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Currency devaluation and stock market response: An empirical analysis

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A B S T R A C T

We study local stock market reaction to currency devaluation by a country's central bank. Devaluations appear to be anticipated by the local stock markets, and there are significant negative abnormal returns even one year prior to the announcement of the devaluation. A negative trend in stock returns persists for up to one quarter following the first announcement, and then becomes positive thereafter, suggesting a reversal. We explore whether changes in macroeconomic variables prior to currency devaluations are related to abnormal stock returns. We find that stock returns are significantly lower if the devaluation is larger and if the country is a developing nation. Furthermore, stock markets decline more around devaluations if reserves are lower, if the real exchange rate has depreciated over the prior years, if the capital account has declined, if the current account deficit has gone up, or if the country credit rating has deteriorated.

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1. Introduction

Equilibrium models of international asset pricing (e.g., Adler and Dumas, 1983) suggest that deviations from purchasing power parity translate into currency risk for equity returns in global markets. For countries that follow a floating exchange rate system, this currency risk may be measured as the coefficient of the regression of the stock returns on the currency returns (Adler and Dumas, 1984; Jorion, 1990). However, for many countries that follow a fixed or managed floating exchange rate system, currency prices remain constant or in a very narrow band until the central bank announces a devaluation. Models of international asset pricing (e.g., Stulz, 1981; Adler and Dumas, 1984) predict that such devaluations will have a significant impact on asset prices, and to the extent that the real cash flows of the firms in these countries are affected by the devaluations, the security prices will also change. We empirically examine the impact of devaluation announcements on stock markets to see how these international asset pricing models, as well as models of devaluations, fit the data.

We have two objectives in this paper. First, we examine the reaction of stock markets around currency devaluations using daily returns and an event study framework. This analysis helps explain how international equity markets respond to such events. We use a sample of 125 devaluation events from 41 countries from 1979 to 2011. To ensure that the returns we observe around devaluations are not driven by normal market fluctuations, we estimate abnormal returns.

We find a significant equity market decline prior to and immediately after the announcement of a devaluation. On average the U.S. dollar value of the equity market drops by 3.76 percent 30 days before the devaluation was announced, and by 3.10 percent one day after the announcement is made. While abnormal returns on average continue to be negative for up to 30 trading days after the first announcement, they become positive thereafter, perhaps because of remedial efforts by central banks and international agencies.

Our second objective is to examine what economic variables explain the direction and magnitude of the stock market reaction around currency devaluations, motivated by the prior literature (e.g., Krugman, 1998; Kaminsky and Reinhart, 1999; Obstfeld, 1994; Corsetti et al., 1999). We use a number of macroeconomic variables to examine if they can explain the size of the stock market's decline upon the announcement of the devaluation. Our choice of variables is largely guided by Frankel and Rose (1996), who consider which macroeconomic variables are capable of predicting that a devaluation will occur.

Using windows around the devaluation announcements, we find that the amount of the devaluation and whether a country is a developing nation significantly impact the stock market's returns. However, other macroeconomic factors also help explain equity markets' reactions to a devaluation. Specifically, stock markets decline more around a devaluation if reserves are lower, if the real exchange rate has depreciated over the prior year, if the capital account has declined, if the current account deficit has gone up, or if the country credit rating has deteriorated. These findings have useful implications for central bankers as well as for international investors. Recently, there has been increased investment in what are termed 'frontier' markets, many of whom have fixed or pegged exchange rates. Our findings have implications for equity markets in these countries if the central bank announces a devaluation.

In related literature, Wilson et al. (2000) study the stock market reaction around the 1994 Mexican peso devaluation. Their findings suggest that investors did not anticipate the devaluation of the peso, and that the decline in the stock market was much more significant in dollar terms than in peso terms. Glen (2002) studies the stock market response to currency devaluation for a sample of 24 emerging markets using monthly returns and finds significant negative returns in the months before, but not after, the devaluation. A related literature studies the impact of devaluations on the real economy. For instance, Kim and Ying (2007) find that devaluations are expansionary in East Asian countries but not in Mexico or Chile. As stock markets forecast real economic activity, our study can also provide insight into how outputs react to devaluations across different countries.

Section 2 discusses our data and events. The empirical methodology is explained in Section 3. Section 4 provides an overview of the abnormal returns for equity markets around a currency devaluation. Section 5 presents a regression analysis of abnormal returns during currency devaluations using a number of macroeconomic variables primarily drawn from the existing literature, and Section 6 concludes.

2. Data and events

In efficient markets, prices react to new information as soon as the information is released. Therefore, to examine the effect of currency devaluations on country market index returns, we collect the earliest announcement dates of these devaluations from *Lexis-Nexis* and *Factiva*. We search this database from 1979 to 2011 for all announcements of currency devaluations by countries for which we have stock market data, and record the date and magnitude of the devaluation as well as if the country switched from a fixed exchange rate system to a floating exchange rate system.[3] This data collection gives us a sample of 125 announcements of currency devaluations for 41 countries, although only for 106 of these announcements do we have sufficient data for our event study analysis when returns are expressed in U.S. dollar terms. When the returns are expressed in local currency terms, there are 97 events for which we have sufficient data for our analysis. Out of these 106 observations, 86 are from developing countries. Appendix A reports the complete list of event dates and countries.[4]

We use the daily returns on the Morgan Stanley Capital International (MSCI) country indices denominated both in U.S. dollars and in local currencies for our event study analysis. These are value-weighted indices and MSCI targets an 85 percent market capitalization in the construction of these indices. We begin our sample in December 31, 1979 since that is the earliest date when the MSCI country index series are available on a daily basis. The world market index used is the MSCI world market index in U.S. dollar terms.

We obtain macroeconomic data from IMF's *International Financial Statistics*. Guided by prior research (Krugman, 1979; Flood and Garber, 1984; Obstfeld, 1994; Kaminsky and Reinhart, 1999; Patro et al., 2002), the variables we collect include Reserves, GDP, Real Exchange Rate, Price Index, Capital Account, and Current Account. The exchange rate is defined as the foreign currency price per U.S. dollar so that an increase indicates a depreciation of the foreign currency relative to the dollar. We transform these variables to induce stationarity by taking growth rates or ratios to GDP. Further, we also collect data on the country credit ratings as reported in the March and September issues of *Institutional Investor*.

3. Methodology

We use the traditional market model to estimate abnormal returns. However, since we are using country stock market index returns, the market is the return on the world market index. The return on the world market portfolio has been identified as the most important source of variations in international equity index returns (e.g., Ferson and Harvey, 1993). To estimate risk-adjusted abnormal returns, returns on the MSCI country indices are regressed on the returns of the MSCI world market index for a 255 trading days period before the event from $t = -510$ to $t = -256$, where the day of the announcement is $t = 0$.[5] The market model is estimated as follows:

[3] An example of such an announcement is, "The devaluation of the Belgian franc decided after Sunday's finance ministerial wrangling the Brussels marks a watershed not just for Belgium but for the whole of Europe. The 8.5 percent devaluation against other members of the European Monetary System – announced along with a 3 percent lowering of the Danish Krone – is Belgium's first formal devaluation since 1949." (Financial Times, February 23, 1982). Similarly, "Russia devalues ruble after months of turmoil-After weeks of financial turmoil, Russia sharply devalued the ruble today – a move that is expected to cause hardship for Russian consumers. The Central Bank said it would permit the value of the ruble to fall about 34 percent – from about 6.3 to the dollar to 9.5 to the dollar. The price for dollars on the street immediately jumped as high as 9.5 rubles." (Financial Times, August 17, 1998).

