THE NATURE OF THE SHOCK MATTERS: NIGEM ESTIMATIONS OF THE MACROECONOMIC EFFECTS OF RECENT DOLLAR AND EURO FLUCTUATIONS

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Exchange rate fluctuations have been particularly large since mid-2014, displaying divergent developments across the period. The nominal effective exchange rate of the dollar has appreciated by 15 per cent since June 2014, masking a 25 per cent appreciation to December 2016 followed by a depreciation of 8 per cent. Changes in the euro have turned positive after being negative. This article attempts to measure the impact of currency changes on domestic activity, accounting for the source of fluctuations. More specifically, by using the multi-country structural model NiGEM, we show that different types of exchange rate shocks can have different macroeconomic outcomes. Focusing on the period from January 2017 to February 2018, we show that the depreciation of the dollar, stemming mostly from changes in sentiment in foreign exchange markets, would in fact have been detrimental to US growth. A weaker currency, in this particular case, turned out to be no recipe for stronger growth. Similarly, the appreciation of the euro, triggered by a fall in the risk premium of the currency, may have been positive for growth. There are caveats to the exercise, but the results are nonetheless consistent with previous research pointing to the importance of the nature of the exchange rate shocks in estimating their impact on prices and growth.

Keywords: Exchange rate pass-through, global structural models.

JEL codes: F41, E27.

1. Motivation

Exchange rate fluctuations have been unusually large since January 2017. Between January 2017 and February 2018, the US dollar depreciated by around 8 per cent in both nominal and real effective terms, while the euro appreciated by around 8 per cent and 7 per cent, respectively. Although not unprecedented, such movements are at the bottom (US$) and top (euro) of past fluctuations ranges, as shown in figures 1 and 2.

The factors behind these currency movements are not all clearly identified. Regarding the dollar, upwards revisions in US growth and expectations of further monetary tightening should have boosted the value of the currency in the course of 2017 (see also Summers, 2018). In fact, the currency rebounded towards the end of 2017. But the rebound was modest and short-lived, other factors (among them worries about the sustainability of the US public debt) having maintained a downward pressure on the dollar. The case for the euro is perhaps more clear-cut, with domestic conditions having improved significantly in the course of 2017: levelling-off of uncertainty in the wake of the French presidential election results; improved economic outlook for the Euro Area and more optimistic communication from Governing Council members.

Exchange rate variations are important determinants of external positions, activity and inflation. But how are exchange rate fluctuations passed onto prices and volumes? The aim of this article is to assess the impact of exchange rate shocks in the context of a large-scale macroeconomic model, NiGEM. In particular, it seeks to show that different underlying causes of exchange rate fluctuations can lead to different outcomes for inflation and activity. We focus on the dollar and euro fluctuations over the year 2017 and their possible impact on inflation and activity in the US and the Euro Area.

This article is organised as follows: after a brief overview of the literature on exchange rate pass-through (ERPT) in section 2, section 3 will decompose the evolution of the dollar and euro nominal effective exchange rates by

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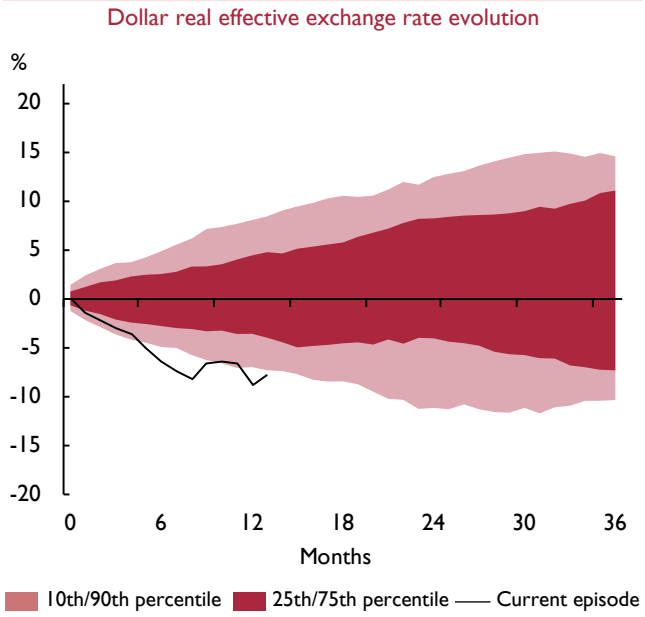
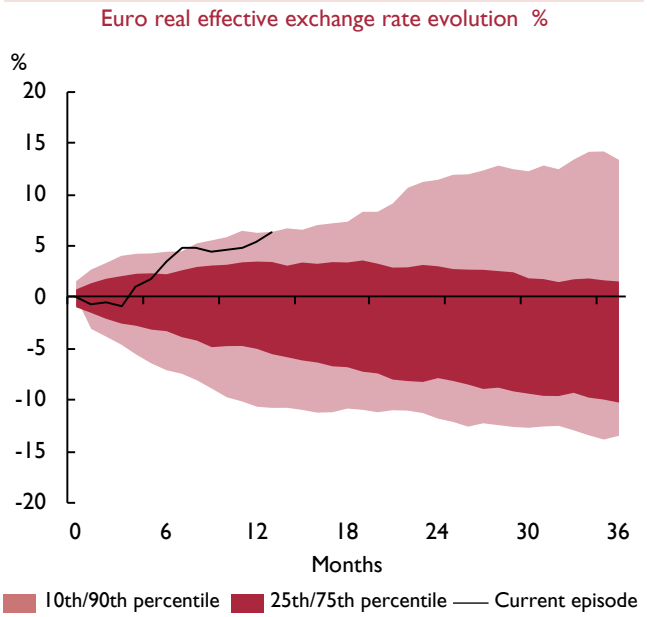
Figure 1. Current dollar fluctuations outside past range



