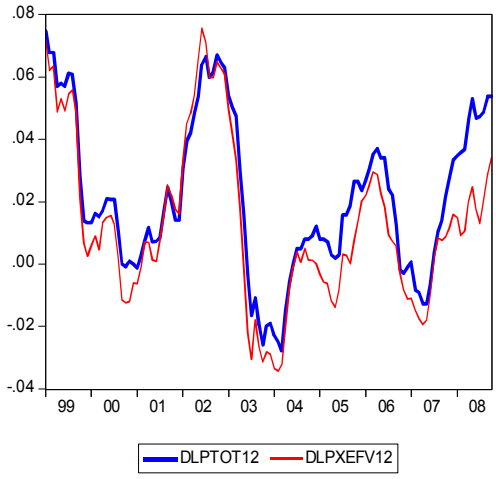




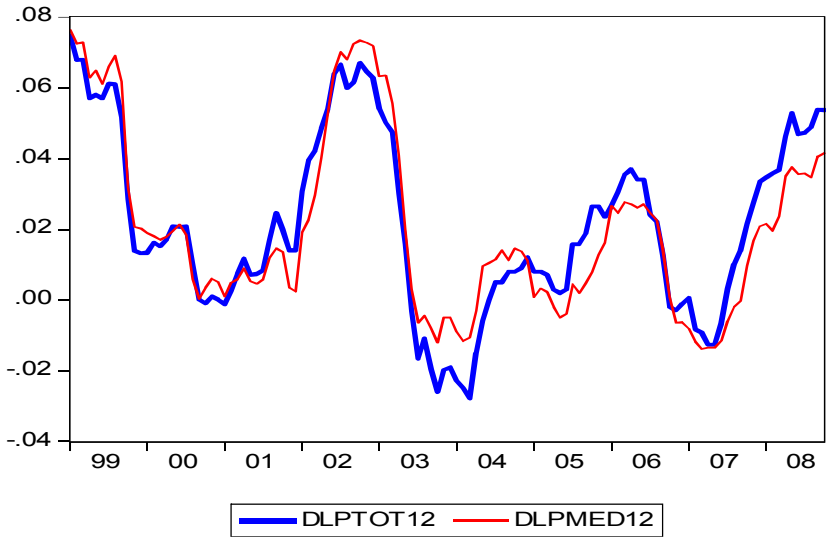


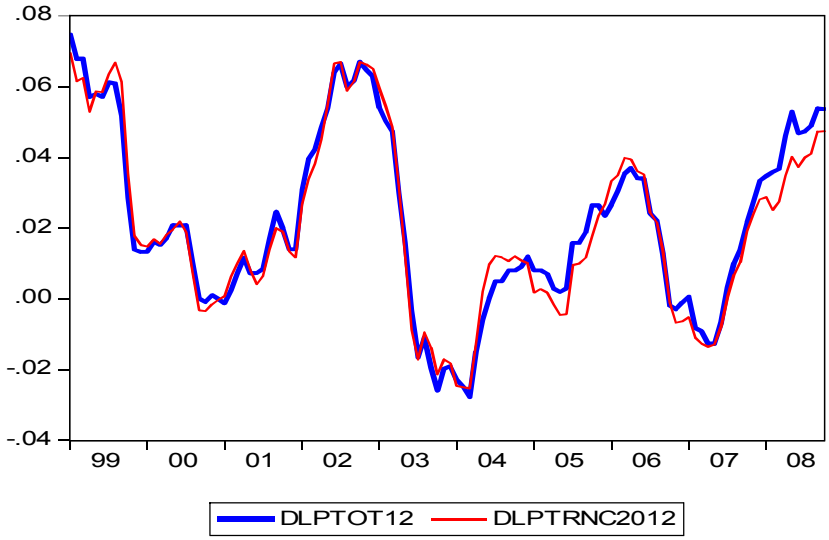


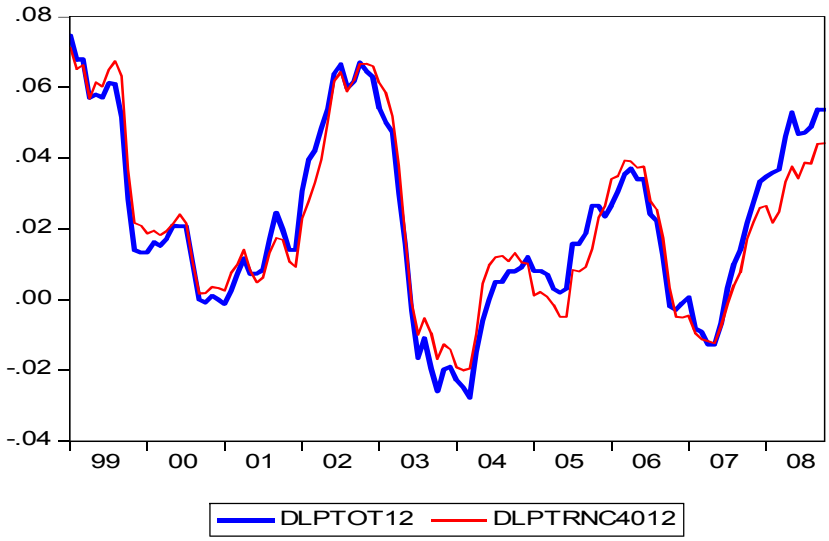




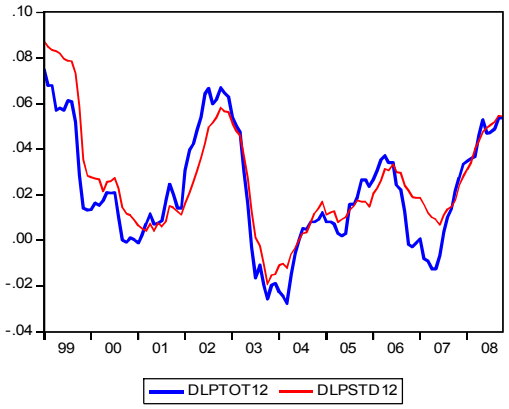
B: Indices based on the center of the distribution

