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## Current account adjustment in EU countries: Does euro-area membership make a difference?

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# Non-technical summary

In the pre-crisis period, substantial current account imbalances showed up in euro- area member countries. Large deficits in some catch-up countries as well as large surpluses in more developed core countries of the euro area proved to be quite persistent, ie it was only after the euro area was hit by the sovereign debt crisis and severe balance of payments problems that major corrections in the current account imbalances occurred. From a theoretical point of view, there is some evidence that in countries joining a monetary union the current account adjustment mechanism is, indeed, slower and more delayed compared to economies that belong to other exchange rate regimes, as the single monetary policy goes hand in hand with strong interest rate convergence.

This paper evaluates current account dynamics in countries with different exchange rate regimes by explicitly differentiating between countries with flexible and fixed exchange rates. Unlike in other empirical studies, members of a monetary union are also classified separately. The sample covers annual data for all 27 EU countries from 1994 to 2011. The analysis is based on a simple autoregressive model, which is standard in the literature. The impact of the exchange rate regime is modelled, first, by referring to an exchange rate regime classification, and, second, by taking into account the degree of both exchange rate and interest rate volatility.

According to our results, the exchange rate regime does indeed significantly determine the degree to which current account balances of EU member states revert to a mean value that is endogenously determined by the model.

In a nutshell, the paper concludes that current account adjustment is significantly hampered in countries that are members of a monetary union. This holds particularly in comparison with floating exchange rate regimes owing to the lower level of exchange rate flexibility. Furthermore, the persistence of current account balances in member countries of a monetary union is also more pronounced than in fixed-rate regimes due to less flexible interest rates as a result of the single monetary policy.

# Nicht-technische Zusammenfassung

Im Vorfeld der Finanzkrise haben sich in den Mitgliedstaaten des Euro-Raums erhebliche Ungleichgewichte in den Leistungsbilanzen aufgebaut. Die hohen Defizite in einigen Aufholländern, aber auch die ausgeprägten Überschüsse in weiter entwickelten Kernländern des Euro-Raums erwiesen sich als überaus persistent, d.h. erst nachdem der Euro-Raum von der Staatsschuldenkrise in Mitleidenschaft gezogen wurde und mit ernsthaften Zahlungsbilanzschwierigkeiten kämpfte stellten sich deutliche Korrekturen der Leistungsbilanzsalden ein. Aus theoretischer Sicht gibt es in der Tat Hinweise darauf, dass die Anpassung der Leistungsbilanz in Ländern, die einer Währungsunion angehören, langsamer ist bzw. später einsetzt als in Volkswirtschaften mit anderen Wechselkurssystemen. Ausschlaggebend ist die gemeinsame Geldpolitik des Euro-Raums, die mit einer starken Zinskonvergenz einhergeht.

Das vorliegende Papier untersucht Leistungsbilanzanpassungen in Ländern mit unterschiedlichen Wechselkursregimen. Dabei wird explizit zwischen Ländern mit flexiblen und festen Wechselkursen unterschieden; im Unterschied zu anderen empirischen Untersuchungen werden aber auch Volkswirtschaften, die einer Währungsunion angehören, separat klassifiziert. Der Datensatz beruht auf jährlichen Daten aller 27 EU Länder von 1994 bis 2011. Den empirischen Untersuchungen liegt ein einfaches autoregressives Modell zugrunde. Der Einfluss des Wechselkurssystems auf den Grad der Leistungsbilanzanpassung wird berücksichtigt, erstens, anhand einer Klassifikation des Wechselkursregimes und zweitens, anhand der bestehenden Wechselkurs- und Zinsvolatilität.

Gemäß den Ergebnissen des Papiers beeinflusst das Wechselkursregime in der Tat die Geschwindigkeit, mit der die Leistungsbilanzsalden der EU Mitglieder zu einem vom Modell bestimmten Mittelwert zurückkehren. Es zeigt sich, dass die Leistungsbilanzanpassung in den Mitgliedsländern einer Währungsunion signifikant beeinträchtigt ist. Dies gilt in erster Linie im Vergleich zu Ländern mit flexiblen Wechselkursen auf Grund der geringeren Wechselkursflexibilität. Darüber hinaus sind die Leistungsbilanzsalden aber auch persistenter als in Volkswirtschaften mit Fixkurssystem angesichts der geringeren Zinsvolatilität, die das Ergebnis der gemeinsamen Geldpolitik ist.

BUNDESBANK DISCUSSION PAPER NO 49/2013

# Current account adjustment in EU countries: Does euro-area membership make a difference?[1]

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**Abstract**

The paper evaluates current account dynamics in countries with different exchange rate regimes within the EU. In this, the empirical analysis explicitly differentiates between countries with a flexible and a fixed exchange rate regime and members of a monetary union. In addition, we model the adjustment process of external disequilibria by referring to the flexibility of exchange rates and interest rates. The sample covers annual data for 27 EU countries from 1994 to 2011. The estimation is based on a simple autoregressive model and comes to the conclusion that current account adjustment is significantly hampered in countries that are members of a monetary union. This holds particularly in comparison with floating exchange rate regimes owing to lower exchange rate flexibility. However, the persistence of current account balances in member countries of a monetary union is also more pronounced than in fixed-rate regimes due to less flexible interest rates as a result of the single monetary policy.

**Keywords:** Balance of Payments, European Monetary Union, Exchange Rate Regime, Current Account Adjustment, Financial Crisis

**JEL classification:** E52, F32, F33, F34

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# 1 Introduction

The new millennium has seen a substantial divergence between current account balances in the European Union as a whole, including the member countries of the euro area. For a long period of time, most market participants have interpreted growing current account deficits as a risk-free by-product of the catching-up process[2] in fast-growing countries, facilitated by the increasing degree of financial integration. This was especially true for member states of the euro- area that seemed to be protected against national balance of payment crises or speculative attacks.[3] The positive assessment of EMU countries compared to economies outside the euro area appeared to be further corroborated by the outbreak of the global financial crisis in the immediate aftermath of the Lehman collapse in September 2008, because interest rate differentials were still relatively limited in the euro area. However, it proved to be wrong when, finally, the sovereign debt crisis hit the euro area in 2010. Those member countries with the highest deficits in their external balances were affected the most. Then, eventually, major corrections in the current account imbalances took place.

Friedman (1953) pointed out that the exchange rate regime is an important determinant of the pace of current account adjustment. His seminal paper concluded that the mean reversion process of the current account balance within fixed exchange rate regimes might be delayed and abrupt rather than timely and smooth as seems to be the case in flexible regimes. The empirical literature, so far, provides mixed evidence. While some studies come to the conclusion that the degree of exchange rate flexibility does not influence the pace at which current accounts adjust, others support the *Friedman hypothesis* claiming that flexible exchange rates are more suitable for avoiding current account imbalances than fixed exchange rate regimes (Chinn and Wei, 2008; Gosh et al., 2009; Herrmann, 2009; Gosh et al., 2013; Tippkötter, 2010).

