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Abhandlungen

The U.S. Current Account and Real Effective Dollar Exchange Rates

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Abstract

This study analyzes long-run and short-run dynamics between the current account and the real effective dollar exchange rates from a novel perspective. Applying multivariate cointegration techniques, we first test for a long-run relationship between the real effective dollar exchange rate and the U.S. current account. We then include further macroeconomic factors as an extension. As a next step, we pay particular attention to the evolvement of the coefficients over time based on an estimation of a time varying coefficient approach by means of Kalman filtering. (E31, F31)

Zusammenfassung

Die US-Leistungsbilanz und reale effektive Dollar-Wechselkurse

Diese Studie analysiert die lang- und kurzfristige Dynamik zwischen der US-amerikanischen Leistungsbilanz und realen effektiven Dollar-Wechselkursen auf innovative Weise. Im Rahmen einer Anwendung multivariater Kointegrationstechniken testen wir zunächst auf das Vorhandensein einer langfristigen Gleichgewichtsbeziehung zwischen dem realen effektiven Dollar-Wechselkurs und der US-Leistungsbilanz. Als Erweiterung nehmen wir weitere makroökonomische Variablen in den Ansatz auf. Schließlich analysieren wir unter Verwendung eines zeitvariierenden Koeffizienten-Ansatzes und eines Kalman-Filters die zeitliche Entwicklung der Koeffizientenschätzer. (E31, F31)

I. Introduction

The U.S. current account deficit has been in the core of an extensive debate over the last decade. Some economists argue that large capital inflows to the United States present a feature of a stable international monetary system, while others see the resulting large global imbalances as a thread for global stability and one reason for the recent financial crisis. It is worth mentioning that the U.S. also faced a situation of the so-called twin-deficit in both the federal budget and the current-account after 1981 during the so-called Reaganomics era.

Another similarity of the eighties to the current situation is that an exchange rate adjustment in the form of a sharp dollar depreciation was seen as a key ingredient for a reversal of the current account deficit (*Krugman* (1985); *Obstfeld/Rogoff* (2008)). In a series of papers, *Obstfeld/Rogoff* (2001, 2005, 2008) calibrate different scenarios of exchange rate and net foreign asset adjustments for reducing the U.S. current account deficit. Depending on parameter choices such as the elasticity of substitutions between tradables and non-tradables, the effective dollar exchange rate is expected to fall between 21 and 33 % according to their calculations (*Obstfeld/Rogoff* (2008)). However, they also argue that exchange rate changes as a result of global imbalances are only likely to occur if shocks to the exchange rates simultaneously lead to a closing of the imbalances (*Rogoff* (2007)). Based on a different framework, *Fratzscher* et al. (2012) reach a related conclusion. Their estimation of a Bayesian structural VAR model suggest that equity market shocks and housing price shocks have been major determinants of the U.S. current account. They conclude that exchange rate patterns are not necessarily a key element of an adjustment of large current account imbalances, and that in particular relative global asset prices are the key source of the adjustment.

From a general point of view, several theoretical approaches, which will be briefly summarized in the next section, suggest a link between current account changes and exchange rate movements. However, there is little convincing evidence for the wisdom that a flexible exchange rate regime generally facilitates current account adjustment (*Chinn/Wei* (2009)). On the other hand, some studies have found predictive power of change in the U.S. current account for exchange rate movements (*Gourinchas/Rey* (2005); *Rogoff* (2007)).

Considering that both quantities are simultaneously determined from a theoretical point of view and that their relationship might be subject of several structural changes, the empirical literature is notably silent regarding time variations in the in-sample relationship between them. This is the central topic we address in this paper. Our aim is to provide an evaluation of the relationship between the U.S. current account and real effective dollar exchange rates since the breakdown of Bretton Woods. Accounting for the fact that the underlying causality between both variables is not clear, we start with the multivariate modeling approach of *Johansen* (1988) to analyze the relationship between them from an unrestricted long-run perspective. We then put time-varying long-run and short-run dynamics under closer scrutiny. It is important to note that our approach is not designed to distinguish between different sources of shocks to the real exchange rate or to the current account. We do not discriminate between nominal exchange rates and price dynamics by focusing solely on real effective exchange rates either. The reason is that both issues are not directly related to the main question: The causality pattern between the U.S. current account and the real effective dollar exchange rate since the breakdown of Bretton Woods.