Source: Author's calculations based on ECB data and IMF calculation methodology described in the October 2015 *World Economic Outlook*.
Notes: The figure reports dollar fluctuation bands for real (consumer price adjusted) effective exchange rate since 1994, based on all 36-month-long evolutions. Black line indicates the dollar exchange rate path between January 2017 and February 2018.

Figure 2. Current euro appreciation at top of past range



Source: Author's calculations based on ECB data and IMF calculation methodology described in the October 2015 *World Economic Outlook*.
Notes: The figure reports dollar fluctuation bands for real (consumer price adjusted) effective exchange rate since 1994, based on all 36-month-long evolutions. Black line indicates the euro exchange rate path between January 2017 and February 2018.

currency counterparts, in order to identify the factors at the source of the exchange rate (ER) changes. Section 4 will, first, describe simulation results of different types of exchange shocks using the global structural model NiGEM; and in a second step, build a scenario reproducing the shocks experienced by the dollar and the euro over the recent past, allowing an assessment of the impact of the exchange rate shocks on prices and activity in the US and Euro Area (EA). Section 5 concludes.

2. Literature review on exchange rate pass-through (ERPT)

The impact of exchange rate movements on inflation and activity has been the focus of numerous research studies, looking more particularly at the relationship between exchange rate movements and export and import prices (so-called exchange rate pass-through). Using firms' data, microeconomic studies focus on exporters' reaction to exchange rate changes in mark-ups and export volumes, with firm's productivity, currency invoicing and goods' homogeneity as main determinants. Macroeconomic studies tend to look at the heterogeneity in countries' responses to exchange rate fluctuations, especially between advanced and emerging economies.

However, most studies tend to overlook the role played by the *source* of exchange rate changes, with few exceptions so far: Forbes (2014, 2015), Kirby and Meaning (2014), and Bussière *et al*. (2014).

ERPT refers to the elasticity of inflation to exchange rate changes and can be decomposed into two components: (i) the ERPT on import prices and (ii) the pass-through (PT) of import prices on inflation. The first PT is generally incomplete (lower than 1) and quite rapid, and differs among countries. It is related to microeconomic factors like margin behaviour or currency invoicing, but also to economic conditions. The second PT also varies across countries as it depends on the import-intensity of GDP, a structural feature of the economy.

Bussière *et al*. (2013) look at the issue of ERPT from a macroeconomic perspective. They find that (i) ERPTs are highly heterogeneous across countries: high for EMEs

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and very low for the US and (ii) countries with a high elasticity on the export side also have a high elasticity on the import side. Both results are consistent with Gopinath's theory of the Internal Price System.

Gopinath (2015) emphasised the importance of the invoicing currency. She presents evidence that a disproportionate share of international transactions is invoiced in US dollars and, to a lesser extent, in euros. This matters a lot given that prices invoiced in foreign currencies are not very sensitive to exchange rate movements. As a matter of fact, in the case of the US, the empirical evidence shows that US exporters change their prices by a very small amount (elasticity around 0.1), leading to an almost perfect pass-through.

