

Nominal and real exchange rate movements during the financial crisis

Over the past three years, the international financial markets and the global economy alike were roiled by crisis. Nominal and real exchange rates, which are affected to a similar degree by developments in the financial markets and the real sector, were a kind of seismograph of the various phases of the crisis. This article describes the exchange rate movements of the key global currencies and exchange rate policy responses to the crisis, while at the same time seeking to identify the relevant determinants of each of the different phases of the crisis.

From mid-2007, the financial and economic crisis led to violent exchange rate fluctuations, which impacted quite unevenly on the currencies of major industrial countries, however. Whereas, for example, the euro and the US dollar each underwent a see-saw pattern of appreciation and depreciation, the Japanese yen and the Swiss franc posted considerable net gains. By contrast, the value of pound sterling is now significantly lower than prior to the outbreak of the crisis.

During the financial crisis, exchange rates were determined not only by traditional factors but also, to a major extent, by anxiety among market participants, which led to a flight to safe investments and an unwinding of risky transactions – such as currency carry trades. From December 2009, Greece's severe budget problems also figured prominently in the euro's declining value.

The crisis-related changes in the exchange rate relationships and prices have caused shifts – some temporary, some enduring – in the competitive positions of the most important currency areas. Within the euro area, the differences in the individual countries' competitive positions have, to date, not diminished noticeably for the most part, however.

The tensions in the foreign exchange markets associated with the financial and economic crisis have led in various countries to policy interference in foreign exchange markets, such as intervention and capital controls. Such interference, however, has been restrained compared with past periods of severe global recession and turmoil in the financial markets – such as the Great Depression of the 1930s. Given the resulting virtual absence of exchange rate policy conflicts that hamper economic recovery, this may be regarded as a success.

Exchange rate movements of major currencies during the financial crisis

Tensions in US real-estate market ...

In the summer of 2007, the tensions in the US mortgage market spilled over to the international financial markets. Although, at that time, market participants were still bullish overall about global economic activity, the US economic outlook clouded over given the very advanced stage of the business cycle and the burdens that the crisis was threatening to cause. This gave rise to heightened expectations regarding a reorientation of US monetary policy, thus putting the US dollar under pressure against key currencies. The Federal Reserve did indeed cut interest rates several times starting in September 2007, gradually reducing the interest rate advantage of short-term US dollar-denominated investments against, for instance, euro-denominated counterparts, and leading to an interest-rate disadvantage starting in January 2008. In spring 2008, the effective exchange rate of the US dollar against 21 trading partners hit an all-time low. Amidst the great tension in the UK financial system, the pound sterling likewise came under massive downward pressure in autumn 2007. Unlike the US dollar, however, the pound sterling had previously been quite strong.

... initially put US dollar under selling pressure ...

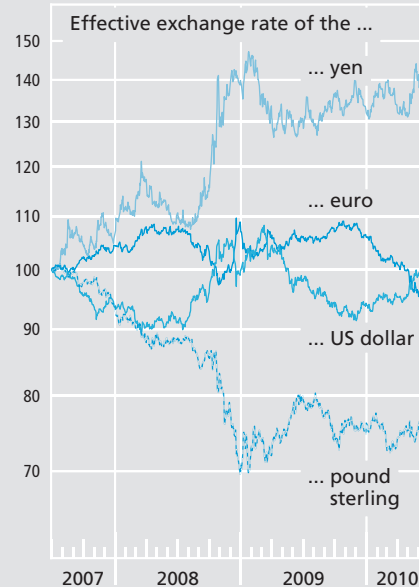
... and also put pressure on pound sterling in autumn 2007

Envelopment into a global financial and economic crisis in summer 2008 ...

The US dollar's downward slide was brought to an abrupt halt in mid-July 2008, when it became clear that the financial crisis had reached a second stage in which it would increasingly encroach into the real sector in all major currency areas. In addition, the Lehman Brothers bankruptcy in September 2008 triggered a massive global shock to confidence.

Effective exchange rates of key currencies *

29 June 2007 = 100, log scale, daily data



* Calculated against the currencies of 21 countries.

Deutsche Bundesbank

The upshot was a considerable decline in risk appetite on the financial markets and a withdrawal of funds, especially from emerging market economies, by internationally active investors.

The US dollar derived particular benefit from the fall in risk appetite, as investment in this currency area was regarded as particularly liquid and low-risk (a "safe haven") despite the fact that the United States was the epicentre of the crisis. In addition, the repatriation of investment to the United States and banks' mutual distrust – especially with regard to cross-border lending – led to a "dollar shortage", in response to which the Federal Reserve concluded swap agreements with several other central banks, including the Eurosystem.

... associated with considerable recovery of US dollar

Owing to its role as a “safe haven”, the Swiss franc also appreciated markedly during that period. After briefly falling, owing, among other things, to intervention by the Swiss central bank in the foreign exchange markets, the Swiss franc subsequently continued its upward movement – initially, in part, even despite further intervention.¹ The Swiss franc is one of those currencies that emerged from the crisis with a massive increase in its value.

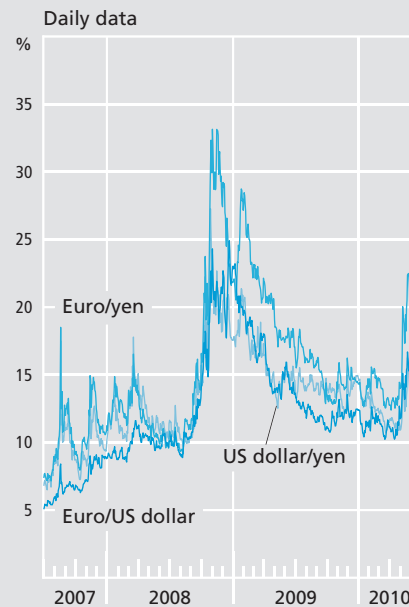
Unwinding of risky carry trades strengthened yen, ...

Aside from the diminishing risk appetite, the growing tension in the financial markets during this second phase of the crisis was associated with exceptionally high exchange rate volatility, which resulted not only in Japanese households and firms scaling back their overseas investments but also a massive unwinding of currency carry trades and a significant (effective) appreciation of the yen. On a weighted average against 21 trading partners, the yen, after having previously already tended upwards – amidst sharp fluctuations – gained around 35% in value between end-July 2008 and end-January 2009.

