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When Do Long-term Imbalances Lead to Current Account Reversals?

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1. INTRODUCTION

SINCE the crises of the 1990s, Asian and Latin American countries have improved their current account positions. The current accounts in Asian economies have remained positive since the 1997 crisis, and Latin American countries enjoy surpluses thanks to the favourable terms of trade. At the same time, a number of industrial and transition countries have exhibited persistent current account deficits. Most prominent and enduring in this respect is the US current account deficit, which reached US$857 billion in 2006, which represents 6.5 per cent of GDP. Other developed countries have experienced external deficits which are even bigger relative to the size of their economies; for example, Spain's current account deficit amounted to 8.8 per cent in 2006 and is forecasted to continue to worsen. Among transition and developing countries, new EU member states, which enjoy an increase in capital flows after joining the EU, deserve special attention. In 2006 Latvia's current account deficit was 20 per cent of GDP, the highest in the EU. The current account deficits in Estonia, Lithuania, Bulgaria and Romania have similarly climbed above 10 per cent, which raises questions about their sustainability.

Unsurprisingly, a number of studies have analysed current account reversals. Milesi-Ferretti and Razin (1998) have initiated this literature, which relies on non-linear econometric methods, such as binary probit and logit analysis (Milesi-Ferretti and Razin, 1998, 2000; Edwards 2001; Eichengreen and Adalet, 2005).[1] However, the above-mentioned studies consider current

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[1] Chinn and Prasad (2003) analyse medium-term determinants of current accounts in industrial and developing countries. The current account deficits in new EU member states were analysed by Buiter and Taci (2003), Zanghieri (2004) and Bussière et al. (2006).

accounts as a flow variable and therefore their analyses focus on short-term determinants. They ignore the fact that the external position of a country is described not only by its current account, but also by the level of net foreign assets (NFA). This can lead to misleading conclusions for mainly two reasons. First of all, current account *deficits* are not dangerous as such and they can be beneficial for a developing country that lacks capital but enjoys high productivity growth, which makes it an attractive place for investment. At the same time, some large current account deficits, which arise *inter alia* from high consumption growth, are not sustainable, and their reversals have disruptive effects on macroeconomic activity. Moreover, we should not assume that the current level of NFA is optimal, because if the country is located away from its equilibrium level of NFA, the current account deficit can be sustained precisely because the economy is adjusting to a higher level of long-term liabilities. Edwards (2001) shows that this adjustment process can lead to quite substantial transitional current account deficits. Finally, asset valuation effects have to be taken into account, since a country running persistent current account deficits might be at the same time improving its NFA position if capital gains on its foreign assets exceed those on its foreign liabilities (Lane and Milesi-Ferretti, 2006b).

Relying on the stock approach to external imbalances that has recently been used by several authors,[2] we contribute to the current account reversal literature (Milesi-Ferretti and Razin, 1998, 2000; Edwards, 2001; Eichengreen and Adalet, 2005) by introducing a variable that controls for stock imbalances. To do this, we first analyse the long-term relationship between net foreign assets and a set of long-run determinants. Then, we compute whether the stocks of net foreign assets lie above or below their long-term equilibrium levels and construct a measure of imbalances which is a deviation of a country's NFA from their long-term trend. Next, we incorporate this measure in our predictions of current account reversals and compare it with a baseline model which does not account for disequilibria in the external stock position.

Our results show that standard models of current account reversals perform well in the sample of industrial countries, and they do not need to be augmented. However, these models fit very poorly developing countries, and their predictive power increases significantly when we include our estimated measure

[2] Lane and Milesi-Ferretti (2001, 2006a) use their own estimates of external positions to study the determinants of NFA in developing and industrial countries and they find that public debt, GDP per capita and a set of demographic variables give a good account of the patterns of external holdings. Calderon et al. (2000) use a dataset constructed by Kraay et al. (2000) to test a portfolio model on a set of developing and industrial countries. Gourinchas and Rey (2005) use monthly data and an intertemporal budget constraint view to measure external imbalances in the United States. Unlike these studies that worry about low net foreign assets, Dollar and Kraay (2006) ask whether China's zero net foreign assets make economic sense.

of NFA imbalances. It should be stressed that high net foreign liabilities do not necessarily lead to sharp reductions in current account deficits; it is rather the situation when they are above their equilibrium level that triggers reversals.

The paper is structured in the following way. Section 2 presents data and descriptive statistics. In Section 3, we estimate our measures of long-term imbalances and in Section 4 we use these measures in the logit model of current account reversals. Section 5 concludes.

2. THE DATA

One of the most important variables in our research is NFA. Since country reports about their international investment positions are often incomplete, we take the data from Lane and Milesi-Ferretti (2006a). In this study they construct estimates of the foreign assets and liabilities for 145 advanced, emerging and developing countries for the period of 1970–2004.[3] The rest of the data for our study come mainly from the World Bank.

We divide our sample into industrial and middle-income developing countries, according to the definition of the World Bank based on per capita income basis. We additionally exclude small countries with a population below 1 million people. In all, our sample includes 67 developing and 21 developed countries. The time span covers approximately the period from the late 1970s to 2003 for the logit and the period from 1975 to 2004 for the cointegration analysis. The complete information about variable definitions, construction and sources is given in Table 1.

Tables 2 and 3 present descriptive statistics for the variables used in our analysis. We observe that the largest current account deficits in the last three years were experienced by Central and Eastern European countries (4.3 per cent), whereas largest net foreign liabilities are accumulated by Latin American economies (50 per cent of GDP).

3. LONG-TERM DETERMINANTS OF NET FOREIGN ASSETS

a. Choice of Model and Variables

In this section we follow Calderon et al. (2000) and Lane and Milesi-Ferretti (2001) and estimate a long-term model of NFA determinants.[4] Later we calculate deviations of NFA from their long-run equilibria for each country, which

[3] See Lane and Milesi-Ferretti (2006a) for details about data construction.
[4] These papers adopt a portfolio choice approach while Gourinchas and Rey (2005) and IMF (2005) rely on a log-linearised intertemporal budget constraint.

