IDENTIFYING TYPES OF CRISIS: A COMPLEMENTARY APPROACH IN A LARGE-SAMPLE DATASET

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Abstract

Reflecting a stagnating nature in the empirical literature of currency crisis, a new but complementary approach featuring types of crisis is attempted instead of stereotyped multivariate ways. Tested here for identification are three kinds of assumed crisis-types among a large-sample dataset: [1] the chronic "high inflation gap (HIG)" type, [2] the "classical" type à la Krugman, and [3] the "foreign investment-led development (FID) " type, the last of which can be observed full-fledgedly in the East Asian countries with forerunners in the peripheral Europe.

Chapter 1
Introduction

It is one of the most urgent research themes in international finance today to diagnose currency crises and to make preemptive measures. However, both analytical and empirical studies of crisis have not adequately been developed as yet.

For example, Andrew K. Rose, creating the term "the crisis crisis" in his comments on Bordo, Eichengreen, Klingebiel and Martinez-Peria (2001), lamented that "Yet the huge amount of recent research has left us with remarkably few concrete results. ••• The crisis literature is in crisis. As a profession, we simply do not have a very good understanding of what causes crises (especially currency crises). We are therefore unable to provide policy-makers with good crisis prevention techniques, early warning systems, and so forth. Theory is ahead of empirics in this area of economics, but both are in terrible shape." (p.75). His comments unveil jitters of a leading economist that he cannot completely be satisfied with a great deal of compiled researches in both the analytical and empirical literature.

In the realm of analytical studies, a vanguard model was presented by Krugman (1979) in the late 1970s, which explained the crisis mechanism by using a factor set of chronic fiscal deficits, expanding money supply, declining international reserves and a fixed exchange rate system. This is called the first-generation model. Obstfeld (1986) suggested another possibility that currency crises could occur through self-fulfilling prophecies even without deteriorating fundamentals as developed in Krugman's model. This is labeled as the second-generation model. In turn, miscellaneous kinds of models presented after the onset of the European Currency Crisis (1992-93) are usually called the third-generation models[1].

In the empirical literature, on the other hand, a

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1 Among the leading third-generation modes are:
   - Gerlach and Smets (1995), which explains the contagion of crises through international trade linkages,
   - Krugman (1998), in which a host country gives implicit guarantees against inward investment and provides moral hazard to lenders, leading to the failure of reckless investment plans,
   - Chang and Velasco (1998), which emphasizes the role of mismatches in the balance sheets of financial institutions; mismatches in denominated currencies and those in maturities between assets and liabilities.
   Ito (1999) provides a brief review of the major theoretical models raised up until the first half of 1999.

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certain number of studies have been compiled that attempted to explain individual crises empirically conforming to specific theoretical models[2]. However, empirical analyses with large-sample datasets have just set out without having generated satisfactory results as yet, which resulted in Rose's jitters.

This paper is a preliminary work to open a new research paradigm by addressing the inherent problems in the traditional large-sample empirics. The key idea of this paper derives from the insight that, if one accepts the existence of multiple crisis types, as proposed by various theoretical studies to date, the uniform style of multivariate regression employed in the previous studies might not be appropriate.

Furthermore, large-sample studies have had a close methodological link with the "early warning system" literature, which explicitly aims at enhancing predictability of currency crises. Signaling a looming crisis properly could urge us to take preemptive measures. Therefore, upgrading predictability of crises by elaborating the approach extended here would surely contribute to advancing early warning system studies.

This paper is organized as follows. Chapter 2 briefly reviews the literature of large-sample empirics, summarizing common features and inherent problems. Chapter 3 identifies "currency crises" in a large-sample dataset for the period between 1970 and 2000, and presents regional and decadal features among identified "crises" while pointing out the intrinsic problems in identifying them. Chapter 4 attempts to separate out three types of crises in the identified "crises"; (i) "high inflation gap (HIG)" type, (ii) "classical" type à la Krugman (1979) and (iii) "foreign investment-led development(FID)" type. This is a tentative but promising methodology for crisis-type detection. The last chapter concludes with referring to remaining problems.

Chapter 2
Literature of Large-Sample Empirics and Unsolved Problems

Table 1 enlists major large-sample empirics. Pioneered by Eichengreen, Rose and Wyplosz (1995), this research field has not yet been cultivated for a long time and the outcome is limited. Major features among these empirics can be summarized as follows.

First, the country coverage, the period studied and the frequency of data varied substantially among studies. Eichengreen *et al*. (1995, 1996) limited the number of examined countries to only 20 developed ones. On the other hand, Frankel and Rose (1996) chose a much greater rank of 105 developing countries, including Portugal. The examined periods are also diverse, such as 1959~93 (Eichengreen *et al*. (1995, 1996)), 1971~92 (Frankel and Rose (1996)) and 1880~1998 (Bordo *et al*. (2001)). Data frequency is either annual (Frankel and Rose (1996), Bordo *et al*. (2001)) or quarterly (Eichengreen *et al*. (1995, 1996)), while Edison (2000), one of the influential early warning studies, used monthly data. This warns us against comparing these results incautiously in a panel.

Second, discriminating "crisis periods" from "tranquil periods" among a dataset, which is a fundamental process in all these empirics, cannot avoid the problem of arbitrarily adopted "crisis" thresholds[3]. The simplest "crisis" definition is one employed by Frankel and Rose (1996), which identifies "crises" exclusively by annual percentage changes of the nominal exchange rate. An advantage of this definition is that it can include dozens of developing countries into the analysis in that nominal exchange rate data is far more available than other economic data.

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2   Among well-known studies of individual crises are Eichengreen and Wyplosz (1993) for the ERM crisis, Sachs, Tornell and Velasco (1996) for the Mexican "meltdown," and Radelet and Sachs (2000) for the Asian "flu."

3   The term "currency crisis" contains an ambiguous and journalistic feeling, sending an alien smell as an economic jargon, for which logic strictness is usually required (similar sense of vagueness can be perceived in "banking crisis").

Table 1   Literature of Large-sample Empirics

Research	Eichengreen, Rose and Wyplosz (1995)
Period covered	1959~93 (quarterly data)
Countries covered	20 (developed) countries
Data sources	IMF *EAER (Exchange Arrangements and Exchange Restrictions)*
Crisis identification method	[1] Events by IMF *EARE*.
	[2] Crises are recognized in cases where a weighted average of nominal exchange rate, interest rate and foreign exchange reserve exceed a critical threshold (average + <standard deviation × 2>).
Number of identified crises	[1] 223 events (81 devaluations, 20 revaluations, 33 shifts to floating systems, 33 shifts to fixed systems, 56 other).
	[2] 79 crises.
Base currencies	Deutschmark

Research	Eichengreen, Rose and Wyplosz (1996)
Period covered	1959~93 (quarterly data)
Countries covered	20 (developed) countries
Data sources	IMF *IFS (International Financial Statistics)*
Crisis identification method	Crises are recognized in cases where a weighted average of nominal exchange rate, interest rate and foreign exchange reserve exceed a critical threshold (mean + <standard deviation × 1.5>).
Number of identified crises	77
Base currencies	Deutschmark

Research	Frankel and Rose (1996)
Period covered	1971~92 (annual data)
Countries covered	105 countries (developing countries except Portugal)
Data sources	Annual data by World Bank *World Data CD-ROM*
Crisis identification method	Annual depreciation of 25% or more in nominal exchange rate (and an increase of at least ten points on the preceding year in the rate of depreciation).
Number of identified crises	117
Base currencies	US Doller

Research	Bordo, Eichengreen, Klingebeil and Marinez-Peria (2001)
Period covered	1880~1998 (annual data)
Countries covered	1880~1972: 21 countries, 1973~1998: 56 countries
Data sources	See Bordo and Schwartz (1996) in detail.
Crisis identification method	Mixed method (EMP method + qualitative evidence)
Number of identified crises	[1] 1980~1913: 23, [2] 1919~1919: 48, [3] 1940~1971: 48, [4] 1972~1998: 163
Base currencies	British Pound to 1913, US Dollar thereafter
Others	Bank crises are counted separately, and are omitted here.

Research	Orii (2003, this paper)
Period covered	1970~2000 (annual data)
Countries covered	178 countries
Data sources	IMF *IFS* and World Bank *World Development Indicators*
Crisis identification method	Annual depreciation of 15% or more in nominal exchange rate (and an increase of at least ten percentage points on the preceding year in the rate of depreciation).
Number of identified crises	289
Base currencies	[1] Deutschmark for Europe (developed countries), [2] French Franc for 16 African countries, including the CFA Franc zone, [3] US Dollar elsewhere.

On the other hand, Eichengreen *at al.* (1995, 1996) and Bordo *et al.* (2001) adopted another popular option of the Exchange Market Pressure (EMP) for "crisis" identification. The EMP method has now become a standard method employed in the early warning system literature (see Edison (2000)[4]). An EMP is calculated as a weighted combination of changes in nominal exchange rates, foreign exchange reserves and nominal interest rates (or at least of the first two). A crisis is identified when thus calculated EMP exceeds a critical threshold value. The reason why fluctuations in foreign reserves or short-term interest rates are included in "crisis" identification is that we assume the possibility of unsuccessful speculative attacks on currencies which can be fended off at the expense of drying up reserves or raising short-term interest rates. On the other hand, one of the drawbacks in the EMP method lies in the fact that the data on foreign reserves and domestic interest rates are less available in developing countries than in developed countries, which severely restricts the number of countries and time periods for which "crises" can be identified. The second disadvantage refers to the "sample dependency" problem in crisis identification: a "crisis" identified in a certain dataset may not be recognized as "crisis" in an extended or shortened dataset of the same country (see Edison (2000)).

Third, a critical threshold must be decided in identifying "crisis," whether decided by a univariate way (à la Frankel and Rose (1996)) or by a multivariate way (the EMP method). The common methodology is to identify "crises" when an index exceeds a threshold. However, the reason why the threshold was chosen is, in usual cases, not adequately explained like an opaque "black box"[5]. In the individual case studies of crisis such as the Mexican or the Thai

Currency Crises, the researchers recognized the concerning event *a priori* as a "crisis" without being annoyed with crisis criterion problem. However, in large-sample emprics, it has now become a standard process to set a threshold at first for "crisis" identification, regardless of whatever arbitrarily the threshold setting seems to be.

Fourth, thus binomially identified "crisis (periods)" and "tranquil (periods)" are usually thrown into regression analyses as dependent variables for detecting significant regressors. Frequently employed econometric methods are multivariate Logit or Probit analysis. Through regressions, Eichengreen *et al.* (1995, Logit), who addressed crises in developed countries, have detected past experiences of crises, capital controls, money supply, inflation rate, fiscal and current account balances as significant factors. On the other hand, Frankel and Rose (1996, Probit) found FDI (foreign direct investment), foreign reserves, domestic credit, growth rates and overseas interest rates as relevant.

This methodology is, at least, convenient for finding significant determinants. However, there are qualifications in them: while theoretical models are referred to in choosing candidate regressors, they tend to be selected arbitrarily, and multivariate analyses cannot tell any causal relationship between independent factors[6].

Fifth, the problem of selecting base currencies is relevant. Eichengreen *et al.* (1995) examined crises in developed countries by choosing the Deutschmark as the base currency, while Frankel and Rose (1996) analyzed those in developing countries by selecting the US Dollar. More careful consideration will be required in choosing base currencies in analyses with larger sample datasets.

It can be concluded here that the methodology

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4   Edison (2000) identified crises in 20 countries (developing countries) by monthly data between 1970 and 1999. Edison used the EMP method, but due to the low availability of interest rate data, he used two variables in identifying crises; nominal exchange rates and foreign reserves.

5   In identifying a "crisis" in the country i at the period t, Eichengreen et al. (1995) adopted the EMP (Exchange Market Pressure) method. If the EMP at the period of t satisfies the condition $EMP_{i,t} > 2\sigma_{EMP} + \mu_{EMP}$ (where μ_{EMP} is the sample mean of EMPs and σ_{EMP} is the standard deviation), he identified the period as a "crisis." However, Eichengreen *et al.* (1996) defines a "crisis" with a smaller standard deviation as $EMP_{i,t} > 1.5\sigma_{EMP} + \mu_{EMP}$.

6   Frankel and Rose (1996) admitted that the selection of determinants in econometric analysis is prone to arbitrariness. They also recognized that the problem of multicolinearity could emerge because the structural relationships between the factors were not contemplated.

of large-sample empirics has yet to be elaborated. Trial and errors are still under way.

Chapter 3
Identification of Currency Crises

1. Criteria for Identifying a Crisis

As we saw in the previous chapter, deciding a threshold for identifying "crises" is problematic since it tends to be selected arbitrarily. However, under the current analytical framework, adopting a certain kind of process for discriminating "crisis periods" from "non-crisis periods" is indispensable, whatever the threshold seems arbitrary.

In identifying "crises," we herein follow Frankel and Rose (1996), which recognizes "crises" exclusively by the extent of nominal depreciation. Their method is adpoted in consideration of higher extent of accessibility to the nominal exchange rate data, which enables us to cover a wider range of countries. However, the critical threshold is relaxed here compared to the original criteria in Frankel and Rose (1996); depreciation of at least 15%, in addition to more than ten percentage points acceleration in the rate of depreciation compared to the preceding year. Thus, when S_t, the nominal exchange rate (denominated on the home currency) at the term t, satisfies both the following conditions,

$$\ln S_t - \ln S_{t-1} > 0.15 \tag{1}$$
$$(\ln S_t - \ln S_{t-1}) > (\ln S_{t-1} - \ln S_{t-2}) + 0.1 \tag{2},$$

the period t is identified "crisis[7]." As for a "crisis window," the same standard as in Frankel and Rose (1996), in which no new crisis is identified for the three consecutive years after a "crisis" is recognized, is applied.

