Currency Crisis and Economic Fundamentals in Emerging Countries

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Abstract

We examine empirical consistency of the fundamentals in (1) the Middle and South American and (2) the Asian currency crises with the first-generation model, using panel data. We also evaluate our model by forecasting, and examine the differences between the two currency crises in terms of fundamentals. Some differences in explanatory power between fundamentals suggest that we should consider other factors in addition to our fundamentals. Dividing data into the two countries groups manifests that the causes were slightly different. The in-sample and out-of-sample tests indicate that our model could better predict the Middle and South American currency crisis.

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1. Introduction

Currency crises[1] have attracted much attention from both academic and practical economists, because they've had devastating consequences on not only the economies in which they occurred, but also other countries linked through international trade and capital flows. Thus, one of the central issues in currency crises rests on how to identify the genesis of the outbreaks of those crises. To do so, economists have constructed theoretical models to explain the various episodes of historical currency crises by reviewing the relevant literature. Boldly speaking from the present perspective, the theories of currency crises can be classified into the first-generation and second-generation models[2].

A pioneering theoretical model was laid down by Krugman (1979) who formulated the first generation model. In this model, under a fixed exchange

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[1] Traditionally a crisis is viewed as a sharp depreciation of the exchange rate . Frankel and Rose(1996) and Edwards (1989) in their empirical studies use exchange rate devaluation as the criterion for crisis. However, we adopt the definition similar to the one employed by Kaminsky, Lizondo, and Reinhart(1997) who wrote that "A crisis is defined as a situation in which an attack on the currency leads to a sharp depreciation of the currency, a large decline in international reserves, or a combination of the two. A crisis so defined includes both successful and unsuccessful attacks on the currency. The definition is also comprehensive enough to include not only currency attacks under a fixed exchange rate but also attacks under other exchange rate regimes." A similar definition was given in Takagi (2003), and Kamikawa (2000). For a survey on the currency crisis literature, see Flood and Marion (2001).

[2] Besides the above-mentioned two models there is still another model called the third generating model. This model incorporates the domestic financial sector that is blamed to generate the so-called twin crisis, etc. For example, see Goldfajn and Valdes (1997), Kaminsky and Reinhart (1999), Corsetti, Pesenti, and Roubini (1999), and Chang and Velasco (2001). However, since there are several alternative models in the group of this third generation models, it seems difficult to succinctly summarize the specific features of those models. For this reason, we confine ourselves to discuss those two models in this paper.

rate regime, domestic credit expansion in excess of money demand growth leads to a gradual but persistent loss of international reserves and ultimately a speculative attack on the currency. This suggests that expanding the money supply to finance fiscal deficits may cause excessive credit growth, which in turn brings pressure on a currency in a fixed exchange rate regime, and eventually causes its collapse. This model has often been cited to explain the currency crises of the Middle and South American countries in the 1970s and the 1980s.

Historically speaking, in the fall of 1992 massive capital flows led to the exit of Britain, Italy, and Spain from the exchange rate mechanism of the European Monetary System (ERM). In the summer of 1993 a second wave of attacks led to a decision to widen the exchange rate bands of that system, essentially to allow the French franc to depreciate without any formal exit. However, this currency crisis did not fit the traditional crisis model at all. Looking at the ERM currency crisis, Obstfeld (1994) formulated the self-fulfilling features of the currency crisis, which is called the second-generation model. The second-generation models allow the possibility of crises even though an economy which triggers a crisis does not suffer continuous deterioration in its economic fundamentals. However, as these models underscore the role of expectations of economic agents in a crisis, some of these models introduce the concepts of herding behavior and contagion effects to emphasize the role played by expectations.

Since then two serious currency crises erupted in the emerging countries during the 1990s, which resulted in turmoil. One was the Mexican currency crisis in 1994-1995, which saw a sharp devaluation of the peso and brought Mexico to the brink of default. There were also the so-called tequila effects on Argentina and Brazil. The other was the Asian currency crisis during the second half of 1997 and early 1998. A series of speculative attacks caused several Asian currencies—notably the Thai bath, Malaysian ringgit, Indonesian rupiah, and Korean won—to depreciate sharply. The severity of these two crises, which were more severe than previous ones, revived interest in the study of currency crises, both theoretically and empirically.

As we mentioned before, although there are numerous preceding studies on the possible causes of currency crises, they are roughly classified into the first-generation and second-generation models. Since those two models have different policy implications, it is crucial to distinguish them clearly, at least

for the following two reasons. Firstly, from the crisis countermeasure standpoint, if the deterioration in fundamentals is the principal reason for the (predictable) currency crisis, it is necessary to appropriately change economic policy and the financial system. On the other hand, if the financial panic due to expectations is the main reason for the (more or less unpredictable) crisis, such a change may not be required. Secondly, on the issue of whether Lender of Last Resort (LLR) should exist or not, the answer also depends on different views. If fundamentals are the principal reason for the currency crisis, the LLR does not have effective measures to prevent a currency crisis, but conversely may even possibly promote inappropriate policies by the monetary authority to trigger a crisis. On the contrary, if the financial panic is the main reason for the crisis, the existence of the LLR is meaningful, since the panic of international investors can be effectively avoided because of discretionary, preventive, and credible measures taken by the LLR. Nevertheless, there has been no consensus on which of the two models better explains the outbreak of these two crises[3].

Recognizing that empirical results to date have been inadequate and hence inconclusive, the main purpose of this paper is to further analyze empirically the causes of the Middle and South American and Asian currency crises using variables to be considered as fundamentals. We analyze whether the role of the fundamentals in the two currency crises is consistent with that

[3] Based on a classic currency crisis model with an emphasis on the demand for money function, Ito (1997) showed that the most important cause of the Mexico currency crisis was the growing domestic credit for sterilization and mistaken monetary policy. On the other hand, a "Policy Slippage" theory emphasizes that, although the intention of macroeconomic policy was sound, the persistent inconsistency became noticeable during 1994 and was the important reason for the crisis (IMF, World Economic Outlook 1995). In addition there are other theories such as the "expectation theory" (Sachs, Tornell and Velasco, 1996) which emphasized investors' herding behavior and self-fulfilling-expectations, the "moral hazard-adverse selection" theory (Mishkin, 1997) which explained crises from an informational asymmetric theory, etc. On the cause of the Asian currency crisis, Corsetti, Pesenti, and Roubini (1999) and Dooley (2000) pointed out that it was the implicit guarantee of the domestic bank debts that caused moral hazard in bank lending, and as the consequence, non-performing loans of commercial banks were increasing which eventually led to the currency crisis. In other words, since the non-performing loans of commercial banks could in fact be identified as the fiscal expenditures of the country, the Asian currency crisis is explained within the 1st generation model. Although approaches differ in the precise development of the model and the emphasis on observation of economic variables, Chang and Velasco (1998) pointed out a possibility that an undesirable equilibrium (an equilibrium with currency depreciation) among the multiple equlibria was realized as a currency crisis. Their model is an application of coordination failure theory or bank-run theory.

implied in the first generation model using panel data with variables relating to fundamentals. Especially, according to precedent studies that examine the role of monetary policy in a currency crisis, there is a significant difference in definitions and choices of variables, and hence differing conclusions[4].

Several novelties of our empirical investigation are as follows. First, we use the ratio of the domestic credit on the private sector to GDP as an explanatory variable to measure the effectiveness of monetary policy during a currency crisis. The reason for using this variable is that, as some precedent researches indicated, it has been observed that the domestic credit on private sector increased quickly before the outbreak of the two currency crises[5]. In view of this historical fact, we use domestic credit on *private sector* in this paper, which is different from previous studies in which domestic credit was used. Secondly, we evaluate our econometric model and compare the results by interpolation forecasting. This in-sample test was seldom used in the preceding studies. Thirdly, we try to examine the differences between the two currency crises in terms of fundamentals. We empirically analyze samples of three groups, that is (a) the all sample group which includes the Middle and South American and Asian countries and area (19 countries and 1 area), which is divided into two sub-sample groups: (b) the Middle and South American countries group (10 countries), and (c) the Asian countries (9 countries and 1 area)). Unlike previous studies, which were not explaining the reasons why the variables were inconsistent with theories of currency crises in details, our paper tries to interpret variables inconsistent with traditional theories of currency crises. We compare the empirical results for the two currency crises and summarize the specific features of each crisis.