TABLE 1
Variable Definitions and Sources

Variable	*Definition and Data Source*
NFA	Lane and Milesi-Ferretti (2006a) measure of net foreign assets over GDP.
GDP per capita	Log of GDP per capita in 2000 constant international dollar (World Bank).
Dem1, Dem2 and Dem3	Demographic variables constructed out of the population shares of 12 cohorts (0 to 14, above 65 and all the five-year cohorts between them). The coefficients of these 12 shares are restricted so that they must lie along a cubic polynomial (four parameters) and sum to zero. Following these assumptions, the number of parameters to estimate falls down to three. We follow Lane and Milesi-Ferretti (2001) to construct the underlying three age variables that should be introduced to estimate those parameters. The data come from the United Nations.
Productivity	Index calculated as a weighted average of the principal components of four indicators, where the weights are given by the share of the indicators' overall variance explained by each principal component: Literacy rate (Barro and Lee, 2001), Life expectancy (United Nations), Bank credits as a percentage of GDP (World Bank), Trade: exports plus imports over GDP (World Bank).
CA	Average current account as percentage of GDP over three preceding years (World Bank).
Growth	Average GDP growth rate over three preceding years (World Bank).
Government	Government consumption over GDP (World Bank).
Investment	Investment as a percentage of GDP (World Bank).
Trade	Exports plus imports over GDP (World Bank).
FDI	Net FDI over GDP (Lane and Milesi-Ferretti, 2006a, and World Bank).
Reserves	Reserves as a percentage of imports (World Bank).
Growth in OECD	Average growth rate in OECD countries (World Bank).

we use as an additional explanatory variable in our predictions of current account reversals. Our model of long-term NFA determinants takes the following form:

$$NFA_{it} = \beta Z_{it} + \varepsilon_{it}, \tag{1}$$

where NFA_{it} is net foreign assets as a share of GDP, and Z_{it} is a set of explanatory variables. In our study we define three important long-term determinants of the net foreign asset position: output per capita, demographic structure and productivity. Exact variable definitions and data sources are given in Table 1.

One of the most important factors in explaining net foreign assets is the output per capita which can affect the external position through different

TABLE 2
Descriptive Statistics for Variables used in the NFA Model

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Industrial countries					
NFA	636	−11.49	36.04	−168.97	130.50
Productivity	636	1.44	0.68	−0.29	4.20
GDP per capita	636	9.92	0.26	9.05	10.50
pop < 24	636	36	5	25	52
pop > 60	636	18	3	12	26
Asia					
NFA	218	−24.46	53.12	−140.14	260.56
Productivity	222	−0.08	1.17	−3.14	2.76
GDP per capita	222	8.31	0.80	6.42	10.26
pop < 24	222	52	9	28	65
pop > 60	222	8	2	5	15
Latin America					
NFA	558	−49.07	34.11	−192.15	28.19
Productivity	558	−0.48	0.96	−3.34	1.24
GDP per capita	558	8.54	0.42	7.62	9.47
pop < 24	558	57	7	39	67
pop > 60	558	7	3	4	17
CEEC					
NFA	134	−29.09	24.61	−105.58	14.86
Productivity	134	0.52	0.38	−0.21	1.23
GDP per capita	134	9.17	0.35	8.56	9.87
pop < 24	134	34	3	28	40
pop > 60	134	19	2	15	22
Others					
NFA	556	−6.69	92.51	−228.47	419.78
Productivity	556	−0.99	1.12	−4.96	1.53
GDP per capita	556	8.67	0.65	7.39	10.71
pop < 24	556	55	10	29	70
pop > 60	556	7	5	2	22

channels. In the standard classical growth model, individuals save less in lower income and thus faster-growing economies, because their permanent income is higher than their current one. This positive link between income and savings is even greater when we depart from some standard assumptions. For example, Rebelo (1992) introduces Stone–Geary preferences: utility depends on a subsistence level which affects the intertemporal elasticity of substitution. Agents want to save only when their level of consumption gets away from this subsistence level and thus only when they get richer. At the same time, countries with low income can attract capital flows which they will repay at the later stage of their development, and therefore the positive association between income and net foreign assets can be used to support the 'stages of the balance of payments' hypothesis (Cairnes, 1874; Crowther, 1957). Alternatively, Lane and Milesi-Ferretti (2001) find a

TABLE 3
Descriptive Statistics for Variables used in the Current Account Reversals Model

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Industrial countries					
CA	555	−0.6	3.6	−11.8	14.6
Growth	555	2.1	1.6	−3.4	10.4
Government	555	20.2	4.9	10.0	41.5
Investment	555	22.5	3.7	15.1	36.0
GDP per capita	555	9.94	0.24	9.19	10.46
Trade	555	61.3	33.8	0.0	178.1
FDI	555	1.0	15.8	−61.6	104.7
Reserves	555	6.7	4.7	0.3	25.5
Growth in OECD	555	2.1	0.7	0.4	3.0
Asia					
CA	179	−1.2	4.8	−12.6	12.8
Growth	179	4.1	3.3	−6.3	11.9
Government	179	11.0	2.2	5.7	17.7
Investment	179	29.0	7.1	11.4	45.0
GDP per capita	179	8.36	0.65	6.96	10.26
Trade	179	83.0	52.7	22.0	337.3
FDI	179	11.4	10.5	−2.8	41.0
Reserves	179	14.6	13.2	1.9	76.3
Growth in OECD	179	2.0	0.7	0.4	3.0
Latin America					
CA	490	−3.1	3.7	−14.4	11.5
Growth	490	0.7	2.9	−11.4	8.6
Government	490	11.8	4.0	2.9	23.4
Investment	490	20.7	5.3	6.2	43.9
GDP per capita	490	8.54	0.42	7.62	9.47
Trade	490	58.4	31.4	14.5	194.4
FDI	490	20.7	19.0	1.5	106.5
Reserves	490	9.0	6.5	0.4	50.7
Growth in OECD	490	2.0	0.7	0.4	3.0
CEEC					
CA	121	−4.3	3.3	−11.9	5.7
Growth	121	2.8	4.0	−12.5	8.5
Government	121	17.6	5.0	5.7	27.2
Investment	121	23.9	5.0	8.1	34.7
GDP per capita	121	9.17	0.35	8.56	9.87
Trade	121	101.6	31.3	45.2	169.0
FDI	121	19.9	16.2	0.0	80.0
Reserves	121	15.8	7.5	2.8	36.4
Growth in OECD	121	2.1	0.7	0.4	3.0
Others					
CA	458	−0.3	9.4	−27.7	54.9
Growth	458	1.6	4.7	−28.6	12.7
Government	458	19.0	6.8	7.5	45.3
Investment	458	23.7	6.4	3.6	49.1
GDP per capita	458	8.61	0.52	7.50	10.21
Trade	458	77.7	28.9	10.9	143.4
FDI	459	17.3	18.6	−15.9	103.4
Reserves	458	14.8	19.8	0.0	125.4
Growth in OECD	458	2.1	0.7	0.4	3.0

negative correlation between output per capita and net foreign assets position for developing countries, explaining this phenomenon by credit constraints. In their opinion, improvement in net worth or cash flows relaxes financial constraints, and therefore an increase in production may lead to a greater recourse to foreign borrowing. Thus, we can expect the sign of output per capita to be either positive (stages of the balance-of-payments hypothesis) or negative (financial constraints hypothesis).