The time-varying property of ERPT has been debated. In a chapter of its 2015 October *World Economic Outlook* (IMF, 2015), the IMF investigates the relationship between exchange rate changes and trade for a large group of countries. The main finding is that, on average, a 10 per cent real effective exchange rate depreciation increases domestic import prices by 6.1 per cent and reduces export prices paid by foreigners by 5.5 per cent. The results imply that a 10 per cent depreciation of the currency is associated with a rise in real net exports of 1.5 per cent of GDP, with substantial cross-country variation depending on GDP shares of exports and imports. The main finding is that exchange rate movements still have sizable effects on prices and volumes, consistent with Bussière *et al.* (2016) who, using a large dataset of disaggregated bilateral trade flows, underline that omitting unobserved marginal costs and competitor prices in the importing market could bias pass-through estimates. All countries in the sample satisfying the Marshall-Lerner conditions, exchange rate changes can be said to play an important role in addressing global trade imbalances.[1]

Because exchange rate fluctuations are not exogenous to the economy, Forbes (2014, 2015) looks at fluctuations in UK prices caused by different types of exchange rate shocks, stemming from global or domestic demand, global or domestic supply, as well as domestic monetary policy shocks. Using a SVAR model, Forbes shows that exchange rate appreciations are associated with lower import prices in all cases, except when the appreciation results from a positive shock to global demand (first stage of PT). The sharpest fall in inflation (second stage of PT) is associated with appreciation driven by supply shocks (such as productivity shocks). On the contrary, appreciations driven by (global or domestic) demand shocks have large positive effects on inflation. This is probably because stronger domestic or global demand allows companies to avoid lowering prices despite a dearer currency. The model allows Forbes to break down the 2007–8 sterling depreciation into different shocks. In particular, as depreciation occurred partly due to a sharp negative global supply shock (including in the UK), Forbes offers an explanation to the missing disinflation puzzle during that period.

Kirby and Meaning (2014) discuss Forbes using a global structural model, pointing at significantly different ERPT despite equivalent fluctuations in the exchange rate. Similarly to Forbes, they find that different exchange rate shocks can lead to different outcomes for prices and activity: supply-driven currency movements tend to generate higher ERPT than demand-driven shocks.

Similarly, Bussière *et al.* (2014) address the issue of the importance of the underlying ER shock, looking more specifically at productivity and capital flows shocks. Based on a large sample of emerging and advanced economies, they show that appreciations associated with higher productivity have a larger negative impact on growth than appreciations associated with capital inflows.

In a recent speech, ECB Executive Board member Benoit Coeuré (2017) looks at state-dependent ERPT, in order to explain why inflation in the Euro Area responded less than expected to the marked depreciation of the euro in 2014, followed by its appreciation in 2015. Beyond structural factors (such as trade integration and currency invoicing), weaker responsiveness of EA inflation to currency changes could be explained by cyclical factors related to the type of shock hitting the economy. One of the main findings is that appreciations driven by positive demand shocks can lead to higher inflation, at odds with traditional thinking of the PT. As a result, although there is no empirical evidence that the exchange rate channel of monetary policy is inactive, its strength will depend on the state of the economy and more particularly on the factors at the source of the ER shock.

3. Identification of dollar and euro shocks

In this section, we decompose changes in the dollar and euro nominal effective exchange rates by the contributions of their currency counterparts, as shown in figure 3.

Several insights emerge from the charts in figure 3:

- Regarding the dollar (left panel), the negative evolution of the first nine months of 2017 was interrupted in the last quarter of the year with an

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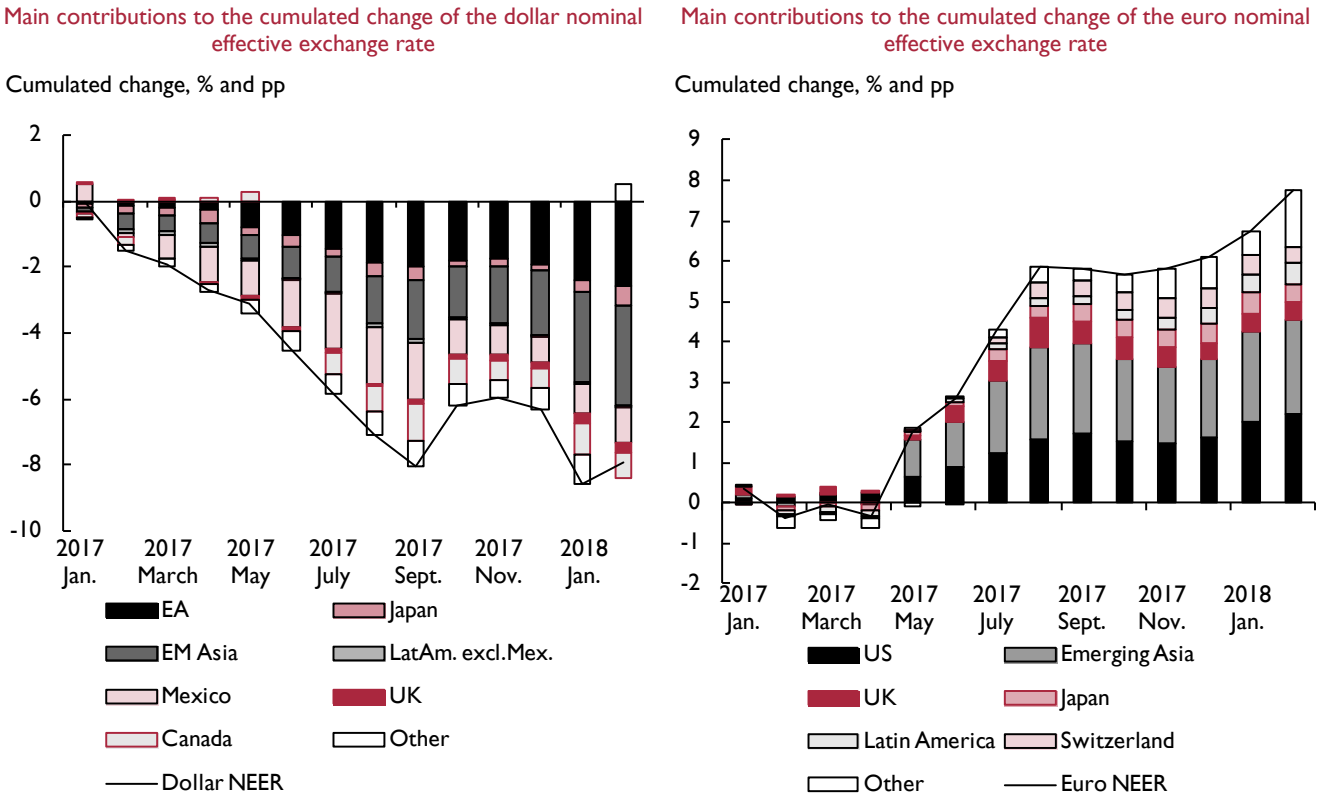
Figure 3. Dollar and euro fluctuations mostly driven by FX sentiment



