BANCO DE ESPAÑA
Eurosistema

ECONOMIC BULLETIN 4/2018
ANALYTICAL ARTICLES

4 October 2018

Recent movements in the euro exchange rate and the impact on inflation in the Spanish economy

Danilo Leiva, Jaime Martínez-Martín and Eva Ortega

Abstract

The effect of the euro exchange rate on inflation has taken on significant importance recently, with the application of the ECB's expansionary monetary policy measures having coincided with episodes of euro appreciation, such as that observed between the second half of 2017 and early 2018, which tend to exert downward pressure on imported prices. This article analyses the factors behind the fluctuations in the euro exchange rate against the dollar during the recent period, and finds that this appreciation may have largely been due to the higher relative growth of the euro area, compatible with a pick-up in expected euro area inflation. However, the subsequent depreciation, since February 2018, might reflect factors related to changes in the relative confidence of financial markets to the detriment of the euro, and to the lower relative growth of the euro area compared with the United States. Further, it is documented how the pass-through of exchange rate movements to overall consumer-price inflation in the Spanish economy has increased slightly in recent years, owing mainly to the energy component, while core inflation remains much less sensitive to exchange rate changes.

Keywords: exchange rate, inflation, structural VAR model, time-varying parameters models.

JEL codes: E31, F3, F41.

RECENT MOVEMENTS IN THE EURO EXCHANGE RATE AND THE IMPACT ON INFLATION IN THE SPANISH ECONOMY

The authors of this article are Danilo Leiva, Jaime Martínez-Martín and Eva Ortega of the Directorate General Economics, Statistics and Research.

Introduction

The nominal exchange rate of the euro against the US dollar, after reaching a 10-year low on 28 December 2016 (of $1.04 per euro), appreciated by 15.3% over the course of 2017. In the opening months of 2018, it rose a further 4.2% to stand at close to $1.25 per euro on 15 February.[1] This cumulative appreciation of the euro has since been partly corrected, and it has dipped almost 6% against the dollar to $1.18 per euro as at 25 September 2018.

In the context of flexible foreign exchange markets, such as those for the euro and the dollar, the exchange rate is a relative price that reacts to any news or information that changes perceptions of the value of the real and financial assets of the economies whose currencies it links. Accordingly, the exchange rate can fluctuate widely in a short space of time. These fluctuations may be due to fresh developments relating to the fundamentals that determine the growth of each economy, whether on the demand or supply side, or to perceived changes in their respective monetary policies which, since they determine interest rates, have a bearing on the relative return on each country's financial assets. Furthermore, the exchange rate between two economies may vary owing to other factors — not directly linked to economic or monetary fundamentals — which are difficult to identify and predict, and may prompt strong and swift movements. Such factors include most notably changes in confidence or in perceptions or sentiment (optimism or pessimism) among those operating on foreign exchange markets in favour of one economy against the other.

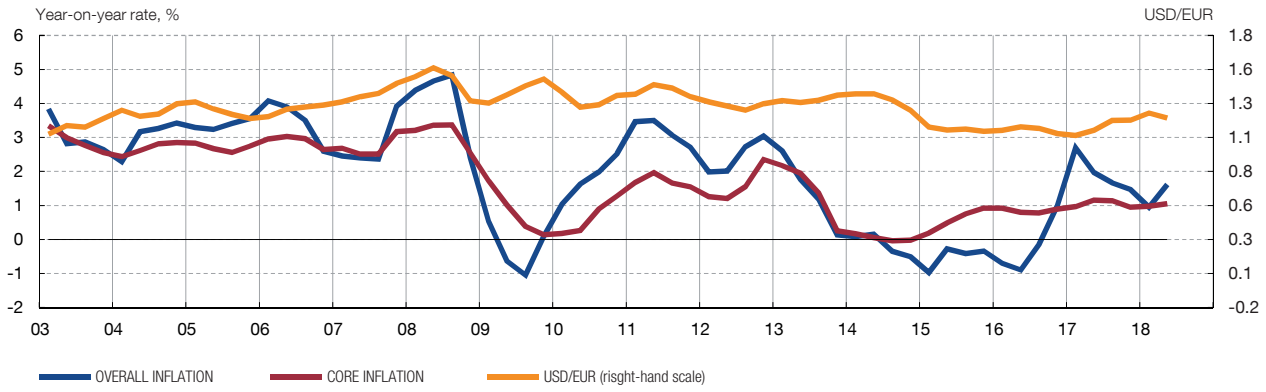
The euro area economies, Spain among them, are highly integrated into the global economy at the productive, trade and financial levels. Consequently, the exchange rate is a key component in determining their prices. Changes in the euro rate feed through to import prices and from there to the entire price chain and, ultimately, to the overall level of consumer prices.[2] Hence, appreciations of the euro on the scale observed to February this year normally entail lower import prices and, therefore, downward pressure on producer and consumer prices. Moreover, against a background of continuing low inflation such as that marking the euro area in recent years, the appreciation of the euro may have a contractionary effect on the economy's financial conditions and ease the intensity of the transmission of the recent monetary policy expansionary measures aimed at moving inflation in a sustained manner up towards the ECB's objective, with medium-term inflation rates lower than but close to 2%.

