Currency Crises, Current Account Reversals and Growth:
The Compounded Effect for Emerging Markets

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Currency Crises, Current Account Reversals and Growth: The Compounded Effect for Emerging Markets*

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Abstract

This paper investigates the possible negative effect of external crises, sudden stops in capital flows and currency crises in emerging market economies. We find that a current account reversal has an important effect, both direct and indirect, on economic growth, and depresses GDP by about 1 percentage point in the current year, when using a broad group of emerging markets. On the other hand, currency crises themselves, identified as a sharp depreciation, do not appear to have a significant direct impact on growth. Their overall effect on growth is positive, though rather insignificant from an economic point of view. The joint occurrence of the currency crisis and the current account reversal appears to be the most damaging event for economic growth. Both the direct and compounded effects are about 5 times larger than those of the reversal in the current year. The estimated cumulative losses for current account reversals and the joint crisis are 2 and 21 percentage points, respectively. The time necessary for the adjustment of actual growth back to its equilibrium rate is roughly 2.5 years after the current account reversal and 6.5 years after the joint occurrence of the currency crisis and the reversal.

Keywords: External Crises, Economic Growth, Open Transition Economy, Panel Data.

JEL Classification: F32, C23, O40, O52

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1 Introduction

Recently there has been interest in the effect of external crises on economic performance, since the vast majority of emerging market (EM) countries have been affected by some kind of such an event during the last two decades. However, the story is far from being over since the pegging of an exchange rate, which is the regime most vulnerable to the crises, is still policy at use in some emerging or developing countries. If we simplify the variety of external crises into two cases, namely currency crises and sudden stops in capital inflow (balance of payment crises), the response of an economy to such shocks vary under different exchange rate regimes. Unlike the case of currency crises the existence of the national currency is not the only potential source of sudden stops in capital flows to emerge. In the latter case all the other types of domestic and international shocks may result in sudden stop of capital inflow or even an outflow of financial resources from the economy.

The theoretical literature on the possible effects of external crises on economic performance is wide-ranging. However, unlike in the case of sudden stops in capital flows that are deemed to have negative influence on economic performance (Calvo, 1998 and 2000, and Calvo and Reinhart, 1999) the effect of currency crises is ambiguous (Moreno (1999), Gupta et. al. (2000), Shankar (2001). Some authors therefore suggest further splitting of currency crises into two groups, of anticipated and unanticipated events.

The objective of this paper is to analyse consequences of currency crises, sudden stops in capital flows (current account reversals)[1] and their concurrent occurrence for economic performance of emerging market economies. And further, investigate the subsequent adjustment dynamics after such events. The former part is carried out taking into account

[1] The terms a sudden stop in capital flow and a current account reversals will be used interchangeably throughout the paper, since it is common to identify the former event by the latter based on the simplified national account identities.

endogeneity issues arising when standard methods are applied. The latter introduces a possible alternative to the common analysis of the dynamics of the crises' effects.

The paper is organised as follows. Section 2 reviews recent empirical work dealing with the effect of external crises on growth. Section 3 provides estimates of the overall (compounded) effect of currency crises, current account reversals and their concurrent occurrence on economic growth. Section 4 explores the adjustment dynamics after the event under consideration, and Section 5 concludes.

2 Empirical Antecedents

The recent empirical research of the influences of external crises on economic performance is quite extensive in terms of approaches adopted and samples analysed. Some of the studies are summarised in this section in terms of the samples analysed, approaches and estimation methods applied and main findings.

Aziz et al. (2000) search for the common elements of the currency crises in a broad sample that spans the period 1975-97 for 50 industrial countries and emerging market economies. They adopted a univariate approach and for each variable of interest (including growth), conduct a graphical "event study" to see whether its average pattern of movement before and after a crisis is different from its behaviour during normal or tranquil periods. The differences in behaviour between crisis and tranquil periods are then tested for statistical significance. They find that, on average, output growth returned to trend in about 1.5 years, and the cumulative loss in output growth per crisis was 4.5 percentage points relative to trend. Further, for approximately 40 percent of the currency crises, there were no significant output losses estimated using the applied technique.

Barro (2001) analyses the effect of currency and banking crises on growth and investment in 9 East Asian countries using a five-year grouped panel from 1980 to 2000 for 67 countries.

He uses three stage least squares without country fixed effects as the estimation procedure and employ investment, initial GDP, male upper-level schooling, life expectancy, a total fertility rate, government consumption, a rule-of-law index, openness, inflation and a growth rate of terms of trade as control variables. He finds that a combined currency and banking crisis typically reduces economic growth over a five-year period by 2 % per year, compared with 3 % per year for the 1997-98 crisis in East Asia. Further, he explores dynamics using lagged dummies. The broader analysis found no evidence that financial crises had effects on growth that persisted beyond a five-year period. However, when analyzing the effect of banking and currency crises separately the estimates suggest that both may have small positive effect on growth. Additionally, estimates of the lagged banking crisis' dummy in investment equation suggest small negative effect on investment.

Edwards (2001) analyses the circumstances surrounding major current account reversals. In particular, he investigates how frequent and how costly these reversals have been. The empirical analysis is based on a data set that covers over 120 countries over more than 25 years. He uses OLS with fixed effects and the Arellano-Bond procedure to estimate the effect of reversals on investment and feasible GLS to estimate the effect of reversals on economic growth. Regarding the growth equation he uses investment, government consumption, international trade and the initial level of GDP as a set of control variables. In his estimates of the investment equation the coefficients of the contemporaneous and lagged reversal dummies are significantly negative, with point estimates –2.06 and –0.84 percentage points, respectively. Although both private and public sector investments are negatively affected, he finds that the impact is significantly higher on private investment. Concerning the estimates of the growth equation the results obtained support the hypothesis that current account reversals have had a negative effect on GDP per capita growth, even after controlling for investment.

Hutchison and Neuberger (2001, 2002a and 2002b) analyse the impact of currency crises, currency and banking crises (twin crises) and current account reversals, currency crises and the so-called "sudden stops" on output growth. In all three papers they use a panel data set over the 1975-97 period covering 24 emerging market economies. Concerning the growth equation specification the authors use lagged real GDP, a change in budget surplus, credit growth, external growth rates, real exchange rate overvaluation and openness as control variables concurrently with the relevant impulse dummies. They employ Arellano and Bond, and Hausman and Taylor procedures for estimation, and explore the dynamics of the events under consideration by leading and lagging the crises' dummies. In the first paper they find that currency crises reduce output by about 5-8 percent over a two-three year period. Typically, growth tends to return to trend by the third year following the crisis. In the second paper they conclude that twin crises do not adversely impact on output over and above the independent effects associated with a currency and banking crisis taken together. They find that currency (banking) crises are very damaging, reducing output by about 5-8 (8-10) percent over a two-to-four year period. The cumulative output loss of both types of crises occurring at the same time is therefore very large, around 13-18 percent. The investigation undertaken in the third paper implies that sudden-stop crises have a large negative, but short-lived, impact on output growth over and above that found with currency crises. A currency crisis typically reduces output by about 2-3 percent, while a sudden stop reduces output by an additional 6-8 percent in the year of the crisis. The cumulative output loss of a sudden stop is even larger, around 13-15 percent over a three-year period.

Milesi-Ferretti and Razin (1998) deal with a sample of 105 low and middle-income developing economies and analyse the current account reversals. They attempt to both explain the reversals and estimate the effects on output and exports resulting from sudden sharp reversals. In their "before-after" analysis they relate output growth after the reversal to its

level before the reversal and to a set of explanatory variables. The latter are GDP per capita before the event, the current account deficit, interest payments, level of U.S. interest rates, the real exchange rate and the degree of openness. Estimating the cross-section sample by OLS they find that countries that had a less appreciated level of the exchange rate, higher investment and more trade openness before the event are likely to grow faster after the event. Moreover, the median change in growth between the period after and before the event is around zero; however, they detect very heterogeneous output performance.

