Bank of Israel

The Effective Exchange Rate in Israel

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Abstract

The effective exchange rate is an index that reflects the relative price of the shekel vis-à-vis a basket of currencies, with the weight of each currency reflecting that currency's importance in Israel's foreign trade. Israel maintains economic ties with many other countries. As a result, a large number of exchange rates affect competitiveness and prices in Israel. The effective exchange rate index assists in tracking the level of competitiveness in the economy and the functioning of the foreign exchange market, helps in measuring the "pressure" on domestic prices as a result of a change in the exchange rates, and constitutes an important input in the Bank of Israel's policy decisions.

This document re-examines the weights of the currencies in calculating the effective exchange rate. The Bank of Israel calculates and publishes an effective exchange rate index on a daily basis. The original index was revised at the beginning of 2009, using data from 2006–7. Since then, there has been a shift in trade that is reflected in an increase in the share of trade of goods with developing economies, especially in the share of China. The revision here is based on 2013 data for the trade of goods, and 2012 data for the trade of services.

The revised weights are also based on exports and imports of business services. These services were previously considered nontradable by definition, and the weight of these services in foreign trade has increased consistently, so that they now constitute about one-quarter of total exports. Expanded coverage of Central Bureau of Statistics data, which now also include the geographic distribution of trade in services (source and destination), makes it possible for the first time to use them in calculating the weights in the index. The data show that the US is the source and destination of about one-half of trade in business services.

The revised basket includes a lower number of countries. The new basket includes 33 countries and 26 currencies, instead of the 38 countries and 28 currencies included until now. Foreign trade has become more concentrated: Nine countries have been removed from the basket, after trade with them fell below 0.5 percent[2], and four countries were added to the basket.[3] The weight of the US dollar in the new basket is greater, and the

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[2] Austria, Argentina, Denmark, South Africa, Greece, Philippines, Finland, Colombia and Romania were removed from the basket.

[3] The Czech Republic, Vietnam, Malaysia and Costa Rica were added to the basket. Malaysia appeared in the initial basket (2007), and its weight in the second basket (2009) was removed due to a technical error.

weight of the euro is lower than in the current basket. In addition, China's weight increased. The strengthening of the dollar relative to the euro in the past year leads the new index to indicate a slightly depreciated (i.e. higher) exchange rate environment than what was derived from the existing index. However, the index remains the most appreciated in a long time.

This document includes: 1. Background information; 2. A description of the trends in Israel's foreign trade; 3. A revision of the weights in the effective exchange rate; 4. A comparison of the new exchange rate with the old and ramifications for the current level of the exchange rate.

1. Background

The "effective exchange rate" is an index comprised of the weighted average of a number of exchange rates. Its purpose is to reflect the relative importance of trade with a country or currency in a single aggregate index. Theoretically, the "existence" of such an index is not certain. It is based on fixed elasticities of substitution between products from different economies. If these assumptions do not hold, a depreciation relative to one country or currency cannot "replace" an appreciation relative to another country or currency by a fixed ratio for any cross-rate, and there is no alternative to examining the exchange rate and its effects on foreign trade relative to each currency and country separately. The accepted assumption at many central banks, however, is that the various exchange rates can be "averaged out" into a single index.[4]

Effective exchange rates are calculated and published by the central banks of many countries. The central banks in the US, Australia, the UK, New Zealand, and Sweden, as well as the European Central Bank (ECB) calculate and publish an effective rate on a daily basis. Almost all of the banks publish two indices—a broad index that encompasses about 90 percent of trade, and a narrow index that includes only main currencies, and encompasses only about 70 percent of trade. The Bank of Israel publishes just a broad index.

In Israel, the need for an effective exchange rate index is particularly great. While most small economies have one dominant currency for economic activity vis-à-vis the world, which constitutes a natural "anchor", such as the case of Sweden or Switzerland (euro), Canada or Mexico (US dollar), and so on, Israel's trade is "spread out" in equal amounts among the US, Europe and the rest of the world. The high level of diversification is reflected in the number of currencies that comprise the current index, which is high, even when compared with the broad indices of other countries.