[4] We also perform our event studies by dropping subsequent devaluations for the same country when they occur in less than a year. Since the results are similar, we report the results with the full sample.

[5] We skip a relatively long time period before the devaluation because there may be leakage of information, and the markets may be declining in anticipation of the event. When we read through the related news announcements, we sometimes find significant discussion of a possible devaluation months before the event. We examine a window relatively far from the devaluation event in order to avoid bias, although this may add some noise to the estimated betas. Our results are robust to alternative estimation windows in terms of trend though the magnitudes differ when we use estimation windows closer to the events.

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

where, $R_{i,t}$ is the daily return on a country's MSCI equity index and $R_{m,t}$ is the return on the MSCI world market index.[6] Using the parameters estimated from the market model, $(\widehat{\alpha}_i, \widehat{\beta}_i)$, the abnormal returns for each day during the observation period are calculated as follows:

$$\mathrm{AR}_{i,t} = \left(R_{i,t} - \widehat{\alpha}_i - \widehat{\beta}_i R_{m,t}\right) \quad (2)$$

These abnormal returns are averaged for each event day across countries (where $t = 0$ is the announcement day). Next, the *Cumulative Abnormal Returns* (CARs) are computed by summing the average abnormal returns for the window of interest.

These CARs are then tested to see if they are statistically significantly different from zero. The *t*-statistic for the hypothesis that CAR is zero is computed in several ways. First, the standard Patell (1976) test is used. This test is also referred to as the standardized abnormal returns test and is based on assuming cross-sectional independence. The test statistic follows a standard normal distribution and is reported as the '*Z-stat*' when we report our event study results.

Brown and Warner (1980) argue that if the securities in the sample experience the event during the same calendar month, there is a 'clustering' of events which can distort the size of the tests, resulting in too frequent rejection of the null hypothesis. Therefore, they propose a 'crude dependence adjustment' to account for this cross-sectional dependency. Unlike the Patell (1976) test which is based on the standardized abnormal returns and allow for unequal variances across securities when computing the standardized abnormal returns, the Brown and Warner (1980) test uses the standard deviation of average abnormal returns for calculating the *t*-statistic for testing hypothesis about the CAR. We report this statistic as the '*t-stat*' in our tables. Additionally, we compute the 'generalized *Z-stat*', which is a test of the hypothesis that the fraction of positive returns is the same during the event window and the estimation period. This non-parametric test complements our above two parametric tests and provides a robustness check for the significance of our test results.

In order to further verify our results, we also estimate mean-adjusted abnormal returns. The methodology used is as follows. Let $R_{i,t}$ be country *i*'s index return at time *t*, and let $\overline{R}_i$ be the time-series mean return for the estimation period. For the mean-adjusted returns technique, the abnormal returns, $\mathrm{AR}_{i,t}$, are calculated as $\mathrm{AR}_{i,t} = R_{i,t} - \overline{R}_i$. The procedures used to test the significance of the mean-adjusted CARs are the same as those for the market adjusted CARs. We use a one factor model since for most of the sample, the countries we examine have fixed or pegged exchange rates. However, for some of the sample, the exchange rates may vary slightly under a pegged regime or there may be other factors affecting the country equity returns. Using mean-adjusted returns partially addresses this issue and also provides a robustness check for our results using market adjusted abnormal returns.

4. Abnormal returns around devaluations

Our first objective in this paper is to examine how financial markets, in particular equity markets, respond to announcements of devaluations by central banks. By examining the announcement effects before the event, we are able to study if markets anticipate devaluations. Our second objective is to explain the abnormal returns around devaluations using a country's macroeconomic variables.

As discussed in the previous section, we estimate abnormal returns for country equity index returns using both the market model and the mean-adjusted returns model. Our estimation period is from $t = -510$ to $t = -256$, where the day of the announcement is $t = 0$. We use the estimated parameters for this period to compute our abnormal returns for various windows of interest. The abnormal returns are summed over these windows and tested if they are significantly different from zero.

[6] Note that the world market index is an index of developed countries'; however, using the all country index, which includes both developed and emerging market indices, gives us similar results since the capitalization weighted indices are dominated by the developed markets. Of course since the countries we examine did not have a floating exchange rate system, we cannot include a currency risk factor.

The empirical results for the cumulative abnormal returns (CARs) for country equity indices around currency devaluations are presented in Table 1. The CARs in dollar terms are based on 106 devaluation events from 41 countries (Panels A–C), while those expressed in local currency terms are based on 97 devaluation events from 38 countries (Panel D). In Panel A, we report the results from the CARs in dollar terms computed using the market model and in Panel B we report the mean-adjusted CARs. Panel C reports the raw returns for ease of comparison. Panel D displays the market model-adjusted CARs in local currency terms. We report the CARs for windows before, during, and after devaluations.

The findings show that there are significant negative abnormal returns in dollar terms around currency devaluations. Since the results from the market model and the mean-adjusted model are similar, our discussion is focused on the market model results reported in Panel A. The announcement CARs for days (−1,0) is −2.36 percent, which is significant at all conventional levels with a Brown and Warner (1980) *t*-stat of −9.036. In fact, the day (−1,0) CARs are significantly negative at the 1 percent level using all three statistical tests (Patell, 1976; Brown and Warner, 1980; and the non-parametric sign test). Similarly, the CARs for days (−1,+1), −3.10 percent, are significantly different from zero at the 1 percent level using all three tests as well. These results indicate that stock markets on average react negatively to currency devaluations. However, the CARs for (−1,0) have a standard deviation of 7.21 percent and range from −42.85 percent for the February 2001 devaluation of the Turkish lira to 9.24 percent for the August 1998 devaluation of the Russian ruble. Therefore, the stock market reaction varies greatly across countries and in the next section we use numerous macroeconomic variables across countries and over time to explore potential determinants of this variation.

Also interesting is that CARs are significantly negative for many days before the announcement, suggesting that currency devaluations are often undertaken when the stock markets are declining. For example, the CAR for (−90, −1) is −10.13 percent. Alternatively, it may be that stock markets often anticipate a devaluation and the negative CARs before the announcement reflect that expectation. Again, this result varies considerably across countries. While Mexico had a −26.30 percent CAR for (−90, −1) during the December 1994 peso devaluation, Italy had a 26.98 percent CAR for the same window during the August 1985 lira devaluation. We explore what explains the stock market returns for the longer window around devaluation in the next section.

Panel D reports the market model-adjusted CARs when returns are expressed in local currency terms. As can be seen, most CARs are positive. Indeed, a devaluation of the local currency will in general lead to positive abnormal stock returns when returns are expressed in local currencies. This can be understood as follows. Suppose that the local currency (say the Argentine peso) is devalued by 10% against the U.S. dollar. Assume that the value of an Argentine firm in real terms (as can be approximately measured by the dollar) does not change. Then this firm's return will increase by 10% if it is measured in peso terms, and will not change if it is measured in dollar terms. On the other hand, if the real value of the firm decreases (assume by 6%) following the peso devaluation, then its return will decrease if it is measured in dollar terms. If the return is measured in peso terms, the firm's return may still increase by 4%. In the extreme case, if the real value of the firm decreases by more than 10% (say by 12%), then the return in peso terms will decrease as well (by 2% in this case).