Source: Author's calculations based on ECB data.

increasing likelihood of a fiscal reform which was actually voted in December. The dollar started to depreciate again in early 2018, regaining some of the lost ground in February. Overall, the dollar lost 8 per cent in nominal terms against a basket of 38 currencies. In terms of composition, the depreciation of the dollar over the period was increasingly driven by the appreciation of emerging Asian currencies, followed by the Mexican peso from March onwards, the euro in May and the Canadian dollar in July. The four regions account for nearly all of the 8 per cent USD depreciation over the period. There are various reasons for the appreciation of the related currencies vis-à-vis the US dollar, two of which dominate. The first reason is akin to a re-assessment of risk premia on foreign exchange markets. This materialised in a fall in the risk premia on the euro, as political uncertainties were dispelled after the French presidential election, and the renminbi, as Chinese authorities intensified their efforts to minimise the risk of a sharp slowdown, triggering a pick-up in capital flows. The two currencies accounted for 30 per cent and 40 per cent of the dollar depreciation over the period, respectively. Conversely, a rise in the risk premium on the dollar appears to have been at the source of the renewed weakness of the dollar in early 2018, reflecting worries that the fiscal reform voted in December 2017, together with the Budget Agreement of February 2018, would deepen the US fiscal and current account deficits, further deteriorating the external position of the country. Net foreign direct investments to the US have declined in 2017 compared to 2015–16, suggesting that it is now a less attractive environment for investors.

- The other underlying factor to the dollar depreciation can be ascribed to business and monetary cycles vis-à-vis Mexico and Canada (accounting for a quarter of the 8 per cent dollar depreciation). Economic projections for Mexico and Canada were positively reassessed in the course of 2017, reflecting better than expected growth outturns in the case of Mexico, and the recovery in oil prices on the back of announced (and implemented) production cuts by OPEC members in the case of Canada. In the meantime, economic projections for the US were revised downwards.[2] As a

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result, relative business cycle dynamics switched from the US to Mexico and Canada, narrowing expected interest rate differentials.

- Two thirds of the 8 per cent appreciation of the euro Nominal Effective Exchange Rate (NEER) occurred against the US dollar and emerging Asian economies (figure 3, right panel). The appreciation of the euro appears to have been triggered by a fall in the risk premium attached to the currency, right after the results of the French presidential election in April 2017. As a result, the NEER of the euro rose by 2.1 per cent in May and by 1.5 per cent on average in June, July and August. The lifting of political uncertainty in the Euro Area came alongside better than expected economic data and more optimistic communication on the part of some Governing Council members (such as the speech given by ECB President Draghi in Sintra in June). Recovery in economic activity did not, however, translate into stronger inflation, leaving unchanged the expected monetary stance on the part of market participants and expected interest rate differentials with the US. The source of the appreciation of the euro vis-à-vis the renminbi is perhaps less clear. As seen above, the Euro Area and China have both benefited from renewed interest on the part of international investors, triggering capital inflows and an appreciation of their currency. The positive reassessment appears to have been relatively more pronounced for the euro than for the renminbi. Interest rate differentials between the two regions remained unchanged over the period, reinforcing our view that the fall in risk premia was more pronounced for the euro than the renminbi.