The Bank of Israel calculates and publishes an effective exchange rate index on a daily basis. The index was first published in 2005 (Sofer, 2005), and included 32 countries. The original index, which was based on data on bilateral trade of goods adjusted for third-party competition, was revised at the beginning of 2009 based on bilateral trade of goods data only, without adjusting for third-party competition. At that time, the basket was expanded to 38 countries. The time that has elapsed since that revision, as well as changes that have taken place in the composition of foreign trade, make it necessary to re-examine the index.

[4] There is also evidence that it may be preferable to build a separate index for developing countries and one for advanced economies, since the composition of trade in these cases is different, leading to different demand elasticities (Spilimbergo and Vamvakidis, 2000).

Effective exchange rate indices for Israel, as well as for a large number of other countries, are also calculated by the IMF and the BIS. These indices are calculated based on a uniform methodology for all countries. There are, obviously, advantages to this[5], but as always, a uniform method also has its disadvantages. The method is based on data regarding the total exports and imports of goods, while in Israel, a calculation based on trade excluding diamonds is preferable. Since the data is processed on a uniform basis, the indices do not take into account data on the geographic distribution of trade in business services, since these data are not available for all countries. Another disadvantage is that the international indices are revised relatively infrequently.[6]

The calculation of the effective rates at central banks and international institutions is based on bilateral trade flows of goods, adjusted for third-party competition. The indices that currently exist for the effective exchange rate in Israel and around the world, other than the Bank of England index, ignore the distribution of trade in business services. It seems that the main reason for this is limited data: In the UK, where such data exist and where there is a high proportion of trade in business services, they are included in the calculation of the index.

There are a number of limitations to the standard methodology. In the global economy of today, "source" and "destination" seem to be of less importance than in the past. This is because a significant portion of global economic activity is done through long supply chains, such that the direct destination of exports or the direct source of imports are less important. This is particularly problematic for global Israeli companies, the direct export destination of which is an affiliated company or regional distribution center. The fact that a large portion of Israeli exports are of intermediate products magnifies the problem, since the chance that these will "remain" in the destination countries is less than the chance that final products will do so. A possible solution to these problems is the indirect measuring of the exchange rate through the relative size of the economies—their share of global GDP (Ho, 2012) or of world trade. However, up to now, no central bank has adopted these methods of calculating the effective rate.

Trade-based methods do not reflect the relative importance of the currencies in the capital account or the excess importance of the main currencies that are used in transactions with third parties. While the use of the US dollar and the euro in transactions with other countries is apparently widespread, we do not have data that enable us to take this into account. As a result, the relative importance of these currencies is apparently greater than that calculated by the geographic distribution of trade flows, even when taking into account data on trade in services.

2. Israel's foreign trade: characteristics and trends

The composition of exports has changed over time, while the composition of imports has remained stable. The relative importance of business services exports has increased in recent years, with business services exports increasing even in years when goods exports and tourism services exports remained virtually unchanged. Business services

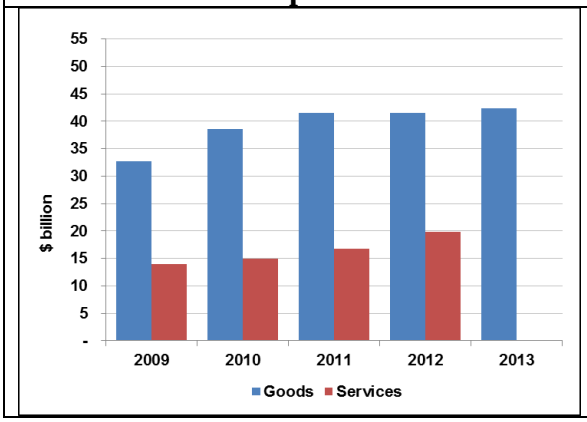
[5] For instance, the BIS calculation includes the uniform handling of the sources of Chinese imports, as well as completion of missing foreign trade data for Taiwan, which are not published in the official statistics of many countries.

[6] The weights in the current rate calculated by the BIS are based on data form 2008–10, and a revision of those weights, based on data from 2011–13, will be published in 2015. The weights in the IMF basket are based on trade data from 2004–06.