Moreno (1999) investigates the deviation of output from its trend in the six East Asian economies around the episodes of sharp devaluation over the 1975-1996 period. He regress GDP growth, investment and consumption on the real exchange rate, nominal M2, real government expenditure, foreign output and the real Federal funds' rate (all the control variables are expressed as deviation from their trend values as well). He adds dummies identifying the banking and currency crises occurrence. The informal analysis suggests that episodes of sharp devaluation are associated with modest expansion and contraction cycles, with output above trend before a sharp depreciation episode and below trend after it. However, when estimating the growth, investment and consumption equations explicitly (using OLS and instrumental variables) neither accounting for sharp depreciation episodes nor banking crises add to explanatory power over the period 1975–1996.

3 Empirical Analysis

If we allow that the effect of the crises on economic growth is not only direct but pervades investment decisions and government spending as well then we need to deal with this. The analysis is carried out using a broad sample of emerging market countries comprising regions of Latin America, East Asia and Central and Eastern Europe. African countries are not considered in the sample since most of them are less developed and

significantly decrease homogeneity of the estimated sample. Even though all countries of the regions mentioned cannot be considered given the data availability, we use the latter as a reasonable condition for identification of sufficiently developed countries within the regions in question. All the countries included in our sample are presented in Table A1 in the Appendix.

3.1 Regression Equation

Following the relevant literature, we analyse the effect of currency crises, current account reversals and their joint occurrence estimating a growth equation that incorporates some familiar control variables. The aim is to eliminate the possibility of specification bias. Therefore, we begin with an outline of the growth equation followed by comments on selected methodological issues related to such an approach. Consequently, we go over some alternative approaches that have been recently used in the literature before proceeding with a proposal of a modified approach.

Consider a growth equation of the following form:

$$\Delta gdp_{it} = \beta_1 gdp_{it-1} + \Psi \boldsymbol{X}_{it} + \beta_2 rev_{it} + \beta_3 cc_{it} + \beta_4 \left(cc_{it} \times rev_{it} \right) + \xi_{it} \qquad (1)$$

where the dependent variable is percentage growth of real GDP, *gdp* is the GDP level index controlling for the influences of the business cycle that is still present in the data regarding their frequency and approximating the "convergence" term (from "rather a technical point" of view). The vector $\boldsymbol{X}$ consists of the following control variables: *GOVCONS*, the ratio of government expenditure to GDP, *INFLATION*, the percentage change in CPI, *RER* a bilateral real exchange rate with respect to the U.S. dollar and *OPEN*, the ratio that captures the degree of openness of the economy, calculated as a sum of imports and exports per GDP. *CC* and *REV* are impulse-dummy variables that take the value of one if the particular country has

experienced a currency crises or current account reversal, respectively, and zero otherwise. We also include a dummy that captures the effect of the joint occurrence of the two events. *i* stands for individuals (countries), *t* for the time period, *j* for the considered lag length and ξ is the residual term. All the data are from the International Financial Statistics (IFS).

We assume that the error term of equation (1) takes the following form:

$$\xi_{ti} = \varepsilon_{ti} + \mu_{ti} \qquad (2)$$

where ε_{ti} is a country error term and μ_{ti} is a standard disturbance term. It may appear that the coefficient of the lagged dependent variable will be upward biased because of the country specific element in equation (1). Handling this problem, we initially apply the basic approach of a fixed-effect model combined with cross-section weights (i.e. estimate by the feasible GLS method)[2]. Thus, we do not allow for time-specific effects and assume that there was no common event affecting all the countries in any particular year. Given the interest in EM countries, it is further assumed that the sample is large enough and is not randomly taken out of some larger homogenous sample. Thus the use of the fixed effect specification does not introduce a bias relative to the random effect specification. A common trend is included as an additional explanatory variable as to control for a possible joint trend in the data[3].

3.2 Identification of Currency Crises and Current Account Reversals

Currency Crises

To identify currency crises we follow the methodology proposed by Park and Lee (2001) which is based on the identification of currency crises introduced by Frankel and Rose (1996).

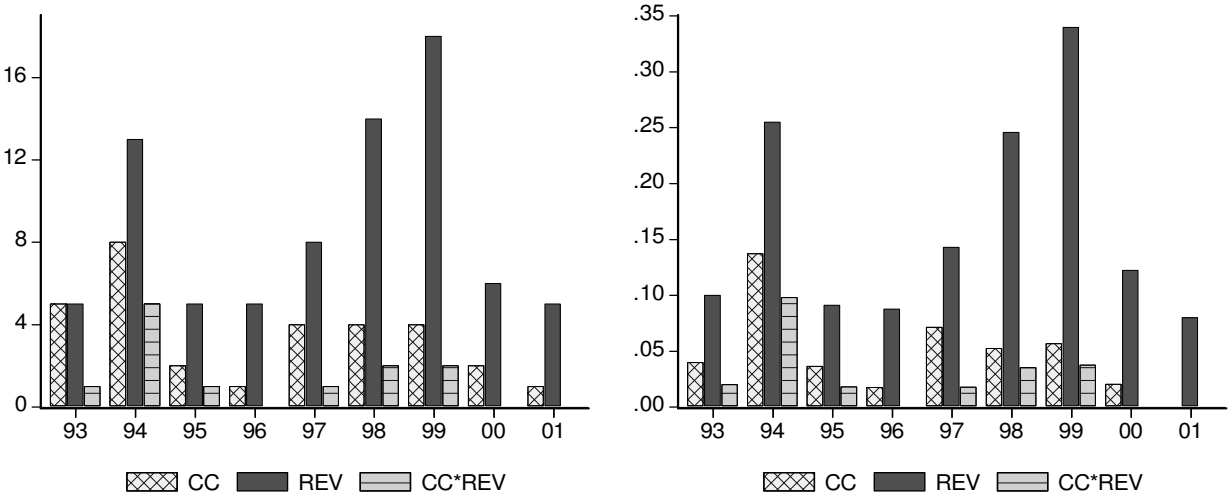
[2] The maximum likelihood (MLE) method is applied as well to check for robustness. Concurrently, the generalised method of moments (GMM) is employed to deal with all issues discussed later on. I discuss the estimation methods below.

[3] However, we check the superiority of such specification with respect to the alternative of country specific trends using differenced panel and testing the fixed-effect specification compared to common constant. The latter specification appeared to be more sensitive.

They identified these kinds of crises with large nominal deprecations of a country's currency over a short period. The more rigorous identification of Park and Lee, recently applied by Barro (2001), defines a currency crisis as a situation in which the nominal depreciation of the currency was at least 25 percent during any quarter of the year and exceeded by at least 10 percentage points the depreciation of the currency in the previous quarter. We apply this kind of identification to the sample of emerging market countries and use, due to data-availability constraint, a month-to-month change as a measure of the necessary condition. Using such method 35 currency crises from 590 observations for the total of 59 EM countries have been identified; 17 of them in Central and Eastern Europe, 5 in East Asia and 13 in Latin America. The exact number of crises and the number of available observation for each particular country are presented in the Appendix in Table A1[4]. The time profile of currency crises, current account reversals and their joint occurrence (the crises) is captured in Figure 1 for the entire sample of EM countries.

[4] Although only the provided identification is used throughout this paper, I have also include currency crises' dummies based on the sufficient condition only, i.e. 10% quarter-to-quarter devaluation, into the regression equation. Surprisingly, such optional dummy appeared to be more significant bearing a larger negative coefficient relative to the primary one.