Our analysis goes beyond other empirical studies by explicitly taking into account not only flexible and fixed exchange regimes but also possible differences between countries with fixed exchange rates and members of a monetary union. Based on an autoregressive model used in the standard economic literature, we examine whether current account balances of EU member states with fixed exchange rates have adjusted differently from those of countries that had already introduced the euro. This is done not only by referring to a dummy variable but also by assessing the role of interest rate volatility, which should substantially differ between the two regimes: given the single monetary policy and the more marked convergence of

[2] However, Giavazzi and Spaventa (2010) point in another direction and argue that the catching-up process in the euro area does not fit into a classic convergence model, as the behaviour of labour productivity and the declining role of total factor productivity in several of the catch-up countries is a signal of lower future growth and not compatible with a steady inflow of foreign capital.

[3] This view is also implied by the Treaty on the Functioning of the European Union, which only envisages balance of payments assistance for those EU member states that have not yet adopted the euro (Article 143), see Marzinotto, Pisani-Ferry and Sapir (2010).

interest rates in a monetary union, interest rates and price pressures that can contain current account imbalances are dampened. Consequently, current account imbalances in member countries of a monetary union might be more persistent. Ultimately, this could increase the risk of a balance of payments crisis going hand in hand with capital reversals. That is what we actually found in the data.

Indeed, according to our results, the exchange rate regime significantly determines the degree to which current account balances of EU member states revert to their mean values: current account adjustment is fastest in countries with floating regimes given that they have the highest level of exchange rate flexibility. In addition, the current account balances of euro-area member countries are more persistent than in economies with fixed regimes due to the lower interest rate flexibility resulting from the single monetary policy. We found that these characteristics still hold even after the onset of the financial crisis.

The rest of the paper is organised as follows. *Section 2* summarises some theoretical arguments on how current account adjustment works in different exchange rate regimes. In *Section 3* we give a short overview on the empirical literature on current account adjustments and present a summary overview of current account developments as well as the degree of exchange rate and interest rate volatility within the EU before and after the outbreak of the financial crisis. In *Section 4* the model and the data are specified. *Section 5* summarises the main results, *Section 6* sets out some robustness checks and *Section 7* concludes.

# 2 Current account adjustment in different exchange rate regimes

Current account imbalances do not necessarily imply an immediate correction. Rather, adjustment is only enforced when current account deficits (surpluses) are no longer offset by capital inflows[4] (outflows) or a reduction (increase) in official reserves is no longer a politically available option. Only then, ultimately, are current account balances forced to adjust. [5]

In an economy with *flexible exchange rates* any deficit in the balance of current account transactions that is not offset by capital inflows, or – more precisely – the resulting surplus demand for a foreign currency, entails the depreciation in the domestic currency. This has an immediate impact on the financial account, since foreign assets become more expensive and less profitable given that expectations about the exchange rate do not change to the same extent as short-run dynamics (overshooting). Furthermore, the current account will also adjust,

[4] The underlying definition of capital flows comprises all forms of capital except foreign reserves.

[5] Thus, in this section we take into account only those current account deficits that go hand in hand with a balance of payments deficit as they are not offset by capital inflows. The different adjustment mechanisms under review are only effective if these two assumptions are given. Furthermore, we also neglect the case where capital flight is the major determinant of a balance of payments deficit. Rather, our focus is on severe current account imbalances that drive balance of payments crises.

since *ceteris paribus* domestic goods become more price-competitive compared to foreign goods.[6] The functioning of this channel, however, crucially depends on the underlying monetary policy and the flexibility of goods and labour markets (see Friedman, 1953, and Mussa, 1986).

Given that the exchange rate cannot act as an adjustment mechanism within a country with a *fixed exchange rate regime,* it is the interest rate flexibility that contributes to the adjustment of prices via changes in the monetary base. A deficit in the current account that exceeds capital inflows creates an outflow of reserves and implies a reduction of the central bank's monetary base, at least in the longer run when sterilisation is forced to phase out. Domestic interest rates tend to rise, thus mobilising additional capital inflows. In the medium term, domestic prices and wages should fall until international competitiveness is restored and the current account adjusts correspondingly *(see Chart 1)*.[7]

In euro-area member states, this adjustment mechanism seems to be severely hampered. First of all, the highly integrated banking sector allows for a large exposure vis-à-vis other countries which, in turn, could imply that current account deficits might be larger and more persistent. Furthermore, as the ECB´s monetary policy is geared towards the monetary aggregate of the euro area, a deficit country´s national monetary aggregate is not reduced in accordance with the net outflow of private capital. Rather, commercial banks can still cover their refinancing needs through the open market operations of the Eurosystem, with the only limit being the availability of eligible securities. Thus, deficits in private balance of payments transactions are mirrored by the accumulation of liabilities vis-à-vis the Eurosystem (essentially TARGET2 liabilities).[8] Ultimately, the adjustment mechanism in euro-area member states is similar to that of a country with fixed exchange rates that sterilises the outflow of foreign reserves through additional credits to the private sector - with the crucial difference that TARGET2 balances, unlike foreign exchange reserves, can take on negative values and may exhibit persistent downward trends, while sterilisation policies can usually be maintained over a relatively short period of time only.[9]

[6] Ultimately, adjustment takes place via disinflation or deflation and a resulting reduction in the nominal interest rates. The effectiveness of the expenditure switching channel is also affected by the degree of exchange rate pass-through to domestic prices (see http://www.econ.ucla.edu/arielb/handbook.pdf).

[7] For a literature overview on the adjustment processes of the balance of payments under different exchange rate regimes, see Frenkel and Johnson (1976).

[8] See Sinn and Wollmershäuser (2011).

[9] The analogy of TARGET balances with foreign exchange reserves has also been emphasised by Kohler (2012). However, comparing the situation of Greece with the issuer country of the reserve currency misses the fact that Greece cannot determine the monetary policy of the Eurosystem and that in this respect the euro is more like a foreign currency for all member states of the euro area.

**Chart 1: Central bank balance (in the case of a current account deficit in private balance of payments transactions)**

| Fixed exchange rates | | | Fixed exchange rates (sterilising) | | | Monetary union | |
|---|---|---|---|---|---|---|---|
| assets | liabilities | | assets | liabilities | | assets | Liabilities |
| R (↓)<br>D (≈) | MB (↓) | | R (↓)<br>D (↑) | MB (≈) | | [T (↓)]<br>D (↑) | MB (≈)<br>[T (↑)] |

R = Reserves; D = Domestic credit; MB = Monetary base; T = TARGET2 balance (positive or negative, thus: T (↓) or T (↑)).

As a result, interest rate effects at the short end of the yield curve - as expected in a fixed exchange rate regime - are largely eliminated. Furthermore, there is less monetary pressure to adapt prices and the common currency acts as a cushion, at least in the short run.[10] Furthermore, the single monetary policy also narrows interest rate spreads at the long end of the yield curve.[11] This is due to the fact that the marginal lending rate is determined by the single monetary policy, the "non bail-out clause" was not credible and solvency risks of individual member states were underestimated.[12]

From the perspective of a single country, the adjustment of balance of payments imbalances via a reduction of credit supply and rising interest rates starts only when its domestic commercial banks are excluded from the ECB´s open market operations due to a lack of collateral. In the current financial crisis this mechanism, however, is very much weakened by an array of extraordinary non-standard monetary policy measures applied by the euro area such as the Covered Bond Purchase Programme (CBPP), the Securities Markets Programme (SMP) and relaxed requirements for collateral.[13] In a nutshell, euro-area member countries face structural obstacles to a fast current account adjustment process. In the current crisis, the delayed reduction of imbalances has been accentuated by discretionary measures on the part of the Eurosystem.