The results for the average CARs in dollar terms are presented graphically in Fig. 1. The patterns of the CARs confirm the negative impact of devaluations on country index returns and the negative abnormal returns before the devaluation. Our average −3.10 percent CAR for days (−1,+1) is comparable with the −2.87 percent return reported by Wilson et al. (2000) for the Mexican currency crisis. The CARs also indicate that the decline during the devaluation announcement eventually reverses around one quarter after the event. For example, the CAR for (+1, +90) is 3.23 percent, and that for (+255, +510) is 8.68 percent. This reversal may reflect an improvement in the country's export sector following the devaluations. For developing countries, this may also reflect remedial efforts by central banks and international institutions. In contrast, Wilson et al. (2000) find that the Mexican stock market did not anticipate the devaluation and the stock returns during the pre-devaluation window are, although negative, not significant. Wilson et al.'s (2000) results are based on the single event of the 1994 Mexican peso crisis and they study the impact of the peso devaluation on Mexico's stock market returns. Our findings are obtained from analysis of a richer data set covering a broad cross section of 41 countries with 106 events over a 30-year period, and are therefore more powerful. Our finding of a negative impact of devaluations during and before announcements is consistent with the findings in

Table 1
Cumulative abnormal returns (CARs) around currency devaluations.

Days	*N*	CAR (in percent)	Positive:negative	*Z*-stat	*t*-stat	Generalized sign *Z*-stat
Panel A: market model-adjusted CARs, in dollar terms						
(−255,−1)	106	−17.29	37:69	−7.113***	−5.873***	−2.970***
(−90,−1)	106	−10.13	44:62	−6.602***	−5.791***	−1.610
(−30,−1)	106	−3.76	51:55	−3.460***	−3.722***	−0.250
(−30,+30)	106	−8.57	44:62	−6.489***	−5.950***	−1.610
(−30,+90)	106	−2.36	59:47	−2.063**	−1.161	1.304
(−30,+255)	106	−3.59	58:48	−2.321**	−1.152	1.110
(−1,0)	106	−2.36	35:71	−9.625***	−9.036***	−3.359***
(−1,+1)	106	−3.10	37:69	−9.163***	−9.693***	−2.970***
(−1,+30)	106	−5.34	40:66	−6.219***	−5.123***	−2.387**
(−1,+90)	106	0.87	58:48	−0.748	0.492	1.110
(−1,+255)	106	−0.37	58:48	−1.472	−0.124	1.110
(+1,+30)	106	−2.99	44:62	−3.938***	−2.958**	−1.610
(+1,+90)	106	3.23	64:42	0.681	1.844*	2.275**
(+1,+255)	106	1.99	57:49	−0.613	0.676	0.915
(−255,+255)	106	−17.13	45:61	−5.943***	−4.108***	−1.416
(+255,+510)	103	8.68	57:46	4.460***	2.942***	1.220
Panel B: mean-adjusted CARs, in dollar terms						
(−255,−1)	106	−22.20	40:66	−9.047***	−6.715***	−2.417**
(−90,−1)	106	−12.86	45:61	−8.453***	−6.550***	−1.445
(−30,−1)	106	−3.62	51:55	−3.235***	−3.189***	−0.280
(−30,+30)	106	−8.91	48:58	−6.634***	−5.509***	−0.863
(−30,+90)	106	−0.81	59:47	−1.063	−0.358	1.274
(−30,+255)	106	1.43	61:45	−0.146	0.408	1.663*
(−1,0)	106	−2.36	34:72	−9.482***	−8.063***	−3.582***
(−1,+1)	106	−3.09	37:69	−8.928***	−8.610***	−3.000***
(−1,+30)	106	−5.80	39:67	−6.588***	−4.952***	−2.611***
(−1,+90)	106	2.29	64:42	0.300	1.155	2.246**
(−1,+255)	106	4.54	61:45	0.766	1.367	1.663*
(+1,+30)	106	−3.44	47:59	−4.356***	−3.033***	−1.057
(+1,+90)	106	4.65	66:40	1.719*	2.370**	2.634***
(+1,+255)	106	6.90	60:46	1.621	2.087**	1.469
(−255,+255)	106	−17.15	46:60	−5.755***	−3.665***	−1.251
(+255,+510)	103	10.04	59:44	5.106***	3.030***	1.585
Panel C: raw returns, in dollar terms						
(−255,−1)	106	−7.00	44:62	−4.150***	−2.112**	−1.534
(−90,−1)	106	−7.50	50:56	−5.544***	−3.807***	−0.369
(−30,−1)	106	−1.83	52:54	−1.555	−1.607	0.020
(−30,+30)	106	−5.27	47:59	−4.239***	−3.251***	−0.952
(−30,+90)	106	6.35	61:45	2.296**	2.778***	1.769*
(−30,+255)	106	17.60	66:40	4.890***	5.013***	2.740***
(−1,0)	106	−2.24	35:71	−9.048***	−7.633***	−3.283***
(−1,+1)	106	−2.91	37:69	−8.396***	−8.087***	−2.895***
(−1,+30)	106	−3.89	46:60	−4.853***	−3.314***	−1.146
(−1,+90)	106	7.72	70:36	3.225***	3.879***	3.517***
(−1,+255)	106	18.98	71:35	5.524***	5.703***	3.712***
(+1,+30)	106	−1.65	51:55	−2.676***	−1.452	−0.174
(+1,+90)	106	9.97	73:33	4.611***	5.059***	4.100***
(+1,+255)	106	21.22	72:34	6.358***	6.401***	3.906***
(−255,+255)	106	12.43	52:54	1.066	2.648***	0.020
(+255,+510)	103	25.21	84:19	10.076***	7.588***	6.617***
Panel D: market model-adjusted CARs, in local currency terms						
(−255,−1)	97	−8.89	34:63	−6.098***	−2.925***	−2.682***
(−90,−1)	97	−11.43	34:63	−6.879***	−6.335***	−2.682***
(−30,−1)	97	−2.22	44:53	−2.115**	−2.133**	−0.651
(−30,+30)	97	7.70	51:46	3.082***	5.182***	0.771
(−30,+90)	97	21.92	60:37	6.582***	10.476***	2.599***
(−30,+255)	97	18.97	55:42	2.568**	5.895***	1.584
(−1,0)	97	0.37	47:50	3.576***	1.384	−0.042
(−1,+1)	97	0.90	50:47	4.622***	2.726***	0.568
(−1,+30)	97	9.72	57:40	6.176***	9.031***	1.990**

Table 1 (*continued*)

Days	*N*	CAR (in percent)	Positive:negative	*Z*-stat	*t*-stat	Generalized sign *Z*-stat
(−1,+90)	97	23.94	59:38	8.687***	13.121***	2.396**
(−1,+255)	97	20.99	58:39	3.394***	6.881***	2.193**
(+1,+30)	97	9.35	52:45	5.455***	8.970***	0.974
(+1,+90)	97	23.57	63:34	8.249***	13.059***	3.209***
(+1,+255)	97	20.61	57:40	3.088***	6.785***	1.990**
(−255,+255)	97	12.30	48:49	−1.894*	2.861***	0.162
(+255,+510)	96	−3.80	50:46	1.319	−1.247	0.670

This table reports the cumulative abnormal returns (CARs) for various event windows and their associated test statistics. The "*Z-stat*" is the standard Patell (1976) test statistic, the "*t-stat*" is the time series standard deviation test as in Brown and Warner (1980), and the "*generalized sign Z-stat*" is a nonparametric test of the hypothesis that the fraction of positive returns is the same during the event window and the estimation period. All three test statistics asymptotically follow the standard normal distribution whose 10, 5, and 1 percent critical values are, respectively, 1.64, 1.96, and 2.58, using a 2-tail test. The symbols *, **, and *** denote statistical significance at the 10, 5, and 1 percent levels, respectively, using a 2-tail test.