Technically we estimate our model using the panel data. The reasons for it are summarized as follows. First of all, it is obvious that we can gain the degree of freedom, compared with the cross-section and time-series data. Secondly, because it is possible to control the heterogeneity among countries by using the panel data, the reliability of results with by panel data analysis increases. Moreover, we estimate our model with sub-samples by dividing

[4] See the `list of variables relating first generation model in precedent research` in Appendix 1.

[5] Sachs, Tornell and Velasco (1995), Radelet and Sachs (1998a), and Shirai (2002), among others.

the whole samples, as mentioned above. The reason for estimation using all samples lies in the fact that the income and the development levels of these countries are similar, and thus we could find some common features in two currency crises by using them. The reason for using the Middle and South American group sample and the Asian group sample is that we hope to find the group-specific features for each crisis by group division.

We collect data from the same source as much as possible for consistency. In processing the data, we deliberately consider the problem of sample dependency[6]. The dependent variable (the crisis index, to be explained later) is calculated using the method of fluctuating (not fixed) standard deviation.

The structure of this paper is as follows. In Section 2 we estimate our econometric model by using the 11 years of panel data from 19 countries 1 area of the Middle and South American and Asian countries. The main results are summarized in the following 3 points. Firstly, we find that some variables are significant and consistent with the first-generation model. However, some other variables are not only inconsistent with the theory, but even statistically insignificant. These results suggest that, although some fundamental variables played an important role in the two currency crises, we should take other factors into consideration in addition to our fundamentals. Secondly, according to our estimation by using divided data of the Middle and South American countries group and the Asian countries group, it became clear that the variables explaining the causes of the two crises were different. Thirdly, as a result of an in-sample prediction test, our specified model showed that variables reflecting fundamentals could better predict the Middle and South American currency crisis in our experiment[7]. Section 3 summarizes the conclusions of this paper with suggestions for future research.

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[6] Sample dependence is dependent on the sample data, i.e., the obtained value will in principle change by adding or deleting the additional data.

[7] In the Middle and South American currency crisis, the short-term external debt (SDFR) and domestic credit on the private sector (CRGDP) were significant, while bank's non-performing loans (CPSGDP), current account (CAGDP) and fiscal expenditure (FDGDP) were not only inconsistent with the theory, but also insignificant. On the other hand, in the Asian countries, bank's non-performing loans (CPSGDP) were significant, while the short-term external debt (SDFR), domestic credit on the private sector (CRGDP), current account (CAGDP) and fiscal expenditure (FDGDP) were not only inconsistent with the theory, but also insignificant.

2. Empirical Analysis

This section empirically examines the possible causes of currency crises, using the panel data covering 19 countries and 1 area hit by currency crises for eleven years from 1990 to 2000. Our main concern is whether the role of our explanatory variables reflecting the fundamentals is consistent with that implied in the first-generation model for the two currency crises. In addition, we also investigate how much the two currency crises can be predicted by our specified model, and where the differences between the two crises arise from.

2.1 Empirical Model

In this subsection, we first examine currency crises in Middle and South America and Asia using panel data covering 19 countries and 1 area [8] over eleven years[9]. We first define the dependent and the explanatory variables, specify our model, and then present the source of data.

2.1.1 Dependent Variable

For our empirical analysis we select the dependent variable, Crisis Index (CI) frequently used in the preceding literature. It is defined as follows:

$$CI = (\triangle S / S) * (1/\sigma_s) - (\triangle R / R) * (1/\sigma_R) \qquad (1)$$

where:

$\Delta S / S$: The annual rate of depreciation for the exchange rate, defined in the domestic currency per unit of the U.S. Dollar

$\Delta R / R$: The annual decreasing rate of foreign exchange reserves

σ_s : The standard deviation of depreciation rate of the exchange rate for the last 9 years

[8] See Table 1 for the sample countries and area. Although they are chosen because of the data availability, most of them have been analyzed in the precedent currency crisis literature.

[9] Since our sample period covers 11 years from 1990 to 2000, periods other than Middle and South America currency crisis in 1994 or the Asian currency crisis in 1997 are also included. For this reason, the relationship between the dependant variables and the explanatory variables in the period before the currency crisis and after it is also analyzed in our empirical analysis.

σ_R : Standard deviation of decreasing rate of foreign exchange reserves for the last 9 years.

As presented in equation (1), CI is defined as the difference between the standardized depreciation rate of the exchange rate and the standardized decreasing rate of foreign currency reserves. As mentioned previously, CI is calculated using fluctuating standard deviation to avoid the problem of sample dependency. This contrasts with Eichengreen, Rose and Wyplosz (1995,1996) who used fixed standard deviation[10].

We calculate CI that way for the following reasons. When the exchange rate experiences unexpected depreciation to a large extent in one country, depreciation pressure will be expected to continue if left alone. If domestic government intervenes in the foreign exchange market by using foreign exchange reserves, the degree of depreciation will be lower than otherwise, while foreign exchange reserves held by the central bank will decrease. Therefore, it is recognized that CI measures depreciation pressure of the exchange rate by considering both changes in the nominal exchange rate and changes in the foreign exchange reserves. Since depreciation and the decrease in foreign exchange rate are expressed as positive and negative values, the larger the value of their difference is, the stronger the possible effects of a currency crisis are[11]. Strictly speaking, however, besides using foreign exchange reserves, the monetary authorities use interest rate policy, raising the domestic interest rates to defend the currency value. For this reason, in order to measure the depreciation pressure, a change in the domestic interest rate is sometimes added to define CI. However, since the statistical data of the market rate of interest are not available for some

[10] Needless to say, the crisis index is not a synonymous with a crisis. The crisis index includes both the large depreciations, and also speculative attacks that are successfully warded off by the monetary authorities. A crisis is defined somewhat arbitrarily in the literature. For example, Frankel and Rose (1996, p.352) defined it as "a nominal depreciation of at least 25% that is also at least 10% increase in the rate of depreciation". Eichengreen, Rose, and Wyplosz (1996) defined a crisis when the index of "exchange market pressure" is more than its average plus 1.5 times the standard deviation. The index of exchange market pressure in turn was arbitrarily defined as a weighted average of changes in the exchange rate, the ratio of international reserve differential, and the interest rate differential.

[11] There are some other empirical methods such as a probit model, for example. See Frankel and Rose (1996).

countries, many preceding studies have not used the change in the interest rate in defining CI[12].

2.1.2 Explanatory Variables

We used the five explanatory variables in our estimation: The first is the ratio of the changes in the private loans by the commercial banks for the last four years to GDP, which is the proxy variable for bank's non-performing loans (CPSGDP). The second is the ratio of the domestic credit on the private sector to GDP (CRGDP). The third is the ratio of the current account to GDP (CAGDP). The fourth is the ratio of the fiscal budget to GDP (FDGDP). And the fifth is the ratio of the short-term external debt to foreign exchange reserves (SDFR)[13].

The first explanatory variable, **claims on private sector of the deposit money banks (CPSGDP)**, stands for the proxy for the portion of non-performing loans to the total outstanding bank loans. Since the bank's criteria for examining loan applications becomes relatively loose in a situation where the loans increase quickly, easy money is expected, and as a result the portion of non-performing loans is expected to increase. As Corsetti, Pesenti and Roubini (1999) pointed out, the high ratio of non-performing loans was one of the possible causes of the Asian currency crisis[14]. They observed the "implicit guarantee" made by the government, implying that they would relieve the banks from a large amount of bad loans in case they fell into management difficulty. Since it was well-documented that domestic commercial banks in Asia had a close relationship with their government before the currency crisis, the non-performing loans come to the forefront when analyzing this currency crisis[15].

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[12] See Sachs, Tornell and Velasco (1996), and Corsetti, Pesenti and Roubini (1999).

[13] We use the year-to-year ratio (or 4 years) in consideration of the sample dependency problem. See Appendix 2 for the list of the definitions of the explanatory variables.

[14] Following the idea of Corsetti, Pesenti and Roubini (1999), we use "claims on private sector of the deposit money banks" as the proxy variable for bank's non-performing loans.