The critical threshold is relaxed to 15% because, with the original critical threshold of 25% in Frankel and Rose (1996), several of the typical crises in Europe and East Asia in the 1990s would be excluded from "crises." Under the 25% criterion, neither the ERM countries in 1992~93 nor Thailand in 1997~98 is identified as a "crisis." When the criterion is relaxed to 20%, Sweden (1993) and Thailand (1997) join "crises." With the value further reduced to 15%, the "crisis" list expands to include Finland (1992), Italy (1993) and Spain (1993). Considering that the literature employing the EMP method usually identified these events as "crises," relaxing this criterion to 15% should be rendered relevant[8].

Base currencies adopted here are a hybrid of Eichengreen *et al.* (1995) and Frankel and Rose (1996). The Deutschmark is chosen for the European developed economies and the US while the US Dollar is, in principle, selected for the rest of developed countries (Australia, Canada, Japan and New Zealand) and the most developing countries. Meanwhile, the French Franc is applied for CFA Franc zone countries in Africa[9], considering their firm economic ties with France.

The data were taken from the International Financial Statistics CD-ROM of the IMF, using period averages of exchange rate (the IFS line rf.) as adopted in Frankel and Rose (1996).

2. Results of Crisis Identification

Table 2 reports annual depreciations (appreciations, for negative figures) for the 178 countries (including regions, hereafter), and identified "crises." Table 3 and Figure 1 aggregate thus identified "crises" by region and by period.

A total of 289 crises are identified between 1970 and 2000 with a frequency of nine crises per annum

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7   The annual exchange rate variation (%) is calculated by approximation ($\ln S_t - \ln S_{t-1} \approx \frac{S_t}{S_{t-1}} - 1$). Positive values stand for nominal depreciations, and negative ones for nominal appreciations. However, note that the wider the range of exchange rate variation, the greater the divergence from ($\frac{S_t}{S_{t-1}} - 1$) (%).

8   Bordo *et al.* (2001), who employed the EMP method, identified crises in nine European countries in 1992~93; Denmark, Finland, France, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom. In East Asia in 1997~98, they identified crises in Indonesia, South Korea, Malaysia, the Philippines, Singapore and Thailand.

9   Include are 14 countries in the CFA Franc zone (Benin, Burkina Faso, Cameroon, Chad, Central African Republic, Republic of Congo, Cote D'Ivoire, Equatorial Guinea, Gabon, Guinea Bissau, Mali, Niger, Senegal, Togo), as well as Morocco and Madagascar.

Table 2   Annual Depreciation and the "Crises" Identified

Definition of a "crisis":   At least 15% annual depreciation in the nominal exchange rate, and with an acceleration of depreciation rate with more than ten percentage points higher than the preceding year. However, after one "crisis," no new one can be identified for the following three years ("crisis window"). In the years when acceleration data are not available, a "crisis" is identified exclusively by annual depreciation data.

Plus (+) stands for nominal depreciation, while minus (-) does nominal appreciation (units: %). Shadowed brackets represent depreciation of at least 15% on the preceding year, and years in bold letters are those identified as "crises."

Developed Countries

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
USA	DM		United States	1986	1990				4.3	9.5	17.7	3.2	5.1	−2.3	8.1	14.5	9.2
GER			Germany	1981					−4.3	−9.5	−17.7	−3.2	−5.1	2.3	−8.1	−14.5	−9.2
JPN			Japan						−2.6	−14.6	−11.0	7.2	1.6	−0.1	−9.9	−24.4	4.1
CAN			Canada						−3.4	−2.0	1.0	−2.2	3.9	−3.1	7.6	7.0	2.7
AUS			Austraila	1985	1998				−1.1	−5.1	−17.6	−1.0	9.2	6.9	9.7	−3.2	2.4
NZL			New Zealand	1975	1998				−1.4	−5.1	−12.7	−2.9	15.1	18.8	2.5	−6.6	1.4
AUT	DM		Austria						0.3	1.7	1.1	−1.4	−2.0	0.6	−0.1	1.6	0.9
BEL	DM		Belgium						2.4	−1.3	5.5	3.2	−0.7	2.5	0.7	1.6	2.0
DEN	DM		Denmark						3.3	2.9	3.8	4.0	−|0.8	2.8	7.4	6.0	4.4
FIN	DM		Finland	1992					3.9	8.6	9.5	2.0	2.5	2.6	12.3	16.7	3.0
FRA	DM		France						4.0	0.1	5.2	10.9	−6.4	9.0	10.2	6.2	3.3
GRE	DM		Greece	1986					4.3	9.5	16.4	4.5	11.7	10.7	9.0	14.3	10.0
ISL	DM		Iceland	1973	1978	1982			4.3	9.8	19.8	13.6	48.1	14.7	16.9	45.5	35.4
IRE	DM		Ireland	1973					2.9	6.9	19.6	7.9	10.6	18.5	11.1	5.0	2.6
ITA	DM		Italy	1973	1993				3.5	3.4	17.6	14.	2 5.4	22.0	13.9	10.6	7.0
LUX	DM		Luxemburg						2.0	−0.9	5.5	3.2	−0.7	2.5	0.7	1.6	2.0
NED	DM		Netherlands						1.4	0.4	3.8	−0.7	−1.1	2.1	0.7	1.9	1.6
NOR	DM		Norway	1986					3.0	2.7	4.3	−0.8	−0.8	2.0	5.6	13.0	5.7
POR	DM	*	Portugal	1977	1982				2.9	4.8	7.8	6.8	5.6	14.5	31.7	28.3	19.9
ESP	DM		Spain	1983	1993				3.5	1.8	7.8	2.2	4.6	13.0	20.8	15.4	−4.1
SWE	DM		Sweden	1993					3.3	2.2	9.0	4.9	−1.6	2.5	10.9	15.3	3.9
SUI	DM		Switzerland						−1.4	1.6	−1.1	−2.8	−9.3	−5.5	4.2	−15.1	1.9
GBR	DM		United Kingdom	1973	1986				2.9	6.9	19.6	7.9	10.6	18.5	11.1	5.0	−0.8

Developing Countries
Asia

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
BAN		*	Bangladesh	1975	1981				...	−2.2	1.9	4.7	39.3	24.4	0.2	−2.4	3.5
BHU		*	Bhutan	1991					−0.1	1.4	1.9	4.5	3.3	6.7	−2.5	−6.4	−0.8
CAM		*	Cambodia	1971	1993	1998			31.1	76.1	4 1 .2	...	...	...	...	...	...
CHN		*	China	1984	1990	1994			0.0	−9.2	−12.1	−1.4	−5.3	4.3	−4.4	−9.8	−7.9
HKG			Hong Kong						−1.4	−5.8	−9.2	−2.3	−1.9	−0.6	−5.1	0.5	6.6
FIJ		*	Fiji	1998					−1.4	−4.0	−3.8	1.4	2.0	8.8	2.2	−8.0	−1.3
IND		*	India	1991					−0.1	1.4	1.9	4.5	3.3	6.7	−2.5	−6.4	−0.8
INA		*	Indonesia	1979	1983	1987	1997		7.7	5.7	0.0	0.0	0.0	0.0	0.0	6.3	34.3
KOR		*	Korea	1975	1980	1997			11.1	12.4	1.4	1.5	18.0	0.0	0.0	0.0	0.0
LAO		*	Lao PDR	1972	1978	1985	1997		0.0	75.4	16.3	0.0	18.9	−52.4	−76.4	51.1	9.8
MAS		*	Malaysia	1998					−0.3	−7.9	−14.3	−1.5	−0.6	6.0	−3.2	−6.1	−5.7
MDV		*	Maldives	1975	1987				−0.3	−7.9	−9.3	−1.4	38.3	37.2	4.7	2.3	−18.0
MGL		*	Mongolia	1992	1996				...	...	...	...	...	...	...	...	...
MYA		*	Myanmar	1975					0.1	13.6	−10.2	−1.4	27.0	6.1	5.1	−3.4	−3.4
NEP		*	Nepal	1991					0.0	0.0	3.4	0.8	4.1	12.8	0.0	−3.2	−0.9
PAK		*	Pakistan	1972	1982				0.0	59.7	14.0	−0.9	0.0	0.0	0.0	0.0	0.0
PNG		*	Papua New Guinea	1995					−1.1	−5.6	−17.1	−1.1	9.2	3.7	−0.2	−11.0	0.4
PHI		*	Philippines	1983	1998				8.6	3.7	1.2	0.5	6.6	2.6	−0.5	−0.5	0.2
SAM		*	Samoa	1976					−0.3	−6.2	−9.4	−1.4	4.2	22.9	−1.2	−6.5	11.5
SIN			Singapore						−0.3	−8.1	−13.5	−0.8	−2.7	4.1	−1.3	−7.0	−4.5
SOL		*	Solomon Islands	1998					−1.3	−5.2	−17.3	−0.9	9.0	6.9	9.7	−3.2	−0.9
SRI		*	Sri Lanka	1976					−0.3	0.6	7.0	3.8	5.2	18.3	5.3	56.5	−0.2
THA			Thailand	1997					0.0	0.0	−0.9	−1.2	0.0	0.1	0.0	−0.3	0.4
TGA			Tonga	1985	1998				−1.4	−7.2	−15.1	−1.2	9.3	6.9	9.8	−3.2	2.4
TUR		*	Turkey	1971	1978	1984	1988	1994	26.3	−5.6	0.0	−1.6	3.6	10.6	11.5	29.9	24.7
VAN		*	Vanuatu	1981					−0.3	−21.0	−12.5	7.7	−11.6	10.9	2.8	−8.5	−5.9
VIE			Vietnam	1987	1991				...	...	...	...	...	...	...	...	...

Middle East

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
BRN			Bahrain						−0.3	−7.9	−9.3	−1.2	0.2	0.0	0.0	−2.1	−1.5
EGY		*	Egypt	1979	1989				0.0	0.0	8.9	1.7	0.0	0.0	0.0	0.0	58.2
IRI		*	Iran	1993					0.0	0.0	−9.5	−1.8	0.0	3.7	0.6	−0.2	0.0
IRQ			Iraq						−1.0	−6.0	−9.5	−2.5	0.0	0.0	0.0	0.0	0.0
ISR			Israel	1971	1975	1980	1984	1989	18.2	−0.5	0.4	5.9	35.3	22.4	27.6	51.2	37.6
JOR		*	Jordan	1989					0.0	0.0	−8.3	−2.0	−0.7	3.7	−0.8	7.5	1.7
KUW			Kuwait						−0.3	−7.9	−10.4	−1.2	−1.1	0.8	−2.0	−4.1	0.5
LIB		*	Lebanon	1981	1985	1990			−1.3	−5.6	−15.6	−11.5	−1.1	22.1	6.6	−3.8	9.3
LBA			Libya	1999					−0.2	−8.0	−9.2	−1.3	0.0	0.0	0.0	0.0	0.0
OMA		*	Oman						−0.3	−7.9	−9.0	−1.5	0.0	0.0	0.0	0.0	0.0
QTA			Qatar						−0.3	−7.9	−9.3	−1.2	−0.4	0.8	−0.1	−2.1	−2.7
KSA			Saudi Arabia						−0.3	−7.9	−11.2	−4.3	−0.9	0.4	−0.1	−3.6	−1.1
SYR		*	Syrian Arab Republic	1988					0.0	0.0	0.1	−2.4	−0.9	4.0	1.9	0.0	0.0
UAE			United Arab Emirates						−0.3	−7.9	−9.3	−0.9	0.1	−0.2	−1.3	−0.8	−1.4
YEM		*	Yemen,Rep.	1995					...	...	...	...	...	...	...	...	...

Africa

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
ALG		*	Algeria	1988	1994				−0.5	−9.2	−12.3	5.4	−5.7	5.3	−0.4	−4.5	−2.9
ANG			Angola	1991	1995	1999			−1.5	−4.1	−9.9	3.6	0.6	14.0	1.8	0.0	0.0
BEN	FF	*	Benin	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
BOT	FF	*	Botswana	1982	1996				0.1	7.2	10.2	−2.1	8.5	16.2	−3.2	−1.7	−1.6
BUR	FF	*	Burkina Faso	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
BDI	FF	*	Burundi	1984	1996				0.0	0.0	−8.9	−1.6	0.0	9.1	4.3	0.0	0.0
CMR	FF	*	Cameroon	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
CPV		*	Cape Verde	1976	1981	1993			−1.4	−4.7	−9.9	3.6	0.5	16.8	11.9	4.2	5.3
CAF	FF	*	Central African Republic	1994					0.0	0.4	0.2	0.0	0.1	0.5	0.7	−0.2	0.0
CHA	FF	*	Chad	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
COM	FF	*	Comoros	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
CGO	FF	*	Congo,Republic of	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
CIV	FF	*	Cote d'Ivoire	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
DJI		*	Djibouti						−0.3	−7.9	−9.3	−1.2	0.0	0.0	0.0	0.0	0.0
GEQ	FF	*	Equatorial Guinea	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
ETH		*	Ethiopia	1992					−0.3	−8.1	−9.2	−1.4	0.0	0.0	0.0	0.0	0.0
GAB	FF	*	Gabon	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
GAM		*	Gambia,The	1976	1984				−1.4	−2.6	−16.2	0.5	5.5	20.8	3.0	−9.5	−9.9
GHA		*	Ghana	1972	1978	1983	1993	2000	1.4	25.3	−13.5	−1.3	0.0	0.0	0.0	42.8	44.4
GUI			Guinea	1986	2000				−0.3	−7.9	−9.3	−0.8	0.6	3.4	−1.1	−7.0	−3.2
GBS	FF	*	Guinea- Bissau	1984	1991	1995			−1.1	4.7	2.6	−4.1	12.0	5.5	8.6	12.4	3.1
KEN		*	Kenya	1981	1993	1999			0.0	0.0	−1.7	1.7	2.8	13.1	−1.1	−6.8	−3.3
LES		*	Lesotho	1982	1996				0.1	7.2	10.2	−2.1	8.5	16.2	0.0	0.0	−3.2
LBR		*	Liberia	1998					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAD	FF	*	Madagascar	1986	1994				0.0	0.0	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0
MAW		*	Malawi	1992	1998				−0.3	−3.6	2.2	2.6	2.7	5.5	−1.1	−6.8	−3.2
MLI	FF	*	Mali	1994					0.0	0.4	0.2	0.0	−0.1	−0.5	0.7	−0.2	0.0

