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The role of exchange rate for current account: A panel data analysis

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Abstract

The goal of this paper is to address the role of the real effective exchange rate (fundamentals, misalignment and volatility) for the current account using a panel data analysis for a set of 58 countries, over the period of 1994–2014. The results suggest that exchange rate misalignment is relevant for current account adjustment where countries with a more appreciated (depreciated) exchange rate face a worse (better) current account performance. Regarding the role of other control variables, current account adjustment is affected by the savings rate where higher (lower) values are associated with better (worse) current account performance, corroborating the lessons from the consumption smoothing approach. There is also evidence of a positive effect for the lagged current account (persistence effect). For emerging and less developed countries, there is evidence of a significant role played by monetary independence where more (less) monetary independence is associated with better (worse) current account performance.

Keywords: Current account; Exchange rate; Panel data

JEL classification: F32; F41; C23

1. Introduction

The literature on current account dynamics and adjustment is quite large with different theoretical and empirical backgrounds. Understanding the behavior of the current account is considered an important issue for open economy models and there is a wide list of variables thought to be relevant in understanding long and short-term movements in the current account.

This paper focuses on examining the role of the real exchange rate (its level, misalignment and volatility) for the current account and it also investigates the role of other explanatory variables for a set of 58 developed and emerging/less developed economies for the period 1994–2014 using panel data analysis (systems GMM). The paper also investigates

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if the international financial crisis of 2007–2008 has imposed a different path of adjustment of the current account for these countries.

The empirical novelty of this work is to estimate not only a baseline model, with the most used controls variables for current account models, but also to address the role of other variables. These variables include exchange rate volatility and misalignment, different measures of financial development (financial institutions and financial markets), exchange rate stability and monetary independence, which are not frequently used in current account models.

Most of the previous empirical work on current account dynamics investigates the role of the exchange rate (current and/or lagged) but not the role of exchange rate misalignment and volatility (the exceptions to this are: Arratibel et al. (2011), Comunale (2018) and Gnimassoun and Mignon (2013)). We consider these variables as important omissions from the modeling process, since the current account adjustment depends, for example, on how far the exchange rate is from its equilibrium level, which justifies the incorporation of exchange rate misalignment in our models. Also the inclusion of exchange rate volatility is justified given the lessons from the trade flows literature, which argues that exchange rate volatility has a significant impact on trade flows (exports and imports) through the uncertainty and risk channels.

The inclusion of three measures of financial development in our current account models tries to capture the idea that the financial system and institutions in a globalized world have a significant role in issues like access to funds and financing trade flows, which will ultimately affect the current account (see Zhao et al., 2017).

We justify the addition of an exchange rate stability term in our model since this potentially captures the possible side effects of a more stable exchange rate for trade flows since firms involved in exporting and importing tend to prefer more stable exchange rate in order to reduce risk and to be more certain on the magnitude of their production and inputs (see Martin, 2016; Gervais et al., 2016). Finally, we add the monetary independence index to evaluate the role of monetary authorities and their policy instruments, mainly interest rates, to see how they might affect the current account; this channel is associated the impact on capital flows (see Rose, 1996; You et al., 2014).

Our main empirical results suggest that exchange rate misalignment is relevant for current account adjustment, and countries with a more appreciated (depreciated) exchange rate will face a lower (higher) performance of the current account. The estimated models do not reveal a significant role for real effective or nominal exchange rate volatility. The savings rate has a significant role for current account adjustment, where higher (lower) values are associated with better (worse) current account performance. Another empirical finding of our work is the positive role for the lagged current account.

One striking difference from the estimated models for emerging and less developed countries is the evidence of a significant role played by monetary independence, with a negative coefficient suggesting that more (less) monetary independence is associated with a worse (better) current account performance. The estimated models do not revealed a significant role for stage of development, demographics, fiscal policy and trade openness as key determinants of the current account.

The paper is structured as follows. Section 2 summarizes the literature review and the main empirical results. Section 3 deals with data description and methodology (system GMM) while Section 4 presents the empirical results. Section 5 deals with a different measure of exchange rate volatility and Section 6 estimates the models for a set of emerging and less developed countries. Section 7 is dedicated to final remarks.

2. Literature review

The literature on the determinants of the level and dynamics of the current account has been examined by a large number of studies during the past decades and it is an important issue for open economy macroeconomics. There are different models with different predictions and choice of variables to understand which factors play a relevant role for current account dynamics. In this section we provide a summary the most important models and empirical results, without providing a comprehensive overview.

Overlapping generation's models (Obstfeld and Rogoff, 1998) predict a positive relationship between government budget balances and current accounts when considering the medium and long term since government budget deficits tend to be associated with current account deficits by redistributing income from future to present generations. Based on the lessons from the intertemporal approach to the current account, a deficit is the outcome of forward-looking dynamic saving and investment decisions driven by variables such as interest rates, government spending, and the expectations of productivity growth, amongst other factors. According to this approach, the current account balance has the role of a buffer against transitory shocks in productivity or demand (Sachs, 1981; Obstfeld and Rogoff, 1995; Ghosh, 1995; Razin, 1995).

One important issue in the empirical literature is the impact of economic changes on the current account and, specifically, if they are global or country specific in origin. Glick and Rogoff (1995) and Razin (1995), for example, argue that global productivity shocks are less important than country specific shocks for current account deficits. Other authors have used the intertemporal approach to address the impact of variables such as the real exchange rate (Stockman, 1987), changes in the terms of trade (Obstfeld, 1982; Svensson and Razin, 1983; Greenwood, 1983; Mendoza, 1995; Tornell and Lane, 1998), fiscal policy (Leiderman and Razin, 1991; Frenkel et al., 1996), global productivity shocks (Glick and Rogoff, 1995) and capital controls (Mendoza, 1991).[1] There is also a literature dealing with current account sustainability (Milesi-Ferreti and Razin, 1996).

