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Currency collapses and output dynamics: a long-run perspective[1]

Currency collapses, defined as large nominal depreciations or devaluations, are associated with permanent output losses on the order of 6% of GDP on average. In this feature, we argue that the fact that these losses tend to materialise before a drop in the value of the currency indicates that it is not the large depreciation as such that is costly but the factors leading to the currency collapse. Taken on its own, the drop in the exchange rate actually has a positive effect on output.

JEL classification: E32, F31, F41, F43.

Public authorities tend to resist sharp depreciations in their economy's exchange rate, presumably because they fear that they would be very costly in terms of foregone output.[2] This article presents new evidence on the relationship between currency collapses, defined as large nominal depreciations or devaluations, and real GDP. The analysis is based on nearly 50 years of data covering 108 emerging and developing economies.[3] We find that output growth slows several years before a currency collapse, resulting in sizeable permanent losses in the level of output. On average, real GDP is around 6% lower three years after the event than it would have been otherwise. However, these losses tend to materialise *before* the currency collapse. This means that the economic costs do not arise from the depreciation per se but

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[2]   The empirical macroeconomic literature has grappled with the question of how currency collapses affect output. Different transmission mechanisms can operate in opposite directions (eg expansionary expenditure switching effect versus contractionary balance sheet effects), so assessing the overall impact is mainly an empirical exercise. Unfortunately, existing research has failed so far to provide conclusive evidence. For a general survey, see Agénor and Montiel (1999, 2008) and Bussière et al (2010).

[3]   The period under analysis is 1960–2006 and relies on World Bank GDP and bilateral IMF nominal exchange rate data.

rather reflect other factors. Quite on the contrary, depreciation itself actually has a positive effect on output.

Defining currency collapses

We define currency collapses as episodes in which the annual change in the bilateral nominal exchange rate in any given month during the calendar year falls in the top quartile of all depreciation episodes in the sample. To ensure that the events are well identified, no other episode must occur within a three-year window before and after the depreciation.[4]

Using this definition, we identify a total of 79 episodes (Table 1). The threshold for a depreciation to qualify as a currency collapse is around 22%, which is in line with alternative definitions used in the literature. Currency collapses were most frequent during the 1980s and 1990s, and more common in Africa than in Asia or Latin America.[5] They also occurred under all types of

Currency collapses occur when the annual exchange rate drops by around 22%

Descriptive statistics of currency collapses		
		Number of episodes
Decade	1960s	6
	1970s	12
	1980s	24
	1990s	32
	2000s	5
Region	Africa	40
	Asia	21
	Latin America	12
	Other	6
Exchange rate regime[1]	Peg	33
	Crawling	14
	Managed float	15
	Flexible	1
	Freely falling	5
	Unclassified	2
[1] Due to sample coverage, fewer episodes are reported in this category.		
Source: Bussière et al (2010).		Table 1

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[4] Bussière et al (2010) also consider alternative definitions of currency collapses, including some that take into account the acceleration of the exchange rate change or the initial level. Results appear to be robust independently of the definition employed. However, they are somewhat sensitive to the persistence of the event over time.

[5] More episodes are identified in Asia than in Latin America because we are examining one-off drops in the exchange rate rather than persistent depreciations. See Bussière et al (2010) for the implications of such differentiation.

currency regimes,[6] except possibly floating exchange rate regimes, where there are simply too few observations to obtain meaningful estimates.