Second, the demographic structure plays an important role in determining the external position. For instance, a society with a high share of young population may require heavy investment in education, housing and other social infrastructure. Thus, a high youth dependency ratio would lead to low savings as households try to smooth their consumption (Higgins, 1998), and one can expect a negative impact of a high share of young population on net foreign assets. At the other end of the demographic distribution, a high share of retired people might lead to a depletion of savings and foreign assets accumulated in the past. This is the so-called 'running down of assets' result, and we might also expect that a higher share of old population has a negative impact on net foreign assets. Following Lane and Milesi-Ferretti (2001), we use the methodology of Fair and Dominguez (1991) and Higgins (1998) to account for the whole age structure divided into 12 cohorts. By constraining the coefficients of each population cohort to follow a third-order polynomial, this technique has the advantage of capturing the information contained in the entire age distribution while maintaining a parsimonious parametrisation. Indeed, only three variables (*dem1*, *dem2* and *dem3*) are used to estimate the demographic effects.[5] The coefficients for each age cohort can be reconstructed afterwards.

Third, we look at a measure of productivity or return on capital. This variable is inspired by the model of Calderon et al. (2000) which is based on a standard Markowitz–Tobin model of portfolio diversification and in which net foreign assets is a negative function of investment return in a country relative to the rest of the world. The negative sign of the coefficient would indicate that capital flows to the regions with the highest productivity. Productivity is measured as a weighted average of variables reflecting human capital (life expectancy and literacy rate), financial transaction costs and financial development (bank credit as a percentage of GDP), access to foreign technology and competitiveness (trade openness). It should be noted that such measures as productivity or demographic structure make the stock approach superior when compared to the flow approach of the current account, because it allows us to take into account very smooth variables such as human capital.

[5] See Fair and Dominguez (1991) for more details.

b. Estimation

Before turning to the regression analysis, we analyse the univariate time series properties of our data. We test for the non-stationarity of net foreign assets, demographic variables (*dem1*, *dem2*, *dem3*), log of GDP per capita in PPP dollars and productivity. To do so, we rely on the panel unit-root tests of Maddala and Wu (1999), Hadri (2000), Levin et al. (2002) and Im et al. (2003). All time series in the sample of industrial countries are non-stationary, whereas we have somewhat mixed evidence for developing economies. However, the result of the Im et al. (2003) test, which performs better when the residual has some autocorrelation and the time and individual dimensions are small, allows us to conclude that all series are non-stationary.[6] Since we have evidence of the presence of unit roots in our time series, we test for the panel cointegration among our variables using tests suggested by Pedroni (1995) and Kao (1999). The results of both tests strongly point to the existence of a cointegrating relationship between net foreign assets and the other variables.[7]

Having ascertained the cointegrating relationship between our variables, we estimate the model using dynamic ordinary least squares specification with one lag and one lead (DOLS[−1, 1]).[8] The leads and lags of the first differences of our explanatory variables eliminate the effect of regressor endogeneity on the distribution of the OLS estimator. We include country fixed effects in order to capture unobservable country characteristics that might lead to permanent differences in measured net foreign asset positions across countries. To control for common global movements we include time fixed effects.

The estimated relationship takes the following form:

$$NFA_{it} = \beta Z_{it} + \beta_{-1}\Delta Z_{it-1} + \beta_0 \Delta Z_{it} + \beta_{+1}\Delta Z_{it+1} + u_i + v_t + \eta_{it}, \qquad (2)$$

where *NFA* is the ratio of net foreign assets over GDP, and *Z* includes the following: *gdp* – logarithm of GDP per capita in PPP dollars, *dem1–dem3* – demographic variables, *prod* – productivity measure.

The results of our estimations are presented in Table 4. The findings are presented for the whole sample and for industrial and developing countries separately. For each subsample the results also differ with respect to the specification of the output per capita. In the first three columns we assume a linear relationship between NFA and output per capita, whereas in columns 4–6 we test for the non-linearity by adding a squared term.

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[6] See Hlouskova and Wagner (2005).

[7] The results of unit-root and cointegration tests are not presented in this paper due to space constraints, but they are available from authors upon request.

[8] A DOLS[−2, 2] specification gives similar results, but relying on the Bayesian information criteria we prefer DOLS[−1, 1].

TABLE 4
Long-term Determinants of Net Foreign Assets. Dependent Variable: Net Foreign Assets

	All Countries	*Industrial*	*Developing*	*All Countries*	*Industrial*	*Developing*
Productivity	−0.14***	**−0.20*****	−0.12***	−0.15***	−0.19***	**−0.14*****
	(0.02)	**(0.03)**	(0.03)	(0.02)	(0.03)	**(0.03)**
GDP per capita	−0.00	**0.79*****	0.01	1.59***	−2.86	**3.18*****
	(0.05)	**(0.13)**	(0.06)	(0.36)	(2.68)	**(0.55)**
GDP per capita^2				−0.09***	0.19	**−0.19*****
				(0.02)	(0.13)	**(0.03)**
Demographic variables (chi2)	12.44***	**2.22***	12.52***	8.50***	0.95	**7.47*****
$\delta < 15$	0.43	**1.20**	2.62***	0.88*	0.80	**2.41*****
	(0.46)	**(0.85)**	(0.69)	(0.47)	(0.90)	**(0.68)**
$\delta > 64$	−5.32***	**−0.99**	−11.25***	−4.16***	−0.86	**−8.07*****
	(0.91)	**(1.08)**	(1.97)	(0.94)	(1.12)	**(2.01)**
δ max (age)	1.64***	**1.20**	3.40***	1.30**	0.80	**2.41*****
	(40–44)	**(<15)**	(45–49)	(45–49)	(<15)	**(<15)**
	(0.40)	**(0.85)**	(0.87)	(0.56)	(0.90)	**(0.68)**
δ min (age)	−5.33***	**−0.99**	−11.25***	−4.16***	−0.86	**−8.07*****
	(>64)	**(>64)**	(>64)	(>64)	(>64)	**(>64)**
	(0.91)	**(1.08)**	(1.97)	(0.94)	(1.12)	**(2.01)**
Observations	1,633	**529**	1,104	1,633	529	**1,104**
Number of countries	73	**21**	52	73	21	**52**
Stability tests: *F*-statistic (*p*-value)						
All coefficients	3.78 (0.0000)			3.98 (0.0000)		
All coefficients except time dummies	8.22 (0.0000)			7.66 (0.0000)		
Long-term coefficients	7.62 (0.0000)			7.42 (0.0000)		
Adjusted *R*-squared	0.852	**0.861**	0.860	0.855	0.861	**0.866**
AIC	0.012	**−0.762**	0.260	−0.010	−0.754	**0.220**
BIC	−11,246.585	**−3,075.309**	−6,692.856	−11,260.296	−3,054.215	**−6,716.633**