An estimation follows of the factors that may have influenced the recent course of the exchange rate of the euro against the dollar. Thereafter, its pass-through to the various

1 Note that this euro rate is far off the all-time high of $1.59 per euro on 15 July 2008, or the more recent rate of $1.39 per euro on 8 May 2014.

2 The pass-through of changes in the euro exchange rate to consumer prices depends on a large number of macroeconomic and microeconomic factors, structural and cyclical alike. Structural factors include most notably the degree of trade openness (see, for example, Goldberg et al., 2010) and integration of worldwide production into global value chains (e.g. Amiti et al., 2014), the degree of competition on international markets and the market power of exporting firms (e.g. Dornbusch, 1987), the currency in which international trade is invoiced (e.g. Bacchetta et al., 2003 or, more recently, Boz et al., 2017) and price stickiness (e.g. Corsetti et al., 2008). Cyclical factors include the cyclical phase and the level of inflation (e.g. Taylor, 2000), along with monetary policy actions.

YEAR-ON-YEAR OVERALL AND CORE INFLATION IN SPAIN AND NOMINAL USD/EUR EXCHANGE RATE (a) CHART 1



SOURCE: Banco de España.

a The exchange rate is expressed in terms of US dollars per euro, i.e. an increase denotes an appreciation of the euro.

Download

components of inflation in Spain is quantified, with a view to analysing not only the magnitude of the pass-through of movements in the exchange rate to prices but also whether this has stepped up or weakened over time.

It should be stressed that any estimate of the impact of the changes in the euro exchange rate on inflation in Spain is not free from uncertainty. Chart 1 illustrates how exchange rate movements appear to affect inflation in Spain in a limited manner and, in any event, core inflation to a lesser extent than overall inflation.[3] Nonetheless, in some periods, and especially in the past year, there appears to be some negative correlation between the exchange rate and inflation, i.e. the appreciation of the euro that began last year coincided with a reduction in inflation, while the backdrop to the most recent depreciation against the dollar was a pick-up in inflation.

The pass-through of exchange rate changes to prices: determinants

As the introduction argues, the exchange rate is a relative price that reacts to various shocks and whose movements in turn affect an economy's activity and prices through various channels. Furthermore, the same shocks that affect exchange rates directly impact activity and prices, and not only indirectly through the exchange rate. Thus, the interdependencies between the economy's different variables will give rise to some type of relationship between the change in the exchange rate and that observed in prices, depending on the shock at their source.

Since Shambaugh (2008), there has been an abundant literature seeking to estimate empirically to what extent the pass-through to the economy of exchange rate movements depends on the source of the shock prompting the change in the exchange rate (see, for example, Forbes, 2016). Hence, an appreciation of the euro prompted by higher relative growth of demand in the euro area will be accompanied by higher inflation[4], although inflation will normally be tempered

3 Along these same lines, Álvarez and Sánchez (2018) find that the indicator of external pressures on Spanish inflation shows a somewhat greater correlation with overall inflation than with core inflation, owing to the greater responsiveness of the energy component of inflation.