To sum up, the decomposition of the dollar and euro changes points to two main factors: first, opposite forces appear to have been at the source of the dollar and euro fluctuations; second, those forces have evolved over time. Of course, the distinction between the time phases is not so clear-cut, as the underlying forces causing exchange rate changes may have occurred alongside each other. We will get back to this in the following sub-section with a thorough description of the way exchange rate shocks have been combined and implemented in the NiGEM model and our assessment of their impact on activity and prices in the US and the Euro Area.

4. Translating the shocks in NiGEM

This section will test the hypothesis that different exchange shocks may lead to different ERPT and macroeconomic outcomes, using the global structural model NiGEM. The model will be used to assess the impact of the exchange rate shocks experienced by the US and the Euro Area between January 2017 and February 2018. So it is important to understand the determinants of exchange rates in NiGEM and the transmission channels of the exchange rate shocks.

4.1 The 'good' and the 'bad' in NiGEM

Following Kirby and Meaning (2014), we run in NiGEM two different types of exchange rate appreciation:

- a first type of appreciation due to a fall in the risk premium attached to the currency (which could be understood as a good appreciation);

- a second type of appreciation, driven by a domestic monetary policy shock (an alleged bad appreciation);

Let us now turn to the way exchange rates are modelled in NiGEM and the model simulation properties to exchange rate shocks. In NiGEM, the value of the currency of any country n for one US dollar (rx) is determined via the uncovered interest rate parity condition given by:

$$E\left[\frac{rx^n_{t+1}}{rx^n_t}\right] = \left[\frac{1+\text{int}^n_t}{1+\text{usint}_t}\right] * (1+RP^n_t) \qquad (1)$$

Equation (1) shows that movements in bilateral exchange rate are determined by risk-adjusted interest rate differentials, with int^n the short-term interest rate in country n, *usint* the short-term interest rate in the US, and RP^n the risk premium attached to the currency of country n. Effective exchange rates are calculated from a trade-weighted average of bilateral rates.[3] There are therefore several ways to introduce an exchange rate shock in NiGEM: directly, by acting on the UIP equation, changing either *int* or *RP* or both in (1); and indirectly, by generating an interest rate response to other shocks, with subsequent various responses in the exchange rates.

The 'good' appreciation: a fall in the risk premium

We run a risk premium shock (changing RP in equation (1)), generating a 5 per cent appreciation in the NEER of the dollar and the euro.[4] In NiGEM, this is a direct endogenous shock to the floating exchange rate, with forward-looking agents. The fall in the risk premium will induce more investment and a higher equilibrium capital stock. This should lead to higher potential output and therefore more slack today, creating disinflationary pressure. Where monetary space is available, the Central Bank will respond by cutting its intervention rate.

Results are shown in table 1 and point to a long-run pass-through to CPI inflation close to 0 for the US and around

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–0.1 percentage point for the EA.[5] This is consistent with literature findings where the degree of ERPT to prices is lower in the US than in the EA, the reason being that foreign exporters prefer to keep constant the dollar price of the goods they sell in the US (see Gopinath, 2015, on the role of the dollar as a transaction currency). The fall in the risk premium has an immediate positive impact on US GDP, twice the impact on EA GDP. The short-term pass-through to import prices is larger in the US than in the EA, pushing down inflation more significantly in the US (–0.8pp on average the following year), than in the EA (–0.5pp). Purchasing power improves, thus pushing up consumer spending.[6]

Results from the risk premium shock point to short-term ERPT more pronounced in NiGEM than most estimates would suggest (see for example elasticities from the US Fed SIGMA model in Fisher, 2015). This is an intended property of the model, where all non-commodity import price equations have been calibrated to adjust to the new equilibrium level over four quarters, leading to a full pass-through after one year.

As regards export prices, elasticities are on average larger than most literature findings, pointing to a high pricing-to-market on the part of exporters (low PT). A factor which could explain the difference between NiGEM estimates and microeconomic estimates of the PT of the exchange rate to export prices is the acknowledgment of intermediate product prices, possible at a micro or sectoral level, but not within a macroeconomic model with one productive sector.

Demand elasticities are more in line with standard estimates, ranging from 0.1 to 0.4 for export demand and from 0.1 to 0.6 for import demand over the short run for a 1 per cent deviation of the EER. Over the long term, elasticities are larger than standard estimates, notably for Italy and Spain, which pushes up the Euro Area average. An explanation lies in a larger reaction of the user cost of capital and business investment in those two countries, perhaps more than warranted.