[15] It has been pointed out that a currency crisis erupts due to domestic financial uneasiness, such as collapse of a property bubble (third generation model). However, we can consider that there is an expansion of the domestic credit because the central bank may expand the function of LLR to relieve the troubled banks and depositors with financial difficulty before the outbreak of the crisis. Thus, it is possible to regard the first generation model as a model that can explain the outbreak of such a currency

According to Krugman (1979), the growth of excessive domestic credit causes the expectations for future inflation, and thus triggers the outbreak of a currency crisis because of the expected rate of future depreciation. Thus, the second explanatory variable, **the ratio of domestic credit on the private sector to GDP (CRGDP)**, is used in our estimation. As mentioned above, the domestic credit on the private sector actually expanded rapidly before the two currency crises[16].

The ratio of current account to GDP (CAGDP) has been used frequently as the explanatory variable in the currency crisis, since the current account deficit possibly aggravates the pressure of currency depreciation.

The ratio of fiscal budget to GDP (FDGDP) is selected as another explanatory variable, because the fiscal deficits create government incentive for inflationary policy which will lead to currency depreciation. As Krugman (1979) pointed out, this is one of the key variables in analyzing currency crises.

An accumulation of external short-term debts has been the noticeable phenomenon in our sample countries before and during the currency crises. At the same time, sharp depreciation and reduction of foreign exchange reserves were also observed during crises. Thus, we select **the ratio of short-term external debt to foreign exchange reserve (SDFR)** as an explanatory variable here[17]. Specially, there is some precedent literature which examines a relatively high correlation between the ratio of external short-term debt to foreign exchange reserves and currency crises[18].

For the sake of convenience, we collect data from the same source, although various sources have been used in previous studies[19]. We collected data

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crisis.

[16] Domestic credit on public sector is not included here. See Appendix 2 for more detail.

[17] If the ratio of short-term external debts to foreign exchange reserves becomes high, the money supply will eventually be reduced. Then, it is possible for domestic credit to be expanded to sterilize it. For this reason we select it as an explanatory variable of the first generation model.

[18] Radelet and Sachs (1998b) argued that in a case of low proportion, `traditional warning sign (current account deficit, overvalued exchange rate, export growth) gave some reasons for concern, but the signals were muted and generally ignored`, and conclude the SDFR is the significant variable in the empirical analysis of the Asian currency crisis. In addition, Bussiere and Mulder (1999) examined the relationship between the crisis index and a proportion of external short-term debt to foreign exchange reserves, and conclude that the correlation between them becomes stronger when the latter exceeds 1.

[19] For example, Eichengreen, Rose and Wyplosz (1995) used IMF EASR (Exchange

basically from IMF IFS CD-ROM in consideration of accessibility and integrity. But the data of external short-term debts was collected from the open homepage of Joint BIS-IMF-OECD-World Bank statistics[20]. All data are compiled on an annual basis, and the positive value of current account and fiscal budget means a surplus.

2.1.3 Specification of Empirical Model

As our empirical model we assume the following linear form for regression[21].

$$CIit=C+b_1CPSGDPit+b_2CRGDPit+b_3CAGDPit+b_4FDGDPit+b_5SDFRit+Uit \quad (2)$$

i=1, 2,…,20
t=1,2,…,11

where C is the constant term, and Uit is the appropriately defined disturbance term. From our previous discussion, the hypothesized sign conditions for the explanatory variables are positive for CPSGDPit, CRGDPit, and SDFRit, and minus for CAGDPit, and FDGDPit.

2.2 Regression Results

2.2.1 Results of All Samples

The estimation results for all samples are reported in the second column of Table 2[22]. The main finding is summarized in the following three points[23].

Arrangements and Exchange Restrictions). Eichengreen, Rose and Wyplosz (1996) used IMF IFS. Frankel and Rose (1996) used World Bank World Data CD-ROM. Radelet and Sachs (1998b) used the data of Institute of International Finance and Inc., IMF BIS (Bank for International Settlements), World Development Data of World Bank, etc. Corsetti, Pesenti and Roubini (1999) used IMF IFS, DataStream, the data source of Taiwan, etc. Chinn, Dooley and Shrestha (1999) used the IMF data (Rescue Package, etc.) besides IMF IFS.

[20] See Appendix 3 for the detailed information.

[21] The presence of time effects seems to be negligible, and thus we adopted one-way variance component model without time effects. That is, uit=ait+εit, where ait is an individual effect, and εit is the other effect.

[22] We use both the fixed effect and the random effect models for estimation. The results reported in Tables 2 and 3 are selected by the Hausman Test. The criteria for selection

Firstly, the sign conditions (plus) for CRGDP and FDGDP are satisfied, and they are statistically significant at the 1% and the 10% level, respectively. Secondly, the sign conditions of CPSGDP and SDFR are satisfied, but they are statistically insignificant at the 10% level. Thirdly, CAGDP is not only statistically insignificant at the 10% level, but also inverse to the expected sign condition (negative). According to these results, it is suggested that, based on the first generation model to explain the currency crisis, the increase in domestic credit (CRGDP) and aggravation of fiscal expenditure (FDGDP) were possible causes of the currency crises.

2.2.2 Results of the Two Sub-Samples

The results presented in the previous 2.2.1 (with all samples including the samples of the Middle and South American countries and the Asian countries) show only the average influence of possible causes of the two currency crises. However, Shirai (2002) and Hattori (2002) point out that there seem to exist somewhat different features for the two currency crises. In order to try to account for such differences in features between the two crises, we continue our estimation with the same model specification, but with divided samples for the two groups (the Middle and South American and Asian countries (area) group). The main finding with the divided samples is summarized in the following 6 points. As shown below predictably, each explanatory variable is shown to have a different effect in each currency crisis episode with divided samples.

Firstly, the hypothesized sign (positive) condition for the proxy for non-performing loans (CPSGDP) is not satisfied for the Middle and South American group, while for the Asian group it is not only satisfied, but also statistically significant at the 10% level[24]. It implies that the financial unrest

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were the expected signs and the goodness of fit.

[23] See Table 2 for the results of three sample groups; the all samples, the Middle and South American samples, and the Asian samples.

[24] This is consistent with the previous empirical finding that the high ratio of bank non-performing loans was one of the possible causes of the Asian currency crisis, as pointed out by Corestti Pesenti and Roubini(1999) and Redelet and Sachs(1998) who emphasized the close relationship between fundamentals and currency crisis. Corsetti and Pesenti and Roubini (1999) deduced that the ratio of foreign short-term debts to foreign reserves, ratio of current account deficit to GDP, and the ratio of the bank non-performing loans to GDP had strong effects on currency crises in the emerging countries, and that this is true for countries with their ratios of current account deficits and/or the ratio of the domestic bank's non-performing loans to GDP being extremely

caused by increases in bank's non-performing loans is more serious in Asian countries than in Middle and South American countries. This accords with the historical fact that the crisis-hit Asian countries were more bank-dependent, while the policies to enhance the soundness of the banking sector were implemented earlier in Mexico[25].

Secondly, the expected sign condition (positive) of domestic credit on the private sector (CRGDP) is satisfied in both groups. Moreover, the coefficient is statistically significant at the 1% level in the Middle and South American group[26], but insignificant even at the 10% level in the Asian group[27].

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high.

[25] In Mexico, deposits and loans to the private sector increased as the result of promoting the privatization of the government-managed banks in 1990. However, because the deposits could not sufficiently satisfy the demand for money by private enterprises, the commercial banks raised the additional funds from the foreign commercial banks. Since these banks quickly expanded their credits to the private sector using these foreign funds, the bank's asset composition deteriorated. For example, the ratio of the banks' non-performing loans was only 5% in 1991, which exceeded the ratio of own-capital. In order to deal with this deterioration in their asset composition, the Mexican government strengthened its prudential regulation. Because of the regulation, the Mexican commercial banks stacked and increased the loan loss charges, and as the result the ratio of own-capital of the commercial bank increased from 6% by the end of 1991 to 8% by the end of 1993, and reached at 10% in September 1994. Thus, the ratio of banks' bad loans of the Central and South American countries was relatively low, compared with those in Asian countries. In contrast with the Middle and South America, the structural problems in the banking sector of Asian countries were quite serious, and the ratio of banks' bad loans was extremely high. According to the available data, just after the Asian crisis erupted, the ratio of banks' bad loans in Indonesia reached 69% in December 1998 (Joyosumarto, 2000 and Shirai, 2002). This ratio was quite high compared with Mexico's, although the ratio improved up to 32% in March 2000. Besides, while the capital inflows into Mexico were mainly in the form of portfolio investments in stocks and government national bonds, in Asian countries, they were mainly in the form of the bank borrowings that were partly loaned out and accumulated as non-performing loans. Thus, the effects of financial unrest from the unsound banking sector because of huge accumulated bad loans on the real economy were relatively more serious in the crisis-hit Asian countries (Shirai (2002)).