[10] The current account adjustment in countries joining the euro area is similar to the mechanism in a country with a fixed exchange rate regime and a sterilising monetary policy.

[11] This was evident in the harmonisation of interest rates in the run-up to the crisis magnified by the financial market´s scepticism regarding the enforcement of the EU Treaty's no bail-out clause.

[12] Given the sometimes erratic development of risk premia for market participants, persistent current account deficits may entail rather volatile interest rate adjustments and sudden capital flow reversals. This will impede a soft downsising of external imbalances.

[13] In addition, national central banks can provide liquidity to domestic commercial banks through Emergency Liquidity Assistance (ELA).

# 3 Current account adjustment: review of the empirical literature and stylised facts about the EU

In line with the arguments outlined above, the adjustment mechanism should be different for differing exchange rate regimes. More precisely, we expect exchange rate flexibility to be the main adjustment mechanism in the case of flexible exchange rates, while it is mainly interest rate flexibility that contributes to the mean reversion process in pegged exchange rate regimes. By contrast, within the euro area both mechanisms are assumed to be subdued. In the following we summarise briefly the empirical literature on current account adjustment worldwide before we present some brief description of developments in the EU.

Based on time series as well as panel estimates, Chinn and Wei (2008) pointed out that the degree of exchange rate flexibility does not influence the pace of current account adjustment, at least not to a significant extent. This view was also supported by Decressin and Stavrev (2009). Although they found differences in current account dynamics between euro-area countries and other advanced economies, they were not able to relate these findings to different exchange rate dynamics.

On the other hand, there is also empirical evidence in favour of the Friedman hypothesis. Based on the argument that the exchange rate regime classification of Chinn and Wei (2008) does not adequately capture the degree of exchange rate flexibility, a recent strand of the literature comes to the conclusion that exchange rate flexibility determines the rate at which current account balances revert to their mean values. Gosh, Terrones and Zettelmeyer (2009) point to the importance of non-linear behaviour in current account balances. Based on the existence of threshold effects, they highlighted the way fixed exchange rate regimes add to the build-up of imbalances. Gosh et al. (2013) establish trade-weighted bilateral exchange rate volatilities in order to measure the exchange rate regimes more precisely. As a result, they find more flexible regimes to be associated with faster adjustment in the current account. By referring to a continuous z-score measure of exchange rate volatility, Herrmann (2009) points out that a more flexible exchange rate regime significantly enhances the mean reversion process for current account balances. Furthermore, Tippkötter (2010) argues in favour of a better specification of the Chinn and Wei model. Based on a dynamic panel estimator he emphasises the relevance of the exchange rate regime for the persistence of current account balances. In a similar approach, Berger and Nitsch (2010) show that the introduction of the euro increased bilateral trade imbalances of euro-area members and made them more persistent.

Our analysis goes beyond the literature. The main goal is to measure the pace of current account adjustment by differentiating not only between countries with flexible and fixed exchange rates but also between members of a monetary union and countries with other fixed

exchange rate regimes. In addition, we model the adjustment process for external disequilibria by referring to the flexibility of exchange rates and interest rates.

In the following, this section illustrates current account developments as well as the degree of exchange rate and interest rate flexibility in the EU countries from 1994 to 2011 by explicitly differentiating between the three regimes under review. In order to keep the analysis as clear as possible we restrict the presentation to the EU countries with large current account deficits. According to theory, exchange rate flexibility should differ between fixed and flexible exchange rates while interest rate flexibility ought to be different between fixed regimes and members of the European monetary union.

*First*, we measure the degree of exchange rate flexibility. We follow the reasoning of Gosh et al. (2013) who argue that the traditional exchange rate regime classification does not always capture the exchange rate flexibility directly and, therefore, propose an exchange rate volatility measure.[14] In line with Arratibel et al. (2008), we use the degree of exchange rate volatility by referring to a continuous z-score volatility index proposed by Gosh et al. (2003). Exchange rate fluctuations around an appreciation or depreciation path are taken into account in the following equation:

$$(1)\quad z_t=(\mu^2+\sigma^2)^{1/2}$$

where $\mu_t$ is the arithmetic average of month-to-month percentage changes in the exchange rate in year $t$, and $\sigma$ the standard deviation of the month-to-month percentage changes in the exchange rate in year $t$. Instead of using the nominal exchange rate vis-à-vis the euro, we refer to a nominal effective exchange rate. This is appropriate since we are considering developments in the current account balance as a whole rather than bilateral current account developments.[15]

*Second*, we consider an analogous measure of interest rate volatility. This is appropriate as both countries with fixed exchange rate regimes and members of a monetary union show low (effective) exchange rate volatility. Thus, interest rate volatility should be the main adjustment mechanism in both regimes. Furthermore, according to the theoretical underpinning the current account adjustment process in members of a monetary union is supposed to be different from that in countries with other fixed exchange rate regimes due to subdued interest rate reagibility. The indices are calculated using three-month interbank interest rates provided by Bloomberg and the Bank for International Settlement (BIS).

[14] In contrast to our paper, they include the real exchange rate because that is relevant for the current account. In our view, the nominal exchange rate is more closely related to the exchange rate regime classification.

[15] As far as common trends in the euro area are reflected in the exchange rates of the euro vis-à-vis other currencies, it may still help to adjust current accounts in individual member countries.

The use of exchange rate volatility as well as interest rate volatility as a measure of flexibility[16] is based on the assumption that the countries under consideration, namely the EU countries, are similar enough that they are more or less subject to the same external shocks. Thus, it is assumed that exchange rate volatility as well as interest rate volatility will differ between countries primarily as a reaction to internal developments rather than to external shocks, which seems to be justified in the quite homogenous sample.

Before the outbreak of the global financial crisis in 2007, the growth of current account deficits was most pronounced in emerging EU countries whose currencies were strictly pegged to the euro (see Annex, Tables A.1 to A.5 for summary statistics as well as Graph A.1).[17] Developments within the euro area and in economies with more flexible exchange rate regimes were relatively steady, even if individual economies were already exhibiting large deficits in terms of GDP. In line with theoretical considerations both the volatility of the nominal effective exchange rate and nominal interest rates was very low and, in particular, very uniform within the monetary union, while interest rates in countries with pegged yet but still separate currencies were more volatile. This might reflect the low reagibility of both rates to idiosyncratic shocks or divergences within the monetary union. In countries with more flexible exchange rates, long-term interest rates were relatively stable, which supports the hypothesis that in these countries exogenous shocks were widely absorbed by exchange rate movements.[18]

This picture changed dramatically with the collapse of Lehman Brothers in September 2008. While the euro area at that time was still perceived as a haven of stability, countries outside the monetary union, especially those with other fixed exchange rate regimes, were soon hit by huge capital outflows, mirrored by abrupt adjustments in their current account and substantially elevated interest rate volatility. However, the remarkable stability of the euro area and the still very homogenous development of interest rates proved to be a delusion only two years later, when the accumulated imbalances, caused by a systematic undervaluation of national risk factors and unsustainable fiscal policies in some countries, became apparent. It was only then that long-term interest rates suddenly moved apart and private capital flowed out of the most exposed deficit countries.