The remainder of this paper is organized as follows. The following section provides a brief description of theoretical considerations, summarizes previous empirical findings, and provides a motivation for our empirical approach. Section 3 first describes the data and the empirical methodology. We then proceed by analyzing our empirical findings with regard to the long-run equilibrium and the adjustment dynamics. Section 5 concludes.

II. Theoretical Suggestions and Literature Review

There is no need to search for a sophisticated approach in order to establish a link between the current account and the real exchange rate. With a regard to a distinction between nominal and real exchange rate dynamics, it has to be emphasized that many theoretical approaches rely on purchasing power parity (PPP) and therefore leave little or no space for changes in the real exchange rates.

In an early paper, *Dornbusch/Fischer* (1980) emphasize the role of the current account within an asset market model of the nominal exchange rate. The main line of reasoning is that asset markets determine the exchange rate at a point in time while the current account determines the path of the exchange rate through the net foreign asset position. *Dornbusch/Fischer* (1980) show that such a framework allows for an overshooting behavior of the exchange rates even if prices are fully flexible. They also argue that anticipated exchange rate depreciation may also result in a combination of exchange rate appreciation and current account adjustment. Relying on an extension of the traditional monetary approach, *Hooper/Morton* (1979) provided the first empirical study which suggests a correlation between the nominal exchange rate and the current account. In a parallel development, the class of portfolio balance models inspired by the work of *Branson* (1975) also emphasizes the role of demand and supply of foreign and domestic assets, which are assumed to be imperfect substitutes, for the path of the nominal exchange rates.

We do not elaborate on the different approaches in detail since our approach is based on theory but mostly empirical. For this reason, we now turn to empirical work which is related to our study. The current theoretical literature suggests that current account improvement should be associated with real exchange rate depreciation in a single sector world (*Lee/Chinn* (2007)). However, clear empirical evidence for this suggestion has not been established. *Kim/Roubini* (2008) focus on a broader question by analyzing dynamics between the real exchange rate, the U.S current account and fiscal deficit based on a VAR approach. They find that shocks to the government deficits improve the current account and depreciate the real exchange rate in the short-run.

Based on a structural VAR approach of the G-7 countries, *Lee/Chinn* (2009) offer an explanation which mirrors the theoretical insights of *Backus* et al. (1994): The correlation between the real exchange rate and the current account depends on the source of shocks. They argue that a theory-conform combination of real exchange rate depreciation and a current account surplus is more likely to be observed if temporary shocks which are modeled as monetary policy shocks, are the main driver. For the U.S., they find that the current account is an exception as it is mostly driven by permanent factors, a view which seems reasonable considering the sustainability of the U.S. current account deficit. On the other hand, the findings suggest that the movement of the real dollar exchange rate is driven by temporary shocks to a large extent. *Shibamoto/Kitano* (2012) extend the work of *Lee/Chinn* (2009) by identifying a structural change in the dynamics between current account changes and real exchange rate dynamics during the nineties. From a theoretical point of view, this proceeding is motivated by changes in the exchange rate pass-through mechanism (*Shibamoto/Kitano* (2012)). Although they gain findings which differ from those of *Lee/Chinn* (2009) for some G7 countries, the pattern for the U.S. where a structural break is detected in 1995 still suggests that permanent shocks drive the U.S. current account while temporary shocks drive the real exchange rates. Compared to their approach, we allow for continuous changes in the coefficients instead of discrete switches. The next section provides a motivation for our modeling approach.

III. Nonlinear Exchange Rate Modeling

A comprehensive overview on nonlinear approaches of empirical exchange rate modeling is beyond the scope of this paper. For this reason, this section only provides a brief summarization of the corresponding approaches. *Sarno/Taylor* (2002) and *Sarno* (2004) provide excellent overviews on the evolution of empirical exchange rate modeling. Around the beginnings of the nineties, researchers began to incorporate the fact that the set of fundamentals correlated with the exchange rate do vary over time into their models (*Meese* (1990)). From a methodological point of view, recent research on nonlinear empirical exchange rate modelling can be roughly separated into three different kinds of framework: Markov-Switching models, smooth transmission models and model with structural breaks or time-varying coefficients.