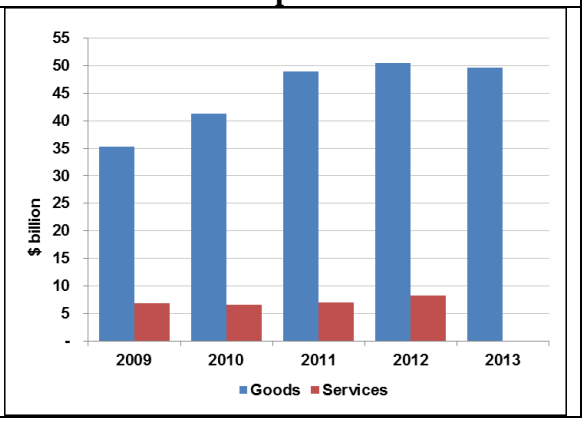
exports are highly technologically intensive, with software and R&D services constituting about half of total exports.

Figure 2.1: The Composition of Foreign Trade (excluding diamonds)

Export



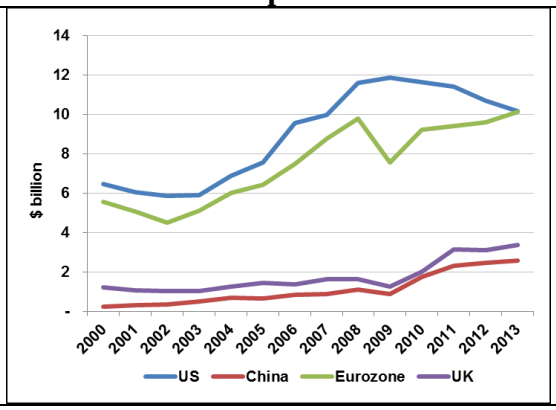
Import



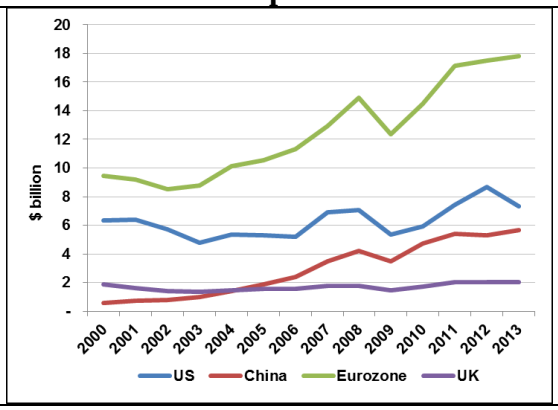
The distribution of export destinations indicates the diversion of trade in goods from advanced economies to developing economies. While goods exports to the US declined (Figure 2.2), there was a steady increase in the relative weights of the developing economies, particularly the importance of China—not just as a source of imports, but also as a destination for exports. These trends are expected to continue in the coming years, since the growth rate in China is much higher than in the advanced economies.