Early studies on the current account were conducted by Ghosh (1995) and Ghosh and Ostry (1995), based on the literature of consumption smoothing, to model current account dynamics. Glick and Rogoff (1995) and Nason and Rogers (2002) are examples of modeling current account dynamics and investment when facing productivity shocks. Razin (1995) and Obstfeld and Rogoff (1998) use open economy dynamic optimizing models based on an intertemporal approach to current account determination.

Debelle and Faruqee (1996) developed an alternative approach to investigate current account determination. Specifically, they use a saving-investment perspective to test different model specifications in order to address possible structural determinants of the current account.[2] The authors estimate a panel of 21 industrial economies (1971–1993) and an additional cross section database including a further 34 industrial and developing countries to understand long-term changes (cross section analysis) and short-run dynamics (panel data) of the current account. The empirical findings suggest that the fiscal surplus, terms of trade and capital controls do not play a significant role on the long-run current account while relative income, government debt and demographics do. For the short run analysis, the results indicate that fiscal policy, changes in the terms of trade, the state of the business cycle (boom or a recession) and the exchange rate have an impact on the current account.

Edwards (1995), on examining the determinants of savings, highlights the importance of the level of financial deepening (some measure of monetary aggregate to GDP) and it is intended to be a measure of depth and sophistication of the financial system with positive association to saving. Chinn and Prasad (2003) emphasize that this positive association is not straight forward since this measure of financial deepening can also be viewed as a proxy for borrowing constraints and in this case higher levels of financial depth results in lower levels of private saving.

Roldos (1996) summarizes the evidence on the studies examining the stages of development hypothesis for the balance of payments suggesting that countries with lower and intermediate stages of development usually face current account deficits since they have to import capital and as they move to an advanced stage of development they have current account surplus since they have to pay previously accumulated external liabilities and export capital to less developed countries.

Chinn and Prasad (2003) summarize the theoretical and empirical choice of variables to be used in investigating current account models. If one takes into account the lessons from an intertemporal approach, the stock of net foreign assets (NFA) can be considered as a relevant initial condition since the current account for each country is the sum of the trade balance and the payments (return) on its net foreign liabilities position. Under specific conditions, favorable income shocks lead to current account deficits (surplus) in debtor (creditor) countries. The authors investigate the medium-term determinants of current accounts in industrial and developing countries and the empirical results suggest that current account balances are positively correlated with government budget balances and initial stocks of net foreign assets. For developing countries there is a positive (negative) association of financial deepening (openness to trade) and the current account.

The literature also highlights the importance of demographics in current account dynamics since it usually plays a relevant role as one of the determinants of national saving. For the current account the demographic profiles should have a significant role if it is associated with cross country differences in saving, and this effect is usually captured by

[1] Part of this literature recognizes the existence of simultaneity between current account deficits and their determinants.

[2] See Schmidt-Hebbel et al. (1992), Edwards (1995), and Masson et al. (1998) for early studies examining the determinants of savings with empirical models linking national and private saving to structural determinants such as the level of economic development and demographic variables, including the current account as an explanatory variable.

differences in the share of the working population that are comprised of young and old dependents; in other words, young and old dependency ratios.

Another variable that is considered as an important determinant of current account dynamics is the volatility of the terms of trade, since higher volatility can induce agents to save for precautionary and consumption smoothing reasons when faced with a more volatile income flow. There is also the argument that higher terms of trade volatility is associated with less capital inflows.

Variables that capture each country's macroeconomic policies are also considered as important determinants for the current account. Among these variables two of them are frequently used in previous studies. One is the degree of trade openness since it can be associated with policy choices such as the tariff regime and attractiveness to foreign capital. The second is a measure of capital controls since it is usually considered as an indication of a country's ability to manage its external balance – especially to prevent capital flight during periods of significant current account deficits. On the other hand, the imposition of capital controls can reduce the current account deficit in terms of limiting access to external financing.

Calderon et al. (1999) is one of the first studies to focus on the determinants of the current account for developing countries. The authors use a panel data set of 44 developing countries with annual data for the period 1966–1995. The results indicate that GDP growth has a positive impact on the current account deficit; foreign (industrial countries) GDP growth reduces the current account deficit; changes in private and public saving rates reduces the current account deficit for the panel estimation but this effect does not hold for the cross section analysis; a real exchange rate appreciation, terms of trade deterioration and lower international real interest rates all increase the current account deficit; and countries with per capita GDP close to the industrial average have lower current account deficits (stages of development hypothesis).

Recent empirical studies examining the determinants of the current account for developing countries includes Calderon et al. (2007) and they found that a real exchange rate appreciation and deterioration in the terms of trade are associated with a worse current account deficit. Another study on the determinants of the current account balance for developing economies is Prat et al. (2010) and their results suggest that the fiscal balance has a significant role on the current account and an increase of net foreign assets improves the current account.

Gruber and Kamin (2007) is one example of the studies addressing the existence of a global pattern of global imbalances mainly associated with a large U.S. current account deficit and a large surplus for Asian developing countries. The authors estimate a panel data model (1982–2003) for 61 countries with a similar specification when compared to Chinn and Prasad (2003), controlling for variables such as per capita income, output growth, fiscal balance, net foreign assets, degree of trade openness and demographic (youth and elderly ratio) variables. The initial estimation indicates that it was not possible to explain the large U.S. current account deficit or the large developing Asian surpluses. When the authors extended the initial model and include a variable for the financial crisis the estimated model was able to explain the current account surplus for Asian countries but not for the large U.S. deficit.

Chinn and Ito (2008) investigate the main determinants of global current account imbalances with special attention to the increasing US current account deficit in an era of a reduction in global real interest rates and expansionary fiscal policies. The authors estimated a current account model addressing the importance of institutional development (financial openness and legal development). The results indicate that for industrial countries that the government balance is a relevant variable for current account adjustment. In sum, the paper provides evidence supporting the role of fiscal factors and the excess savings (East Asia) to understand global current account imbalances.