The first two frameworks focus on deviations in the exchange rate from a fundamental value which assumes cointegration with implied restrictions without modelling the long-run structure separately. Markov-Switching models apply a stochastic switching process to the adjustment coefficients and have for example been applied by *Sarno/Valente* (2006) in the context of Purchasing Power Parity (PPP) and by *Frömmel* et al. (2005a,b) and *Sarno* et al. (2004) when evaluating the monetary approach. On the opposite, smooth transition models which have for example been applied by *Taylor* et al. (2001), *Wu/Hu* (2009) and *Beckmann* (2013) allow for endogenously determined changes in the adjustment coefficients. We do not consider both approaches in the following since they allow for a restricted number of recurring regimes. For this reasons, we stick to a time varying coefficient approach. Models which allow for structural breaks or time-varying coefficients frequently account for changes in the long-run coefficients. Early empirical investigations which adopt time-varying coefficient models when forecasting exchange rates without relying on cointegration have been provided by *Schinasi/Swamy* (1989) and *Wolff* (1987). Recent examples include *Beckmann* et al. (2011) and *Goldberg/Frydman* (2001, 2007) who apply a piecewise linear relationship to the monthly dollar/euro (deutschmark) exchange rate after 1976 to account for changes in the parameters. From a methodological point of view, the study of *Heimonen* (2007) which fits a time-varying error-correction model to a multivariate modelling approach of the relationship between fundamentals and the euro–dollar exchange rate between 1987 and 2001 is also closely related to our study.

IV. Empirical Methodology and Results

1. Data and Variable Choices

Related studies by *Shibamoto/Kitano* (2012) and *Lee/Chinn* (2009) rely on a bivariate approach when analyzing the relationship between exchange rates and the current account. In order to obtain valid results, we consider different settings. Firstly, we analyze two different measures of trade weighted real effective dollar exchange rates which are provided by the Board of Governors of the Federal Reserve System (www.federal reserve.gov).[1] In both cases, the value of the real effective exchange rates at time t is given by

$$q_t^{reff} = q_{t-1}^{reff} + \prod_{j=1}^{n}\left(\frac{q_{j,t}}{q_{j,t-1}}\right)^{wj,t} \tag{1}$$

where $w_{(j,t)}$ denotes the weight of country j at time t. The real exchange rate q_t is defined as $q_t = s_t + p_t / p_{(t^*)}$ where s_t denotes the nominal exchange rate and p_t and $p_{(t^*)}$ domestic (U.S.) and foreign prices (*Loretan*, 2005, *Beckmann/Czudaj*, 2013).[2] Three different indices are provided by the Federal Reserve: A broad index, a main index and an index of other important trading partners (OITP). In the following, we only analyze the first two quantities. The twenty-six currencies which constitute the broad index and their weights are given in Table 1.

Seven of them – the euro, the Canadian dollar, the Japanese yen, the British pound, the Swiss franc, the Australian dollar, and the Swedish krona – are summarized under the major index. Figure 1 one provides the development of both indices and the U.S. current account.

The graph suggests an inverse relationship between the U.S. current account and the broad index. While the latter is upward-trending, the major index shows less variation and seems to have remained constant on average.

Besides analyzing a bivariate setting with one of the two effective exchange rates and the current account, we also analyze a broader setting

[1] See *Chinn* (2006) for an excellent overview on different calculations for real effective exchange rates and a comparison of different weighting criteria depending on topics under investigation.

[2] Geometric instead of arithmetic averaging is applied since the latter includes an upward bias due to the measurement of changes in the dollar's average exchange value (*Loretan* (2005)).

Table 1

Currency Weights in the Broad Dollar Index of the Federal Reserve

Economy	1997	2003	Change (percentage points)
Euro Area	17.49	18.80	1.31
Canada	16.92	16.43	–.49
China	6.58	11.35	4.77
Japan	14.27	10.58	–3.69
Mexico	8.50	10.04	1.55
United Kingdom	5.73	5.17	–.56
Korea	3.68	3.86	.18
Taiwan	3.77	2.87	–.90
Hong Kong	2.65	2.33	–.32
Malaysia	2.25	2.24	–.01
Singapore	2.87	2.12	–.75
Brazil	1.82	1.79	–.03
Switzerland	1.43	1.44	.01
Thailand	1.59	1.43	–.16
Australia	1.31	1.25	–.06
Sweden	1.22	1.16	–.06
India	.88	1.14	.26
Philippines	1.18	1.06	–.12
Israel	.84	1.00	.16
Indonesia	1.25	.95	–.30
Russia	.78	.74	–.04
Saudi Arabia	.80	.61	–.19
Chile	.53	.49	–.05
Argentina	.61	.44	–.18
Colombia	.49	.41	–.08
Venezuela	.58	.30	–.27
Total	100	100	0
Major currencies total	58.37	54.84	-3.54

which additionally includes quantities which are among theoretical determinants of exchange rates and current account movements: Money supply (M1), short-term interest rates with a maturity of three months and industrial production of the United States. We are aware that neglecting aggregated global variables is an inherent shortcoming of our approach. However, our proceeding is justified since we take an U.S. per-