Figure 1 A Time Profile of Currency Crises Appearance During 1993-2001



Current Account Reversals

So-called "sudden stops" in capital flows are viewed as more harmful for economic growth (at least in the short run) relative to currency crises (see e.g. Hutchison and Neuberger, 2002b). It is common practice to identify such "sudden stops" with current account reversals beyond certain threshold (see. e.g. Hutchison and Neuberger, 2002b; Edwards, 2001 or Milesi-Ferretti and Razin, 1998 and 1999). Initially, we consider two thresholds following in this respect Milesi-Ferretti and Razin. A current account reversal is thus defined as a positive change of the current account balance-to-GDP ratio of at least 3 % (alternately 5 %) in the particular year[5,6]. Applying such method 76 current account reversals have been identified using 453 observation on the change in current-account-to-GDP ratios in the total of 59 EM countries during 1993-2001; 29 of them in Central and Eastern Europe, 23 in East Asia and 24

[5] For instance, Edwards uses another alternative measure that is less restrictive and identifies currency crises with a positive change in the current account-to-GDP ratio of at least 3 % in three consecutive years. On the other hand, Hutchison and Neuberger impose, alternatively, an additional condition that the post-reversal current account deficit is higher than –1 % of GDP. This is motivated by the hypothesis that capital inflow reversals will be especially painful if they constitute an almost complete stop in capital inflows (or even capital outflows). In our robustness checks I also control for the size of the reversal (as a fraction of GDP). The approach applied here is therefore a mixture of the two since I use two thresholds of 3 % and 5 % but we are concerned with changes in the current account relative to GDP.

[6] The results provided further in this paper are associated with the 3% threshold only. The inclusion of dummy indicating the 5% reversal appeared to be of the similar significance and a somewhat higher magnitude proportional to the difference between the two thresholds.

in Latin America. The exact number of the reversals for each country and the available observations are provided in the Appendix in Table A1.

Joint Occurrence of Currency Crises and Current Account Reversals[7]

The joint occurrence of a currency crisis and a current account reversal is expected to have an additional effect on economic performance of EM countries since both sets of transmission channels of negative effects associated with the two slightly different events are in force and combined together. We identify 12 joint occurrences of currency crises and current account reversals from 453 available observations for the total of 59 EM countries during 1993-2001; 4 of them were identified in Central and Eastern Europe, 3 in East Asia, and 5 in Latin America. The number of such events for particular country is provided in Table A1 in the Appendix.

3.3 Methodological Issues

Herein we discuss certain methodological issues related to the estimation of Equation 1 and review some approaches dealing with such matters and other approaches that may be borrowed from related literature. Given the specification of Equation 1, there are two major issues that are worth mentioning.

The first issue is an existence of the so-called *indirect effect,* i.e. an effect of the events under consideration upon the control variables. This would complicate or even preclude the estimation of an "equilibrium level" of economic growth. Therefore, we consider a possible application of the *General Evaluation Estimator (GEE)* method that has been introduced by Goldstein and Montiel (1986) and recently applied by e.g. Dicks-Mireaux, Mecagni and Schadler (2000) and Hutchison (2001) in the context of evaluation of IMF stabilisation

[7] Only such joint occurrence of a currency crisis and a current account reversal is deemed to be the so-called "sudden stop" in Hutchison and Neuberger.

programs. And subsequently the same matter is discussed in the light of such indirect effect estimation as it has been carried out by e.g. Edwards (2001).

The second concern might be *possible endogeneity* of the three events with respect to economic growth[8]. The findings in the literature dealing with indicators of currency crises and of current account reversals more or less validate such concern. Namely, the rate of economic growth is considered to be one of the possible significant indicators of the crises (Kaminski and Reinhart, 1999; Millesi-Ferreti and Razin, 1998 and 1999; Reisen, 1998; and Frankel and Rose, 1996). As a result we go over some methods that may be useful for handling such a possible problem. These are methods basically include *instrumental variables* or the so-called *Inverse Mills Ratio* (Heckmen, 1979).

General Evaluation Estimator

At this point we consider a potential application of the GEE method to the estimation of Equation 1. GEE is designed to answer the following question: did the events under consideration significantly affect economic performance relative to what it would have been in the absence of such events? To answer this question, an aggregate measure of economic performance is described as a function of: (i) control variables (policies) that would have been observed in the absence of the events; (ii) exogenous external factors (strictly exogenous variables); (iii) the occurrence of the events in question. The aim is to get consistent estimates for the "independent effect" of the events in question upon macroeconomic performance.

Policies adopted or the values of control variables in the absence of the events are directly observable only for the periods when the given events did not occur. Thus, the key element of the GEE is the construction of a counterfactual for the controls during affected periods. One of the critical issues regarding empirical application is whether the individual country

[8] We might question the same aspect also with respect to the control variables even though we use ratios relative to GDP. I consider this possible problem below when estimating the growth equation by GMM.

behaviour can be sensibly aggregated into a uniform model that is stable over countries and over time. Such aggregation is especially questionable in the case of developing and emerging market due to their institutional variety. However, even if we made such a strong assumption there would be a much more doubtful element in the construction of the counterfactuals. Once the determinants of the control variables, the counterfactuals we are constructing, are themselves significantly affected by the events the created values for controls are also biased.

Another assumption is that all shocks are assumed to be transitory and to cause one-period changes in the control variables that are fully reversed in the following period. This restrictive assumption requires that each control variable is stationary, but also rules out a wide range of stationary stochastic processes for which the impact of temporary shocks persists over time. Even though, the GEE concept is not applicable to our problem as a whole, we will use some of its implications when estimating the "independent indirect effect" of the events in question.

Estimation of Direct and Indirect Effects

When estimating Equation 1 only a direct effect is obtained and not an "overall independent effect" of the events. The reason is that at least some of the explanatory variables bear a value different from what it would have been if the events did not occur. Thus it is necessary to proceed with an analysis of the indirect effect and add the value of the indirect effect to that of the direct effect. Both together should then constitute the overall independent effect (compounded effect) of the events. Edwards analyses one indirect channel, namely the impact of investment on growth, and finds out that such indirect effect of current account reversals is more important for growth than the direct effect.

However, this approach does not seem to be sensitive enough for several reasons. For instance, Edwards estimates the two following regression models:

$$INVEST_{ti} = \beta_1 INVEST_{t-1i} + \beta_2 GOVCONS_{ti} + \beta_3 OPEN_{ti} + REV_{ti} + \xi_{ti} \qquad (3)$$

$$GROWTH_{ti} = \beta_1 GOVCONS_{ti} + \beta_2 INVEST_{ti} + \beta_3 OPEN_{ti} + REV_{ti} + \eta_{ti} \qquad (4)$$

Except for some rather technical assumptions and the fact that he treats government consumption as a strictly exogenous variable there is still one pitfall. When the indirect effect is estimated, e.g. that of the reversal on investment, all the available observations are used. In such case the estimated coefficient on the dummy representing the reversals would be again biased and inconsistent[9] once, at least, one of the explanatory variables is affected by the reversal itself. In the case of the investment equation above it would be the value of government consumption that would be different from what it would have been if the reversal did not occur. More specifically, the value, for instance of government consumption, is unbiased for the purpose of the "independent" indirect-effect estimation during the non-reversal periods. But all the values from the reversal period onwards are or may be affected by this event and thus biased. The estimation obtained when using all the available observations does not precisely capture an "independent" effect of the reversal on government consumption.