[26] In the case of the Middle and South America currency crisis, 1994 was a year of political turmoil for Mexico, and the capital inflow (securities investments) decreased because of the increasing political and social risks. Capital inflows suddenly decreased from the second quarter, and securities investments recorded the net outflow in the fourth quarter. In November, because of an increase in the interest rate of American banks (the FF rate by 0.75%) and the resignation of the Public Prosecutor General, outflows of securities investments increased. Because capital outflows happened with continued high level of the current account deficits, investors were worried about peso depreciation, and the pressure of peso sales increased. The central bank was obliged to intervene by selling the dollar in huge amounts, in order to protect the peso. As a result, credit expansion was increased for sterilization, but, as Ito (1997), and Sachs, Tornell and Velasco (1995) pointed out, this was a monetary policy mistake that actually triggered the Mexican currency crisis.

Thirdly, the current account (CAGDP) is statistically insignificant at the 10% level in both groups. Even its expected sign condition (negative) is not satisfied for the Asian group, but satisfied for the Middle and South American group[28].

The result of CAGDP in all the samples group and Asian samples group (sign condition is not satisfied) is consistent with that of Frankel and Rose (1996). However, there is no explanation about it in collinearity Frankel and Rose (1996). The possible reasons could be multi-collinearity, sample selection and so on, but in the following we consider the latter possibility. To do so, we further divide the sample countries into a sub-countries group who received the IMF emergency support and the other group, which did not. That is the Middle and South American countries are further divided into two country groups (with IMF emergency support) and eight others, while the Asian countries are also further divided into three countries (with the IMF emergency support) and seven others. Thus, 20 sample countries in total are divided into five countries (with the IMF emergency support) and 15 others. The results using the sub-samples are reported in Table 3[29]. According to the result, the coefficient of CAGDP for seven countries in the Asian samples that did not receive the IMF support is the same as before, i.e., still does not satisfy the hypothesized sign condition. In contrast, the coefficient of CAGDP of three countries in the Asian samples and five countries in all samples that received the IMF support now satisfies the hypothesized sign condition, and moreover, for two countries in the Middle and South American samples, it is statistically significant at the 5% level. However, the coefficient of CAGDP of three countries in Asian samples and five countries in all samples, which received the IMF support, is still insignificant.

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[27] The result of CRGDP for the Asian currency crisis is inconsistent with the finding by Chinn, Dooley and Shrestha (1999). The difference may lie in the multi-collinearity between CPSGDP and CRGDP, since our preliminary examination shows that the simple correlation coefficient of these two is 0.79 in Asian sample data.

[28] The result of CAGDP for the Middle and South American currency crisis is consistent with that of Sachs, Tornell and Velasco (1996).

[29] The five countries including Mexico, Argentina, Thailand, Indonesia (countries who received emergent support from IMF) and Korea have been greatly hit by the currency crisis, and could not recover by themselves, so that they called the IMF for emergency support. On the other hand, there are 15 other countries that did not call the IMF for an emergency support. It can be said that the fundamental situations between the two groups is different.

Fourthly, although the expected sign condition (negative) of fiscal budget (FDGDP) is satisfied, the coefficient is insignificant for both groups[30].

Fifthly, the expected sign condition (positive) of short-term debt to foreign exchange reserve (SDFR) is satisfied in both groups. While the coefficient is significant at the 5% level in the Middle and South American group, it is insignificant even at the 10% level in the Asian group.

We found that SDFR is a significant variable when explaining the Middle and South American crisis using the sample of the Middle and South American countries. This conclusion is consistent with the result of Sachs, Tornell and Velasco (1995) who pointed out that one of the possible causes of the Middle and South American currency crisis was the increasing *ratio* of a short term debt to foreign exchange reserves, and IMF (International Capital Markets 1995) who also pointed out that it was the increase in the short term debt *level*. On the other hand, our finding on SDFR for the Asia samples, showing that SDFR is insignificant when explaining the Asian currency crisis, is different from those reported in Radelet and Sachs (1998b). This inconsistency may lie in such problems as sample selection, or multi-collinearity. We discuss the sample selection below.

Chang and Velasco (1998) and Radelet and Sachs (1998a) remarked that, before the Asian currency crisis (from 1995 to June 1997), since the ratio of short term debts to foreign exchange reserves of Thailand, Indonesia, and South Korea were greater than 1 (the values were respectively 1.45, 1.70, and 2.06, respectively)[31], the currency crisis of these three nations was especially serious and thus the financial support from the IMF was needed. In order to examine if there is a difference in explanatory power of the SDFR variable, we divided the Asian samples into the sample countries who

[30] Foe the case of the Middle and South American currency crisis, the possible reason for insignificance may lie in the fact that, with the public finance improvement efforts, privatization and the obligation reduction policy that continued from the 1980s, the Mexican fiscal budget recorded a surplus in 1992 and the ratio of public sector's net debts to GDP was reduced almost by half, from 51% in 1982 to 27% in 1992 (Kuwahara, 1999). In addition, for the case of the Asian currency crisis, our finding that this variable is insignificant is consistent with many precedent studies (e.g., Radelet and Sachs, 1998a; Kondo, Nakajima and Hayashi, 1998; Okuda, 2000) who pointed out that, when and before the Asian currency crisis erupted, the crisis-hit Asian countries' financial situation was relatively preferable (the public budget showed either surplus or balanced), and thus, the currency crisis was not due to the deterioration of financial situation of these crisis-hit countries.

[31] See Table 13 of Chang and Velasco (1998). See Table 3 of Radelet and Sachs (1998a) on SDFR for 5 Asian countries from 1995 to the mid-1997.

received financial support from the IMF and the countries who did not, because the economic situation before the outbreak of the Asian currency crisis was different between the three countries which received financial support from the IMF and those that didn't. The result is reported in Table 3[32]. According to the Table, the sign condition of SDFR is also satisfied for both groups of the sub-samples. Moreover, the coefficient of SDFR for the seven countries who did not receive support is significant at the 1% level, while that of the three countries who received the IMF support is rejected only at the level of 10.1%. This implies that the explanatory power of SDFR was somewhat established for countries who received emergency support.

Sixthly, after performing the in-sample forecasting tests of our model, the RMSE (root mean squared error) and the Theil's U statistics are reported in Tables 2 and 3. According to the in-sample forecasts, the RMSE is 1.256 for the Middle and South American countries and 4.421 for the Asian countries (Table 2). The Theil's U statistic is 0.777 for the former, and 0.821 for the latter samples. This means that our empirical model is about 3.5 times more accurate in predicting the currency crisis for the Middle and South American countries than for the Asian countries, based on the RMSE criterion[33]. A similar phenomenon can also be observed in Table 3. For example, our model will predict the currency crises about 140 times more accurately for the Middle and South American countries than for the Asian countries who received the IMF support, based on the RMSE criterion[34]. This means that our empirical model with 5 variables reflecting fundamentals could better explaining the Middle and South America currency crisis than the Asian crisis[35].

In order to further discuss the predictive capability of our estimation model, we compare the actual value of CI (CIA) with the forecasted value (CIF), as shown in Figure 1. We found that CIF of Ecuador (1999), Venezuela (1994) in Middle and South America, Indonesia (1998), Malaysia (1998),

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[32] See the appended table of Table 3 on the descriptive statistics.

[33] Based on the Theil's U statistics, the crises are also slightly better predicted (6 %) for the former samples than for the latter samples.

