

Box 1.2.3: Exchange rate pass-through to euro-area consumer price inflation

Between June 2021 and October 2022, the nominal effective exchange rate (NEER) of the euro has seen a significant weakening, by more than 5.4%. This was largely driven by the US dollar, against which the euro depreciated by 16.6%, partly offset by the appreciation of the euro against a few other currencies, notably the Japanese yen and the Turkish lira. ⁽¹⁾ The main reasons for this depreciation are differences in market expectations about the pace and size of monetary policy normalisation across currency areas and geopolitical and economic risks specifically related to the EU, due to its proximity to Russia and the war in Ukraine.

Currency movements pass through to consumer prices via both direct and indirect channels. First, they pass on directly via prices of imported consumer goods and services. For example, a euro depreciation against the currency of oil exporters increases the price of imported refined oil, with immediate impact on the HICP energy component. Second, indirect effects work via supply chain and production costs, which may take longer to pass through to consumer prices. The relevance of these two channels will depend on the pricing behaviour of domestic firms, namely, the extent to which they are able to pass the higher production costs on to consumers or have to accept lower profits. A currency depreciation may also lead to an increase in demand for domestic products, both as a result of higher exports and substitution of imports with cheaper domestic products. In turn, increased demand may translate into higher demand for labour and higher wages, which can put further upward pressure on inflation.

The degree to which domestic inflation adjusts to exchange rate fluctuations is important for understanding inflation dynamics. Existing empirical estimates of the exchange rate pass-through to headline HICP inflation in the euro area are limited and vary significantly, essentially due to the still relatively short history of the European Monetary Union and the ensuing limited length of time series. The impact on headline inflation of a 1% depreciation in the euro effective exchange rate is estimated between little more than 0% and 0.1% after one year, with some studies concluding that the effect is not statistically significant ⁽²⁾. The estimated effect of the exchange rate pass-through is usually stronger for import prices (0.3%-0.7% after one year) and weaker or insignificant for core inflation. ⁽³⁾

Chart 1 illustrates the exchange rate pass-through to inflation by plotting month-on-month changes in the euro NEER (lagged by one month) against ‘abnormal changes’ in the euro area inflation rate. The latter are defined as the difference between the monthly inflation rate for any month and the median

⁽¹⁾ The nominal effective exchange rate is the weighted average rate at which the euro exchanges for a basket of 42 foreign currencies.

⁽²⁾ Methodologies also vary: where Hahn (2003), Gaggli (2009) and Comunale and Kunovac (2017) use vector autoregressions, Landolfo (2007) makes use of dynamic simultaneous equations, and Colavecchio and Rubene (2020) use a local linear projection approach. A more recent study by Osbat, Sun and Wagner (2021) also uses a vector autoregressive approach and estimates the exchange rate pass-through to euro area import prices by sector, finding the magnitude of the pass-through to be heterogeneous across sectors. Finally, time-varying estimates for the euro area suggest that the exchange rate pass-through to consumer prices is lower than estimates obtained for other currency areas in earlier decades (see Ortega and Osbat, 2020). References: Colavecchio, R. and I. Rubene (2020). “Non-linear exchange rate pass-through to euro area inflation: a local projection approach.” ECB Working Paper Series, No 2362, Frankfurt am Main, January; Comunale, M. and D. Kunovac (2017). “Exchange rate pass-through in the euro area.” ECB Working Paper Series, No 2003, Frankfurt am Main, January; Gaggli, P. (2009). “The role of exchange rate movements for prices in the euro area.” Oesterreichische Nationalbank *Monetary Policy and the Economy*, Issue 2, June; Hahn, E. (2003). “Pass-through of external shocks to euro area inflation.” ECB Working Paper Series, No 243, Frankfurt am Main, July; Landolfo, L. (2007). “Modelling the impact of external factors on the euro area’s HICP and real economy: A focus on pass-through and the trade balance.” ECB Working Paper Series, No 789, Frankfurt am Main, July; Ortega, E., and C. Osbat (2020). “Exchange rate pass-through in the euro area and EU countries.” ECB Occasional Paper Series, No 241, Frankfurt am Main, April; Osbat, C., Y. Sun, and M. Wagner, (2021). “Sectoral exchange rate pass-through in the euro area,” ECB Working Paper Series, No 2634, Frankfurt am Main, December.