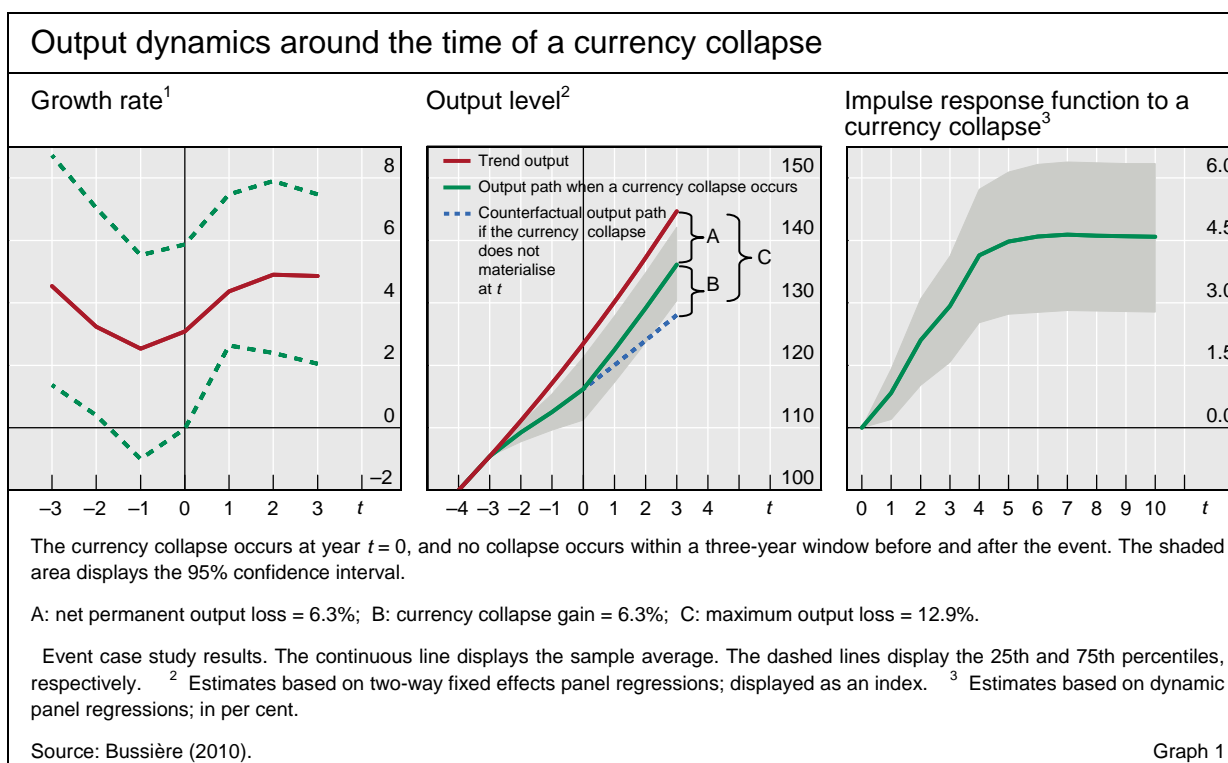## Output dynamics around the time of currency collapses

Output growth slows in the years prior to the collapse, picks up afterwards

We look at the relationship between currency collapses and output by first examining the dynamics of average output growth in the countries where a currency collapse occurred (ie event study) and then using econometric methods that take advantage of the full sample (see box).

Our results based on event analysis show that output growth on average tends to slow down in the years before the currency collapse (Graph 1, left-hand panel), although outright contractions are not that common. In fact, only 22 of the 79 episodes in the sample were preceded by a drop in GDP.[7] Growth tends to pick up in the year of the collapse and accelerate afterwards. Growth rates a year to three years after the episode are on average well above those one or two years prior to the event.

Currency collapses are associated with permanent losses in the level of output …

Econometric estimates confirm the results of the event study (see box). They also show that the higher growth rates after the currency collapse are not sufficient to compensate for the losses in output (relative to trend) incurred before the event. The centre panel of Graph 1 shows that actual output (green line) begins to deviate from trend (red line) three years before the collapse, the distance between the two representing the net output costs. Three years

Output dynamics around the time of a currency collapse

Growth rate[1]

Output level[2]

Impulse response function to a currency collapse[3]

Legend (centre panel):
- Trend output
- Output path when a currency collapse occurs
- Counterfactual output path if the currency collapse does not materialise at t

The currency collapse occurs at year $t = 0$, and no collapse occurs within a three-year window before and after the event. The shaded area displays the 95% confidence interval.