(Unit: %)

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
0.8	−21.8	−7.1	−5.1	−10.9	−3.4	**30.4**	18.9	2.3	−6.8	**15.2**	−2.7	6.1	−5.7	1.9	12.4	−4.9	−14.2	−1.5	−4.2	−14.5	USA
−0.8	**21.8**	7.1	5.1	10.9	3.4	−30.4	−18.9	−2.3	6.8	−15.2	2.7	−6.1	5.7	−1.9	−12.4	4.9	14.2	1.5	4.2	14.5	GER
3.4	−2.8	12.2	−4.8	0.0	0.4	−34.7	−15.3	−12.1	7.4	4.8	−7.2	−6.2	−13.0	−8.4	−8.3	14.5	10.6	7.9	−13.9	−5.5	JPN
−0.2	2.5	2.9	−0.1	5.0	5.3	1.7	−4.7	−7.5	−3.9	−1.5	−1.8	5.4	6.5	5.7	0.5	−0.7	1.5	6.9	0.2	0.0	CAN
−1.8	−0.9	12.5	11.9	2.6	**22.8**	4.4	−4.6	−11.0	−1.2	1.3	0.2	5.9	7.7	−7.2	−1.4	−5.4	5.3	**16.7**	−2.7	10.7	AUS
4.8	11.6	14.5	11.6	**16.4**	13.7	−5.6	−12.1	−10.5	9.1	0.2	3.4	7.1	−0.6	−9.3	−10.1	−4.6	3.9	**21.1**	1.1	15.3	NZL
−2.4	−1.0	−0.2	0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	−0.1	0.0	0.0	0.0	0.0	0.0	AUT
0.6	2.1	13.6	6.2	1.4	−0.7	2.0	1.0	0.8	0.1	−1.3	−0.5	0.0	1.6	−1.5	−0.2	0.0	0.3	0.0	0.0	0.0	BEL
7.7	1.6	8.6	4.2	1.6	−1.1	3.5	2.1	0.7	1.4	−1.5	0.6	0.3	1.5	−0.1	−0.3	−1.4	−1.2	0.0	−0.2	0.2	DEN
−3.5	−7.2	4.0	9.4	−3.3	−0.3	10.3	4.6	−2.6	−4.3	3.6	2.9	**16.3**	18.6	−7.1	−5.5	0.2	−1.9	1.4	0.1	0.0	FIN
0.2	3.4	11.9	9.7	2.8	−0.6	4.4	4.7	1.4	0.1	−0.7	0.9	−0.3	1.0	−0.1	1.8	−2.4	−1.0	−0.4	0.0	0.0	FRA
14.9	4.5	11.6	22.5	13.8	16.9	**31.8**	15.6	7.0	6.7	12.7	11.3	10.6	12.7	7.5	7.8	−1.0	−1.6	6.4	−0.9	3.3	GRE
31.6	19.2	**46.5**	64.8	13.5	23.6	29.5	12.8	12.9	21.4	17.3	−1.5	3.6	10.4	5.3	4.6	−2.1	−7.8	−1.4	−2.3	−6.2	ISL
0.4	2.6	5.5	8.2	2.8	−0.9	6.3	9.0	−0.2	0.4	−0.3	0.1	0.5	8.5	0.6	5.5	−4.7	−8.8	4.8	0.9	0.0	IRE
3.9	6.5	10.3	6.5	3.7	4.9	5.7	4.9	2.7	−1.5	1.6	0.8	5.4	**18.7**	4.3	13.4	−10.3	−4.3	0.5	0.3	0.0	ITA
0.6	2.1	13.6	6.2	1.4	−0.7	2.0	1.0	0.8	0.1	−1.3	−0.5	0.0	1.6	−1.5	−0.2	0.0	0.3	0.0	0.0	0.0	LUX
−0.1	0.9	−0.3	1.6	0.9	0.1	0.0	−0.1	−0.1	0.2	−0.1	0.0	−0.1	−0.2	−0.2	−0.1	0.0	0.4	0.2	−0.1	0.0	NED
−1.7	−6.8	4.6	7.2	0.4	1.8	**15.4**	9.6	−1.0	−1.0	5.3	0.8	1.9	7.5	1.3	1.6	−3.1	−5.0	5.0	−0.9	−2.4	NOR
3.1	−1.1	**18.5**	28.1	17.0	11.8	17.4	12.9	4.5	2.2	5.2	−1.3	−0.7	11.8	5.0	3.0	−2.8	−1.4	1.2	0.2	0.0	POR
7.4	3.5	10.3	**21.6**	0.6	2.2	11.0	6.3	−3.5	−5.2	0.2	−0.8	4.6	**16.1**	7.0	5.3	−3.3	0.3	0.5	0.2	0.0	ESP
−0.5	−3.8	14.5	14.8	−3.3	0.6	11.6	7.3	−1.1	−1.7	6.6	−0.5	2.3	**23.3**	1.0	4.6	−11.1	−1.2	2.6	−0.4	−4.2	SWE
1.6	−5.9	−3.8	−1.8	0.4	1.1	−0.7	0.1	0.4	4.3	−1.2	0.5	4.1	−0.8	−5.9	−2.1	−0.4	1.9	−1.6	−0.7	−2.8	SUI
−8.5	−7.2	6.9	9.1	2.2	0.2	**17.1**	8.0	−6.2	1.5	7.0	−2.0	6.6	10.0	−0.2	9.4	−3.7	−19.0	−2.6	−1.9	−7.8	GBR

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
−0.6	**15.2**	20.7	10.7	3.0	9.9	8.3	1.8	2.5	1.7	6.9	5.7	6.2	1.6	1.6	0.2	3.7	4.9	6.6	4.5	6.0	BAN
−3.3	9.6	8.8	6.6	11.8	8.5	1.9	2.7	7.1	15.3	7.6	**26.2**	13.1	16.3	2.8	3.3	8.9	2.5	12.8	4.3	4.3	BHU
...	...	...	...	...	...	...	...	...	...	...	...	...	75.3	−5.5	−3.8	−6.8	11.6	24.0	1.7	0.9	CAM
−3.7	12.9	10.5	4.3	**16.1**	23.6	16.2	7.5	0.0	1.1	**23.9**	10.7	3.5	4.4	40.3	−3.2	−0.4	−0.3	−0.1	1.7	0.9	CHN
−0.5	11.6	8.2	18.0	7.3	−0.3	0.2	−0.1	0.1	−0.1	−0.1	−0.2	−0.4	−0.1	−0.1	0.1	0.0	0.1	0.0	0.2	0.4	HKG
−2.2	4.4	8.7	8.7	6.2	6.3	−1.8	9.3	14.0	3.6	−0.2	−0.4	1.8	2.5	−5.2	−4.0	−0.2	2.8	**31.9**	−0.9	7.8	FIJ
−3.3	9.6	8.8	6.6	11.8	8.5	1.9	2.7	7.1	15.3	7.6	**26.2**	13.1	16.3	2.8	3.3	8.9	2.5	12.8	4.3	4.3	IND
0.6	0.8	4.6	**31.8**	12.1	7.9	14.4	**24.8**	2.5	4.9	4.0	5.7	4.0	2.8	3.5	4.0	4.1	**21.7**	123.6	−24.3	7.0	INA
22.7	11.4	7.1	5.9	3.8	7.6	1.3	−6.9	−11.7	−8.6	5.3	3.6	6.3	2.8	0.1	−4.1	4.2	**16.8**	38.7	−16.5	−5.0	KOR
−360.4	77.3	48.0	0.0	0.0	**45.2**	54.7	68.0	75.9	39.0	17.9	−0.8	2.0	0.0	0.2	11.4	13.5	**31.3**	96.2	76.7	10.5	LAO
−0.5	5.7	1.3	−0.6	1.0	5.8	3.9	−2.4	3.9	3.4	−0.1	1.7	−7.7	1.0	1.9	−4.7	0.5	11.2	**33.3**	−3.2	0.0	MAS
0.8	0.0	−5.1	−1.7	0.0	0.7	0.7	**25.4**	−4.9	2.9	5.5	7.1	3.0	3.6	5.6	1.6	0.0	0.0	0.0	0.0	0.0	MDV
...	...	...	...	...	...	...	...	...	...	...	...	149.8	...	...	8.3	**20.1**	36.5	6.2	19.5	5.2	MGL
−0.8	9.8	6.8	3.1	4.3	1.1	−14.5	−9.7	−4.0	4.7	−5.6	−0.9	−2.9	0.9	−3.0	−5.3	4.3	5.3	1.6	−0.9	3.6	MYA
0.0	2.8	7.1	9.4	12.4	10.3	15.1	2.7	6.5	15.5	7.7	**23.8**	13.7	12.9	1.6	4.9	8.9	2.3	12.9	3.4	4.1	NEP
0.0	0.0	**18.0**	10.2	6.8	12.6	4.4	4.4	3.4	13.2	5.5	9.2	5.2	11.4	8.4	3.5	13.1	13.1	9.4	8.9	7.3	PAK
−5.9	0.3	9.3	12.4	7.2	10.7	−2.9	−6.8	−4.6	−1.0	10.6	−0.3	1.4	1.4	3.3	**23.5**	3.0	8.6	36.6	21.5	7.9	PNG
1.8	5.0	7.8	**26.3**	40.7	10.8	9.1	0.9	2.5	3.0	11.2	12.2	−7.4	6.1	−2.6	−2.7	1.9	11.7	**32.8**	−4.5	12.3	PHI
10.7	11.8	**15.5**	24.9	18.4	18.7	−0.4	−5.2	−2.0	8.7	1.7	3.8	2.7	4.1	−1.3	−2.5	−0.5	3.9	14.1	2.2	8.7	SAM
−1.5	−1.3	1.3	−1.3	0.9	3.1	−1.0	−3.3	−4.5	−3.1	−7.3	−4.8	−5.9	−0.8	−5.6	−7.5	−0.5	5.2	12.0	1.3	1.7	SIN
−4.3	4.7	11.0	16.8	10.3	15.1	16.2	14.0	3.9	9.6	9.8	7.1	7.6	8.5	3.2	3.4	4.6	4.1	**25.9**	0.5	5.1	SOL
6.0	**15.2**	7.8	12.3	7.8	6.6	3.1	5.0	7.7	12.5	10.6	3.2	5.8	9.8	2.2	3.6	7.6	6.6	8.8	9.2	8.6	SRI
0.3	6.4	5.3	0.0	2.7	13.9	−3.2	−2.2	−1.7	1.6	−0.5	−0.3	−0.5	−0.3	−0.7	−0.9	1.7	**21.3**	27.7	−9.0	5.9	THA
−1.9	−0.9	12.5	11.8	2.6	**22.8**	4.4	−4.6	−11.3	−1.1	1.5	1.2	3.9	2.7	−4.7	−3.8	−3.1	2.5	**16.6**	6.9	9.5	TGA
89.5	38.0	38.0	32.7	**48.6**	35.3	25.6	24.0	**50.6**	40.0	20.7	47.0	49.9	46.9	99.2	43.7	57.4	62.4	54.0	47.4	40.1	TUR
−0.7	**25.2**	9.1	3.2	−0.1	6.6	0.0	3.5	−5.1	10.5	0.9	−4.7	1.5	7.0	−4.4	−3.8	−0.4	3.7	9.6	1.2	6.4	VAN
...	...	...	...	...	...	...	123.6	204.7	199.6	37.3	**43.7**	11.0	−5.1	3.0	0.7	−0.1	5.7	12.7	5.0	1.6	VIE

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
−1.2	−0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BRN
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.4	58.1	70.5	5.7	0.9	1.0	0.2	0.0	−0.1	0.0	0.2	2.2	EGY
0.2	10.4	6.5	3.2	4.2	1.1	−14.5	−9.7	−4.0	4.7	−5.6	−0.9	−2.9	**296.2**	32.2	0.0	0.2	0.1	−0.1	0.1	0.7	IRI
0.0	0.0	1.1	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	IRQ
70.2	80.2	75.3	84.0	165.2	139.1	23.3	6.9	0.3	**18.1**	5.1	12.3	7.6	14.1	6.2	0.0	5.8	7.8	9.7	8.6	−1.5	ISR
−0.8	10.4	6.5	3.0	5.7	2.6	−12.0	−3.3	10.1	4.2	**42.9**	14.4	2.6	−0.2	1.9	0.8	0.2	1.2	0.0	0.0	0.0	JOR
−2.2	3.1	3.2	1.2	1.6	1.6	−3.4	−4.2	0.1	5.2	−1.8	−1.5	3.1	2.9	−1.7	0.5	0.3	1.3	0.5	−0.1	0.8	KUW
5.8	**22.7**	9.5	−4.6	36.3	92.5	84.9	176.7	60.0	19.4	**33.6**	28.9	61.3	1.7	−3.6	−3.6	−3.1	−2.1	−1.5	−0.5	0.0	LIB
0.0	0.0	0.0	0.0	0.0	0.0	0.0	−0.4	−3.2	4.7	−5.6	−0.9	1.4	6.9	5.0	7.6	4.4	5.4	3.1	**23.8**	2.0	LBA
0.0	0.0	0.0	0.0	0.0	0.0	10.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OMA
−3.1	−0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	QTA
−1.0	1.7	1.3	0.8	2.0	2.8	2.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	KSA
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	105.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SYR
−2.9	−1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	UAE
...	...	...	...	...	...	...	...	...	...	...	0.0	0.0	0.0	0.0	**122.4**	83.5	31.7	5.0	13.6	3.8	YEM