4 Owing to the greater weight of domestic as opposed to imported goods in the demand of most European economies, growth in the demand for euro-denominated goods exerts upward pressure on the price of the euro. Moreover, if the monetary authority reacts to higher inflation by raising interest rates, the higher return on euro-denominated assets also exerts pressure on the European currency to appreciate.

by the lower price of imported products that follows the higher value of the euro. However, if the appreciation is in response to a relative tightening of monetary policy in the euro area, conducive to a greater relative return on euro-denominated assets, demand is constrained as are, thereby, prices, with a greater negative impact on inflation. Moreover, the appreciation reduces euro-denominated import prices, thereby heightening the decline in prices in the face of the monetary tightening. Similarly, if the appreciation is due to an exogenous change, not based on fundamentals pertaining to activity or monetary policy, import prices will fall and, therefore, albeit to a lesser extent, so too will consumer prices. Thus, for example, in September 2017 the ECB (see Coeuré, 2017) estimated that the recent appreciation against the dollar was caused, in approximately equal portions, by three factors: higher demand in the euro area than in the United States; a less accommodative monetary policy stance by the ECB; and an appreciation of the euro not based on fundamentals. The last two factors would entail downward pressure on inflation, but the first would mitigate this to the extent that the estimated impact of the exchange rate appreciation on inflation would be very limited.

To approximate the impact on inflation in Spain of the recent movements in the euro exchange rate, a structural vector auto-regressive (SVAR) model including the following variables has initially been estimated: real GDP growth and inflation drawn from the euro area's harmonised index of consumer prices (HICP); the exchange rate of the euro against the dollar; and, to capture the potential effect of global demand, the difference between real GDP growth in the euro area compared with that in the United States. Further, to reflect approximately the relative euro area monetary policy stance, the interest rate measure frequently used in this literature, which proxies conventional and unconventional monetary policy measures, is included.[5]

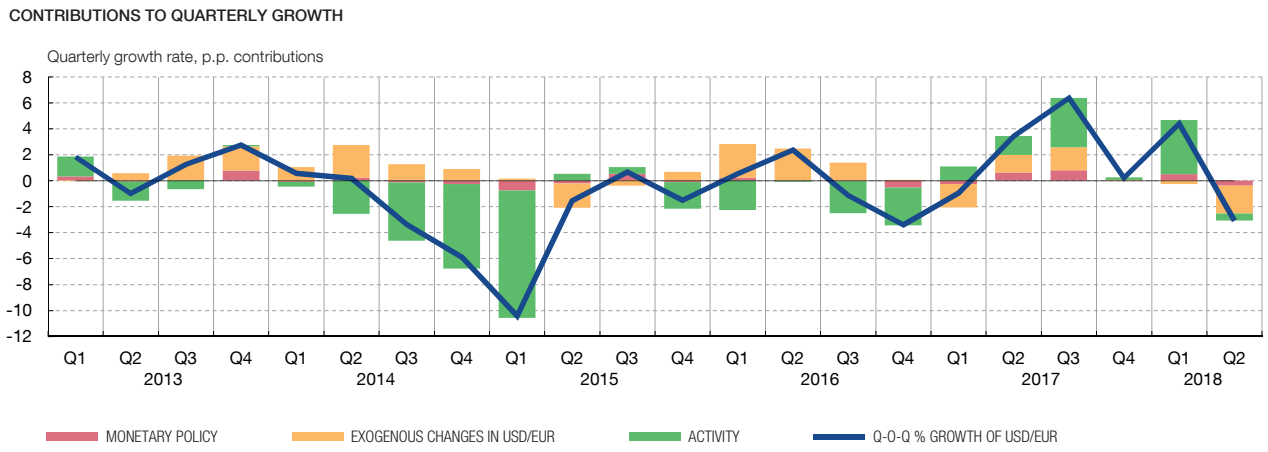
Chart 2 shows the average growth rate for each quarter over the past five years of the exchange rate of the euro against the dollar, along with the contributions thereto of the possible determinants identified in the structural VAR[6]: shocks to activity (from domestic demand and supply, or from the rest of the world), to relative monetary policy, and to factors not linked to fundamentals or to exogenous factors, which reflect changes in confidence or in perceptions or sentiments of optimism among those operating on foreign exchange markets in favour of one economy against the other.