Possible Endogeneity and the Sample Selection Bias

Both the possible endogeneity of the events (dummies) with respect to growth and the sample selection bias have a common basis, essentially. Both issues can be solved by using "valid" and "relevant" instrumental variables for the estimation (as applied by e.g. Dicks-Mireaux, Mecagni and Schadler, 2000)[10] or employing some indirect method as a

[9] Since the observations after either of the crises are more or less biased even an increasing number of cross-section observations (the dominating dimension of the panel here) is not going to decrease the variance of the estimates.

[10] Such alternative procedure uses the predicted probability of experiencing an event as an instrument for the relevant dummy in Equation 1.

construction of the *Inverse Mills Ratio (IMR*). In both cases the auxiliary model considered is a PROBIT model for the crises dummies. Concerning the instrumental variable approach the employed instruments have to be both valid, i.e. uncorrelated with the shocks affecting growth, and relevant, i.e. highly correlated with the related explanatory variable. Given the rather low fit of the crises' models and their complexity (number of explanatory variables) the relevancy of each variable may be a concern. The same concern applies when instrumenting the other explanatory variables by their lagged values. In annual data, the first order autocorrelation of the series is typically small. Consequently, a use of the variables from PROBIT models and the lags as instruments may result in an increasing efficiency of the IV estimator according to the degree of the weakness of such instruments (see Stock, Wright and Yogo, 2002).

3.4 The Compounded Effect of the Crises

In what follows we propose an approach for estimation of the overall (compounded) effect of currency crises, current account reversals and their joint occurrence on growth and perform such estimation subsequently. After that we examine the adjustment dynamics of the economic growth itself and all the explanatory variables found to be influenced by the events. Accordingly, a cumulative loss as a result of the events and the time necessary for the adjustment back to the equilibrium growth are estimated.

The Proposed Approach

To estimate the contemporaneous "independent" effect of currency crises, current account reversals and their joint occurrence on growth we do as follows. First, we run regression (1) to obtain the direct effect of the events.

In the second step, the sample is truncated in such a way that it contains only observations prior to the periods when either of the crises occurred[11]. This is done to exclude observations which are likely to be biased by either of the crises' occurrence. The periods in which either of the crises occurred for the first time are then added. Each variable in Equation 1 is considered as a potential determinant of the other variables in the equation. Consider therefore the following regressions:

$$x_{it} = \Theta \boldsymbol{X}_{it-1} + \gamma_1 rev_{it} + \gamma_2 cc_{it} + \gamma_3 \left(cc_{it} \times rev_{it} \right) + \varphi_{it} \qquad (5)$$

where $\boldsymbol{X}$ is a vector of the variables of country i included in Equation 1 , Θ is a matrix of estimated common coefficients. $\gamma_1,\ldots,\gamma_3$ are the estimates of the "independent" indirect effects of the current account reversals, currency crises and their joint occurrence, respectively, and φ is the residual term.

The compounded effect of each crisis is then calculated as a sum of the estimated direct and weighted indirect effects of the particular crisis, as described by Equation 6:

$$EVENT = EVENT^{DIRECT} + \hat{\Psi} EVENT^{INDIRECT} \qquad (6)$$

where *EVENT* stands for the compounded effect of current account reversals, currency crises and their joint occurrence, respectively. $EVENT^{DIRECT}$ stands for the estimated direct effect and similarly $EVENT^{INDIRECT}$ for the indirect effects of the particular crisis. $\hat{\Psi}$ is the matrix of coefficients obtained when estimating Equation 5.

[11] Only those countries that provide at least 3 observations prior to the event are considered.

Estimation of the Direct Effect

Following the proposed procedure, we estimate Equation 1 by feasible GLS (FGLS), maximum likelihood (ML) and 2-step general method of moments (2-step GMM). The FGLS method is considered to be a core estimator here and is applied together with ML as a check for the robustness (following Baltagi, 2001). Further, we estimate a narrower pool with GMM considering all the possible aspects omitted by the two former estimators. However, the price paid for the increased coherence is a substantially smaller pool of the data available[12]. Therefore, we treat the GMM estimates rather as illustration of a more sensitive approach and the acquired results rather as supplements when drawing any conclusions.

The instruments used for the GMM estimates are all the explanatory variables from Equation 1 lagged one period, except for the measure of openness where both the current and one period lagged values are employed. The main instruments for the dummies indicating the crises are the current account balance-to-GDP ratio, the government budget deficit-to-GDP ratio, the foreign reserves-to-GDP ratio and the portfolio investment-to-GDP ratio. All these variables are lagged one period to represent expected probability of the crises occurrence. The choice of such instruments is based upon studies on indicators of the crises considered carried out by Edison (2000), Miyakoshi (2000), Kaminski and Reinhart (1999), Berg and Pattillo (1999), Millesi-Ferreti and Razin (1998 and 1999) Reisen (1998) and Frankel and Rose (1996). Finally, lags of the dependent variable are used as a GMM-type instrument (see

[12] There are further problems associated with the applied GMM estimator. In some cases, as e.g. investment, the real exchange rate or inflation, the AR(1) coefficient is rather smaller due to higher volatility of the variables. Further, the fit of PROBIT models on the crises is rather poor as well even when a wide range of the relevant indicators is considered. Given the data constraint, the expected probability of crises conditional upon the instruments applied is therefore assumed to be rather inaccurate. Thus, a use of both types of instruments mentioned introduces additional inefficiency. This is in general problem arising when weak instruments are used since not only their validity is required but relevance as well. For thorough treatment of this issue see Stock, Wright and Yogo (2002). Further, construction of the IMR ratio is not considered here since it requires a large set of significant explanatory variables to attain a reasonable fit, so that the ratio is an efficient analytic tool (see e.g. Dicks-Mireaux, Mecagni and Schadler, 2000).

Doornik, Arellano and Bond, 2002). The Estimation by GLS, ML[13] and GMM are presented in Table 1 below:

Table 1 Estimation of the Direct Effects on Growth

Variable	FGLS	MLE	GMM
GDP(-1)	-0.266 (0.026)***	-0.315 (0.024)***	0.024 (0.007)***
Invest	0.123 (0.039)***	0.211 (0.032)***	0.123 (0.031)***
Govcons	-0.418 (0.105)***	-0.562 (0.086)***	0.012 (0.019)
Open	0.0102 (0.004)***	0.012 (0.0046)***	0.0003 (0.00003)***
RER	-0.075 (0.0075)***	-0.056 (0.008)***	-0.024 (0.009)***
Inflation	0.0013 (0.00079)*	0.0012 (0.00068)*	0.002 (0.001)**
REV	-1.040 (0.304)***	-0.982 (0.284)***	-0.668 (0.211)***
CC	0.385 (0.917)	0.193 (1.042)	-0.147 (0.046)***
CC×REV	-5.448 (1.311)***	-3.286 (1.355)***	0.010 (0.003)***
T	1.129 (0.109)***	1.230 (0.098)***	0.004 (0.0004)***
R2 adj.	0.759	0.790	0.086
DW *m*-test	1.505 (0.1335)	1.046 (0.2965)	AR(1)test (0.059) AR(2)test (0.271)
No. of Obs.	340	340	169
White's Test	1.1954 (0.9967)	4.8063 (0.7781)	N/A

The dependent variable is percentage GDP growth. The regression equation includes fixed effects (not reported for brevity) and common trend. *, **, *** - stand for the significance of the particular variable at 5%, 10% and 1% level, respectively. S.E. are in parentheses. The presented White's test on heteroscedasticity has been performed without the inclusion of cross-products. The probability of the F-statistic is in parentheses. The 2-step GMM estimates are reported using finite sample corrected standard errors.