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
−0.4	11.7	6.2	4.2	4.0	0.9	−6.7	3.1	**19.9**	25.2	16.3	72.4	16.7	6.7	**40.7**	30.7	13.9	5.3	1.8	12.5	12.3	ALG
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.1	151.8	235.9	310.8	383.3	384.1	58.2	53.9	196.1	128.0	ANG
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BEN
−4.7	7.4	**20.7**	6.3	16.9	38.2	−1.2	−11.3	8.5	9.7	−8.0	8.3	4.3	13.8	10.3	3.2	**18.2**	9.4	14.6	9.0	9.8	BOT
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BUR
0.0	0.0	0.0	3.2	**25.3**	0.8	−5.6	7.9	12.8	12.2	7.6	5.8	13.8	15.3	4.0	−1.2	**19.2**	15.2	24.0	23.0	24.6	BDI
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CMR
7.1	**19.2**	18.0	20.7	16.9	7.7	−13.4	−10.1	−0.6	7.9	−10.7	1.9	−4.9	**16.8**	1.8	−6.3	7.2	12.1	5.2	4.5	12.1	CPV
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CAF
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CHA
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	COM
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CGO
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CIV
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	DJI
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GEQ
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.3	57.9	8.9	11.9	3.1	5.5	5.9	11.0	3.4	ETH
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GAB
−9.3	14.5	14.0	14.2	**30.6**	8.3	57.8	1.9	−5.3	12.3	3.9	11.0	1.0	7.2	4.8	−0.3	2.5	4.1	4.3	6.8	11.5	GAM
0.0	0.0	0.0	**116.7**	140.5	41.3	49.5	54.4	27.5	28.8	28.8	12.0	17.3	**39.5**	38.8	22.7	31.0	22.5	12.1	13.5	**69.8**	GHA
−0.7	9.9	6.5	3.2	4.2	1.0	**261.8**	25.1	10.2	22.1	11.0	13.3	17.9	5.8	2.2	1.5	1.3	8.7	12.1	11.5	**23.0**	GUI
0.0	−15.2	−12.5	−9.4	**77.3**	39.3	50.6	115.2	69.5	42.1	34.7	**48.0**	70.3	30.7	26.6	**44.4**	35.3	23.2	0.0	0.0	0.0	GBS
−0.7	**19.8**	18.8	19.8	8.0	13.1	−1.3	1.4	7.6	14.8	10.8	18.3	15.8	58.8	−3.4	−8.6	10.5	2.8	2.7	**15.3**	8.0	KEN
−7.8	11.9	**21.3**	2.6	28.1	41.3	2.5	−11.5	11.0	14.3	−1.4	6.5	3.2	13.6	8.3	2.1	**17.0**	6.9	18.2	10.0	12.7	LES
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**372.6**	0.9	−2.3	LBR
0.0	0.0	6.2	6.0	15.6	11.1	**28.1**	60.0	28.4	6.2	8.8	17.0	7.9	−4.1	**49.2**	43.6	−7.4	9.4	5.6	10.1	−7.1	MAD
−0.6	9.8	16.5	10.7	18.5	19.6	7.9	17.1	14.8	7.5	−1.1	2.7	**25.1**	20.0	68.5	55.9	0.2	7.2	**63.6**	35.0	30.1	MAW
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**69.3**	0.0	0.0	0.0	0.0	0.0	0.0	MLI

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
MTN		*	Mauritania	1993	1998				–0.2	–9.5	–12.3	1.7	–5.0	4.4	1.2	1.3	–0.6
MRI		*	Mauritius	1980	1997				–1.3	–2.7	1.9	4.7	5.5	10.3	–1.1	–7.0	2.3
MAR		*	Morocco	1981					–0.2	–9.5	–11.2	6.2	–7.5	8.7	1.9	–7.8	–6.6
MOZ			Mozambique	1976	1987	1991			2.9	–7.0	–9.9	3.6	0.6	**16.8**	7.2	–0.4	–1.3
NAM			Namibia	1976	1984	1996			–0.5	8.1	–10.7	–2.1	8.5	**16.2**	0.0	0.0	–3.2
NIG	FF	*	Niger	1994					0.0	0.4	0.2	0.0	–0.1	–0.5	0.7	–0.2	0.0
NGR		*	Nigeria	1986	1991	1999			–0.2	–8.0	0.0	–4.3	–2.4	1.8	2.8	–1.5	–5.0
RWA		*	Rwanda	1991					–0.3	–8.0	–9.2	10.0	0.0	0.0	0.0	0.0	0.0
STP		*	Sao Tome and Principe	1976	1987	1991	1995		–1.4	–4.7	–9.9	3.6	0.5	**16.8**	21.7	–3.8	–3.2
SEN	FF	*	Senegal	1994					0.0	0.4	0.2	0.0	–0.1	–0.5	0.7	–0.2	0.0
SEY		*	Seychelles	1976					–1.3	–2.7	1.9	4.7	5.5	**20.8**	3.0	–9.5	–9.3
SLE		*	Sierra Leone	1976	1983	1989	1995		–0.3	–3.7	1.9	4.7	5.5	**20.8**	3.0	–9.1	0.9
SOM		*	Somalia	1982	1988				–0.2	–2.1	–10.5	0.2	0.0	0.0	0.0	0.0	0.0
RSA			South Africa	1984	1996				0.1	7.2	–10.2	–2.1	8.5	16.2	0.0	0.0	–3.2
SUD			Sudan	1982	1987	1991			0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	12.8
SWZ		*	Swaziland	1984	1996				0.1	7.2	–10.2	–2.1	8.5	16.2	0.0	0.0	–3.2
TAN	FF	*	Tanzania	1984	1992				0.0	0.0	–1.7	1.6	3.2	12.8	–1.1	–7.2	6.3
TOG	FF	*	Togo	1994					0.0	0.4	0.2	0.0	–0.1	–0.5	0.7	–0.2	0.0
TUN		*	Tunisia	1981					–0.4	–9.2	–12.4	3.5	–8.2	6.4	0.0	0.0	–2.4
UGA		*	Uganda	1981	1986				0.0	0.0	–1.7	1.6	3.9	10.8	–0.1	–6.5	–3.3
COD		*	Congo Dem.Rep.(former Zaire)	1976	1983	1987	1991	1996	2000	0.0	0.0	0.0	0.0	**45.8**	7.8	–2.4	72.6
ZAM		*	Zambia	1983	1989	1998			0.0	0.0	–9.1	–1.4	0.0	8.6	11.9	1.4	–0.9
ZIM		*	Zimbabwe	1983	1991	1998			–0.3	–7.5	–12.2	–0.4	–2.2	9.3	0.4	7.5	0.4

Latin America

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
ANT			Antigua and Barbuda	1976					–1.3	–2.8	2.0	4.7	5.5	**18.7**	3.2	0.0	0.0
ARG		*	Argentina	1971	1975	1981	1985	1989	17.6	10.1	0.0	0.0	**199.0**	134.2	106.9	66.9	50.4
ARU			Aruba						...	...	...	...	...	...	...	...	...
BAH			Bahamas,The						–0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BAR		*	Barbados						–1.3	–2.8	2.0	4.7	–1.7	–0.9	0.0	0.0	0.0
BIZ		*	Belize						–1.4	–2.6	1.9	4.7	5.5	20.8	–10.7	0.0	0.0
BOL		*	Bolivia	1973	1980	1984			0.0	11.3	**40.9**	0.0	0.0	0.0	0.0	0.0	1.9
BRA		*	Brazil	1979	1983	1987	1992	1999	14.1	11.5	3.2	10.3	18.0	27.3	28.2	24.5	**40.0**
CHI		*	Chile	1972	1982				7.9	**53.5**	123.5	211.3	211.4	97.8	50.1	38.5	16.3
COL		*	Colombia	1998					7.8	9.3	7.8	9.8	17.1	11.5	5.8	6.1	8.5
CRC		*	Costa Rica	1974	1981	1991			0.0	0.1	0.2	**17.7**	7.8	0.0	0.0	0.0	0.0
DMA			Dominica						–1.3	–2.8	2.0	4.7	5.5	18.7	3.2	0.0	0.0
COM			Dominican Republic	1985	1990				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ECU		*	Ecuador	1971	1982	1986	1999		**17.8**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ESA			El Salvador	1986	1990				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GRN		*	Grenada	1976					–1.3	–2.8	2.0	4.7	5.5	**18.7**	3.2	0.0	0.0
GUA		*	Guatemala	1986	1990				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GUY		*	Guyana	1984	1989	1999			–0.6	4.8	0.9	5.6	5.6	7.9	0.0	0.0	0.0
HAI		*	Haiti	1991	2000				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HON		*	Honduras	1990					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAM		*	Jamaica	1973	1978	1984	1990	1994	–0.1	–8.2	**16.2**	0.7	0.0	0.0	0.0	**44.1**	22.2
MEX		*	Mexico	1976	1982	1986	1995		0.0	0.0	0.0	0.0	0.0	**21.0**	38.1	0.9	0.2
AHO			Netherlands Antilles						–0.1	–4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NCA		*	Nicaragua	1979	1985				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**30.2**
PAN		*	Panama						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAR		*	Paraguay	1984	1989	1998			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PER		*	Peru	1976	1981	1985	1989		0.0	0.0	0.0	0.0	4.2	**32.3**	41.3	61.8	36.3
SKN			St.Kitts and Nevis	1976					–1.3	–2.8	2.0	4.7	5.5	**18.7**	3.2	0.0	0.0
LCA			St.Lucia	1976					–1.3	–2.8	2.0	4.7	5.5	**18.7**	3.2	0.0	0.0
VIN		*	St.Vincent and the Grenadines	1976					–1.3	–2.8	2.0	4.7	5.5	**18.7**	3.2	0.0	0.0
SUR			Suriname	1994	1999				–0.5	–5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TRI			Trinidad and Tobago	1986	1993				–1.3	–2.8	2.0	4.7	5.5	11.6	–1.5	0.0	0.0
URU		*	Uruguay	1972	1983				0.0	**76.1**	47.9	24.8	71.1	39.0	34.1	25.9	26.3
VEN		*	Venezuela	1984	1989	1994			–0.1	–1.1	–2.2	–0.5	0.0	0.1	0.1	0.0	0.0

Transition economies (including Cyprus and Malta)

Code	Base currency	FR	Country	"Crisis" years					1971	1972	1973	1974	1975	1976	1977	1978	1979
ALB			Albania	1993	1997				...	...	...	...	...	...	...	...	...
ARM			Armenia	1993					...	...	...	...	...	...	...	...	...
AZE			Azerbaijan	1993					...	...	...	...	...	...	...	...	...
BLR			Belarus	1997					...	...	...	...	...	...	...	...	...
BIH			Bosnia and Herzegovina	1997					...	...	...	...	...	...	...	...	...
BUL			Bulgaria	1990	1994				0.0	–8.0	–9.8	–0.9	...	...	...	...	...
CRO			Croatia	1994	2000				...	...	...	...	...	...	...	...	...
CYP			Cyprus	1981					–1.4	–6.8	–9.2	4.1	1.1	10.7	–0.6	–8.9	–5.2
CZE			Czech Republic	1997					...	...	...	...	...	...	...	...	...
EST			Estonia						...	...	...	...	...	...	...	...	...
GEO			Georgia	1999					...	...	...	...	...	...	...	...	...
HUN		*	Hungary						–0.3	–7.9	–12.1	–4.6	–6.1	–5.6	–1.5	–7.7	–6.4
KZK			Kazakhstan	1995	1999				...	...	...	...	...	...	...	...	...
KGZ			Kyrgyz Republic	1996					...	...	...	...	...	...	...	...	...
LAT			Latvia						...	...	...	...	...	...	...	...	...
LTU			Lithuania	1993					...	...	...	...	...	...	...	...	...
MKD			Macedonia,FYR	1997					...	...	...	...	...	...	...	...	...
MLT		*	Malta	1993					–2.3	–6.5	–3.4	4.4	–0.2	10.0	–0.7	–9.1	–7.2
MDA			Moldova	1998					...	...	...	...	...	...	...	...	...
POL			Poland	1982	1987	1992			–2.7	–5.6	–9.4	–0.9	0.0	0.0	0.0	...	...
ROM		*	Romania	1973	1984	1990	1996		0.0	–8.2	**129.8**	–1.3	0.0	0.0	0.0	–8.6	–2.0
RUS			Russian Federation	1994	1998				...	...	...	...	...	...	...	...	...
SVK			Slovak Republic	1999					...	...	...	...	...	...	...	...	...
SLO			Slovenia	1992	2000				...	...	...	...	...	...	...	...	...
TJK			Tajikistan	1993	1999				...	...	...	...	...	...	...	...	...
TKM			Turkmenistan	1995					...	...	...	...	...	...	...	...	...
UKR			Ukraine	1994	1998				...	...	...	...	...	...	...	...	...
UZB			Uzbekistan						...	...	...	...	...	...	...	...	...
YUG			Yugoslavia,FR (Serb./Mont.)						...	...	...	...	...	...	...	...	...

Note: 1. Base currencies: DM = Deutschmark, FF = French France, unmarked = US Dollar.
2. Countries marked with "*" in the FR column are those studied by Frankel and Rose (1996).
3. "..." indicates a year for which data was unavailable.
4. Hungary's depreciation in 1991 was 9.98%, which was not identified as a "crisis."
Source: Author's calculation from IMF *International Financial Statistics CD-ROM*.