... yet pound sterling plunged ...

In contrast to the US dollar, the pound sterling continued its slide until the end of 2008. The pound sterling’s slump had two causes. One was the major importance of the financial industry for the UK economy, where the situation continued to deteriorate in the autumn months of 2008 with the collapse of Lehman Brothers. The other was that the Bank of England cut interest rates sharply in November and December 2008, intensifying selling pressure on the pound sterling. Overall, the pound fell by just under 25% on a

Implied volatility of foreign exchange options of key currency pairs



Source: Bloomberg.

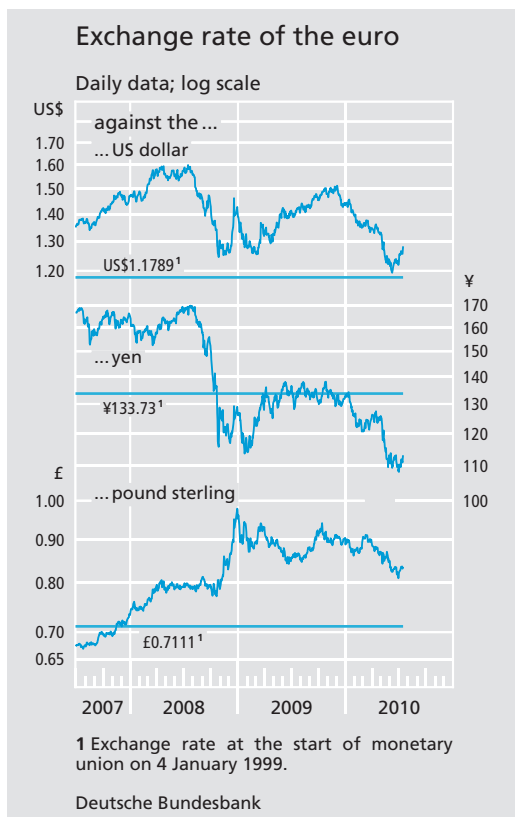
Deutsche Bundesbank

weighted average against 21 trading partners over the course of 2008.

In the late summer of 2008, the euro – following many years of upward drift and a surge in the first phase of the crisis – initially fell distinctly in effective terms against 21 trading partners upon news that the global spillover of the financial crisis had caused the euro-area economic outlook to grow considerably dimmer. The most severe losses were sustained against the US dollar and the yen. The euro’s slump persisted until October 2008, when the euro was down to as low as US\$1.25 and ¥116, and was thus 22% and 32% respectively below its highs in July 2008.

... and euro initially sustained significant losses

¹ For more on the Swiss central bank’s exchange rate policy during the crisis, see also p 53.



Euro-US dollar rate soared towards end of 2008

Whereas the euro-yen exchange rate subsequently fluctuated in a corridor of between ¥117 and ¥128 without a clear trend, the expansionary monetary and fiscal policy in the United States led to a renewed appreciation of the euro against the US dollar. For instance, in mid-December the euro, following the Federal Reserve's move to a "zero-interest" policy, soared from US\$1.30 to more than US\$1.46 within a period of just six trading days. However, that still left it slightly more than 8% below its high in July 2008. The euro also picked up noticeably in the autumn months against the pound sterling and other currencies that had been particularly affected by the slump in global economic activity and global trade. On balance, the euro appreciated in effective terms by 2½%

Effective exchange rate of euro at new peak

over the course of 2008 and reached its peak to date in mid-December.

In the second quarter of 2009, government assistance for the financial sector, extensive economic stimulus packages and central banks' support measures in the key industrial countries led to a stabilisation of global activity and a gradual recovery in the financial markets. Exchange rate volatility – which is usually cited as a measure of uncertainty in the foreign exchange markets – likewise receded distinctly over the course of 2009, and most currencies, especially those of many east Asian countries and some commodity exporting nations, successfully recovered a large percentage of their losses. The Chinese renminbi, however, was largely detached from this development; in the second half of 2008 the Chinese monetary authorities, having allowed a trend appreciation against the dollar between July 2005 and July 2008, largely re-pegged the renminbi to the US dollar. Only since June 2010 has China again been making somewhat greater use of the envisaged fluctuation margin of the renminbi, causing the Chinese currency to appreciate slightly on balance.

Financial markets gradually calmed down in spring 2009

Now that the financial markets have calmed down, risk appetite, and thus also currency carry trade activity, are likely to have gone back up. According to market participants, this has put the US dollar, which has been increasingly used as the currency for funding such trades owing to lower US interest rates, under downward pressure. At the end of 2009 the dollar was trading at just under 10%, on a weighted average, below its level

at the end of March 2009, but was still 5% above its low of March 2008. As the financial markets calmed down, the pound sterling also stabilised in the spring and summer months of 2009; however, owing to unfavourable economic data and the high consolidation pressure in the United Kingdom, some of these gains were surrendered as the year progressed.

Renewed turmoil in financial markets caused by Greece's budget problems

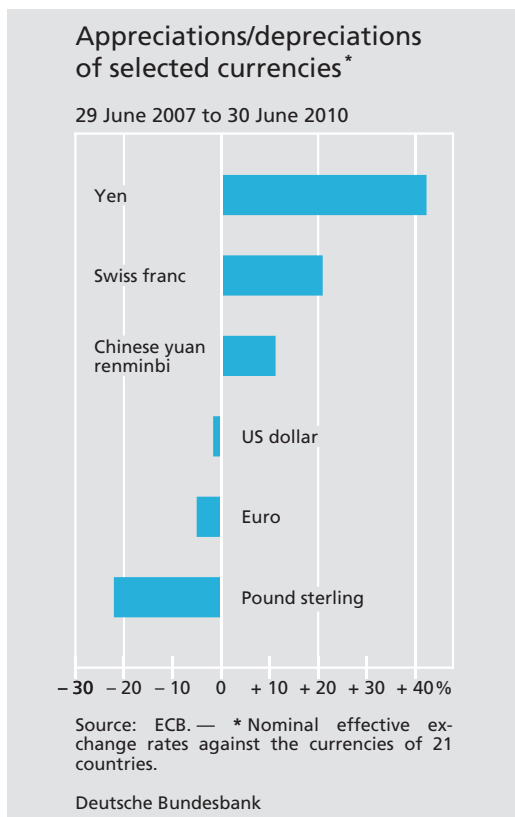
Since December 2009, events in the foreign exchange markets have been crucially shaped by the financial crisis that befell Greece. Greece's looming financial difficulties and fears of contagion to other euro-area countries led in the spring of 2010 to considerable tension in the financial markets and caused volatility in the foreign exchange markets to go back up. The euro was at the centre of all these events. On a weighted average, it depreciated by 12½% between December 2009 and end-June 2010, recording particularly large losses against the US dollar, the Australian dollar, the Canadian dollar and many east Asian currencies. In early 2010, the US dollar also benefited from the announcement of unexpectedly strong US growth figures for the final quarter of 2009 and the expiry of special monetary policy measures to supply liquidity to the US financial sector. Towards the middle of 2010, the US dollar was trading around 7% higher, on a weighted average, than its level at the end of November 2009. Its gains against east European currencies – as well as against the euro (+22½%) – were particularly strong. The yen likewise rose significantly against the euro (+19½%) following the outbreak of the debt crisis in Greece; its effective gains, however, remained relatively low at