Figure 2.2: Trade in Goods, Major Markets

Export

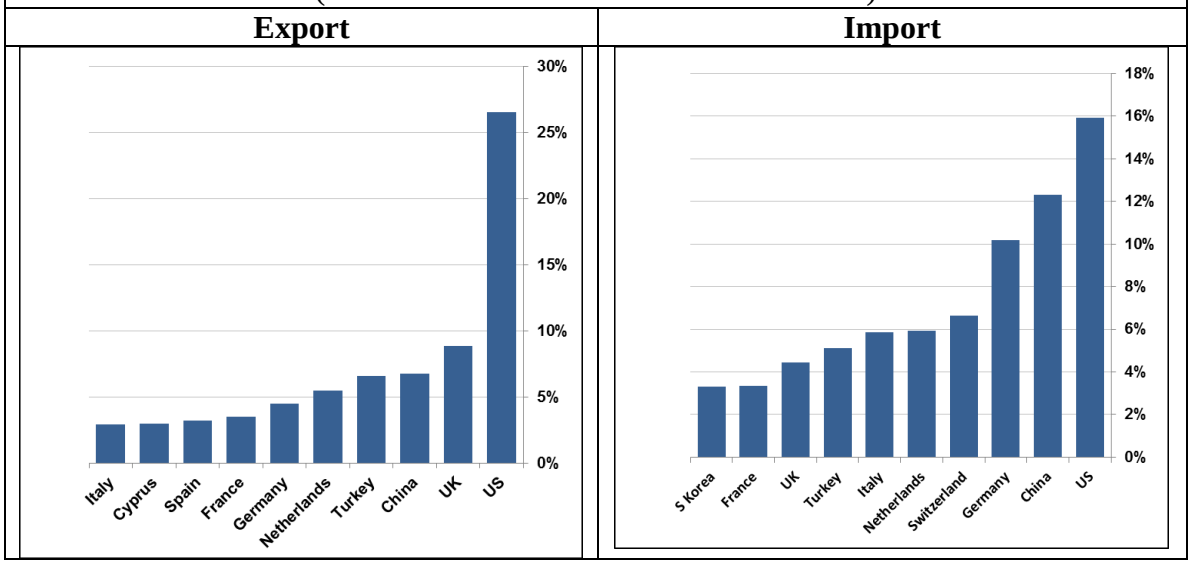


Import



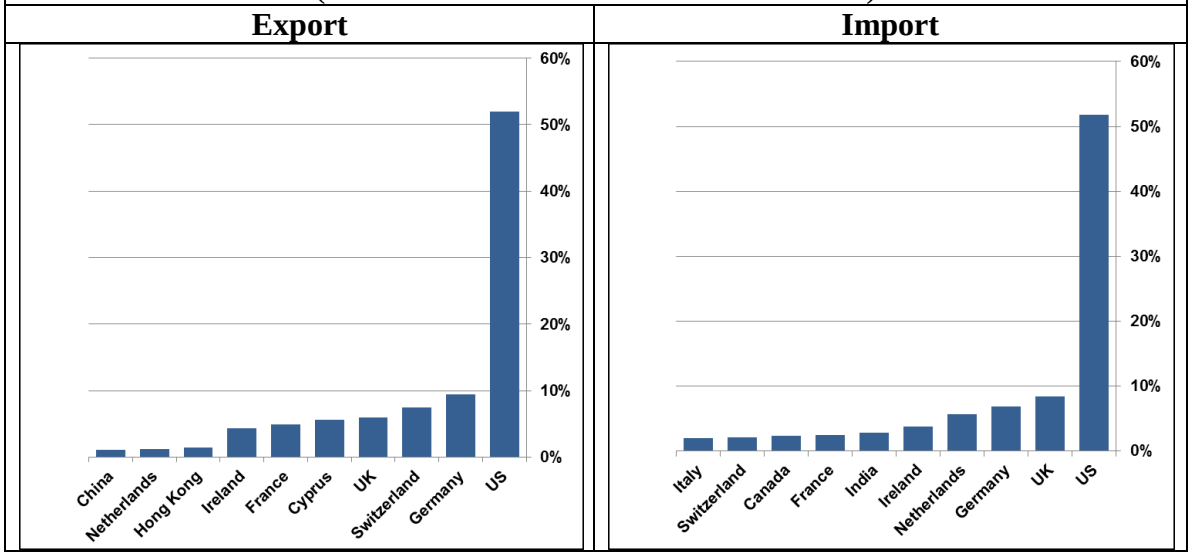
There is also a marked upward trend in the weight of trade with Turkey—which has become the fourth-largest destination for goods exports (Figure 2.3)—and in trade with smaller developing economies such as the Czech Republic—a country that was not included in the calculation of the effective exchange rate until now.

Figure 2.3: The Source and Destination of Goods
(The market share of the 10 main countries)



Trade in goods is "spread out" among a large number of countries, but trade in business services takes place almost completely with advanced economies. This finding is consistent with the behavior of world trade: While most trade in goods takes place between countries of differing characteristics, trade in services takes place mainly among similar countries. The US is the source and destination for more than half of Israel's trade in business services (Figure 2.4), which reflects the strong economic ties in the technology sector between countries, and the activity of American companies in Israel. Services trade figures also emphasize the high level of importance of European countries that do not belong to the Eurozone, such as Switzerland and the UK.

Figure 2.4: The Source and Destination of Services
(The market share of the 10 main countries)



The diversion of goods trade and the increase in the weight of business services partly offset each other from the standpoint of Israel's "currency exposure", since trade in business services takes place almost completely vis-à-vis the advanced economies, and equally vis-à-vis the US and vis-à-vis European countries.

3. Calculation of the effective exchange rate

The nominal effective exchange rate (NEER) of economy *j* at time t is calculated as the geometric average of the exchange rates of countries with which the economy has foreign trade ties:

1. $NEER_t^j = \prod_{i=1}^{I} E_{ij,t}^{w_i^j}, \;\; 0 < w_i^j < 1, \;\; \sum_i^I w_i^j = 1$

where w_i^j is the weight of currency *i* in the basket of economy *j*, and the total of the weights equals 1. The weight is calculated according to bilateral trade—exports and imports—between the economies, adjusted for third-party competition.