3. Data and methodology

In this paper we use a panel data set consisting of annual data for 58 countries for the period of 1994–2014. We use the System GMM estimation (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) for dynamic models using panel data in order to address the fact that the most relevant variables are jointly endogenous with the current account and this empirical methodology controls for simultaneity and reverse causation. The estimation of our system GMM models deals with the problem of instrument proliferation (Roodman, 2009). The idea is that as the time dimension increases, the number of instruments can be too large compared to the sample size, invalidating some asymptotic results and specification tests. Too many instruments can overfit endogenous variables and fail to expunge their endogenous components, resulting in biased coefficients.[3]

In order to address the role of the main conditioning variables in our panel data models, we refer to the choice of variables used in previous work (see Box 1 of the Appendix). From this, we see that different studies use similar control variables.[4] The key terms and variables used in previous work are the determinants of savings, stage of development, demographics, fiscal policy, foreign assets, real exchange rate, financial development and macroeconomic policies (trade openness and capital controls). Therefore, our choice of model specification (see Eqs. (1a) and (1b) for the baseline model and three extended models) is based on the lessons from the empirical literature with the additional contribution of evaluating not only the role of the real effective exchange rate but also the real effective exchange rate misalignment and volatility.[5]

The estimation of the system GMM panel data models starts with a baseline model and then expands the dimensions to three other models (extended models A, B and C). The initial baseline model (BM) is represented by the following equations, the first including the first difference of fundamentals of the exchange rate and misalignment, and the second replacing the real effective exchange rate misalignment with the exchange rate volatility term:

$$\begin{aligned} CA_{it} &= \beta_0 CA_{it-1} + \beta_1 DFUNDAMENTALS_{it} + \beta_2 MISALIGBS_{it} + \beta_3 NFA_{it} + \beta_4 SAV_{it} + \beta_5 BUDGET_{it} \\ &\quad + \beta_6 RELINCUS_{it} + \beta_7 DUCRISIS_t + \beta_8 DUEMLDC_i + \varepsilon_{it} \end{aligned} \tag{1a}$$

$$\begin{aligned} CA_{it} &= \beta_0 CA_{it-1} + \beta_1 DFUNDAMENTALS_{it} + \beta_2 VOLATREER_{it} + \beta_3 NFA_{it} + \beta_4 SAV_{it} + \beta_5 BUDGET_{it} \\ &\quad + \beta_6 RELINCUS_{it} + \beta_7 DUCRISIS_t + \beta_8 DUEMLDC_i + \varepsilon_{it} \end{aligned} \tag{1b}$$

where:

CA = Current account balance (% of GDP). Source: WEO and IFS.
LREER = LN of real effective exchange rate (2010 = 100). (Source: BIS. A higher (lower) value indicates an appreciation (depreciation).)
MISALIGBS = Real effective exchange rate misalignment accounting for the Balassa-Samuelson effect using the real per capita GDP as an explanatory variable. Source: BIS database for REER and Penn World Table for real per capita GDP. A positive (negative) value for the MISALIGBS indicates that the real effective exchange rate is appreciated (depreciated) relative to its equilibrium level.
MISALIGHP = Real effective exchange rate misalignment using the cyclical component of the Hodrick-Prescott (HP) filter.
DFUNDAMENTALS = The first difference of fundamentals ($\Delta(LREER_t - MISALIGBS_t)$), assuming that LREER is non-stationary (see Table A2 of the Appendix), which is a proxy for the changes in the equilibrium real effective exchange rate.
VOLATREER = Real effective exchange rate volatility estimated from ARCH-GARCH models (see Table 1).
MOVSTDEV = Nominal exchange rate volatility measured by a moving average standard deviation. $MOVSTDE_{it} = \sqrt{\frac{\sum_{i=1}^{k}(x_{i,t-1}\bar{x}_{it})}{k-1}}$ where $x_{i,t}$ is the nominal exchange rate in natural log, $\bar{x}_{i,t}$ is the average nominal exchange rate for the last k ($k = 12$) months.
NFA = Net foreign assets (% GDP). Source: Lane and Milesi-Ferreti and IFS.
SAV = Savings rate (% GDP). Source: WDI – The World Bank.
BUDGET = General government budget balance (surplus or deficit) as % of GDP. Source: WDI – The World Bank and United Nations Database.
RELINCUS = Real per capita income relative to U.S. Source: WDI – The World Bank.

[3] All estimated models use the Stata commands *collapse* or *laglimits* to limit the number of instruments.
[4] Box 1 summarizes only what we consider the three main empirical studies on current account adjustment using panel data estimation, with the purpose of justifying the selection of our control variables. A detailed description of other studies with additional control variables and methodology was already developed in Section 2 of this work.
[5] We use two measures of exchange rate misalignment and two measures of exchange rate volatility for robustness purpose.

Table 1
Real effective exchange rate volatility – ARCH/GARCH models – 58 countries (Feb 1994 to Dec 2014).