3%. Despite the difficult budgetary situation in the United Kingdom, the pound sterling also rose perceptibly against the euro (+11½%) from the end of November. These gains contrast with other considerable losses, especially against the US dollar; the pound sterling's effective recovery therefore only amounted to 3%.

All in all, the yen and the Swiss franc, in particular, have thus undergone a particularly sustained shift in their exchange rate relationships since the beginning of the financial and economic crisis. In effective terms, the yen was around 42½% higher and the Swiss franc around 21% higher in mid-2010 than at the end of June 2007; they thus also quite distinctly exceeded their average values over the 2003-2006 pre-crisis period (20½% and 15% respectively). The pound sterling underwent equally marked changes – albeit in the opposite direction. It depreciated massively during the financial crisis; at the end of June of this year, it was trading at 22% below its level three years earlier. Compared with these significant exchange rate effects, the impact of the crisis on the euro and US dollar has remained muted, on balance. The euro depreciated by 5% over a three-year period ending in mid-2010, falling to just under its average for the pre-crisis period. At the end of June 2010 the US dollar was trading only around 1½% below its mid-2007 level but a perceptible 10% above its 2003-2006 average.

Sustained shifts in exchange rate relationships

The impact of these exchange rate changes on the price competitiveness of some individual currency areas will be examined in depth



beginning on page 49. That will be preceded by a detailed analysis and assessment, using econometric methods where possible, of the quantitative importance of various factors which can be assumed to have played a key role in exchange rate movements during the financial crisis. These factors are, specifically, safe-haven flows, carry trades and the Greek debt crisis.

Key factors influencing exchange rate movements during the financial crisis

The role of the US dollar as a "safe haven"

After the US mortgage crisis had ballooned into a global financial crisis by the summer of 2008, and the worldwide economic outlook had accordingly worsened, many observers noted that the US dollar tended to appreciate

upon the announcement of negative economic figures on both sides of the Atlantic. Strikingly, even some negative reports about the US economy strengthened the dollar. This trend, which at first glance appears to be something of a paradox, was repeatedly reported in the press as being the result of portfolio shifts by international investors who, on the heels of rising uncertainty in the financial markets, increasingly "fled" to safe and liquid assets in the dollar zone.²

Provided that heightened uncertainty in the financial markets is reflected in a rise in stock market volatility, a potential relationship between various bilateral exchange rates to the US dollar and the implied volatility of the Standard & Poor's 500 index can provide an insight into the role of the US dollar as a "safe haven" (see box on page 46). If the change in the exchange rate of the US dollar to the euro and the pound sterling is regressed on the change in this measure of uncertainty, one finds that, for the period starting in July 2008, in which "safe haven" considerations are alleged to have played an important role, a statistically significant relationship does indeed exist. In line with the "safe haven" hypothesis, a rise in stock market volatility is therefore associated with an appreciation of the US dollar against the euro and the pound sterling.

Alongside the euro and the pound sterling, the yen has also been included in the analysis, as its character as a funding currency for

² A detailed analysis is contained in M Fratzscher (2009), What explains global exchange rate movements during the financial crisis?, ECB Working Paper No 1060.

carry trades enables a more complex picture to emerge.³ The mechanism is found to have the opposite effect for the US dollar-yen rate: as the volatility of the stock markets rises, the US dollar increasingly comes under pressure to depreciate against the yen. In the yen-US dollar market, the search for safe investments is apparently being overcompensated by another effect as, before the escalation of the financial crisis in the late summer of 2008, international investors had been funding investments in the low-interest-rate yen. The reduction in the resulting exposure in response to the crisis-related market uncertainty tended to put the yen under pressure to appreciate. This effect, frequently associated with the unwinding of carry trades, will be described in more detail in the following paragraph.

*The currency
carry trade
strategy*

In a currency carry trade, funds are borrowed in a low-interest-rate currency and invested in a higher-interest-rate currency.⁴ The open foreign currency position is intentionally left unhedged. The yield on a carry trade is thus composed of the secure interest rate differential and the insecure, actual exchange rate change. A carry trade loses money if the interest rate advantage is overcompensated by a fall in the high-interest-rate investment currency. However, if uncovered interest parity (UIP) is fulfilled (ex post), the interest rate gain is exactly offset by a loss from the depreciation of the high-interest-rate currency; even in this case, the transaction costs alone would make a carry trade strategy pointless. Disregarding transaction costs, a carry trade strategy is always profitable if the exchange rate does not change. Under those condi-

tions, the yield on the carry trade corresponds exactly to the interest rate differential. By contrast, if the high-interest-rate currency appreciates, the transaction is doubly profitable: firstly, through the interest rate advantage, and secondly, through the appreciation of the high-interest-rate currency.

Carry trades could influence exchange rate movements inasmuch as the exchange of funds borrowed in a low-interest-rate currency into a higher-interest-rate currency should tend to strengthen the latter. In addition, the observation of a tendency for an already higher-interest-rate currency to appreciate can also attract additional investors (herding behaviour). Conversely, the unwinding of a carry trade will tend to cause the higher-interest-rate currency to depreciate, thereby potentially leading more investors to withdraw from the currency in question.

