SUDDEN STOPS AND CURRENCY CRISES*

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Abstract

Over the last thirty five years many emerging and developing countries experienced severe financial crises. This paper examines empirical characteristics of commonly used measures of international financial crises, specifically "sudden stop" and currency crisis measures. Sudden stop and currency crisis measures are analyzed using the annual data of 25 emerging market countries from 1990 to 2003. According to the study, sudden stops are more likely to precede currency crises and the output costs are higher when both crises occur simultaneously. Less than half of the sudden stops occur simultaneously with currency crises, while less than 60 percent of currency crises are accompanied by sudden stops. This examination led to the grouping of sudden stop and currency crisis episodes in the following categories: sudden stops that lead to currency crises (introduced here as "twin crises," another kind of twin crises, not the one that refers to joint banking and currency crises) and sudden stops without currency crises. Twin crises have the highest output losses. Moreover, high current account deficits and large portfolio and bank flows could be used as early warning signs to predict twin crises.

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1. Introduction

The alarming frequency of the balance-of-payment crises during the last three decades has motivated a large volume of theoretical and empirical literature on the subject. The significance of these events is obvious from the sizable losses the affected countries suffered. Argentina's losses in the early 1980s crisis amounted to 55 percent of its GDP. The bailout costs of failed banks during the early 1990s crisis in Finland reached 8 percent of its GDP. More recently, during the 1997 Asian crises, Thailand, Indonesia, Malaysia and South Korea experienced on average an 11 percent drop in their per capita real GDP.[1] Increased volatility of international capital flows has been a defining feature of these crises.

The term "sudden stop" was first introduced by Dornbusch, Goldfajn and Valdes (1995). It refers to sudden and large drops in capital inflows. Along with other measures of balance-of-payment crises (i.e. currency crisis measures, capital account reversals), sudden stops have become a popular empirical measure to identify and study the crises.

Empirical papers quite often adopt new or modified versions of previously used crisis measures. Sudden stop and currency crisis measures are often used interchangeably to study the same episodes of financial crises (e.g. Radalet et al. 1998; Milesi-Ferretti et al. 2000; Kaminskey et al. 1997). But do they really identify the same events?

We seek to answer this and other related questions by examining empirical regularities or irregularities between various sudden stop and currency crisis measures. We think that time is ripe for such research, since we have accumulated a fair amount of

[1] The Economist (2007) and (2008).

evidence on all of these measures. Contradicting results and confusing terminology produced by the crisis research creates serious problems for policy makers as well as to researchers.

In this study we look for empirical characteristics among the popular measures of sudden stops and currency crises using the annual data of 25 emerging market countries from 1990 to 2003. We hypothesize and find that the characteristics of the captured balance of payments crises depend on the type of crises measure used in the identification process. This examination led us to group various sudden stop and currency crises episodes in the following categories: severe sudden stops followed by currency crises (we call these events "twin crises") and sudden stops without currency crises. Twin crises term has been used before for the episodes of joint banking and currency crises, but here it refers to the episodes of joint sudden stops and currency crises. The sudden stops that trigger twin crises have the highest output losses. We find that high current account deficits and large portfolio and bank flows could be used as early warning signals to distinguish them from sudden stops without currency crises. We also find that sudden stops are more likely to precede currency crises.

2. Literature Review

Our initial look at the behavior of capital flows, reserves, exchange rates and current account balances, around the time periods of well publicized crises events in emerging market countries, suggests that the first signs of stress tend to show up in net capital flows, rather than in changes in reserves, interest rates or exchange rates. Figure A.1 of appendix A shows capital flows, exchange market pressure index and real

exchange rate behavior around the 1994 crises in Mexico. Do crises theories explain this?

All formal crises models are based on the investor/speculator behavior (e.g., Krugman 1979; Obstfeld 1994; Tirole 2002; Tornell and Westermann 2005; Willett 2000). Depending on the model, either because of the country's macroeconomic fundamentals or external factors, investors backward induct the possibility of a crisis and decide to flee the country. This behavior is immediately reflected in monthly capital inflows and outflows, which is somewhat conditioned by the level of capital controls in the country.

According to Miles-Ferretti and Razin (2000) and Calvo et al. (2004) capital flow reversal could also be a response to a country's macroeconomic policy that promises capital flow restrictions, or it could occur as a result of an unfavorable terms-of-trade shock.

Other balance of payments or macroeconomic variables may also reflect sudden changes in investor behavior. Which variable captures the crisis the earliest and more accurately is an interesting question. Among the most commonly used are foreign reserves, exchange rates, domestic interest rates, current account balances and capital account balances.

Here we focus on the following questions: Do the crises dates identified by different crises measures match? Is there any empirical regularity between them? Does it matter which crisis measure we use? Do they measure the same type of event? What determines when you have one type of crisis, but not the other?

It is helpful to first remember what the components of balance of payments are and use them to categorize measures accordingly. Three components of balance of

payments are: current account (used in the calculation of current account reversals), capital account (used in the calculation of sudden stops and capital flow reversals), and changes in foreign reserves (used in calculation of exchange market pressure index, which may also include exchange rate and/or interest rate.) These three parts together must add up to zero, for an exchange rate to maintain the same level. If the components are not in balance, exchange rate must change to bring back the balance.