34 Also based on the Theil's U statistics, the crises are also slightly better predicted (27 %) for the former samples than for the latter samples

[35] This conclusion is consistent with Kuwahara (1999) who pointed out that macroeconomic fundamentals were important factors, when comparing the Middle and South American crisis with the Asian crisis.

Pakistan (1998), Singapore (1998) and Thailand (1997) in Asia fairly closely follows the CIA fairly closely.

Furthermore, as well-documented in the literature, since the five countries including Mexico, Argentina, Thailand, Indonesia and Korea have been seriously hit by the currency crisis, and could not recover swiftly by themselves, they called the IMF for emergency support. On the other hand, the other 15 countries did not have to call the IMF for emergency support. The reason for this difference in the incipient reaction to crises may lies in the fact that the fundamental situations between the two groups before the crisis were substantially different. Taking this consideration, we divide the Middle and South American (Asian) sample into 2 (3) countries who received the IMF emergency support and 8 (7) other countries to examine the predictive capability of our model by comparing the CIA and CIF. The graphical result is presented in Figure 2. According to Figure 2(1), CIF of Mexico (1994) who called the IMF for emergency support, and Ecuador (1999) and Venezuela (1994) who did not, followed the CIA very well. Meanwhile, according to Figure 2(2), CIF of Indonesia (1998), Thailand (1997) who accepted the IMF support, and Malaysia (1998), Pakistan (1998), Philippines (1998), Singapore (1998) that did not, followed the CIA very well too. Thus, we summarize from the graphical inspection that our specified model, equation (2), has at least some *ex post* forecasting capability for currency crises, and that there seems to be no discernible difference in predicting power between the two groups, implying that the fundamental situation between them before the crisis was not much different at least in triggering the currency crises.

We further perform the out-of-sample test to examine the forecasting accuracy of our model and to compare the results for the different sample groups. Our model is estimated over annual data series which start from 1990 and extend through 2000. Since the period of the sample observation is short (11 years), the model is estimated for CI using data up through 1999. Forecasts are generated at 2000 for all samples, the Middle & South American countries samples, and the Asian countries samples. The accuracy of our out-of-sample forecasts at 2000 is examined by the same measures as before, i.e. the root mean squared error (RMSE) and the Theil's U statistics. The results are summarized in Table 4.[36]

[36] Because of unavailability of the data for the Fiscal budget for 2000, the out-of-sample

A quick glance at Table 4 reveals that the qualitatively similar characteristics of forecasting accuracy to the in-sample forecasts (Table 2). Our model predicts CI at 2000 more accurately for the Middle & South American countries samples than the Asian countries samples for both RMSE and Theil's U statistics. To be more specific, our model predicts CI for the former samples about 60 percent more accurately with both RMSE and Theil's U measures.

2.2.3 Evaluation

Our empirical findings up to the previous subsection are summarized in the following three points. First, our empirical results using the panel data covering twenty countries of the Middle and South American and Asian countries for eleven years, show that statistically significant variables in the explanatory variables reflecting fundamentals are domestic credit (CRGDP) and fiscal budget (FDGDP). This means that the first-generation model could account for our sample currency crises, as these variables are consistent with the first-generation model. However some of the explanatory variables were not consistent with the theory and the other variables were even insignificant. These results suggest that, while we are partly successful in proving that some fundamentals variables have played an important role in our sample currency crises, we should take some other (possibly omitted) factors into consideration in addition to our fundamentals.

Secondly, according to the estimation results using the two divided sub-sample groups, the Middle and South American group and the Asian group, we realize that the convincing explanatory variables in one currency crisis episode may not apply directly to other crisis episodes. This result suggests that there seem to be some differences between the characteristics of the Middle and South American and Asian currency crises. Specifically, the differences were observed in the following points. In the Middle and South American currency crisis, the short-term external debt (SDFR) and domestic credit on the private sector (CRGDP) were significant, while bad bank loans (CPSGDP), current account (CAGDP) and fiscal expenditure (FDGDP) were inconsistent with the first-generation theory and statistically

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forecast tests are not conducted for Brazil, Malaysia, Korea, and Hong Kong.

insignificant. On the other hand, in the Asian countries, bank non-performing loans (CPSGDP) were significant, while the short-term external debt (SDFR), domestic credit on the private sector (CRGDP), current account (CAGDP) and fiscal expenditure (FDGDP) were inconsistent with the first-generation theory and statistically insignificant.

Thirdly, comparing the RMSE and Theil's U statistics from an in-sample test between the two crises, it can be concluded that variables reflecting fundamentals used in this paper could have better predicted the Middle and South American currency crisis.

Fourthly, also comparing the RMSE and Theil's U measures from our out-of-sample forecasts between the two crises, a qualitatively similar conclusion emerged. CI reflecting fundamentals could have better predicted the Middle and South American currency crisis.

However, it is not our intention to imply that there is no problem in our empirical analysis. First, there are some problems in the data. The problems are concerned with missing data and frequency, both of which had been commonly encountered because of imperfect data from developing countries. Secondly, a multi-collinear problem is potentially serious in estimation, as pointed out by Frankel and Rose (1996). Since we could expect some anticipated correlations between variables, *e.g.* between CRGDP and CAGDP, we suspect a multi-collinearity problem might undermine our estimation. Finally, as noticeable in Figure 1, our empirical model does not satisfactorily explain the two currency crises, and this is especially obvious for the Asian currency crisis. It may be suggested that future research should consider, in addition to fundamentals, other factors not only reflecting fundamentals but also expectations and contagion[37].

3. Conclusions

Although numerous theoretical and empirical studies on currency crises have been presented, the causes of currency crises have not yet been solved completely, and there still remain some points of arguments to be

[37] We also try to analyze the contagious effects through trade channel and financial sector, following the idea in Hattori (2002). However, since the results are rather poor, we did not report it here.

considered[38]. Moreover, it has sometimes been alleged that the true reasons for the currency crises such as the Middle and South American currency crisis in 1994, and the Asian currency crisis in 1997 have not yet been completely revealed. But, since the basic theoretical frameworks have been proposed in different purposes of analysis, empirical analyses could be carried out according to these frameworks.

This paper first surveyed the theoretical precedent studies on currency crises, and then empirically investigated whether the role of the fundamentals in the two currency crises is consistent with that implied in the first-generation model, using panel data with variables reflecting fundamentals. The results can be summarized in the following three points. Firstly, through econometric analysis we found that some variables were significant and consistent with the first-generation model. However, we also found that there are some other variables that were inconsistent with the theory and even statistically insignificant. These results suggest that, although some fundamental variables play an important role in the two currency crises, we should consider other factors in addition to our fundamentals. Secondly, from estimation results with divided data into the Middle and South American country group and the Asian country group, it became clear that there are slight differences in the explanatory variables for the causes of the two crises. Thirdly, from both an in-sample and out-of-sample tests, our specified model showed that variables reflecting fundamentals could better predict the Middle and South American currency crisis than the Asian currency crisis.

[38] For example, the problem of definition and threshold value of currency crisis (Frankel and Rose, 1996; Eichengreen, Rose and Wyplosz, 1994, 1995), sample dependency problem of data coverage and frequency (Edison, 2000), specific problems on the causes of currency crisis (Frankel and Rose, 1996) and so on.