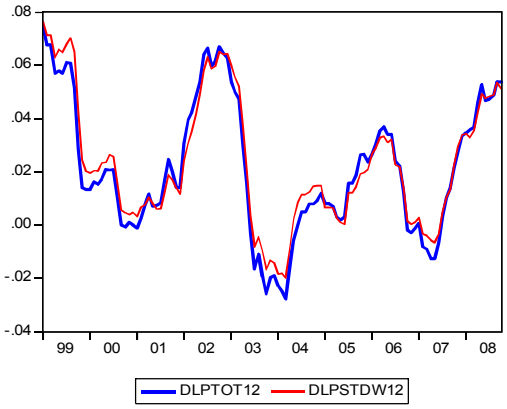


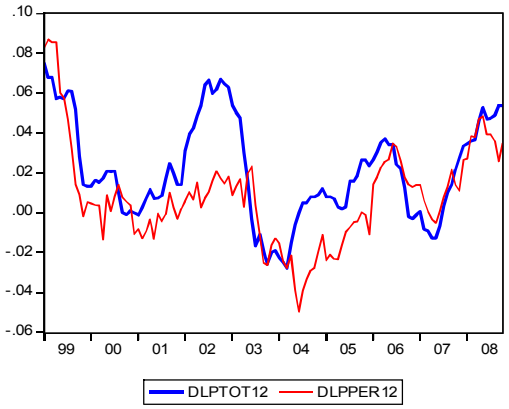


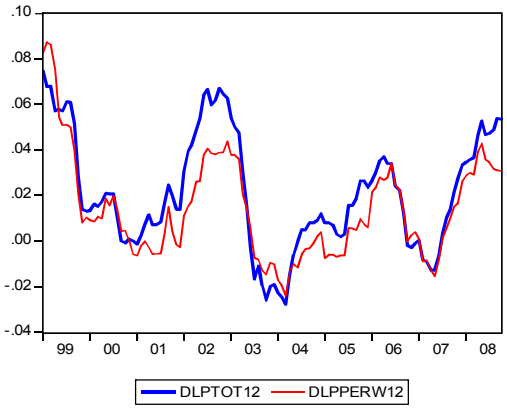


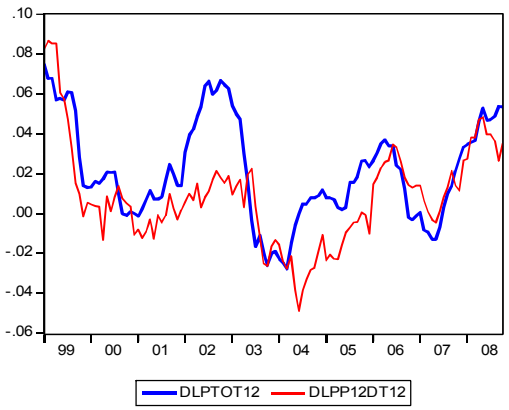
C: Indices weighted by volatility, persistence, or estimation