2. $w_i^j = \frac{x_i^j}{X^j + X_j} + \frac{x_j^i}{X^j + X_j} \widetilde{w}_i^j$

$$\widetilde{w}_i^j = \sum_{k=1}^{K} \frac{x_k^j}{X^j} \frac{x_k^i}{X_k}$$

where x_i^j and x_j^i represent the imports from country *i* to country *j* and the exports from country j to country i, respectively, and X_j and X^j represent total imports and total exports of the economy, respectively.

The first addend in equation 2 reflects the weight of imports from a particular country in the economy's total foreign trade (exports + imports), while the second addend reflects the weight of exports from the economy to that country, adjusted for the fact that exporters are also competing with imports from other countries into that country, but they are also competing with that country's exporters in other countries: The weight of each destination for Israeli exports is multiplied by the weight that reflects the importance of the currency of a third country.

To illustrate the calculation of the weight of the US dollar (if *i* is the US), let us assume that *k* is the German economy. $\frac{x_k^i}{X_k}$ reflects the weight of the US in total German imports, and $\frac{x_k^j}{X^j}$ reflects the weight of Germany in total Israeli exports. In other words, the component $\frac{x_k^j}{X^j} \frac{x_k^i}{X_k}$ reflects the competition of Israeli exporters with American exporters in Germany. The total of all these components for all countries will reflect the competition of Israeli exporters with American exporters throughout the world.[7] The index also obviously reflects Israeli competition with American manufacturers in the US. In particular, the component $\frac{x_i^j}{X^j} \frac{x_i^i}{X_i}$ is a multiplier of the US weight in Israeli exports and the weight of American manufacturers in total goods output in the US.

[7] It can easily be seen that these are weights, since this is a multiplier of two weights (and each component is therefore between 0 and 1). In addition, the total of all the weights for all countries included in the basked equals 1:

$$\sum_{i=1}^{I} w_i^j = \sum_{i=1}^{I} \sum_{k=1}^{n} \frac{x_k^j}{X^j} \frac{x_k^i}{X_k} = \sum_{k=1}^{n} \frac{x_k^j}{X^j} \frac{X_k}{X_k} = 1$$

The approach we use to calculate the weights is the standard approach for calculating the effective exchange rate at other central banks[8] and at the international organizations.

3.1 The data and data processing

We calculate the weights using a number of sources for the data. We use foreign trade data from the Central Bureau of Statistics, which include export destinations and sources of imports for goods (excluding diamonds), and for the first time, due to the Central Bureau of Statistics' expanded coverage, which is made possible by a survey of the geographic distribution of trade in business services, we also include those data in the calculation. In addition, we take into account data on the export of tourism services.[9]

Since the trends in foreign trade are stable in annual data, we only use data from the last year published. The Israeli economy is a dynamic economy in which there is a relatively smooth shift of trade, and yearly foreign trade data indicate clear trends without significant volatility ("noise"). This leads us to base the weights on an index of the most up-to-date data only—2013 data for goods[10] and 2012 data for services—and not to base the index on average data over a number of years as done in several indices around the world.

A currency is included in the basket according to its relative importance in bilateral goods trade. We include currencies with at least a 0.5 weight in goods trade—the accepted "entry" criterion in broad indices of other central banks, which was also used in the compilation of previous baskets at the Bank of Israel. Only then do we add business services trade data, with which we are less well-acquainted, in order to calculate the weights of trade for each country included in the basket.

The adjustment for third-party competition is made through international sources. International trade (third party) data are taken from the Direction of Trade Statistics (DOTS) of the International Monetary Fund (IMF). These data include import and export of goods according to countries of origin and destination. GDP data in local currency are taken from the IFS. The results are presented in Table 3.1.

[8] In addition to the selected method, we also examined alternative methods such as a calculation based on export data only, a calculation excluding the adjustment for third-party competition, and a calculation based on industry-by-industry data. The results were similar to those obtained here, so we chose to stay with the standard method.