Countries	Model selection AR(*n*) or ARMA(*n*,*r*) GARCH(*p*,*q*)	Countries	Model selection AR(*n*) or ARMA(*n*,*r*) GARCH(*p*,*q*)
Algeria	AR(1) GARCH(1,1)	Korea	AR(1) GARCH(1,1)
Argentina	AR(2) ARCH(1)	Latvia	AR(1) GARCH(1,1)
Australia	AR(2) GARCH(1,1)	Lithuania	AR(1) GARCH(1,1)
Austria	AR(2) GARCH(0,1)	Luxembourg	AR(1) GARCH(0,1)
Belgium	AR(2) GARCH(0,1)	Malaysia	AR(1) GARCH(1,1)
Brazil	AR(1) ARCH(1)	Malta	AR(1) GARCH(1,1)
Bulgaria	AR(1) GARCH(1,1)	Mexico	AR(1) ARCH(1)
Canada	AR(1) GARCH(1,1)	Netherlands	AR(2) GARCH(0,1)
Chile	AR(1) GARCH(1,1)	New Zealand	AR(1) GARCH(1,1)
China	AR(1) GARCH(0,1)	Norway	AR(1) GARCH(1,1)
Colombia	AR(2) GARCH(1,1)	Peru	AR(2) GARCH(1,1)
Croatia	AR(1) GARCH(0,1)	Philippines	AR(1) GARCH(1,1)
Cyprus	AR(2) ARCH (1)	Poland	AR(2) GARCH(1,1)
Czech Republic	AR(1) GARCH(1,1)	Portugal	AR(2) GARCH(1,1)
Denmark	AR(2) GARCH(1,1)	Romania	AR(1) GARCH(1,1)
Estonia	AR(2) GARCH(1,1)	Russia	AR(2) GARCH(1,1)
Finland	AR(2) GARCH(1,1)	Saudi Arabia	AR(2) ARCH(1)
France	AR(1) GARCH(0,1)	Singapore	ARMA (1,1) ARCH (1)
Germany	AR(1) GARCH(1,1)	Slovakia	AR(1) GARCH(1,1)
Greece	AR(2) GARCH(0,1)	Slovenia	AR(1) GARCH(0,1)
Hong Kong	AR(1) ARCH(1)	South Africa	AR(1) GARCH(1,1)
Hungary	AR(1) GARCH(1,1)	Spain	AR(2) ARCH(1)
Iceland	AR(2) GARCH(1,1)	Sweden	AR(1) GARCH(1,1)
India	AR(2) GARCH(1,1)	Switzerland	AR(1) GARCH(1,1)
Indonesia	AR(1) GARCH(1,1)	Thailand	AR(1) GARCH(1,1)
Ireland	AR(1) GARCH(1,1)	Turkey	AR(2) GARCH(1,1)
Israel	AR(2) GARCH(1,1)	United Kingdom	AR(1) GARCH(1,1)
Italy	AR(2) GARCH(0,1)	United States	AR(1) GARCH(1,1)
Japan	AR(1) ARCH(1)	Venezuela	AR(2) GARCH(1,1)

Note: *n* is the autoregressive order for the DLREER.
(*n*,*r*) represents *n* autoregressive and *r* moving average terms.
(*p*,*q*) refers to the presence of *p* lagged squared residuals and the *q* lagged conditional variance.

DUCRISIS = Dummy for the international financial crisis of 2008 (1 from 2008 to 2014 and 0 from 1994 to 2007).
DUEMLDC = Dummy variable for emerging/less developing countries (1 for emerging/LDC and 0 for developed/industrialized countries).
ε_{it} and u_{it} are error terms.

After the initial estimation of the baseline model, we estimate three other extended models:
Extended model A – Adds to the baseline model the following control variables:

RELDEPO = Age dependency ratio, old (% of working-age population) deviation from the average of all countries. Source: WDI – The World Bank.
RELDEPY = Age dependency ratio, young (% of working-age population) deviation from the average of all countries. Source: WDI – The World Bank.
DTOT = Changes in Terms of Trade (export prices/import prices). Source: WDI – The World Bank.
OPEN = Sum of exports and imports of goods and services (% of GDP). Source: WDI – The World Bank.

Extended model B – Adds to the baseline model three measures of financial development:

FD = Three measures of financial development.

FD = Financial development; FI = financial institutions; and FM = financial markets. Source: Svirydzenka (2016). Higher (lower) values for the three measures of financial development indicate a more (less) integrated and developed financial system.

Extended Model C – Adds to the baseline model the following control variables:

EXCRATESTAB = Exchange rate stability index. Source: Aizenman et al. (2013). Higher values of this index indicate more stable movement of the exchange rate against the currency of the base country.
MONETINDEP = Monetary independence index. Source: Aizenman et al. (2013). Higher values of the index mean more monetary policy independence.

Table 1 describes the ARCH-GARCH models estimated for each one of the 58 countries using monthly data for the first difference of the real effective exchange rate from February 1994 to December 2014 and after the models were estimated we then use monthly average to obtain the annual data for the standard deviation of the real effective exchange rate volatility (VOLATREER).

4. Results

One required procedure before we report the estimated models is the panel unit root tests (see Appendix Table A2) for each individual variable. The results indicate that all variables are stationary with the exception of LREER, RELINCUS, OPEN and NFAGDP.

Table 2 summarizes the estimation of the baseline model (BM) and the extended model A for the current account where in the first model we introduce the real effective exchange rate misalignment (MISALIGBS) while in the second we replace this variable for the real effective exchange rate volatility (VOLATREER).

The results indicate statistically significance for lagged current account (positive coefficient) and savings (positive coefficient) for all four estimated models. Regarding the positive coefficient sign for savings (SAV) it is what the theory expects since higher (lower) levels of savings are associated to better macroeconomic conditions that improve (deteriorate) the external balance, in other words, the current account. This result corroborates the lessons from the consumption smoothing approach for the current account.

The exchange rate misalignment has a negative estimated coefficient and it is statistically significant only for baseline model 1, indicating that a more appreciated (depreciated) exchange rate relative to its equilibrium level has a negative (positive) impact on the current account, which is the expected sign since over time a more appreciated (depreciated) exchange rate tends to reduce (foster) the trade balance and so, has an impact on the current account.

There is no statistical significance for the real effective exchange rate volatility (VOLATREER) in either of the estimated models.

The tests for no second order autocorrelation, AR(2) indicate that there is no second order autocorrelation at the 5% level for all four estimated models.

Summarizing the results from the estimated models in Table 2 we can say that the savings rate (SAV) and lagged current account play a significant role for current account, and there is partial evidence supporting the role of real effective exchange rate misalignment.

Table 3 reports the estimation of the extended model B adding three measures of financial development (FD, FI and FM) to the baseline model estimated in Table 2.

The results are robust regarding to the ones reported in Table 2. Current account seems to be affected by its own lagged level, exchange rate misalignment (negative sign) and savings rate (positive sign), while the other explanatory variables are not statistically significant.

The negative estimated coefficient for MISALIGBS indicates that a more appreciated (depreciated) exchange rate relative to its equilibrium level has a negative (positive) impact on the current account. The positive estimated coefficient for SAV indicates that higher (lower) levels of savings are associated to better (worse) current account results.

The tests for no second order autocorrelation, AR(2) indicate that there is no second order autocorrelation at the 5% level for all six estimated models.