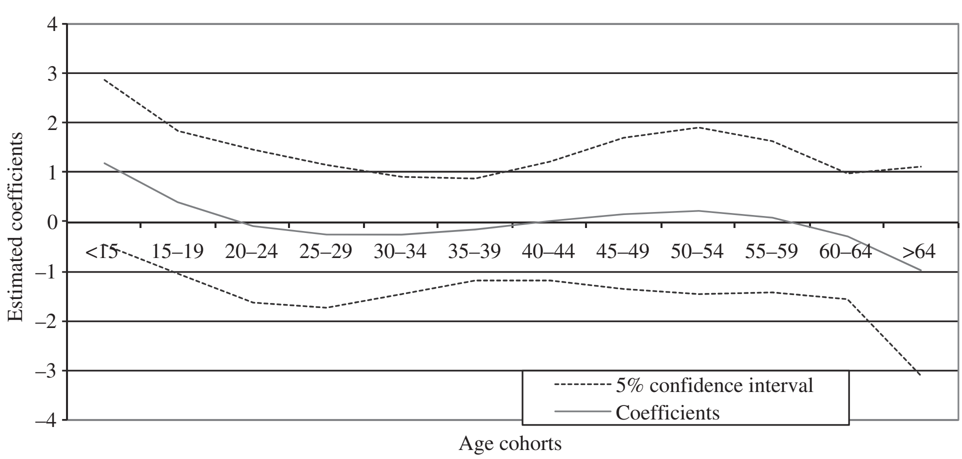
Notes:
Standard errors in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Our findings suggest that countries with higher productivity have lower levels of NFA, since such countries are more attractive for foreign investment. According to the test on stability of coefficients, this relationship is robust and consistent across all samples and specifications. Our results are in line with the findings of Calderon et al. (2000) and Dollar and Kraay (2006).

The nature of the relationship between NFA and output per capita varies across subsamples. According to all model selection criteria (adjusted R-squared, AIC and BIC), the relationship appears to be linear in the case of industrial countries and non-linear for developing countries. Thus, from now on, we will focus exclusively on the results of the second column for industrial countries and on the sixth one for developing countries. Whereas the relationship between NFA and output per capita is positive in industrial countries, it is more ambiguous for developing countries. However, according to the implied threshold GDP per capita and on the range of the GDP variable in developing countries, the relationship between GDP per capita and NFA is also positive in these countries, which did not appear in the linear specification. Thus, the relationship between NFA and output per capita is positive in the whole sample, which is consistent with the 'stages of development hypothesis'.

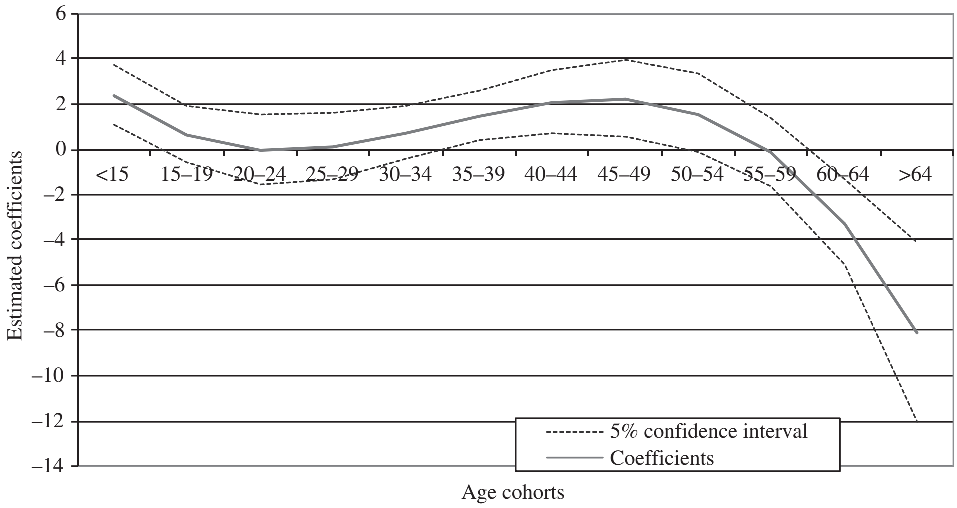
To be able to study the impact of the demographic structure on NFA, we reconstruct coefficients for 12 age groups from the estimated equation.[9] Results are reported in Figures 1 and 2. We find that NFA decrease when the share of the working-age population younger than 25 or older than 50 expands, whereas the population between those ages has a positive impact on NFA. This is consistent with the life-cycle model since there is a stage of investment in

FIGURE 1
Estimated Coefficients for Age Cohorts – Industrial Countries, Linear Model



[9] See Fair and Dominguez (1991) for the estimation of age effects.

FIGURE 2
Estimated Coefficients for Age Cohorts – Developing Countries, Non-linear Model



human capital and infrastructure, followed by an accumulation and finally a running down of assets. Our findings are mostly in line with our theoretical conjectures and are consistent in spirit with Lane and Milesi-Ferretti (2001) even though the exact age group definitions differ.

When we look closer at the differences between industrial and developing countries we find that the demographic coefficients are more significant in the case of developing countries. This result is not surprising and can be explained by welfare provision by the state in most industrial countries. This is consistent with the life-cycle hypothesis which implies that social security, by providing income during retirement, reduces the amount of savings during the working years. Since most social security systems operate on a pay-as-you-go basis, the reduction in private savings is not offset by any increase in public savings (Feldstein, 1974).

To sum up, we succeed in modelling the long-term behaviour of net foreign assets. However, based on tests of stability of coefficients, we cannot pool industrial and developing countries. Therefore, in the remaining part of the paper we will rely on the linear model in the case of industrial countries, and on the non-linear specification for the sample of developing countries.

4. EXPLAINING CURRENT ACCOUNT REVERSALS

a. Definition of Reversals

In this section we use multivariate logit models to examine which macroeconomic, financial and structural variables help to predict sharp current account reversals. Following Milesi-Ferretti and Razin (1998), we define current account reversals as a combination of the following two conditions:

1. The average current account balance as a percentage of GDP during the last three years must be inferior by at least 3 per cent to the average current account balance during the following three years.
2. The maximum current account balance as a percentage of GDP during the last three years must be inferior to the minimum current account balance during the following three years.

The first condition selects sharp reversals because they are more disruptive for the economy and the second condition ensures the persistence in current account reversals.

b. The Model

Here we estimate a logit model with *reversal* as a dependent variable:

$$reversal_{ijt} = \begin{cases} 1 & \text{with probability } \Pr(reversal_{itt} = 1) = P, \\ 0 & \text{with probability } \Pr(reversal_{itt} = 0) = 1 - P. \end{cases} \quad (3)$$

We use a logistic distribution to define the logit model:

$$\Pr(reversal_{it} = 1) = \Lambda(\alpha' x_{it-1}) = \frac{e^{\alpha' x_{it-1}}}{1 + e^{\alpha' x_{it-1}}}, \quad (4)$$

with x_{it-1} denoting the vector of (lagged) explanatory variables and α the vector of coefficients.

The explanatory variables used in the model are the following: *ca* – the average current account balance during the last three years; *Growth* – real GDP growth; *Government* – government consumption to GDP ratio; *GDP per capita* – logarithm of GDP per capita in PPP dollars; *Investment* – investment to GDP ratio; *Trade* – the ratio of imports and exports to GDP; *FDI* – the ratio of net foreign direct investment to GDP; *Reserves* – the ratio of foreign exchange reserves to GDP; and *Growth in OECD* – GDP growth in OECD countries.[10] The choice of variables in the baseline model is based on previous literature about determinants of sudden stops, especially on Milesi-Ferretti and Razin (1998).