This basic balance of payments relationship has been used in various ways to study the crises. While there are papers that do comparisons among some of the measures of the external crises, we find that there is a significant research gap in the analysis of sudden stop and currency crisis measures. The Milesi-Ferretti and Razin (2000) paper has a section comparing currency crises and current account reversals in the sample of low and middle income countries. They find little coincidence or precedence between these two types of events. On average only about 30% of reversals for low income countries (50 percent for middle income countries) are preceded with currency crises within a three year window. The authors call these two events "distinct."

Edwards (2004 and 2006) examines the relationship between sudden stops and current account reversals on the sample of 157 countries during 1970-2001. In addition, he extends the discussion to incorporate the effects of exchange rate regimes, trade openness, financial openness and output losses. We replicate the sudden stop measure used by Edwards (2004) and use it in our analysis (see appendix B for variable descriptions). He finds that 46.1 percent of sudden stops coincide with current account reversals, and 22.9 percent of countries with current account reversals also experience a sudden stop in the same year. Moreover, even with these apparent differences, these events are not statistically independent.

Calvo (2000) emphasizes that recent “financial crises” have been preceded by surges in capital inflows and ended with large drops in output growths. Calvo et al. (2004) uses his own version of the sudden stop measure to capture the “unexpected” and “large” changes in capital account, which at the same time has a large negative effect on a country’s output. Thus, a sudden stop for them is an episode that has a fall in net capital flows larger than two standard deviations from the country’s own sample mean and this event coincides with the large fall in output (see appendix C for CalvogdpdropSS variable description). He argues that this measure catches more crises episodes than current account deficit based measures, because some countries have low volatility in current accounts. Working with monthly data is preferred also for the reasons of crises discovery. The authors use the large fall in output as an additional criteria to identify those sudden stops that have negative economic consequences. Monthly net capital flows in this study equal the monthly trade balance minus changes in international reserves. We also replicate this particular measure in our study.

Calvo et al. (2004) also look at the behavior of key macroeconomic variables around sudden stop episodes. Looking at the window of [t-2, t+2], they compared trough and peak values for each key variable. Sudden stops caused on average a 46.7 percent rise in real interest rates and also reduced foreign reserve holdings on average by 35.69 percent in emerging markets. Current accounts also reverse as a result of sudden stops on average by 6.12 percent of GDP (again for emerging markets). Based on the sharp rises of real interest rates, Calvo et al. (2004) conclude that sudden stops represent mainly supply-side shifts in capital markets. For example, the 1998 Russian default forced highly leveraged world financial centers in US and Europe to sell assets in Latin America.

Becker and Mauro (2006) document output effects of a variety of shocks. They find that the largest output losses for emerging markets are associated with external shocks, particularly with sudden stops in capital flows. For developing countries terms-of-trade shocks have the largest output losses.

Hutchison and Noy (2006) define a sudden stop as simultaneous occurrence of capital flow reversal and currency crisis, but they use the current account balance instead of the capital account to identify capital flow reversals. They justify it, by the claim that current account and capital account are highly correlated. Calvo's sudden stop measure dates the Asian crises in 1997, while the Hutchison and Noy (2006) measure puts it in 1998. This type of disparity in years could have important consequences in the empirical analysis of the crises. The authors find that sudden stops have higher output costs than currency crises or current account reversals. Here we do not replicate Hutchison and Noy's measure of sudden stops. We believe that their measure is closer to current account reversal measure than to other sudden stops, which are typically used to capture sudden and large capital flow reversals.

Based on the review of the literature and some of the initial data observation, we focus on answering the following questions: i) What is the temporal ordering of sudden stops and currency crises? ii) Do empirical findings on the causes of the crises depend on a crisis measure used as a dependent variable? And iii) Do sudden stops that coincide with currency crises have higher output costs?

3. Description of Crisis Measures

3.1 Sudden Stop Measures

CalvoSS: The annual dummies are derived from monthly data. Monthly capital flow series are constructed by netting out monthly exports and imports from changes in monthly reserves. Then, the sudden stop crisis is defined as a phase where year-on-year change in capital flows is at least two standard deviations below its sample mean. The sample is defined as an expending window with a minimum of 24 months that always starts in Jan, 1990. Once the sudden stop phase is detected, it is converted into a dummy variable with annual frequency. Calvo et al. (2004) point out the timing difference between sudden stops and currency crises and prefer using sudden stops to study crises, which they see as to originate by "credit shocks in international markets."

CalvogdpdropSS: This variable is a product of CalvoSS and annual GDP drop dummy. Calvo et al. (2004) use this to capture only those capital flow reversals that are caused by adverse external shocks.

EdwardsSS: This measure is based on annual capital account data. A sudden stop is defined as a fall in net capital flows that is at least 3 (or 5) percent of the current year's GDP. Also the country should have had positive net capital flows in the previous year. No particular rational is given to why Edwards prefers using this measure to other types of sudden stops or currency crises measures to study crises.