[16] A different concept of flexibility might be *elasticity* which is to some extent closer to the idea of flexibility but only takes into account one single reason why exchange rates or interest rates adjust. Elasticity as a measure of flexibility is used in the robustness checks (see Section 7).

[17] The assignment of individual countries to the specific exchange rate regimes is based on their classification in 2011.

[18] However, it has to be kept in mind that there is a wide variety of factors that contribute to the volatility of exchange rate and interest rate volatility (eg market liquidity).

# 4 The empirical model and data

Applying a basic autoregression approach, this paper estimates the rate at which current account balances revert to their mean values and tests whether the exchange rate regime significantly affects the speed at which the current account rebalances. In contrast to earlier empirical work, this study makes an explicit distinction between the euro area and other fixed exchange rate regimes. The sample covers annual data for 27 EU countries from 1994 to 2011.[19]

In an autoregressive model the adjustment of the current account balance is evaluated as a reversion to a mean value which depends on the underlying equation, ie it is determined endogenously to the model by the incorporated variables. Thus, the approach does not assume a balanced current account, even in the steady state, and accepts individual country-specific mean values. Furthermore, the model provides no answers regarding the extent to which the mean levels depend on the underlying exchange rate regime.[20] Since the focus is on the process of adjustment, we do not specify any concrete values for a current account equilibrium, nor does the model incorporate any fundamental variables. In addition, there is no evaluation of whether the mean value corresponds to the long-run equilibrium. In line with Chinn and Wei (2008) the empirical investigation is based on the following equation:

$$(1)\quad CAGDP_{i,t} = p_0 + p_1 CAGDP_{i,t-1} + p_2 CAGDP_{i,t-1} * ER\_REG_{i,t-1} + p_3 ER\_REG_{i,t-1} + \varepsilon_{i,t}$$

where *CAGDP* is the current account balance as a percentage of GDP, $p_1$ is an autoregressive coefficient and *ER_REG* is the exchange rate regime. The sub-indices *i* and *t* denote the countries and the observation year respectively, and $\varepsilon$ is the error term. The persistence of current account balances *p* is derived from the autoregressive coefficient of the lagged current account balance ($p_1$) plus the coefficient of the interaction term of the lagged endogenous variable and the exchange rate regime ($p_2$).

In *a first step,* we analyse the pace at which current account balances adjust for countries with floating, mixed and fixed exchange rate regimes as well as for euro-area member states (*Model 1*). Based on a *dummy variable approach,* which defines the exchange rate regime using a 0/1 variable, we verify to what extent the different exchange rate regimes vary with respect to the strength of their current account adjustment, without yet specifying the reason why the regimes have a different speed of mean reversion (Chinn and Wei, 2008). The

[19] Data source: Deutsche Bundesbank, BIS and IMF; for details see the Annex. Extending the sample period backward would be beneficial for evaluating changes in persistence over time. However, as several central and eastern European countries are included, this is not possible on a sound basis.

[20] By contrast, Arratibel et al. (2008) examine the relationship between exchange rate volatility and the level of the current account balance.

exchange rate regime classification differentiates between euro-area countries, fixed exchange rate regimes, mixed exchange rate regimes and countries with flexible exchange rates.[21]

In a *second step,* based on the theoretical underpinning, we do not model the exchange rate regimes explicitly, but instead refer directly to the underlying adjustment processes (*Model 2*). As already mentioned, the z-score index from Gosh et al. (2003) is used to gauge the degree of exchange rate and interest rate volatility. Thus, we analyse empirically whether the degree of exchange rate volatility and interest rate volatility has any implication for how fast the current account balances adjust.

These two procedures complement each other. On the one hand, a continuous variable provides more detailed information about the mechanisms of current account adjustment than does a dummy variable. On the other hand, however, this approach may accentuate the endogeneity problem, implying that in periods of rapid current account adjustment greater exchange rate volatility or interest rate volatility may be observed. In addition, the analysis is based on the assumption that the three exchange rate regimes differ significantly with respect to the degree of exchange rate as well as interest rate volatility. Equation (1) can be transformed to present the mean reversion:

$$(2)\quad \Delta\ CAGDP_{i,t} = -\left[1 - \left(p_1 + p_2 * ER\_REG_{i,t-1}\right)\right]\left(CAGDP_{i,t-1} - \overline{CAGDP_i}\right) + \eta_{i,t}$$

The rate at which the current account reverts to its mean ($\overline{CAGDP_i}$) is given by the term in brackets: $\left[1 - \left(p_1 + p_2 * ER\_REG_{i,t-1}\right)\right]$. Clearly, a smooth adjustment is only assured if $\left(p_1 + p_2 * ER\_REG_{i,t-1}\right)$ is between zero and unity. A negative sign for the parameter $p_2$ implies a faster current account adjustment as the autoregressive term $p_1$ is reduced and with it the persistence of the current account imbalance.

Excessive volatility in the exchange rate or the interest rate, however, may lead to an overshooting of the current account or even an aggravation of current account disequilibria. This is the case if $\left(p_1 + p_2 * ER\_REG_{i,t-1}\right)$ exceeds unity. In the same vein, abrupt and disorderly adjustments may have an adverse impact on GDP. As a consequence, changes to CAGDP may be dominated by a declining denominator. Both phenomena are typical characteristics of a balance of payments crisis and may occur especially if early and smooth adjustments to the current account are hampered.

[21] We use the following exchange rate regime classification: 1) euro-area countries: countries that have joined the euro area; 2) fixed exchange rate regimes: countries with currencies that are unilaterally pegged to the euro; 3) mixed exchange rate regimes: economies that are members of the ERM II, without a unilateral exchange rate arrangement; 4) flexible exchange rate regimes: all remaining EU countries. Unlike in Graph A.1, which refers to the exchange rate classification in 2011, the panel estimation allows for an exchange rate regime that varies over time. Thus, during the observation period, the dummy variable may switch from zero to one or from one to zero in all countries under review.

# 5 Estimation results

The model is estimated using a feasible generalised least square estimator (FGLS) with fixed country effects, panel-corrected standard errors and an AR term to adjust the autocorrelation, if necessary.[22] It has to be kept in mind that dynamic models are subject to the so-called Nickell bias, which arises from the correlation of the (mean-adjusted) lagged endogenous variable with the (mean-adjusted) error term. However, since the number of periods T is sufficiently large, this bias should not be exceptionally pronounced. Furthermore, endogeneity problems may arise in Model 2 due to repercussions from the current account on exchange rate volatility or interest rate volatility. In the regression, however, both variables come with a lag and therefore do not jeopardise the consistency of the model (*predetermined variables*). For the estimation results, see *Table 1*.

[22] All estimations were conducted using Eviews 7.