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Table1. The sample countries of empirical analysis

No.	the Middle and South American countries	No.	the Asian countries
1	ARGENTINA	11	CHINA, P.R.: MAINLAND
2	BOLIVIA	12	CHINA, P.R.:HONG KONG
3	BRAZIL	13	INDIA
4	CHILE	14	INDONESIA
5	COLOMBIA	15	KOREA
6	ECUADOR	16	MALAYSIA
7	MEXICO	17	PAKISTAN
8	PERU	18	PHILIPPINES
9	URUGUAY	19	SINGAPORE
10	VENEZUELA, REP.	20	THAILAND

Table2. The empirical result

variable(sign)	all samples 20 countries	Middle and South American samples 10 countries	Asian samples 10countries
CPSGDP(+)	4.502	-15.315	12.907
standard error	4.666	2.595	7.423
p value	0.336	0.000	0.086
CRGDP(+)	9.971	8.411	9.356
standard error	3.624	1.886	5.801
p value	0.007	0.000	0.101
CAGDP(-)	2.879	-0.364	4.688
standard error	7.700	3.594	15.076
p value	0.709	0.919	0.757
FDGDP(-)	-30.638	-9.294	-50.467
standard error	17.809	6.272	36.297
p value	0.087	0.138	0.168
SDFR(+)	0.011	0.005	0.296
standard error	0.009	0.002	0.280
p value	0.235	0.027	0.294
C(constant)	—	0.238	—
standard error	—		—
p value	—	0.551	—
adopted model	fixed effect	random effect	fixed effect
Hausman test H0:RE vs. FE	16.091	4.035	10.051
p value	0.007	0.544	0.074
in-sample forcast			
RMSE	3.414	1.256	4.421
Theil`s U	0.845	0.777	0.821

(note)
CPSGDP: the ratio of the changes in the private loans by the commercial banks for the last four years to GDP, which is the proxy variable for bank' s non-performing loans
CRGDP:the ratio of the domestic credit on the private sector to GDP
CAGDP:the ratio of the current account to GDP
FDGDP:the ratio of the fiscal budget to GDP(FDGDP)
SDFR :the ratio of the short-term external debt to foreign exchange reserves

Table3.
The empirical result (the countries received IMF assistance and others)

variable(sign)	all samples		Middle and South American samples		the Asian samples	
	received	unreceived	received	unreceived	received	unreceived
sample of contries	5.000	15.000	2.000	8.000	3.000	7.000
CPSGDP(+)	21.423	-10.146	-1.386	-21.215	25.399	3.461
standard error	9.992	3.883	2.112	2.907	14.913	5.837
P value	0.032	0.010	0.523	0.000	0.089	0.556
CRGDP(+)	-1.517	12.296	-1.962	10.721	0.244	7.295
standard error	5.195	2.614	2.396	2.007	7.218	3.789
P value	0.770	0.000	0.428	0.000	0.973	0.060
CAGDP(-)	-5.649	-0.077	-19.864	-0.600	-32.902	13.610
standard error	31.537	4.404	7.612	3.617	57.770	7.325
P value	0.858	0.986	0.022	0.868	0.569	0.069
FDGDP(-)	-144.053	0.118	-6.325	-14.165	-241.577	17.575
standard error	65.331	10.309	7.760	6.458	127.374	18.209
P value	0.027	0.991	0.430	0.028	0.054	0.339
SDFR(+)	1.076	0.006	2.343	0.005	1.879	0.392
standard error	0.830	0.005	0.778	0.002	1.165	0.117
P value	0.194	0.181	0.010	0.013	0.101	0.001
C(constant)	-4.643	—	—	0.649	-8.693	—
standard error	2.597	—	—	0.428	5.597	—
P value	0.074	—	—	0.130	0.120	—
adopted model	random effect	fixed effect	fixed effect	random effect	random effect	fixed effect
Hausman test H0:RE vs. FE	4.812	22.998	8.050	4.941	2.048	17.437
P value	0.307	0.000	0.005	0.423	0.359	0.004
in-sample forcast						
RMSE	5.863	1.707	0.339	1.211	7.140	1.759
Theil`s U	0.865	0.772	0.648	0.667	0.822	0.686

(note1)
CPSGDP: the ratio of the changes in the private loans by the commercial banks for the last four years to GDP, which is the proxy variable for bank' s non-performing loans
CRGDP:the ratio of the domestic credit on the private sector to GDP
CAGDP:the ratio of the current account to GDP
FDGDP:the ratio of the fiscal budget to GDP(FDGDP)
SDFR :the ratio of the short-term external debt to foreign exchange reserves
(note2)
the countries who received the IMF assistance(5 countries)
the Middle and South America(2): Mexico, Argentina
the Asian countries Thailand

Table 4　The Out-Of-Sample Forecasting Accuracy

Measure	All Samples (16 countries)	Middle & South American samples (9 countries)	Asian samples (7 countries)
RMSE	1.765	1.265	3.066
Theil's U	0.502	0.321	0.800

Remarks:

RMSE: root mean squared error

Estimation period: 1990-1999

Forecast: 2000

Frequency: annual

Samples: Middle & South America (9 countries):

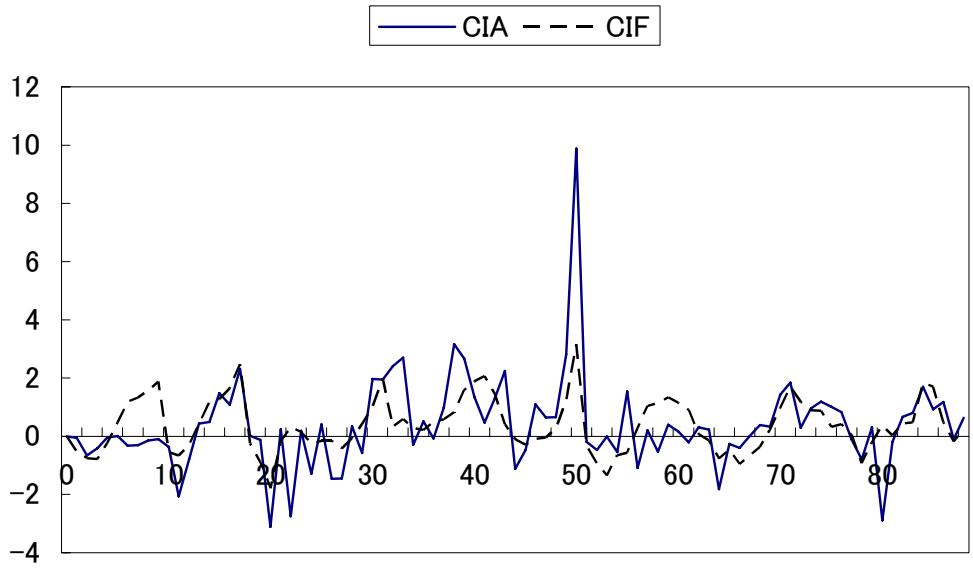
Argentina, Bolivia, Chile, Columbia, Ecuador, Mexico, Peru, Uruguay, Venezuela

Asia (7 countries):

China (Mainland), India, Indonesia, Pakistan, Philippines, Singapore, Thailand

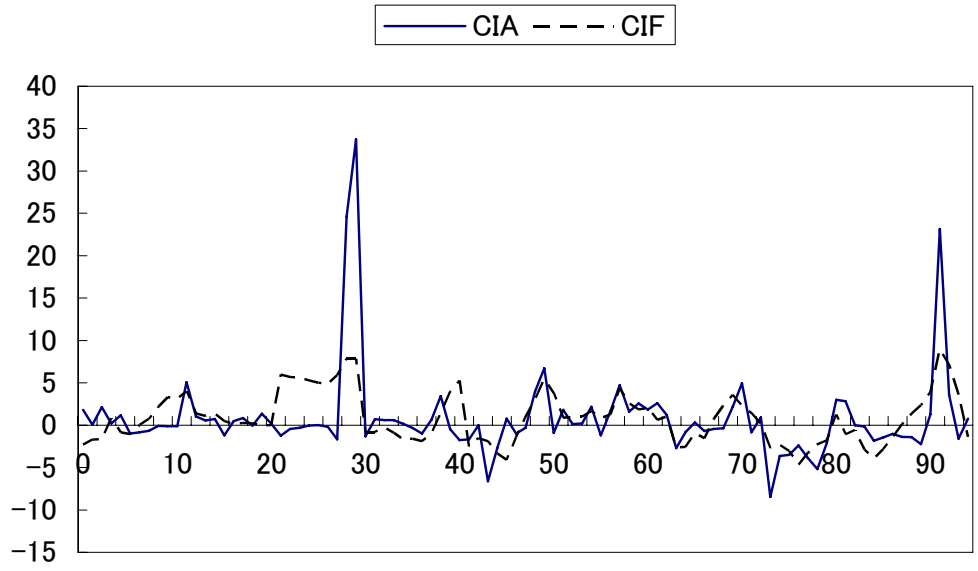
Figure1　The in-sample forcasting result:the actual value(CIA) & forcasting value(CIF)

plot of CIA and CIF in Middle and South American countries



Middle and South American countries
1-9:Argentina　10-17:Bolivia　18-21:Brazil　22-31:Chile
32-40:Colombia　41-50:Ecuador　51-61:Mexico　62-69:Peru
70-79:Uruguay　80-88:Venezuela