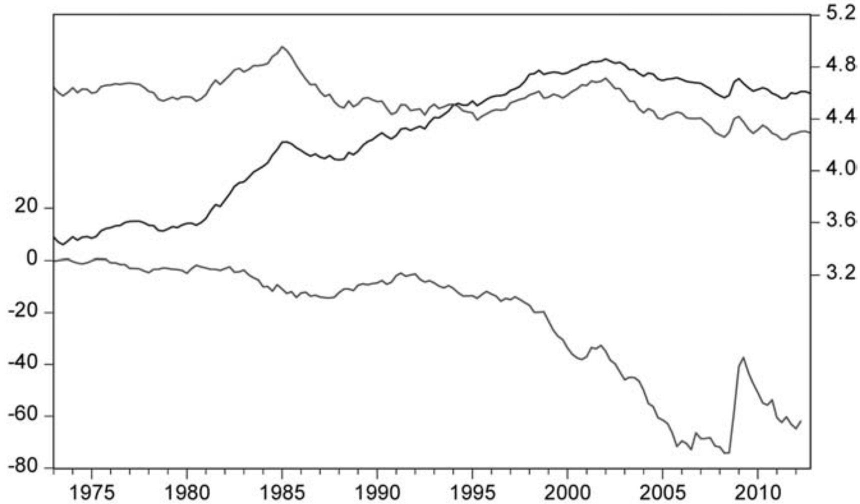


Figure 1: Evolution of Effective Dollar Exchange Rates and the U.S. Current Account

spective and aim at focusing on the relationship between real exchange rates and the current account. We also neglect consumer prices since real exchange rates already include price differentials.

Our sample contains quarterly data running from January 1973 until December 2012. Exchange rates, money supply and industrial production are expressed in logarithms. All series can be approximated as integrated of order one according to the results of previous unit root tests which are available upon request.

2. *Results of Multivariate Cointegration Analysis*

The cointegrated VAR approach proposed by *Juselius* (2006) has the advantage of not assuming a causal relationship between the quantities under observation. In short, the basic model draws upon the following vector autoregression representation (VAR):

$$\Delta Z_t = \Pi Z_{t-1} + \Gamma(\mathrm{L})\Delta Z_{t-l} + \Phi D_t + \epsilon_t\ ,\ t = 1, \ldots, T. \tag{2}$$

The vector $Z_t = [q_t, m_t, y_t, i_t, ca_t]'$ contains the effective real dollar exchange rate, the U.S current account, money supply, industrial production and interest rates. The subvector $Z_t = [q_t, ca_t]'$ corresponds to the bivariate setting. The matrices Π consists of two $r \times p$ matrices α and β' ($\Pi = \alpha\beta'$). β' gives the coefficients of the variables for the r long-run relation, while α contains the adjustment coefficients describing the reaction of each variable to disequilibria from the r long-run relations given by the $r \times 1$ vector $\beta' Y_{t-1}$. The deterministic components are given by the $(p \times 1)$ vector ΦD_t, while ε_t describes an independent and identically distributed error term. The term $\Gamma(L)\Delta Y_{t-1}$ describes the short-run dynamics of the model (*Juselius* (2006)).

Regarding the deterministic components, *Johansen* (1994) distinguishes between five different configurations of a cointegrated VAR model. Our configuration allows for a deterministic trend in the data which cancels or remains in the cointegrating space depending on the results of exclusion tests. After determining the lag length based on information criteria and autocorrelation tests, our modelling cycle includes the following steps:

- As a first step, we identify the number of cointegrating relations r by relying on the trace test developed by *Johansen* (1988).
- In cases of a rank larger than one, it is necessary to impose merely identifying restrictions on β in order to achieve interpretable economic relationships. Hypothesis testing on cointegration vectors is done by specifying the s_i free varying parameters in each β vector, according to the term

(3) $$\beta = (H_1 k_1, \ldots\ldots, H_t k_t)$$

  with β as $(p_1 \times r)$ and k_i as $(s_i \times 1)$ coefficient matrices, and H_i as a $(p_1 \times s_i)$ design matrix. In the following, we base the tests of our hypotheses on a likelihood ratio procedure described in *Juselius* (2006).
- We then carefully analyze the estimation results regarding long-run and short run dynamics to clarify the issue of causality.
- Finally, we reestimate our model in a time varying coefficient framework which combines the Dynamic OLS estimator of *Stock/Watson* (1993) with a Kalman filter procedure. The technical details will be provided in the next section.