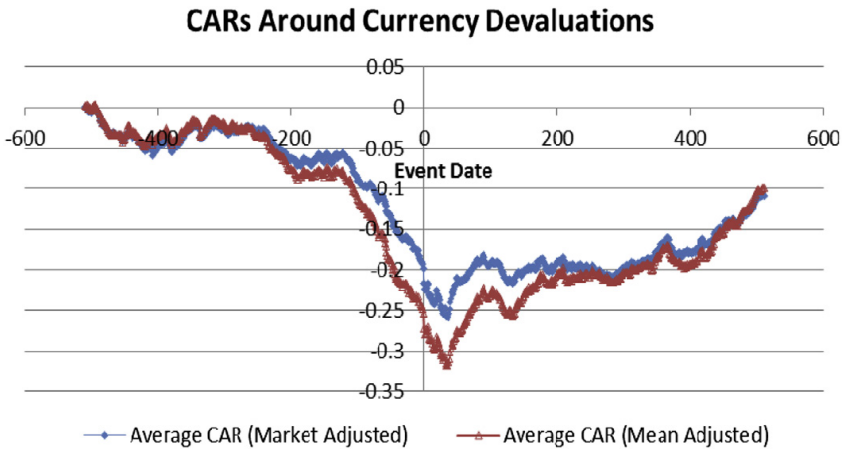

Fig. 1. Cumulative abnormal returns (CARs) around currency devaluations.

Glen (2002), although we have a larger data set consisting of both developed and developing countries, and our analysis is based on abnormal daily returns instead of raw monthly returns. Our use of daily returns also helps us avoid biases due to confounding events.[7]

As mentioned earlier, the market reactions to announcements of devaluations vary across countries. In the next section, we examine which macroeconomic variables explain the cross-sectional variations in CARs across countries.

5. Devaluations and macroeconomic variables

Economic theory suggests that a devaluation is typically associated with growth in exports, a decline in imports, and a depreciation in the real exchange rate (see, for instance, Kaminsky and Reinhart, 1999; Kaminsky, 2006). Table 2 Panel A reports summary statistics of the key macroeconomic variables that we use to explain the impacts of currency devaluation on equity market response. These variables include:

Devaluation Amt. – the amount of the devaluation of the foreign currency;
Float – a dummy variable equal to 1 if the devaluation announcement was accompanied by an announcement that the currency would move to a floating rate regime;

[7] Glen (2002) also does not find the positive returns following devaluations in his smaller sample. Glen's study does not differentiate between developing and developed markets, and it does not consider how the impact of devaluations on stock markets varies with macroeconomic variables.

Table 2
Summary statistics and cross-correlations of CARs and explanatory variables.

Panel A: summary statistics of variables

Variable	Mean	Standard deviation	Number of observations
$CAR (−1,+1)	−0.031	0.079	106
$CAR (−30,+30)	−0.086	0.284	106
Local CAR (−1,+1)	0.009	0.065	97
Local CAR (−30,+30)	0.077	0.705	97
Devaluation Amt.	0.076	0.088	106
Float	0.113	0.318	106
Widen	0.047	0.213	106
Developing	0.547	0.500	106
Reserve growth$_{t-5,t-1}$	0.408	0.560	102
Reserves$_{t-1}$/GDP$_{t-1}$	0.520	0.645	76
Ln (Real Exch. Growth)	0.464	1.379	97
Ln (Inflation)	0.092	0.273	100
(Cap.Ac$_{t-1}$ − Cap.Ac$_{t-5}$)/GDP$_{t-1}$	0.001	0.003	77
(Deficit$_{t-1}$ − Deficit$_{t-5}$)/GDP$_{t-1}$	0.019	0.026	96
Ln (Credit)	61.257	21.795	100

Panel B: correlations of variables around the devaluation

	$CAR (−1,+1)	$CAR (−30,+30)	Local CAR (−1,+1)	Local CAR (−30,+30)	Deval. Amt.	Export growth	Import growth	GDP growth	Reserve growth	Real exch. Growth
$CAR (−30,+30)	0.51 (0.00)									
Local CAR (−1,+1)	0.44 (0.00)	0.35 (0.00)								
Local CAR (−30,+30)	0.17 (0.09)	0.57 (0.00)	0.27 (0.01)							
Devaluation Amt.	−0.40 (0.00)	−0.19 (0.05)	0.20 (0.05)	0.22 (0.03)						
Export growth	0.16 (0.12)	0.14 (0.16)	0.04 (0.67)	0.13 (0.21)	0.16 (0.09)					
Import growth	0.08 (0.40)	0.04 (0.71)	0.00 (0.97)	0.00 (0.98)	0.05 (0.61)	0.47 (0.00)				
GDP growth	0.07 (0.53)	0.05 (0.64)	−0.02 (0.87)	−0.01 (0.91)	−0.06 (0.58)	0.33 (0.00)	0.17 (0.15)			
Reserve Growth	0.10 (0.30)	0.02 (0.81)	0.04 (0.67)	0.03 (0.76)	0.04 (0.67)	0.37 (0.00)	0.22 (0.02)	0.23 (0.05)		
Real Exch. Growth	−0.23 (0.02)	−0.16 (0.11)	−0.37 (0.00)	0.15 (0.16)	0.23 (0.01)	0.12 (0.21)	0.04 (0.63)	0.00 (0.99)	0.03 (0.78)	
Ln(Inflation)	−0.09 (0.38)	0.08 (0.45)	0.01 (0.90)	0.68 (0.00)	0.18 (0.05)	0.54 (0.00)	0.17 (0.06)	−0.02 (0.85)	0.04 (0.66)	0.26 (0.00)

This table reports summary statistics and the cross-correlations of cumulative abnormal returns and key explanatory variables to be used in the cross-section regressions in subsequent Tables. The explanatory variables are.
Devaluation Amt. – the amount of the devaluation of the foreign currency; Float – a dummy variable equal to 1 if the devaluation announcement was accompanied by an announcement that the currency would move to a floating rate regime; Widen – a dummy variable equal to 1 if the announcement included a widening *f* exchange rate bands.
Developing – a dummy variable equal to 1 if the devaluing country is a developing nation; Reserve Growth$_{t-5,t-1}$ – growth rate of reserves in the four quarters prior to the devaluation; Reserves$_{t-1}$/GDP$_{t-1}$ – reserves as a fraction of GDP in the quarter prior to the devaluation; Ln(Real Exch. Growth) – log real exchange rate growth in the four quarters prior to the devaluation; Ln(Inflation) – log inflation in the prior quarter; Short Debt$_{t-1}$/Reserves$_{t-1}$ – short-term debt as a faction of reserves in the prior quarter; Interest$_{t-1}$/Reserves$_{t-1}$ – interest to reserves ratio in the prior quarter; Short/Long Debt$_{t-1}$ – short-term to long-term debt ratio in the prior quarter; (Cap.Ac$_{t-1}$ − Cap.Ac$_{t-5}$)/GDP$_{t-1}$ – change in capital account in the four quarters prior to the devaluation as a fraction of GDP; (Deficit$_{t-1}$ − Deficit$_{t-5}$)/GDP$_{t-1}$ – change in current account deficit in the four quarters prior to the devaluation as a fraction of GDP; and Ln(Credit) – log credit rating.
In Pane B, numbers in parentheses are *p*-values.