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
0.0	5.1	6.9	5.7	15.2	18.9	−3.6	−0.7	1.9	9.8	−3.0	1.6	6.0	**32.8**	2.3	4.9	5.6	10.1	**21.6**	10.6	13.1	MTN
19.7	15.1	19.6	7.4	16.5	11.2	−13.7	−4.5	4.3	12.7	−2.6	5.2	−0.6	12.6	1.8	−3.2	3.2	**16.0**	13.0	4.9	4.1	MRI
1.0	**27.3**	15.2	16.6	21.4	13.3	−10.0	−8.5	−1.8	3.3	−2.9	5.5	−2.0	8.5	−1.0	−7.5	2.0	8.9	0.8	2.1	8.0	MAR
1.5	8.7	6.6	6.2	5.5	1.7	−6.6	**197.3**	59.0	35.1	22.1	**43.4**	56.2	43.1	44.4	40.2	22.4	2.2	2.8	7.3	17.0	MOZ
−7.8	11.9	21.3	2.6	**28.1**	41.3	2.5	−11.5	11.0	14.3	−1.4	6.5	3.2	13.6	8.3	2.1	**17.0**	6.9	18.2	10.0	12.7	NAM
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**69.3**	0.0	0.0	0.0	0.0	0.0	0.0	NIG
−10.0	12.2	8.6	7.3	5.7	15.4	**67.4**	82.8	12.2	48.4	8.8	**20.9**	55.7	24.3	−0.3	−0.5	0.0	0.0	0.0	**144.0**	9.7	NGR
0.0	0.0	0.0	1.6	6.0	1.1	−14.4	−9.5	−4.1	4.5	3.2	**41.5**	6.4	7.9	42.2	17.5	15.7	−1.7	3.5	6.7	15.4	RWA
−0.7	9.9	6.5	3.2	4.2	1.0	−14.5	**34.0**	46.5	36.7	13.9	**34.2**	46.5	29.1	53.3	66.2	43.9	72.6	41.3	3.4	11.4	STP
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**69.3**	0.0	0.0	0.0	0.0	0.0	0.0	SEN
0.9	−1.2	3.7	3.2	4.2	1.1	−14.4	−9.8	−3.9	4.8	−5.6	−0.9	−3.2	1.2	−2.5	−6.0	4.3	1.1	4.6	1.5	6.7	SEY
−0.7	9.9	6.6	**42.0**	28.6	70.8	115.0	74.9	−4.6	**61.0**	92.9	66.8	52.5	12.8	3.3	25.2	19.8	6.4	46.6	14.3	14.8	SLE
0.0	0.0	53.5	38.4	23.7	67.9	60.1	37.9	**48.3**	105.7	...			...							...	SOM
−7.8	11.9	21.3	2.6	**28.1**	41.3	2.5	−11.5	11.0	14.3	−1.4	6.5	3.2	13.6	8.3	2.1	**17.0**	6.9	18.2	10.0	12.7	RSA
15.3	11.1	53.3	31.1	0.0	57.2	8.2	**18.2**	40.5	0.0	0.0	**43.5**	264.0	49.2	59.8	69.6	76.7	23.1	24.2	22.9	1.8	SUD
−7.8	11.8	21.4	2.6	**28.1**	41.0	2.8	−11.5	11.0	14.3	−1.4	6.5	3.2	13.6	8.3	2.1	**17.0**	6.9	18.2	10.0	12.7	SWZ
−0.2	1.1	11.4	18.3	**31.7**	13.3	62.7	67.6	43.5	36.7	30.8	11.7	**30.6**	30.8	22.9	12.0	0.9	5.4	8.2	11.4	7.2	TAN
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**69.3**	0.0	0.0	0.0	0.0	0.0	0.0	TOG
−0.4	**19.8**	17.9	13.9	13.5	7.2	−5.0	4.3	3.5	10.1	−7.8	5.1	−4.4	12.7	0.8	−6.7	2.9	12.8	2.9	4.1	14.5	TUN
−0.9	**190.9**	63.1	49.2	84.9	62.5	**73.4**	111.8	90.7	74.3	65.4	53.7	43.5	5.3	−19.9	−1.1	7.7	3.5	13.6	16.0	12.3	UGA
48.2	44.8	27.1	**80.7**	103.1	32.2	17.9	**63.4**	50.9	71.2	63.3	**307.7**	372.4	245.9	616.3	177.2	**196.6**	96.2	20.2	91.7	**169.2**	COD
−0.6	9.8	6.6	**30.4**	36.5	54.9	90.9	20.1	−14.1	**51.4**	78.5	75.8	98.0	96.7	39.1	25.5	33.5	8.5	**34.8**	24.9	26.4	ZAM
−5.6	7.1	9.5	**28.9**	21.6	24.9	3.2	−0.3	8.3	16.0	14.6	**39.0**	34.2	24.0	22.9	6.1	14.3	19.1	**67.0**	48.1	14.8	ZIM

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ANT
33.3	**87.4**	177.3	140.2	186.0	**218.6**	44.9	82.1	140.7	**387.9**	244.4	67.1	3.8	0.8	0.0	0.1	0.0	0.0	0.0	0.0	0.0	ARG
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ARU
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BAH
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BAR
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	BIZ
18.4	0.0	96.1	128.5	260.6	494.4	147.4	6.7	13.4	13.6	16.4	12.1	8.6	8.9	8.0	3.8	5.6	3.5	4.8	5.3	6.2	BOL
67.1	56.9	65.6	**116.8**	116.4	121.0	79.0	**105.5**	189.9	238.1	318.2	178.4	240.7	297.5	299.0	36.1	9.1	7.0	7.4	**44.7**	0.8	BRA
4.6	0.0	**26.6**	43.7	22.3	49.1	12.9	11.0	8.6	13.3	13.6	3.8	10.9	3.9	−5.7	3.8	1.7	9.3	10.0	5.1	0.7	CHI
10.5	14.2	16.2	20.7	24.6	34.5	31.1	22.2	21.0	24.6	27.2	23.1	18.2	12.8	−2.1	7.7	12.7	9.6	**22.3**	20.8	17.3	COL
0.0	**93.2**	54.2	9.4	8.0	12.5	10.4	11.4	18.9	7.2	11.7	**29.0**	9.4	5.5	10.0	13.5	14.5	11.3	10.1	10.5	7.6	CRC
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	DMA
0.0	0.0	0.0	0.0	0.0	**113.5**	−6.9	28.1	46.4	3.7	**29.6**	39.8	0.6	−0.8	3.7	3.3	1.3	3.5	6.8	4.9	2.4	COM
0.0	0.0	**18.3**	38.5	34.9	10.6	**56.8**	32.8	57.1	55.7	37.8	31.0	38.3	22.4	13.5	15.5	21.8	22.6	30.9	**77.2**	75.1	ECU
0.0	0.0	0.0	0.0	0.0	0.0	**66.3**	3.0	0.0	0.0	**31.5**	15.8	4.2	4.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	ESA
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GRN
0.0	0.0	0.0	0.0	0.0	0.0	62.9	28.8	4.7	7.2	**46.6**	11.4	2.8	8.6	2.0	1.0	4.0	0.3	5.3	14.4	5.0	GUA
0.0	9.8	6.5	0.0	**24.5**	10.4	0.5	82.6	2.5	**99.9**	37.5	**104.0**	11.2	8.7	2.6	−1.1	1.4	5.5	**16.8**			GUY
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**18.8**	48.5	26.9	16.0	0.5	3.8	5.9	0.7	1.0	**22.3**	HAI
0.0	0.0	0.0	8.1	**71.3**	34.3	−1.5	0.2	0.0	0.0	**72.1**	25.7	3.4	16.3	26.2	11.9	21.2	10.5	2.9	6.0	4.3	HON
0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	22.4	52.3	63.9	8.3	**28.2**	6.0	5.5	−4.7	3.2	6.6	9.0	JAM
0.6	6.6	**83.3**	75.6	33.5	42.6	**86.8**	81.2	50.0	8.0	13.3	7.1	2.5	0.7	8.0	**64.3**	16.9	4.1	14.3	4.5	−1.1	MEX
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−0.4	−0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	AHO
5.6	0.0	0.0	0.0	0.0	**97.0**	92.0	5.1	787.4	406.1	380.7	341.1	15.8	11.7	17.9	11.5	11.1	11.3	11.3	11.0	7.1	NCA
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	PAN
0.0	0.0	0.0	0.0	**46.7**	42.2	10.1	48.3	0.0	**65.3**	15.2	7.5	12.4	15.1	8.8	3.0	4.7	5.7	**22.5**	13.5	11.1	PAR
25.1	**38.0**	50.2	84.8	75.6	**115.2**	24.0	18.8	203.5	**303.0**	425.5	141.4	47.8	46.7	9.9	2.6	8.5	8.2	9.5	14.4	3.1	PER
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SKN
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	LCA
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	VIN
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	431.9	119.3	−9.7	−0.1	0.0	**76.2**	43.1	SUR
0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	**38.5**	0.0	6.6	10.0	0.0	**23.0**	10.2	0.4	1.0	4.0	0.7	0.0	0.0	TRI
14.6	17.4	25.0	**90.9**	48.6	59.3	40.3	39.8	46.4	55.0	63.3	54.5	40.5	26.5	24.7	23.0	22.8	16.9	10.4	8.0	6.5	URU
0.0	0.0	0.0	0.1	**49.0**	6.7	7.5	58.4	0.0	**87.2**	30.2	19.2	18.5	28.4	**49.2**	17.5	85.9	15.8	11.4	10.1	11.6	VEN

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
...	...	...	...	...	...	...	...	...	...	...	...	...	**30.8**	−7.6	−2.1	12.0	**35.4**	1.1	−9.0	4.3	ALB
...	...	...	...	...	...	...	...	...	...	...	...	...	...	**345.6**	34.1	2.0	17.0	2.8	5.8	0.8	ARM
...	...	...	...	...	...	...	...	...	...	...	...	...	**61.2**	275.4	103.3	−2.6	−7.6	−3.0	6.3	8.2	AZE
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13.8	**67.6**	57.3	168.5	126.0	BLR
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4.9	**474.7**	1.5	4.3	14.5	BUL
...	...	...	...	...	...	−9.1	−7.7	−4.7	1.2	**95.8**	209.5	27.2	16.7	**67.4**	21.6	97.4	224.7	4.6	4.2	14.5	BUL
...	...	...	...	...	...	...	...	...	...	...	...	...	**51.6**	−13.7	3.8	11.6	4.2	11.1	**15.2**		CRO
−0.4	**17.7**	12.0	10.2	11.1	4.0	−16.7	−7.4	−3.1	5.8	−7.7	1.4	−3.3	10.1	−1.1	−8.4	3.0	9.7	0.8	4.7	13.7	CYP
...	...	...	...	...	...	...	...	...	...	...	...	...	...	−1.3	−8.1	2.3	**15.5**	1.8	6.8	11.0	CZE
...	...	...	...	...	...	...	...	...	...	...	...	...	...	−1.8	−12.5	4.8	14.3	1.4	4.2	14.5	EST
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.7	6.9	**37.6**	−2.4	GEO
−8.9	5.3	6.5	15.3	11.9	4.2	−8.9	2.5	7.1	15.8	6.8	16.8	5.5	15.2	13.4	17.8	19.4	20.2	13.8	10.1	17.4	HUN
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	**53.9**	9.9	11.4	3.7	**42.3**	17.3	KZK
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	−0.2	**16.9**	30.4	18.2	62.7	20.1	KGZ
...	...	...	...	...	...	...	...	...	...	...	...	...	−8.7	−18.8	−5.9	4.3	5.3	1.5	−0.8	3.6	LAT
...	...	...	...	...	...	...	...	...	...	...	...	...	...	**89.6**	−8.8	0.6	0.0	0.0	0.0	0.0	LTU
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	−13.3	5.4	**22.4**	8.5	4.4	14.7	MKD
−3.7	11.3	6.4	4.8	6.4	1.7	−17.7	−12.9	−4.3	5.2	−9.2	1.7	−1.3	**18.1**	−1.1	−6.8	2.1	6.8	0.6	2.7	9.4	MLT
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.4	0.4	**15.0**	67.2	16.8	MDA
9.6	14.6	**50.6**	7.6	21.3	26.2	17.5	**41.4**	48.5	120.7	188.7	10.7	**25.3**	28.5	22.7	6.5	10.6	19.6	5.8	13.2	9.1	POL
0.0	−18.2	0.0	13.6	**21.4**	−21.6	−5.9	−10.4	−1.9	4.4	**40.8**	122.5	139.4	90.3	77.8	20.6	**41.7**	84.3	21.4	54.7	34.8	ROM
...	...	...	...	...	...	...	...	...	...	...	...	...	...	**79.3**	73.3	11.6	12.2	**51.7**	93.1	13.3	RUS
...	...	...	...	...	...	...	...	...	...	...	...	...	...	4.1	−7.6	3.1	9.2	4.7	**16.0**	10.7	SVK
...	...	...	...	...	...	...	...	...	...	...	...	**108.1**	33.2	12.9	−8.3	13.3	16.5	4.0	9.0	**20.3**	SLO
...	...	...	...	...	...	...	...	...	...	...	...	...	**143.4**	86.1	161.3	87.8	64.3	32.3	**46.6**	51.7	TJK
...	...	...	...	...	...	...	...	...	...	...	...	...	...	**175.4**	338.0	24.1	16.6	6.1	...	...	TKM
...	...	...	...	...	...	...	...	...	...	...	...	...	...	**197.8**	150.4	21.7	1.7	**27.4**	52.2	27.5	UKR
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	UZB
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	YUG

on average. Of the 178 countries studied, 147 (83%) have experienced at least one identified "crisis" throughout the period.

The number of crises, broken down by decade, has been rising gradually with 52 in the 1970s, 98 in the 1980s, and 140 in the 1990s. In the 1970s the largest number of "crises" was recorded in Latin America, whereas Africa has topped the list since the 1980s, soaring to approximately 40% of all the "crises" recorded in the world. Another feature is that there was a rapid increase in crises in transition economies from the onset of the 1990s, rising from four cases in the 1980s to as many as 32 in the 1990s

(see Figure 1).