We start our analysis with the estimation of two bivariate models which include the current account of the United States and either the broad or the major effective exchange rate index. The findings suggest that a long-run relationship is only detected for the broad index. This finding is in line with the graphical inspection. The results of the rank tests for the broad index are provided in Table 2. Table 3 displays the test for autocorrelation while Table 4 gives final estimates.

Table 2

Rang Tests Results (Bivariate Model)

$p-r$	r	Eig.	Trace	Trace*	Frac95	p-Value	p–Value*
5	0	0.126	28.735	27.587	20.164	0.002	0.003
4	1	0.052	8.125	3.290	9.142	0.079	0.538

* *Note:* The table shows *Johansen's* (1988, 1991) cointegration test. r denotes the cointegration rank. P-Value* corresponds to Bartlett corrected p-values.

Table 3

Test for Autocorrelation (Bivariate Model)

LM(1):	χ^2 (4)	23.216	[0.000]
LM(2):	χ^2 (4)	1.570	[0.814]
LM(3):	χ^2 (4)	14.837	[0.005]
LM(4):	χ^2 (4)	3.611	[0.461]

Note: The table shows LR tests on autocorrelation which are distributed as χ^2 with degrees of freedom in parentheses [p-value].

Table 4

Results of Bivariate Cointegration Estimates (Bivariate Model)

Long run relationships			
Panel (a): Cointegration vectors			
	EXCHANGE_RATE	CURRENT_ACCOUNT	CONST
β	–0.410 (–11.727)	–0.018 (–4.111)	1.000 (.NA)
Panel (b): Adjustment coefficients			
	DEX	DCUR	
α	–0.017 (–3.673)	1.175 (2.714)	

Note: Panel (a) shows the estimates of the cointegration vector with t-statistics in parenthesis. Panel (b) gives the adjustment coefficients towards the long-run equilibrium.

Table 5

Tests for Normality and Descriptive Statistics

	Normality		Skewness	Kurtosis
EXCHANGE_RATE	0.000	[0.020]	–0.293	2.941
CURRENT_AC.	0.000	[0.826]	0.466	6.174
GDP	0.000	[0.005]	–0.111	2.890
INTEREST_RATE	0.000	[0.707]	0.041	5.635
MONEY SUPPLY	0.000	[0.013]	0.723	8.084

Note: The table provides tests for normality as well as skewness and kurtosis for each quantity.

As expected, both quantities are inversely related: Effective dollar depreciation coincides with an improvement of the current account. With regard to the causality, an inspection of the adjustment coefficients shows that only the current account adjusts significantly with the correct sign while the exchange rate adjustment enters significantly but wrongly signed. Using the terminology of *Juselius* (2006), the exchange rate might be considered as the pulling force while the current account seems to be the pushing force. Hence, we conclude that the relationship is in line with theory since a depreciation of the dollar improves the current account.

As a next step, we extend our model by including money supply, interest rates and industrial production of the United States. Since this mainly deals as a robustness check, we drop the major index at this stage. The reason is that we are mainly interested in the link between the current account and effective dollar exchange rates. Considering the long-run relationships should continue to hold if the model is extended, the interesting question is if the long-run structure identified at the first stage continues to hold in a broader context (*Juselius* (2006)).

Table 5 provides skewness, kurtosis and a test for normality for each coefficient of the full model under investigation. Since excess kurtosis does not introduce a significant bias to the estimated cointegration vectors, the remaining excess kurtosis does not alter the overall results since the findings are more sensitive to excess skewness (*Juselius* (2006)). Table 6 provides the tests for autocorrelation. According to *Rahbek* et al. (2002), the results we gain in the following are still robust under the ARCH-effects that remain in some cases. The corresponding tests are available upon request.