On this analysis, the appreciation of the euro between 2017 Q2 and 2018 Q1 may have been due mainly to the higher growth in the euro area. Along with this, exogenous factors also played a significant role, as they made for greater relative confidence in the euro in the second half of 2017. Finally, the perception that the ECB's monetary policy was somewhat less lax in the final stretch of 2017, in relative terms, than in previous quarters (the opposite was the case in 2016 Q4-2017 Q1) likewise contributed to this period of appreciation. The factors that led to higher GDP growth in the euro area during this period are estimated to have exerted inflationary pressure. However, this positive effect on inflation is estimated to have been largely countered by the impact in the opposite direction on prices of the perceived change in monetary policy stance and of the exogenous factors of appreciation (via a reduction in import prices), in line with the findings set out in Coeuré (2017), with data to 2017 Q2.

5 Use is made of the difference between the nominal interest rates in the euro area and in the United States known as "shadow rates", which are those that would be observed were there no zero bound on interest rates. The estimates for shadow interest rates proposed by Krippner (2013), for which monthly updates are available, are used. The results of the model are robust to alternative estimates of these shadow interest rates, such as those of Wu and Xia (2016).

6 The factors motivating the movements in the VAR variables are identified by imposing exclusion and sign restrictions on their impact on the variables. The maximum period available for all these variables has been used: 1996 Q1-2018 Q2.

BREAKDOWN OF THE GROWTH OF THE NOMINAL USD/EUR EXCHANGE RATE (a) CHART 2



SOURCE: Banco de España.

a The exchange rate is expressed in terms of US dollars per euro, i.e. an increase denotes an appreciation of the euro.

Download

Preliminary estimates of the determinants of the recent depreciation of the euro since February this year identify exogenous factors as the main determinant. Such factors are not linked directly to changes in activity or in monetary policy but do alter the confidence on the financial markets in the euro area relative to the United States, during 2018 Q2. The lower relative rate of growth of activity in the euro area, which has persisted throughout the summer, would also appear to be playing a significant role in the depreciation.[7]

The impact on inflation in the Spanish economy

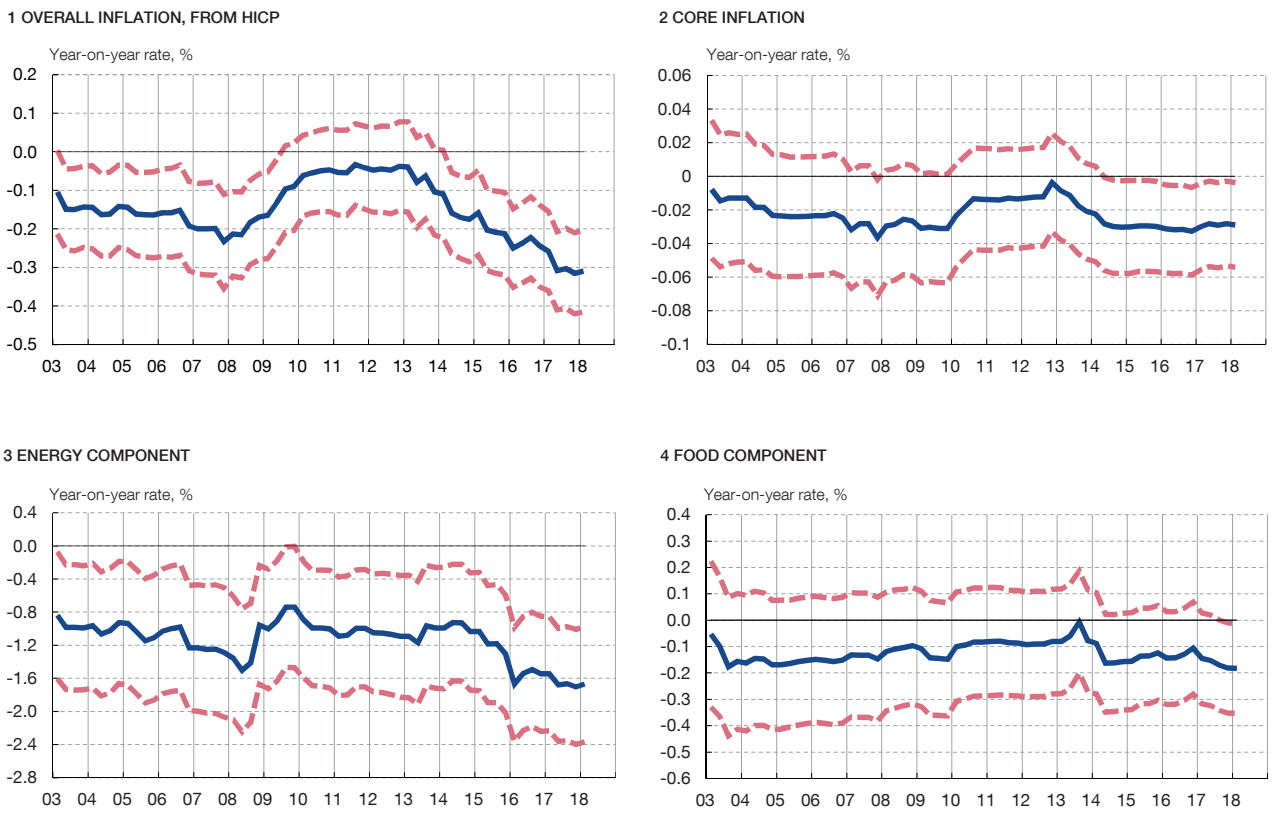
Below we use regression techniques with time-varying parameters which, moreover, enable the differing impact on prices of changes in the exchange rate in terms of their source to be explored, for which purpose the results of the structural VAR estimated in the previous section are used.