3.2 Currency Crisis Measures

Currency Crisis: Currency crisis dummies are constructed from changes in an index of exchange market pressure (EMP), defined as a weighted (with equal or precision weights) average of monthly real exchange rate changes, monthly reserve losses and/or

interest rate changes. The precision weights are inversely related to the variance of changes of each component over the sample of each country. Annual crises dummy takes the value of 1 if change in the pressure index exceeds the mean plus 2 (or 1.25, 1.5, 1.75) times the country-specific standard deviation.

3.3 Data Description

We use annual and monthly data for 25 emerging market countries for the period of 1990-2003. Emerging market country classification matches with the Economist magazine classification. The source of the data is the International Financial Statistics Database produced by International Monetary Fund. The list of countries is provided in appendix A and is organized by region. All of the collected and constructed variables are described in appendix B.

4. Examination of Empirical Regularities

In this section we discuss the major findings that stand out from the table of several sudden stop and currency crises measures, correlation tables, two way frequency tables and precedence tables.

Table D.1 of appendix D includes the following measures: sudden stops based on standard deviations (CalvoSS and Calvogdpdrop with 2 standard deviation thresholds), sudden stops based on the % of GDP thresholds (EdwardsSS with 5% threshold) and currency crises (EMP measure with precision weights, including interest rates and with 2.5SD).

The main finding from table D.1 is that different measures produce different dating of crises years. Further analysis of this phenomenon using the two-way

frequencies in tables 1 and 2 reveals that on average less than half of the sudden stops occur simultaneously with currency crises, while less than 60% of currency crises coincide with sudden stops.

Table 1. Two-way Frequencies (each episode includes 1 or more years) Percentages in parenthesis

		Currency Crises		
		Yes	**No**	**Total**
CalvoSS	**Yes**	15	38 (72%)	53
	No	9 (38%)	X	
	Total	24		

		Currency Crises		
		Yes	**No**	**Total**
EdwardsSS	**Yes**	7	15 (68%)	22
	No	17(70%)	X	
	Total	24		

		Currency Crises		
		Yes	**No**	**Total**
EdwardsSS	**Yes**	10	7 (41%)	17
	No	14(58%)	X	
	Total	24		

Note: See Appendix C for the description of variables.

Table 3 shows that sudden stops precede currency crises events. Sudden stops captured by CalvoSS precede the currency crises nine times, while a currency crisis precedes a sudden stop only once. It is not a surprising result, if we consider that exchange rate represents an important component of currency crisis measure, and exchange rate changes tend to come late, especially when a government defends a pegged exchange rate regime.

Table 2. Two-way Frequencies (each episode includes only 1 year)
Percentages in parenthesis

		Currency Crises (EMP equal weights)			
		Yes	**No**	**Total**	**%**
CalvoSS (2SD)	**Yes**	25	84	109	*(40.7%)*
	No	17	142	159	*(59.3%)*
	Total	42	226	268	
	%	*(15.7%)*	*(84.3%)*		

		Currency Crises (EMP precision weights)			
		Yes	**No**	**Total**	**%**
CalvoSS (2SD)	**Yes**	31	78	109	*(40.7%)*
	No	24	135	159	*(59.3%)*
	Total	55	213	268	
	%	*(20.5%)*	*(79.5%)*		

		Currency Crises (EMP equal weights)			
		Yes	**No**	**Total**	**%**
EdwardsSS (5%)	**Yes**	10	15	25	*(9.2%)*
	No	32	215	247	*(90.8%)*
	Total	42	230	272	
	%	*(15.4%)*	*(84.6%)*		

Table 3. Temporal Ordering of Sudden Stops and Currency Crises

	CalvoSS (2SD)	Currency Crisis
CalvoSS (2SD)		9
Currency Crisis	1	

Note: The row variable precedes the column variable.
See variable descriptions in appendix C.

5. Discussion of Measures

5.1 Explaining Low Correlations Among Different Crises Measures

Table D.2 of appendix D shows that correlations between the sudden stop and currency crises measures are less than 0.25. The correlations among different standard deviation based sudden stops range between 0.62 and 0.86. We would expect some differences, but why are the correlations so low among sudden stops and currency crises? Even if the events we are looking to identify were similar, just the differences in types of variables and calculating methods used would produce dissimilar crisis dates. First, they are based on different balance-of-payments accounts. Sudden stops primarily are capital flow reversal measure, whereas currency crises or EMP indexes are calculated with reserves, exchange rate and interest rate changes. Moreover, economic shocks are not immediately transmitted among the balance-of-payment accounts and macroeconomic variables. The second explanation of the low correlations could be that sudden stop and currency crisis measures identify somewhat different types of events or distinct stages of the same kind of event.

Some of the crises measures use monthly data that are then converted into yearly crises dummies (Calvo's sudden stops), while others (Edwards sudden stops) use only annual data. Also, some researchers construct measures using standard deviations as a threshold of abnormal deviation (e.g. CalvoSS and Calvogdpdrop), while others use changes that are scaled by GDP in percentages (e.g. EdwardsSS). Moreover, the standard deviation based measures (Calvo's sudden stops and EMP measures) have no crises in the first two years of data series, while capital flow reversals/GDP measures could have the crises in the second year of the data series.