**Table 1 Current account adjustment – FGLS estimation results**

| | (1) Model 1 FGLS | (2) Model 2 FGLS |
|---|---|---|
| CAGDP (-1) | 0.638 *(11.01)**** | 1.040 *(14.89)**** |
| CAGDP (-1) * FLEXIBLE | -0.136 *(-1.683)** | |
| FLEXIBLE[1)] | -0.384 *(-0.88)* | |
| CAGDP (-1) * FIX | 0.036 *(0.475)* | |
| FIX[1)] | -1.099 *(-4.31)**** | |
| CAGDP (-1) * EMU | 0.120 *(1.809)** | |
| EMU[1)] | -1.099 *(-4.32)**** | |
| CAGDP (-1) * ER_VOL(-1) | | -1.839 *(-1.984)*** |
| ER_VOL(-1) [1)] | | 5.617 *(2.56)*** |
| CAGDP (-1) * IR_VOL(-1) | | -4.493 *(-2.974)**** |
| IR_VOL(-1) [1)] | | 6.585 *(2.17)*** |
| | | |
| $R^2$ adj. | 0.91 | 0.92 |
| Number of observations | 429 | 249 |
| Durbin-Watson statistic | 1.81 | 1.97 |

*Notes: T values in brackets; *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.* [1)] The variables for the exchange rate regime (FLEXIBLE, FIX, EMU, ER_VOL and IR_VOL) enter the equations not only in the interaction terms, but also in their levels. However, this is done for econometric reasons only and there are no economic implications.

The empirical studies show that the exchange rate regime has a significant impact on the current account adjustment rate. Thus, the autoregressive coefficient depends on the interaction between the lagged current account balance and the exchange rate regime measured by dummy variables. More precisely, the greater the degree of exchange rate flexibility, the faster the current account rebalances. In a mixed exchange rate regime (eg ERM I or ERM II), which serves as a benchmark,[23] about 36 % of existing deviations are reduced within a year (see *Table 2*). In a freely floating exchange rate regime, only 50 % of a potential imbalance persists in the following year. The estimated parameter for fixed exchange rates (other than monetary union) is not significant in statistical terms and the yearly rate of

[23] Persistency in a mixed exchange rate regime is given by $p_1$ alone, since it is not explicitly included in the estimation as an additional dummy.

adjustment seems to be quite similar to that in mixed exchange rate regimes (ie roughly one-third). By contrast, current account rebalancing is by far the slowest within a country joining a monetary union: the rate of rebalancing within a year is just 24%. During the period under review from 1994 to 2011, current account imbalances in the euro-area member countries not only persisted for much longer than in countries with floating exchange rate regimes but also significantly longer than in countries with other fixed exchange rate regimes.[24]

**Table 2 Persistency and adjustment rate of the current account**

| **MODEL 1** | **PERSISTENCY** | **ADJUSTMENT RATE** |
|---|---|---|
| **Mixed exchange rate regime** | 0.64 | 0.36 |
| **Flex. exchange rate regime** | 0.50 | 0.50 |
| **Fixed exchange rate regime** | 0.67 | 0.33 |
| **European monetary union** | 0.76 | 0.24 |
| **MODEL 2** | | |
| **Exchange rate volatility** | $1.04 - 1.84 * \text{ER volatility}_{t-1}$ | $0.04 + 1.84 * \text{ER volatility}_{t-1}$ |
| **Interest rate volatility** | $1.04 - 4.49 * \text{IR volatility}_{t-1}$ | $0.04 + 4.49 * \text{IR volatility}_{t-1}$ |

The findings of *Model 2* deliver additional insight into the underlying transmission channel which influences current account adjustment in countries with different exchange rate regimes. It becomes evident that a higher degree of exchange rate volatility as well as a higher degree of interest rate volatility facilitate the mean reversion process of the current account balance. The autoregressive coefficient is reduced by 1.84 times the previous year's level of exchange rate volatility, and by 4.49 times the lagged z-score index of interest rate volatility.

Furthermore, the analysis allows us to assess the extent to which exchange rate volatility and interest rate volatility have contributed to the adjustment process within different exchange rate regimes since 1999. In doing this, we mix the procedures of Model 1 and Model 2. *First*, based on the approach in Model 1 individual EU member states are assigned to specific

[24] This is in line with the results of Gros and Alcidi (2013), who claim that the Eurosystem has created an environment in which the pressure for a quick adjustment to a sudden stop is much weaker, although the authors assume that there is likely to be little difference between a monetary union and other fixed exchange rate regimes.

exchange rate regimes according to their classification in 2011 (*see graph A.1. in the Annex*). *Second*, the average exchange rate and interest rate volatilities in each group between 1999 and 2011 are multiplied by the respective coefficients estimated in Model 2 (see *Table 3)*.[25]

**Table 3 Contribution of factors to the acceleration of current account average adjustment in different exchange rate regimes***

| | EMU | fixed ER | flexible ER |
|---|---|---|---|
| **Exchange rate volatility** | - 0.06 | - 0.08 | - 0.20 |
| **Interest rate volatility** | - 0.20 | - 0.25 | - 0.18 |
| **Total contribution** | **- 0.26** | **- 0.33** | **- 0.38** |

* Negative values reduce the autoregressive coefficient (persistence) and, thus, accelerate the adjustment process.

The analysis reveals that the three exchange rate regimes under review do indeed significantly vary with respect to the degree of exchange rate as well as interest rate volatility. Furthermore, in line with the previous findings, the results confirm that the mean reversion process is fastest within countries with a flexible exchange rate and this is clearly due to the degree of exchange rate flexibility, which is highest in these countries. By contrast, current account balances are most persistent within euro-area member countries. This can be attributed to the fact that interest rate volatility is lower than in the other fixed exchange rate regimes and, thus, is not able to offset the subdued volatility of the effective exchange rate.

An analysis that takes into account the pre-crisis period (1999-2006) and the period after the onset of the financial crisis separately (2007-2011) backs the major results outlined above, ie even in a period of severe financial stress the pace at which current account balances adjust is still highest in countries with flexible exchange rates, followed by fixed exchange rate regimes, and is lowest in euro-area member countries (see *Table 4)*. In addition, exchange rate volatility increases most markedly in response to crises in economies where exchange rates are flexible. The figures highlight that interest rate volatility increases in the crisis period and, consequently, so does its contribution to current account adjustment. Although this happens in every exchange rate regime under review, the contribution of interest rate volatility to the adjustment in the current account rises most extensively in countries with fixed exchange rate regimes. Thus, our previous results are still valid even in times of financial stress: interest rates in euro-area countries are still relatively stable.

[25] Based on a mean comparison test, exchange rate volatility and interest rate volatility are revealed to be significantly lower in EMU member countries compared to the other countries in the sample.

**Table 4 Contribution of factors to the acceleration of current account average adjustment in different exchange rate regimes before and after the onset of the current financial crisis***

| | EMU | | Fixed ER | | Flexible ER | |
|---|---|---|---|---|---|---|
| | pre-crisis period | crisis period | pre-crisis period | crisis period | pre-crisis period | crisis period |
| **Exchange rate volatility** | - 0.06 | - 0.06 | - 0.08 | - 0.07 | - 0.18 | - 0.25 |
| **Interest rate volatility** | - 0.17 | - 0.24 | - 0.21 | - 0.30 | - 0.17 | - 0.20 |
| **Total contribution** | **- 0.23** | **- 0.30** | **- 0.29** | **- 0.37** | **- 0.35** | **- 0.45** |

* Negative values reduce the autoregressive coefficient (persistence) and, thus, accelerate the adjustment process.