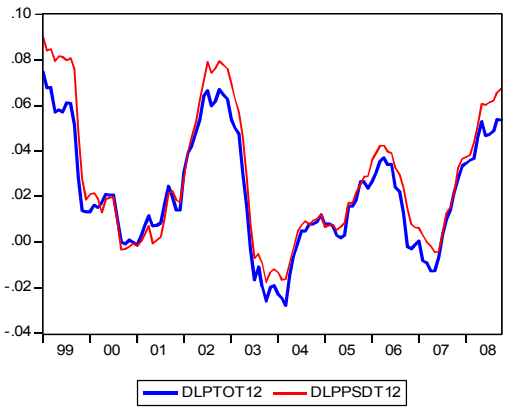


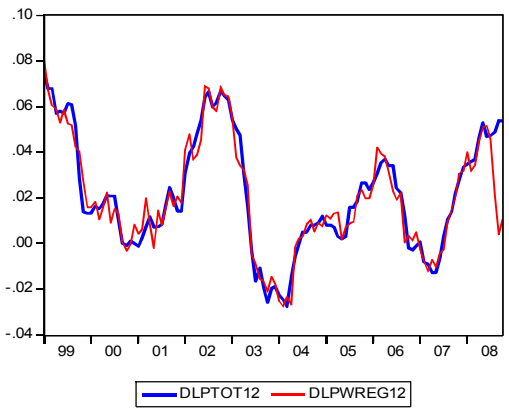




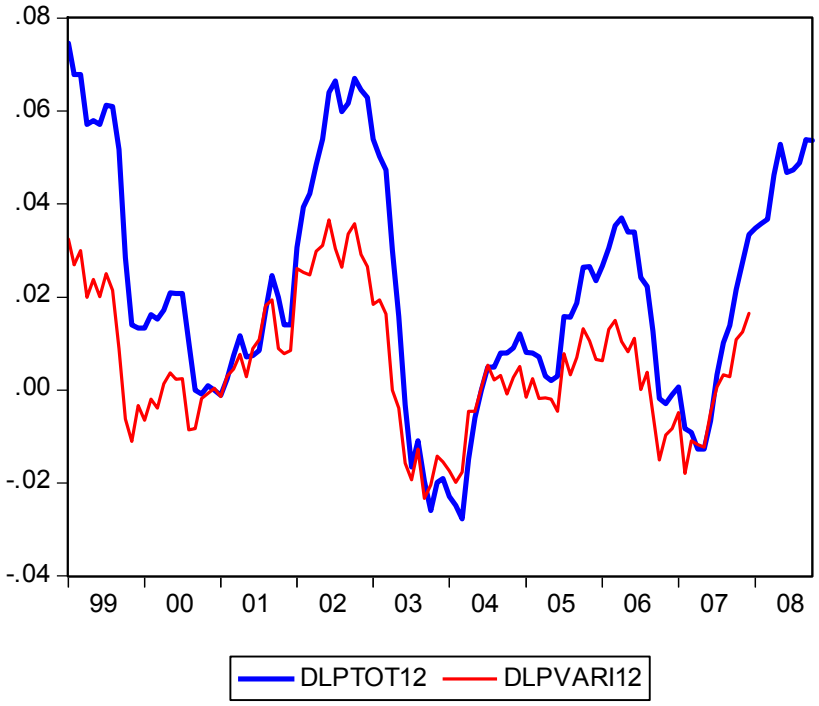


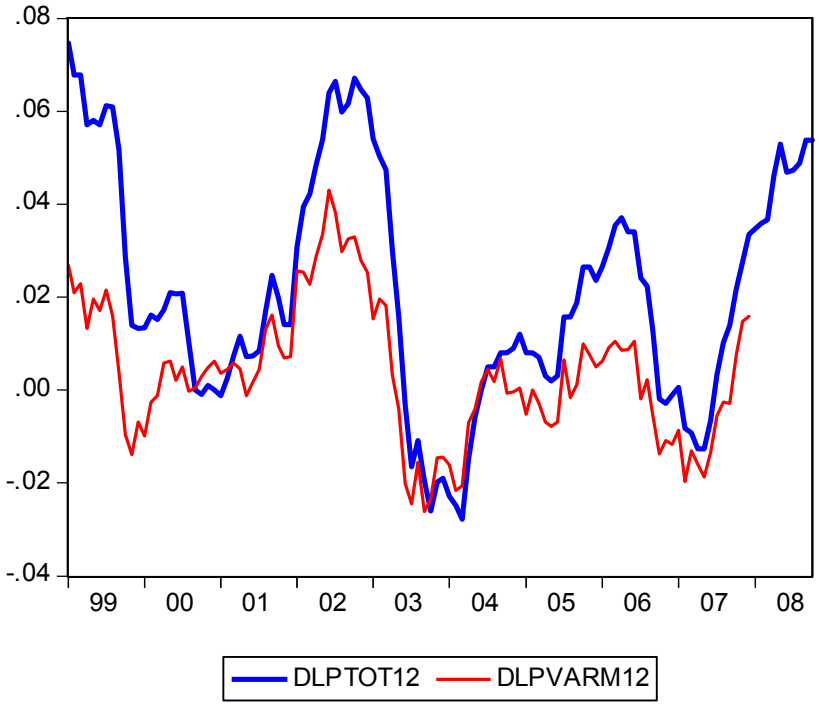