The last set of estimated current account models are reported in Table 4 for the extended model C, to which exchange rate stability (EXCRATESTAB) and monetary independence (MONETINDEP) are added to the baseline model.

Table 2
Current account models – baseline and extended model A.

Models	Baseline 1	Baseline 2	Extended model 1	Extended model 2
CA_{t-1}	0.579	0.634	0.575	0.587
Robust	(0.075)***	(0.079)***	(0.081)***	(0.064)***
DFUNDAMENTALS	0.048	0.101	0.022	−0.031
Robust	(0.075)	(0.064)	(0.096)	(0.105)
MISALIGBS	−0.048		−0.054	
Robust	(0.022)**		(0.035)	
VOLATREER		24.226		53.062
Robust		(46.467)		(61.868)
DNFA	1.131	2.098	2.694	2.634
Robust	(1.216)	(1.372)	(2.122)	(1.830)
SAV	0.426	0.397	0.538	0.568
Robust	(0.245)*	(0.214)*	(0.233)**	(0.218)***
BUDGET	−0.113	−0.049	−0.206	−0.144
Robust	(0.097)	(0.104)	(0.141)	(0.106)
DRELINCUS	−44.398	−31.402	−54.654	−44.340
Robust	(34.466)	(30.609)	(39.131)	(39.366)
RELDEPY			−6.303	5.413
Robust			(10.634)	(14.270)
RELDEPO			2.221	8.755
Robust			(8.146)	(15.967)
DTT			0.009	0.032
Robust			(0.028)	(0.047)
DOPEN			0.025	−0.0006
Robust			(0.052)	(0.042)
DUCRISIS	−0.528	−1.356	−0.351	−0.115
Robust	(1.281)	(1.394)	(1.352)	(1.822)
DUEMLDC	−5.113	−4.224	−9.455	−5.974
Robust	(6.889)	(4.748)	(10.055)	(16.046)
AR(2)	0.187	0.145	0.136	0.064
Number of countries	55	55	55	55

Note: Stata 12. System GMM, 2 step procedure. Robust standard errors.
Stata command using laglimits (1 1) and collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

The statistically significant variables are the following: the lagged current account with a positive estimated coefficient; the exchange rate misalignment term with a negative coefficient; change in net foreign assets (NFA) for model 2 with positive coefficient; savings rate (SAV) for both models with a positive coefficient; and DUCRISIS with a negative coefficient in both models.

The difference from previous models (Tables 2 and 3) is the statistical significance of the estimated coefficients for the international financial crisis and a mixed evidence in favor of the significance of changes in net foreign assets.

The tests for no second order autocorrelation, AR(2) indicate that there is no second order autocorrelation at 5% for the two estimated models.[6]

[6] For robustness purposes, we use a different measure of exchange rate misalignment using the cycle component of the Hodrick-Prescott Filter (HP), naming this variable MISALIGHP. After this, we estimated the same models from Tables 2–4 that use MISALIGBS (06 models), with the new measure of misalignment (MISALIGHP) and the results indicate that all estimated coefficients are negative but not statistically significant.

Table 3
Current account model – extended model B.

Models	1	2	3	4	5	6
CA_{t-1}	0.560	0.586	0.557	0.595	0.601	0.602
Robust	(0.079)***	(0.083)***	(0.079)***	(0.082)***	(0.080)***	(0.085)***
DFUNDAMENTALS	0.049	0.055	0.049	0.060	0.061	0.062
Robust	(0.061)	(0.057)	(0.057)	(0.057)	(0.061)	(0.059)
MISALIGBS	−0.054	−0.044	−0.047			
Robust	(0.023)**	(0.022)**	(0.019)**			
VOLATREER				33.011	40.057	22.272
Robust				(47.637)	(42.323)	(47.432)
DNFA	1.381	1.651	1.763	2.254	2.495	2.013
Robust	(1.463)	(1.436)	(1.662)	(1.480)	(1.557)	(1.547)
SAV	0.466	0.393	0.543	0.485	0.442	0.414
Robust	(0.202)**	(0.111)***	(0.142)***	(0.265)*	(0.200)**	(0.276)
BUDGET	−0.085	−0.099	−0.117	−0.052	−0.037	−0.054
Robust	(0.103)	(0.126)	(0.097)	(0.106)	(0.115)	(0.110)
DRELINCUS	−54.63	−38.870	−46.550	−40.098	−32.354	−35.272
Robust	(36.125)	(36.326)	(34.997)	(32.642)	(34.349)	(30.529)
FD	−3.422			−2.532		
Robust	(5.769)			(14.550)		
FI		−1.307			0.263	
Robust		(11.223)			(15.224)	
FM			−0.124			−5.457
Robust			(3.380)			(8.781)
DUCRISIS	−1.445	−1.098	−0.979	−0.850	−1.269	−1.180
Robust	(1.510)	(1.421)	(1.472)	(1.486)	(1.396)	(1.744)
DUEMLDC	−6.583	−4.840	−2.847	−6.454	−5.766	−6.770
Robust	(6.151)	(4.689)	(3.767)	(6.332)	(7.535)	(5.022)
AR(2)	0.173	0.148	0.160	0.105	0.085	0.116
Number of countries	55	55	55	55	55	55

Note: Stata 12. System GMM, 2 step procedure. Robust standard errors.
Stata command using laglimits (1 1) and collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

5. A different measure of exchange rate volatility

This section of the paper uses a different measure of exchange rate volatility, calculated as the moving standard deviation of the nominal exchange rate using monthly data, and then average this for annual data.[7] This measure is different from the one used in our previous estimated models (Tables 2–4) which uses the real effective exchange rate and based on the estimation of ARCH-GARCH models.

The estimated models of the current account reported on Table 5 indicate mixed evidence in favor of statistically significance (three out of six models) for the nominal exchange rate volatility (MOVSTDEV) with positive estimated coefficients indicating that higher (lower) levels of exchange rate volatility foster (deteriorates) the current account. The other two statistically significant variables are robust relative to previous estimated models (Tables 2–4) indicating that lagged current account and savings rate are statistically significant to explain the current account.