The 'bad' appreciation: a domestic monetary policy tightening

Here, we simulate a new path to the Central Bank intervention rate by changing the nominal target (NOMT) in the monetary policy rule. We use the two-pillar rule which brings the current nominal GDP back to its target level, as shown in equation (2) for the US:

$$\text{usint}_t = \beta_t \text{usint}_{t-1} + \beta_2 \left[\frac{\text{usnom}_t}{\text{usnomt}_t} \right] + \beta_3 \left[\frac{\text{usinf}_t}{\text{usinft}_t} \right] \quad (2)$$

With *usint*: Central Bank interest rate; usnom: nominal GDP; usnomt: nominal GDP target; usinf: inflation expectations; and usinft: inflation target. β_1 and β_2 are set equal to 0.5 and β_3 to 0.7 (as in the Euro Area monetary policy rule).

We build a scenario where a faster-than-expected closing of the output gap puts a positive pressure on US interest rates, eventually pushing up the dollar. We do a similar exercise for the Euro Area.[7]

In a first stage, the monetary policy shock will change the short-term interest rate and, as agents are forward-looking and rational, the long-term interest rate. In a second stage, financial variables will act on the various components of demand, but will also affect supply through new expectations of real factor costs as inflation expectations will be affected by the monetary policy shock.

A monetary policy shock is expected to be more painful to activity than a risk premium shock, as the former implies an instantaneous rise in the Central Bank

Table 1. Impact of different exchange rate shocks on GDP and CPI inflation in the US and Euro Area

	A 5 per cent appreciation of the nominal effective exchange rate prompted by:			
	a fall in the domestic risk premium		a rise in domestic CB intervention rates	
	US	Euro Area	US	Euro Area
N+1				
GDP (% diff. from baseline level)	+0.32	+0.15	–0.90	–1.10
CPI inflation (pp diff. from baseline growth rates)	–0.77	–0.45	–1.42	–0.87
Long term				
GDP (% diff. from baseline level)	+0.59	+1.11	–1.43	–0.38
CPI inflation (pp diff. from baseline growth rates)	+0.03	–0.10	–0.02	–0.15

Source: Author's calculations using NiGEM.

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interest rate. In our scenario, the Fed Fund and 3-month Euribor rates increase by 50bp and 57bp respectively to generate a 5 per cent appreciation in the dollar and euro nominal effective exchange rates. The transmission to consumer prices and growth is rapid and significant for both the US and Euro Area (see table 1). In both countries, the transmission of higher interest rates to investment explains most of the negative impact on activity, with negative spillovers to employment and wages. On average the following year, GDP is 0.9 per cent and 1.1 per cent below the baseline for the US and Euro Area respectively.[8] As in a risk premium shock, the long-run implied pass-through of exchange rate appreciation to consumer prices is lower for the US than for the Euro Area.

To sum up, an ER appreciation originating in a fall in the currency risk premium tends to have a more benign impact on inflation than ER appreciations originating from changes in interest rate differentials. This is because a fall in the risk premium reflects improving agents' expectations on future growth, allowing companies to avoid lowering prices despite a dearer currency. This is consistent with aforementioned results from Forbes and Coeuré. Moreover, NiGEM simulation results point to the possible occurrence of GDP increases as the fall in the risk premium induces more investment.

4.2 Macroeconomic impact of the dollar and euro shocks

Based on the decomposition of the dollar and euro fluctuations described in section 3 and NiGEM ERPT of different types of exchange shocks described in section 4.1, we build a scenario where the dollar and the euro experience different types of shocks and assess their impact on US and Euro Area GDP growth and inflation.

The shocks and their calibration are as follows:[9]

- Based on the observed evolution of the dollar NEER and the respective contributions of the US trading partners, the three shocks at the root of the dollar depreciation are weighed as follows: 60 per cent stemming from a fall in the euro and renminbi risk premia, 25 per cent generated by changes in relative interest rate differentials between the US on one side and Canada and Mexico on the other, and 15 per cent due to a higher risk premium attached to the dollar, reflecting mounting worries on the US fiscal and external positions.

  Elasticities described in section 4.1 are then used to measure the impact of the dollar depreciation on GDP and inflation. We assume that results on the risk premium shock are symmetric and can be applied to a rise, instead of a fall, in the risk premium attached to the dollar, observed towards the end of the period. On top of elasticities shown in table 1, we run two more shocks:

  (i) A monetary policy shock leading to an appreciation of the Mexican peso and the Canadian dollar, assumed as one of the three underlying factors of the dollar depreciation. Based on the approach described in section 4.1, we build a scenario where a faster-than-expected closing of the output and employment gap puts positive pressure on Mexican and Canadian interest rates, pushing the NEER of the Mexican peso and Canadian dollar up by 5 per cent and the NEER of the US dollar down by 2 per cent (25 per cent of the observed 8 per cent depreciation of the US dollar over the period);

  (ii) A fall in the risk premium on the renminbi, assumed as one of the three underlying factors of the dollar depreciation. Together with the fall in the euro risk premium, we rescale both shocks in order to get a 4.8 per cent dollar depreciation (60 per cent of the 8 per cent observed depreciation of the NEER of the dollar over the period), as a result of both the euro and renminbi risk premia induced appreciation.