Furthermore, theoretical and empirical work accumulated on these crises makes us believe that there is a distinction as well as a relationship between the crises measured by these different indexes. They are not the same, nor are they unrelated. Having only a sudden stop is different from having a sudden stop that leads to a currency crisis. Either one of the crises alone is less harmful to an economy than having them simultaneously or in a sequence (e.g., Milessi-Ferretti and Razin 2000, Edwards 2006). This proposition is explored in section 7.

In summary, different measures emphasize only certain types of crises and no single measure can systematically capture and explain all of the external crises, assuming that there are several types of crises even within our sample of years (Kaminsky 2003).

6. Using Sudden Stop and Currency Crisis Measures in the Regressions

To compare the predictors of sudden stop and currency crises we follow the existing theoretical and empirical literature and use following explanatory variables in the multivariate probit model: current account deficit as percentage of current output, external debt as a percentage of current output, terms-of-trade, real exchange rate appreciation, short-term debt ratio over foreign reserves, domestic credit growth, foreign reserves as a percentage of output, foreign direct investment as a percentage of output and accumulated hot flows (portfolio flows and bank loans) of the previous three years as a percentage of current output.

Table 4 presents results of these regressions. Surprisingly, even with so much variation in dating crises by different measures, which we discussed in previous sections, we don’t see major differences among the significant variables and coefficient signs,

when we change an underline dependent variable. Current account deficits are significant in all of the regressions.

Table 4: Crisis Determinants
Estimated Marginal Effects at Mean (Standard Errors in Parenthesis)

Regression #	*(1)*	*(2)*	*(3)*	*(4)*
Dependent Variable	*Calvo gpddropSS*	*CalvoSS*	*EdwardsSS*	*Currency Crisis*
/ Independent Variables				
CA/GDP(t-1)	-1.19***	-3.47***	-1.20***	-1.82***
	(0.40)	(0.96)	(0.40)	(0.45)
Exdebt/GDP(t-1)	0.07	0.079	0.11	-0.199**
	(0.07)	(0.17)	(0.72)	(0.08)
ToT(t-1)	-0.0003	0.001	0.0001	-0.0014
	(0.001)	(0.003)	(0.0007)	(0.001)
RERappr(t-1)	-0.09	-0.14	-0.066	0.214**
	(0.09)	(0.21)	(0.07)	(0.098)
Short-termDebt/GDP(t-1)	0.01*	-0.018	0.009	0.01
	(0.008)	(0.031)	(0.008)	(0.01)
LendingBoom(t-1)	-0.01	-0.033	-0.07	0.14
	(0.12)	(0.282)	(0.13)	(0.09)
FDI/GDP(t-1)	-0.57	-0.82	0.86	-0.34
	(0.70)	(1.72)	(0.56)	(0.77)
# of Observations	223	222	220	223
Pseudo R^2	0.15	0.07	0.24	0.16

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

7. Output Losses and the Classification of Crises by Their Severity

Based on the analysis in previous sections we conjecture that some sudden stops lead to currency crises, while others don't. This could be due to the differences in the magnitudes of the capital flow reversals that underlie sudden stops and also due to certain amplifying economic conditions that may accompany sudden stops. In this section we explore whether the output costs are different among the sudden stops that lead to currency crises and the crises that are captured by various other common sudden stop and currency crises measures replicated in this paper. We calculate output costs associated

with each sample of crises using a method that is similar to one used by Hutchison and Noy (2006). There is substantial disagreement about how to measure output costs of crisis in the literature, but here we are interested in a relative output costs associated among the crisis types, rather than precise absolute values of GDP loss. Output growth rates are regressed on a crisis measure with two lags and two leads. Then changes in the coefficients are compared to see how average output growth changes around the crises.

For comparison purposes, we create the "twin crises" measure, which captures simultaneous occurrences of sudden stops and currency crises. Sudden stops that don't lead to currency crises are named as "sudden stops without currency crises." We use these two measures in the next section to find early warning signals that help distinguish among the two types of sudden stops from each other.

The results of output regressions are reported in table 5. Twin crises show on average a 6 percent decline per year in output growth rate during the crises years. Other sudden stop and currency crises measures show much smaller changes in output growth (between 1-3.5 percent).

Table 5. Summary Statistics of Output Growth Before and After Each Type of Crisis

Type of crisis	*t-2*	*t-1*	*t*	*t+1*	*t+2*
Twin Crises	2.17	-2.16	**-9.2*** **	1.95	0.27
CalvoSS	-0.07	-1.74***	-1.51**	0.54	1.52
EdwardsSS	1.32	-2.27**	-2.83**	1.65*	0.42
Currency Crises	1.73**	-1.63*	**-4.16*** **	1.97**	0.64

*significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

8. Early Warning Signals: Can We Predict the Severity of a Sudden Stop at the Time of Its Start? What Determines When You Have a Sudden Stop, But Not a Currency Crisis?