Widen – a dummy variable equal to 1 if the announcement included a widening of exchange rate bands;
Developing – a dummy variable equal to 1 if the devaluing country is a developing nation;
Reserve Growth$_{t-5,t-1}$ – growth rate of reserves in the four quarters prior to the devaluation;
Reserves$_{t-1}$/GDP$_{t-1}$ – reserves as a fraction of GDP in the quarter prior to the devaluation;
Ln (Real Exch. Growth) – log real exchange rate growth in the four quarters prior to the devaluation;

Ln (Inflation) – log inflation in the prior quarter;
$(\text{Cap.Ac}_{t-1} - \text{Cap.Ac}_{t-5})/\text{GDP}_{t-1}$ – change in capital account in the four quarters prior to the devaluation as a fraction of GDP;
$(\text{Deficit}_{t-1} - \text{Deficit}_{t-5})/\text{GDP}_{t-1}$ – change in current account deficit in the four quarters prior to the devaluation as a fraction of GDP; and.
Ln (Credit) – log of country credit rating.

In Table 2 Panel B, we examine the raw correlations between the cumulative abnormal returns around the devaluation announcement, the amount of the announced devaluation, and several macroeconomic variables. We measure these economic variables around the devaluation, from four quarters before to four quarters after the announcement. As expected, we find that a larger devaluation is associated with a decrease in CARs expressed in dollar terms and an increase in CARs in local currency terms. Also, a devaluation is significantly associated with an increase in inflation and an increase in exports. Thus the basic economics of devaluations function as expected. The cross correlations among the macroeconomic variables are in general relatively small and therefore multicollinearity should not be a concern in the regressions with multiple macroeconomic variables as independent variables.

We next turn to explaining the impact of devaluations on the local stock market in a regression framework. We conduct a formal Lagrangian multiplier test for heteroskedasticity in the regression error term in our basic specification and find that the null hypothesis of no heteroskedasticity can be rejected at the 5 percent significance level. To take care of this econometric problem, we use a feasible generalized least squares estimator, where the independent variables significantly related to the variance are included in a heteroskedasticity correction. We model the variance of the error term as $\sigma^2 = \exp(Z'\gamma)$, where Z is a vector of independent variables and γ is the corresponding vector of parameters. The results reported in the subsequent tables are all based on such feasible generalized least squares regressions.

Tables 3 through 5 consider regressions on cumulative abnormal returns from -1 to $+1$ days around the announcement of the devaluation. Because in most cases the devaluation appears to be at least partly anticipated, and because some of the devaluations' impacts appear to have a long-term impact, we also examine the cumulative abnormal returns from -30 to $+30$ days around the announcement. Furthermore, we conduct our analysis for CARs expressed in dollar terms as well as in local currency terms.

One difficulty with this type of analysis is that not every macroeconomic variable is available for every country. At each point, we present the regressions with the largest possible number of observations, and discuss possible selection bias along the way.

Regression 1A in Table 3 Panel A presents results using the amount of the devaluation as the only explanatory variable when the CAR(-1,$+1$) is expressed in dollar terms. If the value of the stocks does not change in local currency terms, the expected coefficient would be -1, whereas if the value of the stocks does not change in dollar terms, the expected value would be 0. Regression 1A, and most of our other results for this cumulative abnormal return suggests that the truth is some place between these extremes, with a coefficient of -0.179 which is not significantly different from 0, but is significantly different from -1 at the 1 percent level.

In Regression 1B in Panel B, we add a dummy variable equal to one if the devaluation announcement was also accompanied by an announcement that the currency would move to a floating rate regime, a dummy variable equal to one if the announcement included a widening of exchange rate bands, and a dummy variable equal to one if the devaluing country is a developing nation. Neither the Float nor the Widen dummy is significant at conventional significance levels; however, developing countries appear to have a significantly larger drop at the 1 percent level in their stock markets than developed countries upon the announcement of a devaluation.

Regression 2A in Panel A of Table 3 presents similar regressions for the 30 days before to 30 days after the devaluation announcement. The result shows a coefficient between zero and minus one on the amount of devaluation, although closer to minus one than in the case above, suggesting that the devaluation impact on the stock market is more negative in the longer time period. When the Float and Widen dummy variables are included in Regressions 2B in Panel B, again the dummy for developing countries is negative and significant at the 1 percent level, although in this case the coefficient on the amount of the devaluation is no longer significant.

Regressions 3A and 4A present the results for the single regressor cases when CARs are expressed in local currency terms. As explained in the previous section, CARs in local currency terms will in general rise following a local currency devaluation. We obtain the expected results for both CAR(−1,+1) and CAR(−30,+30) in local currency terms. The slope coefficient is significant at the 1 percent level in both cases. Regressions 3B and 4B in Panel B report similar results when the three dummy variables are added to the basic regressions.

Notice that in our data set, some countries have multiple devaluations within a single year. This means some overlap in the windows used. We use two methods to examine whether this event clustering affects our results. First, we use a 3 percent filter, that is, only changes of 3 percent or more in the local currency value would be considered as an event and would be included in the sample. Second, we require that events be at least 60 days apart to be included. If there is more than one devaluation within a 60-day period, only the first one is qualified to be an event and is included in the regression.

Regression 5A presents the results for the CAR(−1,+1) regression when the 3 percent filter is applied. The slope coefficient is estimated with the expected negative sign and is significant at the 5 percent level. Regression 5B in Panel B reports similar results when the three dummy variables are added. We find that the coefficient of the "Developing" dummy is estimated with the correct sign and is statistically significant at the 5 percent level. Furthermore, we find that the coefficient for the "Float" dummy is significant at the 10 percent level. If the devaluation coincided with a move to a floating exchange rate regime, CAR(−1,+1) is expected to rise.

Regression 6A reports results for the CAR(−1,+1) case where events of at least 60 days apart are included in the regression. The slope coefficient is estimated with the correct sign and is statistically

Table 3
Cross-sectional variation of CARs.