Let us check the number of countries that have experienced crises at least once throughout the three decades by region. Of the 50 African countries as many as 49 have experienced crises, with the unique exception of Djibouti. Even in Asia, 25 out of 27 countries have suffered from crises except Hong Kong and Singapore. The "incidence" ratio is also high in transition economies (83%) and Latin American countries (79%). Developed countries have also suffered from "crises": 14 out of the 23 developed countries (61%) have undergone "crises."

Thus large-scale currency fluctuations with the

Table 3   Identified Currency "Crises"

	Countries covered	1970 ~ 79	1980 ~ 89	1999 ~ 2000	Total	Number of "crisis"-hit countries
Developed countries	23	7	9	7	23	14
Asia	27	13	14	21	48	25
Middle East	15	3	8	4	15	8
Africa	50	10	34	55	99	49
Latin America	34	18	29	20	67	27
Transition economies	29	1	4	32	37	24
Total	178	52	98	139	289	147

Note: Malta and Cyprus are included in "transition economies".

Source: Table 2.

Figure 1   "Crises" by Period and Region
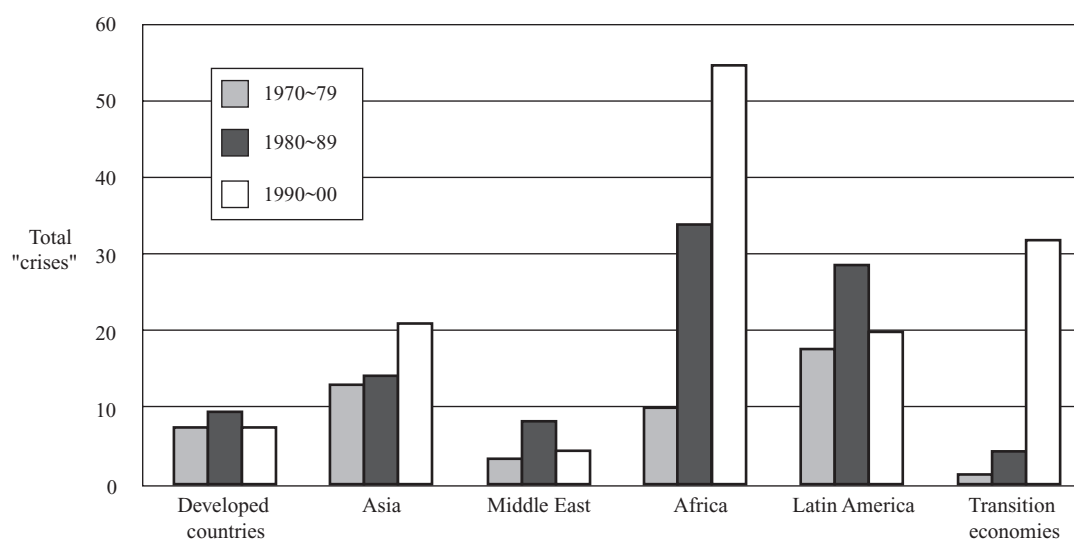
Source: Table 3

extent matching those of European and Asian currency crises can be observed rather casually[10]. On the other hand, countries with small population (with one million or less) and a few developed countries such as Japan, Canada and Switzerland were immune from crises[11].

Chapter 4
Identification of Crisis Types

This chapter, on the assumption that there exist multiple types of crises, attempts to identify them in the "crises" identified in Chapter 3.

As noted in Chapter 2, the traditional large-sample empirics designed to explain dependent variables by intuitively and arbitrarily chosen explanatory variables. This methodology does not take into account the manifold crisis types proposed in the theoretical literature.

If, however, we once accept the existence of multiple types of crises, it is plausible that the same regressors might exert different levels of explanatory powers in a cluster of a specific crisis type than in other groups. This chapter is a preliminary work that attempts to verify plural crisis types within a large-sample dataset, in preparation for forthcoming full-blown analyses.

This approach depends on whether we can relevantly assume plural crisis types, which intrinsically have qualitative characters. Due to the difficulty in addressing this inherent problem, the methodology presented here remains, at present, a complement to the conventional approach, not a substitute.

We tentatively assume three types of crisis to be examined. The first type is the "high inflation gap (HIG)" type, in which there is a wide inflation disparity vis-à-vis the base-currency country. The second is the "classical" type à la Krugman (1979), in which a fiscal deficit is financed by ballooning money supply by the central bank. The third one is the "foreign investment-led develoment (FID)" type," in which an inflow of foreign capital funds economic development[12]. In this tentative and preliminary research, the "reagents" for separating out crisis types are limited with a small number of typical macroeconomic variables.

1. "High Inflation Gap (HIG)" Type Crises

Table 2 tells us that a large number of countries have suffered from high rates of depreciation in nominal exchange rates with 15% or more per annum for long periods. Among them are Iceland in the developed countries, Turkey in Asia, Israel in the Middle East, a number of countries in Africa and Latin America including Ghana, Argentina, Bolivia and Brazil and so on. Despite the limited data availability during the former two decades in transition economies, a number of long spells of large depreciation are observed in the 1990s.

A break-down of the PPP (Purchasing Power Parity) equation suggests that a crisis could be caused by a large inflation disparity vis-à-vis the base-currency country.

When the PPP holds,

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10 Most of the crises identified by Frankel and Rose (1996) were re-verified as "crises" by the author. The exceptions were the countries with the French Franc as the base currency (the sixteen countries listed in the preceding footnote). Frankel and Rose (1996) identified "crises" in those countries in 1981 (0.7% appreciation against the US Dollar in 1980, followed by 25.2% depreciation in 1981). However, the year 1981 was when the Reagan administration set high interest rates in favor of a strong Dollar. While these countries saw no depreciation vis-à-vis the French Franc in 1981, the depreciation vis-à-vis the US Dollar made them qualified as "crises." This is why we did not identify "crises" in those countries in 1981.

11 In small countries, abnormal values are occasionally observed in their statistics, making us hesitant to put them directly into econometric analysis. For example, the current deficit / GDP ratios for these small economies often exceed an unsustainable level of -10% in the World Bank data. On the other hand, the IMF's *International Financial Statistics* do not report external variables for most of these small economies.

12 Ito (2000) showed a classification of crisis types as follows: Thai crisis can be "explained mainly by the classical-type model (deteriorating current account balance and declining international reserves)," Korean crisis is "characterized by an international bank run," and Indonesia crisis cannot be explained without referring to "political and social factors." Since crisis types can be presumed deliberately, those used in this paper are only tentative ones.

Table 4   Identified Crisis Types

Developed countries

1970's	HIG	(ROV)
NZL(1975)		
ICE(1973)		...
ICE(1978)		
IRE(1973)		...
ITA(1973)		...
POR(1977)		
GBR(1973)		

1980's	HIG	Classical	FID	(ROV)
USA(1986)				
GER(1981)		...	...	
AUS(1985)				
GRE(1986)				
ICE(1982)				
NOR(1986)				
POR(1982)		...	...	
ESP(1983)		...	...	
GBR(1986)		...		

1990's	HIG	Classical	FID	(ROV)
USA(1990)				
AUS(1998)				
NZL(1998)				
FIN(1992)		...		
ITA(1993)		...		
ESP(1993)		...		
SWE(1993)		...		

Developing countries
Asia

1970's	HIG	(ROV)
BAN(1975)	...	...
CAM(1971)	...	...
INA(1979)		
KOR(1975)		
LAO(1972)	...	...
LAO(1978)	...	...
MDV(1975)	...	...
MYA(1975)		
PAK(1972)	...	
SAM(1976)		
SRI(1976)		...
TUR(1971)	...	...
TUR(1978)		

1980's	HIG	Classical	FID	(ROV)
BAN(1981)	...		...	...
CHN(1984)	...	...	...	...
INA(1983)			...	
INA(1987)			...	
KOR(1980)			...	
LAO(1985)	...	...	...	...
MDV(1987)	...			...
PAK(1982)				
PHI(1983)				
TGA(1985)				
TUR(1984)				
TUR(1988)				
VAN(1981)		...	...	...
VIE(1987)	...	...	...	...

1990's	HIG	Classical	FID	(ROV)
BHU(1991)				
CAM(1993)		...		...
CAM(1998)		...		...
CHN(1990)		...		
CHN(1994)				
FIJ(1998)		...		
IND(1991)				
INA(1997)				
KOR(1997)				
LAO(1997)		...		
MAS(1998)				
MGL(1992)	...	...	...	...
MGL(1996)				
NEP(1991)				
PNG(1995)				
PHI(1998)				
SOL(1998)		...	...	
THA(1997)				
TGA(1998)		...	...	
TUR(1994)				
VIE(1991)	...	...	...	...

Middle East

1970's	HIG	(ROV)
EGY(1979)		
ISR(1971)	...	...
ISR(1975)		

1980's	HIG	Classical	FID	(ROV)
EGY(1989)				
ISR(1980)				
ISR(1984)				
ISR(1989)				
JOR(1989)				
LIB(1981)	...	...	...	...
LIB(1985)	...	...	...	...
SYR(1988)				

1990's	HIG	Classical	FID	(ROV)
IRI(1993)				
LIB(1990)	...	...	...	...
LBA(1999)	...	...	...	...
YEM(1995)			...	

Africa

1970's	HIG	(ROV)
CPV(1976)	...	...
GAM(1976)		
GHA(1972)	...	
GHA(1978)		
MOZ(1976)	...	...
NAM(1976)	...	...
STP(1976)	...	...
SEY(1976)		
SLE(1976)		
COD(1976)		

1980's	HIG	Classical	FID	(ROV)
ALG(1988)		...		
BOT(1982)			...	
BDI(1984)			...	
CPV(1981)	...	...	...	...
GAM(1984)		...		
GHA(1983)				
GUI(1986)	...	...	...	...
GBS(1984)		...	...	
KEN(1981)				
LES(1982)		...		
MAD(1986)		...		
MRI(1980)			...	
MAR(1981)				
MOZ(1987)	...	...		...
NAM(1984)		...		
NGR(1986)			...	
STP(1987)	...	...		...
SLE(1983)				
SLE(1989)				
SOM(1982)	...	...		...
SOM(1988)	...	...		...
RSA(1984)				
SUD(1982)		...		
SUD(1987)		...		
SWZ(1984)				
TAN(1984)		...	...	
TUN(1981)	...		...	...
UGA(1981)	...		...	...
UGA(1986)				
COD(1983)			...	
COD(1987)		...		
ZAM(1983)	...		...	...
ZAM(1989)				
ZIM(1983)				

1990's	HIG	Classical	FID	(ROV)
ALG(1994)		...		
ANG(1991)	...	...		...
ANG(1995)		...		
ANG(1999)		...		
BEN(1994)		...		
BOT(1996)				
BUR(1994)				...
BDI(1996)				
CMR(1994)				
CPV(1993)		...		
CAF(1994)		...		
CHA(1994)		...		
COM(1994)	...	...		...
CGO(1994)				
CIV(1994)		...		
GEQ(1994)		...	...	
ETH(1992)				
GAB(1994)		...		
GHA(1993)				
GHA(2000)		...		
GUI(2000)	...	...		...
GB5(1991)		...		
GB5(1995)		...		
KEN(1993)				
KEN(1999)		...		
LES(1996)				
LBR(1998)	...	...	...	...

	HIG	Classical	FID	(ROV)
MAD(1994)				
MAW(1992)		...		
MAW(1998)		...		
MLI(1994)		...		
MTN(1993)		...		
MTN(1998)		...		
MRI(1997)				
MOZ(1991)		...		
NAM(1996)		...		
NIG(1994)		...		
NGR(1991)		...		
NGR(1999)		...		
RWA(1991)				
STP(1991)	...	...		...
STP(1995)	...	...		...
SEN(1994)		...		
SEN(1994)				
RSA(1996)				
SUD(1991)		...		
SWZ(1996)		...		
TAN(1992)		...	...	
TOG(1994)		...		
COD(1991)				
COD(1996)				
COD(2000)	...	...		...
ZAM(1998)	...	...		...
ZIM(1991)				
ZIM(1998)				

Latin America

1970's	HIG	(ROV)
ANT(1976)	...	...
ARG(1971)	...	...
ARG(1975)		...
ARG(1975)		...
BRA(1979)	...	...
CHI(1972)		...
CRC(1974)		...
ECU(1971)		...
GRN(1976)		...
JAM(1973)		...
JAM(1978)		
MEX(1976)		
NCA(1979)		
PER(1976)		
SKN(1976)	...	...
LCA(1976)		
VIN(1976)		...
URU(1972)		...

1980's	HIG	Classical	FID	(ROV)
ARG(1981)			...	
ARG(1985)			...	
ARG(1989)			...	
BOL(1980)		...	...	
BOL(1984)		...	...	
BRA(1983)				
BRA(1987)				
CHI(1982)				
CHI(1982)			...	
DOM(1985)				
ECU(1982)				
ECU(1986)				
ECU(1986)		...		
GUA(1986)		...		
GUY(1984)	...			...
GUY(1989)	...	...		...
JAM(1984)				
MEX(1982)			...	
MEX(1986)				
NCA(1985)				
PAR(1984)				
PAR(1989)				
PER(1981)		...		
PER(1985)				
PER(1989)				
TRI(1986)		...		
URU(1983)			...	
VEN(1984)				
VEN(1989)				

1990's	HIG	Classical	FID	(ROV)
BRA(1992)				
BRA(1999)				
COL(1998)				
CRC(1991)				
DOM(1990)				
ECU(1999)		...		
ESA(1990)		...		
GUA(1990)		...		
GUY(1999)		...		...
HAI(1991)		...		
HAI(2000)		...		
HON(1990)		...		
JAM(1990)		...		
JAM(1994)		...		
MEX(1995)				
PAR(1998)		...		
SUR(1994)		...		
SUR(1999)		...		
TRI(1993)		...		
VEN(1994)				

Transition economies

1970's	HIG	(ROV)
ROM(1973)	...	...