Specifically, Chart 3 shows the time variation of the contemporaneous correlation, in the same quarter, between overall inflation and the shocks to the exchange rate attributable to exogenous factors, not directly linked to changes in the relative activity or monetary policy of the euro area vis-à-vis the United States, and which are estimated in the previous section as the main determinant of the latest change in the euro rate against the dollar. Furthermore, the results for overall inflation and the three most significant components are shown: core inflation, energy and food. These correlations are from estimated regressions that allow the parameter measuring the impact of the shocks to the exchange rate to vary over time[8], so that changes over time in the intensity of the pass-through to prices of these exchange rate changes may be estimated. It is important to clarify that the magnitudes

7 Extending the analysis a further quarter, the depreciation of the euro against the dollar running into 2018 Q3 would seem mainly due to this lower relative growth of activity in the euro area. The estimates thus obtained for 2018 Q3 are based on data observed for July and August, and on own estimates for the variables for which no information from the quarter is available..

8 Specifically, a regression equation with time-varying parameters is estimated to explain the course of inflation in terms of lagged inflation, the growth of output in the previous quarter, the exchange rate movements in the same quarter attributable to exogenous factors, depending on whether they have been estimated in the foregoing SVAR, and a residual. All the coefficients of the regression follow a random walk. Chart 3 shows the median and confidence intervals (one standard deviation) of the regression coefficient relating to the exchange rate. The estimation period is 1991 Q1-2018 Q2.

RESPONSE OF INFLATION IN SPAIN TO EXOGENOUS CHANGES IN THE EXCHANGE RATE (a) CHART 3



SOURCE: Banco de España.

a The unbroken line depicts the median, and the dotted lines the confidence intervals (one standard deviation each side) of the regression coefficient corresponding to the exchange rate. Estimation period: 1999 Q1-2018 Q2.

Download

associated with these partial correlations are not directly comparable to the estimates from more complete macroeconomic models, since they leave aside numerous interactions between the variables that these models do capture, and they refer moreover to only one of the possible sources of exchange rate movements. However, this exercise allows us to assess whether the pass-through to inflation of the factors moving the exchange rate in specific periods of interest has varied significantly.

The top left-hand panel of Chart 3 shows how the response of overall inflation in the quarter coinciding with the appreciation is negative. An appreciation due to the most exogenous component of the exchange rate movements would significantly reduce overall inflation over most of the recent period by lowering imported prices. While the average impact of the past two decades has been approximately -0.1% given an appreciation of the euro of 1%, the chart shows that the current impact of this type of shock to overall inflation is somewhat higher than in the last recession.