- A simpler approach is implemented to reproduce the euro NEER fluctuations, mostly triggered by changes in FX sentiment, positive on the euro and negative on the dollar. The respective shares of the shocks are 75 per cent and 25 per cent and stem from the observation that if the euro appreciation vis-à-vis the dollar was mostly triggered by positive news coming from the Euro Area between January and December 2017, the reverse is true for the early part of 2018 when the euro appreciation appeared to have stemmed mostly from dollar weakness. Short-term elasticities shown in table 1 are used for the earlier part of the period, while spillovers of a dollar risk premium rise are used for the later part. More specifically, in NiGEM, a 5 per cent depreciation of the dollar triggered by a rise in the risk premium attached to the currency translates into a 2 per cent appreciation of the NEER of the euro, which is what we observed in the first two months of 2018. In NiGEM, this translates into EA GDP growth gaining an extra 0.1pp, while EA inflation is cut by 0.3pp.

According to our calculations and NiGEM simulations, the 8 per cent depreciation of the dollar between

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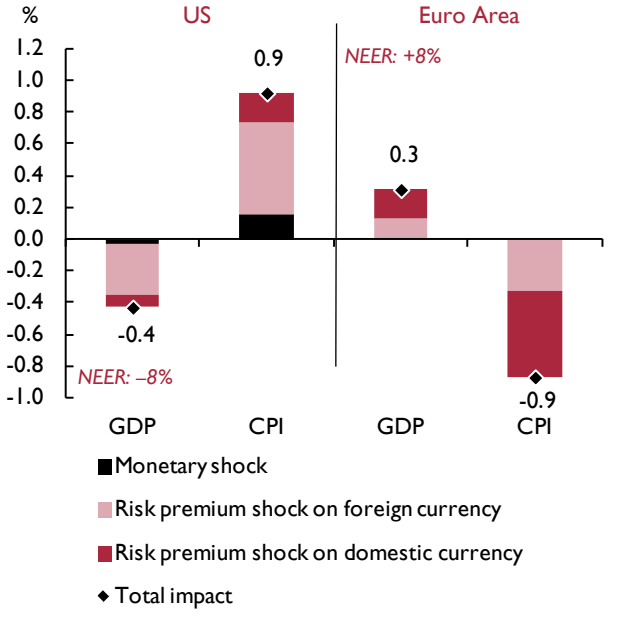
January 2017 and February 2018 would have actually subtracted 0.4pp from GDP growth in the US over the period considered, while adding 0.9pp to inflation (see figure 4). The rise in the dollar risk premium has a direct negative impact on the user cost of capital, pushing down investment demand on the part of businesses and households. The impact of the risk premia decline of trading partners' currencies is less instantaneous and more indirect, coming from higher imported inflation (+0.6pp in the current year) and issuing tighter monetary policy (interest rates up 30 and 20bp on average in the current year). The weakening of the dollar due to a stronger Mexican peso and Canadian dollar reinforces external inflationary pressures and the tightening of monetary policy. The impact on activity is slightly negative, as higher interest rates more than offset the positive impact of a weaker dollar on exports.

The case for the euro is more straightforward as, according to our analysis, the appreciation of the currency was mainly triggered by changes in foreign exchange market sentiment.[10] For the period as a whole, the 8 per cent appreciation of the nominal effective exchange rate of the euro would have, according to NiGEM metrics, added 0.3 per cent to Euro Area growth, while subtracting 0.9 per cent from the price level. The main channels of transmission on GDP are improved economic sentiment inducing lower user cost of capital and higher investment. Moreover, by allowing a sustained accommodative monetary policy stance, lower imported inflation reinforces the positive impact of the euro appreciation on activity.

Figure 4. Exchange rate changes since January 2017: impact on US and Euro Area GDP and inflation



Source: Author's calculations using NiGEM. NEER stands for Nominal Effective Exchange Rate. The bars show the respective contributions of the shocks (monetary and risk premia) to GDP growth and inflation.

5. Conclusion

The nature of the shock matters, indeed. According to our estimations, the depreciation of the dollar since January 2017 did not bring about extra growth as would have been expected according to the usual exchange rate pass-through. The reason is that the dollar depreciation was partly caused by a rise in the risk premium attached to the currency, thereby pushing up financing costs for households and businesses. Another important channel to the ER shock is inflation. As shown in table 1, the ER pass-through to prices in NiGEM is above average estimates, while playing an important role in the transmission of the ER shock to policy and demand variables. As a result, our estimation of the ERPT to activity could be an upper limit. Nevertheless, the exercise points to the importance of the source of the ER shock and a weaker currency, in this particular case, turns out to be no recipe for stronger growth.