In principle, severe sudden stops could force the authorities to devalue the currency and sudden stops will be accompanied (or followed) by the currency crises. Let's examine the probability distributions of key macroeconomic variables separately at or before the twin crises and the episodes of the sudden stops without currency crises.

As we see from table 6, twin crises take place in countries with 4.3 percent current account deficit (at a median of the sample), while countries that experience only the sudden stops show nearly a balanced current account. Also twin crises arise in countries with high level of portfolio and bank flows. Two-tailed t-tests show that the means are significantly different (at 1% significance level) between the two samples for the portfolio and bank flows (measured by hot flows/GDP, see appendix B), and marginally significant (at 10.5% significance level) for current account deficits.

Table 6: The 50th Percentile Values of Key Variables at or Before the Start of Sudden Stops

Variable	*Twin Crises*	*Sudden Stops without Currency Crises*
Output Growth (t)	0.55%	5.19%
CA/GDP (t-1)	**-4.3%**	**-1.3%**
Exdebt/GDP(t-1)	47.5%	38.3%
RERappr(t-1)	-8.6%	-1.7%
Short-termDebt/GDP(t-1)	1.12	0.46
LendingBoom(t-1)	4.5%	1.9%
Res/GDP(t-1)	9.1%	15%
Hotflows/GDP(pr.3year.avg.)	**6.9%**	**1.6%**

9. Conclusion

The severity of recent balance-of-payments crises in the emerging markets and developing economies have generated enormous interest in understanding the nature of these crises and produce appropriate policy recommendations. One of the crucial issues in this area of research is to develop a sound methodology for crisis identification. In this paper we analyzed two types of commonly used crises measures: sudden stops and currency crises.

Empirical analysis on these measures shows that there is a substantial difference among the crises dates identified by different measures. Two-way frequency tables reveal that on average less than half of the sudden stops occur simultaneously with currency crises, while less than 60 percent of currency crises coincide with sudden stops. We also find that sudden stops are more likely to precede currency crises. Despite these distinctions, sudden stops and currency crises measures did not produce substantially different probit regression results. Current account deficits were consistently significant across all regressions.

The examination led us to group various sudden stop and currency crises episodes in the following categories: twin crises (sudden stops joined by currency crises) and sudden stops without currency crises. Twin crises show the highest output losses. In addition, empirical evidence suggests that high current account deficits, and excessive portfolio and bank flows could be used as early warning signals to predict twin crises.

Although it is tempting to look for the one best measure of crises, we think that the proper analysis should focus on how to use these different measures to understand the nature of the crises. Thus, sudden stop and currency crisis measures should be used as

complements, rather than substitutes. In other words, both types of measures could be useful to understand different features of the crisis episodes. More work is needed in this direction, but based on the analysis of temporal ordering of crisis events identified by different measures we saw that standard deviation based sudden stop measure is more useful in catching sudden and large capital flow changes early on, thus providing valuable information to manage the crises and possibly prevent their further spread.