1980's	HIG	Classical	FID	(ROV)
CYP(1981)			...	
POL(1982)		...		...
POL(1987)			...	
ROM(1984)	...		...	...

1990's	HIG	Classical	FID	(ROV)
ALB(1993)		...		...
ALB(1997)				
ARM(1993)	...	...	...	...
AZE(1993)		...	...	...
BLR(1997)			...	
BIH(1997)	...	...	...	...
BUL(1990)		...		...
BUL(1994)				
CRO(1994)		...	...	
CRO(2000)			...	
CZE(1997)			...	
GEO(1999)			...	
KZK(1995)		...	...	
KZK(1999)				
KGK(1996)	...	...	...	
LTU(1993)	...	...	...	...

	HIG	Classical	FID	(ROV)
MKD(1997)		...	...	
MLT(1993)				...
MDA(1998)			...	
POL(1992)		...	...	
ROM(1990)	...	...	...	...
ROM(1996)				
RUS(1994)		...	...	...
RUS(1998)		...	...	
SVK(1999)			...	
SLO(1992)	...	...		...
SLO(2000)			...	
TJK(1993)	...	...	...	
TJK(1999)	...	...	...	
TKM(1995)	...	...	...	...
UKR(1994)	...	...	...	...
UKR(1998)	...	...	...	

Note:
1. "HIG" refers to the "high inflation gap " type.   stands for Case A (Chapter 4) and   Case B.
2. "FID " refers to the "foreign investment-led development".
3. Classical and FID cases marked with   are cases not accompanied by ROV.
4. (ROV) refers to "real overvaluation".
5. … indicates data not available .

$$P = SP^*, \qquad (3)$$

where S is the nominal exchange rate (denominated in home currency), and P is the price level in the home country, while P^* is that in the base currency country. Taking logarithms for both sides makes

$$\Delta s = \Delta p - \Delta p^*.$$

(The lower-case letters are logarithms, hereafter).

$$(4)$$

The left-hand side of (4), when positive, means a nominal depreciation (a nominal appreciation when negative), and the right-hand side is the inflation disparity vis-à-vis the base-currency country.

Since a "crisis" here is defined exclusively by the extent of Δs (conditions (1) and (2)), when the PPP holds or nearly holds in the consecutive two periods, a widening inflation gap could generate a "crisis" as defined in this paper. In countries with contained inflation rates, a sudden expansion of the inflation gap vis-à-vis base currency countries by 15% or more is rare. Therefore, this type of crisis is most likely to occur in high-inflation countries where inflation is accelerating and where misalignment of the RER (real exchange rate) requires the adjustment

of the PPP[13].

It should be noted that in detecting HIG type crises it is difficult to distinguish which is the dependent variable, either the inflation gap ($\Delta p - \Delta p^*$ in equation (4)) or the depreciation (Δs). In other words, the problem refers to which is the cause and which is the effect (see Breuer (1994)). There are a number of cases in which the annual depreciation and inflation gap simultaneously jump to the extent of exceeding 15%, even though the inflation gap in the previous year was relatively contained (e.g. not exceeding 10%)[14]. In such cases, a sharp depreciation tends to occur first by some exogenous factors, followed by a skyrocketing inflation (i.e. there occurs an import inflation, triggered by a sudden depreciation).

One way to eliminate such cases of reverse causality in identifying high-inflation crises is to set a criterion for the inflation gap in the year preceding the crisis for detecting the above hypothesized type. The following two criteria are attempted here (case A and case B, the latter with more relaxed criteria).

Case A: The inflation gap is 15% or more in the crisis year and 10% or more in the preceding year, $\Delta p_t - \Delta p_t^* > 0.15$, and $\Delta p_{t-1} - \Delta p^*_{t-1} > 0.1$.

Case B: The inflation disparity is 10% or more in both the crisis year and the preceding year, $\Delta p_t - \Delta p_t^* > 0.1$, and $\Delta p_{t-1} - \Delta p^*_{t-1} > 0.1$.

"Crises" satisfying these conditions are marked in Table 4 (the second column), which in turn are enumerated in Table 5 by period and region. Case A and Case B are collectively calculated because the latter counts for no more than four cases. Of the total 227 identified "crises," there observed at least 82 HIG type crises, corresponding to 36% of all the crises. They are observed most frequently in Latin America with 34 cases (58% of "crises" in the region). Latin America is followed by Africa with 27 HIG crises

Table 5   "High Inflation Gap (HIG)" Type Crises

	1970~79			1980~89			1990~2000			Total			
	Total "crises"	Tested "crises"	HIG type	Total "crises"	Tested "crises"	HIG type	Total "crises"	Tested "crises"	HIG type	Total "crises"	Tested "crises"	HIG type	HIG type ratio
Developed countries	7	7	2	9	9	3	7	7	–	23	23	5	21.7%
Asia	13	6	3	14	9	2	21	18	3	48	33	8	24.2%
Middle East	3	2	1	8	6	5	4	2	2	15	10	8	80.0%
Africa	10	5	3	34	25	10	55	47	14	99	77	27	35.1%
Latin America	18	12	4	29	27	19	20	20	11	67	59	34	57.6%
Transition economies	1	–	–	4	2	1	32	24	6	37	26	10	38.5%
Total	52	31	11	98	78	36	139	118	35	289	227	82	36.1%
HIG type ratio			35.5%			46.2%			29.7%			36.1%	

Note: 1. Tested "crises" are a set of "total crises" for which CPI data are available to verify "HIG" type crises.

2. "HIG" is an abbreviation for the "high inflation gap."

Source: Author's calculation from IMF *International Financial Statistics CD-ROM*.

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13   When PPP does not hold between the two consecutive terms, there is a change in the real exchange rate (RER). From the definition of RER ($=Q$),

$$Q \equiv \frac{SP^*}{P} \qquad \text{(A)}$$

the following relationship is derived:

$\Delta s = \Delta q + (\Delta p - \Delta p^*)$ (B)

(lower-case letters are logarithms). When PPP holds between the two terms, $\Delta q = 0$, so (B) is reduced to (4). $\Delta q > 0$ represents a real undervaluation, while $\Delta q < 0$ signifies a real overvaluation(ROV, hereafter). Since PPP does not necessarily hold between the two consecutive terms, it is necessary to look at both inflation gap and ROV. However, this paper exclusively focuses on inflation gap for the sake of analytical simplicity. Relationships between ROV and crises will be discussed in a forthcoming paper.

14   35 cases of this kind are found (one in Asia, one in the Middle East, 19 in Africa, ten in Latin America and four in transition economies). The large number in Africa was mainly attributed to the concerted devaluation by CFA Franc Zone countries in 1994 . In Mexico in 1995, the inflation gap jumped from 4.2% in 1994 to 27.2% in 1995.

(35%). Cases in the Middle East are less frequent (eight cases, of which four were in Israel), while the HIG ratio (80%) is high. On the other hand, the ratio is low in developed countries (5 cases, 22%) and in Asia (8 cases, 24%).

By period, HIG type crises were most epidemic in the 1980s, healed to some extent in the 1990s. However, the decline in Latin America was counterbalanced by the increase in Africa. The ERM and East Asian crises are not classified as the HIG type.

Countries with chronic high inflation gaps vis-à-vis base-currency countries extremely tend to suffer crises. In Table 6 are listed 29 countries with the inflation gap of 10% or more for at least 10 years, with the number of crises during such high inflation periods counted in the right-hand column. Most infected regions are Latin America with 13 countries and Africa with eight, representing 70% of all. Turkey in Asia and Israel in the Middle East are also the most prominent examples in their regions. 68 "crises" are

Table 6   Countries Afflicted with a High Inflation Gap for More than Ten Years

Region	Country	Period	Years with annual CPI hike of more than 10%	Identified "crises" in the "years"	Notes (Years with inflation rate gaps below 10% points etc.)
Developed countries	Greece	1979-1991	13	1	
	Iceland	1973-1990	18	3	
	Portugal	1974-1986	13	2	
Asia	Myanmar	1987-1999	13	0	
	Turkey	1976-2000	25	4	
Middle East	Iran	1991-2000	10	1	
	Israel	1973-1991	19	4	
Africa	Angola	1991-2000	10	3	
	Ghana	1975-2000	26	4	1985 (6.3%pt), 1992 (6.6%pt), 1999 (9.5%pt)
	Sierra Leone	1981-1999	19	3	
	Sudan	1981-1999	19	3	
	Tanzania	1980-1998	19	2	1987-88 (NA)
	Uganda	1982-1992	11	1	
	Zaire	1974-1997	24	5	
	Zimbabwe	1990-1999	10	2	
Latin America	Argentina	1971-1992	22	5	
	Bolivia	1980-1991	12	2	1987 (9.9%pt), 1989 (9.4%pt)
	Brazil	1981-1996	16	3	
	Chile	1971-1980	10	1	
	Colombia	1973-1998	26	1	1978 (9.0%pt)
	Costa Rica	1981-1997	17	2	1984 (7.1%pt), 1986 (9.3%pt), 1993 (6.4%pt)
	Ecuador	1983-2000	18	2	
	Mexico	1980-1992	13	2	
	Nicaragua	1979-1993	15	2	
	Paraguay	1984-1994	11	2	
	Peru	1975-1994	20	4	
	Uruguay	1971-1997	27	2	
	Venezuela	1987-2000	14	2	
Transition economies	Hungary	1988-1998	11	0	
Total	29 countries			68	

Note: "High inflation gap" is defined here as an annual inflation gap of 10 percentage points or more. In some cases years less than 10% case may be included in a spell of high-inflation gap, as mentioned in the notes column.

Source: IMF *International Financial Statistics CD-ROM*.

found in the high-inflation periods of Table 6 alone, equivalent to as much as 80% of all the HIG type crises[15]. This finding does underwrite that a chronic high inflation is likely to trigger a crisis.

The result in this section depends on an arbitrarily selected threshold for finding HIG type crises (15% or 10%), but it warns that chronic high domestic inflation might result in crises. Containing inflation, therefore, is a priority from the viewpoint of crisis prevention. With the exception of Russia, none of the typical crises of the 1990s (the crises in ERM, Mexico, East Asia, and Brazil) are qualified as the HIG type.

2. "Classical" Type Crises

In this section we will attempt to identify "classical" type crises à la Krugman(1979), the seminal work in this literature, in which increase in money supply to finance chronic fiscal deficits, combined with less flexible exchange rate regimes, will give rise to a real overvaluation (ROV) and ultimately result in a crisis. This is the type in which lax financial policy drive the external economic variables (exchange rates, current account balance etc.) to unsustainable levels in the medium- and long-run.

The fiscal deficit/GDP ratio and money supply (M2)/GDP ratio are used for detection of this crisis type. The three conditions for crisis identification are set as follows:[1] fiscal deficit/GDP ratio should be negative for the consecutive two terms before the crisis, [2] the money supply (M2)/GDP ratio should be higher than that of the preceding year or two years before the crisis, and [3] ROV[16] should apply[17]. Thus,

$$[1] \; (\frac{BS}{Y})_t < 0 \tag{5}$$

$$[2] \; (\frac{M}{Y})_t > (\frac{M}{Y})_{t-1} \; \text{or,} \; (\frac{M}{Y})_t > (\frac{M}{Y})_{t-2} \tag{6}$$

and the [3] ROV condition are to be probed for the periods of

t=-2, -1 (where t=0 is the year of the crisis). When all of the three conditions are satisfied simultaneously, a "classical" type is identified (where BS is the treasury budget surplus, M is money supply and Y is GDP).

The situation two years before the crisis (t=-2) was added to the test, because there could be a delay of one term or so till a crisis emerges after a signal turns on[18]. As for the conditions of the M2/GDP ratio, comparison with two years before are added, taking into consideration the high annual volatility in this ratio (condition (6)). The data come from The World Bank's *World Economic Indicators CD-ROM*, but the IMF's *International Financial Statistics CD-ROM* is complementarily used for calculating ROVs. Fiscal data in the World Bank covers central governments.

Table 7 shows the results. Coverage rates for probing are limited with 66% in the 1980s and 40% in the 1990s, due to the lower availability in the CPI data compared to the exchange rate statistics. Classical crises accounted for 59% (38/64) of subject cases in the 1980s and 56% (31/55) in the 1990s. It should be noted that these figures allow "double listings." Classical type crises are most frequently discovered in Latin America (15 cases) and Africa (12 cases) in the 1980s. In the 1990s, there were still as many as ten cases in Africa, but the number in Latin America dropped to five, due partly to the lower data availability in this decade. Instead, there was an increase in the number of detected cases among transition economies with ten cases.

When doubly listed cases are excluded, the pure "classical" type can be discovered in 16 cases in the 1980s and 18 in the 1990s. In the 1980s there were

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15   There are exceptional cases such as Myanmar and Hungary, which witnessed no "crisis" during long high-inflation periods for over ten years. Colombia , experienced only one "crisis" for the chronic high inflation period of 26 years. Nevertheless they were afflicted with high degrees, of nominal depreciation even as they did not correspond to "crises" defined here.

16   We defined "ROV" here as (1) when a real over-valuation compared to the preceding year is observed, or (2) when a cumulative sum of annually calculated RERs (real exchange rates) for the five years backward is negative. The cumulative effects of ROV will be discussed in a forthcoming paper.

17   Determinants selected here refer to shifting directions (trends) in the relevant time series data. Note that in the previous literature, explanatory powers of the levels of selected determinants were tested within the cross-country data instead of those of the trends.

18   Compare with the typical EWS-type research (Kaminsky, Lizondo and Reinhard (1998)), which aims at raising a predictability of crises within two year period (24 months) after a signal was raised.