The distinct appreciation of the yen in the second half of 2008 – especially against the high-interest-rate Australian dollar and New Zealand dollar – led many observers to suspect that international investors, in response to the increased volatility in forex markets,

*Potential repercussions of
carry trade
strategies on
the exchange
rate*

*Incomplete
data*

³ In C Christiansen, A Rinaldo and P. Söderlind (2009), The time-varying systematic risk of carry trade strategies, CEPR Discussion Paper No 7345, the authors show that the profitability of currency carry trade falls in times of rising financial market risk. Against this background, one may expect that, as uncertainty rises, carry trades will be unwound and the demand for yen will rise.

⁴ Carry trades have also made their way into the economic literature. See the articles by M Brunnermeier, S Nagel and L Pedersen (2008), Carry trades and currency crashes, NBER Macroeconomics Annual 2008, pp 313-347; C Burnside, M Eichenbaum, I Kleshchelski and S Rebelo (2006), The returns to currency speculation, NBER Working Paper No 12489; R Clarida, J Davis and N Pedersen (2009), Currency carry trade regimes: beyond the Fama regression, NBER Working Paper No 15523.

Determinants of exchange rate developments during the financial crisis: econometric studies

The role of the US dollar as a safe haven currency

In order to assess the role of the US dollar as a safe haven currency, the percentage appreciation of the US dollar against the euro, the pound sterling and the yen is regressed on the change in the Chicago Board Options Exchange Volatility Index (VIX). The indicator is constructed as the implied volatility of the Standard & Poor's stock index (30 days) and, as a measure of global investor risk, is designed to model the level of global investor uncertainty during the financial crisis. In order to control for general forex market developments, the change in the interest rate differential between the currencies (three-month Euribor and Libor) is considered as a further regressor. This produces the following estimation method

$$\Delta s_t = \beta_0 + \beta_1 \Delta(i_t^{US} - i_t^*) + \beta_2 \Delta VIX_t + u_t, \quad (1)$$

where i_t^* represents the Euribor or Libor rates of the euro, pound sterling or yen. The estimation period begins in mid-July 2008 when the effective exchange rate of the US dollar swung into an upward trend and uncertainty on the forex markets increased markedly. The estimation results are summarised in the table below.

Estimation results for the safe haven hypothesis

Daily data for the period 15 July 2008 to 30 June 2010

Coefficient	US\$/€	US\$/£	US\$/¥
β_0	0.05 (1.21)	0.05 (1.16)	-0.03 (0.91)
β_1	0.21 (0.12)	0.69 (0.65)	1.91 (1.77)*
β_2	0.07 (5.89)***	0.08 (4.06)***	-0.07 (3.57)***
R^2	0.06	0.06	0.06

Notes: ordinary least squares estimation with Newey-West correction; * (***) statistically significant at the 10% (1%) level. US dollar exchange rates given as indirect quotation (units of the foreign currency per US dollar).

While the coefficients β_0 and β_1 are not statistically significant at the 5% level, the exchange rate appears to react as expected to volatility shocks. The β_2 coefficient has a positive sign for both the euro and the pound sterling and is statistically significant. The development in the value of both currencies could certainly have been influenced by safe haven considerations. In the case of the yen, the sign is negative, however. An increase in risk thus tends to cause the yen to appreciate against the US dollar. It is possible that the

¹ As described in more detail in the main article, carry trades are not statistically recorded, meaning that a direct analysis of their influence is not possible. Instead the article looks at the carry-to-risk ratio (CtR), which is a measure of the superiority of carry trades and thus can be regarded as an indicator for the extent of such activities. — ² If the

search for safe investments is overcompensated by the reduction in exposure from carry trades, which are typically funded using low-interest-rate currencies such as the yen. This reaction in international portfolios to the uncertainty in the financial markets caused by the crisis is investigated below.

The importance of carry trades for exchange rate developments

The carry trade argument was mentioned in the press, in particular when describing the evolution of the yen as a funding currency. However, it was also mentioned on several occasions in discussions regarding high-interest-rate investment currencies such as the Australian dollar. The following analysis thus takes the following exchange rate relationships as examples: euro/yen, US dollar/yen, US dollar/Australian dollar and yen/Australian dollar. First-differencing yields daily percentage appreciations and depreciations which are then compared with the change in the carry-to-risk ratio (CtR), defined as the relationship between the interest differential and the exchange rate risk.¹ Under the assumption of static exchange rate expectations, CtR reflects the expected standardised return from carry trades and is a risk-adjusted measure of the superiority of carry trades over other investment forms.² If carry trades have actually initially brought about an appreciation of the higher-interest-rate currency against the lower-interest-rate currency and this process was reversed after the onset of the financial crisis, the change in the exchange rate should be positively correlated with the change in CtR. In the estimation equation

$$\Delta s_t = \beta_0 + \beta_1 \Delta CtR_t + \varepsilon_t \quad (2)$$

β_1 is significantly positive, where Δs_t represents the percentage appreciation of the higher-interest-rate currency and ΔCtR_t represents the change in CtR. The estimation is based on daily data from the beginning of 2004 to mid-2010. CtR was calculated using the (3-month) Libor for the yen, US dollar and Australian dollar and the 3-month Euribor for the euro, and the respective implied volatilities of forex options with a maturity of three months. Owing to the heteroscedasticity of high-frequency exchange rate data, the Newey-West correction was used in the ordinary least square estimates. The results are shown in the table below.

There is a statistically significant β_1 coefficient with the expected positive sign for all currency pairs. An increase in the interest advantage is thus consistent with appreciation, while

exchange rate risk is disregarded, a positive correlation between the change in the exchange rate and the change in the interest differential could also clearly be interpreted as an initial exchange rate reaction (as defined in interest parity theory) which generates the equilibrium expected exchange rate changes. — ³ On the one hand, higher-

Estimation results for the carry trade hypothesis

Daily data for the period 2 January 2004 to 30 June 2010

Currency pair	β_0	β_1	R^2
€/¥			
2.1.2004-15.7.2008	0.0002 (1.14)	0.20 (11.85)***	0.15
16.7.2008-30.6.2010	- 0.0003 (0.60)	0.79 (6.94)***	0.18
US\$/¥			
2.1.2004-15.7.2008	- 0.00002 (0.17)	0.18 (9.03)***	0.18
16.7.2008-30.6.2010	- 0.0001 (0.44)	0.67 (5.88)***	0.21
US\$/A\$			
2.1.2004-15.7.2008	0.002 (1.13)	0.42 (6.53)***	0.09
16.7.2008-30.6.2010	0.00001 (0.03)	0.62 (6.84)***	0.14
¥/A\$			
2.1.2004-15.7.2008	0.0002 (0.99)	0.07 (5.13)***	0.05
16.7.2008-30.6.2010	- 0.00003 (0.05)	0.83 (6.71)***	0.20