The upper right-hand panel of Chart 3 shows the pass-through to core inflation, which excludes energy and other more volatile components. This is much less intense than is the pass-through to overall inflation, almost one-tenth of the latter, and scarcely significant. Notably, though more volatile than core inflation, food-price inflation is not significantly sensitive either to exchange rate changes. Accordingly, it is the energy component of overall inflation, which is more volatile and has a high import content, and is therefore more

exposed to exchange rate fluctuations, which reacts with greater intensity to a change in the exchange rate. Moreover, it is also this energy component that explains the estimated step-up in recent years in the pass-through to prices of exchange rate changes.[9]

When comparing with research based on data from the 1970s to the 2000s, which reported a reduction over time in the pass-through to prices of changes in the exchange rate[10], more up-to-date estimates do not find clear evidence that this reduction is continuing. Thus, for example, Jasova et al. (2016) estimate with time-varying parameters that the pass-through of the exchange rate to prices in the advanced economies remains low but has not continued to fall. The estimates made here use this same methodology of time-varying parameters so as to be able to identify changes in shorter periods.

4.10.2018.

REFERENCES

ÁLVAREZ, L.J. and I. SÁNCHEZ (2018), "Indicadores sintéticos de presiones inflacionistas", Analytical Article, Banco de España, forthcoming.

AMITI, M., ITSKHOKI, O. and J. KONINGS (2014), "Importers, exporters, and exchange rate disconnect", American Economic Review, vol. 104 (7), pp.1942-78.

BACCHETTA, P. and E. VAN WINCOOP (2003), "Why do consumer prices react less than import prices to exchange rates?", Journal of the European Economic Association, vol. 1 (2-3), pp. 662–670.

BOZ, E., GOPINATH, G., and M. PLAGBORG-MOLLER (2017), "Global trade and the dollar", NBER Working Paper N. 23988.

CAMPA, J. M., GOLDBERG, L. and J. M. GONZÁLEZ-MÍNGUEZ (2005), "Exchange Rate Pass-Through to Import Prices in the Euro Area", NBER Working Paper Series No. 11632.

COEURÉ, B. (2017), "The Transmission of the ECB's monetary policy in standard and non-standard times", Workshop on Monetary Policy in Non-standard Times, Frankfurt, 11 September 2017.

CORSETTI, G., DEDOLA, L. and S. LEDUC (2008), "High exchange rate volatility and low pass-through", Journal of Monetary Economics, vol. 55, pp.1113-1128.

DORNBUSCH, R. (1987), "Exchange rates and prices", American Economic Review, vol. 77(1), pp. 93-106.

FORBES, K. (2016), "Much ado about something important: How do exchange rate movements affect inflation?", The Manchester School, vol. 84 (S1), pp.15-41.

GOLDBERG, L.S. and J.M. CAMPA (2010), "The Sensitivity of the CPI to Exchange Rates: Distribution Margins, Imported Inputs, and Trade Exposure", Review of Economics and Statistics, Vol. 92(2), pp. 392-407.

HAHN, E. (2003), "Pass-through of external shocks to euro area inflation", ECB Working Paper No.243.

JASOVA, M., MOESSNER, R., and E. TAKATS (2016), "Exchange rate pass-through: What has changed since the crisis?", BIS WP 583.

KRIPPNER, L. (2013), "Measuring the stance of monetary policy in zero lower bound environments", Economics Letters, Vol. 118(1), pp. 135-138.

SHAMBAUGH, J. (2008), "A new look at pass-through", Journal of International Money and Finance, vol .27, pp. 560-591.

TAYLOR, J. (2000), "Low inflation, pass-through and the pricing power of firms", European Economic Review, vol. 44, pp. 1389-1408.

WU, J.C. and F.D. XIA (2016), "Measuring the macroeconomic impact of monetary policy at the zero lower bound", Journal of Money, Credit and Banking, vol. 48, No.2-3.

9 Despite the fact that the Spanish economy's energy dependence, measured as the volume of consumption and energy imports as a percentage of GDP, has fallen in recent years, the energy prices component remains highly influential in the HICP.

10 For example, see Hahn, 2003, for the euro area as a whole, or Shambaugh, 2008, or Campa et al., 2005, for individual countries.