Based on these findings, however, we cannot rule out the possibility that a delayed adjustment process might lead to a balance of payments crisis with a sudden and disorderly current account adjustment in euro-area member countries. This is due to the fact that the degree of exchange rate as well as interest rate volatility in the crisis period is to a large extent determined by the amount of external assistance. The various emergency measures help to maintain financial stability and reduce the social costs of adjustment, but at the same time may hamper structural adjustment if they are insufficiently embedded in political reforms.

Overall, the empirical study supports the hypothesis that current account adjustment is hampered in countries within a monetary union. This holds particularly in comparison with floating-rate regimes owing to lower exchange rate flexibility; but compared with other fixed exchange rate regimes, euro-area member countries also exhibit a much higher level of persistence in their current account balances due to less volatile interest rates.

# 6 Robustness checks

*Time dummies*

In addition to the fixed country effects that are included in the main regressions we introduced time dummies that take into account shocks that are common across countries and change over time. The results indicate that the outcome is quite robust with respect to this alternative specification, ie the coefficients are slightly higher and the level of significance is even improved. However, the coefficient for the fixed exchange rate regime is still not statistically significant. Estimation results are provided in the Annex (*Table A.6 row 1*).

*Generalised Methods of Moments (GMM) estimator*

In our main empirical analysis we accounted for endogeneity problems in the right-hand-side variables by lagging exchange rate as well as interest rate volatility. Alternatively, we now refer to a Generalised Methods of Moments (GMM) estimator from Arrelano and Bond (1991) which controls for endogeneity by using adequate instruments to avoid reverse causality.[26] The GMM estimator avoids the Nickell bias. However, the inefficiency of a dynamic panel estimator might outweigh the bias observed in the GLS estimation. All in all, the outcome of the GMM estimator points in the same direction as the original results (*Table A.6 row 2 in the Annex*).[27]

*Interest rate elasticity with respect to internal and external risks*

As an alternative to the volatility of exchange rates and interest rates used so far we calculate the risk elasticity of (long-term) interest rates and evaluate to what extent it determines the pace of current account adjustment. This risk elasticity represents the extent to which interest rates fluctuate in line with existing risks. We are interested in the interest rate elasticity with respect to both *internal* and *external* risks. *External* interest rate elasticity is defined as the correlation between domestic long-term interest rates and the VIX S&P 500 volatility index, which should be exogenous to the individual country. The estimated correlation coefficient shows the relationship between domestic interest rates and the overall volatility of the financial markets. *Internal* interest rate elasticity is defined as the correlation between domestic long-term interest rates and general government net lending/borrowing as a percentage of GDP. As our focus is on the estimated correlation coefficient it does not matter in which direction causality runs. Ultimately, however, it can be assumed that neither the interest rate nor the public deficit ratio is perfectly exogenous.[28]

The results indicate, *first*, that the currency area acts as a kind of firewall which has prevented country-specific financing terms from directly mirroring global developments. The correlation between domestic long-term interest rates and the VIX S&P 500 global volatility index in countries with fixed exchange rate regimes is significantly higher than within the euro area.[29] *Second*, during the observation period the correlation between long-term interest rates and the government budget balance is also higher in fixed regimes or, to put it another way, an

[26] The second (and following) lag of the left-hand-side variables as well as the second (and following) lags of the predetermined variables are used as instruments.

[27] The signs of the coefficients are as expected and the size is comparable to the original outcome, except for the interaction term (lagged current account* interest rate volatility) which is much smaller than in the GLS estimation.

[28] Ejsing and Lemke (2009) interpret the correlation between a common global risk factor and the CDS as the degree to which country risk premia react to global developments. The coefficient is based on a correlation of annual figures.

[29] In a similar vein, Honohan (2010) pointed out that the common currency made the interest rate less sensitive to domestic developments.

unsustainable government deficit is sanctioned by higher interest rates to a lesser extent within the euro-area member states. Thus, interest rate stickiness in the euro area seems to hamper the adequate pricing of risk (*Tables A.7 and A.8 in the Annex*). *Third*, both elasticity measures play a significant role for current account adjustment in the expected way: the autoregressive coefficient is reduced by 0.139 times the external risk elasticity and by 0.044 times the internal risk elasticity, though the coefficient of internal risk elasticity is not statistically significant (*Table A.6 row 3 in the Annex*). This implies that in fixed exchange rate regimes the higher interest rate elasticity with respect to both internal and external risks contributes to accelerated current account adjustment. By contrast, in euro-area member countries muted interest rate elasticity adds to the persistency of the current account balance.

*Real exchange rate volatility and real interest rate volatility*

In the main part of our analysis we used *nominal* figures for exchange rate flexibility as well as for interest rate flexibility since these variables are introduced to distinguish between different exchange rate regimes. This is, ultimately, a nominal concept. However, in order to make our work comparable with the analysis of Gosh et al. (2013) we extend the estimations to real exchange rate volatility and verify to what extent the results differ. By using consumer prices to deflate both exchange rates and interest rates, we calculate volatility figures which are made to interact with the lagged current account balance. To sum up, we still found a significant negative impact for both volatility figures. Again, a higher degree of exchange rate volatility as well as higher volatility in the interest rate induces faster current account reversion. This is also in line with the findings of Gosh et al. (2013) and shows that the extension to real variables does not change the basic features of the analysis (*Table A.6 row 4 in the Annex*).

*Additional control variables*

The analysis may be amended to include additional control variables. In a first step, we accounted for trade openness TRADE, which is the sum of imports and exports as a percentage of the GDP ratio, and for the degree of current account openness OPEN, for which we make use of the Chinn and Ito (2006) financial openness index. In line with Chinn and Wei (2008) the two variables that represent the country´s real and financial openness are the most important control factors to be considered. However, *a priori* it is far from clear in which direction the coefficient would go as, on the one hand, a higher degree of openness could make it easier to adjust to shocks but, on the other hand, it could induce a stronger susceptibility to external turmoil. The two variables are made to interact with the lagged current account balance in order to measure their impact on the pace of current account reversion.

In a second step, in line with Gosh et al. (2013) we also introduced the inflation rate INFLATION based on the HICP in percent, the degree of economic development GDP_CAPITA measured by GDP per capita based on a purchasing-power-parity (PPP) valuation of the country´s GDP, as well as the fiscal balance FISCAL which is government net lending and borrowing in relation to the GDP of the countries under review.

It is to be noted that even after accounting for these factors the coefficients of exchange rate flexibility and interest rate volatility retain their sign and the values are very close to those of the original estimation. With respect to the additional control variables, only the financial openness variable matters significantly for the pace of current account adjustment. In addition, the stage of development and the government budget balance are significant in determining the current account balance while the inflation rate does not show a significant impact (*Table A.7 row 1 in the Annex*).

*Estimations before the onset of the European debt crisis*

The results so far could be driven to some extent by large current account reversals in fixed exchange rate regimes (other than monetary union) during the crisis period. In order to eliminate an estimation bias due to such crisis effects we restrict the sample to a shorter time period. Basically, we delete the years 2010 and 2011 when the European debt crisis severely hit the EMU countries and current account balances adjusted quite abruptly in some countries. All in all, the results show that the main conclusion still holds even if we exclude the sovereign debt crisis period (*Table A.7 row 2 in the Annex*).