Notes: ordinary least squares estimation with Newey-West correction;
*** statistically significant at the 1% level.

an increase in exchange rate risk causes the higher-interest-rate currency to depreciate. In addition, an R^2 value of between 0.05 and 0.21 indicates a, to some extent, high explanatory power for daily data. Along with the identification of an econometric relationship between the two variables, the effects of the financial crisis on carry trade mechanisms are also of interest. The data set was therefore split into two sub-periods for the estimation. As discussed earlier, the changes in the forex markets as a result of the financial crisis began in mid-July 2008. Thus, 15 July 2008 marks the boundary in the data set between the pre-crisis and crisis periods. The clear increase in the β_1 coefficient for all currency relationships points to an increasing sensitivity of exchange rates to changes in Ctr. This can be reconciled with the observation that the losses in value, for example of the yen against the euro between 2004 and mid-2008, were corrected within half a year.

The influence of the Greek debt crisis on the euro exchange rate

In order to examine the influence of the Greek debt crisis on the euro, the change in the euro exchange rate against the US dollar is regressed on the change in the differential between returns on Greek government bonds and German Federal bonds. In order to control for general forex market developments, the VIX mentioned above is considered as a further regressor. The change in the interest differential be-

order lags are statistically insignificant. On the other hand, the equation was re-estimated without a constant; the result was that the coefficients remain largely unchanged. — 4 The spread has actually increased by 2¼ percentage points since 22 October 2009 (as at 9 April 2010), which under the assumptions taken, results in a devaluation of

tween the euro and the US dollar (3-month Euribor/Libor) is included in the equation as an additional control variable and is used as a proxy for news relevant to the forex market. This produces the following estimation method

$$\Delta s_t = \beta_0 + \beta_1 \Delta(i_t^{US} - i_t^{EUR}) + \beta_2 \Delta VIX_t + \beta_3 \Delta SPREAD_t + u_t, \quad (3)$$

which is an extension of equation (1).

The estimation is based on daily data from 22 October 2009, the day on which the newly elected Greek government announced the revised budget deficit, to 9 April 2010, the day before the EU/IMF rescue package for Greece was approved. The estimation results are summarised in the table below.

Estimation results for the Greece hypothesis

Daily data for the period 22 October 2009 to 9 September 2010

Coefficient	€/US\$ exchange rate
β_0	- 0.03 (0.57)
β_1	- 46.14 (2.82)***
β_2	- 0.08 (2.05)**
β_3	- 0.80 (2.78)***
R^2	0.14

Notes: ordinary least squares estimation with Newey-West correction;
** (***) statistically significant at the 5% (1%) level. Euro/US dollar exchange rate quoted indirectly (units of US dollar per euro) which, in comparison with the results in table 1, implies different signs of the coefficients.

While the β_0 coefficient is not statistically significant, the exchange rate reacts both to changes in the interest rate and, as already shown above, to safe haven flows. The β_2 coefficient has the expected sign and is statistically significant. A significant influence on the part of Greek government bond spreads is also observable. Under the assumption of linear independent regressors, the β_3 coefficient can be interpreted in such a way that the euro records a fall of 0.8% against the US dollar when the spread increases by one percentage point.³ The influence is thus clearly economically significant.⁴ Estimations over a longer period show, however, that the effect seems to be fading slowly, particularly after the rescue package for Greece in April and after the introduction of the ECB's Securities Market Programme at the beginning of May.⁵

the euro against the US dollar by just over 2% (or 3 cent). Overall, the euro-dollar exchange rate has fallen by 16 cent since 22 October. — 5 Estimations up to 7 May 2010 show a lower but still significant β_3 of -0.18.

were increasingly unwinding their carry trade positions. However, the absence of sufficient data on the behaviour of key agents, such as hedge funds, makes it difficult to quantify the effects of these investment strategies on the exchange rate.⁵ In addition, a variety of instruments are used to conduct carry trades, which is why they are difficult to identify among international financial transactions – such as are captured in the balance of payments.

Carry-to-risk ratio as an indicator of the extent of carry trades

We will therefore pursue another approach to identifying the influence of carry trade strategies on observable exchange rate movements. The “carry-to-risk ratio” (CtR), defined as the ratio between the interest rate differential and exchange rate risk, may serve as an indicator of the profitability of carry trades, thereby potentially providing some insight into the quantitative significance of carry trades for exchange rate movements. If it is assumed that, as the profitability increases, the extent of these transactions also increases, it is possible to analyse empirically the potential effect of carry trades on exchange rate movements (see box on pages 46-47). In fact, the changes in the exchange rates and CtR for selected currencies do indeed turn out to be positively correlated. The relationship between the two variables apparently intensified following the outbreak of the financial crisis. The establishment of carry trade positions and their subsequent unwinding could therefore quite possibly provide an explanation for exchange rate movements since the middle of the decade, especially since the beginning of the financial crisis.

The decline in the euro’s exchange rate observable since December 2009 has been attributed by market watchers to the debt crisis which emanated from Greece, amongst other factors. The trigger of the crisis was the new Greek government’s dramatic upward revision of the (expected) budget deficit for 2009 on 22 October 2009. Financial market concerns that Greece might not be able to roll over expiring debt instruments led to a sharp increase in risk premiums on Greek government bonds.

Debt crisis in Greece

There had already been a perceptible widening of spreads within the euro area between October 2008 and March 2009 as the financial crisis worsened following the collapse of Lehman Brothers, yet these increases subsequently receded. The escalation of the debt crisis in 2010 then led to an unprecedented dispersion in euro-area yields, with ten-year Greek government bonds earning yields that, at their maximum, reached nearly 13% (1,000 basis points higher than German federal bonds with similar maturities).