The baseline model does not take into account the long-term imbalances that we calculated in the last section. Therefore, we extend it by adding other explanatory variables that should capture the long-term external position. First

[10] Complete information about variable definitions, construction and data sources is given in Table 1.

we include NFA as a share of GDP to see whether a simple measure of the stock external position is sufficient to explain current account reversals. Then we also include the variable *Deviation*, which is a residual from the long-term models of NFA, estimated according to the linear specification for industrial countries and non-linear specification for developing countries.

$$Deviation_{it} = NFA_{it} - \hat{\beta} Z_{it}. \tag{5}$$

Taking into account the fact that positive and negative deviations from the long-term equilibrium can have different impacts on current accounts, we additionally include variables *Deviation* < 0 and *Deviation* > 0, which take respectively negative and positive values of *Deviation,* and zero otherwise.

c. *Estimation*

The results of our baseline estimations are given in Table 5. First, we report the baseline specification for the whole sample, industrial and developing countries. Then we additionally include a ratio of NFA to GDP.

The empirical analysis identifies a number of predictors of current account reversals that are common to industrial and developing countries. First of all, the most economically important variable is the average current account deficits in the last three years.[11] Our results are consistent with solvency and willingness to lend considerations, which is in line with the findings of Milesi-Ferretti and Razin (1998, 2000) and Edwards (2006) who use similar definitions for current account reversals.[12] Second, countries with larger GDP per capita are more prone to reversals. This reflects the theory of stages in the balance of payments, according to which, countries with low income can attract capital flows which they will repay at the later stage of their development. Per capita income might also be a proxy for financial openness that makes countries more vulnerable to capital flow reversals. These results are consistent with the findings of Milesi-Ferretti and Razin (1998, 2000). Third, in the baseline model we see that the lower government consumption, the higher the reversal probability. This surprising result may be due to fiscal retrenchment before the crisis. Milesi-Ferretti and Razin (1998) also report a negative coefficient for fiscal balance. The

[11] It can be argued that the average current accounts from $t - 1$ to $t - 3$ must be endogenous since it is used in the construction of our sudden-stop measure. We test for this endogeneity by using CA_{t-4} as an instrument and by performing a Hausman test for the equality of coefficients of the instrumented and non-instrumented regressions. The test detects no significant differences (p-value of 0.76), which means that we can consider that the estimators we provide are unbiased.

[12] Calvo et al. (2004) and Eichengreen and Adalet (2005) do not include the current account deficit in their models of sudden stops, but consider the effect of similar variables, respectively the ratio of current account deficit on the supply of tradables (which is supposed to account for the percentage fall in the absorption of tradables needed to close the current account gap) and trade balance. Their results are also consistent with ours.

TABLE 5
Determinants of Current Account Reversals. Baseline Models.
Dependent Variable: Current Account Reversal

	Baseline			*With NFA*		
	All Sample	*Industrial*	*Developing*	*All Sample*	*Industrial*	*Developing*
CA	−27.75***	−67.36***	−24.70***	−27.69***	−60.83***	−25.23***
	(2.69)	(9.82)	(2.89)	(2.70)	(10.58)	(2.93)
NFA				−0.62**	0.73	−0.77***
				(0.26)	(0.95)	(0.29)
Growth	−2.84	−35.95**	−1.77	−2.82	−39.28**	−1.84
	(3.15)	(16.24)	(3.25)	(3.16)	(16.44)	(3.28)
Government	−3.52*	−14.18***	−4.72*	−3.99*	−17.70***	−4.44*
	(2.05)	(4.45)	(2.47)	(2.06)	(5.29)	(2.46)
Investment	−4.43**	−18.43***	−2.87	−4.76**	−14.86**	−3.16
	(1.91)	(6.66)	(2.02)	(1.93)	(7.00)	(2.04)
GDP per capita	0.80***	2.21**	0.92***	1.18***	2.71**	1.26***
	(0.23)	(1.06)	(0.24)	(0.27)	(1.12)	(0.28)
Trade	1.11***	4.49***	0.40	1.03***	4.92***	0.17
	(0.35)	(0.92)	(0.43)	(0.36)	(0.98)	(0.46)
FDI	−0.79	−5.97***	0.25	−1.55**	−7.50***	−0.44
	(0.65)	(1.77)	(0.73)	(0.69)	(2.04)	(0.77)
Reserves	−1.30	11.96**	−2.41	0.00	13.40***	−0.94
	(1.49)	(4.89)	(1.68)	(1.57)	(5.14)	(1.77)
Growth in OECD	6.67	−0.39	12.66	7.56	−11.88	15.49
	(13.29)	(31.10)	(15.67)	(13.30)	(31.79)	(15.77)
Constant	−8.35***	−21.79**	−9.09***	−11.76***	−27.05**	−12.21***
	(1.93)	(10.65)	(2.01)	(2.28)	(11.27)	(2.40)
Observations	1,562	495	1,067	1,561	495	1,066
Pseudo *R*-squared	0.1579	0.3320	0.1524	0.1672	0.3394	0.1613

Notes:
Dependent variable takes value 1 if a reversal takes place and 0 otherwise.
Explanatory variables are lagged.
Standard errors in parentheses.
* Significant at 10%; ** significant at 5%; *** significant at 1%.

decrease in government consumption may also reflect the government debt burden that provokes the crisis. Fourth, higher investment makes the probability of reversals less likely in industrial countries under all specifications and in developing countries when we control for the level of NFA imbalances. Indeed, in theory, high investment should increase the ability of a country to sustain current account deficits through productivity gains.

The rest of the variables are not significant in the estimations for the developing countries and we observe that the baseline specification performs much better for the sample of industrial countries. For example, we find that economic expansion in these countries decreases the probability of current account reversals. Higher GDP growth could be interpreted as a positive signal on the assets' returns in the country which would lead to capital inflows (Chinn and Prasad, 2003). On the other hand, a growth slowdown could be the signal that triggers a crisis. We also find that the structure of net foreign assets is important and that countries with a higher share of foreign direct investment experience a lower probability of sharp reversals. This could be explained by the fact that foreign direct investments are the least volatile form of foreign capital inflows and cannot be withdrawn at short notice. Moreover, this type of investment is considered to be 'superior' because it also brings better technology and management, which increases productivity, growth and exports in the future.

Finally, we find that reversals are more likely in more open economies. In theory, more open economies have fewer difficulties in servicing their foreign liabilities due to foreign exchange earnings through exports (Frankel and Cavallo, 2004). Besides, more open economies have fewer incentives to default on their debt since they have more to lose from being cut off from international capital and goods markets (Rose, 2002). But openness can also make the country more vulnerable to external shocks. The conclusion of other papers on the effect of trade openness on reversal probability is mixed: Milesi-Ferretti and Razin (1998) and Frankel and Cavallo (2004) find it negative, Milesi-Ferretti and Razin (2000) report non-significant results while our results are in line with Eichengreen and Adalet (2005), who find that reversals are more likely in more open economies.