A: net permanent output loss = 6.3%; B: currency collapse gain = 6.3%; C: maximum output loss = 12.9%.

[1] Event case study results. The continuous line displays the sample average. The dashed lines display the 25th and 75th percentiles, respectively. [2] Estimates based on two-way fixed effects panel regressions; displayed as an index. [3] Estimates based on dynamic panel regressions; in per cent.

Source: Bussière (2010).   Graph 1

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[6]   We follow the classification by Reinhart and Rogoff (2004). An update is available at terpconnect.umd.edu/~creinhar/Papers.html.

[7]   The median GDP decline in such cases was 2.8%.

Econometric methodology

The results we report in the article are derived from two econometric exercises.[1] The first examines the impact of currency collapses on output growth rates using two-way fixed effects panel regressions (see Forbes (2002)). The benchmark equation that we estimate is:

$$g_{i,t} = \sum_{j=-3}^{3} \beta_j D_{i,t-j} + \delta_1 Infla_{i,t} + v_i + \omega_t + \varepsilon_{i,t}$$

where $g_{i,t}$ is real GDP growth rate in country i in year t, $Infla_{i,t}$ is the inflation rate[2] and $D_{i,t-j}$ is a dummy variable that is equal to one if country i had a currency collapse in period $t = 0$. v_i is an idiosyncratic time-constant but cross-sectional varying component, ω_t is the time-varying but cross-sectional constant factor, and $\varepsilon_{i,t}$ is the error term. To avoid selection bias we use the full country sample. This allows us to compare the performance of countries affected by a currency collapse with that of countries that are not. We then use the econometric results to evaluate the impact on output levels. We set the level of output at t–4 to 100 and then project it forward using the statistically significant parameter estimates, which we can compare to the path of output in the absence of a currency collapse.

The drawback of this approach is that it may suffer from endogeneity problems. To deal with this, we estimate a forecasting equation in which the currency collapse can only have a lagged effect on output. This means that we do not capture the costs incurred before the depreciation, but we can isolate the impact of the change in the exchange rate itself. Specifically, we estimate a univariate autoregressive model in output growth rates using panel data with fixed effects (see Cerra and Saxena (2008) and Romer and Romer (1989)). We report the results using the group averages of impulse responses of output to the currency shock. The specific model that is estimated is given by:

$$g_{i,t} = \alpha_i + \sum_{j=1}^{4} \gamma_j g_{i,t-j} + \sum_{s=1}^{4} \delta_s D_{i,t-s} + \varepsilon_{i,t}$$

The impulse response function (IRF) of this forecasting equation provides a ceteris paribus estimate of the total effect of a large currency collapse over time. It thus provides a natural way to summarise the output response to currency collapses as it traces the effect of a unit shock to the currency collapse variable D, including the feedback effect through lagged output. IRFs are calculated relative to the estimated trend output and cumulated over time to reflect movements in levels.

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[1] See Bussière et al (2010) for further details.   [2] Controlling for inflation is important for at least two reasons: first, to take into account the possible impact of prices changes on output growth, and second, to ensure that results are not driven by hyperinflationary episodes.

Output dynamics following a currency collapse[1]

	Coefficient	Standard error
Collapse t+3	–0.46	0.73
Collapse t+2	–1.77**	0.73
Collapse t+1	–2.44***	0.63
Collapse t	–2.12**	0.92
Collapse t–1	0.43	0.59
Collapse t–2	0.39	0.69
Collapse t–3	0.37	1.26
Inflation	–0.00**	0.00
Constant	5.42***	0.67

[1] The currency collapse occurs at $t = 0$. Based on 3,138 observations from 97 countries. Two-way panel fixed effects. Robust standard errors in brackets. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Source: Bussière et al (2010).   Table A

after the collapse, these costs are estimated to be around 6% of GDP.[8] The estimates also show what would have happened if the currency for some reason had not collapsed. In this case, output would have continued on the low-growth trajectory (blue line), and the output cost would have increased even further.