Table 7　　　"Classical" Type Crises

1980s					
Region	Total "crises"	Tested "crises"	"Classical"	<[1] and [2] only>*	Excluding "HIG"
Developed countries	9	5	2	<1>	1
Asia	14	10	5	<3>	4
Middle East	8	6	4	<1>	0
Africa	34	18	12	<3>	6
Latin America	29	23	15	<1>	5
Transition economies	4	3	0	<0>	0
Total	98	65	38	<9>	16

1990s					
Region	Total "crises"	Tested "crises"	"Classical"	<[1] and [2] only>*	Excluding "HIG"
Developed countries	9	5	2	<1>	1
Asia	14	10	5	<3>	4
Middle East	8	6	4	<1>	0
Africa	34	18	12	<3>	6
Latin America	29	23	15	<1>	5
Transition economies	4	3	0	<0>	0
Total	98	65	38	<9>	16

Note:　1.　'Tested "crises"' are the number of crises for which data are available for detecting classical type.

　　　　2.　* marks cases of "classical" crises where the conditions [1] M2/GDP ratio and [2] fiscal surplus /GDP ratio are satisfied, but the condition [3] ROV is not satisfied.

Source: Author's calculation from World Bank *World Development Indicators* and IMF *International Financial Statistics.*

six cases in Africa, followed by five in Latin America and four in Asia. In the 1990s there were seven cases in transition economies, followed by six in Africa. Meanwhile, "classical type" crises cannot be found in East Asian countries in the 1990s, except China in 1994 and Papua New Guinea in 1995, whereas they cannot be observed in crisis-hit East Asian countries, which had balanced budgets and to which, therefore, this type is not applicable. On the other hand, "classical" type is detected in Mexico (1995) and Brazil (1999), suggesting that the crises in them share the elements of the classical type crisis.

3. "Foreign Investment-led Development (FID)" Type Crises

The third type of crisis we assume for verification is one that occurs in the midst of an economic development driven by robust inflows of private capital. Large inflows of private capital and their subsequent sudden reversals characterize the crises in ERM countries (to some extent), Mexico and the East Asian countries. However, foreign capital does not always pour solely into asset markets (the securities, real estate and other asset markets). In some cases real investment is stimulated at least at the initial stages of economic growth.

Furthermore, private capital flows take diversified forms other than foreign direct investment (FDI); "portfolio investment" or "other investment", the terms used in the IMF data, which may in part

finance real investment in the host countries, channeled by the domestic financial institutions or non-banks.

When real investment is stimulated, increasing import demand for inputs (capital goods, and raw and intermediate materials) may deteriorate the current account balance. When accompanied by an employment expansion in highly productive sectors and a rise in income levels, demand for imports of consumption goods also rises, aggravating the current account deficits for the time being.

Economic growth can be maintained as long as there is a positive contribution by the domestic demand (i.e., the gross capital formation and private consumption exceed the negative external demand, that is, the net-export deficits). This is what Ito (1999, 2000) called "a virtuous cycle." However, a change in the exogenous conditions (e.g., a fall in the Yen-Dollar exchange rate), persistent ROV, or (as a result) stock adjustment after over-investment can reverse a virtuous cycle to a vicious one. Therefore the virtuous cycle may embrace a potential for abruptly causing future crises.

This section attempts to identify cases in which side effects of active inward investment suddenly reversed virtuous cycles to vicious ones, leading to crises. We have chosen three economic indicators for testing, namely [1] deteriorating current account/GDP ratio, [2] increasing investment/GDP ratio, and [3] ROV.

However, the up-and-down movements in the

annual current account/GDP and investment/GDP ratios are so volatile that an annual increase or decrease in solely the preceding year of a crisis cannot correctly represent a trend in the current account or gross capital formation. Taking this concern into account, the author decided to adopt five-year moving averages of these ratios: five-year moving averages of the preceding year of crises are to be compared to those of five years before the crisis. Thus, when

$$[1]\frac{1}{5}\sum_{k=0}^{4}(\frac{I}{Y})_{t-k} - \frac{1}{5}\sum_{k=0}^{4}(\frac{I}{Y})_{t-5-h} > 0 \quad (7)$$

$$[2]\frac{1}{5}\sum_{k=0}^{4}(\frac{CA}{Y})_{t-k} - \frac{1}{5}\sum_{k=0}^{4}(\frac{CA}{Y})_{t-5-h} < 0 \quad (8)$$

and [3] ROV, three conditions, are met for the two terms t=-1 and t=-2, an "FID" type is detected.

As in the previous section, the data were taken from the World Bank's *World Economic Indicators CD-ROM*, but the IMF's *International Financial Statistics CD-ROM* was used for calculating ROV.

Table 8 shows the results. 57% of all the "crises"

in the 1980s could be tested for the detection of FID type, whereas 85% in the 1990s.

FID type crises accounted for 23% (13/56) of the tested cases in the 1980s and 25% (29/118) in the 1990s. Therefore there is some overlaps between the HIG and classical crises. FID type crises are most frequently observed in Latin America (7 cases) in the 1980s and in Africa (14 cases) and Asia (6 cases) in the 1990s.

Seven cases in the 1990s can be specified as pure FID types, by eliminating overlaps with classical types[19]; four in Asia (South Korea in 1997, Malaysia in 1998, the Philippines in 1998 and Thailand in 1997), two in Africa (Botswana and Lesotho both in 1996), and one in transition economies (Slovakia in 1999).

The three cases in Europe (Finland in 1992, Spain in 1993 and Sweden in 1993)[20], as well as Mexico in 1995[21], are equipped with both FID and classical features. In that sense the four East Asian countries are almost the initial cases in which this type has been

Table 8   "Foreign Investment-led Development (FID)" Type Crises

	1980s						1990s				
Region	Total "crises"	Tested "crises"	FID type	[1] and [2] only>*	"Pure FID" type	Region	Total "crises"	Tested "crises"	FID type	[1] and [2] only>*	"Pure FID" type
Developed countries	9	6	2	<1>	0	Developed countries	7	7	4	<0>	0
Asia	14	6	1	<0>	0	Asia	21	15	6	<2>	4
Middle East	8	6	0	<0>	0	Middle East	4	1	0	<0>	0
Africa	34	18	3	<0>	0	Africa	55	51	14	<3>	2
Latin America	29	20	7	<2>	0	Latin America	20	20	4	<0>	0
Transition economies	4	0	0	<0>	0	Transition economies	32	24	1	<0>	1
Total	98	56	13	<3>	0	Total	139	118	29	<5>	7

Note: 1. 'Tested "crises"' are the number of crises for which data are available for detecting FID types .
      2. * marks FID crises where the conditions [1] current account /GDP ratio and [2] investment/GDP ratio are satisfied, but the condition [3] ROV is not satisfied.
      3. "Pure FID" type crises are FID crises without "HIG" and "classical" characters.
Source: Author's calculation from *World Bank World Development Indicators* and IMF *International Financial Statistics*

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19   In cases in which both signals of "classical" and "FID" types turn on simultaneously, it may be that either type is dominant. Some developing countries may end up with being categorized as FID types due to temporary and colossal investments funded by external official debts. How to gauge the relative weights of mixed elements is subject to future works.

20   The M2/GDP ratios are unavailable in the World Bank's data for Finland (1992), Italy (1993), Spain (1993) and Sweden (1993). Instead, when the IMF's corresponding data (IFS) are applied, "classical" elements are detected in those European countries except Italy.

21   Mexico (1995) fits the FID type. However, the moving average of investment/GDP ratio changed just marginally during the five years, whearas the consumption/GDP ratio rose more distinctly. Therefore, as explained by Ito (1997), Mexican crisis may be a result of a consumption boom.

detected full-fledgedly. However, it should be noted that the forerunners of the Asian Crisis furnished with FID type qualities can already be observed in the peripheral countries of Europe and in Mexico. Therefore the novelty of the Asian Crisis lies in the fact that the pure FID features are initially detected.

All these countries have a common feature of being involved in regional economic associations (EU, NAFTA, ASEAN) and having undergone capital liberalization. As Table 8 indicates, the number of FID type crises (both pure types and mixed types) increased in the 1990s compared to the preceding decade. Now that the globalization and regional economic integration (including FTAs) are proceeding in parallel, academic concern should be focused on diagnosing the mechanisms of this kind of crisis and preventing its reemergence.

Chapter 5 Conclusions

Much emphasis has been placed upon diagnosing crisis mechanisms through large-sample datasets, which will greatly contribute to making preemptive measures. However, due to the limited literature, the methodology has not yet been thoroughly developed. After acknowledging inherent problems in the literature to date, this paper attempted to cluster types of crises as a preliminary work for more elaborated and effective analyses.

In order to maximize the number of countries examined, this paper adopts the simplest definition for identifying "crisis": the extent of annual depreciation in the nominal exchange rate à la Frankel and Rose (1996). Against thus identified "crises," a test was applied for detecting three kinds of assumed crisis types, using a set of typical macroeconomic indicators.

The mechanism of the "high inflation gap (HIG)" type, was explained in the PPP equation and the test showed the HIG type accounted for over 30% of all the examined "crises." They are frequently observed in Latin America and Africa, but transition economies joined the ranks since the 1990s. Former communist countries also witnessed a sharp rise in the number of "classical" type crises à la Krugman (1979), along

with Africa and Latin America.

The "foreign investment-led development (FID)" type, in which heavy capital inflows give rise to a synchronized phenomenon of increased domestic investment, expanding import demand and appreciating real exchange rates, was detected full-fledgedly in East Asian countries. This crisis type was observed in Mexico and in peripheral countries of Europe as well, albeit sharing classical-type elements, which suggests that these countries might be recognized as forerunners of the crisis-hit Asian countries. Considering the ongoing process of regional economic integration and capital account liberalization in tandem across the world, the analysis of FID type will sure emerge as relevant from the viewpoint of crisis prevention.

This paper is a tentative work: crisis types are arbitrarily selected and the method of detecting them was intuitive. In addition, crises of self-fulfilling prophecies or contagion are not treated in this paper. However, now that crisis literature is at a deadlock this paper casts a fundamental question of whether the stereotyped way of finding determinants employed in the literature of large-sample empirics to date should on earth be sufficient, once multiple crisis types are assumed to coexist. Therefore the typological approach attempted here could, when elaborated further, complement the previous literature and lead to more significant and relevant crisis studies.

References

Bordo, Michael, Barry Eichengreen, Daniela Klingebiel, and Maria Soledad Martinez-Peria (2001), "Is the Crisis Problem Growing More Severe?" *Economic Policy*, 32, pp.51-82.

Breuer, Janice Boucher (1994), "An Assessment of the Evidence on Purchasing Power Parity," in John Williamson (ed.) *Estimating Equilibrium Exchange Rates*, Washington DC: Institute for International Economics, pp.245-77.

Chang, Robert, and Andres Velasco (1998), "The Asian Liquidity Crisis," Federal Reserve Bank of Atlanta Working Paper 98-11.

Edison, J. Hali (2000), "Do Indicators of Financial Crises Work? An Evaluation of an Early Warning System," The Federal Reserve Board International Finance Discussion Paper No.675.

Edwards, Sebastian (1999), "Capital Inflows into Latin America: A Stop-Go Story?" in Martin Feldstein (ed.) *International Capital Flows*, Chicago: The University of Chicago Press, pp.5-42.

Eichengreen, Barry, Andrew K. Rose, and Charles Wyplosz (1995), "Exchange Market Mayhem: the Antecedents and Aftermath of Speculative Attacks," *Economic Policy 21*, pp.249-312.

Eichengreen, Barry, Andrew K. Rose, and Charles Wyplosz (1996), "Contagious Currency Crisis: First Tests," *Scandinavian Journal of Economics* 98 (4), pp.463-84.

Eichengreen, Barry, and Charles Wyplosz (1993), "The Unstable EMS," *Brookings Papers on Economic Activity* 1, pp.51-124.

Frankel, Jeffrey, and Andrew K. Rose (1996), "Currency Crashes in Emerging Markets: an Empirical Treatment," *Journal of International Economics* 41, pp.351-66.

Gerlach, Stefan, and Frank Smets (1995), "Contagious Speculative Attacks," *European Journal of Political Economy*, Vol.11, pp.45-63.

Ito, Takatoshi (1997), "On Capital Flows to Emerging Markets: Lessons of the Mexican Peso Crisis 1994-5,"(in Japanese), *The Economic Review*, Vol.48, No.4, pp.289-305.

Ito, Takatoshi (1999), "Asian Currency Crisis: Its Origin and Backgrounds," *Journal of Development Assistance* Vol.5, No.1 (August), pp.108-41.

Ito, Takatoshi (1999), "Capital Flows in East and Southeast Asia," in Martin Feldstein (ed.), *International Capital Flows*, Chicago: The University of Chicago Press, pp.111-32.

Ito, Takatoshi (2000), "Capital Flows in Asia," in Sebastian Edwards (ed.) *Capital Flows and the Emerging Economies: Theory, Evidence, and Controversies*, Chicago: The University of Chicago Press, pp.255-97.

Kaminsky, Graciela L., Saul Lizondo, and Carmen Reinhart (1998), "Leading Indicators of Currency Crises," *IMF Staff Papers*, Vol.45 No.1, pp.1-48.

Krugman, Paul (1979), "A Model of Balance of Payments Crisis," *Journal of Money, Credit and Banking*, Vol.11 No.3, pp.311-25.

Krugman, Paul (1998), "What Happened in Asia?" mimeo. (website:http://web.mit.edu/krugman/www/DISINTER.html).

Obstfeld, Maurice (1986), "Rational and Self-fulfilling Balance of Payments Crisis," *American Economic Review*, Vol.76 No.1, pp.72-81.

Radlet, Steven, and Jeffrey Sachs (2000), "The Onset of the East Asian Financial Crisis," in Paul Krugman (ed.) *Currency Crises*, Chicago: The University of Chicago Press, pp.105-61.

Sachs, Jeffrey, Aaron Tornell, and Andres Velasco (1996),"Financial Crises in Emerging Markets: The Lessons from 1995," *Brookings Papers on Economic Activity*, No.1, pp.147-98.