Both FGLS and ML estimates produce a good fit and satisfy the respective diagnostic tests on residuals' autocorrelation and heteroscedasticity. On the other hand, the fit of the GMM

[13] I do not report the estimation results when using heteroscedasticity-consistent standard errors and covariance since significance of the results is even reinforced. In view of the fact that the crises' periods are largely associated with extremely volatile economic environment disregarding of some information using robust estimators may be insensible.

estimation is very poor as expected. In what follows we focus mainly on the FGLS (and ML) estimates with a cautious eye to the interpretation of the estimated coefficients on the control variables and the crises' dummies given their possible endogeneity.

All the controls appear to be highly significant except for inflation, which is significant only at 10 % level. Namely, 1 % increase of investment or fixed capital formation increases economic growth at least by 0.12 % in the current year. This result confirms that investment is an engine of economic growth. On the other hand, an increase in government consumption has a possible negative effect on growth possibly due to a crowding-out effect on private investment. However, the result is not supported by the GMM estimate when endogeneity of government consumption is considered.

The magnitude of the coefficient on the measure of openness is fairly small but highly significant emphasising the positive impact of foreign trade on growth. Negative signing of the real exchange rate suggests that 1 % excessive depreciation or undervaluation of the domestic currency hinders output growth in the domestic country by nearly 0.1 %. RER undervaluation has a negative effect, especially on EM countries in their early stage of development when they import technology and production capital[14].

The positive impact of inflation on growth is somewhat surprising, however, the evidence from the empirical literature is also mixed. Interpreting the result we may say that most of the countries included in our sample have inflation predominantly under control during the analysed period. The positive slope coefficient of the time trend implies that emerging countries jointly speed up the rate of growth by at least additional 1.13 % a year.

The reversals in current account appeared to represent a significant damage for the economy decreasing the economic performance in current period by more than 1 %. This finding supports the idea that the foreign and domestic capitals are not substitutes and/or that

[14] It is well known from the literature on the dynamic of the current account that the trade balance is likely to follow the so-called U-shape during the catching-up process of emerging markets to industrial countries.

the domestic economy is not capable to generate saving that would substitute the sudden stop in foreign capital inflows in the short run. On the other hand, the significant devaluations that characterise currency crises seem to increase the competitiveness of the domestic country supporting economic growth. Nevertheless, the influence of currency crises themselves is insignificant according to our estimates. Finally, the most detrimental effect on growth comes from the joint occurrence of currency crises and current account reversals according to the estimates. The combination of the sudden stop in the foreign capital inflows and large devaluations depresses growth in the domestic economy by devastating 3-5 %[15].

Estimation of the Indirect Effects

In the next step, the indirect effect of the crises on relevant explanatory variables[16] in Equation 1 is estimated using the truncated sample as described. The estimations of Equation 5 are presented, in their parsimonious versions (following the general-to-specific approach), in Tables 2 to 4 below:

[15] If the GMM estimates of the coefficients on crises' dummies are considered we cannot be so confident about the effects of currency crises and the concurrent crisis. The explanation for such ambiguity may be the fact that currency crises (11 cases) are quite rare compared to the reversals (50 cases – gives 7 joint crises) in the sample analysed and therefore a significant amount of positive observations on currency and joint crises is lost when using GMM.

[16] These are those variables not affected by the events by definition. Therefore, the measure of openness and the real exchange rate with respect to the U.S. dollar are excluded. Further, they are treated as being rather exogenous allowing them to initially enter the regression equation with lags 0 and 1, and thus compete with the dummies.

Table 2 Estimation of the Independent Effects on Investment

Variable	Estimated Coefficient
Invest(-1)	0.389 (0.059)***
Govcons(-1)	-0.343 (0.027)***
RER(-1)	-0.016 (0.008)**
REV	-1.551 (0.161)***
CC	-1.424 (0.214)***
R2 adj.	0.957
DW *m*-test	0.2819 (0.7784)
No. of Obs.	190
White's Test	1.9224 (0.9833)

The dependent variable is the investment-to-GDP ratio. The estimation method is FGLS with fixed effects and a common trend is initially included. *, **, *** - stand for the significance of the particular variable at 5%, 10% and 1% level, respectively. S.E. are in parentheses. The presented White's test on heteroscedasticity has been performed without the inclusion of cross-products. The probability of the F-statistic is in parentheses.

The performed regression for investment shows a very good fit as indicated by the adjusted coefficient of determination and the null hypotheses of no autocorrelation in residuals and residuals' homoscedasticity are not rejected. The investment ratio shows moderate persistence that is highly significant. We can again observe the significant negative effect of government consumption on fixed capital formation which is of a considerable magnitude. It suggests that a 1 % increase in the government consumption-to-GDP ratio depresses the similar ratio for investment by 0.34 %. Further, there are significant influences from external macroeconomic variables on the investment ratio. Namely, real depreciation of the domestic currency reduces the investment ratio by increasing the relative price of imported technology and production capital. This finding is consistent with the estimation for growth. The impacts of both the current account reversal and the currency crisis are significantly negative and of a similar

magnitude. However, for the joint crisis (not reported) the estimates do not produce any additional effect on the investment.

Table 3 Independent Effects on Government Consumption

Variable	Estimated Coefficient
Govcons(-1)	0.477 (0.045)***
Irvol(-1)	-0.010 (0.009)
Inflation(-1)	0.015 (0.0077)*
REV	-0.330 (0.069)***
CC	-0.740 (0.245)***
T	0.207 (0.023)***
R2 adj.	0.968
DW *m*-test	0.2128 (0.8318)
No. of Obs.	161
White's Test	1.9843 (0.9841)

The dependent variable is the government consumption-to-GDP ratio. The AR(2) term was additionally included to eliminate indicated autocorrelation of residuals. The estimation method is FGLS with fixed effects and a common trend is initially included. *, **, *** - stand for the significance of the particular variable at 5%, 10% and 1% level, respectively. S.E. are in parentheses. The presented White's test on heteroscedasticity has been performed without the inclusion of cross-products. The probability of the F-statistic is in parentheses.

The regression for government consumption fits the data very well and the tests on residuals' homoscedasticity and autocorrelation do not indicate any problems in this respect. Government consumption shows fairly higher persistence that is further highly significant. Interest rate volatility has negative, though insignificant effect on government consumption. Higher inflation significantly increases government consumption. The government consumption-to-GDP ratio is significantly increasing over time by 0.21 % a year. Both the current account reversals and currency crises have a significant negative effect on government

consumption. As in the case of investment, the joint occurrence of the two events does not have any additional effect on government consumption.

Table 4 Independent Effects on Inflation

Variable	Estimated Coefficient
Inflation(-1)	0.318 (0.061)***
RER(-1)	0.033 (0.013)**
CC×REV	65.56 (5.10)***
R2 adj.	0.915
DW m-test	1.610 (0.1108)
No. Of Obs.	137
White's Test	2.0677 (0.8397)

The dependent variable is CPI inflation. The AR(2) and AR(3) terms were additionally included to eliminated indicated autocorrelation of residuals. The estimation method is FGLS with fixed effects and a common trend is initially included. *, **, *** - stand for the significance of the particular variable at 5%, 10% and 1% level, respectively. S.E. are in parentheses. The presented White's test on heteroscedasticity has been performed without the inclusion of cross-products. The probability of the F-statistic is in parentheses.

The regression carried out fits the data on inflation very well and does not violate either of the residuals' tests performed. Also inflation shows significant persistence above 30 % according to our results. The other influence, given the system of considered variables, comes from the pass-trough effect of the real exchange rate. The coefficient on the real exchange rate is positive and significant. Namely, 1 % depreciation of the domestic currency produces 0.03 % increase in inflation. The results suggest that neither the current account reversal nor the currency crisis provide any additional information on the top of that conveyed by the real exchange rate. On the other hand, the joint occurrence of the reversal and the currency crisis raise the inflation in the affected country by 66 percentage points.