	Base case				3% filter	Widely spaced
	U.S. dollar returns		Local currency returns		$ Returns	$ Returns
	CAR (−1,+1)	CAR (−30,+30)	CAR (−1,+1)	CAR (−30,+30)	CAR (−1,+1)	CAR (−1,+1)
	Reg 1A	Reg 2A	Reg 3A	Reg 4A	Reg 5A	Reg 6A
Panel A: regression of CARs on devaluation amount						
Devaluation Amt.	−0.179 (1.56)	−0.367 (1.02)	0.500*** (4.08)	3.600*** (2.64)	−0.284** (2.14)	−0.255* (1.93)
Constant	−0.014* (1.90)	−0.056 (1.63)	−0.021*** (2.86)	−0.156* (1.89)	−0.003 (0.27)	−0.009 (1.05)
Observations	106	106	97	97	74	92
Adjusted *R*-squared	0.01	0.00	0.14	0.06	0.05	0.03
	Base case				3% filter	Widely spaced
	U.S. dollar returns		Local currency returns		$ Returns	$ Returns
	CAR (−1,+1)	CAR (−30,+30)	CAR (−1,+1)	CAR (−30,+30)	CAR (−1,+1)	CAR (−1,+1)
	Reg 1B	Reg 2B	Reg 3B	Reg 4B	Reg 5B	Reg 6B
Panel B: regression of CARs on devaluation amount and others						
Devaluation Amt.	−0.218** (2.10)	−0.011 (0.03)	0.444*** (3.60)	2.004*** (3.13)	−0.250* (1.91)	−0.264** (2.09)
Developing	−0.038*** (3.67)	−0.161*** (3.64)	−0.021** (1.97)	−0.035 (0.62)	−0.032** (2.20)	−0.040*** (3.66)
Float	0.027 (1.09)	0.112 (0.70)	0.024 (1.07)	0.333 (0.90)	0.053* (1.92)	0.037* (1.65)
Widen	−0.007 (0.25)	0.091 (0.41)	−0.024 (0.79)	−0.346 (0.53)	0.014 (0.66)	−0.006 (0.25)
Constant	0.005 (0.65)	−0.007 (0.18)	−0.01 (1.24)	−0.077* (1.74)	0.003 (0.24)	0.008 (0.86)
Observations	106	106	97	97	74	92
Adjusted *R*-squared	0.13	0.08	0.14	0.07	0.12	0.16

This table reports GLS regressions of CARs on various cross-sectional characteristics. "Float" is a dummy variable equal to one if the devaluation coincided with a move to a floating exchange rate regime. "Widen" is a dummy variable equal to one if the devaluation coincided with a move to widen a pegged exchange rate. "Developing" is a dummy variable equal to one if the country is a developing nation. "3% filter" means the devaluation amount must be at least 3% in order for an observation to be qualified as an "event". "Widely Spaced" means events at least 60 days apart are included. If there is more than one devaluation within a 60-day period, only the first one is qualified to be an event and is included in the regression. Numbers inside parentheses are t-ratios in absolute values. The symbols *, **, and *** denote statistical significance at the 10, 5, and 1 percent levels, respectively, using a 2-tail test. Panel A reports results for the regression with the devaluation amount as the regressor, while in Panel B the regression includes other regressors.

Table 4
Devaluation and macroeconomic variables.

	U.S. dollar returns		Local currency returns							
	Reg 7A	Reg 8A	Reg 9A	Reg 10A	Reg 11A	Reg 12A	Reg 13A	Reg 14A	Reg 15A	Reg 16A
Panel A: regression of CARs (−1, +1)										
Devaluation Amt.	−0.258**	−0.345**	−0.203*	−0.253**	−0.468***	0.450***	0.452***	0.424***	0.485***	0.362**
	(2.40)	(2.36)	(1.68)	(2.37)	(3.36)	(3.91)	(3.63)	(3.82)	(3.90)	(2.56)
Developing	−0.038***	−0.042***	−0.026**	−0.031***	−0.025	−0.022**	−0.024*	−0.003	−0.020	−0.022
	(3.42)	(2.82)	(2.43)	(2.79)	(1.30)	(2.10)	(1.82)	(0.26)	(1.60)	(1.01)
Reserve Growth$_{t-5,t-1}$	0.018**				0.042***	0.010***				0.016
	(2.28)				(2.77)	(3.96)				(0.91)
Reserves$_{t-1}$/ GDP$_{t-1}$		0.010			0.010		0.013**			0.014
		(0.79)			(0.90)		(1.97)			(1.02)
Ln (Real Exch. growth)			−0.012**		−0.018			−0.021***		−0.027***
			(2.00)		(1.55)			(3.29)		(2.76)
Ln (Inflation)				0.000	−0.021				−0.047	0.160
				(0.01)	(1.46)				(0.51)	(1.18)
Constant	0.002	0.007	0.006	0.005	−0.001	−0.012	−0.017*	−0.007	−0.009	−0.017
	(0.27)	(0.66)	(0.72)	(0.55)	(0.12)	(1.62)	(1.88)	(0.88)	(1.21)	(1.60)
Observations	102	76	97	100	64	95	75	88	91	63
Adjusted *R*-squared	0.15	0.13	0.14	0.11	0.39	0.18	0.16	0.19	0.15	0.27

	U.S. dollar returns					Local currency returns				
	Reg 7B	Reg 8B	Reg 9B	Reg 10B	Reg 11B	Reg 12B	Reg 13B	Reg 14B	Reg 15B	Reg 16B
Panel B: regression of CARs (−30, +30)										
Devaluation Amt.	0.026	0.678	0.089	0.005	0.396	2.919**	1.603**	1.389*	1.075**	1.756***
	(0.06)	(1.06)	(0.21)	(0.01)	(0.63)	(2.57)	(2.25)	(1.70)	(2.49)	(3.81)
Developing	−0.135***	−0.159***	−0.107**	−0.135***	−0.165***	−0.009	−0.116**	−0.028	−0.072	−0.114**
	(2.73)	(3.71)	(1.98)	(2.96)	(3.39)	(0.08)	(2.02)	(0.27)	(1.25)	(2.19)
Reserve Growth$_{t-5,t-1}$	0.035				0.057	0.018				0.092*
	(0.55)				(0.90)	(0.32)				(1.89)
Reserves$_{t-1}$/GDP$_{t-1}$		0.065***			0.067***		0.084***			0.049
		(3.03)			(6.18)		(2.79)			(1.58)
Ln (Real Exch. Growth)			−0.035		−0.035			0.067		−0.248***
			(1.43)		(1.12)			(0.75)		(10.86)
Ln (Inflation)				0.011	0.003				−0.318	−0.277
				(0.05)	(0.07)				(0.48)	(0.27)
Constant	−0.020	−0.074*	−0.008	−0.010	−0.075*	−0.126*	−0.102**	−0.049	−0.026	−0.091**
	(0.50)	(1.77)	(0.21)	(0.29)	(1.74)	(1.76)	(2.07)	(0.76)	(0.61)	(2.22)
Observations	102	76	97	100	64	95	75	88	91	63
Adjusted *R*-squared	0.04	0.19	0.06	0.06	0.52	0.04	0.12	0.01	0.05	0.83

This table reports GLS regressions of CARs on growth rate of reserve over the past four quarters before the devaluation, reserve over GDP ratio, growth rate of real exchange rate (a positive growth means a real depreciation) over the past four quarters, and inflation of the past quarter. Numbers inside parentheses are *t*-ratios in absolute values. The symbols *, **, and *** denote statistical significance at the 10, 5, and 1 percent levels, respectively, using a 2-tail test. Panel A reports results for the short window CARs (−1,1) while Panel B those for the long window CARs (−30,30).

significant at the 10 percent level. From Regression 6B, we see that when the dummy variables are added to the regression, the results are stronger.

We have also applied a 1 percent filter to the data and find qualitatively the same results. As the results are similar for our other analyses as well, our subsequent analysis is presented for the baseline case.

We next analyze the impact of three macroeconomic variables often associated with government policies that may be inconsistent with a fixed exchange rate regime. Specifically, based on models by Krugman (1979), Flood and Garber (1984), and Obstfeld (1994), and the empirical findings of Kaminsky and Reinhart (1999), variables such as the growth rate of reserves, the growth rate of the real foreign exchange rate (a positive growth represents a real depreciation of the foreign currency relative to the dollar), and the inflation rate may be associated with a devaluation. If government policies are inconsistent with the fixed

Table 5
Devaluation and capital flow.