Dynamic panel data estimates confirm that currency collapses in the absence of other events, ie ceteris paribus, induce a positive adjustment in the level of output. In particular, these estimates indicate that such output gains exceed 4% and fully materialise within five years after the shock (Graph 1, left-hand panel). This is qualitatively and quantitatively similar to the results reported above suggesting that output picks up after a currency collapse.[9] Interestingly, this is also consistent with dynamic stochastic general equilibrium models that have examined the role of devaluations on output while carefully controlling for the transmission mechanisms involved and the source of the shock triggering the currency collapse (eg Tovar (2005, 2006)). In this literature, contractionary transmission mechanisms such as balance sheet effects, which arise when firms' debts are denominated in dollars and revenues are denominated in local currency, are outweighed by expansionary expenditure-switching effects – ie domestically produced goods become cheaper in relative terms than foreign produced goods. As a result, following a devaluation output ends up expanding.

The evidence reported so far summarises the average behaviour of output around the time of currency collapses. We now complement this statistical analysis by looking at three particular episodes: Mexico in 1994–95, Korea in 1980 and Korea in 1997. The domestic currency depreciated by 89% in the case of Mexico, and by 25% and 51% in the case of Korea in 1980 and 1998, respectively. The evolution of output around these three currency collapses matches the average pattern surprisingly well (Graph 2, left-hand panel). In particular, output losses materialised prior to the currency collapse, and the episodes were associated with permanent output losses relative to trend in the medium run.
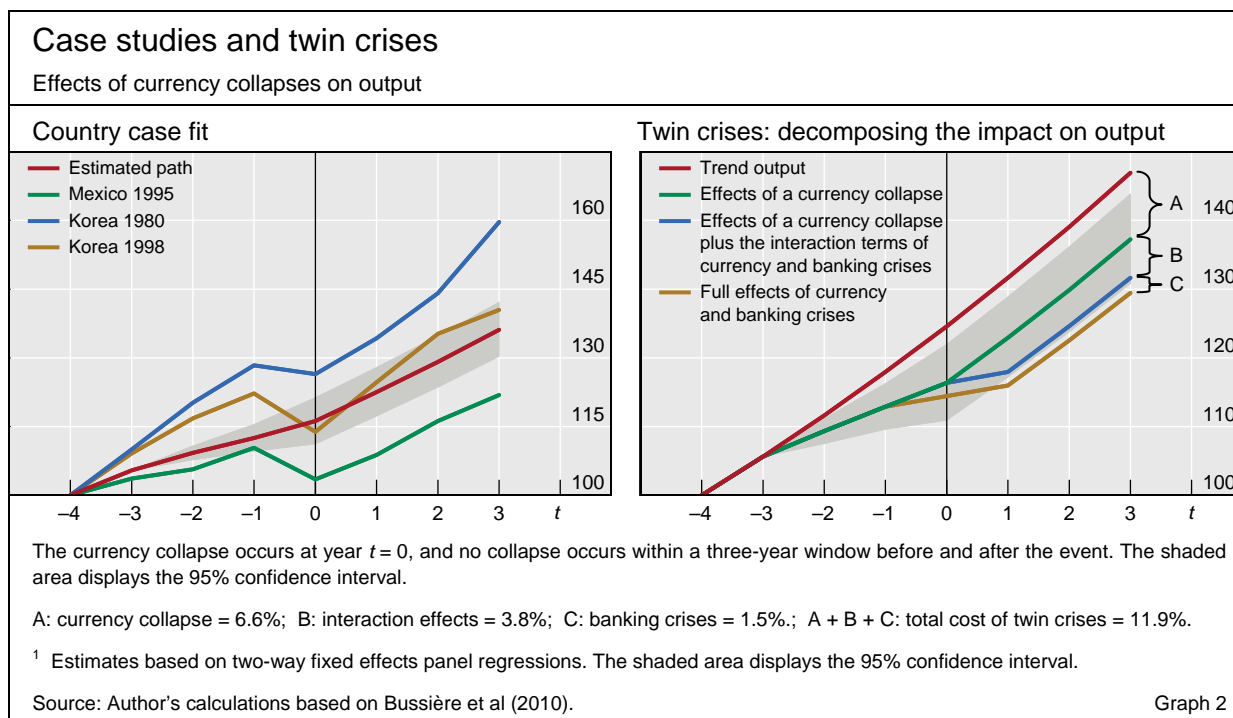
We also examine the robustness of our results to banking crises. The costs of a currency collapse are magnified if it coincides with a banking crisis.[10] On average, GDP after twin crises (brown line in the right-hand panel of Graph 2) drops 11.9% below trend (red line) three years after the second event. This is almost double the output loss associated with a currency