[7] See Bauwens et al. (2012) for additional discussion on volatility models.

Table 4
Current account model – extended model C.

Models	1	2
CA_{t-1}	0.554	0.582
Robust	(0.068)***	(0.101)***
DFUNDAMENTALS	0.045	0.093
Robust	(0.063)	(0.070)
MISALIGBS	−0.047	
Robust	(0.026)*	
VOLATREER		41.343
Robust		(45.097)
DNFA	1.653	2.563
Robust	(1.584)	(1.455)*
SAV	0.501	0.494
Robust	(0.165)***	(0.283)*
BUDGET	−0.065	−0.067
Robust	(0.114)	(0.125)
DRELINCUS	−62.274	−33.550
Robust	(38.488)	(29.881)
EXCRATESTAB	−2.144	−0.541
Robust	(3.162)	(3.129)
MONETINDEP	−1.274	0.130
Robust	(3.155)	(4.220)
DUCRISIS	−3.186	−2.760
Robust	(0.986)***	(1.245)**
DUEMLDC	−1.458	−13.358
Robust	(3.499)	(33.206)
AR(2)	0.151	0.105
Number of countries	54	54

Note: Stata 12. System GMM, 2 step procedure. Robust standard errors.
Stata command using laglimits (1 1) and collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

6. Robustness tests: emerging and less developed countries

A final step in the estimation strategy involved replicating the results from Tables 2–4 for the subset of emerging and less developed countries in order to see if there are significant differences (Appendix Tables A3–A5).[8]

The determinants of the current account for emerging and less developed countries, using the baseline and extended model A, is determined mainly by the savings rate (positive coefficient), net foreign assets (positive coefficient) and the real effective exchange rate misalignment (negative coefficient), which can be considered as a robust result compared to the ones from the whole sample (Table 2). Regarding the extended model B, the current account adjustment for emerging and LDC countries relies mainly on the savings rate (positive coefficient) and there is some role for one of the three measures of financial development and integration (FM variable) with a positive coefficient. This result is similar to the previous one for the complete sample (Table 3) with the exception that for emerging and less developed countries we have not found a statistically significant role for the real exchange rate level and misalignment terms. Finally, for the extended model C the current account adjustment relies on net foreign assets (positive coefficient) and the savings rate (positive coefficient) which are consistent with the previous estimation (Table 4) for the entire sample. The striking difference not found for the complete sample, is that monetary independence is statistically significant,

[8] The estimation results for emerging and less developed countries uses a three year average data due to problems of instrument proliferation (Roodman, 2009) that could not be mitigated by using the COLLAPSE command in Stata since the cross section dimension is too small for this set of countries.

Table 5
Current account models – using moving standard deviation as measure of exchange rate volatility.

Models	Baseline 2	Extended model 2	Models	Extended model B – 4	Extended model B – 5	Extended model B – 6	Models	Extended model C – 2
CA$_{t-1}$	0.604	0.592	CA$_{t-1}$	0.596	0.589	0.603	CA$_{t-1}$	0.590
Robust	(0.073)***	(0.083)***	Robust	(0.099)***	(0.103)***	(0.072)***	Robust	(0.075)***
DFUNDA-MENTALS	0.053	0.005	DFUNDA-MENTALS	0.040	0.042	0.040	DFUNDA-MENTALS	0.029
Robust	(0.049)	(0.060)	Robust	(0.065)	(0.069)	(0.066)	Robust	(0.084)
MOVSTDEV	0.003	0.006	MOVSTDEV	0.003	0.003	0.004	MOVSTDEV	0.004
Robust	(0.001)**	(0.0023)***	Robust	(0.002)*	(0.002)	(0.002)	Robust	(0.003)
DNFA	1.800	2.321	DNFA	2.015	2.255	1.617	DNFA	1.974
Robust	(1.449)	(2.204)	Robust	(1.287)	(1.391)	(1.251)	Robust	(1.452)
SAV	0.379	0.511	SAV	0.353	0.365	0.319	SAV	0.343
Robust	(0.170)**	(0.191)***	Robust	(0.173)**	(0.203)*	(0.171)*	Robust	(0.160)**
BUDGET	−0.104	−0.129	BUDGET	−0.088	−0.122	−0.075	BUDGET	−0.125
Robust	(0.101)	(0.175)	Robust	(0.107)	(0.126)	(0.092)	Robust	(0.109)
DRELINCUS	−39.245	−35.956	DRELINCUS	−35.746	−43.210	−14.985	DRELINCUS	−16.359
Robust	(51.526)	(35.780)	Robust	(31.625)	(30.323)	(28.374)	Robust	(45.674)
RELDEPY		11.593	FD	−4.680			EXCRATESTAB	−1.390
Robust		(13.022)	Robust	(11.957)			Robust	(3.561)
RELDEPO		15.921	FI		−3.351		MONETINDEP	−1.717
Robust		(16.433)	Robust		(14.303)		Robust	(2.978)
DTT		0.026	FM			−3.019	DUCRISIS	−1.258
Robust		(0.023)	Robust			(6.061)	Robust	(1.868)
DOPEN		−0.003	DUCRISIS	−1.391	−1.352	−1.341	DUEMLDC	−7.596
Robust		(0.044)	Robust	(1.688)	(1.618)	(1.619)	Robust	(8.315)
DUCRISIS	−1.024	−0.304	DUEMLDC	−2.766	−3.649	−4.702		
Robust	(1.566)	(1.419)	Robust	(5.572)	(7.442)	(4.632)		
DUEMLDC	−0.590	2.380						
Robust	(4.727)	(9.703)						
AR(2)	0.109	0.062	AR(2)	0.088	0.095	0.083	AR(2)	0.096
Number of countries	55	55	Number of countries	55	55	55	Number of countries	54

Note: Stata 12. System GMM, 2 step procedure. Robust standard errors.
Stata command using laglimits (1 1) and collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

with a negative estimated coefficient for emerging and less developed countries, suggesting that more (less) monetary independence is associated with lower (higher) levels of the current account.