Calculation of the Compounded Effects of the Crises

As described in Equation 6 the compounded effects of the crises is calculated as a sum of their direct and weighted indirect effects. The weights applied are the estimated coefficients from the parsimonious version of the growth equation (see Table 1, the FGLS column). By substituting the relevant estimated coefficients into Equation 7 we obtain:

$$EVENT = EVENT^{DIRECT} + 0.12EVENT_{INVEST}^{INDIRECT} - 0.42EVENT_{GOVCONS}^{INDIRECT} + 0.001EVENT_{INFLATION}^{INDIRECT} \quad (7)$$

The compounded effects of the currency crises, current account reversals and their join occurrence are then calculated according to Equation 7 by substituting in relevant estimates. The results are presented in Table 5[17]:

Table 5 Indirect and Compounded Growth Effects According to the Type of the Event

Type of the Event	Investment	Government Consumption	Inflation	Compounded Effect
Current Account Reversal (REV)	-0.186	0.139	NA	-1.087
Currency Crises (CC)	-0.171	0.311	NA	0.140
Joint Occurrence of REV and CC	NA	NA	0.092	-5.356

The calculations are based on the estimations of the direct and indirect effects by FGLS presented in Table 1 to 4. The numbers are in percentage points for the current year.

The results imply that the current account reversals are associated with a decrease of 1 percentage point in the growth rate of the economy affected. On the other hand, the occurrence of currency crises has mild positive effect on growth even in the current year. This finding is likely based upon the increased external competitiveness resulting from the large devaluation. Although we may suspect that the initial effect of the large devaluation is negative the price effect on exports is likely to reverse so that the overall effect is positive (or

[17] I do not proceed further with GMM since it cannot be applied in the current context due to the small sample of data available.

at least neutral) in the current year. Finally, the simultaneous occurrence of currency crises and current account reversals dramatically reduces the rate of growth by about 5 percentage points in the current year.

Analysis of the Dynamics

This subsection focuses on the dynamics of the compounded effect of the crises on economic growth. It attempts to answer the following question: How fast or slow is the adjustment of output growth after a shock (a crisis) back to its equilibrium path. In other words, the time necessary to "get back on track" after the crises is estimated.

In the recent literature the dynamics of current account reversals and currency crises has been mostly analysed using the leads and lags of identification dummies (see Section 2). Significance of such leads or lags should have then revealed whether the crisis had a long lasting or anticipation effect on growth. Such an approach is, however, likely associated with certain pitfalls. Regarding the implementation of the leads without leading other explanatory variables why would one believe that the dummies pick up just the information bit pertaining to the anticipation effect of the crisis onset and not an effect pertaining to the anticipation of e.g. higher borrowing costs (interest rates) or a decline in investment.

Another issue may be incorporation of the lags for a similar purpose. Even though the economic intuition is clear in this case, the intended outcome may not be achievable. As discussed before if the crises affect the explanatory variables as well the dummies may not be capable to pick up the targeted impact of the event. In this case three concepts of economic growth have to be considered. These are the actual growth, the estimated growth and the growth that would have been present if the event had not occurred (equilibrium growth). More specifically, after the crisis occurred onwards, all the explanatory variables that have positive (negative) effect on growth, and are negatively (positively) affected by the crisis themselves,

show lower (higher) values relative to what they would have showed if the crisis did not appear. It is one period after the crisis onwards there is a difference between the estimated growth and the equilibrium one. Since the estimated growth is fitted to the data on the actual growth and the equilibrium growth is likely to lie somewhere else the dummies would fail to be an effective tool for the analysis of the dynamics. Given the pitfalls discussed and the fact that the dummies may further pick up other effects, regardless whether they are associated with the event or not, an approach which seems to be more time consistent and explicit is followed here.

It is assumed that there exists equilibrium growth driven by fundamentals. Once the crisis occurred such shock makes the actual growth deviate from its equilibrium path. This deviation is further reinforced if the positive (negative) determinants are dampened (boosted) by the crisis itself. The convergence of the actual growth back to its equilibrium is then given by what we call "the compounded factor of adjustment" (CFA). The latter is obtained by compounding the speed of convergence in output growth and all the explanatory variables affected.

$$\Delta x_{it} = \omega \Delta^2 x_{i,t-1} + \upsilon_{it} \qquad (8)$$

where $\boldsymbol{x}$ stands for the variables of country i included in Equation 1 respectively. ω's are a estimated common, convergence coefficients used to calculate the CFA as described in Equation (9). Further, the convergence coefficients are compounded using the coefficients' estimates in Table 1 as weights:

$$CFA = \hat{\omega}_{growth} + \hat{\psi}_{invest}\hat{\omega}_{invest} + \hat{\psi}_{govcons}\hat{\omega}_{govcons} + \hat{\psi}_{inflation}\hat{\omega}_{inflation} \qquad (9)$$

where, for example, $\hat{\psi}_{invest}$ is 0.123 from Table 1. The estimated common convergence coefficients and the calculated CFA are provided in Table 6:

Table 6 Estimation of the Convergence Coefficients and Calculation of the CFA

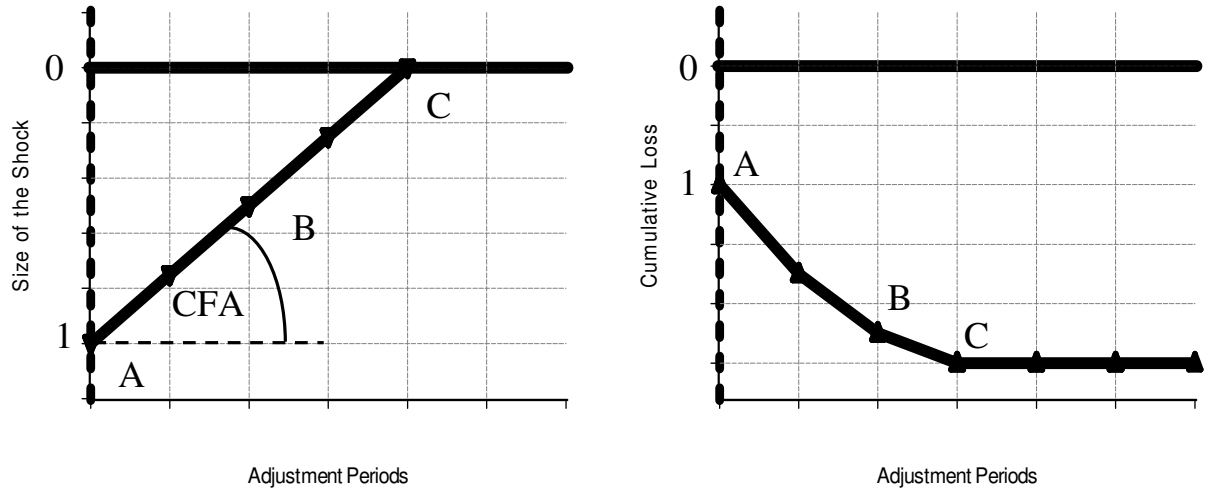
Variable	Convergence Coefficient	No. Of Obs.
Growth	-0.806 (0.041)***	286
Invest	-0.099 (0.020)***	330
Govcons	-0.032 (0.009)***	332
Inflation	-1.120 (0.076)***	300
CFA	-0.806	NA

Convergence coefficients are the estimates of ω's from Equation 8. The estimation method is GLS. *, **, *** - stand for the significance of the particular variable at 10%, 5% and 1% level, respectively. Standard errors are in parentheses.