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[8] The confidence interval around the point estimate can be affected by the window size around the currency collapse; it therefore may be relevant to check the sensitivity of results to alternative window sizes. See Bussière et al (2010) for a discussion.

[9] The dynamic panel estimates only fit the dynamics from $t = 0$ onwards and do not allow us to examine the dynamics of output prior to the event as in the previous methodology, which incorporates both leads and lags.

[10] The data employed for banking crisis episodes are from Laeven and Valencia (2008), available at www.luclaeven.com/Data.htm. See Cecchetti et al (2009) for a recent literature review.

Effects of currency collapses on output

Country case fit	Twin crises: decomposing the impact on output
Estimated path Mexico 1995 Korea 1980 Korea 1998	Trend output Effects of a currency collapse Effects of a currency collapse plus the interaction terms of currency and banking crises Full effects of currency and banking crises

The currency collapse occurs at year $t = 0$, and no collapse occurs within a three-year window before and after the event. The shaded area displays the 95% confidence interval.

A: currency collapse = 6.6%; B: interaction effects = 3.8%; C: banking crises = 1.5%.; A + B + C: total cost of twin crises = 11.9%.

[1] Estimates based on two-way fixed effects panel regressions. The shaded area displays the 95% confidence interval.

Source: Author's calculations based on Bussière et al (2010).   Graph 2

collapse alone (green line). The estimates for the costs of twin crises are in line with those reported in the recent literature. For instance, IMF (2009) estimates that twin crises induce output losses of a magnitude of 10% over a similar horizon. The results also confirm that losses due to currency crises materialise prior to the event, while those associated with banking crises tend to materialise afterwards. Therefore, it appears that the isolated effects of currency collapses identified earlier are robust.

Concluding remarks

Currency collapses are associated with permanent output losses of a magnitude of 6% of GDP on average. Such costs, however, tend to materialise *before* the currency collapse itself, which has a positive effect on output. This suggests that it may not be the currency collapse that reduces output, but rather the factors that led to the depreciation.

Before drawing policy conclusions we should emphasise that these results are subject to a number of caveats. Our estimations are based on the evolution of output and the exchange rate, but ignore many other factors that determine the welfare costs of a currency collapse. Most importantly, the analysis does not address the reasons why currency collapses occur in the first place. A vast theoretical and empirical literature examines the factors and shocks behind currency collapses.[11] Our analysis also has little to say about the mechanisms involved after the currency collapse takes place. While we cannot disentangle the various factors, our results do suggest that expansionary mechanisms tend to dominate. That said, even if currency collapses can have a positive

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[11] See Bussière et al (2010) for references.

correcting effect on output, they may also have undesirable side effects; for instance, inflation may increase or the financial system may become unstable.

From a policy perspective, our analysis raises several additional questions. For instance, why does output remain below trend for so long? And what can policies do to close the output gap faster? Unfortunately, we do not have a straightforward or general answer to these.

In summary, to gain a full understanding of the implications of currency collapses on economic activity it is important to carefully examine the full circle of events surrounding the episode, ie before and after the event. In this sense, the patterns identified here are an invitation to marry the literature explaining the factors that preceded and triggered the currency collapse with that examining economies' adjustment before and after these episodes.

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