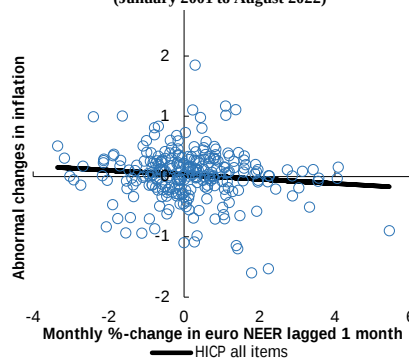
⁽³⁾ The Quarterly Report of the Euro Area features a chapter on exchange rate pass-through to import prices, see Meyermans, E., (2022). “The exchange rate elasticity of import prices across the euro area.” In European Commission (DG ECFIN) [Quarterly Report on the Euro Area](#), Vol. 21, No. 3, pp. 27-44.

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Box (continued)

inflation rate of the previous month. ⁽⁴⁾ The black line represents the fitted values from a regression where the abnormal changes in inflation are regressed on a constant and the monthly changes in the euro NEER. The slope coefficient in the chart is slightly negative, meaning that a depreciation increases abnormal inflation, but has a p-value of 8.2%, falling just short of conventional significance levels. Performing the same analysis using HICP excluding energy prices also gives an insignificant result.

Graph 1: Monthly abnormal changes in inflation vs. monthly changes in euro NEER (January 2001 to August 2022)



Source: Eurostat and IHS Markit

Colavecchio and Rubene (2020) find that euro area consumer prices do not respond linearly, as the impact is stronger when the exchange rate movements are relatively large. This may be due to the fact that larger fluctuations may limit the capacity of importers and of other firms dependent on foreign input to absorb foreign exchange rate shocks, and that cost increases are easier to pass through in a context of generalised price increases.

Based on this evidence, the analysis that follows assesses the impact of movements in exchange rate pass-through to consumer inflation, with focus on large fluctuations in the euro NEER. The question is whether the conclusion of a relatively weak exchange rate pass-through in the euro area also holds for the large depreciation in the euro NEER observed since mid-2021, especially in some months (e.g. in April and July 2022).

The analysis is based on an ‘event study’, which tests the extent to which large monthly changes in the euro NEER affect the month-on-month inflation rate. Large changes in the euro NEER are defined as the 30 percent largest month-on-month changes in the euro NEER in the period January 2001 to August 2022. This corresponds to euro NEER changes larger than 1.3%. ⁽⁵⁾ The procedure involves testing for ‘abnormal’ changes in the month-on-month inflation rate (as defined above) across a set of event periods, defined as the month when the large exchange rate movement takes place (the event month) and the following six months.

The impact of large exchange rate changes on inflation is appraised in the event-month (t_0) and in the following six months (t_1 to t_6). Due to the timing of price data collection, any immediate effect of a large change in the exchange rate is likely to show up in the month following the first event month, i.e. in t_1 . ⁽⁶⁾ The additional five months (i.e. t_2 to t_5) are used for assessing if any effect persists or reverses

⁽⁴⁾ The median inflation rate is in this case the middle inflation rate of all the ranked categories of individual consumption expenditures making up the HICP in one particular month. The suggested measure of abnormal change in the inflation rate can be interpreted as a forecast error of inflation, when using a naïve forecast option based on the median inflation rate of the previous month. For a detailed discussion see: Meyer, B.H., and M. Pasaogullari (2010). “Simple ways to forecast inflation: what works best?” Federal Reserve Bank of Cleveland *Economic Commentary*, No 2010-7, Cleveland, December.

⁽⁵⁾ The largest and the smallest absolute changes in the month-on-month NEER changes considered are 7.2% and 1.3%, respectively, with an average of 2.2%.