We can infer from Table 6 that output growth shows quite strong convergence back to its equilibrium and rapidly eliminates any deviation from long-run trend[18]. On the other hand investment and government consumption contribute only marginally to the overall strength of the CFA resulting from long memory of the series. The movements in inflation show excessive volatility most likely due to some high inflation periods considered. Given the results the calculated CFA is quite similar to the original convergence coefficient of the growth series.

Since the compounded effect of the crises and the CFA are identified we can easily compute *the time* necessary for the full adjustment back to the equilibrium and the resulting *cumulative loss* of economic performance. The intuition is captured in Figure 2 below which outlines all the main features of a stylised adjustment after a crisis.

Figure 2 Stylised Adjustment Back to the Equilibrium Growth and Cumulative Loss



As outlined in Figure 2 the adjustment path is approximated by a trajectory equal to the hypotenuse of a triangle the other two sides of which are the overall size of the shock ("Size of the Shock" given by the Compounded Effect of a crisis) and the time necessary for the full adjustment (Adjustment Periods). The slope of the hypotenuse, which represents the overall strength of adjustment, is given by CFA. All the results are summarised in Table 7 below:

Table 7 Time Necessary for Full Adjustment and Cumulative Loss of Performance

Event	Size of Shock	Length of Adjustment	Cumulative Loss
REV	-1.087	1.35	1.826 (0.74)
CC	0.140	0.17	-0.152 (-0.012)
REV^CC	-5.356	6.25	20.79 (15.75)

The Size of the Shock (SS) is the Compounded Effect from Table 5 in percentage points. Length of Adjustment in years (LA) is calculated as corresponding SS divided by CFA. The cumulative loss (CL) in percentage points is given by $CL = \frac{1}{2}(SS \times LA) + SS$. The numbers in parentheses corresponds to the cumulative loss during the adjustment period only, i.e. $\frac{1}{2}(SS \times LA)$.

The intuition behind Table 7 is as follows. Assumed that the system is initially in equilibrium, i.e. economic growth is determined purely by the relevant long-run

[18] This may in fact demonstrate that the choice of yearly frequency is not far from being suitable for the analysis of "long-run" economic growth.

fundamentals. Then occurs a crisis period when the growth is forced to deviate from its long-run path. The "Size of the Shock" column gives the magnitude of deviation in this period zero for each event. The consequent time necessary for the full adjustment back to the long-run equilibrium is calculated in the next column "Length of Adjustment". For instance, given that the loss of output growth in the period zero when the current account reversal occurred is 1.1% the economy needs additional 1.4 years for the full adjustment. Thus the overall contraction period spans over 2.4 years (Period Zero + 1.4 years). Finally, the cumulative loss provided in the last column is calculated as a sum of the current compounded effect and losses in subsequent periods until the full adjustment. It is therefore a sum of the loss in period zero and the cumulative loss during the periods of adjustments. Both the *overall* cumulative loss and the cumulative loss *during the adjustment process* (provided in parentheses) are presented in Table 7.

We can infer from Table 7 that only reversals in current account or their combination with currency crises are associated with a significant loss in output growth and a painful adjustment process. Particularly the combined crisis seems to be very harmful for the economy according to both the current compounded effect (about 5 %) and the length of the adjustment (over six years). On the other hand, currency crises themselves do not appear to have devastating consequences for the economy affected and their initial effect is rather positive.

4 Conclusions

This paper has estimated impacts of current account reversals and currency crises on economic growth. The former should have, according to theory, a negative effect on growth at least in the current period. The effect of the latter event is rather ambiguous regarding the plausible underlying theory. Based on the previous findings the most damaging should be joint occurrence of the two.

The analysis was divided into two steps. First, the direct effect of the crises was estimated using standard growth equation with investment, government consumption, the degree of openness, inflation, the real exchange rate and the convergence term as control variables. We find significant negative impact of current account reversals and the joint occurrence of the reversal and the currency crisis on growth. While the magnitude of the former is about 1 percentage point, that of the latter is three to five times larger. Further, the effect of currency crises appears to be mildly positive, though insignificant at this stage of the analysis.

In the second step the indirect effect of the crises on all variables possibly affected is estimated. The variables affected by definition are not considered in this respect. We find a negative influence of current account reversals and currency crises on investment, whereas their concurrent occurrence is insignificant. Similar results apply to estimation of the indirect effect on government consumption. However, in this case the magnitude of the estimated impact is roughly four times smaller for both crises. When estimating the inflation equation we find only the joint occurrence of currency crises to be significant increasing inflation in the affected country, by 65 percentage points.

Next the compounded effect of the crises was calculated. As expected, the highest and most damaging impact at about 5 percentage points comes from the concurrent emergence of currency crises and the reversals. Then comes the current account reversal with slightly more than 1 percentage point. On the other hand, the compounded impact of currency crises is

positive increasing output growth by 0.1 percentage points, a result rather insignificant from an economic point of view. Finally, based on the estimated unconditional convergence factors we calculate the time necessary for the full adjustment of the actual growth to its equilibrium level after a shock. The calculations suggest that the affected country needs roughly 2.5 and 6.5 years to recover from the recession resulting from the current account reversal, and joint occurrence of the currency crisis and the reversal, respectively. Further, an emerging market economy needs less than one year and a half to absorb a positive shock as a result of the currency crisis occurrence. Finally, the estimated cumulative losses for current account reversals and the joint crisis are 2 and 21 percentage points respectively. The cumulative positive effect of the currency crises is about 0.15 percentage points.

References

Aziz, J., Caramazza, F., Salgado, R., 2000. Currency Crises: In Search of Common Elements. IMF Working Paper WP/00/67.

Baltagi, B. H., 2002. Econometric Analysis of Panel Data. Wiley College, Second Edition, Chichester.

Barro, R. J., 2001. Economic Growth in East Asia before and after the Financial Crisis. NBER Working Papers Series 8330.

Berg, A., Pattillo, C., 1999. Predicting Currency Crises: The Indicators approach and an Alternative. Journal of International Money and Finance 18, 561-586.

Bordo, M., Eichengreen, B., Klingebiel, D., Soledad Martinez-Peria, M., 2001. Is the Crisis Problem Growing More Severe? Economic Policy 16(32), 53-82.

Calvo, A. G., 1998. Capital Flows and Capital-Market Crises: The simple economics of Sudden Stops. Journal of Applied Economics, 1(1), 35-54.

Calvo, A. G., Reinhart, C. M., 1999. When Capital Inflows Come to a Sudden Stop: Consequences and Policy Options. Mimeo, University of Maryland, (June).

Calvo, A. G., 2000. Balance-of-Payments Crises in Emerging Markets: Large Capital Inflows and Sovereign Governments, in: Krugman, Paul (ed.) Currency Crises, University of Chicago Press, Chicago, Illinois.

Dicks-Mireaux, L., Mecagni, M., Schadler, S., 2000. Evaluating the Effect of IMF Lending to Low-Income Countries. Journal of Development Economics 61, 495-525.

Doornik, J., Arellano, M., Bond, S., 2002. Panel Data Estimation Using DPD for Ox. DPD Package. www.nuff.ox.ac.uk/users/doornik.

Edison, H. J., 2000. Do Indicators of Financial Crises Work? An Evaluation of an Early Warning System. Board of Governors of the Federal Reserve System. International Finance Discussion Papers Series 675.

Edwards, S., 2001. Does the Current Account Matter? NBER Working Papers Series 8275.

Frankel, J.A., Rose, A. K., 1996. Currency Crashes in Emerging Markets: An Empirical Treatment. Journal of International Economics 41, 351-366.