Appendix A

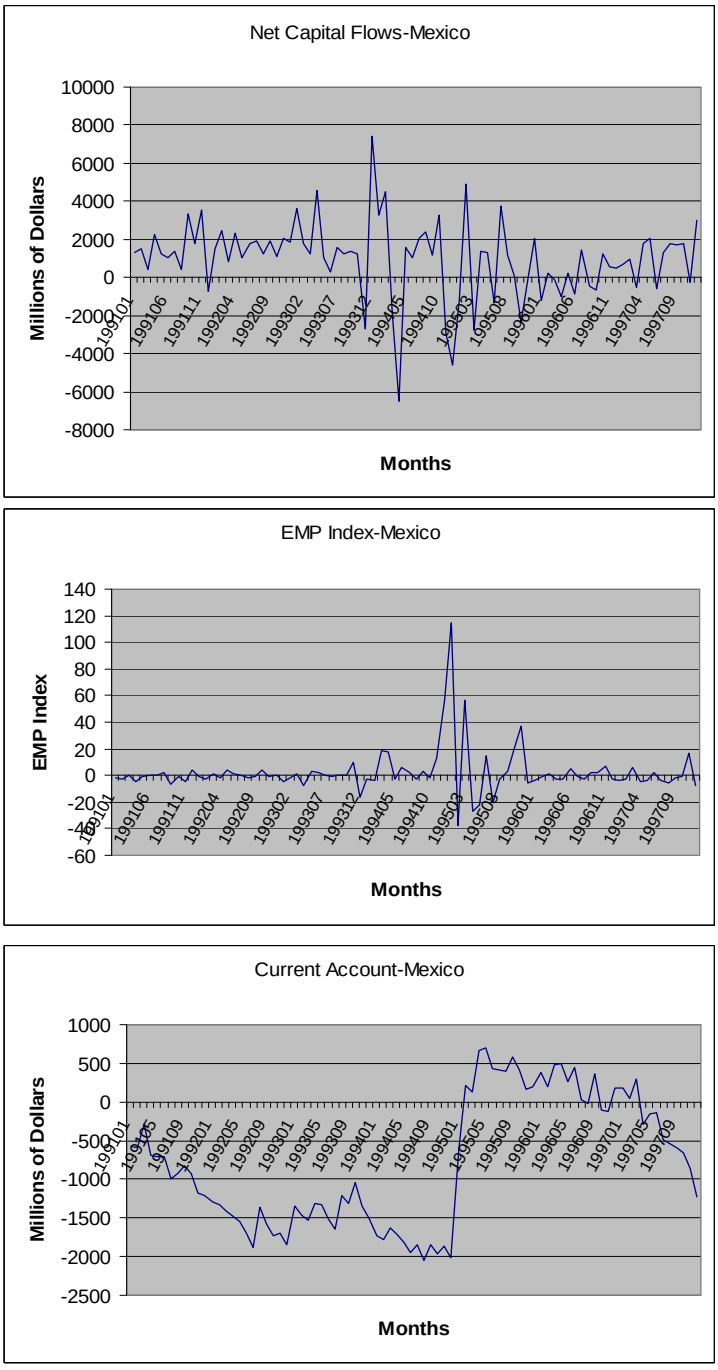

Figure A.1. The 1994 Crisis in Mexico.

Appendix B

List of Countries: 25 Emerging Market Countries (according to The Economist magazine classification)

Asia	Europe	Africa/Middle East	Latin America
China	Czech Republic	Egypt	Argentina
Hong Kong	Hungary	Israel	Brazil
India	Poland	South Africa	Chile
Indonesia	Russia		Colombia
Malaysia	Turkey		Mexico
Philippines			Peru
Singapore			Venezuela
South Korea			
Taiwan			
Thailand			

Appendix C

Description of Variables

Crises Variables

Sudden stop measures:

CalvoSS: The annual dummies are derived from monthly data. First monthly capital flow series are constructed by netting out monthly exports and imports from changes in monthly reserves. Then, sudden stop crisis is defined as a phase where year-on-year change in capital flows is at least two standard deviations below its sample mean. The sample is defined as a minimum of 24 months of previous observations. Once the sudden stop phase is detected then it is converted into a dummy variable with annual frequency.

CalvogdpdropSS: This variable is a product of CalvoSS and annual GDP drop dummy. Calvo et al. (2004) use this to capture only those capital flow reversals that are caused by adverse external shocks.

EdwardsSS: Based on annual capital account data. A sudden stop is defined as a fall in capital inflows of at least 5 percent of current year's GDP. Also the country should be receving positive capital inflows in the previous year.

Currency crisis measure:

Currency Crisis: Currency crisis dummies are constructed from "large" changes in an index of currency pressure, defined as a weighted average of monthly real exchange rate changes and monthly (percent) reserve losses. The weights are inversely related to the variance of changes of each component over the sample for each country. Annual Crises dummy takes the value of 1 if changes in the pressure index exceed the mean plus 2.5 times the country-specific standard deviation.

Explanatory Variables used in Crises Regressions

CA/GDP: current account balance as a percentage of gdp

RERAppr: three year percentage change in the real exchange rate. (An increase is depreciation)

LendingBoom (credit growth): Defined as the three year change in the banking sector credit to non-government sector divided by the GDP.

Short-termDebt/Res: Short-term debt as a percentage of reserves.

Exdebt/GDP: External debt as a percentage of gdp

ToT: Terms of trade index.

FDI/GDP: FDI flows as a percentage of current gdp

HotF/GDP: accumulated hot flows in the previous three years as a percentage of current gdp. Hot flows are portfolio flows and other investment (bank loans, etc…)

Res/GDP: reserves as a percentage of gdp

Appendix D

Table D.1. List of Crises in 25 Emerging Countries

Country	Year	Net Capital Flows			EMP
		Monthly Based		Yearly	Yearly
		CalvogdpdropSS	CalvoSS	EdwardsSS	Currency Crisis
Argentina	1994	-	1	-	-
	1995	1	1	-	-
	1999	1	1	-	-
	2000	1	1	-	-
	2001	1	1	1	-
	2002	1	1	-	-
Brazil	1992	1	1	-	-
	1993	-	1	-	-
	1995	-	1	-	-
	1996	-	1	-	-
	1997	-	1	-	-
	1998	-	1	-	1
	1999	-	1	-	1
	2000	-	1	-	-
	2002	-	-	1	-
	2003	-	1	-	-
Chile	1991	-	-	1	-
	1995	-	1	-	-
	1997	-	1	-	-
	1998	-	1	1	-
	1999	1	1	-	-
	2003	-	1	-	-
China	1992	-	1	-	1
	1994	-	-	-	1
	2003	-	1	-	-
Columbia	1995	-	1	-	-
	1996	-	1	-	-
	1997	-	1	-	1
	1998	-	-	-	1
	1999	1	1	-	1
	2002	-	-	-	1
Czech Republic	1996	-	-	1	-
	1997	1	1	1	-
	1999	-	-	-	1
	2000	-	1	-	-
	2003	-	1	1	-
Egypt	1991	-	-	-	1
	1996	-	1	-	-
	2002	-	1	-	-
Hong Kong	2001	-	-	1	-