The impact of these events on the (bilateral) exchange rates of the euro is the result of fears that plummeting Greek government bond values could once again cause severe difficulties for European banks and destabilise the financial system. In addition, the high risk premiums of some euro-area countries that – in the eyes of market watchers – are facing similar fiscal challenges are reinforcing the threat of contagion. All in all, this may have

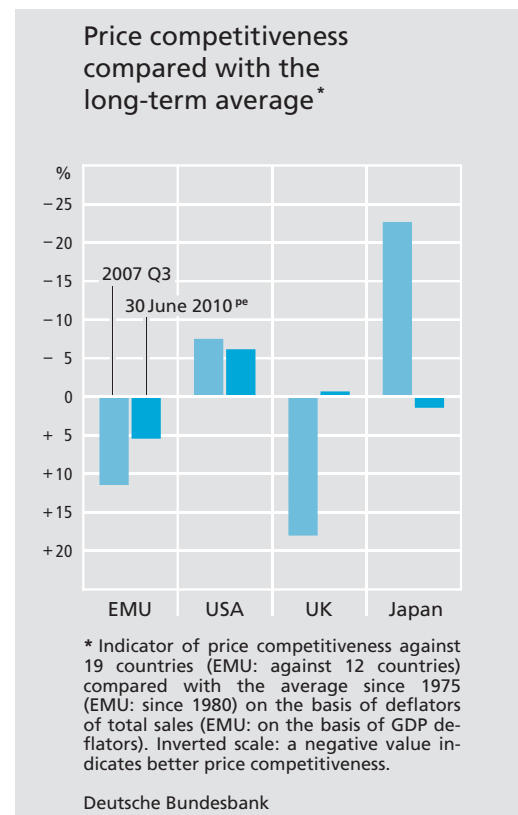
⁵ See G Galati, A Heath and P McGuire (2007), Evidence of carry trade activity, BIS Quarterly Review, September, pp 27-41.

led to a certain reticence about investing in the euro area and may have put a considerable strain on the euro.

An empirical study shows that the interest rate premiums on Greek bonds certainly have had a systematic influence on the euro-US dollar exchange rate (see box on page 47). The euro does indeed fall against the US dollar if the bond spread described above increases. Greece's debt problems have apparently manifested themselves in a less favourable "sentiment" towards the euro, even though this effect appears to have been subsiding of late.

Real exchange rates and price competitiveness

The financial crisis has not only caused major shifts in nominal exchange rates but has also had a considerable impact on the price competitiveness of many currency areas. Whereas the shifts have, in some cases, reversed themselves in some economies, elsewhere the corrections have become more entrenched. Real effective exchange rates, which take into account not only the weighted nominal exchange rate movements against the currencies of key trading partners but also the relevant inflation differentials, are the commonly used indicator of price competitiveness. The financial crisis and the resultant recession in many parts of the world led to a marked decline in goods and asset price inflation; however, it was, above all, the above-mentioned violent fluctuations in nominal

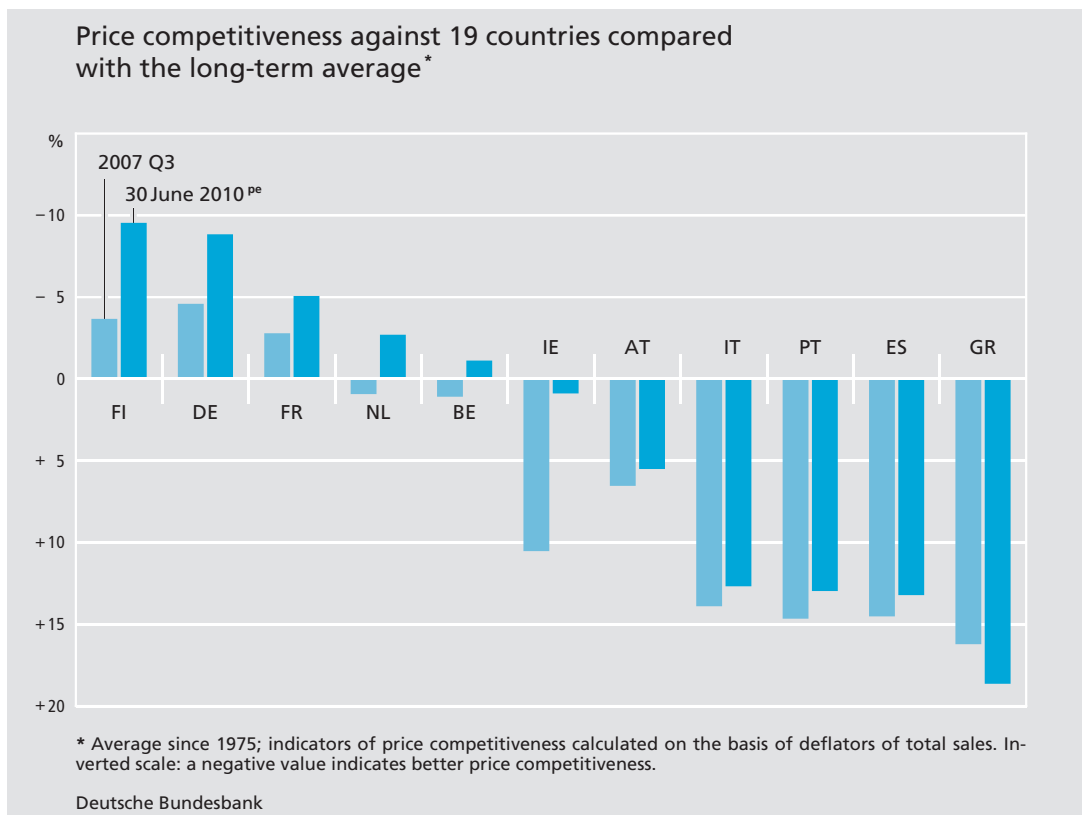


exchange rates which had a major impact on price competitiveness.

Compared with its long-term average,⁶ the current competitive position of the United States is still relatively good despite the recent appreciation of the US dollar; in mid-2010, the US economy is faring around 6% better than its average since 1975. On balance, US competitiveness has thus fallen only slightly (by 1½%) compared with the beginning of the crisis in the third quarter of 2007. However, the indicator was temporarily subject to considerable fluctuation.

Price competitiveness in USA better than long-term average

⁶ For more on the concept, see Deutsche Bundesbank, Purchasing power parity theory as a concept for evaluating price competitiveness, Monthly Report, June 2004, pp 29-42.