Now we turn our attention to different measures of long-term external position. First of all, we include net foreign assets as a ratio of GDP and results are presented in Table 5. In line with our expectations, we find that low NFA increase the probability of reversals and this relationship is highly statistically significant, but only for developing countries. Next, we include our measures of *Deviation* from the equilibrium level of NFA, calculated according to equation (5). The results are presented in Table 6 and appear to be significant, but again only for developing countries. Finally, we take into account that positive and negative deviations might have a different predictive power and, again in line with our expectations, we find that only negative deviations from equilibrium lead to sharp reductions in current account deficits.

There are a few explanations of why our measures of long-term external imbalances do not enter significantly into models for industrial countries. First of all, valuation effects play different roles in emerging and industrial countries. The idea behind this is that valuation effects are destabilising in developing countries because of liability dollarisation (see, for example, Obstfeld, 2004). In the presence of liability dollarisation, the depreciation following capital flight negatively affects banks and firms' balance sheets, thus leading to an output collapse (Calvo et al., 2004; IMF, 2005).

TABLE 6
Determinants of Current Account Reversals including Deviations of NFA from their Long-term Equilibrium. Dependent Variable: Current Account Reversal

	With NFA Deviation			*With NFA Deviation* $\gtrless 0$		
	All Sample	*Industrial*	*Developing*	*All Sample*	*Industrial*	*Developing*
CA	−38.06***	−66.01***	−35.14***	−38.01***	−67.97***	−35.45***
	(3.94)	(10.46)	(4.62)	(3.94)	(10.90)	(4.65)
Deviation	−1.66***	−1.64	−1.88***			
	(0.48)	(1.53)	(0.52)			
Deviation < 0				−1.98***	0.26	−2.55***
				(0.59)	(1.99)	(0.63)
Deviation > 0				−0.09	−12.34*	1.55
				(1.75)	(7.45)	(1.81)
Growth	−1.08	−33.72**	0.75	−1.12	−37.81**	0.50
	(4.23)	(16.69)	(4.44)	(4.22)	(17.35)	(4.41)
Government	−0.63	−13.23***	−0.35	−0.88	−13.51***	−1.46
	(2.43)	(4.71)	(3.24)	(2.45)	(4.85)	(3.30)
Investment	−9.94***	−17.28***	−8.83***	−9.90***	−16.81**	−8.64***
	(2.52)	(6.67)	(2.81)	(2.52)	(6.66)	(2.79)
GDP per capita	1.53***	2.02*	1.73***	1.56***	1.91	1.81***
	(0.31)	(1.23)	(0.34)	(0.31)	(1.23)	(0.35)
Trade	1.08***	4.45***	0.11	1.07***	4.64***	0.05
	(0.41)	(0.96)	(0.52)	(0.41)	(0.99)	(0.53)
FDI	−1.74**	−5.95***	−1.00	−1.73**	−6.24***	−0.95
	(0.72)	(1.77)	(0.83)	(0.71)	(1.83)	(0.83)
Reserves	−0.31	11.81**	−1.10	−0.41	12.68**	−1.46
	(1.77)	(4.87)	(2.04)	(1.77)	(4.97)	(2.06)
Growth in OECD	9.94	2.47	22.82	9.39	13.65	23.14
	(15.01)	(31.58)	(18.89)	(15.05)	(32.71)	(19.00)
Constant	−14.06***	−20.57*	−15.50***	−14.35***	−19.44	−16.27***
	(2.59)	(12.12)	(2.80)	(2.60)	(12.14)	(2.84)
Observations	1,369	476	893	1,369	476	893
Pseudo *R*-squared	0.2030	0.3421	0.2038	0.2039	0.3515	0.2093

Notes:
Dependent variable takes value 1 if a reversal takes place and 0 otherwise.
Explanatory variables are lagged.
Standard errors in parentheses.
* Significant at 10%; ** significant at 5%; *** significant at 1%.

Second, large net foreign liabilities might have a smaller impact on the probability of current account reversals in industrial countries, because in addition to the *level*, the *composition* of a country's external assets and liabilities significantly matters for an assessment of its long-run current account (Lane and Milesi-Ferretti, 2006b). This is because the role of capital gains substantially differs across assets, being more relevant for equity and FDI than for bonds. A country that is a net creditor in such assets can then sustain a larger current account deficit. Tille (2008) shows that this aspect substantially tilts the estimates of the long-run current account towards a deficit among industrialised economies (net creditors of equity and FDI), whereas the result is the opposite for emerging markets (net creditors of debt). Specifically, industrialised economies benefit from capital gains that offset about one-third of their current account deficits. Conversely, emerging markets see a quarter of their surpluses being offset by capital losses.

Finally, the fact that current account reversals are not affected by their NFA in industrial countries could also be partly due to the fact that these economies are more likely to have flexible exchange rates which allow adjustment of NFA via exchange rate movements.[13] More generally, Bubula and Otker-Robe (2003) find that pegged regimes, as a whole, have been characterised by a higher incidence of crises than floating regimes. Coudert (2004) summarises two main arguments to explain why fixed exchange rate regimes may be more vulnerable to speculative attack than other systems. First, defending the exchange rate is limited by the size of central bank reserves, and when these run out, speculation tends to follow. Second, if regimes that allow fluctuation within a band have a credibility problem and the exchange rate approaches the upper ceiling, a self-fulfilling speculative attack may again be unleashed.

Importantly, our measures of long-term external imbalances are very significant economically for developing countries. A half-standard-error fall in the deviation of NFA from its long-term trend leads to a 1.1 percentage point increase in the probability of current account reversal. This is smaller than the impact of the current account deficit, which increases the probability of reversal by 3.8 percentage points. NFA deviations clearly outperform the other significant variables of the model, such as investment/GDP and GDP per capita. It is also important that deviations from equilibrium NFA have a superior impact on the probability of current account reversals to a simple NFA to GDP ratio (0.6 percentage point).

d. Predictive Power and Models' Evaluation

In Table 7 we report the results of the in-sample and out-of-sample goodness-of-fit tests for our logit model in developing countries. To determine a threshold probability for an alarm we choose to minimise a 'loss function' that is equal to the sum of false alarms (as a share of total tranquil periods) and missed reversals (as a share of total reversals). For each model, we apply this procedure on the whole available sample (1978–2003). But in-sample goodness-of-fit comparison is not enough to assess the predictive power of the models. To do this, we perform out-of-sample predictions by running rolling regressions:

[13] We thank the referee for pointing this out.