Country	Year	Net Capital Flows			EMP
		Monthly Based		Yearly	Yearly
		CalvogdpdropSS	CalvoSS	EdwardsSS	Currency Crisis
Hungary	1991	-	-	-	1
	1994	-	1	1	-
	1995	-	1	-	-
	1996	-	1	1	-
	2001	-	1	-	-
India	1991	-	-	-	1
	1992	-	1	-	-
	1993	-	-	-	1
	1994	-	1	-	-
	1995	-	1	-	-
	1997	-	1	-	-
	1998	-	1	-	-
	2001	-	1	-	-
Indonesia	1992	-	1	-	-
	1997	-	1	1	1
	1998	1	1	-	1
	2000	-	1	-	-
	2001	-	1	-	-
Israel	1995	-	1	-	-
	1998	-	-	1	-
Korea	1990	-	1	-	-
	1992	-	1	-	-
	1993	-	1	-	-
	1995	-	1	-	-
	1996	-	1	-	-
	1997	-	1	1	1
	1998	-	-	-	1
	2001	-	1	-	-
Malaysia	1992	-	1	-	-
	1993	-	1	-	-
	1994	-	1	1	-
	1995	-	1	-	-
	1997	-	1	1	1
	1998	-	-	1	1
Mexico	1993	-	1	-	-
	1994	-	1	-	1
	1995	1	1	1	1
Peru	1990	-	-	-	1
	1992	1	1	-	-
	1995	-	1	-	-
	1997	-	1	-	-
	1998	1	1	1	-
	1999	-	1	-	-

(continued)

		Net Capital Flows			EMP
Country	Year	Monthly		Yearly	Yearly
		CalvogdpdropSS	CalvoSS	EdwardsSS	Currency Crisis
Philippines	1992	-	1	-	-
	1993	-	1	-	-
	1994	-	1	-	-
	1995	-	1	-	-
	1997	-	1	1	1
	1998	1	1	1	1
	1999	-	1	-	-
	2000	-	1	-	-
Poland	1990	-	-	-	1
	1994	-	-	1	-
	1996	-	1	-	-
	1997	-	1	-	-
	1998	-	1	-	-
	1999	-	1	-	-
	2000	-	1	-	-
	2003	-	1	-	-
Russia	1998	-	-	-	1
	1999	-	-	-	-
	2000	-	-	-	-
South Africa	1995	-	1	-	-
	1996	-	1	-	-
	1998	-	1	-	1
	2001	-	-	-	1
Singapore	1993	-	-	1	-
	1994	-	1	-	-
	1995	-	1	-	-
	1996	-	1	-	-
	1997	-	1	-	1
	1998	1	1	-	1
	1999	-	1	-	-
	2001	1	1	-	-
Thailand	1992	-	1	-	-
	1994	-	1	-	-
	1996	-	1	-	-
	1997	1	1	1	1
	1998	1	1	-	1
	2003	-	1	-	-

(continued)

		Net Capital Flows			EMP
Country	Year	Monthly		Yearly	Yearly
		CalvogdpdropSS	CalvoSS	EdwardsSS	Currency Crisis
Turkey	1993	-	1	-	-
	1994	1	1	1	1
	1995	-	1	-	-
	1997	-	1	-	-
	1998	-	1	-	-
	1999	1	1	-	-
	2001	1	1	1	1
	2002	-	1	-	-
Venezuela	1992	-	1	-	-
	1994	1	1	1	-
	1996	-	-	-	-
	1998	-	1	-	-
	1999	-	-	-	-
	2000	-	1	-	-
	2002	-	-	-	-

Table D.2. Correlation coefficients between crisis measures

(obs=261) *Variable*	CalvoSS (1.25SD)	CalvoSS (1.5SD)	CalvoSS (1.75SD)	CalvoSS (2SD)	EMP (eqw)	EMP (prw)	Edwards SS (3%)	Edwards SS (3%)	GDP drop
CalvoSS (1.25SD)	1.00								
CalvoSS (1.5SD)	0.82	1.00							
CalvoSS (1.75SD)	0.71	0.86	1.00						
CalvoSS (2SD)	0.62	0.75	0.86	1.00					
EMP(eqw)	**0.13**	**0.18**	**0.16**	**0.17**	1.00				
EMP(prw)	**0.13**	**0.14**	**0.12**	**0.16**	0.57	1.00			
EdwardsSS (3%)	0.21	0.26	0.21	0.25	**0.20**	**0.24**	1.00		
EdwardsSS (5%)	0.15	0.18	0.20	0.22	**0.22**	**0.23**	0.77	1.00	
GDPdrop	0.15	0.19	0.20	0.17	0.16	0.27	0.22	0.26	1.00

Table D.3. Correlation Coefficients between Explanatory Variables
(obs=206)