Enduring shift in competitive positions of Japan and United Kingdom

The crisis has left a deeper and more enduring imprint on the Japanese and UK real effective exchange rates. The current competitive positions of these two countries are almost on a par with their long-term averages. However, their starting positions at the beginning of the crisis could not have been more different: whereas the Japanese economy's price competitiveness was far above average (+22½%), the United Kingdom's was markedly below its multi-year average (-18%). The adjustment in Japan was due mainly to the yen appreciation in the second half of 2008 outlined above, which was attributable to portfolio shifts by Japanese firms and households and the unwinding of carry trades amidst mounting risk aversion. In the United Kingdom, the slump in the pound triggered by the early collapse in real estate

prices and by the UK economy's heavy dependence on the financial sector shaped events in the first one-and-a-half years of the crisis.

Measured against the strong shifts in competitive positions, such as that of Japan and the United Kingdom, or also against the temporary volatility of the indicator for the United States, the euro area's price competitiveness came away from the crisis relatively unscathed. Compared with its long-term average, the euro area's competitive position remained weak. Although both the euro depreciation in the second half of 2008 and the euro's latest losses in connection with the Greek budget crisis contributed to an improvement in the euro area's price competitiveness (of 5½% on balance since mid-

Crisis had relatively little impact on euro-area competitiveness ...

... yet latest depreciation of euro associated with improvement in indicator

2007), the periods of a falling euro have thus far not been enough to achieve at least an average competitive position. The fact that, of the major industrial economies, only the euro area has significantly unfavourable competitiveness in a long-term comparison (with the deviation at around 5½% in mid-2010) indicates that, in the long view, the latest losses should be seen as a correction of a previously high valuation level.

Competitive positions of euro-area countries remain highly dispersed

In this area, however, major disparities exist between the individual members of European Monetary Union (EMU). At the outset of the crisis, some countries, such as Finland, France and Germany, already enjoyed a high level of price competitiveness against a group of 19 countries from both within and outside the euro area, whereas countries such as Greece, Portugal, Spain, Italy and Ireland were far less competitive.⁷ This high dispersion of competitive positions among euro-area countries has not diminished significantly during the crisis. According to the indicator, Finland and Germany even managed to become more competitive, whereas Greece's competitiveness fell even further.

Germany in good competitive position

The development of the euro's exchange rate contributed to the relative gain in German competitiveness. Germany was affected more strongly by the changes in the euro's exchange rate than most of the rest of the euro area because, as a large and highly open economy, it transacts a relatively large share of its foreign trade with non-euro-area trading partners. The relatively low rate of inflation in Germany has also tended to be beneficial to the competitiveness of its exporting

sector. However, the influence of price competitiveness on the German export sector should not be overstated – the price component has been proving less and less important for German exporters recently.⁸

Of all countries in monetary union, Ireland has seen the largest growth in competitiveness since the beginning of the crisis. This is attributable solely to the perceptibly falling price levels, as Ireland's competitiveness had been put under noticeable strain by the appreciation of the euro against the pound sterling owing to its close trading relations with the United Kingdom. Conversely, Greece's sizeable losses in competitiveness during the crisis can be explained by the fact that its inflation rate is still relatively high.

Competitiveness gains in Ireland, losses in Greece

Measures to restrict exchange rate flexibility as political response to crisis

The tension in the foreign exchange markets brought about by the financial and economic crisis and the asynchronous recovery of the world economy have provoked exchange rate policy measures in various countries. Since the beginning of the crisis, some countries have constrained exchange rate flexibility by means of intervention and restrictions on the free movement of capital. In the following

⁷ See article on pp 17-38 of this report and Deutsche Bundesbank, Current account balances and price competitiveness in the euro area, Monthly Report, June 2007, pp 33-53.

⁸ See K Stahn (2006), Has the impact of key determinants of German exports changed?, in O de Bandt, H Herrmann and G Parigi (eds), Convergence or divergence in Europe? A study on growth and business cycles in France, Germany and Italy, Springer, Heidelberg and New York, pp 359-382.

paragraphs, developments in China, Iceland and Switzerland shall serve to illustrate the broad range of measures taken as well as the underlying economic policy objectives.

Peg of the renminbi to the US dollar

As early as mid-2008, the authorities of the People's Republic of China discontinued the policy they had employed since mid-2005 of gradually permitting the renminbi to appreciate against the US dollar. Though the renminbi's exchange rate was still officially oriented to a currency basket of undisclosed currencies and weights, in actual fact it had been re-pegged to the US dollar, albeit without official comment. However, China's trade ministry had called for such steps to be taken at the time, referring to rising costs to exporters. At that time, the media also reported a connection with the upcoming Peking Olympics, which the authorities did not want to see spoiled by negative business news. Although the crisis may not therefore be regarded as a direct cause of the exchange rate peg, the crisis-related increase in pressure on exports owing to the subsequent global slump in demand is still likely to have played a major role in the continuation of this measure. In June 2010 the People's Bank of China once again started to gradually allow the renminbi to float while maintaining the formal arrangements of the existing exchange-rate regime.

Collapse of banking system and introduction of capital controls in Iceland

The financial crisis had an immediate and lasting impact on Iceland and its foreign exchange market. In the run-up to the crisis, a rapidly growing financial sector coincided with enormous stock market gains, soaring house prices and, at times, a relatively high inflation rate, which not even double-digit

central bank lending rates were able to contain for long. The high interest rates initially favoured capital imports, with which the country was able to finance the massive current account deficit. However, when the three major Icelandic banks encountered liquidity problems in the wake of the financial crisis, ultimately requiring their nationalisation in October 2008, many investors, fearing a government default, pulled large amounts of funds out of Iceland. This put massive pressure on the Icelandic krona, which had already lost more than one-third of its value against the euro over the course of the year leading up to October 2008. The Icelandic central bank initially attempted to break the krona's fall by intervening in the foreign exchange market. On 10 October, however, the central bank already introduced extensive foreign exchange control measures, including instructions to banks to stop using foreign exchange for financial transactions. This effectively brought trading in the Icelandic krona to a halt. Capital controls, which, for instance, require that securities denominated in domestic currency which reach maturity be reinvested in krona and also prohibit earnings from being exchanged into foreign currency, are still in force. According to the findings of the Icelandic central bank,⁹ foreign exchange controls result in financial institutions and large enterprises building up their own foreign currency reserves. One positive outcome that is stressed is that the controls have helped to prevent capital outflows and thus to stabilise the exchange rate, thereby paving the way for interest rate cuts. The controls

⁹ See Sedlabanki Islands, Capital Control Liberalisation, announcement published on 5 August 2009.

were partly loosened in October 2009 to permit capital inflows and the repatriation of the resulting gains.