7. Conclusions

Our review of the theoretical and empirical literature on current account adjustment demonstrates that there is no consensuses on which variables are crucial in understanding the determinants of the current account and there is a significant variety of empirical approaches/methodologies applied for different set of countries.

The novelty of the new work presented in this paper relies first on investigating a time period that includes the post international financial crisis of 2007–2008 and the use of the real effective exchange rate fundamentals, the exchange rate misalignment and its volatility (two measures). There is a further contribution in the empirical analysis in that we consider the role of other variables not frequently used in the empirical literature of current account adjustment such as a measure of exchange rate stability and monetary independence.

We estimate a baseline and three other extended models to address the role of other variables, such as net foreign assets, the budget surplus/deficit, relative income to U.S., the age dependency ratio, changes in terms of trade, trade openness, financial integration, monetary independence, exchange rate stability and the role of international financial crises.

The estimation of our panel data models reveals some important results. Focusing on our main goal, which is to evaluate the role of real exchange rate fundamentals, misalignment and volatility, the results suggest that exchange rate misalignment is relevant for current account adjustment. Countries with a more appreciated (depreciated) exchange rate will face a lower (higher) performance of the current account, which is consistent with the expected results from the literature due to the trade balance effect. The estimated models do not reveal a significant role for the real effective or nominal exchange rate volatility in explaining current account adjustment.

Regarding the role of the other control variables, current account adjustment is affected by the savings rate where higher (lower) values are associated with better (worse) current account performance. This result corroborates the lessons from the consumption smoothing approach for the current account. Another empirical finding of our work is the positive role of the lagged current account, which is an indication of a persistence effect.

One striking difference from the estimated models for emerging and less developed countries is the evidence of a significant role played by monetary independence, with a negative coefficient suggesting that more (less) monetary independence is associated with a worse (better) current account performance. One possible explanation for this result is that emerging and less developed countries are more likely to impose some form of capital controls in order to increase exchange rate stability and the outcome of a higher degree of monetary independence can ultimately impose some limitation on current account performance. Our estimated models have not revealed a significant role for stage of development, demographics, fiscal policy and trade openness as key determinants of the current account.

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Appendix

List of countries: Algeria, Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States and Venezuela.

Box 1: Current account – main previous empirical studies using panel data.

Previous work	Variables	Dependent variable	Time period	Estimated models
Chinn and Prasad (2003)	CAGDP current account/GDP; general government budget/GDP; net foreign assets/GDP; relative per capita income (relative to U.S.); youth dependency ratio; old dependency ratio; average real GDP; standard deviation of GDP growth; standard deviation of terms of trade; log of trade weighted real exchange rate; trade openness (exports plus imports/GDP); financial deepening (M2/GDP); capital controls on current account transactions; national saving/GDP.	Current account/GDP	1971–1995 18 industrial countries and 71 developing countries	Cross section and panel data

Previous work	Variables	Dependent variable	Time period	Estimated models
Calderon et al. (1999)	Current account deficit lagged one period; domestic output deficit; country specific productivity shock; global specific productivity shock; domestic output growth; saving: national/private; investment; public saving; budget surplus; government spending shocks; degree of openness; real effective exchange rate; terms of trade; exchange controls; industrialized country growth rate; world real interest rate.	Current account deficit/gross national disposable income	1966–1995 44 developing countries	Panel data (GMM estimation)
Debelle and Faruqee (1996)	Current account deficit/GDP; net foreign assets; government debt; general government surplus; government investment expenditure; relative income; capital/output ratio; capital per worker; dependency ratio (deviation from average); terms of trade change; inflation; real interest rate; oil imports; oil exports; capital controls; real effective exchange rate.	Current account deficit/GDP	1971–1993 21 industrial countries	Cross-section and panel data

Table A1
Descriptive statistics.

Variable	Mean	Std. dev.	Min	Max
ca	0.190	6.463	−21.455	24.730
lreer	4.567	0.177	3.869	5.505
dfundamentals	0.002	8.507	−75.387	161.792
dtt	3.491	11.516	−86.503	35.639
relincus	0.577	0.332	0.052	1.866
open	93.698	72.609	17.103	448.056
reldepy	1.000	0.344	0.548	1.978
reddepo	1.000	0.399	0.199	1.967
nfagdp	−0.131	0.694	−6.402	3.121
sav	25.965	9.009	8.438	56.780
budget	−2.076	4.489	−23.058	18.564
fd	0.535	0.218	0.077	0.991
fi	0.588	0.227	0.108	0.989
fm	0.472	0.247	0.002	0.995
volatreer	0.018	0.016	0.004	0.176
movstdev	13.148	95.565	0.000	2165.451
misalighp	−0.051	5.602	−57.151	27.282
misaligbs	0.000	8.536	−69.028	65.964
excratestab	0.563	0.300	0.069	1.000
monetindep	0.341	0.214	0.000	0.842

Table A2
Panel unit root tests.