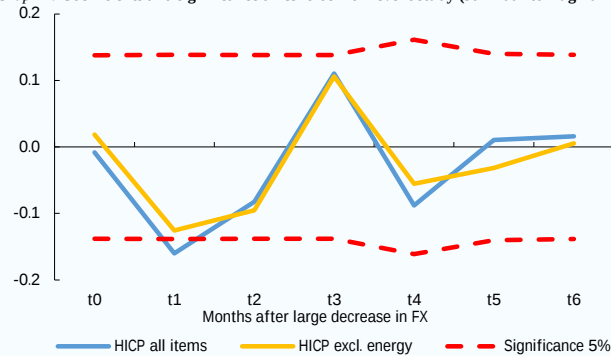
⁽⁶⁾ Since the national statistical institutes collect price information during at least one working week at, or near, the middle of the calendar month to which the index pertains, the ‘news’, constituting the large exchange rate changes cannot be incorporated into the measured inflation rate in the first event-month (t_0).

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in the following months. In principle, the methodology amounts to calculating the average abnormal change in the inflation rate across the selected months (see Chart 2).

Graph 2: Coefficients and significance thresholds from event study (Jan 2001 to Aug 2022)



Source: Eurostat and IHS Markit

Restricting the sample to events of large changes in the euro NEER alters the picture, as it emerges from Chart 2. The blue and green solid lines represent the estimated coefficients at different horizons (on the horizontal axis) from regressing the abnormal changes in HICP rate of inflation (including and excluding energy, respectively) on a set of dummy variables that take the value one on months with the large changes in the euro NEER.⁽⁷⁾ The coefficients represent the average abnormal change in the inflation rates at different dates after the shock. The dashed red lines show the 5%-significance level for these coefficients. The results imply that when a large depreciation in the euro takes place, the m-o-m inflation rate increases by 0.16 pps. on average.

As from mid-2021, there have been two episodes of large depreciation: in April and July 2022, when the euro NEER depreciated by 2.7% and 1.7% on the previous month, respectively. Applying the above estimates, these large depreciations increased HICP inflation by 0.7 pps. However, when considering the cumulative NEER depreciation of 5.4% over the whole period between June 2021 and October 2022 as a large depreciation episode in itself, the impact on HICP inflation is estimated at approximately 0.9 pps., as compared to a cumulative rise in inflation over the same period by 12.4%. As illustrated in the chart, the adjustment of inflation implies an immediate change in the price level, with no significant additional impact in the following five months.

It should be noted that the focus on the NEER in the above estimates could somewhat underestimate the impact of the recent large depreciation against the US dollar on inflation. Based on available data for 2020, the US dollar was the most used currency for invoicing imports into the EU, with a share of 48%, while the euro was used for invoicing imports with a share of 38%. Evidence suggests that the pass-through into import prices is relatively small for goods priced in the own currency and more significant for goods priced in other currencies.⁽⁸⁾ The structure of EU import invoicing implies that fluctuations in the euro-dollar exchange rate are set to account for proportionally more than just the weight of US imports in total EU imports. Overall, the above estimates should probably be considered as a lower bound to the potential inflationary impact of the recent weakness of the euro.

⁽⁷⁾ The test procedure has three steps. The first step is to calculate abnormal changes (or forecast errors) in the m-o-m inflation rates for all months. The second step is to regress the abnormal changes in the monthly inflation rate on a set of seven dummy variables representing the event months. The first dummy variable takes the value 1 in the months of large changes in NEER, the event months, and 0 otherwise. The following six dummy variables take the value 1 in the months following the event month and 0 otherwise. The final step is to test if the coefficients are significantly different from zero, i.e. whether aggregated abnormal change for each month is statistically significant.

⁽⁸⁾ See for example Gopinath, G., O. Itkhoki, and R. Rigobon (2010), "Currency Choice and Exchange Rate Pass-Through," *The American Economic Review*, Vol. 100 (1), pp. 304-336; and Ortega and Osbat (2020).