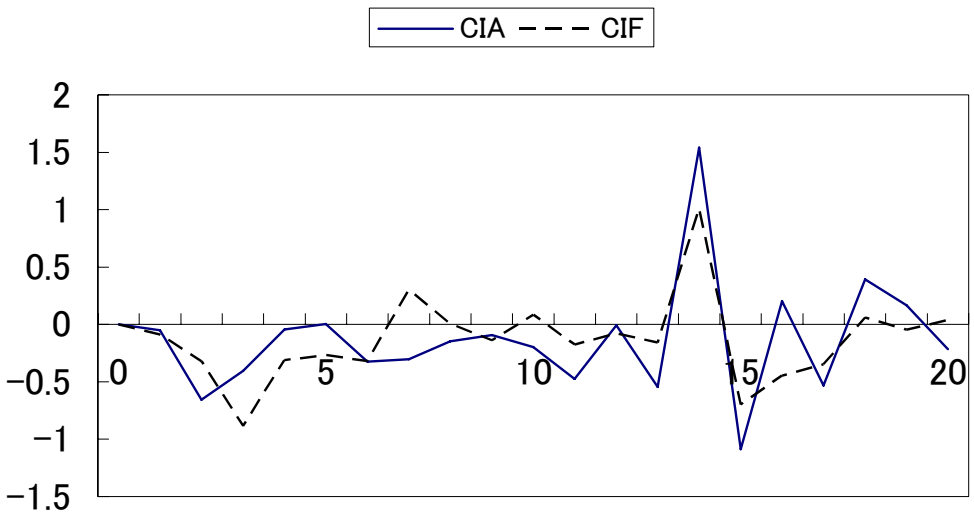
plot of CIA and CIF in Asian countries



Asian Countries
1-11:China(Mainland)　12-21:India　22-31:Indonesia　32-41:Korea
42-51:Malaysia　52-62:Pakistan　63-73:Philippines　74-84:Singapore
85-95:Thailand

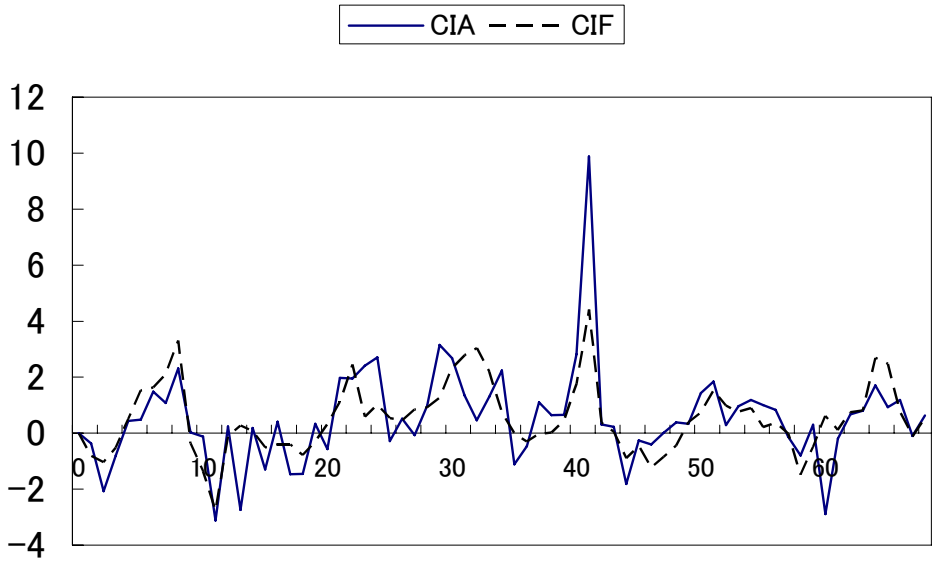
Figure2(1) The in-sample forcasting result:the actual value(CIA) & forcasting value(CIF) the Middle and South American countries

plot of CIA and CIF in 2 Middle and South American countries
(who received the IMF assistance)



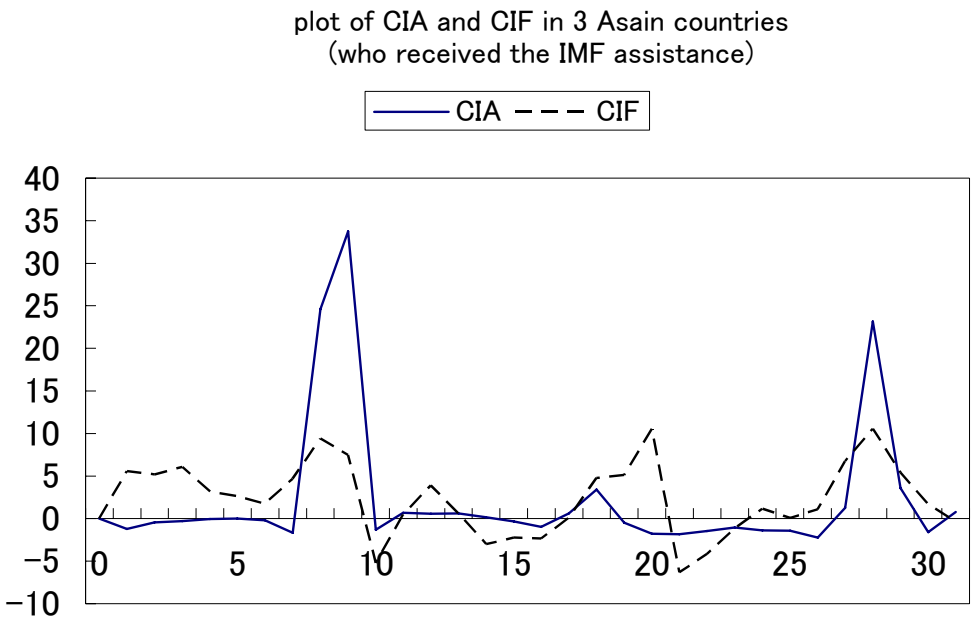
2 Countries
1-9:Argentina 10-20:Mexico

plot of CIA and CIF in 8 Middle and South American countries
(who didn't receive the IMF assistance)

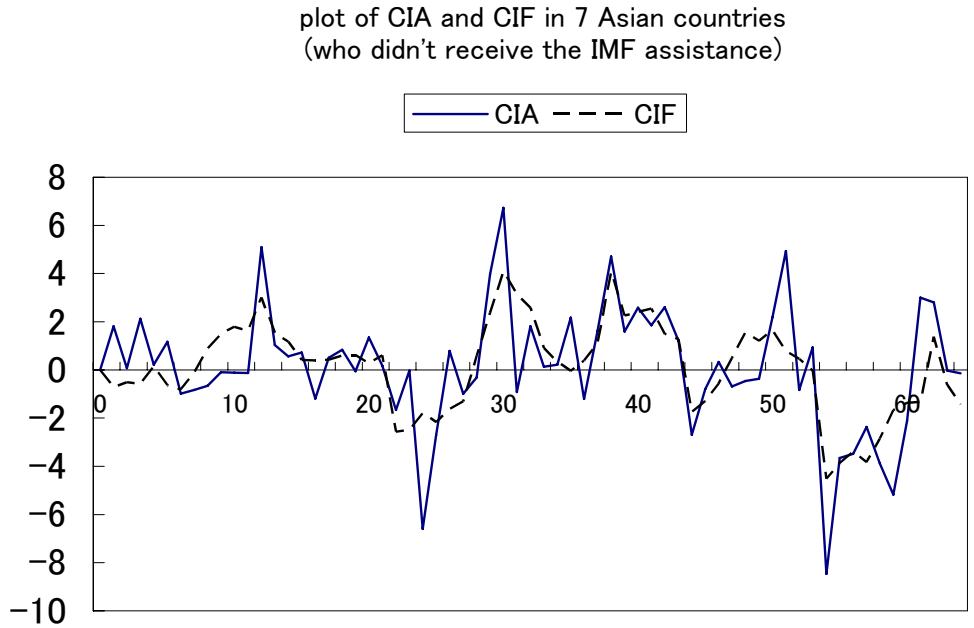


8 Countries
1-8:Bolivia 9-12:Brazil 13-22:Chile
23-31:Colombia 32-41:Ecuador 42-49:Peru
50-59:Uruguay 60-68:Venezuela

Figure2(2) The in-sample forcasting result:the actual value(CIA) & forcasting value(CIF) the Asian countries