*Foreign
exchange
market
intervention
in Switzerland*

Switzerland serves as a third example of constraints on exchange rate flexibility during the crisis. Even in the early stages of the crisis, the Swiss franc had already begun to appreciate against the euro, a development to which the unwinding of currency carry trades is likely to have contributed. On 12 March 2009 the Swiss National Bank announced plans to prevent a further appreciation of the franc against the euro by means of foreign exchange market interventions. It justified its decision by stating that appreciation amounted to a tightening of monetary conditions, which was an obstacle to its expansionary monetary policy. By intervening, the Swiss National Bank was attempting to counteract the risk of deflation and a massive worsening of the economic situation. Even though the details of these operations were not disclosed, official statements by the Swiss National Bank have made it perfectly clear that the authorities have henceforth repeatedly sold Swiss franc on the foreign exchange markets; however, these efforts were ultimately unsuccessful in preventing the appreciation of the Swiss franc. With foreign reserves now at a considerably higher level, however, the Swiss National Bank has recently hinted that it intends to discontinue its interventions.

*Capital inflows
in emerging
market
economies ...*

In many emerging market economies, the calming of the financial markets and the cyclical recovery that began in the second quarter of 2009 have led to a resurgence of net

capital inflows. The attendant pressure on the affected currencies to appreciate was seen by many in these countries as problematic, amidst fears that a worsening of domestic price competitiveness would threaten the nascent upswing. In addition, concerns about speculative bubbles in the credit markets and in asset prices, as well as about an abrupt pullout of capital inflows, were being voiced. Reports of major foreign exchange market intervention at the expense of the domestic currency, especially from the emerging economies of eastern, south-eastern and southern Asia, therefore came as no surprise. In October 2009, Brazil introduced a financial transaction tax on foreign investment in domestic debt securities and stocks.

Such measures must be viewed against the background of the monetary policy trilemma, defined as the existence of a trade-off between capital mobility, exchange rate stability and monetary autonomy. Foreign exchange market intervention and capital controls are used to open up scope to pursue the latter two goals. However, since economic recovery is not sufficiently advanced in many industrial countries, which leads them to keep their interest rates low, the incentives for investing across borders in emerging market economies will therefore tend to persist, as will, therefore, the pressure to make monetary policy concessions.

*... and
monetary policy
trilemma*

This has kindled a debate on whether or not to reassess the merits of capital controls. The International Monetary Fund (IMF), for instance, has called into question key elements

*Emerging
debate on
reassessing
capital controls*

of its previous stance on capital controls.¹⁰ The Fund now sees justification for the use of capital controls in a context of high net capital imports in two scenarios. One is a situation where there are macroeconomic considerations which perceptibly constrain latitude in economic policy; and the other is a situation in which there is a risk of excessive domestic credit growth, engendering fears that capital inflows could increase the country's vulnerability to a financial crisis.

Indeed, the events during the financial crisis provide cause for reviewing whether, and to what degree, existing principles, such as that of maximum liberalisation of capital movements, are macroeconomically optimal. However, if they are not, the next question to ask is whether there was a market failure with regard to international capital allocation, since capital controls would be an appropriate policy measure only in that particular situation. By linking the use of capital controls to numerous conditions, the new approach of the IMF is intended to temper the fundamental recommendation of capital controls with restrictions to relevant individual cases. This strategy, however, is of only limited practicability as it is impossible to determine conclusively whether the listed criteria have actually been met. As a case in point, it is often difficult to find a general and unequivocal answer to questions regarding the existence of undervaluation, the proper amount of foreign reserve holdings or the possibilities of fiscal policy consolidation. Fundamental scepticism regarding the use of capital controls as a means of fighting capital imports (as opposed to a case of a genuine crisis) is also engen-

dered by the resultant constraints on an efficient global allocation of investment, the danger of counteractive measures and, most notably, empirical studies which find that capital controls are not able to significantly reduce the volume of capital inflows or to influence the real exchange rate.¹¹

The renewed debate on the advantages of capital controls therefore poses the risk that some countries, citing domestic interests, will use this discussion to justify interference in the international exchange rate system. However, such interference has been limited compared with previous periods of severe global recession and considerable upheaval in the financial markets, such as the Great Depression in the 1930s. Back then, the breakdown of the gold standard among the industrialised world led to a series of devaluations, foreign exchange controls and regimentation of cross-border movements of goods, which had a marked adverse impact on global trade and global growth.

The fact that cases of exchange rate policy intervention have been relatively isolated during the current crisis may certainly be viewed as a success, inasmuch as economic policy conflicts which hamper economic recovery

Sparing use of exchange rate policy intervention prevented further impairment of global trade

¹⁰ See J D Ostry, A R Ghosh, K Habermeier, M Chamon, M S Qureshi and D B S Reinhardt (2010), Capital inflows: the role of controls, IMF Staff Position Note 10/04. As late as autumn 2007 the IMF, by contrast, had emphasised the considerable microeconomic costs and the at best temporary macroeconomic impact of capital controls. See IMF, Box 3.1: Can capital controls work?, World Economic Outlook, October 2007, pp 113-116.

¹¹ See eg Ostry et al, loc cit, and J De Gregorio (2010), Tackling the capital inflow challenge, BIS Review No 72/2010, pp 17-27. Another outcome, though, is that capital controls are often a significant factor in shifting the structure of capital inflows towards longer maturities.

have thus largely been circumvented. If, however, a number of countries were to start using foreign exchange intervention or restrictions as a policy instrument, there would be no denying the danger that the parochial pursuit of national interests could damage the international monetary system. Much like resorting to national protectionism in the real

economy, this development would entail long-run costs which would far exceed the supposed short-run benefits, thereby adversely affecting the global economy in general and the respective countries in particular. One of the lessons from the experience of the Great Depression in the 1930s is that such a development must be avoided at all costs.