TABLE 7
Goodness-of-Fit of the Model of Current Account Reversals (Developing Countries)

	Baseline		*With NFA*		*With NFA Deviation*		*With NFA Deviation* $\gtrless 0$	
	Whole Sample	*Out of Sample*	*Whole Sample*	*Out of Sample*	*Whole Sample*	*Out of Sample*	*Whole Sample*	*Out of Sample*
Cut-off[a]	13		13		17		16	
Value of loss function[b]	69	80	68	79	53	75	50	61
Per cent of reversals correctly called[c]	76	54	79	63	61	42	65	64
Per cent of tranquil correctly called[d]	55	66	53	58	86	83	85	75
False alarms as per cent of total alarms[e]	83	88	83	88	66	83	66	83
Probability of reversal given a signal[f]	17	12	17	12	34	17	34	17
Probability of reversal given no signal[g]	5	6	5	5	5	5	5	4
Odds ratio[h]	3.4	2.0	3.5	2.5	6.2	3.1	7.0	4.6

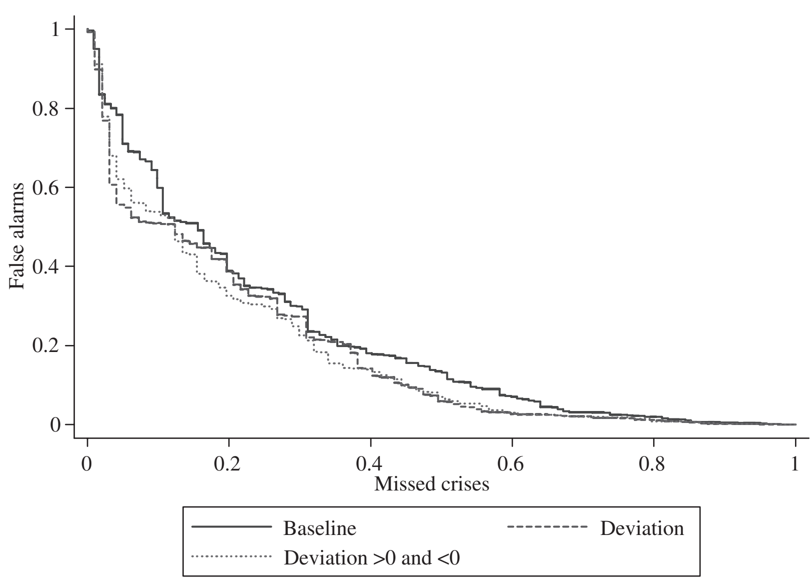
Notes:
Goodness-of-fit results are based on current account reversal models with different specifications. Out-of-sample results are based on rolling regressions and are performed for the period of 1990–2004. Whole sample results are done for the period 1978–2004. All variables are in per cent.
[a] This is the cut-off probability above which a forecast is considered to signal a reversal.
[b] The loss function is equal to the sum of false alarms as a share of total tranquil periods and missed reversals as a share of total reversal periods.
[c] This is a number of reversals correctly called as a share of total reversal periods.
[d] This is a number of tranquil periods correctly called as a share of total tranquil periods.
[e] A false alarm is an observation with estimated probability of crisis above the cut-off which is not followed by a reversal.
[f] This is the number of periods where a reversal was predicted and it eventually took place as a share of total predicted reversal periods.
[g] This is the number of periods where tranquillity was predicted and a reversal took place as a share of total predicted tranquil periods.
[h] This is the ratio of the probability of reversal given a signal over the probability of reversal given no signal.

we estimate the model on the period 1978–89 and predict crises for the year 1990, then we extend the sample year by year and repeat the procedure until 2004.

Our models have goodness-of-fit comparable to other studies (see, for example, Berg et al., 2004, for the evaluation of early warning systems of currency crises). In the baseline model the value of the loss function is 69 in-sample and 80 out-of-sample. The probability of reversal given a signal equals 17 per cent for in-sample and 12 per cent for out-of-sample forecasts, which represents respectively 3.4 and 2 times the probability of reversal given no signal. The results are similar in the model that incorporates NFA. However, when we include our estimated deviations from the long-term NFA equilibrium (‘*Deviation*’), the in-sample fit of the model strikingly improves: the loss function is a little above 50. The probability of reversal given a signal is around six times higher than the probability of reversal given no signal in-sample and around three out-of-sample. The models accounting for the sign of imbalances – ‘*Deviation NL*’ – are even better for out-of-sample prediction: when a signal is extracted, the probability of crisis is respectively 4.6 times higher than the probability of crisis when there is no signal. Including the measure of countries’ departures from their long-term NFA improves the traditional model’s performances both in and out of sample in terms of loss function and odds ratio.

Figure 3 gives a more complete picture of the models’ relative performances. Until now, we have chosen for each model the optimal cut-off with respect to a predefined loss function. It provided a particular trade-off between missed crises and false alarms. Now we plot for each cut-off between 0 and 1 the shares of missed crises and false alarms for the models with estimated deviations from equilibrium NFA, with and without control for the sign of imbalances. These two models are compared to the baseline one. Points that are closer towards the lower left are unambiguously preferred for any loss

FIGURE 3
Trade-off of False Alarms and Missed Crises for Baseline Model, Model with Estimated Deviations from the NFA, and Model with Deviations Controlling for their Sign (Developing Countries)



Notes:
Missed crises: fraction of missed crises among all crisis periods.
False alarms: fraction of false alarms among all tranquil periods.

function, because they are associated with a lower percentage of both missed crises and false alarms. As shown in the figure, the models including deviation measures dominate the baseline model for all cut-off definitions, since their curves lie to the left and below the baseline model's curve. For any given percentage of crises correctly called, models including NFA deviations call as many or fewer false alarms.

5. CONCLUSIONS

In our study we contribute to the literature by showing that when predicting current account reversals it is important to account for the long-term equilibrium of NFA, particularly for developing economies.

In the first part of the paper we analyse the long-term relationship between net foreign assets and a number of its determinants. Our findings are in line with previous literature: (1) Countries borrow at early stages of their development ('stages of balance of payments' hypotheses); (2) Capital flows to more productive economies; and (3) Ageing societies are spending more, whereas societies with a high share of population between 40 and 45 years old have the highest share of NFA.

Based on the above model we construct a measure of imbalances which equals the deviation of net foreign assets from their equilibrium level. When this measure is included into the baseline model of current account reversals, this improves its predictive power. The fit of the model is especially good when we control for the sign of imbalances, which means that only unjustifiably low NFA would trigger current account reversals while high NFA do not significantly diminish the crisis probability.

It should be stated that our measure of external imbalances is helpful in predicting current account reversals only in the case of developing countries. There are a number of explanations for this result, which are related to liability dollarisation, low level of capital gains on foreign assets, and prevalence of fixed exchange rate regimes in emerging economies. In the case of industrial economies, standard predictors, such as GDP growth, government consumption, rate of investment and FDI, are good determinants of sharp reductions in current account deficits. Therefore, there is little need to investigate the long-term level of net foreign assets and their deviation from the equilibrium. However, in the case of developing countries, standard models perform very poorly, and our estimated measure of imbalances significantly improves the predictive power of the model both in and out of sample.

Finally, the model with the simple ratio of NFA to GDP is only slightly superior to the baseline model, and only our estimated deviation of NFA from its equilibrium level improves the fit of the model in a significant manner.