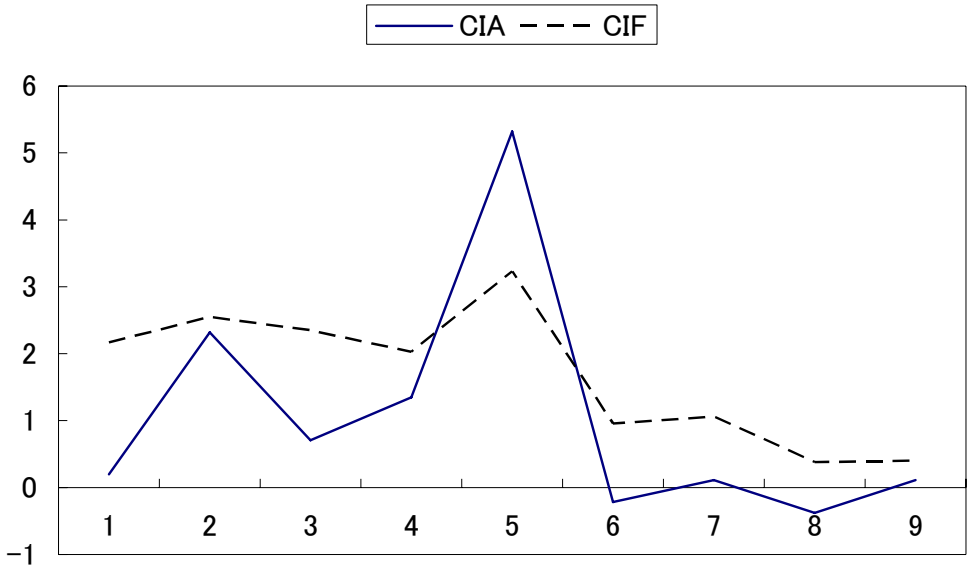
3 Countries
1-10:Indonesia 11-20:Korea 21-31:Thailand



7 Countries
1-11:China(Mainland) 12-21:India 22-31:Malaysia
32-42:Pakistan 43-53:Philippines 54-64:Singapore
China(Hongkong):no data

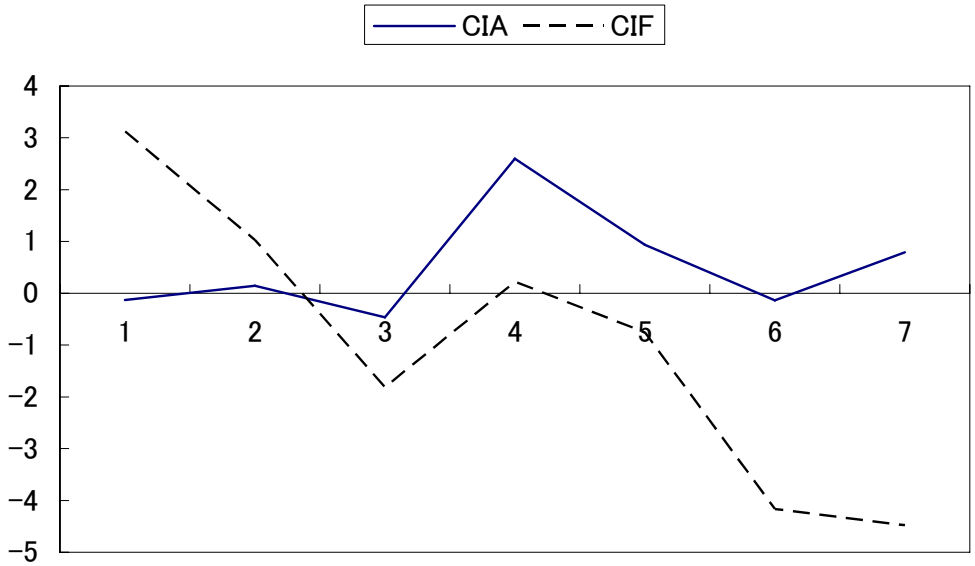
Figure3　The out-of-sample forcasting result:the actual value(CIA) & forcasting value(CI

plot of CIA and CIF in Middle and South American countries



Middle and South American countries
1:Argentina　2:Bolivia　3:Chile　4:Colombia　5:Ecuador
6:Mexico　7:Peru　8:Uruguay　9:Venezuela

plot of CIA and CIF in Asian countries



Asian Countries
1:China(Mainland)　2:India　3:Indonesia　4:Pakistan
5:Philippines　6:Singapore 7:Thailand

Appendix 1

List of variables related to the first generation model in precedent research

precedent research	sample country	explanatory variables	result
Otker and Pazarbasioglu (1994)	the developed countries (5 countries)	domestic credit/GDP	insignificant
Moreno (1995)	the developed and developing countries （7 countries）	domestic credit/money stock、the growth rate of money supply	insignificant
Eichengreen, Rose and Wyplosz (1995, 1996)	the developed countries （20 countries）	the growth rate of money supply	insignificant
Sachs, Tornell and Velasco (1996)	the developing countries （20 countries）	M2/foreign exchange reserve	significant
Kaminsky and Reinhart (1996)	the developed and developing countries （20 countries）	M2/foreign exchange reserve, domestic credit growth rate/GDP、over demanded money	M2/foreign exchange reserve is significant
Frankel and Rose (1996)	the developing countries (105 countries)	the growth rate of money supply	significant
Kaminsky, Lizondo and Reinhart (1998)	the developed and developing countries （20 countries）	Money supply/foreign exchange reserve、over demanded money、total domestic credit、	precedent indicators of currency crisis
Milesi-Ferretti and Razin (1998)	the developing countries (105 countries)	Foreign exchange reserve/M2	significant
Chinn, Dooley and Shrestha (1999)	the developed and developing countries （11 countries）	Domestic credit/foreign exchange reserve	significant

Appendix 2

Explanatory variables

CPSGDP

1. Claims on private sector of the deposit money bank(CPS):1986～2000
2. Claims on Central Bank and Government(CCBG):1986～2000
3. **the ratio of the changes in the private loans by the commercial banks for the last four years to GDP, which is the proxy variable for bank's non-performing loans (CRGDP):**CRGDPt = (CRt—CRt-4)/GDPt
   - hypothesized sign: positive

CRGDP

1. Domestic Credit(DC):1990～2000
2. Claims on Central Bank and Government(CCBG):1990～2000
3. domestic credit on the private sector (CR)＝DC—CCBG
4. **the ratio of the domestic credit on the private sector to GDP (CRGDP):**CRGDP =CR/GDP
   - hypothesized sign: positive

CAGDP

1. CA (Current Account):1990-2000
2. **the ratio of the current account to GDP (CAGDP)**=CA/GDP
   - hypothesized sign: minus

FDGDP

1. Government Finance (GF):1990-2000
2. **the ratio of the fiscal budget to GDP(FDGDP)**=GF/GDP
   - hypothesized sign: minus

SDFR

1. Short Debt(SD): Foreign short-term debt:1990-2000
2. Reserve: Foreign exchange reserves : 1990-2000
3. **the ratio of the short-term external debt to foreign exchange reserves (SDFR)**=SD/Reserve
   - hypothesized sign: positive

Appendix 3

List of data source

Exchange rate: IFS(International financial statistics：IMF)、item rf (Exchange rate, Principal rate)

Foreign exchange reserve: IFS、item 11.d (International liquidity, Total reserves minus Gold)

Domestic credit on the private sector: IFS、the value equal to the item 32 minus item32an（Monetary survey, Domestic credit minus claims in central govt.<net>）

Claims on the private sector of the deposit money bank: IFS、item 22.d (Claims on the private sector of the deposit money bank)

Current account: IFS、item 78ald(International transactions, current account)

Fiscal budget：IFS、item 80(Government finance, deficit or surplus)

GDP：IFS、item 99b(National accounts, gross domestic product)

Short-term external debt: Joint BIS-IMF-OECD-World Bank statistics on external debt, BIS, IMF, OECD, World Bank (G. Liabilities to banks-due within a year