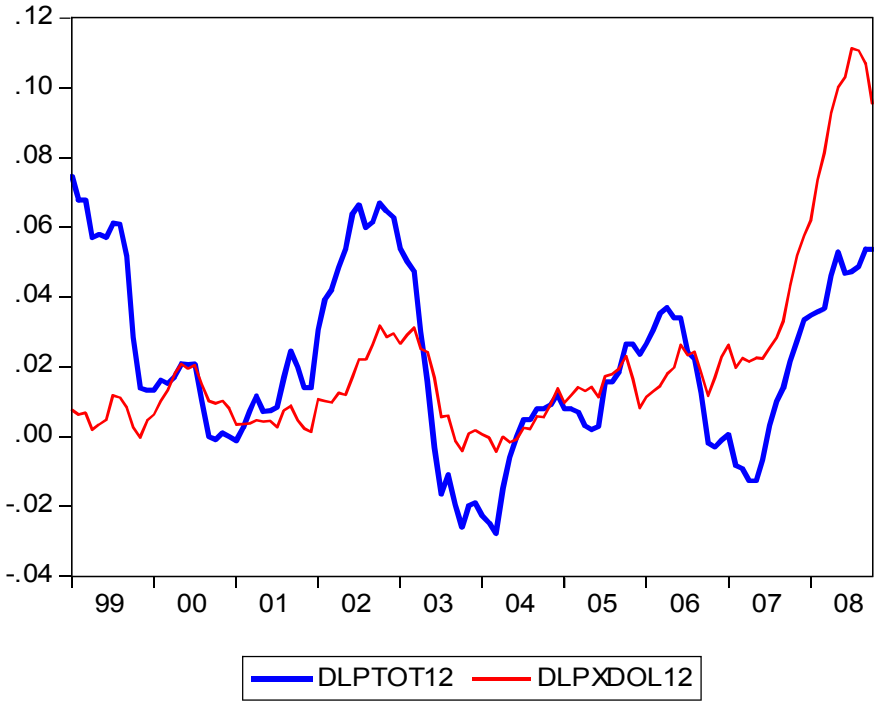


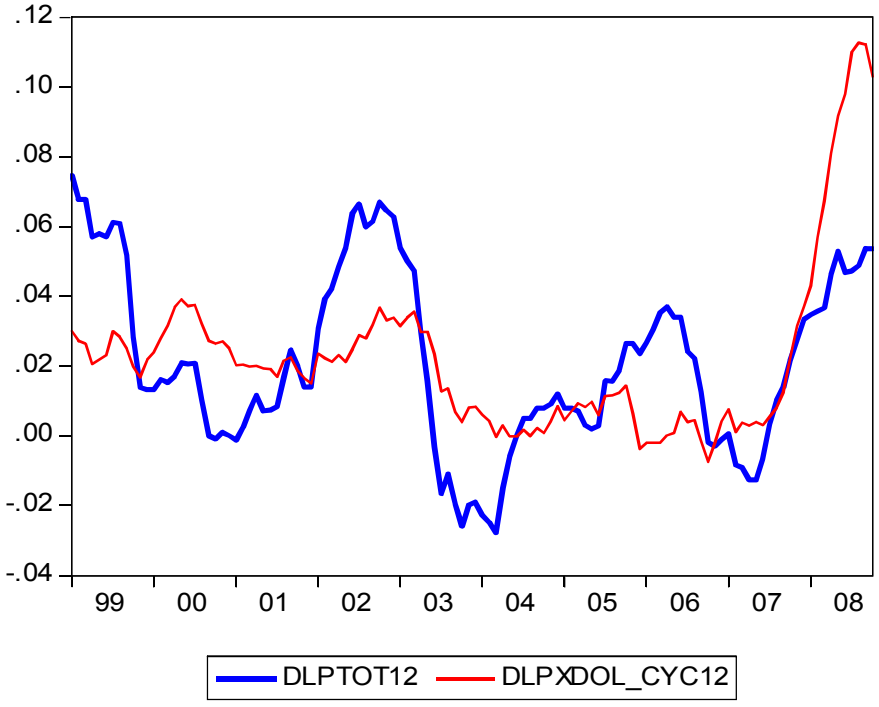
D. Indices according to VAR



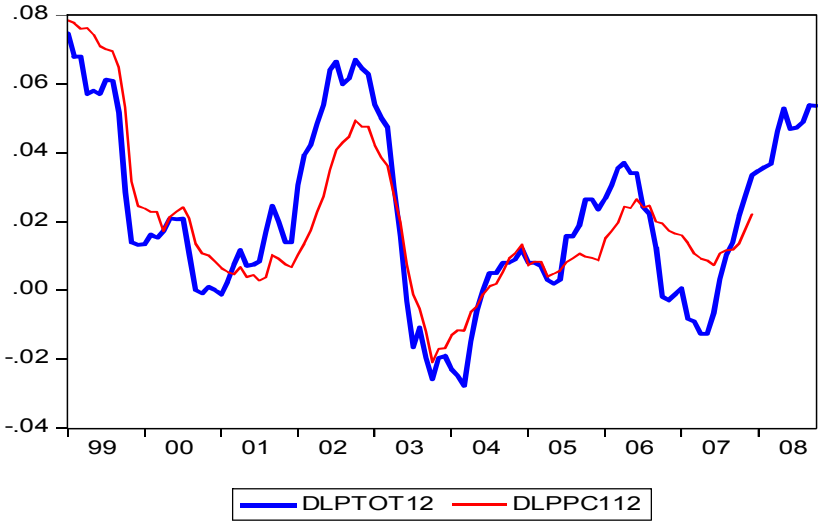


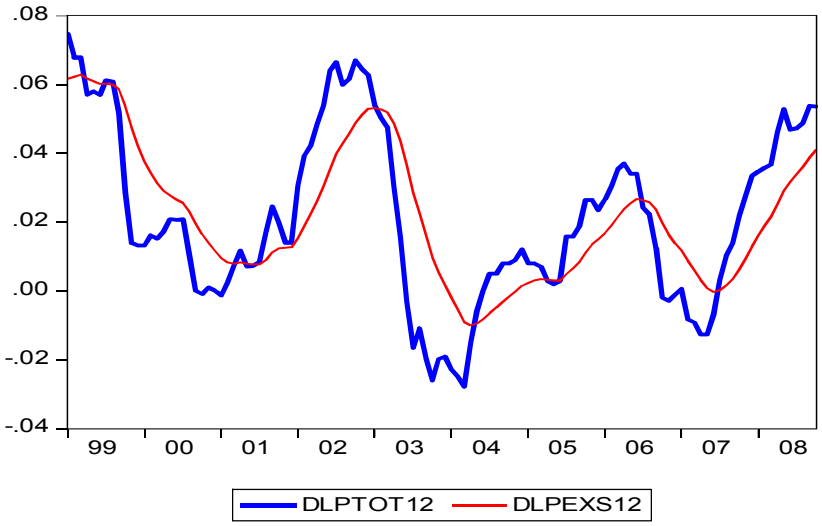