As for the EA, the 8 per cent appreciation of the nominal effective exchange rate of the euro would have added 0.3 per cent to Euro Area growth in 2017–18, which is also contrary to usual ER shock estimations. The same limitations as above apply but the results are consistent with previous research pointing to the importance of the nature of the ER shock.

There are numerous caveats to the results, however, and results should be interpreted with caution.

First, NiGEM being a structural model, the simulation results depend heavily on the model estimated elasticities and parameters. As a result, disparities in the ERPT will derive not only from the type of exchange rate shock, but also from two kinds of structural features: those reflecting modelling assumptions embedded in the model and those reproducing the structure of the economy (for example the weight of import prices in consumer prices). When comparing the pass-through of different types of ER shocks within a country, this is of minor significance. But this is less true when comparing ERPT across countries.

Second, the initial condition matters for the simulation results. Indeed, exchange rate depreciations tend to have

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more impact when economic slack and available capacity in the economy is high, giving scope for production and exports to expand following a rise in foreign demand associated with the fall in the currency.

Third, the identification of the underlying sources of the dollar and euro fluctuations is based on the observation of the contributions of counterpart currencies and not on exchange rate models *per se*. The international role of the dollar is another feature not accounted for in the study, which could leave unexplained a part of currency fluctuations linked to capital flows.

NOTES

1 The Marshall-Lerner condition is fulfilled if a currency depreciation results in an improvement of the trade balance. It generally implies that the absolute sum of the long-term export and import demand elasticities is greater than 1. The paper considers the full Marshall-Lerner conditions, i.e. taking into account not just the sum of the export and import quantity elasticities, but also the reaction of export and import prices.
2 See IMF October 2017 *World Economic Outlook*.
3 In this article we use the 2010–12 update of the trade matrix weights.
4 The shocks are run independently. The exchange rate being calculated relative to the dollar, the US risk premium shock is derived as a shock to all other economies in the model. The 5 per cent subsequent rise in the NEER is equivalent to a 4 per cent ex-post appreciation in real terms for both the dollar and the euro.
5 In NIGEM, inflation is defined as the annual growth rate of the Consumer Expenditure Deflator.
6 Obviously the baseline is important for this type of exercise. At the time the simulations were implemented, the baseline scenario assumed a progressive rise in the FF rate, allowing some monetary space. As for the Euro Area, official rates were assumed at zero over the simulation period, leaving no monetary space. The risk premium shock in the US leads to a 50bp cut in policy rates, as the Central Bank responds to more slack in the economy. For a fair comparison with the EA (stuck at ZLB), we assume that interest rates are left unchanged in the risk premium shock.
7 The shocks are run independently.
8 Again, this is stronger than simulation results from the Fed SIGMA model. But the results are not fully comparable as baseline scenarios may be different.
9 NiGEM being a quarterly model, shocks and model results are now expressed on a quarterly basis.
10 In this we agree with ECB staff research showing that the marked appreciation of the euro vis-à-vis the dollar in 2017 had an increasingly larger exogenous component, which can be associated with changes in the risk premium (see Coeuré 2017).

REFERENCES

Bussière, M., Delle Chiaie, S. and Peltonen, T.A. (2013), 'Exchange rate pass-through in the global economy: the role of emerging market economies', Banque de France WP No. 424.
Bussière, M., Gaulier, G. and Steingress, W. (2016), 'Global trade flows: revisiting the exchange rate elasticities', Banque de France WP No. 608.
Bussière, M., Lopez, C. and Tille, C. (2014), 'Do real exchange rate appreciations matter for growth?', CEPR Discussion Paper No. 9938.
Coeuré, B. (2017), 'The transmission of the ECB's monetary policy in standard and non-standard times', Monetary policy in non-standard times workshop, Frankfurt am Main, September 2017.
Ferrara, L., Hernando, I. and Marconi, D. (eds), (2018), *International Macroeconomics in the Wake of the Global Financial Crisis*, Springer (forthcoming, June).
Fisher, S. (2015), 'US inflation developments', speech at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, Wyoming, 08/2015, available at https://www.federalreserve.gov/newsevents/speech/fischer20150829a.htm.
Forbes, K. (2014), 'The economic impact of sterling's recent moves: more than a midsummer night's dream', speech given in London, October 2014.
—(2015), 'Much ado about something important: how do exchange rate movements affect inflation?', speech given at the 47th Money, Macro and Finance Research Group Annual Conference, Cardiff, September 2015.
Gopinath, G. (2015), 'The international price system', Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, August 2015.

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