[9] The Annual Statistical Abstract of Israel contains publication of the number of tourists from each country and the average expenditure per tourist, where only for some of the countries is there a specific figure regarding average tourist expenditure from that country. Regarding the rest of the countries, we used the figure for average tourist expenditure from the relevant region (e.g., Latin America, etc.).

[10] Import weights are based on country of origin data, and not on purchase country data as was done in the past.

Table 3.1: The Nominal Effective Exchange Rate, Weights

Number	Country	Currency code (ISO)	Original weight*	Previous weight**	Revised weight***	Weight of exports	Weight of imports
1	United States	USD	24.0%	24.8%	**26.4%**	32.1%	20.6%
*	Total Eurozone	EUR	34.8%	32.6%	**26.4%**	24.7%	28.7%
2	China	CNY	2.6%	5.7%	**10.2%**	4.8%	15.4%
3	Germany	EUR	9.9%	8.1%	**7.6%**	5.6%	9.4%
4	United Kingdom	GBP	6.8%	5.2%	**6.0%**	7.7%	4.1%
5	Turkey	TRY	1.9%	3.9%	**4.6%**	4.4%	4.9%
6	France	EUR	5.1%	3.9%	**4.0%**	4.2%	3.4%
7	Italy	EUR	5.7%	5.0%	**3.9%**	2.3%	5.4%
8	Netherlands	EUR	5.2%	5.4%	**3.1%**	4.0%	3.1%
9	Spain	EUR	2.5%	2.7%	**2.5%**	2.3%	2.7%
10	Japan	JPY	5.4%	3.5%	**2.3%**	1.4%	2.8%
11	Switzerland	CHF	2.3%	3.2%	**2.2%**	2.2%	2.2%
12	India	INR	0.9%	1.7%	**2.1%**	2.0%	2.1%
13	Russia	RUB	0.9%	1.4%	**2.0%**	2.8%	1.3%
14	South Korea	KRW	2.4%	2.5%	**2.0%**	1.2%	2.9%
15	Cyprus	EUR	0.3%	1.0%	**2.0%**	3.3%	0.6%
16	Belgium	EUR	3.3%	3.6%	**1.8%**	1.6%	2.0%
17	Ireland	EUR	1.4%	0.8%	**1.6%**	1.3%	2.2%
18	Brazil	BRL	0.9%	1.2%	**1.5%**	2.0%	0.9%
19	Taiwan	TWD	2.0%	2.0%	**1.5%**	1.3%	1.7%
20	Canada	CAD	3.0%	1.5%	**1.4%**	1.2%	1.2%
21	Hong Kong	HKD	2.2%	1.7%	**1.3%**	1.3%	1.3%
22	Malaysia	MYR	1.2%	0.0%	**1.2%**	2.5%	0.5%
23	Ukraine	UAH	0.0%	0.4%	**1.2%**	0.9%	1.7%
24	Singapore	SGD	1.5%	1.3%	**1.0%**	1.4%	0.9%
25	Vietnam	VND	0.0%	0.0%	**0.9%**	1.2%	0.8%
26	Thailand	THB	0.8%	0.7%	**0.8%**	0.6%	1.1%
27	Australia	AUD	0.8%	0.8%	**0.8%**	1.1%	0.4%
28	Mexico	MXN	1.5%	0.5%	**0.8%**	0.7%	0.6%
29	Sweden	SEK	1.4%	1.0%	**0.8%**	0.4%	1.2%
30	Poland	PLN	0.4%	0.5%	**0.8%**	0.6%	0.9%
31	Czech Republic	CZK	0.0%	0.0%	**0.7%**	0.4%	1.1%
32	Hungary	HUF	0.0%	0.6%	**0.5%**	0.3%	0.7%
33	Costa Rica	CRC	0.0%	0.0%	**0.4%**	0.8%	0.0%
34	South Africa	ZAR	1.0%	0.5%	**0.0%**	0.0%	0.0%
35	Greece	EUR	0.6%	0.9%	**0.0%**	0.0%	0.0%
36	Finland	EUR	0.9%	0.7%	**0.0%**	0.0%	0.0%
37	Austria	EUR	0.0%	0.6%	**0.0%**	0.0%	0.0%
38	Colombia	COP	0.0%	1.1%	**0.0%**	0.0%	0.0%
39	Argentina	ARS	0.0%	0.4%	**0.0%**	0.0%	0.0%
40	Romania	RON	0.0%	0.5%	**0.0%**	0.0%	0.0%
41	Denmark	DKK	0.6%	0.5%	**0.0%**	0.0%	0.0%
42	Philippines	PHP	0.6%	0.4%	**0.0%**	0.0%	0.0%

* These weights are used for calculating the exchange rate until the end of 2008.