E. Indices excluding the effect of the exchange rate

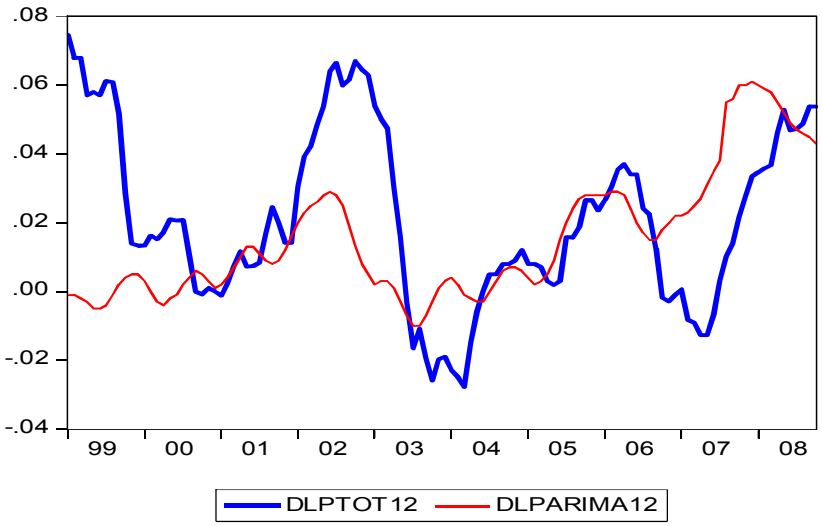




F. Other indices







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