Variable	CA /GDP	Ext debt /GDP	RER appr	Sh. Deb /Res	Lend. boom	Res /GDP	ToT	Hot Flow 3y /GDP	FDI /GDP
CA/GDP	1.00								
Exdebt/GDP	0.22	1.00							
RERappr	0.29	0.42	1.00						
ShDebt/Res	-0.13	0.04	0.14	1.00					
Lendingboom	-0.38	-0.25	-0.26	0.09	1.00				
Res/GDP	0.26	0.33	0.04	-0.46	-0.07	1.00			
ToT	-0.21	-0.21	0.04	-0.04	0.12	0.17	1.00		
HotFlow3y/GDP	-0.06	0.04	0.04	-0.32	-0.10	0.47	0.18	1.00	
FDI/GDP	-0.70	-0.24	-0.27	0.13	0.41	-0.23	0.21	-0.20	1.00

Table D.4. Selected Crisis Countries

Country	*CalvoSS*	*EdwardsSS*	*CurrencyCrisis*
Mexico	1993, 1994	1995	1994, 1995
Thailand	1996, 1997, 1998	1997	1997, 1998
Korea	1996, 1997	1997	1997, 1998
Philippines	1997, 1998, 1999, 2000	1997, 1998	1997, 1998
Malaysia		1997, 1998	1997, 1998
Indonesia	1997, 1998	1997	1997, 1998

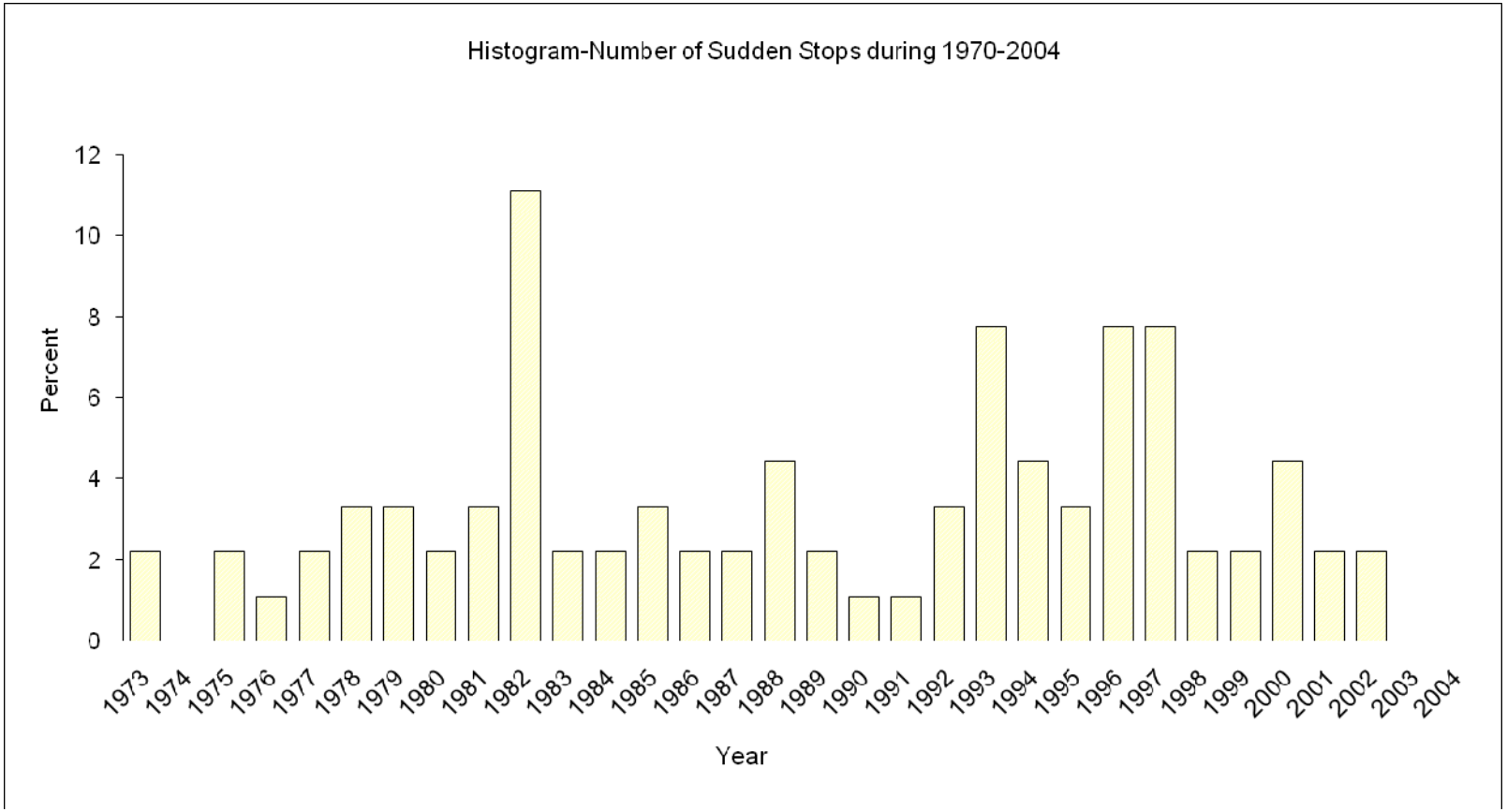

Figure E.1. Annual frequency of sudden stops in percentages, 1970-2004.

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