Table 6

Test for Autocorrelation (Full Model)

LM(1):	χ^2 (25)	83.042	[0.000]
LM(2):	χ^2 (25)	62.351	[0.000]
LM(3):	χ^2 (25)	38.418	[0.042]
LM(4):	χ^2 (25)	29.763	[0.233]

Note: The table shows LR tests on autocorrelation which are distributed as χ^2 with degrees of freedom in parentheses [p-value].

Table 7

Rang Tests Results

$p - r$	r	Eig.	Trace	Trace*	Frac95	p-Value	p–Value
5	0	0.278	112.776	98.156	88.554	0.000	0.008
4	1	0.180	62.974	36.924	63.659	0.057	0.925
3	2	0.090	32.557	15.721	42.770	0.365	0.995
2	3	0.075	18.204	9.328	25.731	0.337	0.943
1	4	0.040	6.306	3.561	12.448	0.433	0.799

Note: The table shows *Johansen's* (1988, 1991) cointegration test. r denotes the cointegration rank. P-Value* corresponds to Bartlett corrected p-values.

Table 7 provides the rank test for the full model. According to the tests statistic for both normal and simulated value, a rank of 2 is marginally not rejected at the 5 % level.

A closer look at the recursive graph of the trace test which is available upon request, suggests that a rank of two is an adequate choice. As a next step, we restrict all macroeconomic quantities except the current account and the exchange rate to zero in the first relation. The results are presented in Table 8.

In the second relation, we restrict the Current Account to zero. Those restrictions are not rejected by the data with a very high p-value. The character of the first long-run relationship displays the same pattern as in the bivariate system with the current account adjusting significantly with the correct sign. Hence, the first relationship mirrors the inverse relationship between the U.S. current account while the second corresponds to a relationship between the effective exchange rate and U.S fundamentals. As a preliminary conclusion, we are able to identify a the-

Table 8

Results of Multivariate Cointegration Estimates

Results for three long-run relationships

Panel (a): Cointegration vectors

	EX-CHANGE_RATE	CUR-RENT_AC-COUNT	GDP	INTER-EST	MON-EY	TREND
β_1	1.000 (.NA)	0.044 4.566	0.000 (.NA)	0.000 (.NA)	0.000 (.NA)	–0.061 –7.698
β_2	0.248 1.841	0.000 (.NA)	1.000 (.NA)	–0.137 (–6.090)	0.137 –6.090	0.000 (.NA)

Panel (b): Test of restricted model: χ^2 (4) = 1.376 [0.848]

Panel (c): Adjustment coefficients

	DEX	DCUR	DGDP	DINTE.	DMONEY
α_1	0.012 –3.621	–0.746 (–2.464)	–0.002 (–2.719)	–0.073 (–0.613)	–0.002 (–0.684)
α_2	–0.025 (–4.307)	0.606 –1.144	0.003 –1.816	0.474 –2.278	0.003 (0.697)

Note: Panel (a) shows the estimates of the cointegration vector with *t*-statistics in parenthesis. Panel (b) shows the test for over-identifying restrictions, which is an LR-test [*p*-value]. Panel (c) gives the adjustment coefficients towards the long-run equilibrium.

ory conform causality for the broad real effective dollar exchange rate to the U.S. current account. As a next step, we turn to the question whether this relationship change over time. Note that we use the current account as a left-hand side variable considering our results in this section.

3. *Time-varying Dynamics*

The framework we use for considering time varying dynamics is a state space model which relies on a Kalman filter estimation. The DOLS estimator introduced by *Stock/Watson* (1993) corrects traditional OLS with regard to endogeneity and serial correlation by including leads and lags for the first differences on the right hand side of the equation. More precisely, the basic equations have the following form

$$CA_t = X_t\theta_{k,t} + \varepsilon_t \quad \varepsilon_t \sim N\left(0, H_{k,t}\right) \tag{4}$$

For the time varying adjustment coefficients, the framework remains unchanged.

$$\Delta Adj_t = Dev_{t-1}\theta_{k,t} + \varepsilon_t \quad \varepsilon_t \sim N\left(0, H_{k,t}\right) \tag{5}$$