** The weights previous to the revised weight, used for calculating the exchange rate in 2009.

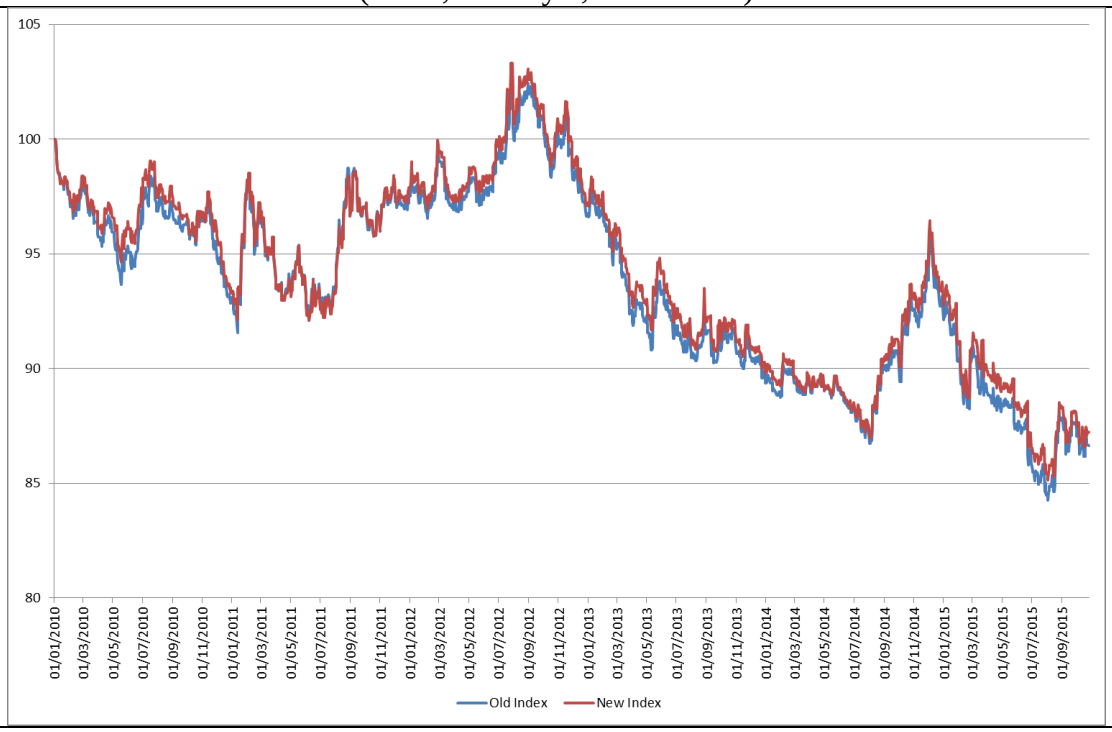
*** The revised weights are used for recalculating the effective exchange rate from the beginning of 2010.

4. Comparing the new and old indices

The picture that emerges from the new index is that the current level of the nominal effective exchange rate is the most appreciated since 2010. A similar picture emerges from the existing index, but the level of the exchange rate in the new index is slightly more competitive than the one derived from the old index. Since the dollar has strengthened against the euro in the past year, and its weight in the new index is higher, the new index indicates a slightly higher level of the current effective exchange rate, by about 1 percent. At the same time, the level of the exchange rate is very appreciated in taking a long-term perspective.[11]

The new index is slightly more stable than the existing index. The reduction in the number of currencies lowers the volatility of the daily rate of change of the effective exchange rate.

Figure 4.1: The Nominal Effective Exchange Rate*
(Index, January 1, 2010 = 100)



* Daily data, January 1, 2010 – October 26, 2015.

[11] The real effective exchange rate, which also takes into account the inflation differential between Israel and the various countries, is a more precise index of competitiveness over time. The weighted inflation of the countries in the basket is higher than that of Israel, so that the nominal effective exchange rate is slightly biased toward competition (downward). This bias is important when examining the level of competitiveness over long periods of time.

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