	U.S. dollar returns				Local currency returns			
	Reg 17A	Reg 18A	Reg 19A	Reg 20A	Reg 21A	Reg 22A	Reg 23A	Reg 24A
Panel A: regression of CARs (−1, +1)								
Devaluation Amt	−0.396** (2.55)	−0.351** (2.17)	−0.364** (2.38)	−0.144 (0.94)	0.364*** (2.65)	0.291** (2.39)	0.407*** (2.74)	0.300** (2.11)
Developing	−0.020 (1.04)	−0.022 (1.25)	−0.017 (0.80)	0.024 (1.45)	−0.012 (0.57)	0.004 (0.19)	−0.019 (0.86)	−0.005 (0.16)
$Reserves_{t-1}/GDP_{t-1}$	−0.006 (0.23)	0.015 (1.13)	0.010 (1.22)	−0.029 (0.92)	0.009 (0.57)	0.015 (1.54)	0.012 (0.99)	0.016 (1.55)
Ln (Real Exch. Growth)	−0.019 (1.37)	−0.017 (1.15)	−0.011 (0.65)	−0.01 (0.51)	−0.021* (1.65)	−0.026** (2.16)	−0.016 (1.18)	−0.018 (1.09)
$(Cap.Ac_{t-1} - Cap.Ac_{t-5})/GDP_{t-1}$	2.411* (1.90)			2.347* (1.78)	3.753* (1.74)			3.531 (1.49)
$(Deficit_{t-1} - Deficit_{t-5})/GDP_{t-1}$		−0.343 (1.22)		−0.230 (0.69)		−0.464* (1.67)		−0.466* (1.67)
Ln (Credit)			0.031 (0.75)	0.095** (1.99)			0.007 (0.19)	0.009 (0.20)
Constant	0.013 (0.98)	0.013 (1.07)	−0.129 (0.70)	−0.407* (1.88)	−0.013 (1.24)	0.001 (0.10)	−0.041 (0.26)	−0.043 (0.21)
Observations	61	66	67	59	60	65	66	58
Adjusted R-squared	0.17	0.08	0.14	0.14	0.14	0.15	0.11	0.12
	U.S. Dollar returns				Local currency returns			
	Reg 17B	Reg 18B	Reg 19B	Reg 20B	Reg 21B	Reg 22B	Reg 23B	Reg 24B
Panel B: regression of CARs (−30, +30)								
Devaluation Amt	0.835 (1.11)	0.156 (0.27)	0.689 (1.20)	0.591 (1.23)	1.882*** (3.56)	1.281*** (2.77)	1.351*** (3.08)	1.753*** (3.50)
Developing	−0.180*** (2.63)	−0.104** (1.96)	−0.031 (0.44)	0.032 (0.63)	−0.130** (2.44)	−0.038 (0.85)	−0.032 (0.60)	0.040 (0.62
$Reserves_{t-1}/GDP_{t-1}$	0.040 (0.90)	0.087*** (3.90)	0.04* (1.64)	0.076*** (3.79)	0.032 (0.72)	0.089*** (4.83)	0.045*** (3.71)	0.067* (1.70)
Ln (Real Exch. Growth)	−0.024 (0.52)	−0.042 (1.26)	0.030 (0.55)	0.064 (1.35)	−0.249*** (7.43)	−0.264*** (8.44)	−0.190*** (3.76)	−0.183*** (3.96)
$(Cap.Ac_{t-1} - Cap.Ac_{t-5})/GDP_{t-1}$	2.515 (0.40)			−4.947 (0.83)	11.554** (2.14)			3.271 (0.40)
$(Deficit_{t-1} - Deficit_{t-5})/GDP_{t-1}$		−3.133** (2.40)		−4.317*** (3.47)		−2.724*** (3.02)		−3.230*** (3.03)
Ln (Credit)			0.480*** (3.23)	0.598*** (5.30)			0.274** (2.00)	0.396*** (2.87)
Constant	−0.058 (1.21)	0.019 (0.46)	−2.142*** (3.25)	−2.577*** (5.14)	−0.074* (1.84)	−0.011 (0.28)	−1.240** (2.04)	−1.743*** (2.85)
Observations	61	66	67	59	60	65	66	58
Adjusted *R*-squared	0.09	0.27	0.20	0.47	0.63	0.65	0.47	0.55

This table reports GLS regressions of CARs on several measures of capital flow. Numbers inside parentheses are *t*-ratios in absolute values. The symbols *, **, and *** denote statistical significance at the 10, 5, and 1 percent levels, respectively, using a 2-tail test. Panel A reports results for the short window CARs(−1,1) while Panel B those for the long window CARs(−30,30).

exchange rate regime, this would manifest itself in a significant decline in reserves, and in increases in inflation and the real exchange rate (a real depreciation of the foreign currency).

Regressions 7A and 8A in Table 4 Panel A show the impact of reserves, either measured via growth in the four quarters prior to the devaluation or as reserves as a fraction of GDP in the quarter prior to the devaluation, on equity returns in dollar terms, where we include the "Developing" dummy variable which was found to be significant in Table 3B as a control variable in our regression. The parameter of the former variable is estimated with the expected positive sign and is statistically significant at the 5 percent level, while that of the later measure is insignificant. For the longer 60-day window considered in Regressions 7B and 8B in Table 4 Panel B, both parameters are estimated with the correct positive sign. The parameter on the Reserves/GDP ratio is statistically significant at the 1 percent level, suggesting that higher reserves are associated with more positive stock market returns.

Regression 9A in Panel A of Table 4 considers the impact of real foreign exchange growth in the four quarters prior to the devaluation on cumulative abnormal returns. Larger growth in real exchange rates appears to be significantly negatively related to equity returns around a devaluation, suggesting a more severe economic impact of devaluation in countries with a larger foreign exchange depreciation. Real foreign exchange rate growth is similarly related to stock returns in the 60-day window in Regression 9B of Table 4 Panel B, although the effect is not statistically significant. Thus, for countries which had larger past real depreciations, a currency devaluation event implies a greater real decline in equity prices.

Regression 10A in Panel A of Table 4 includes inflation in the prior quarter as an additional explanatory variable, but inflation does not appear to be significantly related to equity returns immediately around the devaluation. Regression 11A includes these four variables together, and finds that for the short window, the Reserves Growth variable is significant at the 1 percent level, and the other three variables are not significant for the smaller sample when considered in the same regression. On the other hand, for a 60-day window in Regression 10B in Panel B, prior quarter inflation does not have a significant relationship with equity returns. These results continue in Regression 11B, where the Reserves/GDP ratio is statistically significant at the 1 percent level, while the other variables are not significant. We find also that the adjusted R^2 climbs to a relatively high 52 percent.

Regressions 12A–16A in Panel A of Table 4 report similar regression results for the CARs $(-1,+1)$ expressed in local currency terms. The parameter for the "Devaluation Amt" variable is estimated with the correct positive sign and is statistically significant at least at the 5 percent level in all regressions. Furthermore, the parameters for other explanatory variables are in general more significant than those in the regressions when CARs $(-1,+1)$ are expressed in dollar terms. We obtain similar conclusions from Regressions 12B–16B in Table 4 Panel B where the long-window CARs $(-30,+30)$ are expressed in local currency terms.