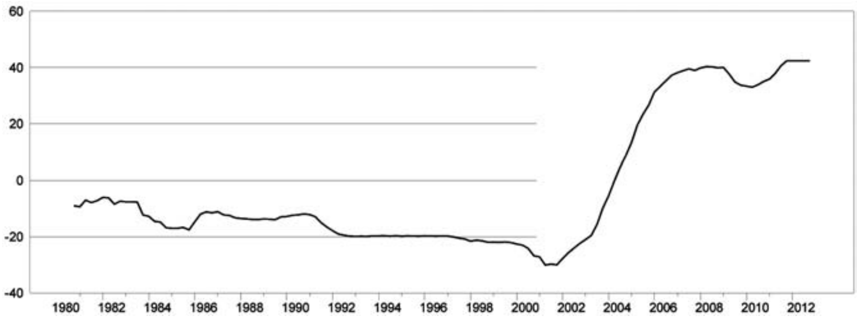
In both cases, the equation for the parameters which evolve as random walks are given by

$$\theta_t = \theta_{t-1} + \eta_t \quad \eta_t \sim N\left(0, Q_{k,t}\right) \tag{6}$$

Equation (4) and (5) are the observation equation and Equation (6) the state equation. The vector X_t contains levels as well as first leads and lags of changes of all quantities except the current account. In Equation (5), ΔAdj_t corresponds to the adjustment coefficient of the current account to the long-run deviation Dev_{t-1} in the previous period obtained from Equation (4). We consider two specifications of the $1 \times m$ vector dev_t. θ_t is an $m \times 1$ vector of states corresponding to the coefficients. The matrix Q_t corresponds to the variances and covariances of the states and determines changes of the coefficients. At each point in time Kalman-filtering begins with a prediction of both equations based on an optimization of the projected error covariances. After observing a new observation estimates are then corrected based on the Kalman gain or the blending factor which minimizes the posterior error covariances.

Figures 2–4 focus on the evolution of three important coefficients: (1) The long-run coefficient in levels which provides the impact of exchange rate changes on the current account, (2) The error correction estimation for the trade balance and finally (3) The short coefficient displaying the impact of exchange rate changes on the current account. The complete set of estimation results is available upon request.

The findings provide some important insights. Firstly, the character of the relationship between the exchange rate and the current account changes around the Millenium. Before that point in time, the coefficient only slightly changes and remains negative. However, the coefficients turn out to be positive afterwards, suggesting that a depreciation of the dollar is associated with a worsening of the current account. This finding can be explained by structural factors which are not included in our empirical framework. As a next step, we turn to the evolution of the error correction estimates. The adjustment coefficient is only negative and therefore in line with theory until the beginning of the nineties. From



Note: The graph provides the evolution of the long-run coefficient for the exchange rate over

Figure 2: Time-varying Long-run Coefficient

Note: The graph provides the evolution of the error correction coefficient over time

Figure 3: Time-varying Error Correction Coefficient

Note: The graph provides the evolution of the short-run coefficient for the exchange rate over time

Figure 4: Time varying Short-run Coefficient

that point on, the coefficient turns out to be positive until the recent crisis and negative and insignificant afterwards. Interestingly, the findings for the time varying short-run dynamics also display a break around the beginning of the nineties. This finding is in line with the results of *Shibamoto/Kitano* (2012) who also analyze first differences. Similar to the long-run coefficients, the findings are in line with theory in terms of a negative relationship during the first period while they provide an unexpected sign during the second period.

V. Conclusion

For the broad index, our findings show that a long-run relationship is detected on a basis of different configurations and estimation techniques. However, in line with previous studies, the underlying coefficients are subject to substantial instabilities. This illustrates that the empirical results crucially depend on the sample under investigation. In this sense, it doesn't seem sensible to pay too much attention to the specific magnitudes of the coefficients over a fixed sample. Another crucial result is that the link between the current account and the exchange rate does not seem to be in line with theory at least over the last decade. This is true for both short-run and long-run dynamics.

With regard to the correction of global imbalances, one should bear in mind that our approach enables an in-sample investigation and does not allow for rapid change of the exchange rate if a country decides to abolish a peg to the U.S. dollar. However, our findings suggest that change of the real exchange rates are unlikely to carry much of the adjustment burden since the time varying estimates suggest that the theory-conform link between the broad effective index and the current account has is no longer valid over the recent period. Hence, our findings are in line with *Obstfeld/Rogoff* (2005) and others.

When analyzing dynamics of real effective dollar exchange rates, further research needs to discriminate between nominal exchange rates and price dynamics as outlined by *Sarno/Taylor* (2002) and *Beckmann* (2013).

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