# 7 Summary

The empirical analysis provides evidence that the exchange rate regime does indeed matter for the pace of current account adjustment. Thus, we are consistent with a recent strand of the literature that questions the results of Chinn and Wei (2008) and argues in favour of the Friedman hypothesis (1953) – that more flexible regimes facilitate the return of current account balances to their long-run equilibrium.

In addition, we found that the current account adjustment process is to some extent hampered within member countries of a monetary union. According to our results this is the case not only relative to countries with flexible exchange rate regimes, due to lower nominal exchange rate volatility, but also in comparison with countries with fixed exchange rate regimes in consequence of the single monetary policy and reduced interest rate flexibility.

Thus, in the short run, harmonised short-term interest rates and a convergence of longer-term rates might prevent an overly abrupt adjustment process that would imply a sharp reduction in income. However, it is still an open question whether the characteristics of the monetary union are indeed amenable to smoothing necessary corrections and limiting spillovers to other EMU countries, or whether they merely aggravate existing imbalances and delay necessary structural reforms. We leave this question for future research.

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## ANNEX

**Table A.1 Exchange rate volatility/interest rate volatility (whole sample)[1]**

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| ZET_WK | 0.0411 | 0.0604 | 0.0698 | 0.0092 | 0.8672 |
| ZET_ZINS | 0.0387 | 0.0469 | 0.0339 | 0.0100 | 0.4840 |

[1] The sample covers annual data for 27 EU countries from 1994 to 2011.

**Table A.2 Exchange rate volatility/interest rate volatility in fixed exchange rate regimes[1]**

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| ZET_WK | 0.0392 | 0.0486 | 0.0324 | 0.0142 | 0.2055 |
| ZET_ZINS | 0.0374 | 0.0473 | 0.0310 | 0.0100 | 0.2122 |

[1] The assignment of individual countries to the specific exchange rate regimes refers to their classification in each year, ie the regime is adjusted whenever the regime has changed.

**Table A.3 Exchange rate volatility/interest rate volatility in flexible exchange rate regimes[1]**

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| ZET_WK | 0.1020 | 0.1149 | 0.0593 | 0.0368 | 0.3736 |
| ZET_ZINS | 0.0382 | 0.0412 | 0.0161 | 0.0152 | 0.0849 |

[1] The assignment of individual countries to the specific exchange rate regimes refers to their classification in each year, ie the regime is adjusted whenever the regime has changed.

**Table A.4 Exchange rate volatility/interest rate volatility in the European Monetary Union[1]**

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| ZET_WK | 0.0303 | 0.0328 | 0.0157 | 0.0092 | 0.0962 |
| ZET_ZINS | 0.0383 | 0.0442 | 0.0212 | 0.0116 | 0.1724 |

[1] The assignment of individual countries to the specific exchange rate regimes refers to their classification in each year, ie the regime is adjusted whenever the regime has changed.

**Table A.5 Exchange rate volatility/interest rate volatility in mixed exchange rate regimes[1]**

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| ZET_WK | 0.0697 | 0.1003 | 0.1230 | 0.0228 | 0.8672 |
| ZET_ZINS | 0.0430 | 0.0562 | 0.0607 | 0.0203 | 0.4840 |

[1] The assignment of individual countries to the specific exchange rate regimes refers to their classification in each year, ie the regime is adjusted whenever the regime has changed.

## Table A.6 Current account adjustment – GMM/FGLS estimation results

| | (1) Model 1 Time dummies | (1) Model 2 GMM | (2) Model 2 IR elasticity | (3) Model 2 Real factors |
|---|---|---|---|---|
| CAGDP (-1) | 0.517 *(8.53)*** | 0.949 *(25.83)*** | 1.071 *(29.25)*** | 1.077 *(28.70)*** |
| CAGDP (-1) * FLEXIBLE | -0.121 *(1.91)** | | | |
| CAGDP (-1) * FIX | 0.104 *(1.27)* | | | |
| CAGDP (-1) * EMU | 0.249 *(3.33)*** | | | |
| CAGDP (-1) * ER_VOL(-1) | | -0.824 *(-10.02)** | -0.389 *(-4.37)*** | |
| CAGDP (-1) * IR_VOL(-1) | | -1.615 *(-5.00)*** | | |
| CAGDP (-1) * IR_ELAST_EXT(-1) | | | -0.139 *(-2.78)*** | |
| CAGDP (-1) * IR_ELAST_INT(-1) | | | -0.044 *(-1.14)* | |
| CAGDP (-1) * REAL_ER_VOL(-1) | | | | -0.846 *(-2.84)*** |
| CAGDP (-1) * REAL_IR_VOL(-1) | | | | -0.562 *(-23.07)*** |
| | | | | |
| $R^2$ | 0.8 | | 0.9 | 0.9 |
| N | 429 | | 298 | 429 |
| Durbin-Watson statistic | 1.7 | | 1.9 | 1.9 |

*Notes: T values in brackets; *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.* The variables for the exchange rate regime enter the equations not only in the interaction terms, but also in their levels. This is done for econometric reasons only. As there are no economic implications, the results are not quoted in the table.

## Table A.7 Current account adjustment – GMM/FGLS estimation results

| | (1) Model 2 FGLS | (2) Model 2 FGLS |
|---|---|---|
| CAGDP (-1) | 0.052 *(0.18)* | 1.071 *(24.06)*** |
| CAGDP (-1) * ER_VOL(-1) | -2.237 *(-2.00)*** | -1.612 *(-2.10)*** |
| CAGDP (-1) * IR_VOL(-1) | -5.449 *(-2.94)*** | -5.344 *(-12.44)**** |
| CAGDP (-1) * TRADE | 0.002 *(1.43)* | |
| CAGDP (-1) * OPEN | 0.332 *(3.29)**** | |
| INFLATION | -0.562 *(-0.35)* | |
| GDP_CAPITA | -0.002 *(-2.30)*** | |
| DEFICIT | -0.099 *(-2.88)**** | |
| | | |
| $R^2$ | 0.9 | 0.9 |
| N | 187 | 299 |
| Durbin-Watson statistic | 2.0 | 1.9 |

*Notes: T values in brackets; *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.* The variables for the exchange rate regime (ER_VOL and IR_VOL) enter the equations not only in the interaction terms, but also in their levels. The same is true for the variables TRADE and OPEN. This is done for econometric reasons only. As there are no economic implications, the results are not quoted in the table.

## Table A.8 External/internal interest rate elasticity in the European Monetary Union [1]

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| IR_ELAST_EXT | 0.160 | 0.166 | 0.130 | -0.005 | 0.545 |
| IR_ELAST_INT | - 0.260 | - 0.215 | 0.278 | -0.678 | 0.356 |

[1] The assignment of individual countries to the specific exchange rate regimes refers to their classification in each year, ie the regime is adjusted whenever the regime has changed.