A number of authors, such as Krugman (1998), Corsetti et al. (1999) and Kane (2000), consider a moral hazard explanation as a possible cause for sudden devaluations. These authors suggest that large debt investments may be implicitly guaranteed either by local authorities or by the IMF and may therefore be associated with overinvestment.

A separate hypothesis originally associated with Diamond and Dybvig (1983) suggests that if there is a sufficiently large mismatch in duration between assets and liabilities, a self-fulfilling run on liquidity may occur. In this case, investors lose confidence in the ability of the local institutions to pay back their debts, and a sudden run on liquidity occurs, causing a shortage of funds and a real contraction. Both this hypothesis and the moral hazard hypothesis above suggest that measures of debt in the economy are crucial to the severity of a devaluation. For instance, Furman and Stiglitz (1998) and Rodrik and Velasco (1999) use short-term debt flows as a fraction of reserves to explain the severity of the crisis.

We consider three measures of a country's debt and how they relate to the equity decline around a devaluation. Specifically, we consider the ratio of short-term debt to the international reserves, the ratio of interest paid on debt to reserves, and the ratio of short-term to long-term debt, all measured in the quarter prior to the announcement. The first two variables may be effective measures of the stock of debt, whereas the third may serve as a proxy to measure the mismatch between short-term and long-term assets.

Unfortunately, due to data limitations, our regressions have only 39–42 observations, and we do not obtain significant estimates, probably because the power of our test given this small sample is insufficient to capture these effects. The results are therefore not reported to save space.

Table 5 considers a variety of measures of capital flows, including changes in the capital account as a fraction of GDP, changes in the current account deficit as a fraction of GDP, and the log of country credit rating. We include the amount of the devaluation, a dummy for developing countries, the real foreign exchange rate growth, and the Reserves/GDP ratio as control variables in these regressions. Regressions 17A and 17B consider changes in the capital account as a fraction of GDP and find that for the short window, this variable is significantly related to changes in the value of equity in dollar terms at the 10 percent level around currency devaluations. The capital account variable in the longer window regression has the expected positive sign but is not statistically significant. Consistent with expectations (Kaminsky and Reinhart, 1999), a larger decrease in the capital account is associated with a larger decrease in the value of equity around a devaluation.

Similarly, Regressions 18A and 18B consider changes in the current account deficit as a fraction of GDP as an alternative explanatory variable. Consistent with the capital account results, a larger increase

in the current account deficit is associated with a greater decline in equity values around a devaluation, although this result is only statistically significant for the longer window.

In regressions 19A and 19B we consider the country credit rating from the March or September prior to the devaluation as an alternative measure of how the country's borrowing position impacts the economy during a devaluation. We find that credit rating positively impacts equity returns around a devaluation, although this result is statistically significant only for the longer window.

Regressions 20A and 20B include all three variables in the regressions, where we find the country credit rating variable to be significant in both the short- and long-window regressions.

Results for local currency returns are reported in Regressions 21A–24A and 21B–24B, and the coefficients in these regressions are in general more significant than their counterparts when returns are expressed in dollar terms. In particular, the regressions for the longer window have higher adjusted R^2s.

Jorion (1990), Patro et al. (2002), and others suggest that exchange rate exposure may vary with imports and exports. Thus, larger exports may imply a larger positive impact on equity returns around a devaluation, while larger imports may imply a larger negative impact around a devaluation. However, neither lagged imports as a fraction of GDP nor lagged exports as a fraction of GDP is significant when added to the abnormal returns regressions. Either other factors are more important during a devaluation, or the power of our test is insufficient to capture these effects. These results are not reported in the table to save space.

6. Conclusions

In this paper we study local stock market reaction to currency devaluations by a country's central bank. Our analysis indicates that devaluations are often anticipated by the local stock markets, and that there are significant negative abnormal returns even one year prior to the announcement of the devaluation. This negative trend persists for up to one quarter following the first announcement, and then becomes positive thereafter, suggesting a reversal in trend.

Guided by the theoretical literature on devaluations, we conduct a cross-sectional analysis of the relationship between the local stock market's abnormal returns around currency devaluations and the country's key macroeconomic indicators. We find that stock returns are significantly lower for greater devaluations and if the country is a developing nation. Furthermore, stock markets decline more around a devaluation if reserves are lower, if the real exchange rate has depreciated over the prior years, if the capital account has declined, if the current account deficit has gone up, or if the country credit rating has deteriorated. These findings have useful implications for central bankers as well as for international investors.

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Appendix A. List of countries and the event dates

Country	Event date							
Argentina	1/6/1988	1/22/1988	2/9/1988	8/4/1988	9/12/1988	2/8/1989	4/5/1989	5/3/1989
	12/10/1989	12/27/1989	1/4/2002					
Australia	12/10/1983							
Brazil	1/15/1989	5/4/1989	7/3/1989	9/30/1991	3/6/1995	6/22/1995	1/13/1999	
Chile	1/5/1988	1/6/1988	6/9/1989					
China	1/1/1994	7/21/2005						
Columbia	9/2/1998							

(*continued*)

Country	Event date							
Czech Republic	5/27/1997							
Denmark	3/21/1983	4/6/1986						
Egypt	8/5/2001	1/29/2003						
Finland	11/15/1991							
France	10/4/1981	1/15/1982	3/21/1983	4/6/1986				
Germany	10/4/1981	1/15/1982	3/21/1983	4/6/1986	1/11/1987			
Greece	3/14/1998							
Hong Kong	9/29/1988							
Hungary	1/3/1995	3/12/1995	6/4/2003					
Indonesia	8/14/1997							
Ireland	1/30/1993	3/15/1998						
Italy	3/22/1981	10/4/1981	1/15/1982	6/13/1982	3/21/1983	7/23/1985	8/5/1985	1/5/1990
	9/13/1992							
Jordan	10/15/1988	7/18/1989						
Kazakhstan	2/4/2009	3/15/2011						
Korea	11/18/1997							
Malaysia	7/3/1997	7/15/1997						
Mexico	2/1/1988	12/14/1988	5/28/1990	12/20/1994				
Morocco	4/25/2001							
Netherlands	10/4/1981	1/15/1982	2/23/1982	3/21/1983	4/6/1986	1/11/1987		
Nigeria	11/5/2003							
Norway	5/12/1986	12/10/1992						
Pakistan	7/16/1993	7/23/1993	10/29/1995	9/10/1996	10/23/1996	10/15/1997	6/28/1998	
Philippines	10/31/1990	7/12/1997						
Poland	8/30/1993	2/25/1998	4/11/2000					
Portugal	11/23/1992	5/13/1993	3/5/1995					
Russia	8/17/1998	11/11/2008	12/11/2008	12/15/2008	12/18/2008	12/24/2008	12/26/2008	12/29/2008
	1/12/2009							
Singapore	7/17/1997	4/14/2009						
Spain	12/5/1982	9/15/1992	11/23/1992	5/13/1993	3/5/1995			
Sri Lanka	6/21/2000	1/15/2001						
Sweden	10/8/1982	11/20/1992						
Thailand	7/1/1997							
Turkey	2/22/2001							
Ukraine	2/5/2009							
Venezuela	12/11/1995	2/9/2004	3/3/2005	1/8/2010				
Vietnam	6/11/2008	11/25/2009	2/11/10	8/17/10	2/11/2011			

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