Variables and tests	Statistic	Prob.	Evaluation	Variables and tests	Statistic	Prob.	Evaluation
cagdp			Stationary	**Fd**			Stationary
Levin, Lin and Chu t	−4.3408	0.000		Levin, Lin and Chu t	−9.0644	0.000	
Im, Pesaran and Shin W-stat	−3.0563	0.001		Im, Pesaran and Shin W-stat	−4.0058	0.000	
ADF – Fisher chi-square	158.9	0.005		ADF – Fisher chi-square	225.78	0.000	
PP – Fisher chi-square	138.58	0.075		PP – Fisher chi-square	449.49	0.000	
lreer			Non-stationary	**Fi**			Stationary
Levin, Lin and Chu t	−2.972	0.002		Levin, Lin and Chu t	−5.026	0.000	
Im, Pesaran and Shin W-stat	−1.072	0.142		Im, Pesaran and Shin W-stat	−0.5128	0.304	
ADF – Fisher chi-square	135.637	0.103		ADF – Fisher chi-square	196.5	0.000	
PP – Fisher chi-square	102.126	0.817		PP – Fisher chi-square	204.3	0.000	
dtt			Stationary	**Fm**			Stationary
Levin, Lin and Chu t	−26.957	0.000		Levin, Lin and Chu t	−14.148	0.000	
Im, Pesaran and Shin W-stat	−21.552	0.000		Im, Pesaran and Shin W-stat	−9.0203	0.000	
ADF – Fisher chi-square	620.09	0.000		ADF – Fisher chi-square	506.22	0.000	
PP – Fisher chi-square	691.09	0.000		PP – Fisher chi-square	288.62	0.000	
relincus			Non-stationary	**Volatreer**			Stationary
Levin, Lin and Chu t	2.8165	0.998		Levin, Lin and Chu t	−10.602	0.000	
Im, Pesaran and Shin W-stat	3.6376	1.000		Im, Pesaran and Shin W-stat	−12.392	0.000	
ADF – Fisher chi-square	95.769	0.891		ADF – Fisher chi-square	339.14	0.000	
PP – Fisher chi-square	60.129	1.000		PP – Fisher chi-square	477.42	0.000	
open			Non-stationary	**Misaligbs**			Stationary
Levin, Lin and Chu t	−3.7838	0.000		Levin, Lin and Chu t	−5.3362	0.000	
Im, Pesaran and Shin W-stat	0.3851	0.650		Im, Pesaran and Shin W-stat	−7.159	0.000	
ADF – Fisher chi-square	102.02	0.820		ADF – Fisher chi-square	238	0.000	
PP – Fisher chi-square	107.58	0.700		PP – Fisher chi-square	193.07	0.000	
reldepy			Stationary	**Excratestab**			Stationary
Levin, Lin and Chu t	−11.815	0.000		Levin, Lin and Chu t	−16.199	0.000	
Im, Pesaran and Shin W-stat	−1.16	0.123		Im, Pesaran and Shin W-stat	−13.145	0.000	
ADF – Fisher chi-square	254.11	0.000		ADF – Fisher chi-square	553.78	0.000	
PP – Fisher chi-square	210.97	0.000		PP – Fisher chi-square	262.98	0.000	
reddepo			Stationary	**Monetindep**			Stationary
Levin, Lin and Chu t	−7.29	0.000		Levin, Lin and Chu t	−2422	0.000	
Im, Pesaran and Shin W-stat	−1.8397	0.033		Im, Pesaran and Shin W-stat	−56,598	0.000	
ADF – Fisher chi-square	195.89	0.000		ADF – Fisher chi-square	1151.8	0.000	
PP – Fisher chi-square	158.44	0.005		PP – Fisher chi-square	187.59	0.000	
nfagdp			Non-stationary[a]	**Dfundamentals**			Stationary
Levin, Lin and Chu t	−4.0333	0.000		Levin, Lin and Chu t	−23.071	0.000	
Im, Pesaran and Shin W-stat	−0.8637	0.194		Im, Pesaran and Shin W-stat	−19.894	0.000	
ADF – Fisher chi-square	151.79	0.014		ADF – Fisher chi-square	573.610	0.000	
PP – Fisher chi-square	128.98	0.193		PP – Fisher chi-square	854.030	0.000	
sav			Stationary	**Movstdev**			Stationary
Levin, Lin and Chu t	−3.819	0.000		Levin, Lin and Chu t	−10.460	0.000	
Im, Pesaran and Shin W-stat	−2.5337	0.006		Im, Pesaran and Shin W-stat	−8.836	0.000	
ADF – Fisher chi-square	168.3	0.001		ADF – Fisher chi-square	270.348	0.000	
PP – Fisher chi-square	185.01	0.000		PP – Fisher chi-square	472.466	0.000	
budget			Stationary				
Levin, Lin and Chu t	−8.2228	0.000					
Im, Pesaran and Shin W-stat	−6.8282	0.000					
ADF – Fisher chi-square	234.12	0.000					
PP – Fisher chi-square	233.91	0.000					

Notes: Levin, Lin and Chu: null hypothesis of unit root (assumes common unit root process).
Im, Pesaran and Shin; ADF – Fisher and PP – Fisher: null hypothesis of unit root (assumes individual unit root process).
Panel unit root tests with individual intercept.
[a] Evaluation based on Im, Pesaran and Shin and PP – Fisher chi-square.

Table A3
Baseline and extended model A – emerging and LDC countries – reporting only the statistically significant variables for each model.

Models	Baseline 1	Baseline 2	Extended Model 1	Extended Model 2
MISALIGBS	−0.255			
Robust	(0.107)**			
NFAGDP		3.484	4.117	
Robust		(0.964)***	(2.488)*	
SAV	0.422	0.587	0.505	0.442
Robust	(0.160)***	(0.104)***	(0.178)***	(0.160)***

Note: Stata 12. SYST GMM = System GMM, 2 step procedure. Robust standard errors.
Stata command using the collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

Table A4
Extended model B – emerging and LDC countries – reporting only the statistically significant variables for each model.

Models	1	2	3	4	5	6
NFAGDP						2.310
Robust						(1.301)*
SAV	0.595	0.539	0.486	0.561	0.593	0.601
Robust	(0.147)***	(0.188)***	(0.182)***	(0.125)***	(0.120)***	(0.132)***
FM			11.232			
Robust			(6.833)*			

Note: Stata 12. SYST GMM = System GMM, 2 step procedure. Robust standard errors.
Stata command using the collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

Table A5
Extended model C – emerging and LDC countries – reporting only the statistically significant variables for each model.

Models	1	2
NFAGDP	4.736	6.856
Robust	(2.759)*	(2.380)***
SAV		0.576
Robust		(0.125)***
MONETINDEP	−16.290	−20.564
Robust	(5.577)***	(11.232)*

Note: Stata 12. SYST GMM = System GMM, 2 step procedure. Robust standard errors.
Stata command using the collapse to control for instrument proliferation.
* Significance at 10%.
** Significance at 5%.
*** Significance at 1%.
All estimated models include a constant and time dummies.

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