Goldfajn, I., Valdés, R., 1997. Are currency crises predictable. IMF Working Paper 97/159.

Goldstein, M., Montiel, P.J., 1986. Evaluating Fund Stabilization Programs with Multicountry Data: Some Methodological Pitfalls, in: Staff Papers 33 International Monetary Fund, WA, pp. 304–344.

Gupta, P., Mishra, D., Sahay, R., 2000. Output Response During Currency Crises. IMF Manuscript May 2000.

Heckman, J., 1979. Sample Selection Bias as a Specification Error. Econometrica 1 (47), 153-162.

Hutchison, M. M., 2001. A Cure Worse than the Disease? Currency Crises and Output Costs of IMF-Supported Stabilization Programs. NBER Working Papers Series 8305.

Hutchison, M., Neuberger, I., 2001. Output Costs of Currency and Balance of Payments Crises in Emerging Markets. Mimeo, University of California, Santa Cruz. (September).

Hutchison, M., Neuberger, I., 2002a. How Bad Are Twins? Output Costs of Currency and Banking Crises. Mimeo, University of California, Santa Cruz. (July).

Hutchison, M., Neuberger, I., 2002b. The Cost of Sudden Stops: Capital Flow Reversals and Output Loss. Mimeo, University of California, Santa Cruz. (July).

Kaminski, G., Lizondo, S., Reinhart, C., 1998. Leading Indicators of Currency Crises. International Monetary Fund Staff Papers 45, 1-48.

Kaminski, G., Reinhart, C., 1999. Twin Crisis: The Causes of Banking and Balance of Payment Problems. American Economic Review 3 (89), 473-500.

Milesi-Ferretti, G., Razin, A., 1998. Sharp Reductions in Current Account Deficits: An Empirical Analysis. European Economic Review 42, 897-908.

Milesi-Ferretti, G., Razin, A., 1999. Current Account Reversals and Currency Crises: Empirical Regularities. Paper presented at NBER conference on Currency Crises, Cambridge, Mass 2/6/98.

Miyakoshi, T., 2000. The Causes of the Asian Currency Crises: Empirical Observations. Japan and the World Economy 12, 243-253.

Moreno, R., 1999. Depreciation and Recessions in East Asia. Federal Reserve Bank of San Francisco Economic Review 3, 27-40.

Park, Y.C., and Lee, J.W., 2001. Recovery and Sustainability in East Asia. Mimeo, Korea University, March.

Reisen, H., 1998. Domestic Causes of Currency Crises: Policy Lessons for Crises Avoidance. Technical Papers 136, OECD Development Centre.

Shankar, R., 2001. Growth Effects in a Stochastic Model of Currency Crisis. Job Market Paper, University of California at Santa Cruz.

Stock, J., Wright, J., Yogo, M., 2002. A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments. Journal of Business and Economic Statistic 4 (20), 518-529.

Appendix

Table A1 Identification of Current Account Reversals, Currency Crises and Their Joint Occurrence in Emerging Markets 1992-2001

Country	Obs.	REV	%	Obs.	CC	%	Obs	REV×CC	%
Argentina	9	0	0.0	10	0	0.0	9	0	0.0
Bahamas	4	0	0.0	10	0	0.0	4	0	0.0
Barbados	7	1	14.3	10	0	0.0	7	0	0.0
Bolivia	9	1	11.1	10	0	0.0	9	0	0.0
Brazil	9	0	0.0	10	3	30.0	9	0	0.0
Colombia	9	1	11.1	10	0	0.0	9	0	0.0
Costa Rica	9	1	11.1	10	0	0.0	9	0	0.0
Ecuador	8	2	25.0	10	3	30.0	8	1	12.5
Grenada	9	2	22.2	10	0	0.0	9	0	0.0
Guatemala	9	0	0.0	10	0	0.0	9	0	0.0
Haiti	6	1	16.7	10	0	0.0	6	0	0.0
Honduras	8	1	12.5	10	0	0.0	8	0	0.0
Chile	8	1	12.5	10	0	0.0	8	0	0.0
Mexico	9	1	11.1	10	1	10.0	9	1	11.1
Nicaragua	8	4	50.0	10	1	10.0	8	1	12.5
Panama	8	2	25.0	10	0	0.0	8	0	0.0
Paraguay	9	1	11.1	10	0	0.0	9	0	0.0
Peru	8	0	0.0	10	0	0.0	8	0	0.0
Surinam	6	1	16.7	10	3	30.0	6	1	16.7
Uruguay	8	0	0.0	10	0	0.0	8	0	0.0
Venezuela	8	4	50.0	10	2	20.0	8	1	12.5
Latin America	168	24	14.3	210	13	6.2	168	5	3.0

Continues…

Bangladesh	8	0	0.0	10	0	0.0	8	0	0.0
China, Hong Kong	4	1	25.0	10	0	0.0	4	0	0.0
China, Mainland	8	2	25.0	10	1	10.0	8	1	12.5
India	8	0	0.0	10	0	0.0	8	0	0.0
Indonesia	8	1	12.5	10	2	20.0	8	1	12.5
Korea	9	1	11.1	10	1	10.0	9	0	0.0
Laos	7	2	28.6	10	1	10.0	7	1	14.3
Malaysia	8	2	25.0	10	0	0.0	8	0	0.0
Nepal	8	1	12.5	10	0	0.0	8	0	0.0
Pakistan	8	1	12.5	10	0	0.0	8	0	0.0
Papua New Guinea	7	4	57.1	10	0	0.0	7	0	0.0
Philippines	9	2	22.2	10	0	0.0	9	0	0.0
Singapore	8	3	37.5	10	0	0.0	8	0	0.0
Sri Lanka	9	0	0.0	10	0	0.0	9	0	0.0
Thailand	9	2	22.2	10	0	0.0	9	0	0.0
Vietnam	8	1	12.5	10	0	0.0	8	0	0.0
East Asia	126	23	18.3	160	5	3.1	126	3	2.4

Continues…

Armenia	5	1	20.0	10	3	30.0	5	0	0.0
Belarus	1	0	0.0	10	1	10.0	1	0	0.0
Bulgaria	8	2	25.0	10	3	30.0	8	2	25.0
Croatia	7	3	42.9	10	1	10.0	7	0	0.0
Cyprus	8	2	25.0	10	0	0.0	8	0	0.0
Czech Republic	7	1	14.3	10	0	0.0	7	0	0.0
Estonia	9	2	22.2	10	0	0.0	9	0	0.0
Greece	6	0	0.0	10	0	0.0	6	0	0.0
Hungary	9	1	11.1	10	0	0.0	9	0	0.0
Ireland	6	0	0.0	10	0	0.0	6	0	0.0
Kazakhstan	9	2	22.2	10	2	20.0	9	1	11.1
Kyrgyz Republic	5	2	40.0	10	0	0.0	5	0	0.0
Latvia	9	1	11.1	10	0	0.0	9	0	0.0
Lithuania	7	1	14.3	10	0	0.0	7	0	0.0
Malta	9	2	22.2	10	0	0.0	9	0	0.0
Poland	8	1	12.5	10	0	0.0	8	0	0.0
Portugal	7	0	0.0	10	0	0.0	7	0	0.0
Romania	8	3	37.5	10	2	20.0	8	0	0.0
Slovak Republic	8	2	25.0	10	0	0.0	8	0	0.0
Slovenia	9	1	11.1	10	1	10.0	9	0	0.0
Turkey	8	1	12.5	10	2	20.0	8	1	12.5
Ukraine	6	1	16.7	10	2	20.0	6	0	0.0
CEE	159	29	18.2	220	17	7.7	159	4	2.5
Total	453	76	16.8	590	35	5.9	453	12	2.6