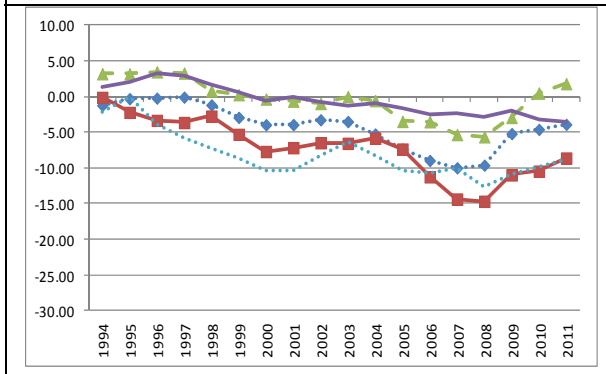
## Table A.9 External/internal interest rate elasticity in fixed exchange rate regimes[1]

| Variable | Median | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| IR_ELAST_EXT | 0.280 | 0.392 | 0.284 | -0.005 | 0.971 |
| IR_ELAST_INT | -0.419 | -0.428 | 0.349 | -0.939 | 0.356 |

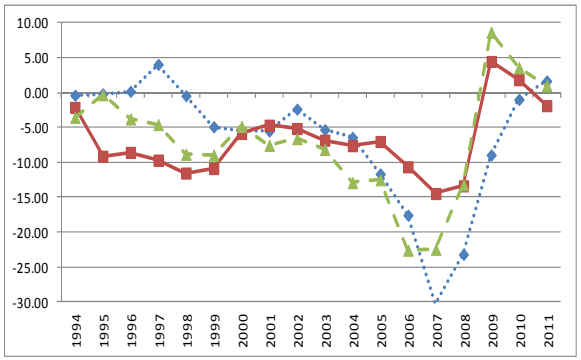
[1] The assignment of individual countries to the specific exchange rate regimes refers to their classification in each year, ie the regime is adjusted whenever the regime has changed.

**Graph A.1 Change in selected indicators**

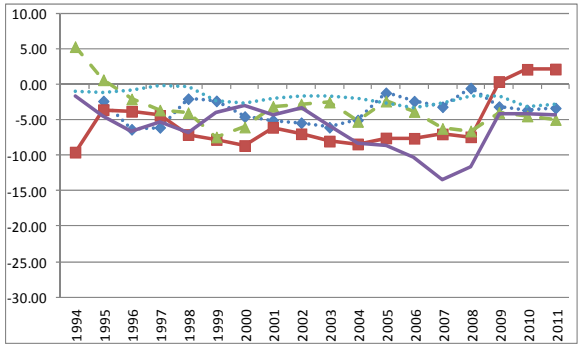
**current account (% of GDP)**




es gr ie it pt

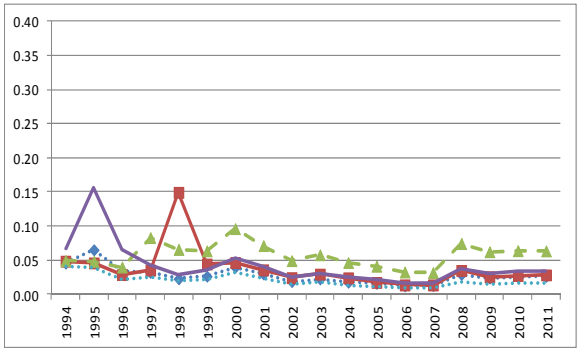



bg lt lv

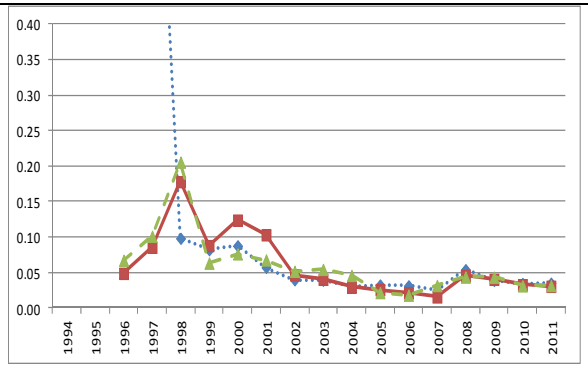



cz hu pl ro uk

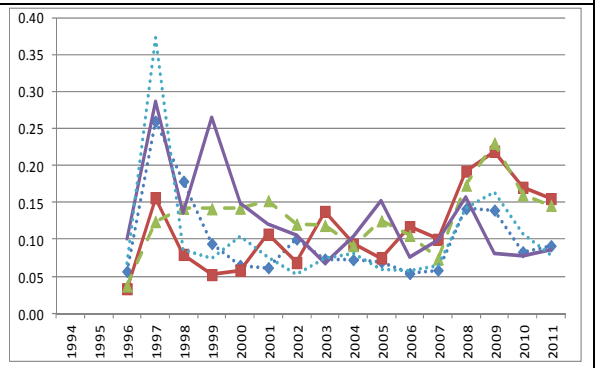
**exchange rate volatility (z-score)**




es gr ie it pt

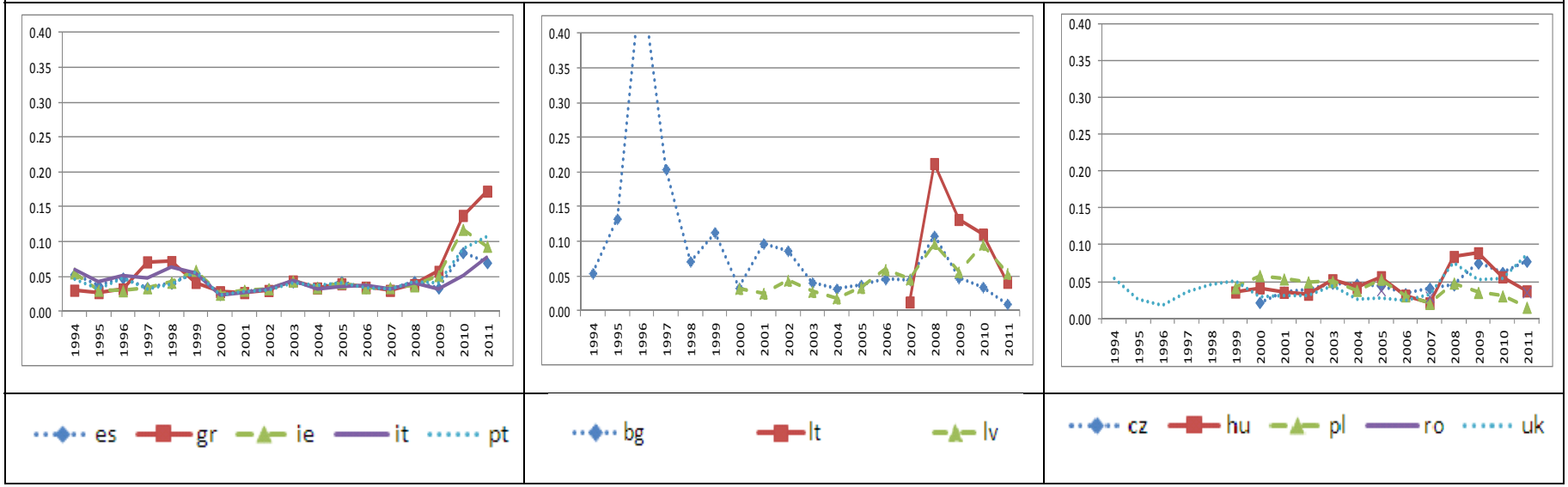



bg lt lv




cz hu pl ro uk

**interest rate volatility (z-score)**




Data source: Deutsche Bundesbank, BIS, Bloomberg and IMF.