New indices of exchange rate effects in the international investment position

A notable percentage of financial assets and liabilities in Germany's international investment position (IIP) are denominated in a foreign currency (see page 34 of the main article). Exchange rate movements therefore have a major impact on trends in the IIP. A newly developed index concept now allows more in-depth analyses. The indices of IIP-weighted exchange rate effects (IIE) show how the value of external assets changes solely as a result of exchange rate movements.

IIE are highly granular and allow conclusions to be drawn about the impact of changes in the prices of individual currencies on asset and liability holdings broken down by sector and instrument. The concept is based on a system of weighted exchange rates. The index system weights are based on IIP stocks broken down by currency, sector and asset class and listed separately for assets and liabilities.[1] The choice of disaggregated weighting units permits aggregation at any level along the dimensions currency, sector and asset class.

The calculation of the IIP-weighted indices of exchange rate effects encompasses the US dollar, pound sterling, Japanese yen, Swiss franc, Canadian dollar and Chinese renminbi. In addition, the weighting matrix must take into account the large percentage of euro on the asset and liability sides, which dampens the effect of exchange rate movements on the aggregate market value of foreign assets.

The weighting matrix further includes the asset classes reported on in the IIP (see page 38). In a sectoral account, the weighting matrix is based on the core sectors outlined in the IIP (see page 39), with financial corporations broken down into the sub-sectors central bank, credit institutions, money market funds and other financial corporations.

The weighting of the IIE is based on the most recent data available, as abrupt transaction-related adjustments of asset or liability positions in the IIP cannot be ruled out. On the basis of the quarterly IIP data, which has been available broken down by currency since the end of 2012, a chained Laspeyres index for exchange rates is constructed. The chain links are as follows:

$$(1) \quad IE_t = \sum_k \sum_i \sum_s \frac{E_t^k}{E_{t-1}^k} g_{t-1}^{k,i,s},$$

where

$$g_{t-1}^{k,i,s} = \frac{E_{t-1}^k A_{t-1}^{k,i,s}}{\sum_k \sum_i \sum_s E_{t-1}^k A_{t-1}^{k,i,s}}$$

with

IE_t the link of the Laspeyres exchange rate index at the end of the quarter t.

E_t^k the exchange rate of currency k ($k = 1,…,K$) *vis-à-vis* the euro at the end of quarter t. Exchange rates are cited using the direct quotation method (eg US\$1 = €0.88). There is no exchange rate conversion for any euro-denominated assets, ie $E = 1$.

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[1] By contrast, the trade-weighted nominal effective exchange rates that the Bundesbank has been calculating since the early 1970s condense developments in bilateral exchange rates into a single index, which can be used, for example, to measure the impact of exchange rate movements on a country's or a currency area's price competitiveness (see Deutsche Bundesbank, Adjustments in the calculation of effective exchange rates and indicators of price competitiveness in August 2013, Monthly Report, August 2013, pp 50-52; and Deutsche Bundesbank, Recalculated weights for indicators of the German economy's price competitiveness, Monthly Report, August 2017, pp 41-43).

$A_{t-1}^{k,i,s}$ the holdings of asset class i mapped to sector s, denominated in currency k at the end of the previous quarter $t{-}1$.

$g_{t-1}^{k,i,s}$ the weight at the end of the previous quarter $t{-}1$, where the euro-denominated external assets stand for the respective currency-sector asset class combination in relation to the foreign assets as a whole.

In order to obtain an index (including for developments over several periods), the quarterly links are chain-linked through continuous multiplication:

$$(2)\ IIE_t = 100 \cdot IE_1 \cdot IE_2 \cdot \ldots \cdot IE_t$$
$$= IIE_{t-1} \cdot IE_t$$

IIE_t refers to the index value at time t, where the value for the fourth quarter of the initial year is made to equal 100 as the reference period (ie 2012 Q4 = 100). The term in equation (2) after the second equals sign indicates that a current index value is created by multiplying the previous value with the current chain link. An increase in the IIE represents a stock-weighted depreciation of the euro and thus an increase in asset or debt levels after conversion into the single currency.

The IIE have similar characteristics to the better-known chain indices of the annual-overlap or monthly-overlap type, which are used, for instance, to calculate price-adjusted gross domestic product or harmonised consumer prices. The chain-linked use of weights may cause statistical distortions in the form of "path dependencies"[2] over the longer term, as a result of which it may no longer be possible to clearly distinguish between exchange rate and structural effects in international assets.

As when analysing other chain indices, there are programmes available for the IIE[3] that allow the growth contributions to the exchange rate-related percentage change in an aggregate to be calculated. For example, the sectors' arithmetic growth contributions to the percentage change in portfolio investment as a whole can be determined.

The IIE allow exchange rate-related wealth effects, which the IIP would only show with a lag of three months, to be approximated in a timely manner based on current exchange rates. Methodologically advanced risk analyses can also be carried out. In addition, sensitivity analyses can be used to identify individual sectors which would, in certain scenarios, be majorly affected by (assumed) changes in the prices of individual currencies. In addition, methods for analysing time series can be applied to the indices, for example to measure the exchange rate-related volatility of the market value of individual asset holdings.

When interpreting the IIE as a measure of risk for changes in the value of assets in individual domestic sectors as a result of exchange rate movements, it should be noted, however, that the hedging operations which financial market players use to reduce their currency risk are not taken into consideration. Moreover, no account is taken of individual enterprises' option of offsetting their exchange rate risk within an international group.

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2 See United Nations et al, System of National Accounts 2008 (2008 SNA), No 15.43, p 300.
3 The program KIXCC, which was developed for quarterly chain-linking, is also available for use by non-Bundesbank users.