REFERENCES

Barro, R. J. and J.-W. Lee (2001), 'International Data on Educational Attainment: Updates and Implications', *Oxford Economic Papers*, **53**, 3, 541–63.

Berg, A., E. Borensztein and C. Patillo (2004), 'Assessing Early Warning Systems: How Have They Worked in Practice?', IMF Working Paper No. 52 (Washington, DC: IMF).

Bubula, A. and I. Otker-Robe (2003), 'Are Pegged and Intermediate Exchange Rate Regimes More Crisis Prone?', IMF Working Paper No. 03/223 (Washington, DC: IMF).

Buiter, W. and A. Taci (2003), 'Capital Account Liberalization and Financial Sector Development in Transition Countries', in *Capital Liberalization in Transition Countries: Lessons from the Past and for the Future* (Cheltenham: Edward Elgar), 105–41.

Bussière, M., M. Fratzscher and G. J. Muller (2006), 'Current Account Dynamics in OECD Countries and in the New EU Member States: An Intertemporal Approach', *Journal of Economic Integration*, **21**, 3, 593–618.

Cairnes, J. E. (1874), *Some Leading Principles of Political Economy* (New York: Harper and Brothers).

Calderon, C., N. Loayza and L. Serven (2000), 'External Sustainability. A Stock Equilibrium Perspective', World Bank Policy Research Working Paper No. 2281 (Washington, DC: World Bank).

Calvo, G., A. Izquierdo and L.-F. Mejia (2004), 'On the Empirics of Sudden Stops: The Relevance of Balance-sheet Effects', NBER Working Paper No. 10520 (Cambridge, MA: National Bureau of Economic Research).

Chinn, M. and E. Prasad (2003), 'Medium-term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration', *Journal of International Economics*, **59**, 1, 47–76.

Coudert, V. (2004), 'Exchange Rate Regimes and Crises: Are Fixed Exchange Rates Really To Blame?', CEPN Working Paper No. 2004/03 (University of Paris: CEPN).

Crowther, G. (1957), *Balances and Imbalances of Payment* (Boston, MA: Harvard University).

Dollar, D. and A. Kraay (2006), 'Neither a Borrower Nor a Lender: Does China's Zero Net Foreign Asset Position Make Economic Sense?', *Journal of Monetary Economics*, **53**, 5, 943–71.

Edwards, S. (2001), 'Does the Current Account Matter?', NBER Working Paper No. 8275 (Cambridge, MA: National Bureau of Economic Research).

Edwards, S. (2006), 'Is the US Current Account Deficit Sustainable? And If Not, How Costly is Adjustment Likely to Be?', NBER Working Paper No. 11541 (Cambridge, MA: National Bureau of Economic Research).

Eichengreen, B. and M. Adalet (2005), 'Current Account Reversals: Always a Problem?', NBER Working Paper No. 1163 (Cambridge, MA: National Bureau of Economic Research).

Fair, R. and K. Dominguez (1991), 'Effects of the Changing US Age Distribution on Macroeconomic Equations', *American Economic Review*, **81**, 1276–94.

Feldstein, M. (1974), 'Social Security, Induced Retirement, and Aggregate Capital Accumulation', *Journal of Political Economy*, **82**, 5, 905–26.

Frankel, J. A. and E. A. Cavallo (2004), 'Does Openness to Trade Make Countries More Vulnerable to Sudden Stops, or Less? Using Gravity to Establish Causality', NBER Working Paper No. 10957 (Cambridge, MA: National Bureau of Economic Research).

Gourinchas, P.-O. and H. Rey (2005), 'International Financial Adjustment', NBER Working Paper No. 11155 (Cambridge, MA: National Bureau of Economic Research).

Hadri, K. (2000), 'Testing for Stationarity in Heterogeneous Panel Data', *Econometrics Journal*, **3**, 148–61.

Higgins, M. (1998), 'Demography, National Savings and International Capital Flows', *International Economic Review*, **39**, 343–69.

Hlouskova, J. and M. Wagner (2005), 'The Performance of Panel Unit Root and Stationarity Tests: Results from a Large Scale Simulation Study', University of Bern Discussion Paper 05-03 (Bern: University of Bern).

Im, K. S., M. H. Pesaran and Y. Shin (2003), 'Testing for Unit Roots in Heterogeneous Panels', *Journal of Econometrics*, **115**, 53–74.

IMF (International Monetary Fund) (2005), 'Globalization and External Imabances', in *World Economic Outlook*, Chapter III (Washington, DC: IMF).

Kao, C. (1999), 'Spurious Regression and Residual-based Tests for Cointegration in Panel Data', *Journal of Econometrics*, **90**, 1–44.

Kraay, A., N. Loayza, L. Serven and J. Ventura (2000), 'Country Portfolios', NBER Working Paper No. 7795 (Cambridge, MA: National Bureau of Economic Research).

Lane, P. and G. M. Milesi-Ferretti (2001), 'Long-term Capital Movements', NBER Working Paper No. 8366 (Cambridge, MA: National Bureau of Economic Research).

Lane, P. and G. M. Milesi-Ferretti (2006a), 'The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004', IMF Working Paper No. 69 (Cambridge, MA: National Bureau of Economic Research).

Lane, P. and G. M. Milesi-Ferretti (2006b), 'Exchange Rate and External Adjustment: Does Financial Globalization Matter?', IIS Working Paper No. 129 (Trinity College, Dublin: Institute for International Integration Studies).

Levin, A., C.-F. Lin and J. C. Chia-Shang (2002), 'Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties', *Journal of Econometrics*, **108**, 1–24.

Maddala, G. S. and S. Wu (1999), 'A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test', *Oxford Bulletin of Economics and Statistics*, **61**, 631–52.

Milesi-Ferretti, G. M. and A. Razin (1998), 'Sharp Reductions in Current Account Deficits: An Empirical Analysis', *European Economic Review*, **42**, 897–908.

Milesi-Ferretti, G. M. and A. Razin (2000), 'Current Account Reversals and Currency Crises: Empirical Regularities', in P. Krugman (ed.), *Currency Crises* (Chicago: University of Chicago Press).

Obstfeld, M. (2004), 'Globalization, Macroeconomic Performance, and the Exchange Rates of Emerging Economies', Center for International and Development Economics Research Working Paper No. C04-137 (UC Berkeley, CA: CIDER).

Pedroni, P. (1995), 'Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis', manuscript, Department of Economics, Indiana University.

Rebelo, S. (1992), 'Growth in Open Economies', *Carnegie-Rochester Series on Public Policy*, **36**, 5–46.

Rose, A. (2002), 'A Reason Why Countries Pay Their Debts: Renegotiation and International Trade', NBER Working Paper No. 8853 (Cambridge, MA: National Bureau of Economic Research).

Tille, C. (2008), 'Composition of International Assets and the Long Run Current Account', *Economic Notes*, **37**, 3, 283–313.

Zanghieri, P. (2004), 'Current Account Dynamics in New EU Members: Sustainability and Policy Issues', CEPII Working Paper No. 07 (Paris: CEPII).